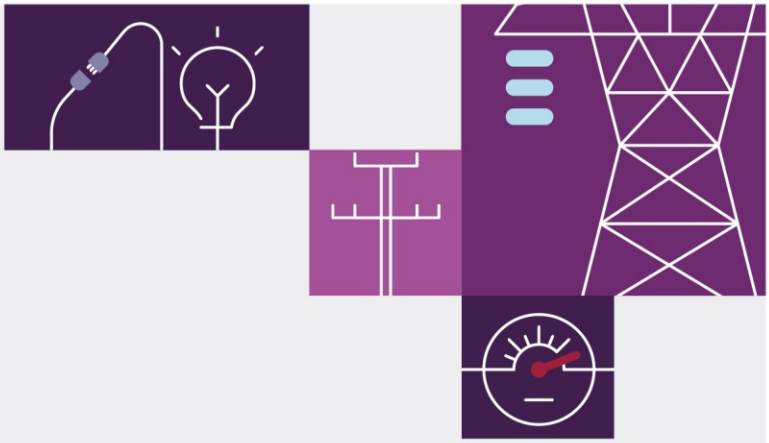
Appendix 3. Renewable Energy Zones

June 2024

Appendix to the 2024 Integrated System Plan for the National Electricity Market



Important notice

Purpose

This is Appendix 3 to the 2024 Integrated System Plan (ISP) which is available at https://aemo.com.au/energy-systems/major-publications/integrated-system-plan-isp. AEMO publishes the 2024 *Integrated System Plan* (ISP) pursuant to its functions under section 49(2) of the National Electricity Law (which defines AEMO's functions as National Transmission Planner) and its supporting functions under the National Electricity Rules. This document is generally based on information available to AEMO as at 1 May 2024 unless otherwise indicated.

Disclaimer

AEMO has made reasonable efforts to ensure the quality of the information in this publication but cannot guarantee that information, forecasts and assumptions are accurate, complete or appropriate for your circumstances.

Modelling work performed as part of preparing this publication inherently requires assumptions about future behaviours and market interactions, which may result in forecasts that deviate from future conditions. There will usually be differences between estimated and actual results, because events and circumstances frequently do not occur as expected, and those differences may be material.

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Version control

Version	Release date	Changes
1.0	26/6/2024	Initial release.

AEMO acknowledges the Traditional Owners of country throughout Australia and recognises their continuing connection to land, waters and culture. We pay respect to Elders past and present.

ISP Appendices

Contents

Figures

Executive summary

AEMO's *Integrated System Plan* (ISP) is a roadmap for the transition of the National Electricity Market (NEM) power system, with a clear plan for essential infrastructure that will meet future energy needs. The ISP's optimal development path (ODP) sets out the needed generation, storage and network investments to transition to net zero by 2050 through current policy settings and deliver significant net market benefits for consumers.

Renewable energy zones (REZs) are high-quality resource areas where clusters of large-scale renewable energy projects can be developed using economies of scale. New network investment will be required to connect these areas, and efficiently and reliably supply consumers as coal generators retire.

Renewable energy is playing a crucial role in the energy transition. The 2024 ISP forecasts a requirement for approximately 127 gigawatts (GW) of utility-scale variable renewable energy (VRE) by 2049-50 in the *Step Change* scenario. AEMO recognises the importance of coordinated and efficient REZ development in supporting state and federal governments to achieve emission reduction policies. AEMO is continuing to work with jurisdictions to ensure the ISP reflects their policies and development plans.

This Appendix 3 identifies a selection of candidate REZs as well as the renewable energy opportunities within them and the network investment needed for their development[1]. It sets out:

- **A3.1 REZ candidates**:
  - A map of the 43 short-listed REZs across eastern and south-eastern Australia that AEMO has identified following rigorous consultation.
  - An overview of how these candidate zones were identified, including information on indigenous interests.
- **A3.2 REZ development overview** to help NEM stakeholders visualise the scale and speed of expected VRE development projected in all scenarios:
  - Information on resource diversity, expected capacity factor and curtailment (as REZs with high-quality wind and solar resources generally experience high network utilisation and low curtailment).
  - An outline of jurisdictional regulatory frameworks for REZ development.
- **A3.3 Regional outlook and REZ scorecards**
  - Regional outlook to help NEM stakeholders visualise the scale and speed of expected VRE development projected in all scenarios, highlighting REZs of greatest near-term interest.
  - REZ scorecards to provide NEM stakeholders with detailed data for specific REZs in all scenarios.

[1] Outcomes presented in this appendix are based on the optimal development path (ODP), which is CDP14 described in Appendix 6. Cost benefit analysis.

Key changes from the Draft 2024 ISP

AEMO notes the following key changes for Appendix 3 between the Draft 2024 ISP and the 2024 ISP.

Changes to REZ geographic boundaries

- Boundaries for Southern Ocean and North Tasmania Coast offshore REZs updated to align with proposed and declared areas published by the Federal Government.

Changes to REZ resource limits

- Resource limit update for Southern Ocean and North Tasmania Coast offshore REZ boundary changes, for both fixed and floating offshore wind turbine structures.
- Updated timing for the planned South West New South Wales (N5) REZ network capacity increase due to a delay in Project EnergyConnect delivery.

Changes to REZ transmission limits

- Corrected the modelling of the South West Queensland (SWQLD1) REZ transmission limit across seasonal ratings to reflect latest advice and align with the 2023 IASR Assumptions Workbook.
- Revised the Mid-North South Australia (MN1) transmission limit from 2,400 megawatts (MW) to 2,000 MW based on updated advice provided by ElectraNet.

Changes to REZ group constraints

- The South West Victoria (SWV1) group constraint has been revised to reflect the Mortlake turn-in project supporting 1,100 MW of transfer capacity (average additional generation output during peak summer periods), which was previously modelled as 1,500 MW (under optimal network conditions). This is based on joint planning advice.
- Updated augmentation options for South East Victoria (SEVIC1) group constraint, capturing operational adjustments post-retirement of Yallourn Power Station, as a result of joint planning. Option 1, costs, scope and capacity have been revised, reflecting the uplift from the inclusion of an additional transformer, and the former Option 2 has been removed.
- Revised the Mid-North South Australia (MN1) group constraint cost estimate, based on updated advice provided by ElectraNet.
- Updated the South West New South Wales (SWNSW1) group constraint to reflect the impact of new non-network options.

A3.1 REZ candidates

A3.1.1 Identifying REZ candidates

REZ candidates were initially developed in consultation with stakeholders for the 2018 ISP[2] and used as inputs to the ISP model. These candidates have been continuously updated and refined through subsequent ISP and *Inputs, Assumptions and Scenarios Report* (IASR) consultation processes.

Since the 2022 ISP, considerable government and transmission network service provider (TNSP) development of REZs has taken place. Jurisdictions have progressed REZ development through REZ roadmaps and emission reduction, energy generation and storage targets enshrined in policy.

An efficiently located REZ can be identified by considering a range of factors, primarily:

- Quality of renewable resources, diversity relative to other renewable resources, and correlation with demand.
- The cost of developing or augmenting transmission connections to transport the renewable generation produced in the REZ to consumers.
- The proximity to load, and the network losses incurred to transport generated electricity to load centres.
- The critical physical requirements to enable the connection of new resources (particularly inverter-based equipment) and ensure continued power system security.

Futher details on the selection of REZ candidates is detailed in the IASR[3], and the 43 REZs are shown in Figure 1. Details and costs of REZ augmentation options are provided in the 2023 *Transmission Expansion Options Report*[4].

Renewable energy developers, network companies and governments are responsible for development of REZs, including early and active engagement with communities, land title holders and affected persons as part of the detailed designs for REZs.

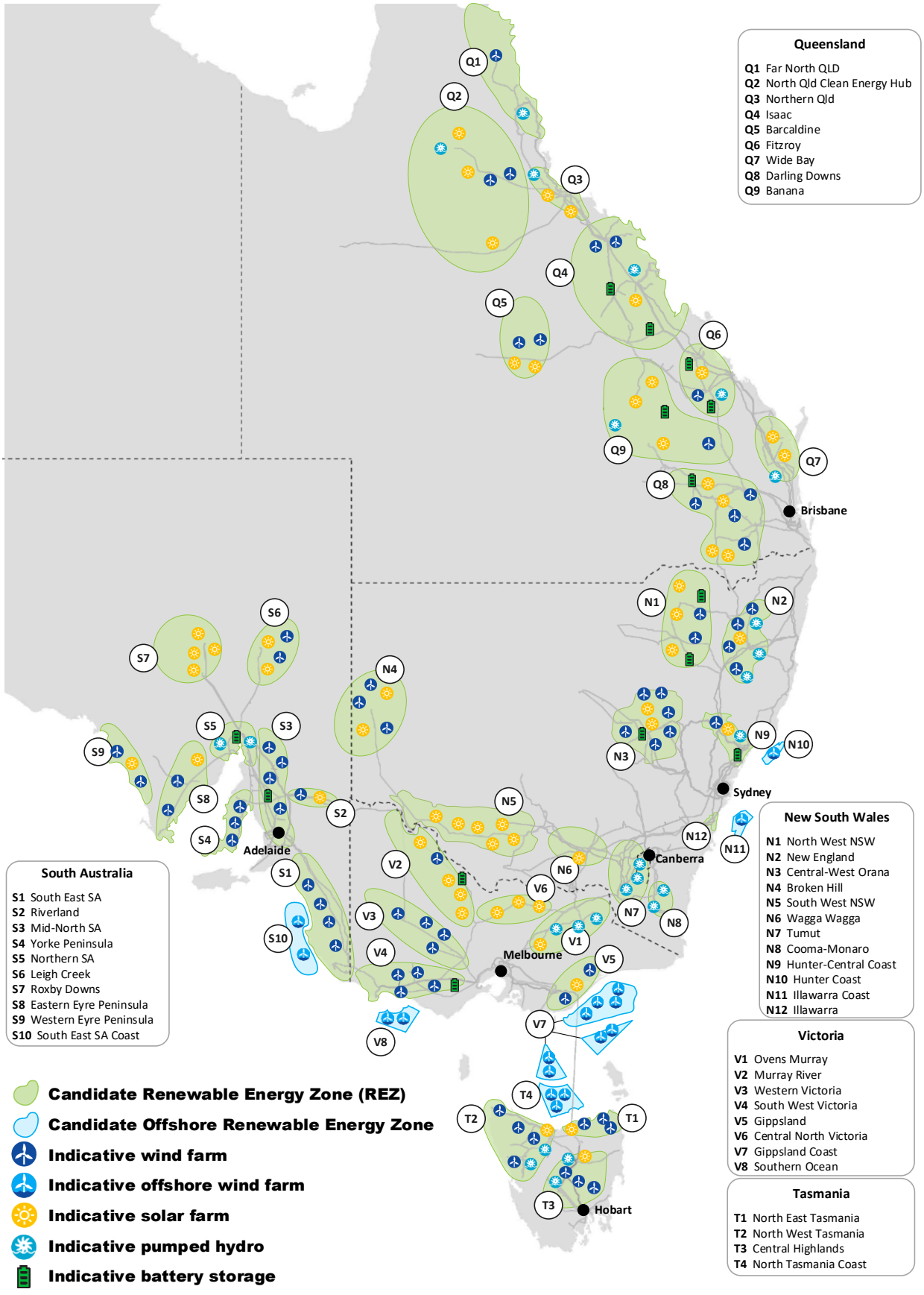
The following sections in this appendix present AEMO's identification of REZs within each NEM region. AEMO has worked with state and federal governments as part of defining the locations and renewable resources within the REZs in each state.

[2] At https://aemo.com.au/-/media/files/electricity/nem/planning_and_forecasting/isp/2018/integrated-system-plan-2018_final.pdf?la=enandhash=40A09040B912C8DE0298FDF4D2C02C6C.

[3] At https://aemo.com.au/consultations/current-and-closed-consultations/2023-inputs-assumptions-and-scenarios-consultation.

[4] At https://aemo.com.au/consultations/current-and-closed-consultations/2023-transmission-expansion-options-report-consultation.

Figure 1 2024 REZ candidates



A3.1.2 Indigenous interests

REZ developments could provide a range of opportunities for Indigenous communities in regional and remote areas. As REZs progress from concepts to pre-feasibility studies, it is important that Traditional Owners and land councils are consulted early, often and throughout the development process. Early and genuine engagement can:

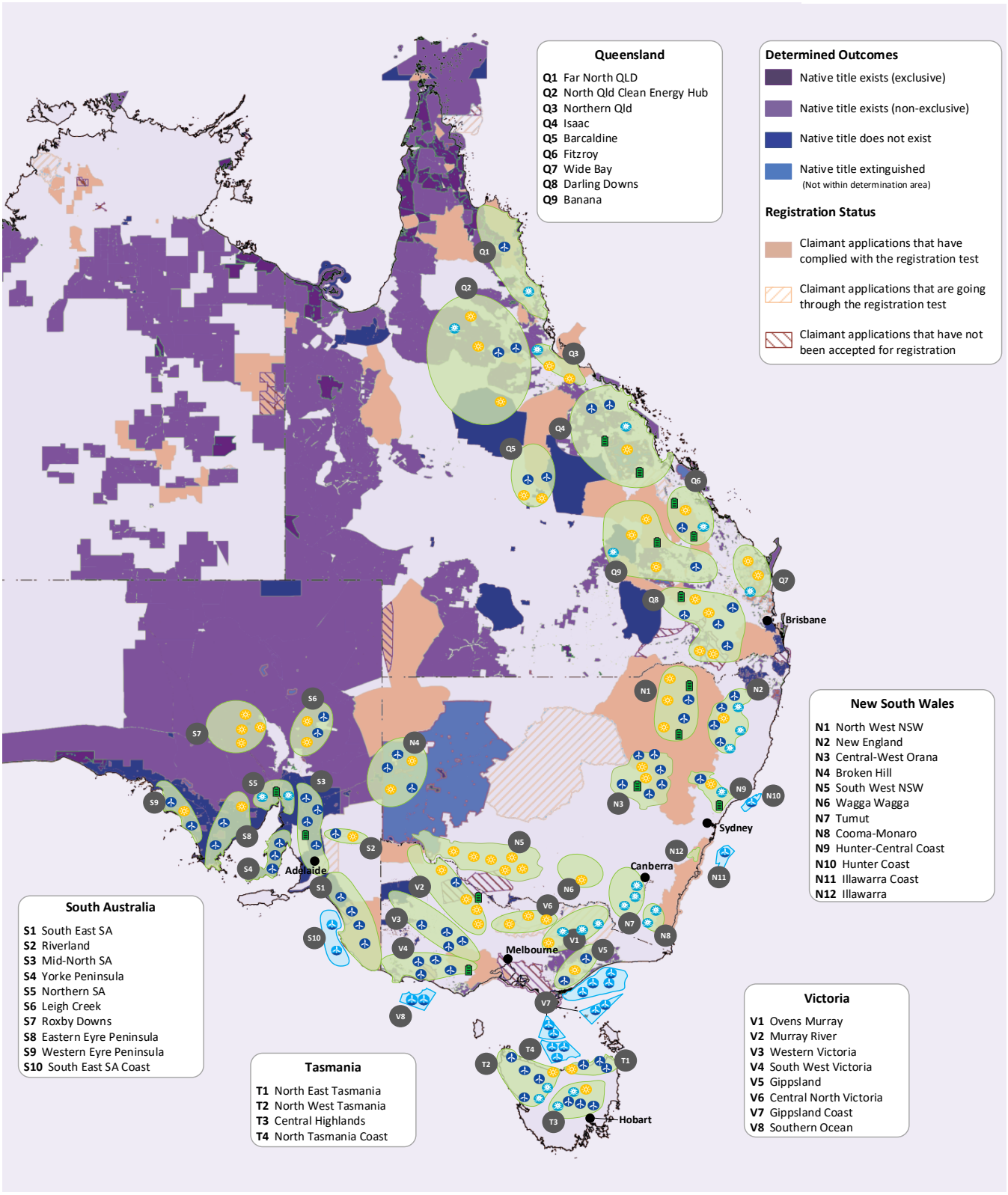
- Improve designs by considering local knowledge.
- Minimise the impact on areas of cultural significance.
- Provide training, employment and other opportunities for local First Nations people.
- Build and maintain the social licence to deliver timely infrastructure.

The National Native Title Tribunal has developed a map of *Native Title Determinations and Claimant Applications*[5]. This map illustrates determination outcomes for native title claimant applications across Australia.

Figure 2 overlays candidate REZs across the native title map to illustrate the broader impacts that energy infrastructure development could have on Indigenous lands and interests, and to highlight a significant overlap between Indigenous land granted and potential energy infrastructure.

[5] National Native Title Tribunal Schedule and Determinations map. May 2024, at http://www.nntt.gov.au/Maps/Schedule_and_Determinations_map.pdf.

Figure 2 Candidate REZs shown on the National Native Title Tribunal, Native Title Determinations and Claimant Applications map



This figure has been reproduced with the permission of the National Native Title Tribunal.

A3.2 REZ development overview

This 2024 ISP projects the need for 83 GW of utility-scale VRE in the NEM out to 2034-35 in the *Step Change* scenario. Allowing for the strong growth in consumer energy resources (CER), the NEM will still need 87 GW to 374 GW of VRE by 2049-50, depending on the scenario. To supply consumers with reliable, low-cost electricity, this ISP considers efficient VRE development by identifying candidate REZs with strong development factors.

The factors that generally affect the development of a REZ include, but are not limited to:

- Energy targets, policies and scenarios.
- Resource quality.
- Existing transmission network capacity.
- Demand correlation.
- Cost of developing or augmenting the transmission network.
- Proximity to the load centre.
- Social licence, or the trust and social acceptance for the development of generation, storage and associated network, by the people most affected by its impacts, opportunities and challenges.

In every scenario – *Progressive Change, Step Change and Green Energy Exports* – large increases in VRE are needed. Targeted and strategic investment is required to balance resources across states and unlock much-needed REZs.

Figure 3 to Figure 5 illustrate the co-optimised geographical dispersion of VRE development for 2029-30, 2039-40 and 2049-50 in each scenario.

In the next decade, *Progressive Change* and *Step Change* projections demonstrate more wind capacity is needed to complement the strong uptake of distributed photovoltaics (PV). Once there is sufficient storage and network investment to take advantage of cheaper solar resources, utility-scale solar development accelerates out to the end of the modelling horizon. Rapid VRE development is required across the entire modelling timeline for utility-scale solar and wind in the *Green Energy Exports* projections.

Geographical VRE dispersion in each scenario emphasises the importance of efficient, coordinated and priority development of REZ candidates.

Figure 3 Forecast geographic dispersion of new VRE developments in the *Step Change* scenario in 2029-30 (left), 2039-40 (middle), 2049-50 (right)

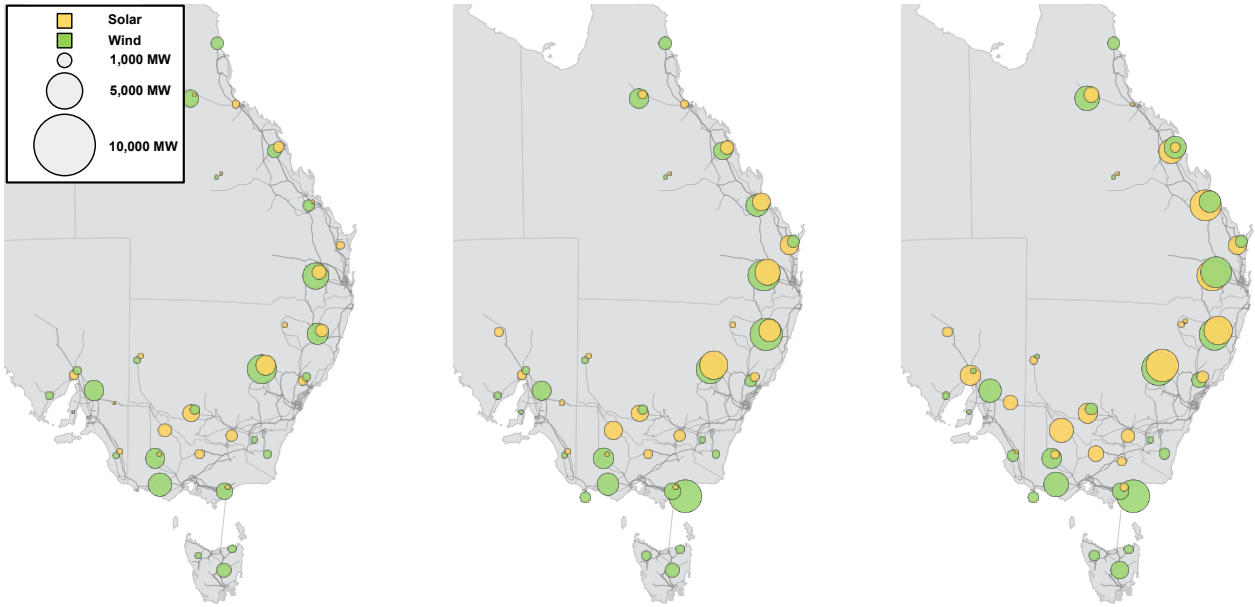


Figure 4 Forecast geographic dispersion of new VRE developments in the *Progressive Change* scenario in 2029-30 (left), 2039-40 (middle), 2049-50 (right)

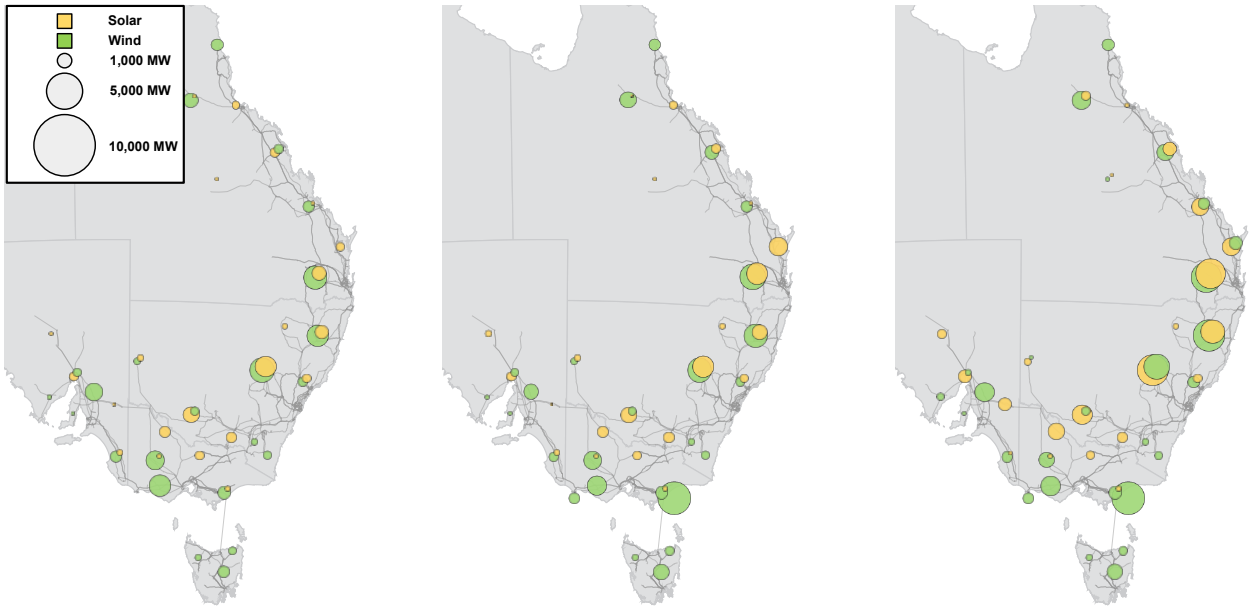
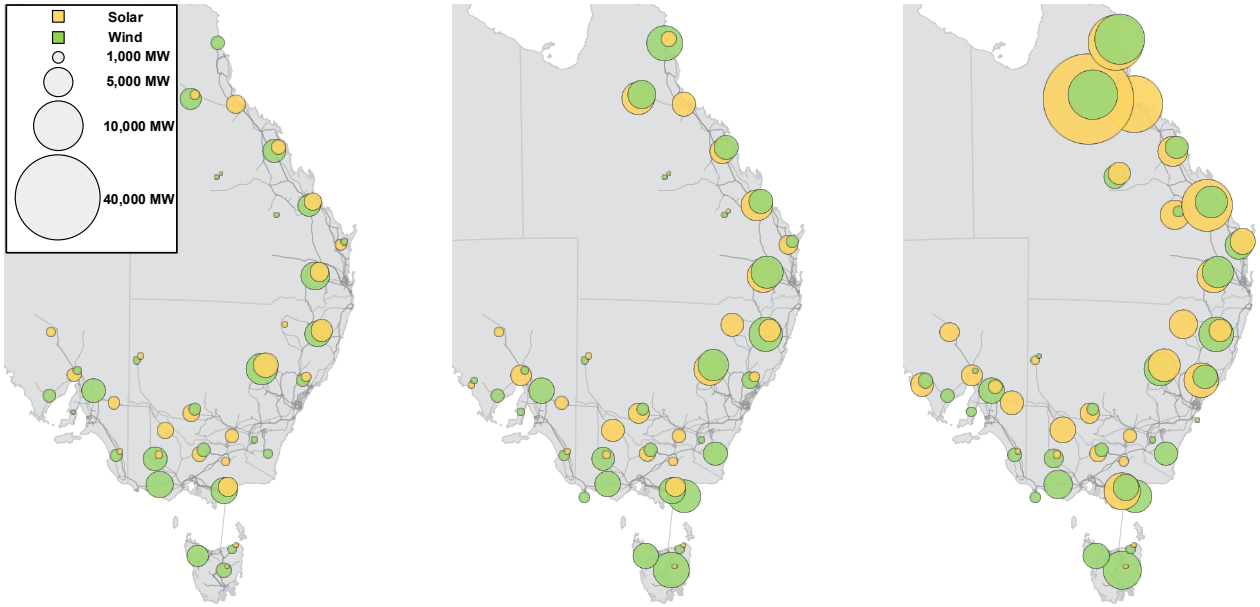


Figure 5 Forecast geographic dispersion of new VRE developments in the *Green Energy Exports* scenario in 2029-30 (left), 2039-40 (middle), 2049-50 (right)



A3.2.1 Diversity of resources in REZs

In the 2024 ISP, AEMO is seeking to optimise investment in wind, solar and transmission development within each REZ. This optimisation allows for the consideration of resource diversity, economic spill[6] and transmission curtailment[7] to maximise the development of VRE while minimising the transmission network expansion.

As an example, Figure 6 illustrates the forecasted cumulative utility-scale VRE, economic spill and transmission curtailment in *Step Change,* across the NEM. To accommodate the projected utility-scale VRE[8] of approximately 127 GW by 2050, the forecast economic spill is 14% and transmission curtailment is approximately 6%.

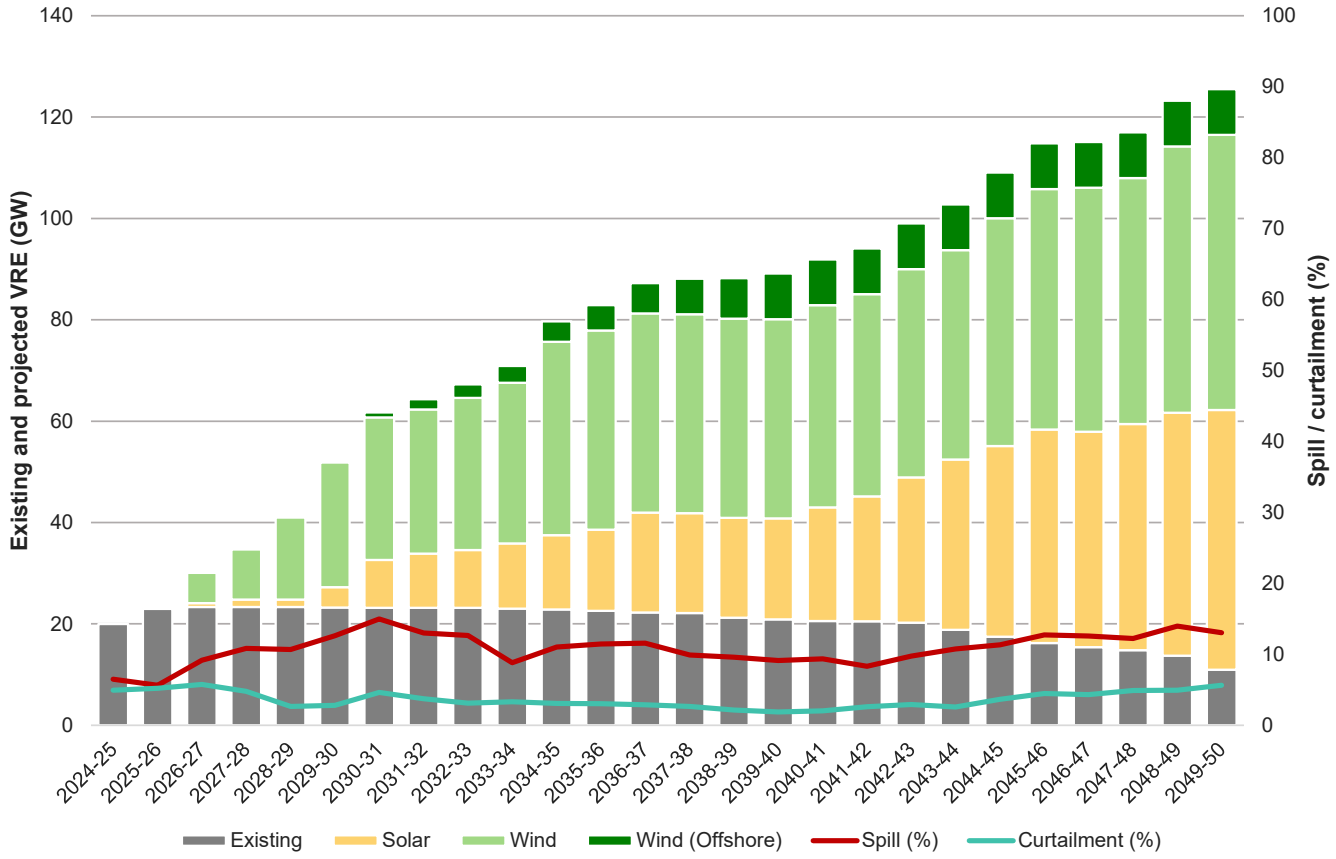
Optimising VRE build is a balance between maximising VRE expansion and developing sufficient transmission and distribution, and storage capacity. It is uneconomic to develop capacity to capture all peak VRE generation potential and some degree of economic spill and transmission curtailment is inevitable. To 2029-30, economic spill increases with rapid VRE expansion and transmission curtailment declines as several transmission projects come online. To 2049-50, economic spill and transmission curtailment fluctuate as coal retires, VRE capacity increases, and regional demand shifts. Further detail on VRE curtailment is provided in Appendix 4.

[6] Economic spill occurs when generation reduces output due to market price.

[7] Transmission curtailment occurs when generation is constrained down or off due to operational limits.

[8] Figures referring to “utility-scale VRE” do not include CER, for example rooftop PV.

Figure 6 Projected utility-scale VRE in REZ for the NEM, economic spill and transmission curtailment, *Step Change* scenario (GW)



A3.2.2 Regulatory framework for REZ development

AEMO aims to incorporate renewable energy targets and REZ development plans from state and federal governments into ISP modelling. Additionally, the REZ design report[9] framework in the National Electricity Rules (NER) aims to improve network planning for REZs.

This framework allows AEMO to trigger the requirement to prepare a REZ design report by the jurisdictional planning body if:

- A REZ including transmission network development is specified on the ODP of an ISP within 12 years of the publication of that ISP, and
- AEMO considers the Minister of the relevant jurisdiction supports the preparation of a REZ design report.

The requirement to prepare a REZ design report places obligations on the jurisdictional planning body to undertake consultation with potential generators, local councils, local community members, members of the public and any other relevant stakeholders wishing to express their views about developments in the REZ.

[9] NER clause 5.24.1 REZ design reports. At https://energy-rules.aemc.gov.au/ner/347/37958.

Additionally, recent NER changes[10] require the jurisdictional planning body and TNSPs (in their capacity as regulatory investment test for transmission (RIT-T) proponents) to engage with interested parties, including local community members, as part of preparatory activities in the planning process in accordance with community engagement expectations. Specifically, the NER require TNSPs to engage with interested parties when planning for ISP projects and REZ stages from the development of the ISP, through the joint planning process, to the completion of the RIT-T.

Similar to the 2022 ISP, the 2024 ISP does not require any REZ design reports to be prepared, in part because some jurisdictions are now progressing REZ projects under their own jurisdictional frameworks[11] rather than the ISP framework. Additionally, AEMO receives information on REZ design considerations from the jurisdictional planning bodies through preparatory activities.

A3.2.3 REZ group constraints

The transmission network is a complex and interconnected system. Transmission flows are influenced by generation and system services across multiple locations. Within AEMO's capacity outlook model, simplifications are needed to represent the power system to keep the optimisation problem tractable, which may rely on flow limits being influenced by single REZ outcomes. To address this need, "group constraints" are applied. These constraints combine either the generation from more than one REZ, or the generation within a REZ with the power flow along a flow path, to reflect network limits that apply to multiple areas of the power system.

The 2023 IASR[12] contains a complete list of the group constraints that apply in the capacity outlook model. These have been developed by considering the limits observed from power system analysis, and in consultation with TNSPs.

[10] AEMC. *Enhancing community engagement in transmission building*, at https://www.aemc.gov.au/rule-changes/enhancing-community-engagement-transmission-building. These NER changes commenced operation on 5 December 2023.

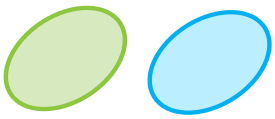
[11] *Electricity Infrastructure Investment Act 2020* (NSW) and the *Energy (Renewable Transformation and Jobs) Act 2024* (Qld).

[12] At https://aemo.com.au/en/consultations/current-and-closed-consultations/2023-inputs-assumptions-and-scenarios-consultation.

A3.3 Regional outlook and REZ scorecards

A3.3.1 REZ scorecard details

The REZ scorecards in this section provide an overview of the characteristics of each REZ. The following table explains the criteria in the scorecards.

<table>
<tr><th colspan="7">REZ report card details</th></tr>
<tr><td colspan="7">REZ assessments</td></tr>
<tr><td>REZ grouping</td><td colspan="6">REZs are grouped into the following:
• REZs where design and community engagement are progressing.
• REZs where the coordination of generation infrastructure may be required.
• REZs where the coordination of transmission and generation infrastructure is required.
• REZs where the coordination of transmission and generation infrastructure can start later.</td></tr>
<tr><td colspan="7">Renewable resources</td></tr>
<tr><td rowspan="2">Map legend</td><td colspan="6">Indicative generation is shown based on the Step Change VRE outlook in 2040:</td></tr>
<tr><td colspan="2">Wind
 
Offshore Wind
 
The green and blue shading shows the indicative geographic area of onshore and offshore REZs, respectively. Augmentation options shown are described in more detail in the Transmission Expansion Options Report[13].</td><td colspan="2">Solar
  </td><td colspan="2">Hydro
 
  </td></tr>
<tr><td rowspan="10">Metrics</td><td colspan="6">Resource quality for solar is the average capacity factor based on 11 reference years:</td></tr>
<tr><td>≥30%</td><td>≥28%</td><td>≥26%</td><td>≥24%</td><td>≥22%</td><td><22%</td></tr>
<tr><td>A</td><td>B</td><td>C</td><td>D</td><td>E</td><td>F</td></tr>
<tr><td colspan="6">Resource quality for wind is the average capacity factor based on 11 reference years:</td></tr>
<tr><td>≥45%</td><td>≥40%</td><td colspan="2">≥35%</td><td>≥30%</td><td><30%</td></tr>
<tr><td>A</td><td>B</td><td colspan="2">C</td><td>D</td><td>E</td></tr>
<tr><td colspan="6">Demand correlation describes whether the REZ resources are available at the same time as the regional demand, using a statistical correlation factor. A higher correlation represents that the resource is more available at regional demand:</td></tr>
<tr><td>≥0.12</td><td>≥0.06</td><td>≥0.0</td><td>≥-0.10</td><td>≥-0.20</td><td><-0.20</td></tr>
<tr><td>A</td><td>B</td><td>C</td><td>D</td><td>E</td><td>F</td></tr>
<tr><td colspan="6">Loss factor robustness is a sensitivity of marginal loss factor (MLF) to additional generation inside the REZ. This is calculated using Step Change scenario outcomes during the Final 2024 ISP. The measure used is the additional generation (in megawatts (MW)) that can be added before the MLF changes by -0.05:</td></tr>
<tr><td>≥1,000</td><td>≥800</td><td>≥600</td><td>≥400</td><td>≥200</td><td><200</td></tr>
<tr><td>A</td><td>B</td><td>C</td><td>D</td><td>E</td><td>F</td></tr>
<tr><td colspan="6">Renewable potential outlines possible REZ size in MW based on the geographical size and resource quality in the REZ. Additional capacity (in MW) above the resource limit is allowed for within the market modelling, but this incurs a penalty factor to account for likely social licence and</td></tr>
</table>

[13] At https://aemo.com.au/consultations/current-and-closed-consultations/2023-transmission-expansion-options-report-consultation.

<table>
<tr><th colspan="3">REZ report card details</th></tr>
<tr><td></td><td colspan="2">community support costs. This can occur for all scenarios, but is predominantly seen in the Green Energy Exports results.</td></tr>
<tr><td colspan="3">Climate hazard</td></tr>
<tr><td></td><td colspan="2">The REZ temperature score is based on the projected once in 10-year maximum temperatures[A] for the years 2030 and 2050. Temperature scores for offshore REZs consider the area on land that is expected to connect.</td></tr>
<tr><td></td><td>Score</td><td>Description</td></tr>
<tr><td></td><td>A</td><td>Between 28°C and 38°C</td></tr>
<tr><td></td><td>B</td><td>Between 30°C and 44°C</td></tr>
<tr><td></td><td>C</td><td>Between 32°C and 48°C</td></tr>
<tr><td></td><td>D</td><td>Between 34°C and 50°C</td></tr>
<tr><td></td><td>E</td><td>Between 44°C and 52°C</td></tr>
<tr><td>Bushfire</td><td colspan="2">The REZ bushfire score is based on the projection of annual average FFDI "high" fire danger days[B] around the years 2030 and 2050 and the probability of large bushfires occurring (a dominant input). Bushfire scores for offshore REZs consider the area on land that is expected to connect.</td></tr>
<tr><td></td><td>Score</td><td>Description</td></tr>
<tr><td></td><td>A</td><td>Model projections associate less than half the days of a year with high fire danger days and a probability of zero large fires in 20 years.</td></tr>
<tr><td></td><td>B</td><td>Model projections associate less than half the days of a year with high fire danger days and a probability of one large fire in 20 years.</td></tr>
<tr><td></td><td>C</td><td>Model projections associate more than half the days of a year with high fire danger days and a probability of one large fire in 20 years.</td></tr>
<tr><td></td><td>D</td><td>Model projections associate more than half the days of a year with high fire danger days and a probability of between one and four large fires in 20 years.</td></tr>
<tr><td></td><td>E</td><td>Model projections associate more than half the days of a year with high fire danger days and a probability of one large fire in three years.</td></tr>
<tr><td colspan="3">Variable generation outlook</td></tr>
<tr><td>Scenario</td><td colspan="2">Long-term market simulations of different scenarios named Progressive Change, Step Change and Green Energy Exports.</td></tr>
<tr><td>Existing, committed and anticipated generation</td><td colspan="2">The existing, committed and anticipated generation as of 21/11/2023, based on the October 2023 Generation information page published by AEMO. This metric includes some data not used as an input to ISP modelling.</td></tr>
<tr><td>Projected variable generation</td><td colspan="2">Long-term market simulations of projected variable energy outlook for utility-scale solar and wind generation at different times intervals across all scenarios. All VRE projections are based on the optimal development path and is in addition to existing, committed and anticipated generation. All values are rounded to the nearest 50 MW.</td></tr>
<tr><td colspan="3">Transmission expansion forecasts</td></tr>
<tr><td>Transmission limit</td><td colspan="2">The limit represents the network limit for the total VRE within a REZ. REZ expansion options are generally linearised, that is, they are not discrete options.</td></tr>
<tr><td>Transmission curtailment</td><td colspan="2">Curtailment happens when generation reduces output due to transmission network congestion. It is represented as a percentage of VRE. The transmission curtailment is calculated based on the DLT zonal network model representation and is rounded to nearest 1%.</td></tr>
<tr><td>Economic spill</td><td colspan="2">Economic spill happens when generation reduces output due to market price. It is represented as a percentage of VRE and rounded to nearest 1%.</td></tr>
</table>

A. Once in 10-year maximum temperature data was provided by the Commonwealth Scientific and Industrial Research Organisation (CSIRO) for 2030 and 2050.
B. A "high" fire danger day is defined as any day where the Forest Fire Danger Index (FFDI) is greater than 12.
C. Advised seasonal generation capacities are taken into account in the modelling and are detailed in the Inputs and Assumptions Workbook.

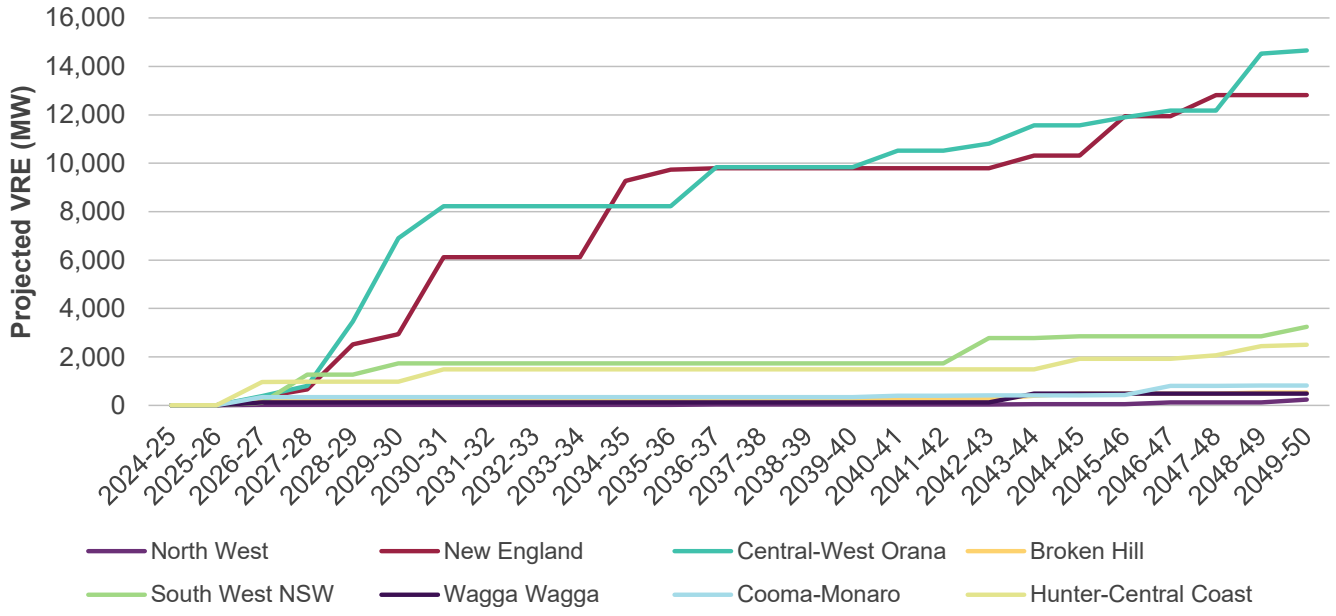
A3.3.2 New South Wales

VRE outlook

In New South Wales, over 34 GW of new utility-scale wind and solar VRE located in REZs is expected to be required by 2050 to assist in replacing retiring coal-fired generation capacity. Figure 7 shows the utility-scale VRE projected for each REZ in New South Wales under *Step Change*. This modelling indicates:

- From the start of the study horizon, there is a rapid increase in VRE in the Central-West Orana REZ, with 3,500 MW new VRE capacity by 2028-29. By 2029-30 this has increased to 6,900 MW, and by 2036-37 is over 9,800 MW.
- There is 2,500 MW of VRE capacity installed by 2028-29 in the New England REZ, with installed capacity reaching 9,750 MW by 2035-36.
- South West New South Wales shows approximately 1,750 MW of VRE developments from 2029-30, and about 3,250 MW by 2049-50.
- Other REZs in New South Wales – such as Wagga Wagga, Hunter-Central Coast and Cooma-Monaro – also see smaller developments later in the study horizon, and account for less than 11% of the total projected utility -scale VRE developments in New South Wales.
- No offshore wind development is projected in the *Step Change* results for New South Wales, largely due to the assumptions around cost and availability.

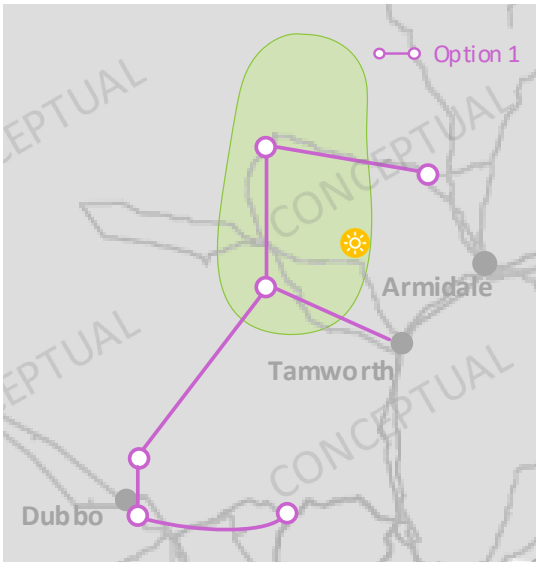
Figure 7 New South Wales utility-scale VRE development in REZs for *Step Change* (MW)



N1 – North West NSW

Summary

The North West New South Wales (NWNSW) REZ is located to the west of the existing Queensland – New South Wales Interconnector (QNI). While this zone has B grade solar resource quality, the wind resource is estimated to be mostly inadequate for wind farm development.



Existing network capability

The existing 132 kV network is weak and would require significant network upgrades to accommodate VRE greater than the transmission network limit of approximately 170 MW.

REZ grouping

Infrastructure coordination can start later.	Modelling outcomes indicate a low likelihood that significant investment in VRE and transmission infrastructure will be optimally required in the next 20 years.

Metrics

Resource	**Solar**			**Wind**		
Resource Quality	B			E		
Renewable Potential (MW)	6,385			-		
Demand Correlation	**2029-30**	**2039-40**	**2049-50**	**2029-30**	**2039-40**	**2049-50**
	F	F	F	A	A	A
MLF Robustness	**2029-30**		**2034-35**		**2039-40**	
	F		F		F	

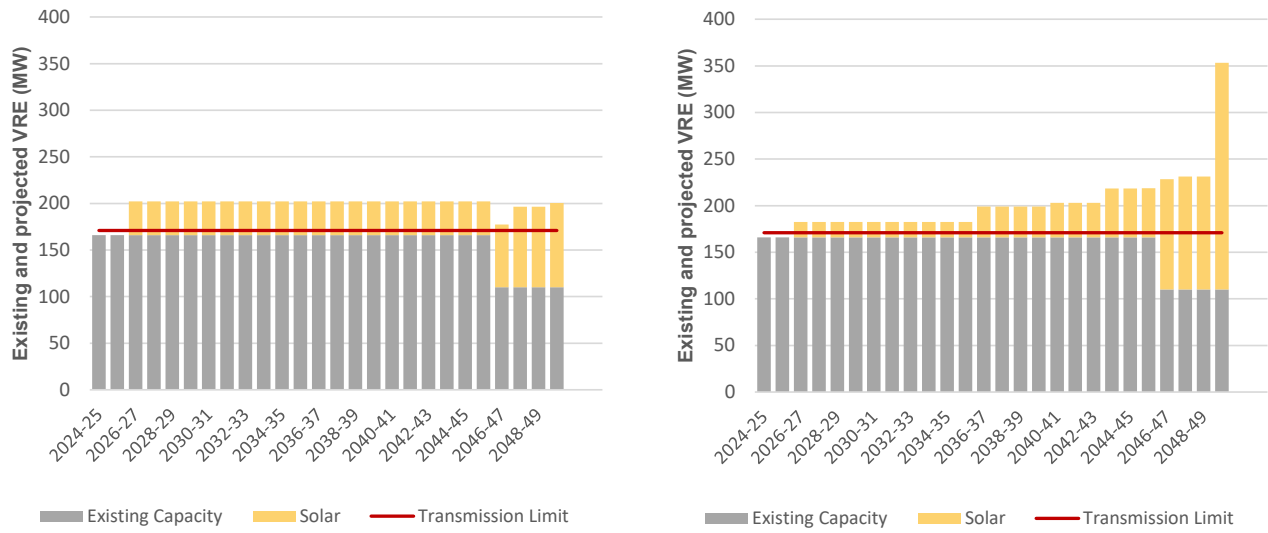
Climate hazard

Temperature score	D	**Bushfire score**	E

VRE outlook

	Solar PV (MW)				**Wind (MW)**			
	Existing/ committed/ anticipated	**Projected**			**Existing/ committed/ anticipated**	**Projected**		
		2029-30	**2039-40**	**2049-50**		**2029-30**	**2039-40**	**2049-50**
Progressive Change	166	50	50	100	There is no existing, committed or anticipated wind generation for this REZ. The modelling outcomes, for all scenarios, did not project any additional wind for this REZ.			
Step Change		-	50	100				
Green Energy Exports		50	3,650	6,000				

Transmission access expansion forecast for *Progressive Change* (left) and *Step Change* (right)



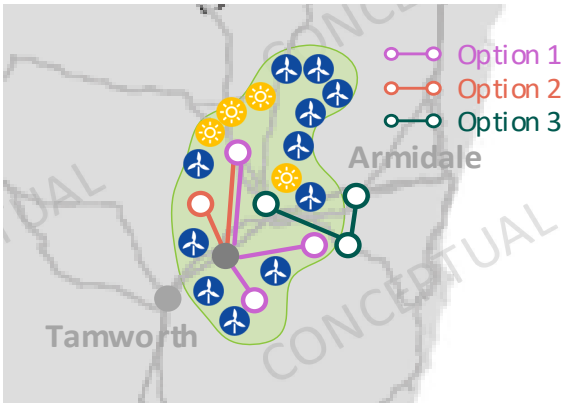
VRE curtailment

Scenario	2029-30		2039-40		2049-50	
	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill
Progressive Change	4%	14%	2%	24%	1%	31%
Step Change	1%	12%	1%	30%	2%	30%
Green Energy Exports	1%	37%	1%	21%	1%	33%

N2 – New England

Summary

New England REZ is located to the east of and along the existing QNI[14]. The capacity of this REZ is supported by extensive Northern NSW – Central NSW corridor network options and it will be part of New England REZ infrastructure development. This REZ has C grade solar and wind resource quality in close proximity to the 330 kV network. Interest in the area includes large scale solar and wind generation as well as pumped hydro generation.



Note: Option 1 reflects the updated scope announced by EnergyCo in March 2024[15]. Options 2 and 3 are consistent with the 2023 *Transmission Expansion Options Report* and are modelled in the 2024 ISP.

Existing network capability

The existing network capacity, following completion of the committed QNI Minor upgrade, is limited by transient and voltage stability on the circuits between Bulli Creek, Sapphire and Dumaresq. Thermal limits on the 330 kV circuits between Armidale, Tamworth, Muswellbrook and Liddell can also restrict flows on this network.

REZ grouping

REZ design and community engagement is progressing	The New England REZ was formally declared on 17 December 2021 under the *Electricity Infrastructure Investment Act 2020* (NSW)[16]. EnergyCo, appointed as the Infrastructure Planner for the New England REZ[17], has identified a preliminary study corridor for community consultation, which commenced in June 2023. The revised study corridor for the project was released in March 2024. Planning approvals and ongoing engagement with the community and industry are progressing to inform network design.

Metrics

Resource	**Solar**			**Wind**		
Resource Quality	C			C		
Renewable Potential (MW)	2,985[18]			7,400		
Demand Correlation	**2029-30**	**2039-40**	**2049-50**	**2029-30**	**2039-40**	**2049-50**
	F	F	F	A/B	A	A
MLF Robustness	**2029-30**		**2034-35**		**2039-40**	
	A		A		A	

Climate hazard			
Temperature score	C	**Bushfire score**	E

VRE outlook

	Solar PV (MW)		**Wind (MW)**	
		Projected		**Projected**

[14] Options shown are a subset of the Central New South Wales to Northern New South Wales flow path options.

[15] EnergyCo. New England Renewable Energy Zone March 2024 Project Update, at https://www.energyco.nsw.gov.au/sites/default/files/2024-03/NEREZ_project-update_Mar2024.pdf

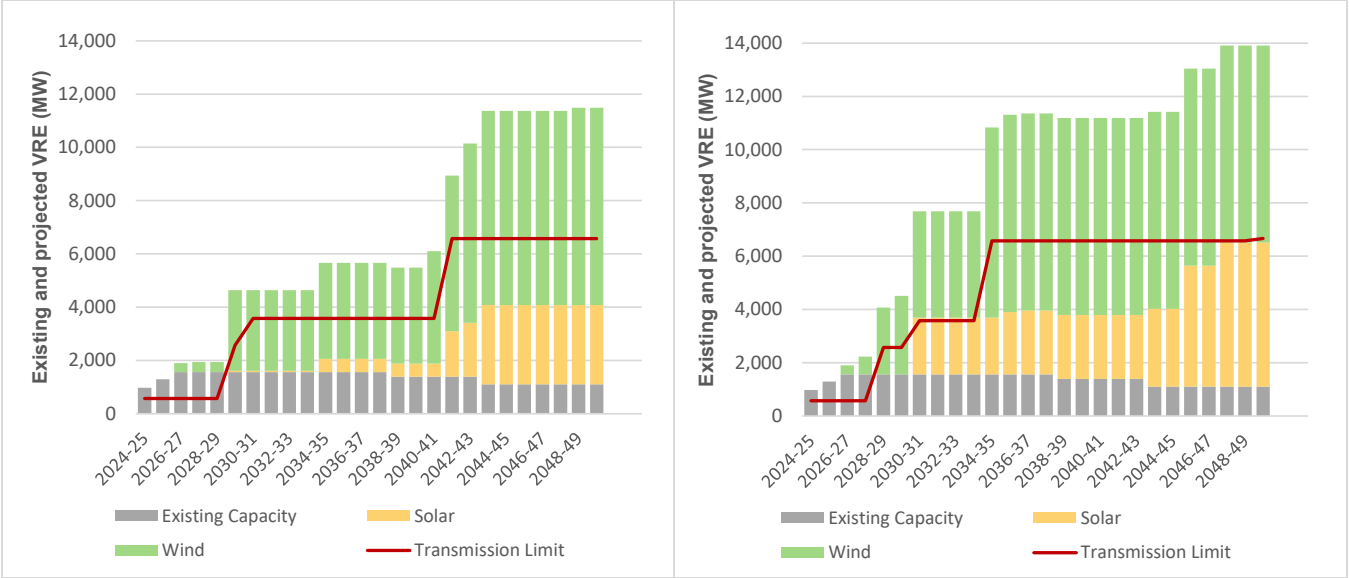
[16] New South Wales Government, *Electricity Infrastructure Investment Act 2020* (NSW), at https://legislation.nsw.gov.au/view/html/inforce/current/act-2020-044.

[17] EnergyCo. New England Renewable Energy Zone, at https://www.energyco.nsw.gov.au/projects/new-england-transmission-project.

[18] New England REZ solar outlook exceeds the expected renewable solar potential based on the geographical size and resource quality. The modelling allows for additional solar above this solar resource limit, but the additional solar capacity incurs a land use penalty factor of $0.29 million/MW. Even with this penalty applied, the ISP model still projects additional solar capacity in *Step Change* by 2049-50.

	Existing/ committed/ anticipated	2029-30	2039-40	2049-50	Existing/ committed/ anticipated	2029-30	2039-40	2049-50
Progressive Change	855	50	500	3,000	442	3,050	3,600	7,400
Step Change		-	2,400	5,400		3,000	7,400	7,400
Green Energy Exports		2,300	2,400	2,400		4,550	8,700	9,150

Transmission access expansion forecast for *Progressive Change* (left) and *Step Change* (right)



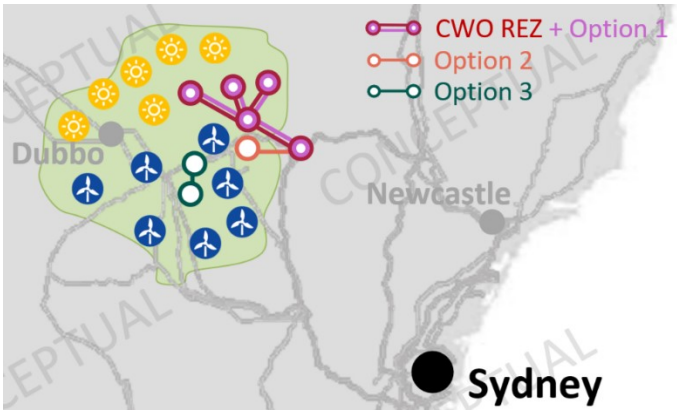
VRE curtailment

Scenario	2029-30		2039-40		2049-50	
	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill
Progressive Change	2%	3%	-	6%	1%	6%
Step Change	2%	3%	-	8%	1%	12%
Green Energy Exports	1%	15%	-	10%	-	15%

N3 – Central-West Orana

Summary

Central-West Orana REZ has been identified by the New South Wales Government as the state's first pilot REZ[19]. The Central-West Orana REZ was declared on 5 November 2021 under the New South Wales *Electricity Infrastructure Investment Act 2020* (the Act) with a revised value of 6,000 MW[20] of additional transmission network capacity within the Central West NSW region of the state. REZ design and community engagement is currently progressing, with an initial 4,500 MW of additional transmission network capacity being planned. The Central-West Orana REZ Access Scheme was declared under the Act on 19 December 2022.



Existing network capability

The project to establish the Central-West Orana REZ is considered anticipated. The existing network capability is approximately 900 MW, which will increase by 4,500 MW once Central-West Orana REZ is established. Hunter Transmission Project 1.0 (Central New South Wales (CNSW) to Sydney Newcastle Wollongong (SNW) Option 1) is required to address network constraints between CNSW and SNW to enable the increase in network capacity from 3,000 MW to 4,500 MW for the Central-West Orana REZ Transmission Project.

REZ grouping

REZ design and community engagement is progressing	The Central-West Orana REZ was formally declared in November 2021 under the *Electricity Infrastructure Investment Act 2020*[21]. EnergyCo, appointed as the Infrastructure Planner for the Central-West Orana REZ[19], consulted on the revised study corridor for the REZ transmission project in early 2022. The Environmental Impact Statement (EIS) consultation, which contains the proposed final alignment for the REZ transmission project, commenced in Q3 2023.

Metrics

Resource	**Solar**			**Wind**		
Resource Quality	C			C		
Renewable Potential (MW)	6,850			3,000[22]		
Demand Correlation	**2029-30**	**2039-40**	**2049-50**	**2029-30**	**2039-40**	**2049-50**
	F	F	F	A	A	A
MLF Robustness	**2029-30**		**2034-35**		**2039-40**	
	A		A		A	

Climate hazard			
Temperature score	C	**Bushfire score**	E

VRE outlook				
	Solar PV (MW)		**Wind (MW)**	
		Projected		**Projected**

[19] EnergyCo, Central-West Orana Renewable Energy Zone, at https://www.energyco.nsw.gov.au/cwo-rez.

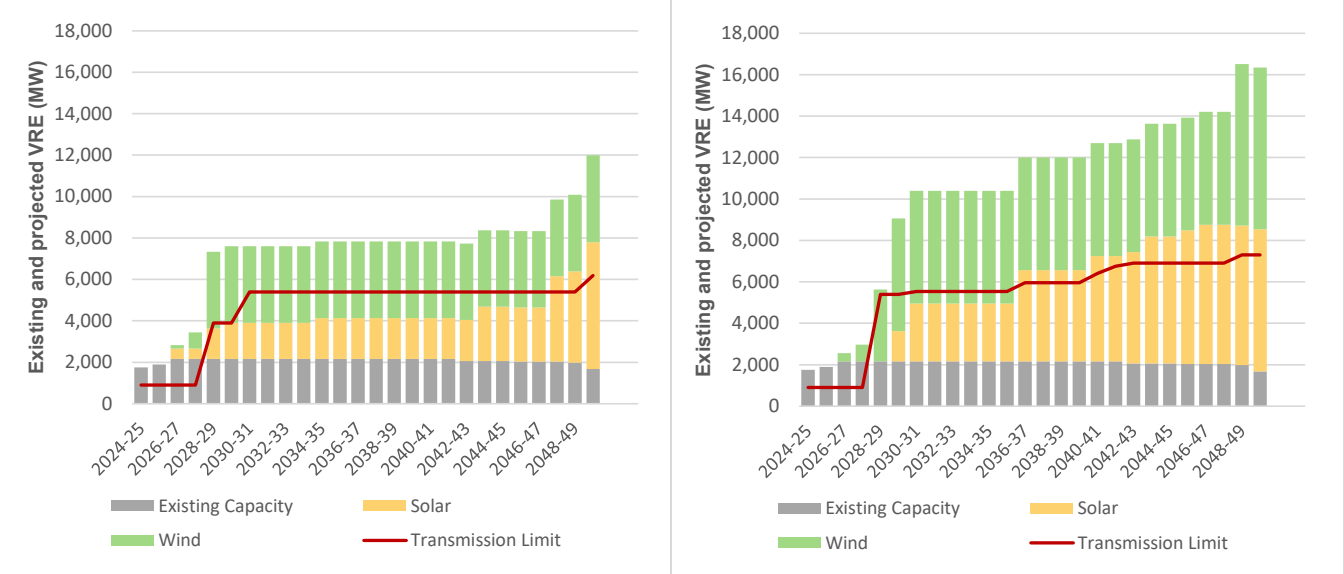
[20] Government Gazette No 580 of Friday 15 December 2023, at https://gazette.legislation.nsw.gov.au/so/download.w3p?id=Gazette_2023_2023-580.pdf.

[21] New South Wales Government, *Electricity Infrastructure Investment Act 2020* (NSW), at https://legislation.nsw.gov.au/view/html/inforce/current/act-2020-044.

[22] Central-West Orana REZ wind outlook exceeds the expected renewable wind potential based on the geographical size and resource quality. The modelling allows for additional wind above this wind resource limit, but the additional wind capacity incurs a land use penalty factor of $0.29 million/MW. Even with this penalty applied, the ISP model still projects additional wind in *Step Change* and *Green Energy Export* scenarios by 2049-50.

	Existing/ committed/ anticipated	2029-30	2039-40	2049-50	Existing/ committed/ anticipated	2029-30	2039-40	2049-50
Progressive Change	1,497	1,700	1,950	6,100	673	3,700	3,700	4,200
Step Change		1,450	4,400	6,850		5,450	5,450	7,800
Green Energy Exports		2,950	6,100	6,650		6,700	6,800	7,500

Transmission access expansion forecast for *Progressive Change* (left) and *Step Change* (right)



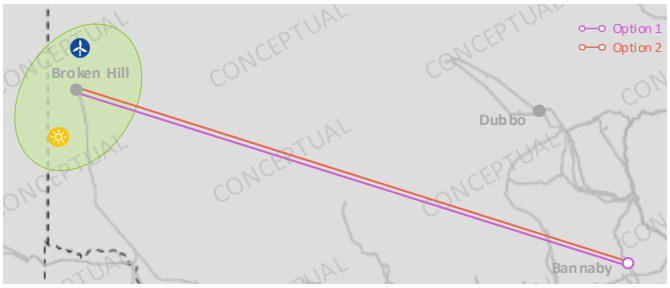
VRE curtailment

Scenario	2029-30		2039-40		2049-50	
	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill
Progressive Change	1%	4%	-	5%	-	9%
Step Change	-	3%	-	10%	1%	11%
Green Energy Exports	1%	11%	1%	12%	-	15%

N4 – Broken Hill

Summary

Broken Hill REZ has grade A solar resource quality. It is connected to the New South Wales grid via a 220 kV line from Buronga with an approximate length of 270 km.



Existing network capability

Due to the existing utility-scale solar and wind generation projects already operating in this REZ, there is limited network capacity within this REZ. Further development of new generation development in this REZ requires significant transmission network augmentation due to the distance of the REZ from the main transmission paths of the shared network.

REZ grouping

Infrastructure coordination can start later.	Modelling outcomes indicate a low likelihood that significant investment in VRE and transmission infrastructure will be optimally required in the next 20 years.

Metrics

Resource	**Solar**			**Wind**		
Resource Quality	A			D		
Renewable Potential (MW)	8,000			5,100		
Demand Correlation	**2029-30**	**2039-40**	**2049-50**	**2029-30**	**2039-40**	**2049-50**
	F	F	F	A	A	A

MLF Robustness	**2029-30**	**2034-35**	**2039-40**
	F	F	F

Climate hazard

Temperature score	E	**Bushfire score**	C

VRE outlook

	Solar PV (MW)				**Wind (MW)**			
	Existing/ committed/ anticipated	**Projected**			**Existing/ committed/ anticipated**	**Projected**		
		2029-30	**2039-40**	**2049-50**		**2029-30**	**2039-40**	**2049-50**
Progressive Change	53	200	200	350	198	100	100	100
Step Change		150	150	400		100	100	150
Green Energy Exports		200	200	400		150	150	150

Transmission access expansion forecast for *Progressive Change* (left) and *Step Change* (right)

VRE curtailment

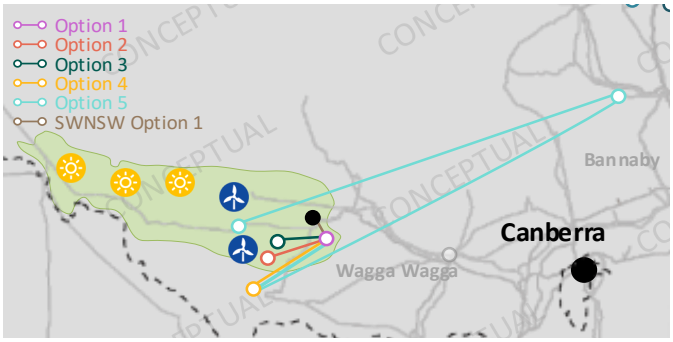
Scenario	2029-30		2039-40		2049-50	
	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill
Progressive Change	-	4%	3%	15%	2%	30%
Step Change	-	4%	1%	16%	3%	38%
Green Energy Exports	2%	27%	3%	25%	3%	46%

N5 – South West NSW

Summary

The South West NSW REZ has grade C solar resource quality and incorporates the Dinawan 330 kV substation that will be built as part of Project EnergyConnect. Further west, the 220 kV links to North West Victoria and Broken Hill. This REZ is one of the REZs which are being targeted for further development under the NSW Electricity Infrastructure Roadmap.

Network limits associated with the existing voltage stability limit for loss of the existing Darlington Point to Wagga 330 kV line are represented by the SWNSW1 secondary transmission limit



Existing network capability

Due to the existing utility-scale solar projects already operating within this REZ, there is no additional capacity. Further development of new generation in this REZ requires network augmentation towards the greater Sydney load centre. The capacity within this REZ and ability to transfer energy from the REZ to the main load centres in the greater Sydney area will be improved with the construction of Project EnergyConnect and HumeLink projects. Furthermore, VNI West also increases the capacity of this REZ.

REZ grouping

REZ design and community engagement is progressing	The South-West NSW REZ[23] was formally declared in November 2022 under the *Electricity Infrastructure Investment Act 2020*[24], which is the first step in formalising the REZ under the Act. This REZ could benefit from early community engagements and from the coordination of generation and transmission infrastructure.

Metrics

Resource	**Solar**			**Wind**		
Resource Quality	C			E		
Renewable Potential (MW)	2,256			3,900		
Demand Correlation	**2029-30**	**2039-40**	**2049-50**	**2029-30**	**2039-40**	**2049-50**
	F	F	F	B	B/A	B/A
MLF Robustness	**2029-30**		**2034-35**		**2039-40**	
	A		A		A	

Climate hazard			
Temperature score	E	**Bushfire score**	D

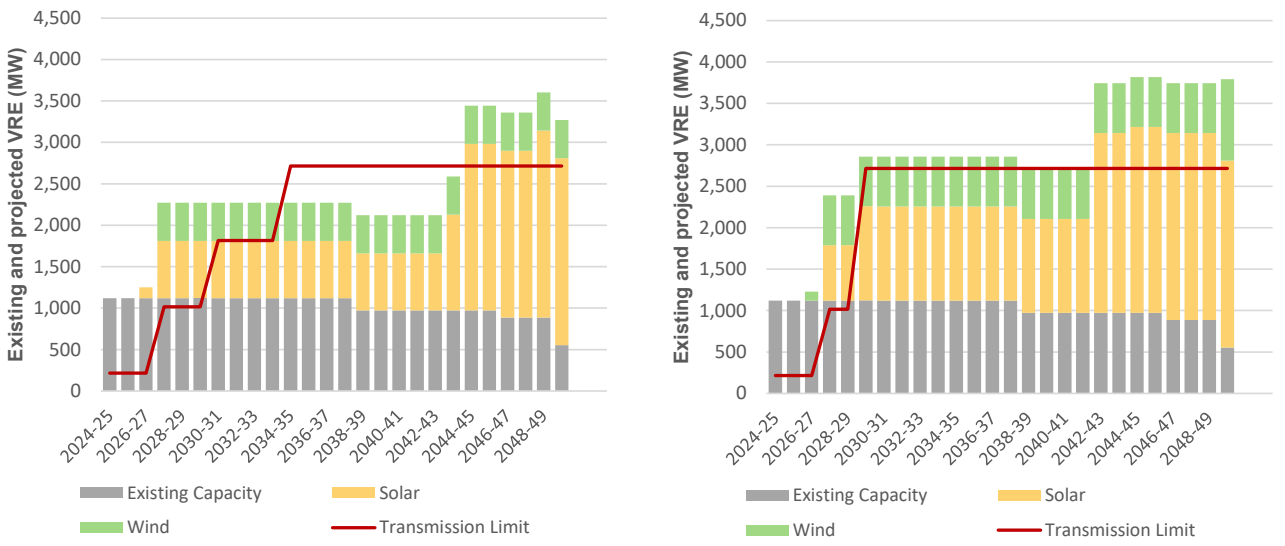
VRE outlook

	Solar PV (MW)				**Wind (MW)**			
	Existing/ committed/ anticipated	**Projected**			**Existing/ committed/ anticipated**	**Projected**		
		2029-30	**2039-40**	**2049-50**		**2029-30**	**2039-40**	**2049-50**
Progressive Change	1,122	700	700	2,250	-	450	450	450
Step Change		1,150	1,150	2,250		600	600	1,000
Green Energy Exports		800	2,150	2,250		1,000	1,000	1,000

[23] EnergyCo, South-West Renewable Energy Zone, at https://www.energyco.nsw.gov.au/sw-rez.

[24] New South Wales Government, *Electricity Infrastructure Investment Act 2020* (NSW), at https://legislation.nsw.gov.au/view/html/inforce/current/act-2020-044.

Transmission access expansion forecast for *Progressive Change* (left) and *Step Change* (right)



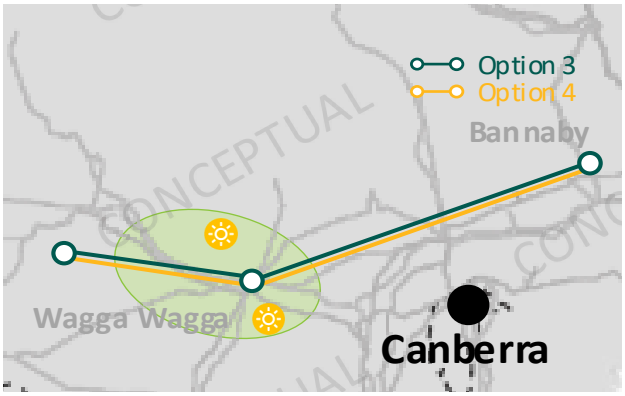
VRE curtailment

Scenario	2029-30		2039-40		2049-50	
	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill
Progressive Change	2%	8%	-	9%	-	9%
Step Change	-	7%	-	13%	-	13%
Green Energy Exports	-	16%	-	13%	-	15%

N6 – Wagga Wagga

Summary

This REZ extends to the west of Wagga Wagga and has C grade solar resource quality.



Existing network capability

There is no additional capacity within this REZ due to congestion in the surrounding 330 kV networks. Further development of new generation in this REZ requires network augmentation towards the greater Sydney load centre.

Additionally, the capacity within this REZ and ability to transfer energy from the REZ to the main load centres in the greater Sydney area are improved with the proposed HumeLink project. Options shown do not depend on HumeLink as a prerequisite.

REZ grouping

Coordination of generation infrastructure can start later.	Modelling outcomes indicate a low likelihood that significant investment in VRE and transmission infrastructure will be optimally required in the next 20 years. Ongoing community engagement is underway for HumeLink.

Metrics

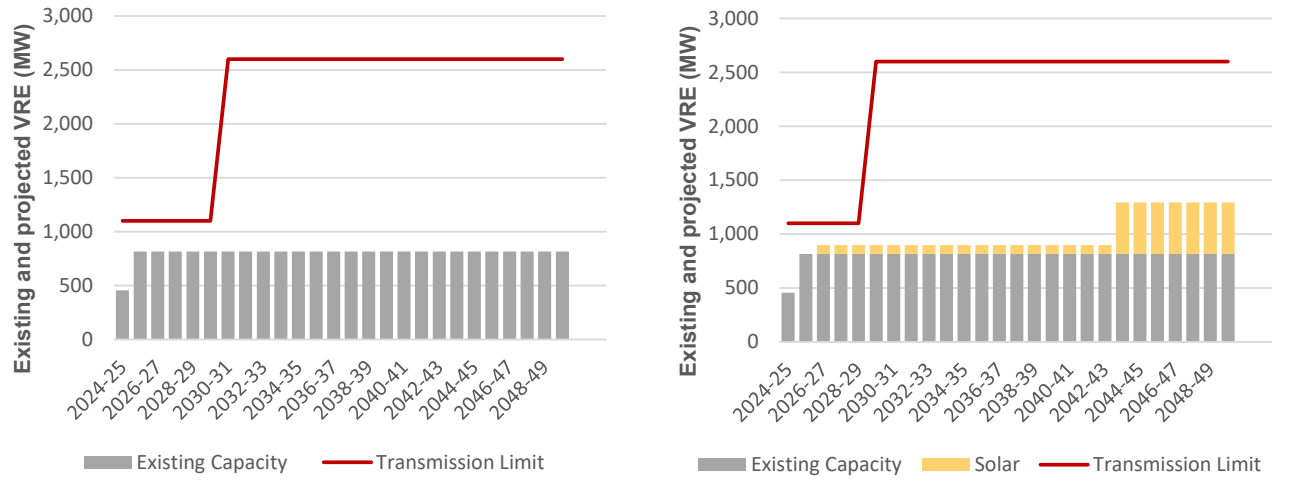
Resource	**Solar**			**Wind**		
Resource Quality	C			E		
Renewable Potential (MW)	1,028			1,000		
Demand Correlation	**2029-30**	**2039-40**	**2049-50**	**2029-30**	**2039-40**	**2049-50**
	F	F	F	B	B	B
MLF Robustness	**2029-30**		**2034-35**		**2039-40**	
	A		A		A	

Climate hazard			
Temperature score	D	**Bushfire score**	D

VRE outlook

	Solar PV (MW)				**Wind (MW)**			
	Existing/ committed/ anticipated	**Projected**			**Existing/ committed/ anticipated**	**Projected**		
		2029-30	**2039-40**	**2049-50**		**2029-30**	**2039-40**	**2049-50**
Progressive Change	456	-	-	-	There is no existing, committed or anticipated wind generation for this REZ. The modelling outcomes, for all scenarios, did not project any additional wind for this REZ.			
Step Change		100	100	500				
Green Energy Exports		500	500	500				

Transmission access expansion forecast for *Progressive Change* (left) and *Step Change* (right)



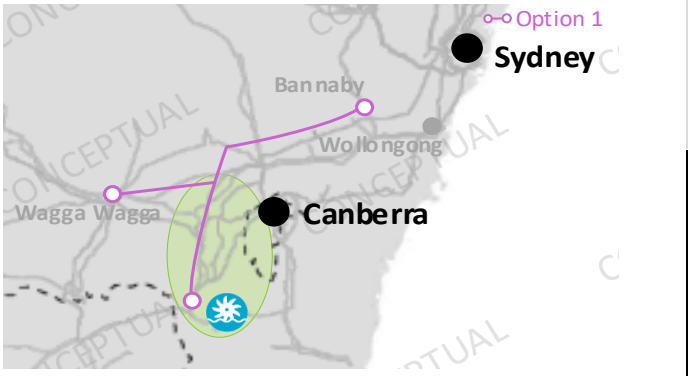
VRE curtailment

Scenario	2029-30		2039-40		2049-50	
	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill
Progressive Change	-	6%	-	3%	-	3%
Step Change	-	6%	-	13%	-	14%
Green Energy Exports	-	13%	-	14%	-	25%

N7 – Tumut

Summary

The Tumut REZ has been identified due to the potential for additional pumped hydro generation in association with Snowy 2.0 and the proposed actionable ISP HumeLink. The HumeLink project[25] will enable the connection of more than 2,000 MW of pumped hydro generation (Snowy 2.0) in the Tumut REZ area.



Existing network capability

There is no additional capacity within this REZ. Further development of new generation in this REZ is associated with the HumeLink project. Currently the 330 kV transmission network around Lower and Upper Tumut is congested during peak demand periods. A careful balance of generation from the existing hydro units and flow between Victoria and New South Wales is required to prevent overloads within this area.

REZ grouping

Design and community engagements are progressing	Modelling outcomes indicate a low likelihood that significant investment in VRE and transmission infrastructure will be optimally required in the next 20 years. Ongoing community engagement is underway for HumeLink.

Metrics

Resource	**Solar**			**Wind**		
Resource Quality	F			E		
Renewable Potential (MW)	-			-		
Demand Correlation	**2029-30**	**2039-40**	**2049-50**	**2029-30**	**2039-40**	**2049-50**
	F	F	F	D/C	D/C	D/C
MLF Robustness	**2029-30**		**2034-35**		**2039-40**	
	N/A*		N/A		N/A	

*No VRE is projected for this REZ.

Climate hazard

Temperature score	C	**Bushfire score**	E

VRE outlook

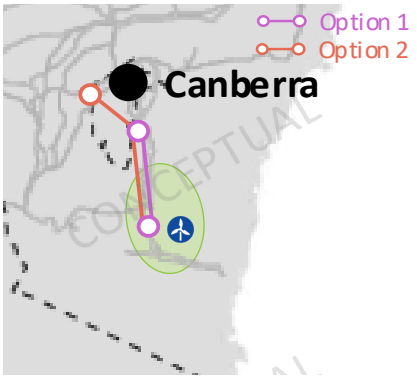
	Solar PV (MW)				**Wind (MW)**			
	Existing/ committed/ anticipated	**Projected**			**Existing/ committed/ anticipated**	**Projected**		
		2029-30	**2039-40**	**2049-50**		**2029-30**	**2039-40**	**2049-50**
Progressive Change	There is no existing, committed or anticipated solar generation for this REZ. The modelling outcomes, for all scenarios, did not project any additional solar for this REZ.				270	-	-	-
Step Change						-	-	-
Green Energy Exports						-	-	-

Transmission access expansion forecast and VRE curtailment

There is no existing, committed, anticipated VRE projects for this REZ and the modelling outcomes, for all scenarios, did not project any additional VRE for this REZ. Therefore, no VRE curtailment or transmission expansion occurs in this REZ.

[25] Transgrid, HumeLink project, at https://www.transgrid.com.au/HumeLink.

N8 – Cooma-Monaro

Summary	
The Cooma-Monaro REZ has been identified for its pumped hydro potential. This REZ has B grade wind resource quality	
Existing network capability	
The existing 132 kV network connecting Cooma-Monaro REZ to Canberra, Williamsdale and Munyang can accommodate approximately 200 MW of additional generation.	

REZ grouping	
Coordination of generation and transmission infrastructure may be required.	The modelling outcomes identify this zone for development of wind generation in the 2020s for all scenarios. This REZ could benefit from early community engagements and from the coordination of generation.

Metrics						
Resource	**Solar**			**Wind**		
Resource Quality	F			B		
Renewable Potential (MW)	-			300		
Demand Correlation	**2029-30**	**2039-40**	**2049-50**	**2029-30**	**2039-40**	**2049-50**
	F	F	F	C	B/C	B/C
MLF Robustness	**2029-30**		**2034-35**		**2039-40**	
	F		F		F	

Climate hazard			
Temperature score	B	**Bushfire score**	E

VRE outlook								
	Solar PV (MW)				**Wind (MW)**			
	Existing/ committed/ anticipated	**Projected**			**Existing/ committed/ anticipated**	**Projected**		
		2029-30	**2039-40**	**2049-50**		**2029-30**	**2039-40**	**2049-50**
Progressive Change	There is no existing, committed or anticipated solar generation for this REZ. The modelling outcomes, for all scenarios, did not project any additional solar for this REZ.				113	350	350	400
Step Change						350	350	800
Green Energy Exports						500	3,950	4,100

Transmission access expansion forecast for *Progressive Change* (left) and *Step Change* (right)

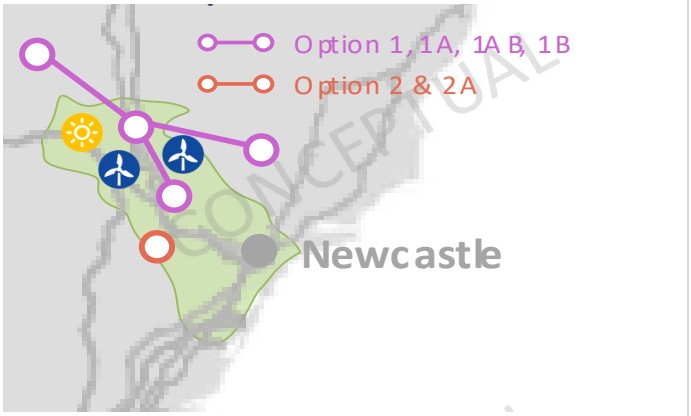
VRE curtailment

Scenario	2029-30		2039-40		2049-50	
	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill
Progressive Change	4%	4%	2%	14%	1%	12%
Step Change	4%	4%	1%	17%	1%	11%
Green Energy Exports	6%	28%	-	8%	-	8%

N9 – Hunter-Central Coast

Summary

The Hunter-Central Coast (HCC) REZ has been identified to assist industries to decarbonise and access renewable energy with a mix of solar, onshore and offshore wind energy projects. The REZ was declared on 9 December 2022 with 1,000 MW of intended network capacity. EnergyCo has been appointed the Infrastructure Planner for the REZ. The capacity of the Hunter-Central Coast REZ is likely to increase over time with the retirement of coal-fired power stations, re-purposing of mining land and existing assets and growth of offshore wind.



Existing network capability

This REZ is intended to supply Sydney, Newcastle and Wollongong (SNW) and it is assumed that supply to SNW would also include high southbound flows from Northern New South Wales (NNSW) to CNSW. The REZ transmission limit is set to 400 MW to reflect this condition.

REZ grouping

REZ design and community engagement is progressing	The Hunter Central Coast REZ[26] was formally declared in December 2022 under the *Electricity Infrastructure Investment Act 2020*[27]. The modelling outcomes identify this zone for development of wind and solar generation in the 2020s for all scenarios.

Metrics

Resource	**Solar**			**Wind**		
Resource Quality	D			D		
Renewable Potential (MW)	516[28]			1,400		
Demand Correlation	**2029-30**	**2039-40**	**2049-50**	**2029-30**	**2039-40**	**2049-50**
	F	F	F	A/B	A/B	A/B
MLF Robustness	**2029-30**		**2034-35**		**2039-40**	
	A		A		A	

Climate hazard

Temperature score	A	**Bushfire score**	E

VRE outlook

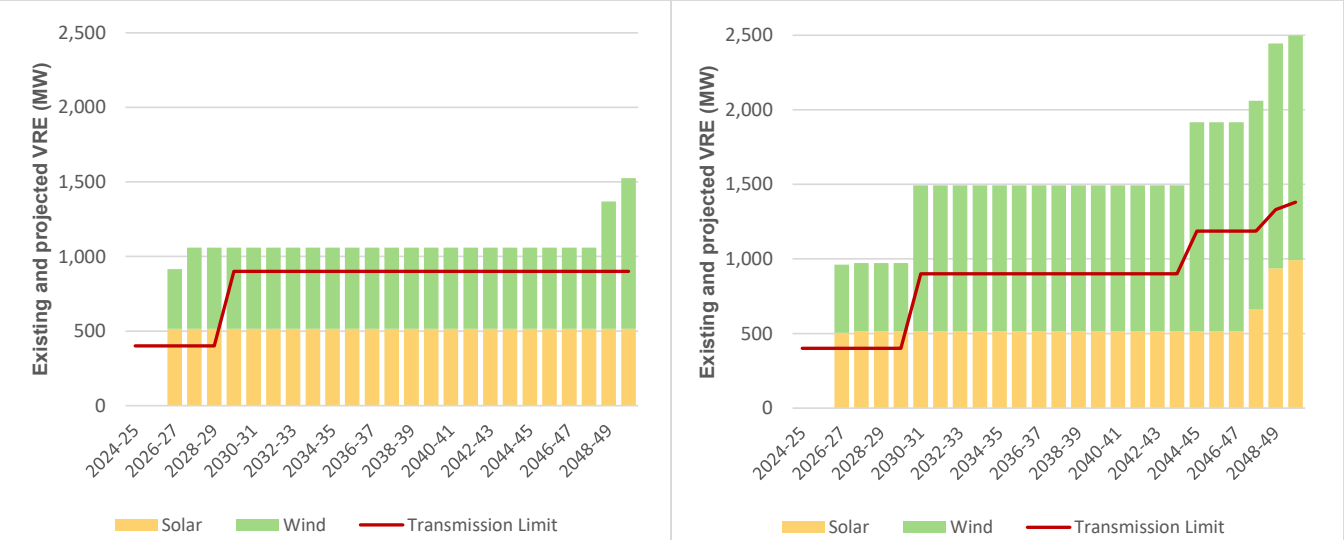
	Solar PV (MW)				**Wind (MW)**			
	Existing/ committed/ anticipated	**Projected**			**Existing/ committed/ anticipated**	**Projected**		
		2029-30	**2039-40**	**2049-50**		**2029-30**	**2039-40**	**2049-50**
Progressive Change	-	500	500	500	-	550	550	1,000
Step Change		500	500	1,000		450	1,000	1,500
Green Energy Exports		650	800	9,000		1,100	2,050	4,400

[26] EnergyCo. Hunter-Central Coast Renewable Energy Zone, at https://www.energyco.nsw.gov.au/hcc-rez.

[27] New South Wales Government, *Electricity Infrastructure Investment Act 2020* (NSW), at https://legislation.nsw.gov.au/view/html/inforce/current/act-2020-044.

[28] Hunter-Central Coast REZ solar and wind VRE outlook both exceed the expected renewable potential based on the geographical size and resource quality. The modelling allows for additional solar and wind above these resource limits, but the additional capacity incurs a land use penalty factor of $0.29 million/MW. Even with this penalty applied, the ISP model still projects additional solar and wind capacity in *Step Change* by 2049-50.

Transmission access expansion forecast for *Progressive Change* (left) and *Step Change* (right)



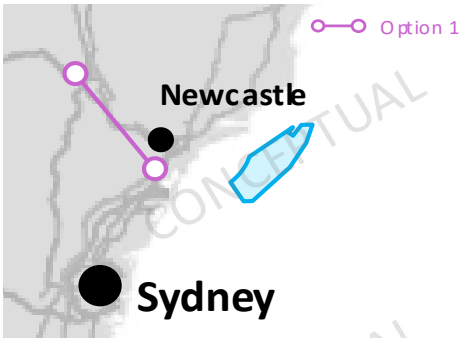
VRE curtailment

Scenario	2029-30		2039-40		2049-50	
	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill
Progressive Change	-	3%	-	10%	1%	12%
Step Change	1%	6%	-	13%	1%	16%
Green Energy Exports	1%	17%	-	14%	-	14%

N10 – Hunter Coast

Summary

The Hunter Coast offshore REZ has been identified for the offshore wind resource potential in relatively shallow waters close to shore, with a connection point near to the SNW load centre[29].



Existing network capability

Newcastle has multiple 330 kV lines already connected and is situated within the SNW load centre. Network capacity is shared with local gas generation and coal generation output. The current network transmission limit is approximately 5,500 MW for new generation connections in the Newcastle and Eraring areas. This capacity could also be shared with any new generation connecting in the Hunter-Central Coast REZ.

REZ grouping

REZ design and community engagement is progressing	Following consultation and being satisfied that it is considered suitable for offshore renewable energy infrastructure, on 12 July 2023, the Federal Government declared an area in the Pacific Ocean off the Hunter, New South Wales, under the *Offshore Electricity Infrastructure Act 2021*[30]. Modelling outcomes indicate a low likelihood that significant investment in VRE and transmission infrastructure will be optimally required in the next 20 years.

Metrics

Resource	**Offshore Wind (fixed)**			**Offshore Wind (floating)**		
Resource Quality	E			B		
Renewable Potential (MW)	-			7,420		
Demand Correlation	**2029-30**	**2039-40**	**2049-50**	**2029-30**	**2039-40**	**2049-50**
	A	A	A	A	A	A
MLF Robustness	**2029-30**		**2034-35**		**2039-40**	
	N/A*		N/A		N/A	

*No VRE is projected for this REZ.

Climate hazard

Temperature score	A	**Bushfire score**	E

VRE outlook

	Offshore Wind – fixed (MW)				**Offshore Wind - floating (MW)**			
	Existing/ committed/ anticipated	**Projected**			**Existing/ committed/ anticipated**	**Projected**		
		2029-30	**2039-40**	**2049-50**		**2029-30**	**2039-40**	**2049-50**
Progressive Change	There is no existing, committed or anticipated offshore wind generation for this REZ. The modelling outcomes, for all scenarios, did not project any offshore wind for this REZ.							
Step Change								
Green Energy Exports								

Transmission access expansion forecast and VRE curtailment

There is no existing, committed, anticipated VRE projects for this REZ and the modelling outcomes, for all scenarios, did not project any additional VRE for this REZ. Therefore, no VRE curtailment or transmission expansion occurs in this REZ.

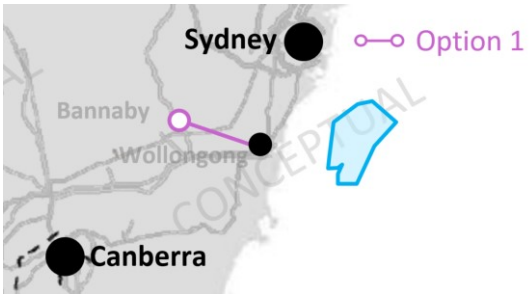
[29] Federal Government, Hunter offshore wind zone declaration, at https://www.dcceew.gov.au/energy/renewable/offshore-wind/areas/hunter

[30] At https://www.dcceew.gov.au/energy/renewable/offshore-wind/areas/hunter.

N11 – Illawarra Coast

Summary

The Federal Government has proposed an area for future offshore renewable energy projects in the Pacific Ocean off the coast of the Illawarra region, and is currently finalising consultation prior to any declaration.



Existing network capability

Dapto has multiple 330 kV lines already connected and is situated within the SNW load centre. Network capacity is shared with local gas generation and hydro generation output. The current network transfer capacity is approximately 1,000 MW. This capacity is shared with any new generation connecting in the Illawarra REZ.

REZ grouping

REZ design and community engagement is progressing	The Minister for Climate Change and Energy declared an area in the Pacific Ocean off the Illawarra, New South Wales (NSW) for offshore renewable energy, including offshore wind, on the 15 June 2024[31]. Modelling outcomes indicate a low likelihood that significant investment in VRE and transmission infrastructure will be optimally required in the next 20 years.

Metrics

Resource	**Offshore Wind (fixed)**			**Offshore Wind (floating)**		
Resource Quality	B			B		
Renewable Potential (MW)[32]	148			5,696		
Demand Correlation	**2029-30**	**2039-40**	**2049-50**	**2029-30**	**2039-40**	**2049-50**
	B	B	B	B	B	B
MLF Robustness	**2029-30**		**2034-35**		**2039-40**	
	N/A*		N/A		N/A	

*No VRE is projected for this REZ under the *Step Change* scenario.

Climate hazard

Temperature score	C	**Bushfire score**	C

VRE outlook

	Offshore Wind – fixed (MW)				**Offshore Wind - floating (MW)**			
	Existing/ committed/ anticipated	**Projected**			**Existing/ committed/ anticipated**	**Projected**		
		2029-30	**2039-40**	**2049-50**		**2029-30**	**2039-40**	**2049-50**
Progressive Change	-	-	-	-	There is no existing, committed or anticipated floating offshore wind generation for this REZ. The modelling outcomes, for all scenarios, did not project any floating offshore wind for this REZ.			
Step Change		-	-	-				
Green Energy Exports		-	-	150				

Transmission access expansion forecast and VRE curtailment

There is no existing, committed, anticipated VRE projects for this REZ and the modelling outcomes, for all scenarios, did not project any additional VRE for this REZ. Therefore, no VRE curtailment or transmission expansion occurs in this REZ.

[31] Federal Government, Illawarra declared offshore wind area, at https://www.legislation.gov.au/F2024L00685/asmade/text.

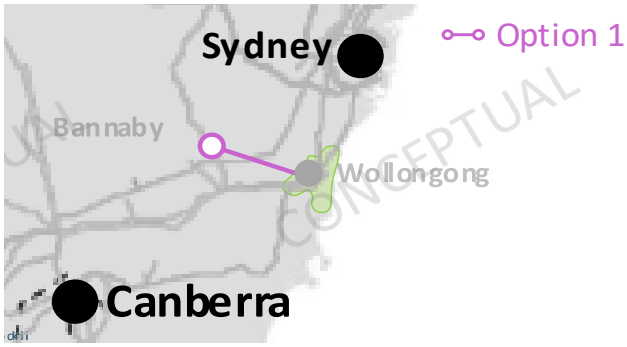
[32] Renewable potential is based on the N11 Illawarra Coast REZ boundary shown in the Draft A3. Renewable Energy Zones, at https://aemo.com.au/-/media/files/stakeholder_consultation/consultations/nem-consultations/2023/draft-2024-isp-consultation/appendices/a3-renewable-energy-zones.pdf?la=en

N12 – Illawarra

Summary

The Illawarra REZ was declared on 27 February 2023 with 1,000 MW of intended network capacity, and EnergyCo has been appointed the Infrastructure Planner for the REZ, under the *Electricity Infrastructure Investment Act 2020* (NSW)[33].

Community consultation has been initiated by EnergyCo, following an earlier Registration of Interest that highlighted potential for wind (onshore and offshore), solar, energy storage, pumped hydro, hydrogen production, and green steel manufacturing.



Existing network capability

Dapto has multiple 330 kV lines already connected and is situated within the SNW load centre. Network capacity is shared with local gas generation and hydro generation output. The intended network capacity for this REZ is approximately 1,000 MW.

REZ grouping

REZ design and community engagement is progressing	EnergyCo is also in the early stages of planning for a REZ, as set out under the *Electricity Infrastructure Investment Act 2020*, in the Illawarra region of New South Wales. Modelling outcomes indicate a low likelihood that significant investment in VRE and transmission infrastructure will be optimally required in the next 20 years.

Metrics

Resource	**Solar**			**Wind**		
Resource Quality	F			E		
Renewable Potential (MW)	-			-		
Demand Correlation	**2029-30**	**2039-40**	**2049-50**	**2029-30**	**2039-40**	**2049-50**
	-	-	-	-	-	-
MLF Robustness	**2029-30**		**2034-35**		**2039-40**	
	N/A*		N/A		N/A	

*No VRE is projected for this REZ.

Climate hazard

Temperature score	-	**Bushfire score**	-

VRE outlook

	Offshore Wind – fixed (MW)				**Offshore Wind - floating (MW)**			
	Existing/ committed/ anticipated	**Projected**			**Existing/ committed/ anticipated**	**Projected**		
		2029-30	**2039-40**	**2049-50**		**2029-30**	**2039-40**	**2049-50**
Progressive Change	There is no existing, committed or anticipated offshore wind generation for this REZ. The modelling outcomes, for all scenarios, did not project any offshore wind for this REZ.							
Step Change								
Green Energy Exports								

Transmission access expansion forecast and VRE curtailment

There is no existing, committed, anticipated VRE projects for this REZ and the modelling outcomes, for all scenarios, did not project any additional VRE for this REZ. Therefore, no VRE curtailment or transmission expansion occurs in this REZ.

[33] At https://www.energyco.nsw.gov.au/ilw-rez.

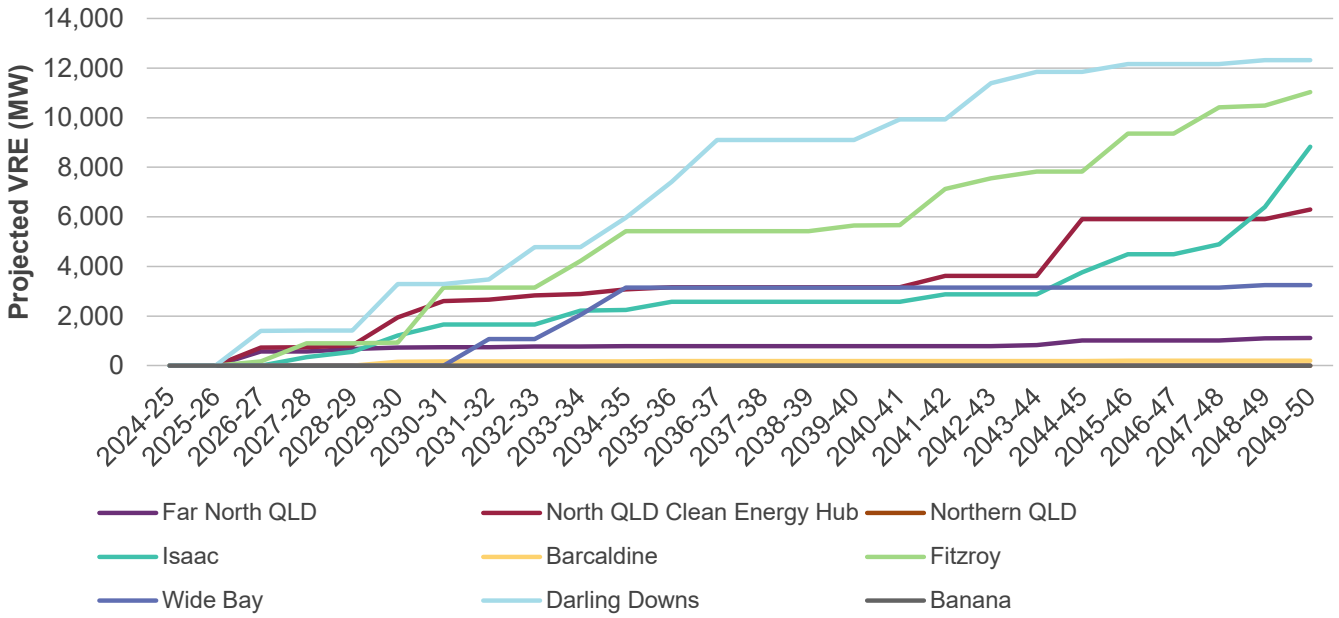
A3.3.3 Queensland

VRE outlook

In Queensland, approximately 43 GW of new utility-scale wind and solar VRE is projected as being required by 2050 to assist in replacing retiring generation and meet forecast load. Figure 8 shows the utility-scale VRE projected for each REZ in Queensland under *Step Change*. This modelling indicates:

- The majority of new VRE capacity is installed in Fitzroy, Darling Downs, Isaac and the North Queensland Clean Energy Hub.
- Darling Downs sees the largest amount of projected new VRE capacity, with rapid developments utilising existing spare network capacity, and with 5,950 MW new VRE by 2034-35, and nearly 10,000 MW by 2041-42.
- There is an increase in VRE in the North Queensland Clean Energy Hub early in the horizon, with around 2,600 MW new VRE capacity installed by 2030-31. By 2034-35 this has increased to over 3,000 MW.
- Fitzroy REZ also has a large amount of VRE connecting, with 3,150 MW of new VRE capacity installed by 2030-31 and increasing to over 7,000 MW by 2041-42.

Figure 8 Queensland utility-scale VRE development in REZs for *Step Change* (MW)



Q1 – Far North Queensland

Summary

The Far North Queensland (FNQ) REZ is at the most northerly section of Powerlink's network. It has grade A wind resource quality with C grade solar and existing hydroelectric power stations. Two options are proposed that progressively increase network capacity and allow for upgrades based on where generation develops.

Existing network capability

The current total REZ transmission limit for existing and new VRE before any network upgrade in Far North Queensland is approximately 750 MW for peak demand, summer typical and winter reference conditions.

REZ grouping

Coordination of generation infrastructure may be required.	The modelling outcomes identify this zone for development of wind generation in all scenarios in the 2020s and further expanded in the 2030s and 2040s. Coordination of generation and transmission and generation infrastructure may be required.

Metrics

Resource	**Solar**			**Wind**		
Resource Quality	C			A		
Renewable Potential (MW)	1,100			2,280		
Demand Correlation	**2029-30**	**2039-40**	**2049-50**	**2029-30**	**2039-40**	**2049-50**
	F	F	F	B	B	B
MLF Robustness	**2029-30**		**2034-35**		**2039-40**	
	E		E		E	

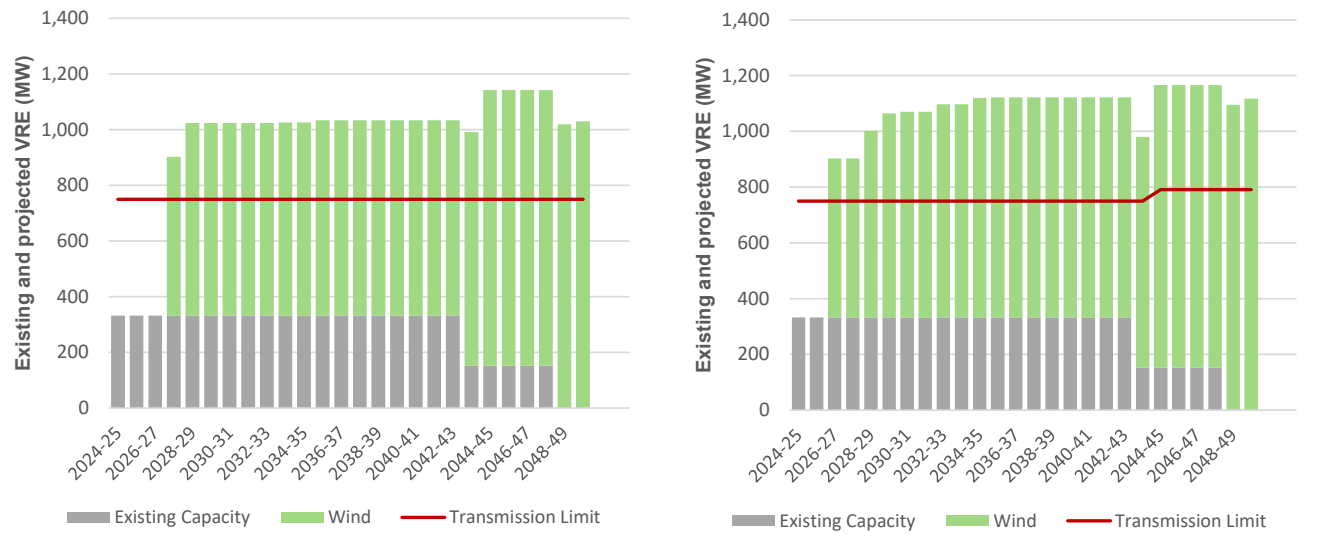
Climate hazard

Temperature score	B	**Bushfire score**	A

VRE outlook

	Solar PV (MW)				**Wind (MW)**			
	Existing/ committed/ anticipated	**Projected**			**Existing/ committed/ anticipated**	**Projected**		
		2029-30	**2039-40**	**2049-50**		**2029-30**	**2039-40**	**2049-50**
Progressive Change	-	-	-	-	332	700	700	1,050
Step Change		-	-	-		750	800	1,100
Green Energy Exports		-	1,650	23,500		950	9,350	19,400

Transmission access expansion forecast for *Progressive Change* (left) and *Step Change* (right)



VRE curtailment

Scenario	2029-30		2039-40		2049-50	
	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill
Progressive Change	1%	7%	-	7%	-	12%
Step Change	2%	6%	1%	12%	1%	17%
Green Energy Exports	3%	19%	-	8%	-	23%

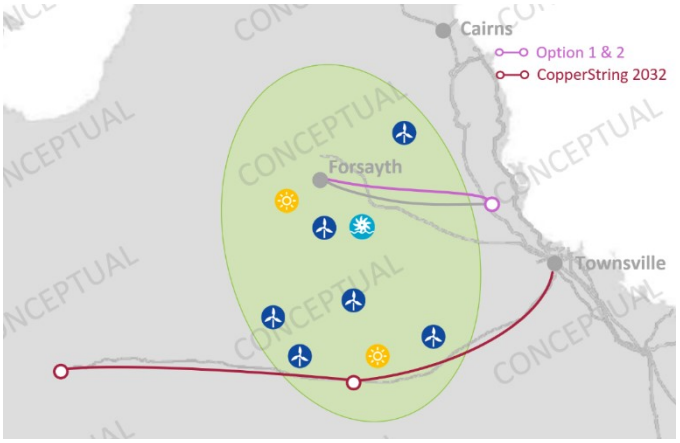
Q2 – North Queensland Clean Energy Hub

Summary

The North Queensland Clean Energy Hub REZ is at the north-western section of Powerlink's network, and has grade A and B wind and solar resource quality.

The Queensland Government has announced that it will deliver the 840 km CopperString 2032 project. CopperString 2032 will connect the North-West Minerals Province of Queensland to the NEM via Woodstock near Townsville. The project scope includes 500 kV transmission capacity between Townsville and Hughenden to unlock the renewable energy potential of the region.

AEMO is now considering the CopperString 2032 project as an anticipated project after outcomes from joint planning with Powerlink and the Queensland Government.



Existing network capability

The existing network capability is assumed to be approximately 2,200 MW, incorporating the anticipated CopperString 2032 project addition of 1,500 MW to the existing 700 MW of network capability. For the 2024 ISP, only the 500 kV section of CopperString 2032 was modelled.

REZ grouping

Coordination of generation infrastructure may be required.	The modelling outcomes identify this zone for development of wind generation in the 2030s across the *Progressive Change* and *Step Change* scenarios. This build is brought forward under the *Green Energy Exports* scenario. Coordination of generation and transmission and generation infrastructure may be required.

Metrics

Resource	**Solar**			**Wind**		
Resource Quality	A			B		
Renewable Potential (MW)	8,000			18,600		
Demand Correlation	**2029-30**	**2039-40**	**2049-50**	**2029-30**	**2039-40**	**2049-50**
	F	F	F	A	A	A
MLF Robustness	**2029-30**		**2034-35**		**2039-40**	
	E		E		E	

Climate hazard

Temperature score	D	**Bushfire score**	C

VRE outlook

	Solar PV (MW)				**Wind (MW)**			
	Existing/ committed/ anticipated	**Projected**			**Existing/ committed/ anticipated**	**Projected**		
		2029-30	**2039-40**	**2049-50**		**2029-30**	**2039-40**	**2049-50**
Progressive Change	84	-	-	600	43	1,450	1,850	2,400
Step Change		-	500	1,600		1,950	2,650	4,700
Green Energy Exports		550	8,000	64,150		3,150	5,850	18,600

Transmission access expansion forecast for *Progressive Change* (left) and *Step Change* (right)

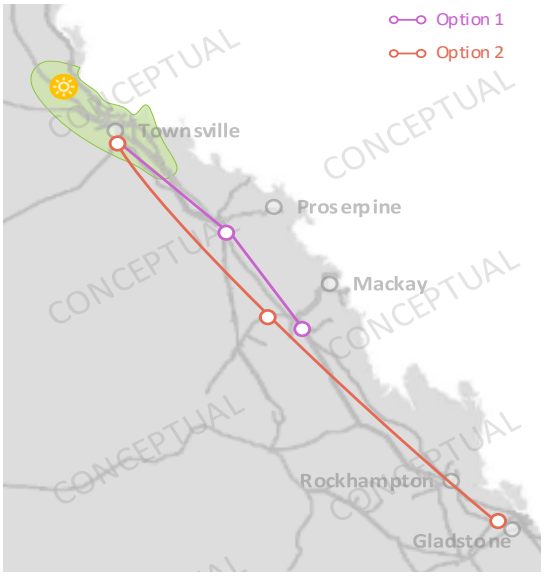
VRE curtailment

Scenario	2029-30		2039-40		2049-50	
	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill
Progressive Change	-	5%	-	3%	-	9%
Step Change	-	3%	-	7%	-	13%
Green Energy Exports	2%	12%	-	13%	-	19%

Q3 – Northern Queensland

Summary

The Northern Queensland REZ encompasses Townsville and the surrounding area. It has B grade solar resource quality and is situated close to the high-capacity 275 kV network. There are already 450 MW of existing large-scale solar generation projects operational within this REZ.



Existing network capability

Existing network capacity can allow for up to approximately 1,200 MW of new generator connections, shared between Q1, Q2 and Q3. Network limits are modelled by the Northern Queensland (NQ)-Central Queensland (CQ) flow path limits.

REZ grouping

Infrastructure coordination can start later.	Modelling outcomes indicate a low likelihood that significant investment in VRE and transmission infrastructure will be optimally required in the next 12 years.

Metrics

Resource	**Solar**			**Wind**		
Resource Quality	B			E		
Renewable Potential (MW)	3,400			-		
Demand Correlation	**2029-30**	**2039-40**	**2049-50**	**2029-30**	**2039-40**	**2049-50**
	F	F	F	A/B	A/B	A/B
MLF Robustness	**2029-30**		**2034-35**		**2039-40**	
	E		E		E	

Climate hazard

Temperature score	C	**Bushfire score**	E

VRE outlook

	Solar PV (MW)				**Wind (MW)**			
	Existing/ committed/ anticipated	**Projected**			**Existing/ committed/ anticipated**	**Projected**		
		2029-30	**2039-40**	**2049-50**		**2029-30**	**2039-40**	**2049-50**
Progressive Change	437	-	-	-	There is no existing, committed or anticipated wind generation for this REZ. The modelling outcomes, for all scenarios, did not project any additional wind for this REZ.			
Step Change		-	-	-				
Green Energy Exports		2,000	3,650	25,050				

Transmission access expansion forecast for *Progressive Change* (left) and *Step Change* (right)

Note: The transmission limit was modelled using the CQ-NQ flow path limit, and includes VRE projections for Q1, Q2 and Q3.

VRE curtailment

Scenario	2029-30		2039-40		2049-50	
	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill
Progressive Change	-	27%	-	9%	-	28%
Step Change	-	18%	-	13%	-	40%
Green Energy Exports	-	9%	-	12%	-	12%

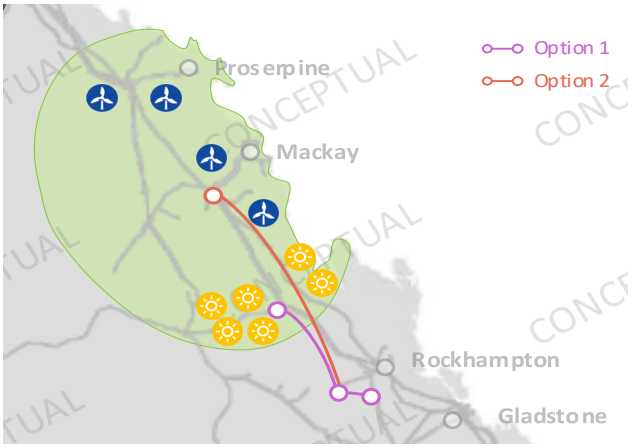
Transmission curtailment for this REZ is not captured. The transmission infrastructure required to upgrade this REZ increases capacity on the 275 kV back bone for Q1, Q2 and Q3.

Q4 – Isaac

Summary

The Isaac REZ has grade B solar resource quality covering Collinsville and Mackay, and has a number of large-scale solar generation projects already in operation. There are numerous potential pumped hydro locations to the north east and south east of Nebo. This REZ has a good diversity of resources – wind, solar and storage. Locating storage in this zone could maximise transmission utilisation towards Brisbane.

In September 2022, the Queensland Government released its Queensland Energy and Jobs Plan (QEJP) and the SuperGrid Blueprint which calls for the large-scale pumped hydro station, Pioneer-Burdekin. Pioneer-Burdekin is currently progressing through Queensland Government assessment and decision-making processes and AEMO is yet to consider it an anticipated project (based on AEMO's criteria). AEMO recognises the Queensland Government's intention to build the project. Inclusion of Pioneer-Burdekin is expected to impact the ultimate REZ generation build and timings within this REZ.



Existing network capability

The Isaac REZ forms part of the NQ transmission backbone from Nebo to Strathmore. Due to the existing high voltage infrastructure, there are no augmentation options specifically for this REZ. The associated augmentations are the NQ2 group constraint and CQ-NQ flow path augmentations that facilitate power from Q1 to Q5 to be transmitted south to the load centres. The network has a transmission limit of 2,500 MW in summer peak and summer typical conditions and 2,750 MW for winter reference conditions.

REZ grouping

Coordination of generation infrastructure may be required.	The modelling outcomes identify this zone for development of solar and wind generation in the 2020s across the *Step Change* and *Green Energy Exports* scenarios. Coordination of generation and transmission and generation infrastructure may be required.

Metrics

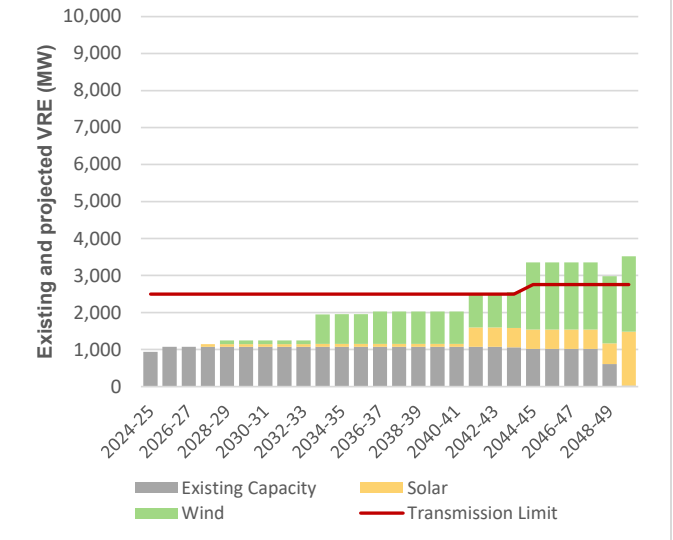
Resource	**Solar**			**Wind**		
Resource Quality	B			D		
Renewable Potential (MW)	6,900			3,800		
Demand Correlation	**2029-30**	**2039-40**	**2049-50**	**2029-30**	**2039-40**	**2049-50**
	F	F	F	A	A	A
MLF Robustness	**2029-30**		**2034-35**		**2039-40**	
	B		A		A	

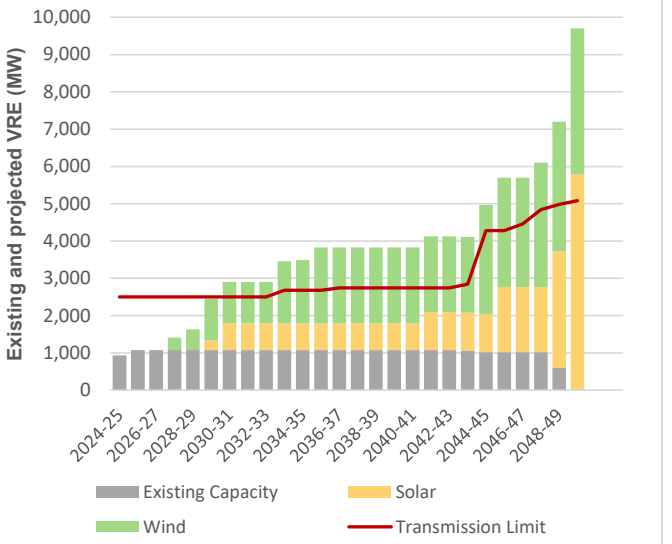
Climate hazard			
Temperature score	C	**Bushfire score**	C

VRE outlook

	Solar PV (MW)				**Wind (MW)**			
	Existing/ committed/ anticipated	**Projected**			**Existing/ committed/ anticipated**	**Projected**		
		2029-30	**2039-40**	**2049-50**		**2029-30**	**2039-40**	**2049-50**
Progressive Change	620	-	-	1,350	439	100	850	1,950
Step Change		200	650	4,350		1,000	1,900	3,800
Green Energy Exports		900	3,700	6,900		3,350	3,800	3,800

Transmission access expansion forecast for *Progressive Change* (left) and *Step Change* (right)





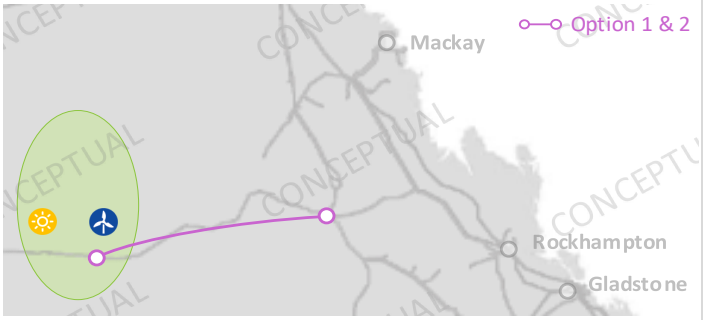
Note: The transmission access expansion forecasts show the results for NQ2 group constraint augmentation, which includes VRE projections for Q1, Q2, Q3, Q4 and Q5.

VRE curtailment

Scenario	2029-30		2039-40		2049-50	
	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill
Progressive Change	-	-	-	4%	-	8%
Step Change	-	-	-	7%	-	11%
Green Energy Exports	-	9%	-	9%	-	9%

Q5 – Barcaldine

Summary
This REZ has grade A solar resource quality but is remote from the Queensland transmission backbone.



Existing network capability
The current total REZ transmission limit for existing and new VRE before any network upgrade in Barcaldine is approximately 85 MW.

REZ grouping	
Infrastructure coordination can start later.	Modelling outcomes indicate a low likelihood that significant investment in VRE and transmission infrastructure will be optimally required in the next 12 years.

Metrics

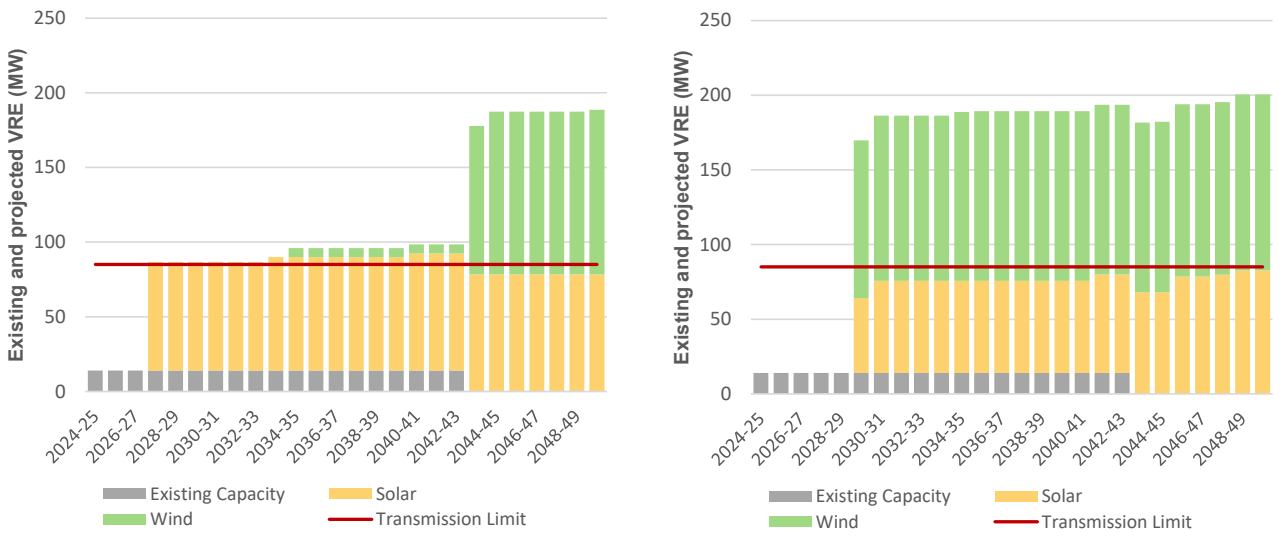
Resource	Solar			Wind		
Resource Quality	A			D		
Renewable Potential (MW)	8,000			3,900		
Demand Correlation	2029-30	2039-40	2049-50	2029-30	2039-40	2049-50
	F	F	F	A	A	A
MLF Robustness	2029-30		2034-35		2039-40	
	F		F		F	

Climate hazard			
Temperature score	D	Bushfire score	C

VRE outlook

	Solar PV (MW)				Wind (MW)			
	Existing/ committed/ anticipated	Projected			Existing/ committed/ anticipated	Projected		
		2029-30	2039-40	2049-50		2029-30	2039-40	2049-50
Progressive Change	14	50	50	100	-	-	-	100
Step Change		50	50	100		100	100	100
Green Energy Exports		50	100	3,400		150	150	3,900

Transmission access expansion forecast for *Progressive Change* (left) and *Step Change* (right)



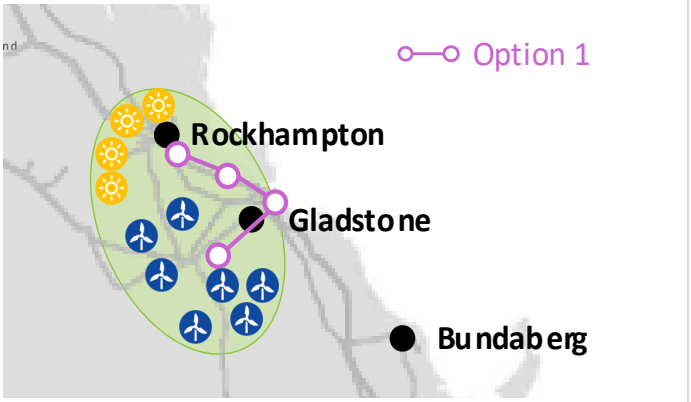
VRE curtailment

Scenario	2029-30		2039-40		2049-50	
	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill
Progressive Change	-	1%	-	20%	2%	23%
Step Change	4%	4%	2%	21%	2%	31%
Green Energy Exports	1%	29%	1%	30%	2%	22%

Q6- Fitzroy

Summary

The Fitzroy REZ is in Central Queensland and covers a strong part of the network where Gladstone and Callide generators are connected. This REZ has grade B and C solar and wind resource quality.



Existing network capability

The network capability for Fitzroy REZ to export electricity to southern Queensland is shared with other generation in northern and central Queensland.

Due to the existing high voltage infrastructure, there are no augmentation options specifically for this REZ. The associated augmentations are the Central Queensland to Gladstone Grid flow path augmentations and Central Queensland to Southern Queensland upgrade augmentation options, as detailed in the *Transmission Expansion Options Report*[34].

REZ grouping

Transmission and generation infrastructure coordination is required.	Preparatory activities were done for the 2020 ISP relating to the Central Queensland to Southern Queensland (CQ-SQ) upgrade and Gladstone Grid re-enforcement options. For the *Transmission Expansion Options Report*, Powerlink provided an updated scope and cost for this project.

Metrics

Resource	**Solar**			**Wind**		
Resource Quality	B			C		
Renewable Potential (MW)	7,533			3,500		
Demand Correlation	**2029-30**	**2039-40**	**2049-50**	**2029-30**	**2039-40**	**2049-50**
	F	F	F	A	A	A
MLF Robustness	**2029-30**		**2034-35**		**2039-40**	
	A		A		A	

Climate hazard

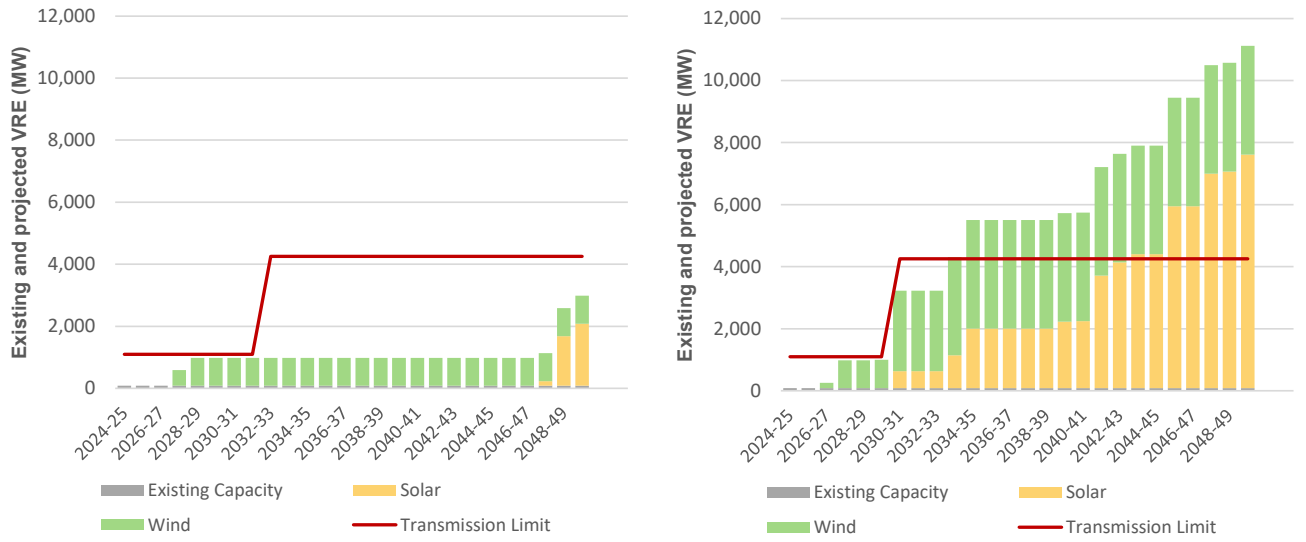
Temperature score	C	**Bushfire score**	B

VRE outlook

	Solar PV (MW)				**Wind (MW)**			
	Existing/ committed/ anticipated	**Projected**			**Existing/ committed/ anticipated**	**Projected**		
		2029-30	**2039-40**	**2049-50**		**2029-30**	**2039-40**	**2049-50**
Progressive Change	82	-	-	2,000	-	900	900	900
Step Change		-	2,150	7,550		900	3,500	3,500
Green Energy Exports		2,200	7,450	20,150		3,500	4,500	7,550

[34] At https://aemo.com.au/consultations/current-and-closed-consultations/2023-transmission-expansion-options-report-consultation.

Transmission access expansion forecast for *Progressive Change* (left) and *Step Change* (right)



Note: The transmission limit was modelled using the CQ-SQ flow path limit

VRE curtailment

Scenario	2029-30		2039-40		2049-50	
	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill
Progressive Change	-	-	-	2%	-	6%
Step Change	-	-	-	4%	-	7%
Green Energy Exports	-	9%	1%	11%	1%	11%

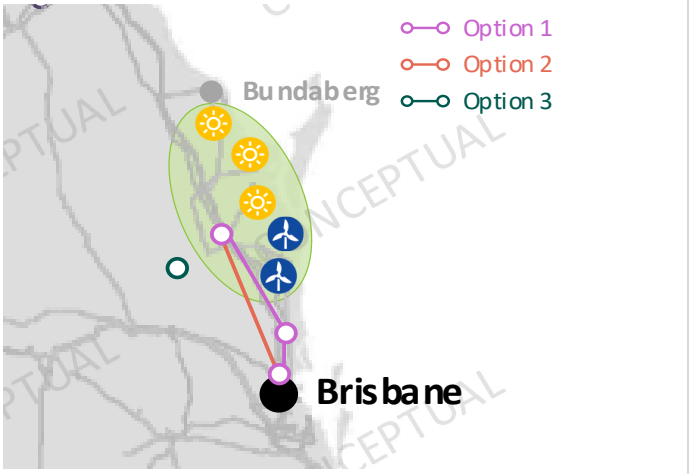
Q7 – Wide Bay

Summary

The Wide Bay area has grade C solar resource quality and already has a number of large solar generators operational within the REZ.

The Queensland Government has announced that, subject to final investment decisions, it will build a 2,000 MW/24-hour Borumba pumped hydro energy storage (PHES) project in southern Queensland, as part of the Queensland SuperGrid.

AEMO considers Borumba to be an anticipated project. The project's dispatch is included in the SQ1 group constraint in the ISP modelling process.



Existing network capability

The existing network facilitates power transfer from Central Queensland to the load centre in Brisbane. This is a 275 kV transmission backbone and currently supports up to approximately 1,400 MW of power flow from CQ into Brisbane. This means the maximum VRE output in the REZ is highly dependent on CQ-SQ flow.

REZ grouping

Coordination of generation infrastructure may be required.	The modelling outcomes identify this zone for development of wind and solar generation. Coordination of generation and transmission and generation infrastructure may be required.

Metrics

Resource	**Solar**			**Wind**		
Resource Quality	C			E		
Renewable Potential (MW)	2,200			1,100		
Demand Correlation	**2029-30**	**2039-40**	**2049-50**	**2029-30**	**2039-40**	**2049-50**
	F	F	F	A	A	A

MLF Robustness	**2029-30**	**2034-35**	**2039-40**
	A	A	A

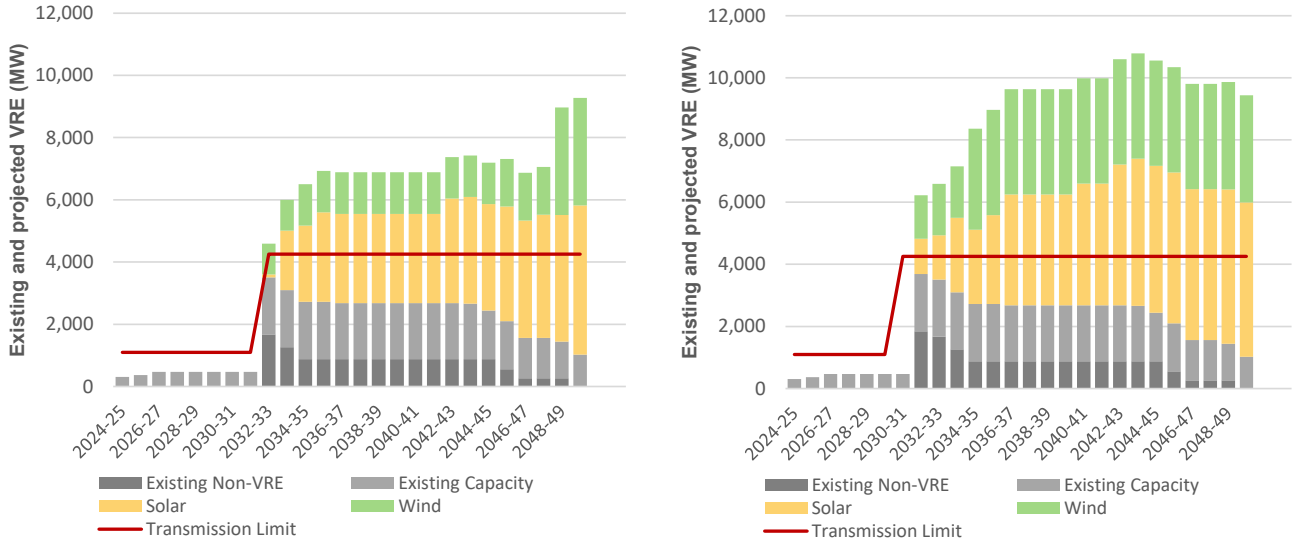
Climate hazard

Temperature score	B	**Bushfire score**	E

VRE outlook

	Solar PV (MW)				**Wind (MW)**			
	Existing/ committed/ anticipated	**Projected**			**Existing/ committed/ anticipated**	**Projected**		
		2029-30	**2039-40**	**2049-50**		**2029-30**	**2039-40**	**2049-50**
Progressive Change	468	-	2,050	2,150	-	-	-	1,100
Step Change		-	2,050	2,150		-	1,100	1,100
Green Energy Exports		350	2,100	4,500		300	1,100	5,700

Transmission access expansion forecast for *Progressive Change* (left) and *Step Change* (right)



Note: The transmission access expansion forecasts show the results for the SQ1 group constraint augmentation, which includes Q7 as well as the effect of CQ-SQ flow. The transmission limit was modelled using the SQ1 group constraint limit as opposed to a static number. (Step increase in transmission limit is as a result of CQ-SQ Option 5 upgrade).

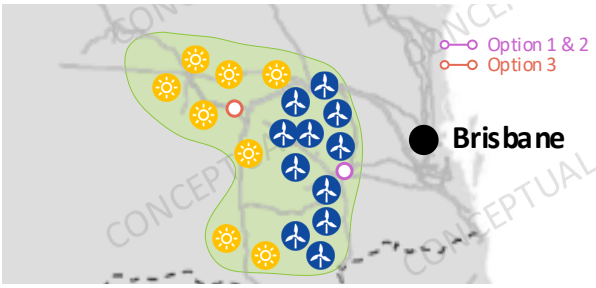
VRE curtailment

Scenario	2029-30		2039-40		2049-50	
	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill
Progressive Change	-	2%	-	4%	-	8%
Step Change	-	7%	-	7%	-	14%
Green Energy Exports	-	19%	-	13%	-	12%

Q8 – Darling Downs

Summary

The Darling Downs REZ extends from the border of New South Wales around Dumaresq up to Columboola within the Surat region of Queensland, and has B and C grade solar and wind resource quality. A number of large solar and wind projects are already connected within the zone.



Existing network capability

The Darling Downs REZ has high network capacity and is near QNI and Brisbane. The ultimate retirement of generation within this REZ will allow for increased VRE connections.

The existing network facilitates power transfer from south west Queensland to the load centre in Brisbane. This transmission can support up to approximately 5,300 MW of generation into Brisbane. This capability is shared with existing coal and gas generation in the REZ, the flow of power from New South Wales, and the flow of power from central Queensland. This sharing is captured by the SWQLD1 transmission limit constraint that facilitates power flow to load centres in south east Queensland. Changes to network capability for this REZ are therefore reflected in the SWQLD1 limit.

REZ grouping

Transmission and generation infrastructure coordination may be required.	Preparatory activities relating to the development of this REZ have been provided by Powerlink as inputs to the 2024 ISP.

Metrics

Resource	**Solar**			**Wind**		
Resource Quality	B			C		
Renewable Potential (MW)	6,992			5,600[35]		
Demand Correlation	**2029-30**	**2039-40**	**2049-50**	**2029-30**	**2039-40**	**2049-50**
	F	F	F	A	A	A
MLF Robustness	**2029-30**		**2034-35**		**2039-40**	
	A		A		A	

Climate hazard

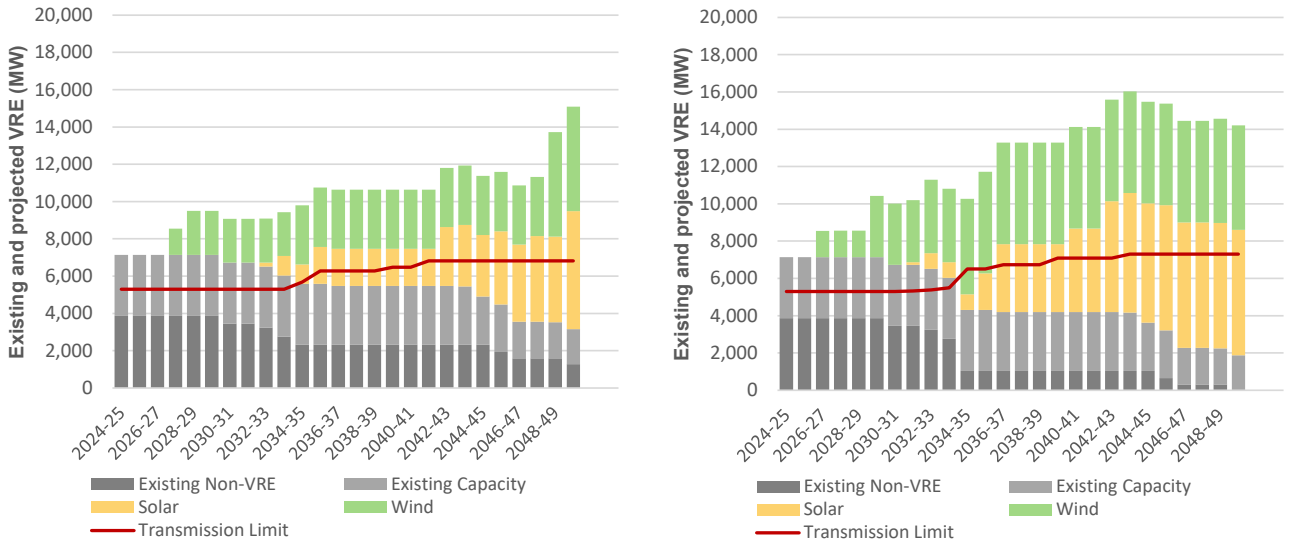
Temperature score	C	**Bushfire score**	E

VRE outlook

	Solar PV (MW)				**Wind (MW)**			
	Existing/ committed/ anticipated	**Projected**			**Existing/ committed/ anticipated**	**Projected**		
		2029-30	**2039-40**	**2049-50**		**2029-30**	**2039-40**	**2049-50**
Progressive Change	1,484	-	2,000	6,300	1,788	2,350	3,150	5,600
Step Change		-	3,650	6,700		3,300	5,450	5,600
Green Energy Exports		1,200	6,700	7,950		4,250	6,100	6,300

[35] Darling Downs REZ wind outlook exceeds the expected renewable potential based on the geographical size and resource quality. The modelling allows for additional wind above this wind resource limit, but the additional capacity incurs a land use penalty factor of $0.29 million/MW. Even with this penalty applied, the ISP model still projects additional wind and solar capacity in *Green Energy Exports* by 2049-50.

Transmission access expansion forecast for *Progressive Change* (left) and *Step Change* (right)



Note: The transmission access expansion forecasts show the results for the SWQLD1 group constraint augmentation, which includes Q8 as well as the effect of CQ-SQ and QNI flow. The transmission limit was modelled using the SWQLD1 group constraint limit as opposed to a static number.

VRE curtailment

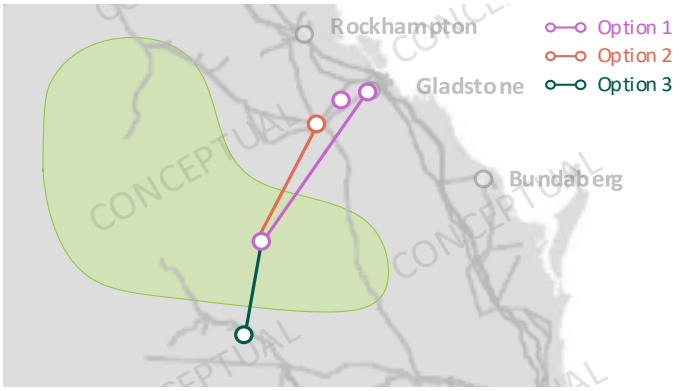
Scenario	2029-30		2039-40		2049-50	
	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill
Progressive Change	-	-	-	3%	-	4%
Step Change	-	1%	-	4%	-	6%
Green Energy Exports	-	8%	-	7%	-	10%

Q9 – Banana

Summary

The Banana REZ is located roughly 200 km south-west of Gladstone and lies north of the CQ-SQ flow path. It has B grade solar resource quality. There are currently no generators and limited high voltage network in this area.

AEMO understands from the Queensland Government and from Powerlink that transmission augmentation projects for the Banana REZ are likely to be delivered as a dedicated asset of some kind. This has been treated similar to a generation connection asset in the ISP model, rather than a network augmentation option.



Existing network capability

There is currently very little high voltage network in the area. There is some 132 kV network on the edge of the REZ, supporting the townships of Moura and Biloela. There is very little spare capacity within the network.

The first two options are proposals that transport the power to the Gladstone region. Substation location both within the Banana REZ and the connection point within the Gladstone section will be based on where generation and load develop.

REZ grouping

Infrastructure coordination can start later.	Modelling outcomes indicate a low likelihood that significant investment in VRE and transmission infrastructure will be optimally required in the next 12 years.

Metrics

Resource	**Solar**			**Wind**		
Resource Quality	B			E		
Renewable Potential (MW)	6,100			3,400		
Demand Correlation	**2029-30**	**2039-40**	**2049-50**	**2029-30**	**2039-40**	**2049-50**
	F	F	F	A	A	A
MLF Robustness	**2029-30**		**2034-35**		**2039-40**	
	E		E		E	

Climate hazard

Temperature score	C	**Bushfire score**	B

VRE outlook

	Solar PV (MW)				**Wind (MW)**			
	Existing/ committed/ anticipated	**Projected**			**Existing/ committed/ anticipated**	**Projected**		
		2029-30	**2039-40**	**2049-50**		**2029-30**	**2039-40**	**2049-50**
Progressive Change	-	-	-	-	-	-	-	-
Step Change		-	-	-		-	-	-
Green Energy Exports		-	150	6,100		200	200	900

Transmission access expansion forecast for *Progressive Change* (left) and *Step Change* (right)

There are no existing, committed, anticipated VRE projects for this REZ and the modelling outcomes for Progressive Change and Step Change scenarios did not project any additional VRE for this REZ. Therefore, no VRE curtailment or transmission expansion occurs in this REZ in those scenarios.

VRE curtailment						
Scenario	2029-30		2039-40		2049-50	
	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill
Progressive Change	-	-	-	-	-	-
Step Change	-	-	-	-	-	-
Green Energy Exports	-	18%	1%	28%	1%	19%

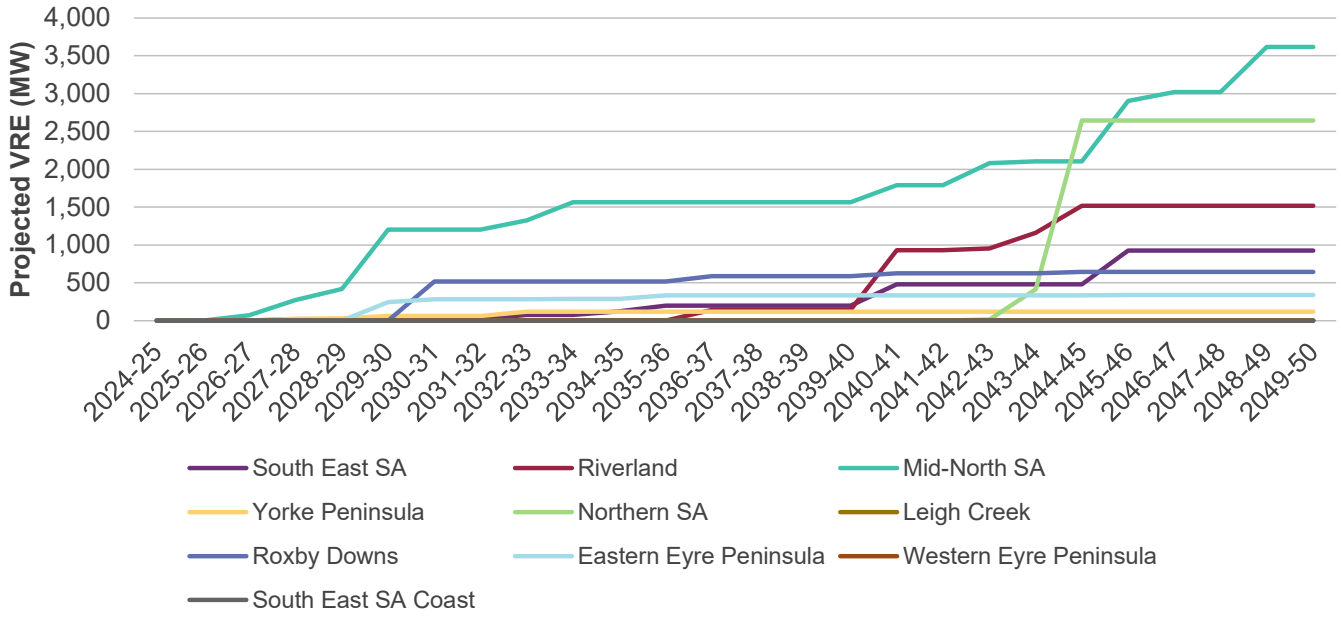
A3.3.4 South Australia

VRE outlook

In South Australia, nearly 10 GW of new utility-scale wind and solar VRE is projected as being required by 2050 to assist in replacing retiring gas generation capacity. Figure 9 shows the utility-scale VRE projected for each REZ in South Australia in *Step Change*. This modelling indicates:

- The projected VRE is shared over many REZs throughout South Australia, with the largest share of early development occurring in the Mid-North South Australia REZs due to the high-quality wind resource.
- The Mid-North South Australia REZ sees an immediate increase in VRE, with an additional 1,200 MW of new VRE capacity by 2029-30, and 1,800 MW by 2041-42 and reaching 3,600 MW by 2049-50.
- The South East South Australia REZ sees a gradual increase in VRE with close to 500 MW new capacity after 2040 and just under 1,000 MW by 2050.
- The Northern South Australia REZ is projected to see developments particularly in solar after 2044-45, with 2,650 MW new VRE capacity by 2049-50.
- The Riverland REZ is projected to developments particularly in solar after 2040-41, with 1,500 MW of new VRE capacity by 2044-45.
- The Eastern Eyre Peninsula and Roxby Downs REZs also see small amounts of VRE developments in the order of 350-600 MW in the mid-2030s.

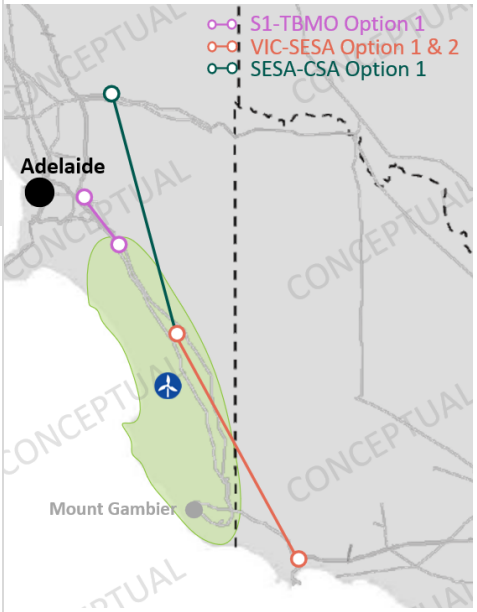
Figure 9 South Australia utility-scale VRE development in REZs for *Step Change* (MW)



S1 – South East South Australia

Summary

The South East South Australia REZ lies on the major 275 kV route of the South Australia – Victoria Heywood interconnector. It has C grade wind resource quality.



Existing network capability

The existing network capacity of this REZ was modelled as part of South East South Australia – Central South Australia (SESA-CSA) sub-regional maximum transfer capability of 650 MW.

Other than the preparatory activity upgrade, there are no augmentation options specifically for this REZ. The associated augmentations are the VIC-SESA and SESA-CSA flow path augmentations, and the S1-TMBO Group Constraint augmentation.

REZ grouping

Coordination of generation infrastructure may be required.	The modelling outcomes primarily identify this zone for development of wind generation. This REZ could benefit from early community engagements and from the coordination of generation.

Metrics

Resource	**Solar**			**Wind**		
Resource Quality	D			C		
Renewable Potential (MW)	100			3,200		
Demand Correlation	**2029-30**	**2039-40**	**2049-50**	**2029-30**	**2039-40**	**2049-50**
	F	F	F	A/B	A	A
MLF Robustness	**2029-30**		**2034-35**		**2039-40**	
	N/A*		N/A		N/A	

*No MLF robustness scores are shown as the MLF robustness for VRE in this REZ is heavily dependent on market conditions and interconnector flows.

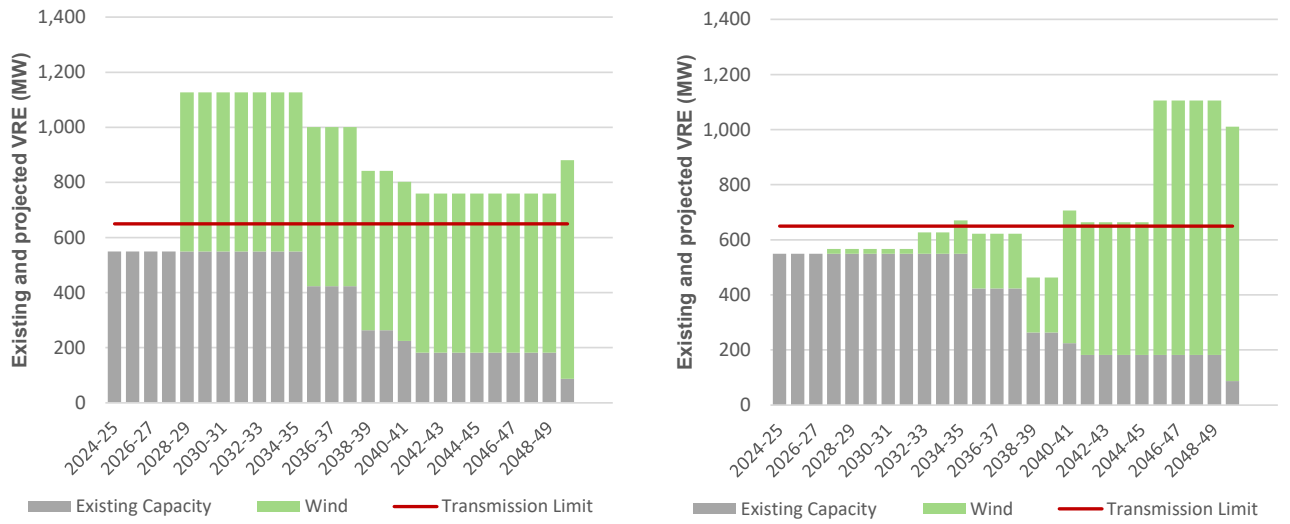
Climate hazard

Temperature score	D	**Bushfire score**	D

VRE outlook

	Solar PV (MW)				**Wind (MW)**			
	Existing/ committed/ anticipated	**Projected**			**Existing/ committed/ anticipated**	**Projected**		
		2029-30	**2039-40**	**2049-50**		**2029-30**	**2039-40**	**2049-50**
Progressive Change	225	-	-	-	324	600	600	800
Step Change		-	-	-		-	200	900
Green Energy Exports		-	-	100		650	800	1,350

Transmission access expansion forecast for *Progressive Change* (left) and *Step Change* (right)



Note: The transmission limit was modelled using the SESA-CSA flow path limit.

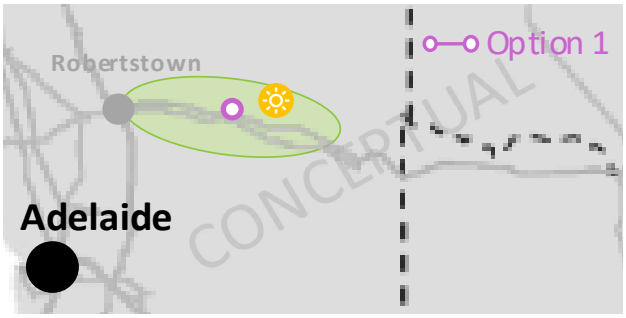
VRE curtailment

Scenario	2029-30		2039-40		2049-50	
	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill
Progressive Change	-	14%	-	15%	-	10%
Step Change	-	22%	-	19%	-	16%
Green Energy Exports	-	23%	-	16%	-	21%

S2 - Riverland

Summary

The Riverland REZ is on the South Australian side of the proposed Project EnergyConnect route. It has grade C solar resource quality.



Existing network capability

There is minimal existing renewable generation in the zone. Prior to Project EnergyConnect, approximately 130 MW can be connected in this REZ for all three operating conditions (peak demand, summer typical and winter reference). Once Project EnergyConnect is commissioned, the REZ transmission limit increases by approximately 800 MW.

REZ grouping

Infrastructure coordination can start later.	Modelling outcomes indicate a low likelihood that significant investment in VRE and transmission infrastructure will be optimally required in the next 12 years.

Metrics

Resource	**Solar**			**Wind**		
Resource Quality	C			E		
Renewable Potential (MW)	4,000			1,400		
Demand Correlation	**2029-30**	**2039-40**	**2049-50**	**2029-30**	**2039-40**	**2049-50**
	F	F	F	A	A	A
MLF Robustness	**2029-30**		**2034-35**		**2039-40**	
	A		A		A	

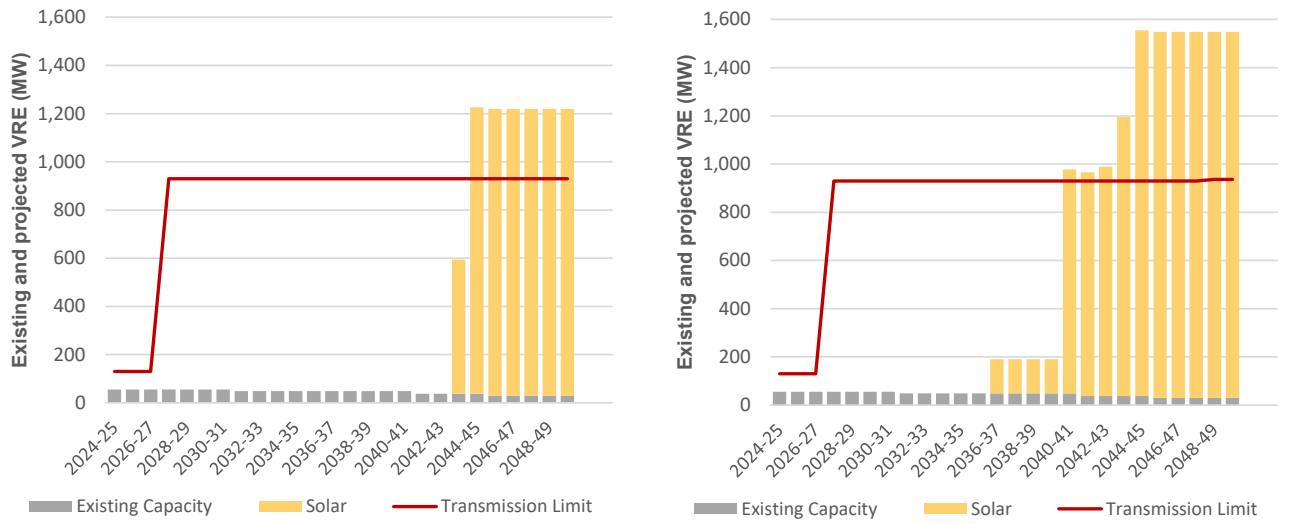
Climate hazard

Temperature score	E	**Bushfire score**	C

VRE outlook

	Solar PV (MW)				**Wind (MW)**			
	Existing/ committed/ anticipated	**Projected**			**Existing/ committed/ anticipated**	**Projected**		
		2029-30	**2039-40**	**2049-50**		**2029-30**	**2039-40**	**2049-50**
Progressive Change	55	-	-	1,200	There is no existing, committed or anticipated wind generation for this REZ. The modelling outcomes, for all scenarios, did not project any additional wind for this REZ.			
Step Change		-	150	1,500				
Green Energy Exports		1,000	1,100	4,000				

Transmission access expansion forecast for *Progressive Change* (left) and *Step Change* (right)



VRE curtailment

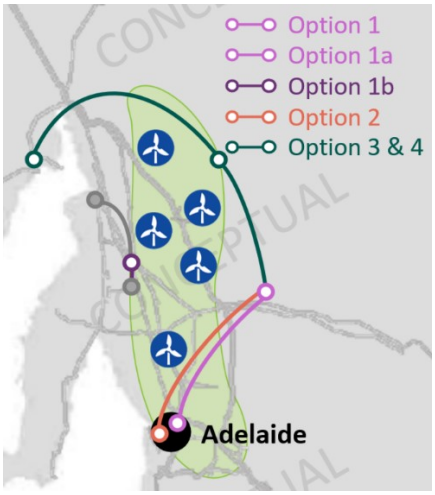
Scenario	2029-30		2039-40		2049-50	
	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill
Progressive Change	-	24%	-	20%	1%	30%
Step Change	-	28%	-	26%	1%	50%
Green Energy Exports	-	27%	1%	27%	2%	39%

S3 – Mid-North South Australia

Summary

The Mid-North South Australia REZ has grade C wind and solar resource quality. There are several major wind farms in service in this REZ, totalling more than 1,700 MW of installed or committed capacity.

Four 275 kV parallel circuits provide the bulk transmission along the corridor from Davenport to near Adelaide (Para) which traverse this REZ. This transmission corridor forms the backbone for exporting power from REZs north and west of this REZ in South Australia.



Existing network capability

The capability of this zone to accommodate new generation is subject to the MN1 mid-north group constraint[36].

REZ grouping

Transmission and generation infrastructure coordination may be required.	ElectraNet provided updated costs and revised options for S3 through the Draft 2024 ISP submission consultation. Modelling outcomes currently indicate a high likelihood that significant investment in VRE and transmission infrastructure will be optimally required in the next 12 years. AEMO recommends that ElectraNet explore the case for augmentation to support industrial loads, given government policy. A sensitivity analysis was conducted with options for varying amounts of additional load in Mid North and Eyre Peninsula regions, and results highlighted potential network capacity may be required if load is connected[37]. ElectraNet will need to proceed with a Project Assessment Draft Report (PADR) as this REZ is considered actionable.

Metrics

Resource	**Solar**			**Wind**		
Resource Quality	C			C		
Renewable Potential (MW)	1,300			4,600		
Demand Correlation	**2029-30**	**2039-40**	**2049-50**	**2029-30**	**2039-40**	**2049-50**
	F	F	F	A	A	A
MLF Robustness	**2029-30**		**2034-35**		**2039-40**	
	A		A		A	

Climate hazard			
Temperature score	D	**Bushfire score**	D

VRE outlook

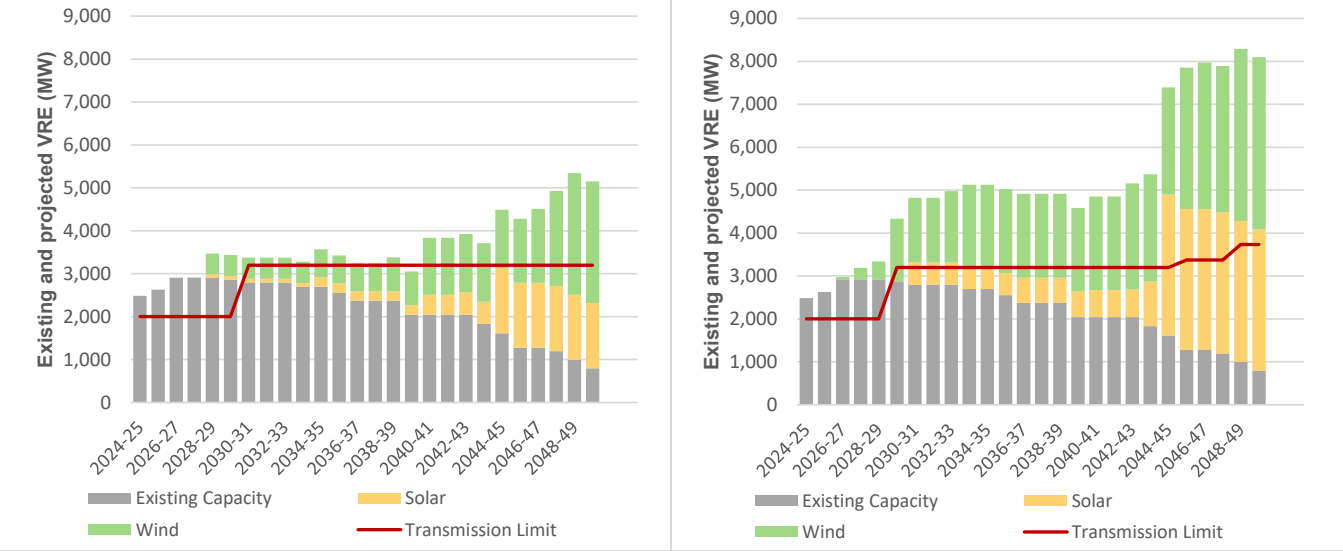
	Solar PV (MW)				**Wind (MW)**			
	Existing/ committed/ anticipated	**Projected**			**Existing/ committed/ anticipated**	**Projected**		
		2029-30	**2039-40**	**2049-50**		**2029-30**	**2039-40**	**2049-50**
Progressive Change	-	-	-	-	1,731	450	600	2,450

[36] Additional augmentation is required in Mid-North when the combination of generation in S3, S4, S5, S6, S7, S8, S9 >2,000 MW.

[37] Further described in Appendix 6. Cost Benefit Analysis.

Step Change		-	-	-		1,200	1,550	3,600
Green Energy Exports		-	-	1,300		2,800	3,850	4,600

Transmission access expansion forecast for *Progressive Change* (left) and *Step Change* (right)



Note: The transmission access expansion forecasts show the results for the MN1 group constraint augmentation.

VRE curtailment

Scenario	2029-30		2039-40		2049-50	
	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill
Progressive Change	-	7%	-	7%	-	8%
Step Change	-	10%	-	10%	-	14%
Green Energy Exports	-	11%	-	10%	-	14%

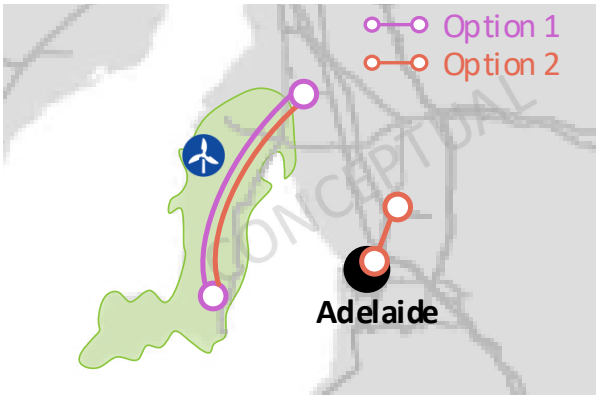
Transmission curtailment for this REZ is not captured. The transmission infrastructure required to upgrade this REZ increases capacity on the 275 kV back bone for S3, S4, S6, S7, S8 and S9.

S4 – Yorke Peninsula

Summary

The Yorke Peninsula REZ has grade C wind resource quality.

A single 132 kV line extends from Hummocks to Wattle Point (towards the end of Yorke Peninsula).



Existing network capability

The existing 132 kV network has 100 MW of additional network capacity for all three operating conditions (peak demand, summer typical and winter reference). Transmission augmentation is required to connect any significant additional generation in this REZ.

The capability of this zone to accommodate new generation is also subject to the MN1 mid-north group constraint[38].

REZ grouping

Infrastructure coordination can start later.	Modelling outcomes indicate a low likelihood that significant investment in VRE and transmission infrastructure will be optimally required in the next 12 years.

Metrics

Resource	**Solar**			**Wind**		
Resource Quality	F			C		
Renewable Potential (MW)	-			1,400		
Demand Correlation	**2029-30**	**2039-40**	**2049-50**	**2029-30**	**2039-40**	**2049-50**
	F	F	F	A	A	A
MLF Robustness	**2029-30**		**2034-35**		**2039-40**	
	F		F		F	

Climate hazard

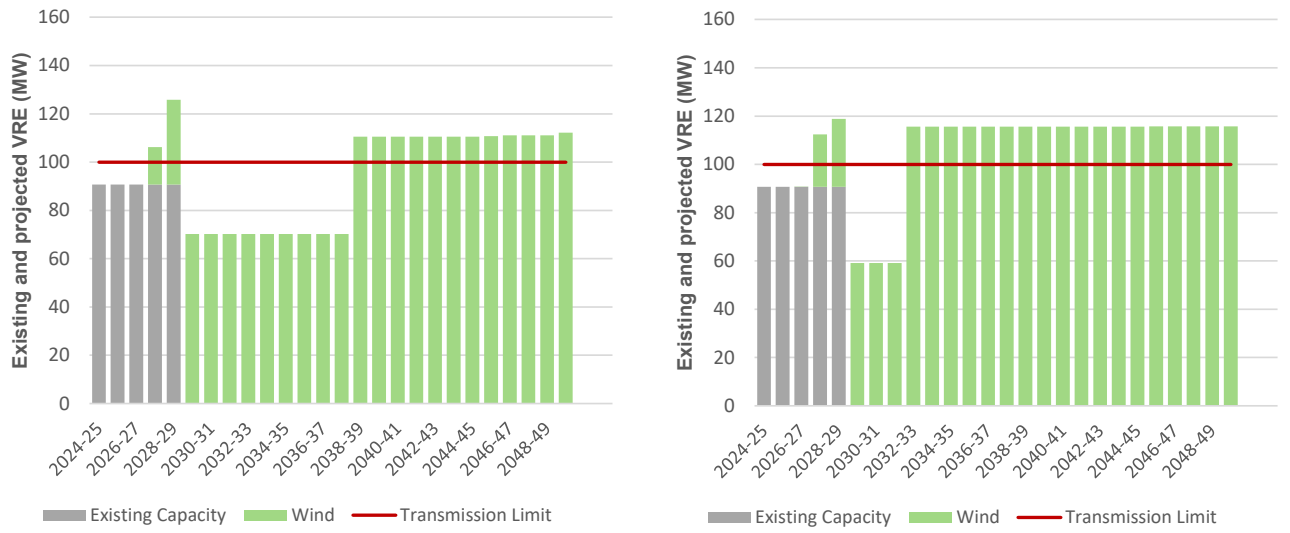
Temperature score	D	**Bushfire score**	C

VRE outlook

	Solar PV (MW)				**Wind (MW)**			
	Existing/ committed/ anticipated	**Projected**			**Existing/ committed/ anticipated**	**Projected**		
		2029-30	**2039-40**	**2049-50**		**2029-30**	**2039-40**	**2049-50**
Progressive Change	There is no existing, committed or anticipated solar generation for this REZ. The modelling outcomes, for all scenarios, did not project any additional solar for this REZ.				91	50	100	100
Step Change						50	100	100
Green Energy Exports						100	400	700

[38] Additional augmentation is required in Mid-North when the combination of generation in S3, S4, S5, S6, S7, S8, S9 >2,000 MW.

Transmission access expansion forecast for *Progressive Change* (left) and *Step Change* (right)



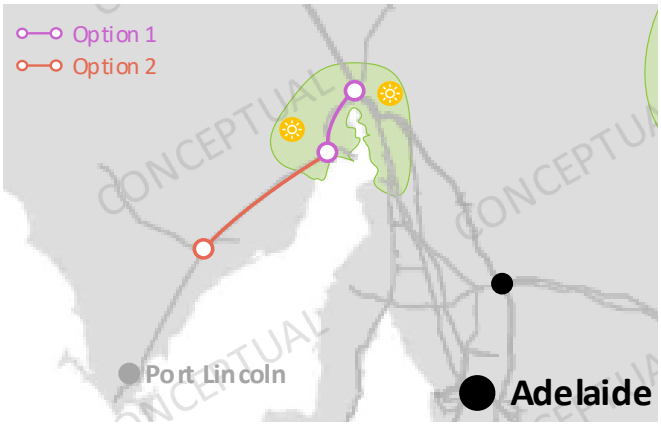
VRE curtailment

Scenario	2029-30		2039-40		2049-50	
	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill
Progressive Change	-	2%	-	13%	-	16%
Step Change	-	6%	-	18%	-	23%
Green Energy Exports	-	30%	-	19%	-	22%

S5 – Northern SA

Summary

The Northern SA REZ has grade B solar resource quality. This REZ forms a candidate for a hydrogen electrolyser facility in South Australia.



Existing network capability

The capability of this zone to accommodate new generation is subject to the MN1 mid-north and NSA1 northern group constraint[39].

REZ grouping

Infrastructure coordination can start later.	Modelling outcomes indicate a low likelihood that significant investment in VRE and transmission infrastructure will be optimally required in the next 12 years. It is noted that additional capacity is forecast under the *Green Energy Exports* scenario under the group constraint NSA1.

Metrics

Resource	**Solar**			**Wind**		
Resource Quality	B			E		
Renewable Potential (MW)	2,900			-		
Demand Correlation	**2029-30**	**2039-40**	**2049-50**	**2029-30**	**2039-40**	**2049-50**
	F	F	F	A	A	A
MLF Robustness	**2029-30**		**2034-35**		**2039-40**	
	C		C		C	

Climate hazard

Temperature score	E	**Bushfire score**	D

VRE outlook

	Solar PV (MW)				**Wind (MW)**			
	Existing/ committed/ anticipated	**Projected**			**Existing/ committed/ anticipated**	**Projected**		
		2029-30	**2039-40**	**2049-50**		**2029-30**	**2039-40**	**2049-50**
Progressive Change	579	-	-	950	416	-	-	-
Step Change		-	-	2,650		-	-	-
Green Energy Exports		800	2,550	2,900		-	-	-

[39] Additional augmentation is required in Mid-North when the combination of generation in S3, S4, S5, S6, S7, S8, S9 >2,000 MW or in Eyre Peninsula when (0.5 x S5), S8, S9 > 1,125 MW.

Transmission access expansion forecast for *Progressive Change* (left) and *Step Change* (right)

Note: S5 forecast shows results for the NSA1 group constraint augmentation.

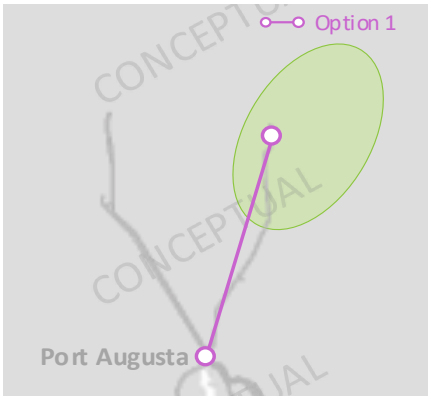
VRE curtailment

Scenario	2029-30		2039-40		2049-50	
	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill
Progressive Change	-	16%	-	10%	-	20%
Step Change	-	21%	-	14%	-	34%
Green Energy Exports	-	15%	-	12%	-	16%

S6 – Leigh Creek

Summary

The Leigh Creek REZ is located between 150 km and 350 km north-east of Davenport. It has grade A and B solar and wind resource quality. This REZ is currently supplied with a single 132 kV line.



Existing network capability

There is no additional network capacity within this REZ. The capability of this zone to accommodate new generation is subject to the MN1 mid-north group constraint[40].

REZ grouping

Infrastructure coordination can start later.	Modelling outcomes indicate a very low likelihood that significant investment in VRE and transmission infrastructure will be optimally required in the next 12 years. ElectraNet has advised there are significant environmental, cultural, and social concerns to be addressed for any possible future development options[41].

Metrics

Resource	**Solar**			**Wind**		
Resource Quality	A			B		
Renewable Potential (MW)	6,500			2,400		
Demand Correlation	**2029-30**	**2039-40**	**2049-50**	**2029-30**	**2039-40**	**2049-50**
	F	F	F	A	A	A
MLF Robustness	**2029-30**		**2034-35**		**2039-40**	
	E		E		E	

Climate hazard

Temperature score	D	**Bushfire score**	C

VRE outlook

	Solar PV (MW)				**Wind (MW)**			
	Existing/ committed/ anticipated	**Projected**			**Existing/ committed/ anticipated**	**Projected**		
		2029-30	**2039-40**	**2049-50**		**2029-30**	**2039-40**	**2049-50**
Progressive Change	There is no existing, committed, anticipated VRE projects for this REZ and the modelling outcomes, for all scenarios, did not project any additional VRE for this REZ.							
Step Change								
Green Energy Exports								

Transmission access expansion forecast and VRE curtailment

There is no existing, committed, anticipated VRE projects for this REZ and the modelling outcomes, for all scenarios, did not project any additional VRE for this REZ. Therefore, no VRE curtailment or transmission expansion occurs in this REZ.

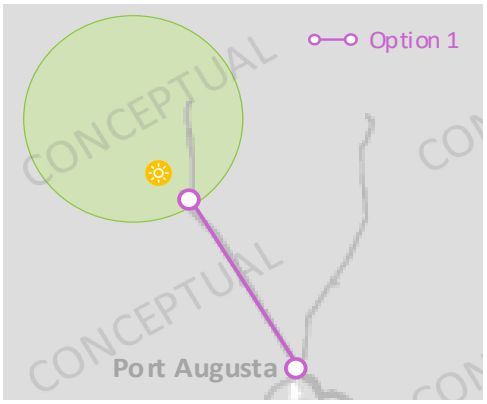
[40] Additional augmentation is required in Mid-North when the combination of generation in S3, S4, S5, S6, S7, S8, S9 >2,000 MW.

[41] See ElectraNet Transmission Annual Planning Report October 2023, at https://www.electranet.com.au/wp-content/uploads/231115_2023-TAPR.pdf.

S7 – Roxby Downs

Summary

The Roxby Downs REZ is located a few hundred kilometres north-west of Davenport. It has grade A solar resource quality. The only significant load in the area is the Olympic Dam and Carrapateena mines. This REZ is currently connected with a 132 kV line that provides supply to small loads, and two privately owned 275 kV lines from Davenport that provide supply to large mines in the area.



Existing network capability

The existing network capacity of this REZ is 500 MW, although the capability of this zone to accommodate new generation is subject to the MN1 mid-north group constraint[42].

REZ grouping

Infrastructure coordination can start later.	Modelling outcomes indicate a low likelihood that significant investment in VRE and transmission infrastructure will be optimally required in the next 12 years. It is noted that additional capacity is forecast under the *Green Energy Exports* scenario.

Metrics

Resource	**Solar**			**Wind**		
Resource Quality	A			E		
Renewable Potential (MW)	3,400			-		
Demand Correlation	**2029-30**	**2039-40**	**2049-50**	**2029-30**	**2039-40**	**2049-50**
	F	F	F	A	A	A
MLF Robustness	**2029-30**		**2034-35**		**2039-40**	
	F		F		F	

Climate hazard

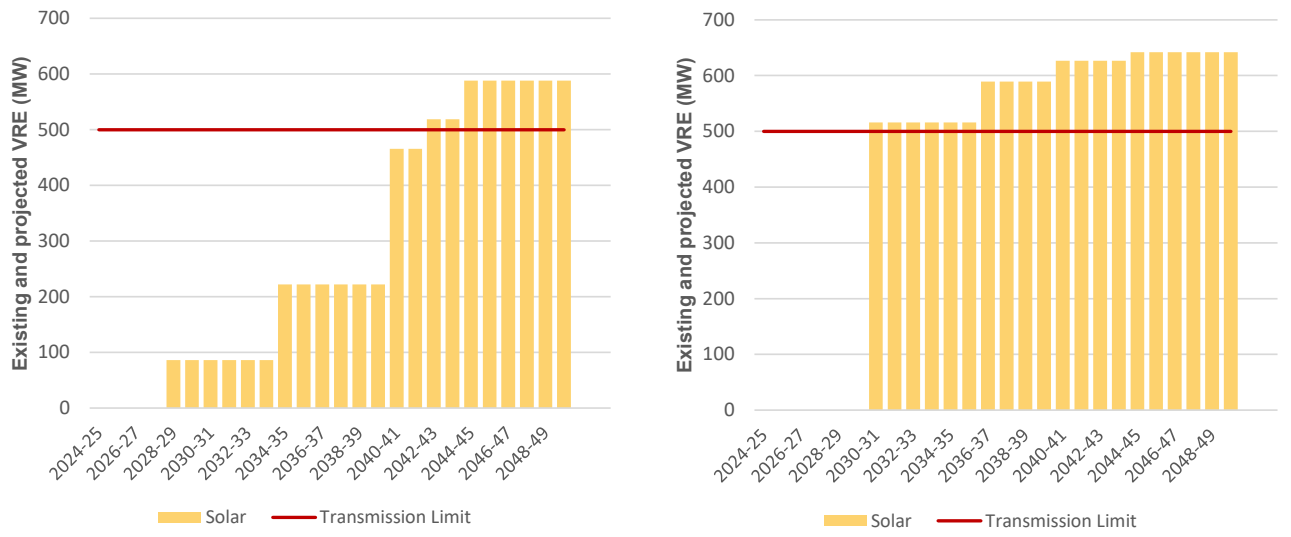
Temperature score	E	**Bushfire score**	C

VRE outlook

	Solar PV (MW)				**Wind (MW)**			
	Existing/ committed/ anticipated	**Projected**			**Existing/ committed/ anticipated**	**Projected**		
		2029-30	**2039-40**	**2049-50**		**2029-30**	**2039-40**	**2049-50**
Progressive Change	-	100	200	600	There is no existing, committed or anticipated wind generation for this REZ. The modelling outcomes, for all scenarios, did not project any additional wind for this REZ.			
Step Change		-	600	650				
Green Energy Exports		600	650	2,750				

[42] Additional augmentation is required in Mid-North when the combination of generation in S3, S4, S5, S6, S7, S8, S9 >2,000 MW.

Transmission access expansion forecast for *Progressive Change* (left) and *Step Change* (right)



VRE curtailment

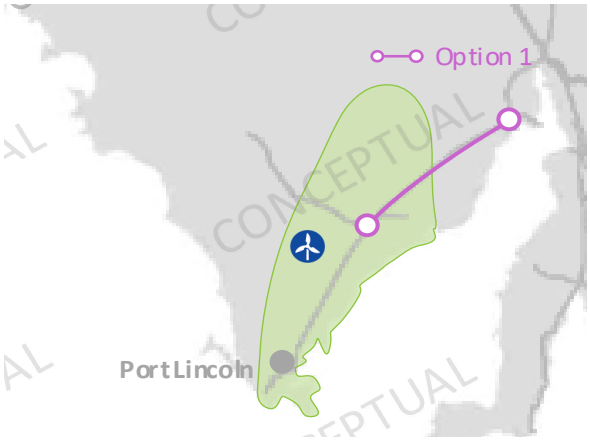
Scenario	2029-30		2039-40		2049-50	
	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill
Progressive Change	-	25%	-	17%	-	31%
Step Change	-	22%	1%	29%	-	47%
Green Energy Exports	-	31%	1%	33%	2%	37%

S8 – Eastern Eyre Peninsula

Summary

The Eastern Eyre Peninsula REZ has grade C wind resource quality.

The Eyre Peninsula Link was completed in February 2023. It replaced the existing Cultana–Yadnarie–Port Lincoln 132 kV single-circuit line with a new double-circuit 132 kV line. The section between Cultana to Yadnarie is built to operate at 275 kV, however, it is initially energised at 132 kV.



Existing network capability

The existing network capacity of this REZ is 300 MW (subject to the capacity of the 275/132 kV transformers).

The capability of this zone to accommodate new generation is subject to the MN1-SA mid-north and NSA1 northern group constraint[43].

REZ grouping

Infrastructure coordination can start later.	Modelling outcomes indicate a low likelihood that significant investment in VRE and transmission infrastructure will be optimally required in the next 12 years. It is noted that additional capacity is forecast under the *Green Energy Exports* scenario under the group constraint NSA1.

Metrics

Resource	**Solar**			**Wind**		
Resource Quality	D			C		
Renewable Potential (MW)	5,000			2,300		
Demand Correlation	**2029-30**	**2039-40**	**2049-50**	**2029-30**	**2039-40**	**2049-50**
	F	F	F	A	A	A
MLF Robustness	**2029-30**		**2034-35**		**2039-40**	
	E		E		E	

Climate hazard

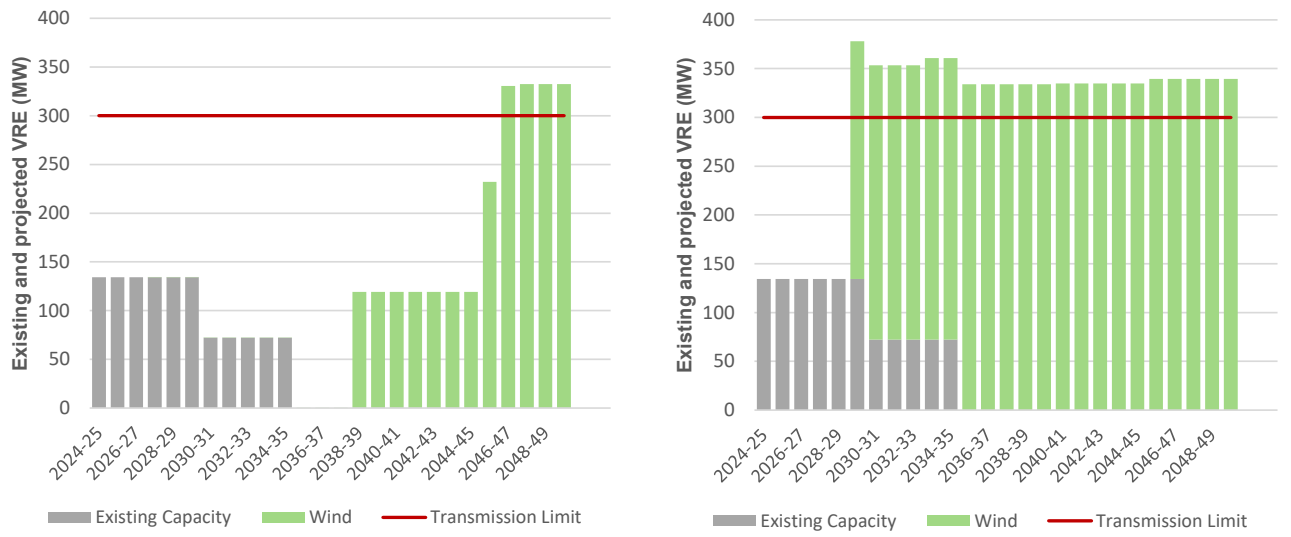
Temperature score	D	**Bushfire score**	D

VRE outlook

	Solar PV (MW)				**Wind (MW)**			
	Existing/ committed/ anticipated	**Projected**			**Existing/ committed/ anticipated**	**Projected**		
		2029-30	**2039-40**	**2049-50**		**2029-30**	**2039-40**	**2049-50**
Progressive Change	There is no existing, committed or anticipated solar generation for this REZ. The modelling outcomes, for all scenarios, did not project any additional solar for this REZ.				134	-	100	350
Step Change						250	350	350
Green Energy Exports						1,050	1,250	1,300

[43] Additional augmentation is required in Mid-North when the combination of generation in S3, S4, S5, S6, S7, S8, S9 >2,000 MW or in Eyre Peninsula when (0.5 x S5), S8, S9 > 1,125 MW.

Transmission access expansion forecast for *Progressive Change* (left) and *Step Change* (right)



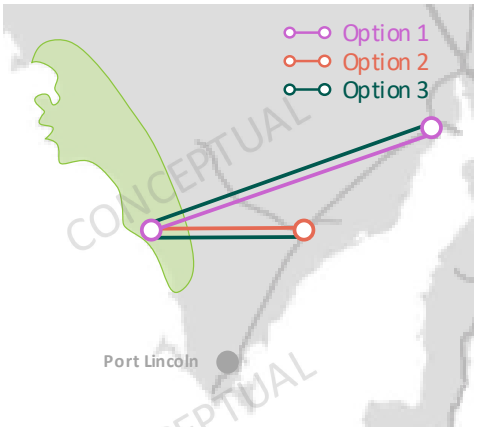
VRE curtailment

Scenario	2029-30		2039-40		2049-50	
	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill
Progressive Change	-	9%	-	10%	-	14%
Step Change	-	8%	-	12%	-	19%
Green Energy Exports	-	15%	-	14%	-	18%

S9 – Western Eyre Peninsula

Summary

The Western Eyre Peninsula REZ shares the same electrical network as the Eastern Eyre Peninsula. It has grade C solar and wind resource quality. There are no generators currently connected or committed within this REZ.



Existing network capability

There is no additional network capacity within this REZ. The capability of this zone to accommodate new generation is subject to the MN1-SA mid-north and NSA1 northern group constraint[44].

REZ grouping

Infrastructure coordination can start later.	Modelling outcomes indicate a low likelihood that significant investment in VRE and transmission infrastructure will be optimally required in the next 12 years.

Metrics

Resource	**Solar**			**Wind**		
Resource Quality	C			C		
Renewable Potential (MW)	4,000			1,500		
Demand Correlation	**2029-30**	**2039-40**	**2049-50**	**2029-30**	**2039-40**	**2049-50**
	F	F	F	A	A	A
MLF Robustness	**2029-30**		**2034-35**		**2039-40**	
	N/A*		N/A		N/A	

*There is currently no network connecting this REZ to the transmission network.

Climate hazard

Temperature score	D	**Bushfire score**	C

VRE outlook

	Solar PV (MW)				**Wind (MW)**			
	Existing/ committed/ anticipated	**Projected**			**Existing/ committed/ anticipated**	**Projected**		
		2029-30	**2039-40**	**2049-50**		**2029-30**	**2039-40**	**2049-50**
Progressive Change	There is no existing, committed or anticipated solar generation for this REZ.	-	-	-	There is no existing, committed or anticipated wind generation for this REZ.	-	-	-
Step Change		-	-	-		-	-	-
Green Energy Exports		-	300	4,000		-	250	1,500

Transmission access expansion forecast for *Progressive Change* and *Step Change*

There is no existing, committed, anticipated VRE projects for this REZ and the modelling outcomes for the *Progressive Change* and *Step Change* scenarios did not project any additional VRE for this REZ.

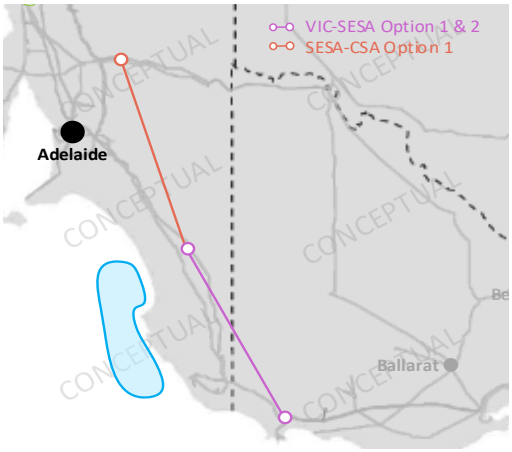
[44] Additional augmentation is required in Mid-North when the combination of generation in S3, S4, S5, S6, S7, S8, S9 >2,000 MW or in Eyre Peninsula when (0.5 x S5), S8, S9 > 1,125 MW.

VRE curtailment						
Scenario	2029-30		2039-40		2049-50	
	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill
Progressive Change	-	-	-	-	-	-
Step Change	-	-	-	-	-	-
Green Energy Exports	-	-	-	25%	1%	25%

S10 – South East South Australia Coast

Summary

The South East South Australia Coast REZ has been identified for offshore wind resource potential in relatively shallow waters close to shore, with a proposed connection point near to the South East South Australia REZ. There is currently interest in this area of approximately 600 MW, but projects have not developed sufficiently at this stage to be considered anticipated.



Existing network capability

South East South Australia Coast REZ is proposed to connect to an offshore collection node in the South East South Australia REZ. The network limit for this REZ is included as part of the SESA-CSA sub-regional limit. There are no augmentation options specifically for this REZ. The associated augmentations are the VIC-SESA and SESA-CSA flow path augmentations.

REZ grouping

Infrastructure coordination can start later.	Modelling outcomes indicate a low likelihood that significant investment in VRE and transmission infrastructure will be optimally required in the next 12 years.

Metrics

Resource	**Offshore Wind (fixed)**			**Offshore Wind (floating)**		
Resource Quality	A			A		
Renewable Potential (MW)	20,428			7,032		
Demand Correlation	**2029-30**	**2039-40**	**2049-50**	**2029-30**	**2039-40**	**2049-50**
	B	B	B	B	B	A
MLF Robustness	**2029-30**		**2034-35**		**2039-40**	
	N/A*		N/A		N/A	

*No VRE is projected for this REZ.

Climate hazard

Temperature score	D	**Bushfire score**	D

VRE outlook

	Offshore Wind – fixed (MW)				**Offshore Wind - floating (MW)**			
	Existing/ committed/ anticipated	**Projected**			**Existing/ committed/ anticipated**	**Projected**		
		2029-30	**2039-40**	**2049-50**		**2029-30**	**2039-40**	**2049-50**
Progressive Change	There is no existing, committed or anticipated offshore wind generation for this REZ. The modelling outcomes, for all scenarios, did not project any offshore wind for this REZ.							
Step Change								
Green Energy Exports								

Transmission access expansion forecast and VRE curtailment

There are no existing, committed, or anticipated VRE projects for this REZ and the modelling outcomes, for all scenarios, did not project any additional VRE for this REZ. Therefore, no VRE curtailment or transmission expansion occurs in this REZ.

A3.3.5 Tasmania

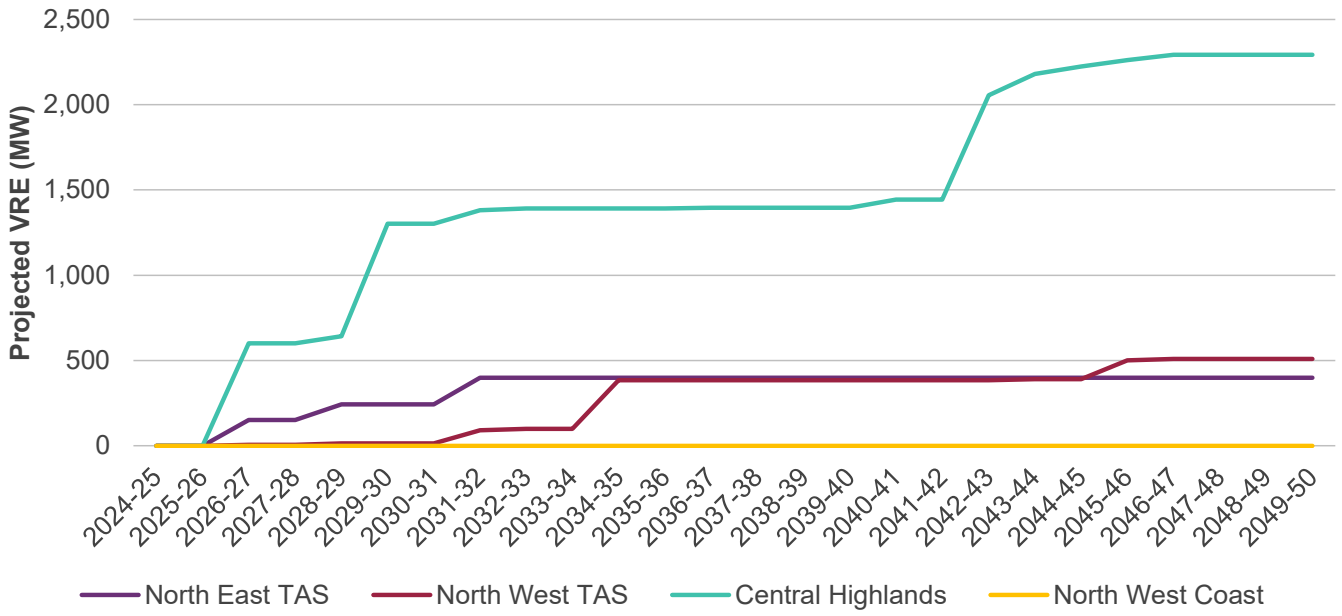
VRE outlook

In Tasmania, around 1.5 GW of new utility-scale wind VRE is projected as being required by 2030-31, utilising transmission capacity released by the development of Project Marinus Stage 1.

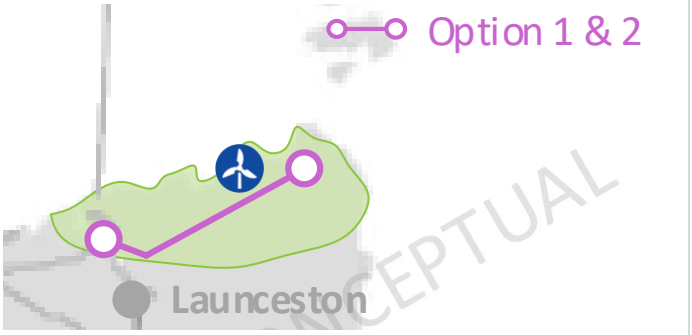
Figure 10 shows the utility-scale VRE projected for each REZ in Tasmania in *Step Change*. This modelling indicates:

- Over 600 MW of new wind is projected for the Central Highlands REZ early in the horizon, by 2026-27, with around 1,300 MW of new wind projected by 2029-30 to utilise the full capacity of Project Marinus Stage 1. This REZ has the highest VRE projection in Tasmania, with nearly 2,300 MW required by 2046-47.
- The North West Tasmania REZ sees a gradual increase of 380 MW of new wind projected by 2034-35, reaching a maximum of 500 MW by 2046-47.
- 400 MW of new wind is projected for North East Tasmania REZ by 2031-32.
- No major change in utility-scale VRE capacity is forecast as required beyond 2042-43.
- No solar or offshore wind development is projected in *Step Change* results for Tasmania.

Figure 10 Tasmania utility-scale VRE development in REZs for *Step Change* (MW)



T1 – North East Tasmania

Summary	
This REZ has B grade wind resource quality. North East Tasmania is remote from the actionable Project Marinus and therefore upgrades are less influenced by its status.	
Existing network capability	
Currently there is no capacity on the 110 kV network from Hadspen to Derby. There is approximately 400 MW of VRE resource capacity available within the vicinity of George Town. The capability of this zone to accommodate new generation is subject to the NET1 northeast Tasmania group constraint[45].	

REZ grouping	
Infrastructure coordination can start later.	Modelling outcomes identify moderate VRE development in the late 2020s, but indicate a low likelihood that significant investment in transmission infrastructure will be optimally required in the next eight years.

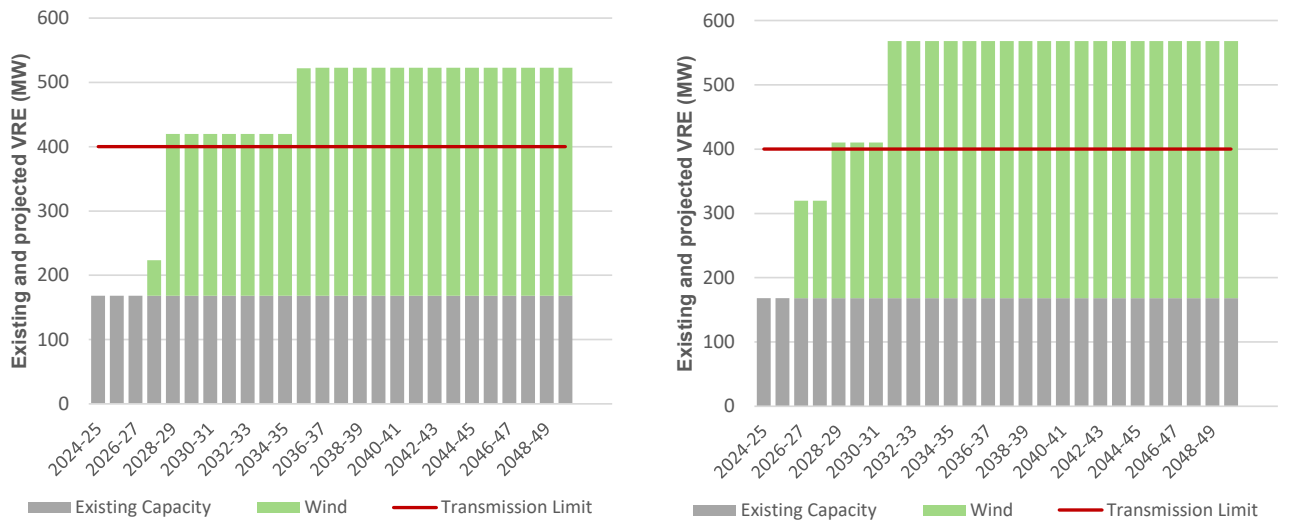
Metrics						
Resource	**Solar**			**Wind**		
Resource Quality	E			B		
Renewable Potential (MW)	300			1,400		
Demand Correlation	**2029-30**	**2039-40**	**2049-50**	**2029-30**	**2039-40**	**2049-50**
	F	F	F	B/C	B	B
MLF Robustness	**2029-30**		**2034-35**		**2039-40**	
	A		A		A	

Climate hazard			
Temperature score	A	**Bushfire score**	B

VRE outlook								
	Solar PV (MW)				**Wind (MW)**			
	Existing/ committed/ anticipated	**Projected**			**Existing/ committed/ anticipated**	**Projected**		
		2029-30	**2039-40**	**2049-50**		**2029-30**	**2039-40**	**2049-50**
Progressive Change	-	-	-	-	168	250	350	350
Step Change		-	-	-		250	400	400
Green Energy Exports		150	150	150		400	400	400

[45] Additional augmentation is required in North East Tasmania when the combination of generation in T1 and T4 is greater than 1,600 MW.

Transmission access expansion forecast for *Progressive Change* (left) and *Step Change* (right)



VRE curtailment

Scenario	2029-30		2039-40		2049-50	
	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill
Progressive Change	-	2%	-	1%	-	6%
Step Change	-	-	-	7%	-	6%
Green Energy Exports	1%	9%	-	7%	-	23%

T2 – North West Tasmania

Summary

This REZ has grade A wind resource quality and good pumped hydro resources. Timing of the North West Tasmania REZ augmentation options are highly dependent on Project Marinus.

In May 2024, the Tasmanian Government released a proposed REZ Area for consultation for North Wrest Tasmania, and AEMO will include outcomes of this consultation in subsequent studies[46].

Existing network capability

The current total REZ transmission limit for existing (112 MW Granville Harbour Wind Farm) and new VRE before any network upgrade in North West Tasmania is approximately 277 MW for peak demand and summer typical conditions and 112 MW for winter reference condition.

This REZ is affected by transient stability constraints for VRE connection at Farrell 220 kV substation. Future REZ generators are assumed to have a runback scheme in place to reduce generation output post contingency to within network capacity for lines currently covered by the Network Control System Protection Scheme (NCSPS), but not for new transmission lines.

REZ grouping

Design and community engagements are progressing	The modelling outcomes identify this zone for development of wind generation in the early 2030s across the *Step Change* and *Green Energy Exports* scenarios, with no generation build in the *Progressive Change* scenario. Ongoing community engagement for network upgrades between Sheffield, Staverton, Hampshire and Burnie is underway as part of the North West Transmission Developments.

Metrics

Resource	**Solar**			**Wind**		
Resource Quality	F			A		
Renewable Potential (MW)	150			5,000		
Demand Correlation	**2029-30**	**2039-40**	**2049-50**	**2029-30**	**2039-40**	**2049-50**
	F	F	F	B	B	A
MLF Robustness	**2029-30**		**2034-35**		**2039-40**	
	E		B		B	

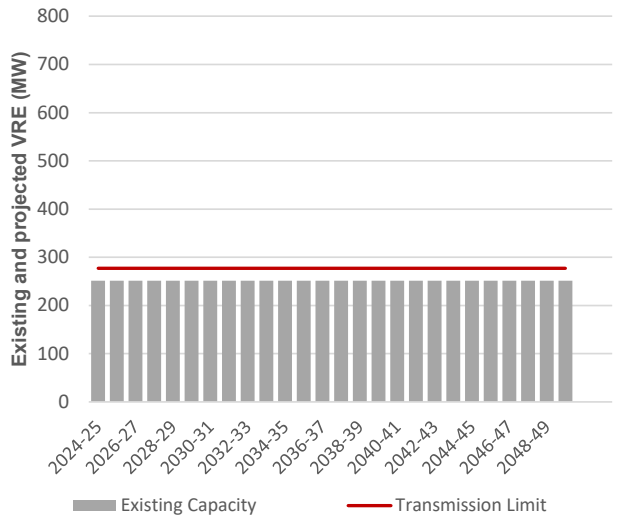
Climate hazard			
Temperature score	A	**Bushfire score**	A

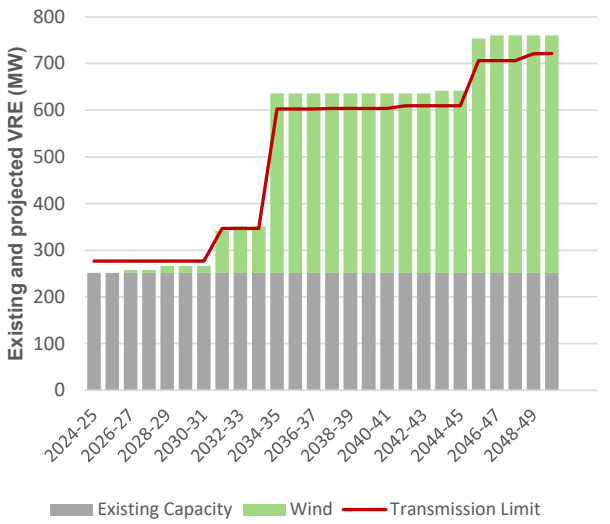
VRE outlook

	Solar PV (MW)				**Wind (MW)**			
	Existing/ committed/ anticipated	**Projected**			**Existing/ committed/ anticipated**	**Projected**		
		2029-30	**2039-40**	**2049-50**		**2029-30**	**2039-40**	**2049-50**
Progressive Change	There is no existing, committed or anticipated solar generation for this REZ. The modelling outcomes, for all scenarios, did not project any additional solar for this REZ.				251	-	-	-
Step Change						-	400	500
Green Energy Exports						3,200	4,600	4,600

[46] See https://www.renewableenergyzones.tas.gov.au/.

Transmission access expansion forecast for *Progressive Change* (left) and *Step Change* (right)

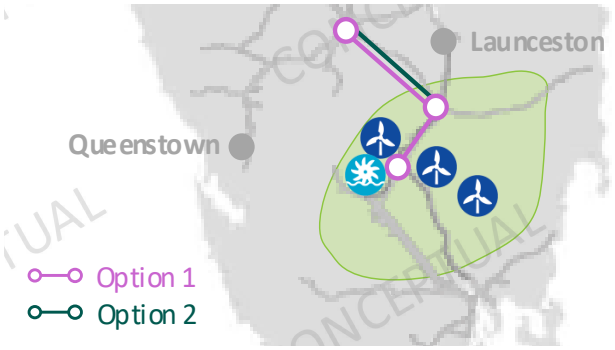




VRE curtailment

Scenario	2029-30		2039-40		2049-50	
	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill
Progressive Change	-	4%	-	4%	-	10%
Step Change	1%	1%	-	8%	-	6%
Green Energy Exports	-	3%	-	2%	-	7%

T3 – Central Highlands

Summary	
This REZ has grade A wind resource quality and has good pumped hydro resources. It is located close to major load centres at Hobart. Timing of the Tasmania Central Highlands REZ augmentation options are influenced by the timing of Project Marinus augmentations.	
Existing network capability	
The current total REZ transmission limit for existing (144 MW Wild Cattle Hill Wind Farm) and new VRE before any network upgrade in the Central Highlands is approximately 527 MW for peak demand and summer typical conditions and 668 MW for winter reference condition. VRE development opportunities are anticipated around the Waddamana substation. Note that a runback scheme is not considered for any new transmission lines.	

REZ grouping	
Design and community engagements are progressing	The modelling outcomes identify this zone for development of wind generation in the 2020s across all scenarios. Ongoing community engagement for network upgrades between Palmerston and Sheffield is underway as part of the North West Transmission Developments.

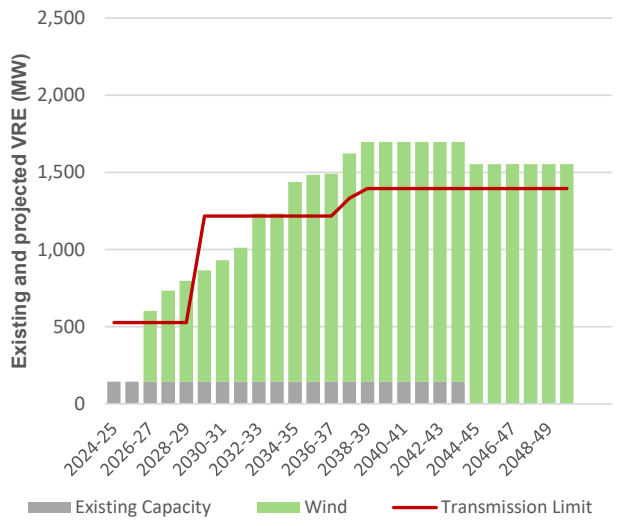
Metrics						
Resource	**Solar**			**Wind**		
Resource Quality	F			A		
Renewable Potential (MW)	150			3,400		
Demand Correlation	**2029-30**	**2039-40**	**2049-50**	**2029-30**	**2039-40**	**2049-50**
	F	F	F	B	B	A/B
MLF Robustness	**2029-30**		**2034-35**		**2039-40**	
	B		B		B	

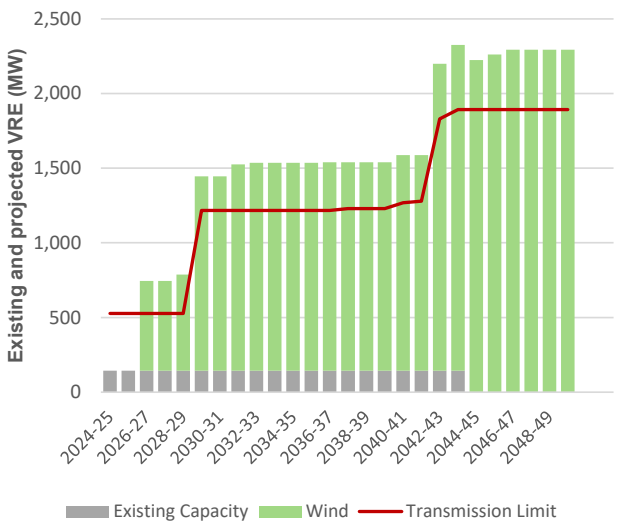
Climate hazard			
Temperature score	A	**Bushfire score**	D

VRE outlook

	Solar PV (MW)				Wind (MW)			
	Existing/ committed/ anticipated	Projected			Existing/ committed/ anticipated	Projected		
		2029-30	2039-40	2049-50		2029-30	2039-40	2049-50
Progressive Change	-	-	-	-	144	700	1,550	1,550
Step Change		-	-	-		1,300	1,400	2,300
Green Energy Exports		150	150	150		1,400	9,700	11,450

Transmission access expansion forecast for *Progressive Change* (left) and *Step Change* (right)





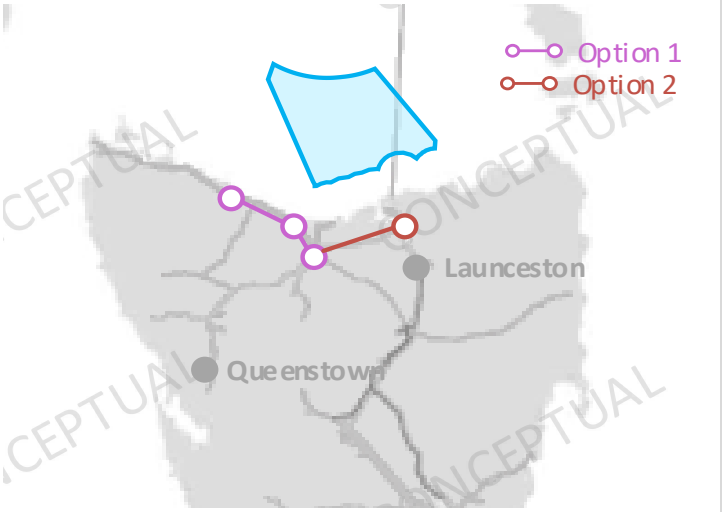
VRE curtailment

Scenario	2029-30		2039-40		2049-50	
	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill
Progressive Change	-	1%	-	1%	-	4%
Step Change	-	-	-	5%	-	3%
Green Energy Exports	1%	6%	-	1%	-	3%

T4 – North Tasmania Coast

Summary

The North Tasmania Coast REZ has been identified for the offshore wind resource potential in relatively shallow waters close to shore, with a connection point close to existing 220 kV networks. There is interest from offshore wind proponents in this REZ but no proposed projects are sufficiently progressed to be considered as anticipated or committed by AEMO's criteria.



Existing network capability

North West Tasmania Coast REZ connects to the 220 kV network within the North West REZ or North East REZ. Two potential connection points for this offshore REZ are in the vicinity of Burnie or George Town, and the REZ transmission network limit for each connection point is considered differently. For a connection to the 220 kV network in the vicinity of Burnie, the total REZ transmission network limit for existing and new VRE is included as part of the North West REZ limit of approximately 277 MW for peak demand and summer typical conditions and 112 MW for winter reference condition. For a connection to the 220 kV network in the vicinity of George Town, the total REZ transmission network limit for existing and new VRE is included as part of the North East Tasmania NET1 group constraint with a combined network limit of 1,600 MW for offshore wind and onshore VRE from T1.

REZ grouping

Infrastructure coordination can start later.	Modelling outcomes indicate a low likelihood that significant investment in VRE and transmission infrastructure will be optimally required in the next 12 years.

Metrics

Resource	**Offshore Wind (fixed)**			**Offshore Wind (floating)**		
Resource Quality	A			A		
Renewable Potential (MW)	14,400			26,150		
Demand Correlation	**2029-30**	**2039-40**	**2049-50**	**2029-30**	**2039-40**	**2049-50**
	B	B	A	B	B	A

MLF Robustness	**2029-30**	**2034-35**	**2039-40**
	N/A*	N/A	N/A

*No VRE is projected for this REZ.

Climate hazard

Temperature score	A	**Bushfire score**	A

VRE outlook

	Offshore Wind – fixed (MW)				**Offshore Wind – floating (MW)**			
	Existing/ committed/ anticipated	**Projected**			**Existing/ committed/ anticipated**	**Projected**		
		2029-30	**2039-40**	**2049-50**		**2029-30**	**2039-40**	**2049-50**
Progressive Change	There is no existing, committed or anticipated offshore wind generation for this REZ. The modelling outcomes, for all scenarios, did not project any offshore wind for this REZ.							
Step Change								
Green Energy Exports								

Transmission access expansion forecast and VRE curtailment

There are no existing, committed, or anticipated VRE projects for this REZ, and the modelling outcomes, for all scenarios, did not project any additional VRE for this REZ. Therefore, no VRE curtailment or transmission expansion occurs in this REZ.

A3.3.6 Victoria

VRE outlook

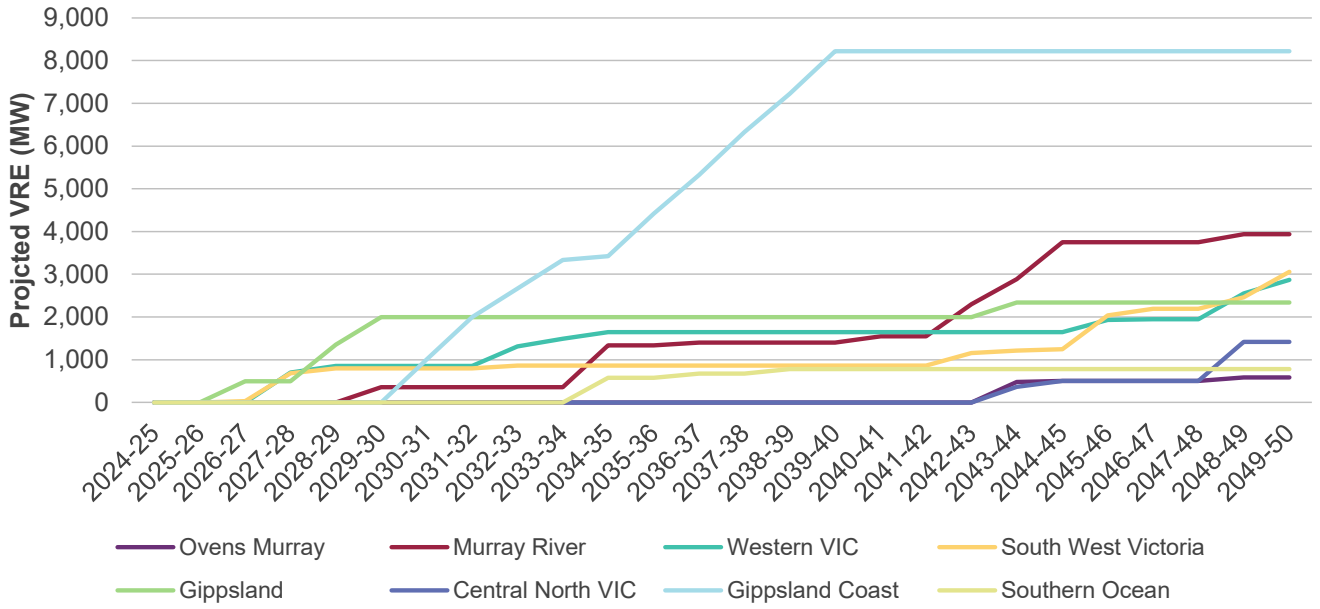
In Victorian REZs, approximately 22 GW of new utility-scale wind and solar VRE is projected by 2050 to assist in meeting VRET targets and replacing retiring generation.

The Victorian Government has outlined its vision[47] for offshore wind and has set targets for at least 2 GW of offshore wind capacity by 2032, 4 GW by 2035 and 9 GW by 2040.

Figure 11 shows the utility-scale VRE capacity projected for each REZ in Victoria in *Step Change*. This modelling indicates:

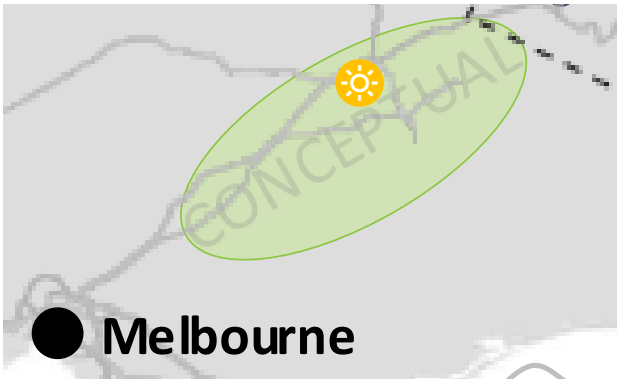
- Approximately 5,000 MW new utility-scale VRE is forecast to be required in Victoria by 2030-31. This new VRE is predominantly located in Western Victoria, South West Victoria and Gippsland REZs.
- The offshore wind targets are drivers for future upgrades to the south-east and south-west regions of Victoria.
- By 2032, the 2 GW offshore wind target is completely developed in Gippsland Coast REZ. By 2035, the Southern Ocean REZ develops with approximately 600 MW and the remaining 3,400 MW develops in Gippsland Coast. By 2040, the Gippsland Coast and Southern Ocean REZs are forecast to develop 8,200 MW and 800 MW respectively.
- Over 3,000 MW of new VRE capacity is projected in the Murray River and Western Victoria REZs combined in the mid-2030s, utilising the additional REZ network capacity from VNI West and the Western Renewable Link.
- After 2043, new utility-scale VRE is projected to connect to the Central North Victoria REZ, with over 1,400 MW by 2049-50.

Figure 11 Victoria utility-scale VRE development in REZs for *Step Change* (MW)



[47] Victorian Government, 2023. "Offshore Wind Transmission Development and Engagement Roadmap". At https://engage.vic.gov.au/offshore-wind-transmission-in-gippsland-and-portland. Viewed 27 October 2023.

V1 – Ovens Murray

Summary	
The Ovens Murray REZ has been identified as a candidate REZ due to this REZ having good pumped hydro resources. There is currently 770 MW of installed hydro generation within this zone.	
Existing network capability	
The current network capacity in Ovens Murray is approximately 350 MW.	

REZ grouping	
Infrastructure coordination can start later.	Modelling outcomes indicate a low likelihood that significant investment in VRE and transmission infrastructure will be optimally required in the next 12 years.

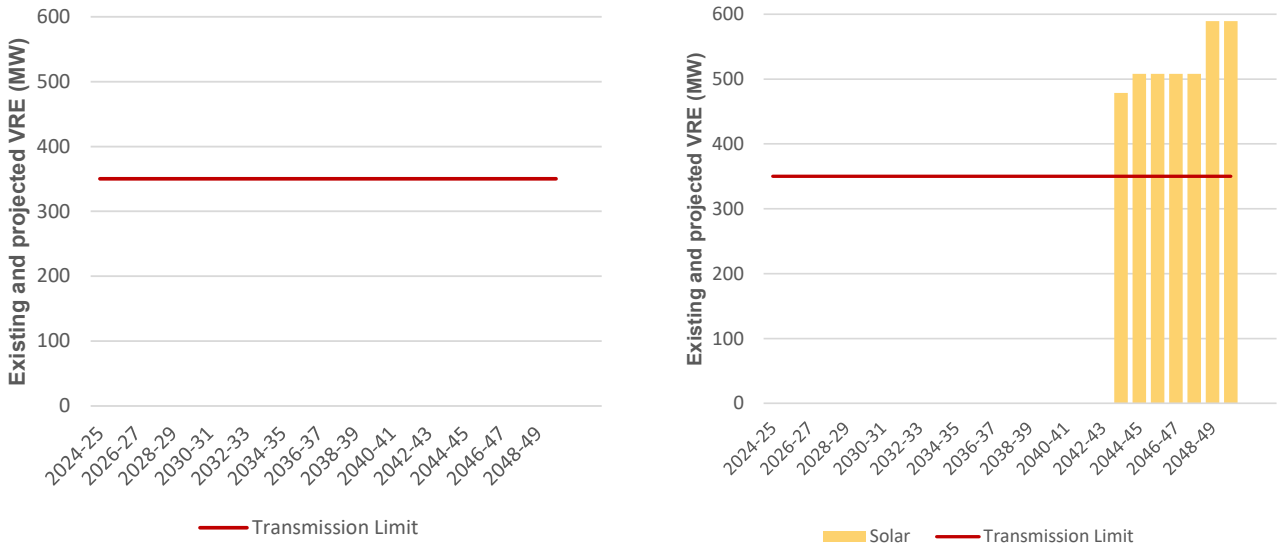
Metrics						
Resource	**Solar**			**Wind**		
Resource Quality	D			E		
Renewable Potential (MW)	1,000			-		
Demand Correlation	**2029-30**	**2039-40**	**2049-50**	**2029-30**	**2039-40**	**2049-50**
	F	F	F	C	C	C
MLF Robustness	**2029-30**		**2034-35**		**2039-40**	
	A		A		A	

Climate hazard			
Temperature score	B	**Bushfire score**	E

VRE outlook

	Solar PV (MW)				Wind (MW)			
	Existing/ committed/ anticipated	**Projected**			**Existing/ committed/ anticipated**	**Projected**		
		2029-30	**2039-40**	**2049-50**		**2029-30**	**2039-40**	**2049-50**
Progressive Change	-	-	-	-	There is no existing, committed or anticipated wind generation for this REZ. The modelling outcomes, for all scenarios, did not project any additional wind for this REZ.			
Step Change		-	-	600				
Green Energy Exports		550	550	650				

Transmission access expansion forecast for *Progressive Change* (left) and *Step Change* (right)



VRE curtailment

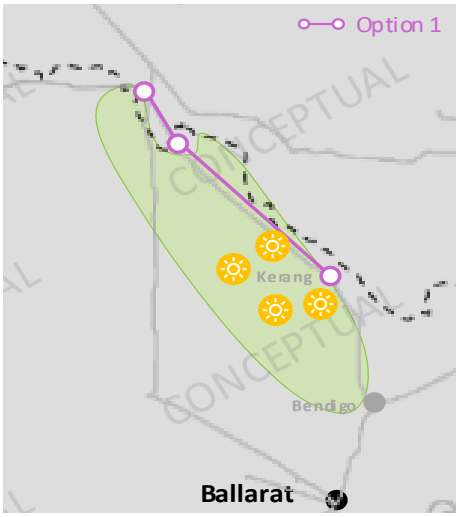
Scenario	2029-30		2039-40		2049-50	
	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill
Progressive Change	-	17%	-	32%	-	33%
Step Change	-	23%	-	35%	13%	32%
Green Energy Exports	3%	32%	11%	28%	8%	45%

V2 – Murray River

Summary

The Murray River REZ has grade C solar resource quality. Despite being remote, this REZ has attracted significant investment in solar generation. Voltage stability and thermal limits currently restrict the output of generators within this REZ.

The actionable VNI West project will upgrade transfer capability between Victoria and New South Wales via Bulgana, and significantly increase the ability for renewable generation to connect in this zone. As noted in the 2023 *Victorian Annual Planning Report*, voltage oscillation constraints affecting this area are expected to reduce following completion of Project EnergyConnect.



Existing network capability

The current REZ transmission limits for existing and new VRE before any network upgrade in Murray River is approximately 440 MW for peak demand and summer typical conditions and 640 MW for winter reference condition.

There is no additional capacity to connect new generation.

REZ grouping

Coordination of generation infrastructure may be required.	The modelling outcomes identify this zone for development of solar generation in the 2030s across the *Step Change* and *Green Energy Exports* scenarios. This REZ could benefit from coordinated community engagement.

Metrics

Resource	**Solar**			**Wind**		
Resource Quality	C			E		
Renewable Potential (MW)	4,700			-		
Demand Correlation	**2029-30**	**2039-40**	**2049-50**	**2029-30**	**2039-40**	**2049-50**
	F	F	F	A	A	A
MLF Robustness	**2029-30**		**2034-35**		**2039-40**	
	A		A		A	

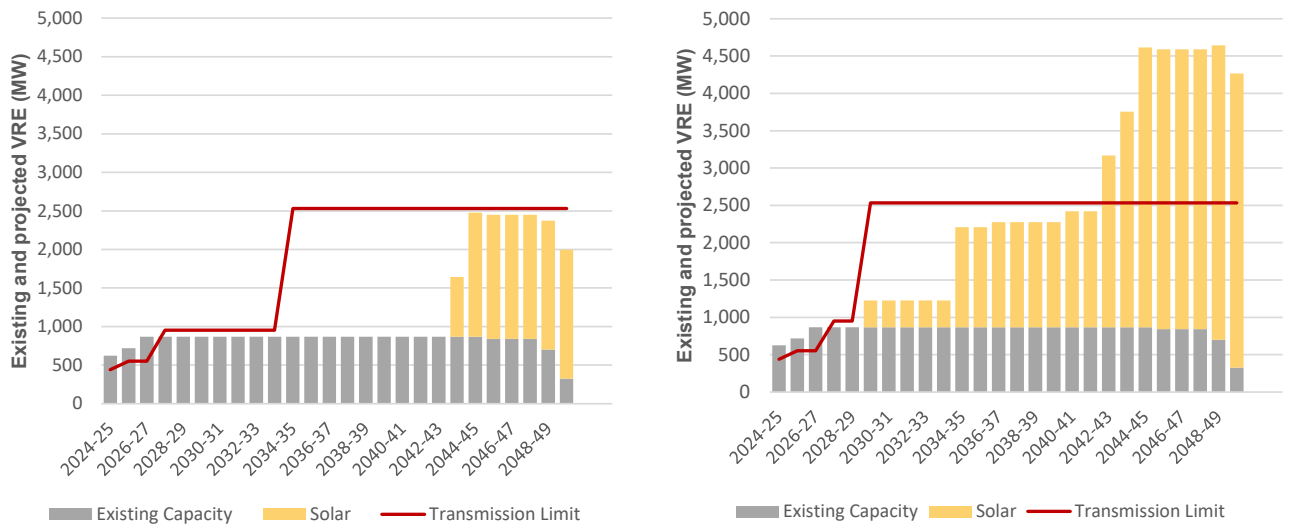
Climate hazard

Temperature score	E	**Bushfire score**	C

VRE outlook

	Solar PV (MW)				**Wind (MW)**			
	Existing/ committed/ anticipated	**Projected**			**Existing/ committed/ anticipated**	**Projected**		
		2029-30	**2039-40**	**2049-50**		**2029-30**	**2039-40**	**2049-50**
Progressive Change	869	-	-	1,650	There is no existing, committed or anticipated wind generation for this REZ. The modelling outcomes, for all scenarios, did not project any additional wind for this REZ.			
Step Change		350	1,400	3,950				
Green Energy Exports		1,100	2,900	4,700				

Transmission access expansion forecast for *Progressive Change* (left) and *Step Change* (right)



VRE curtailment

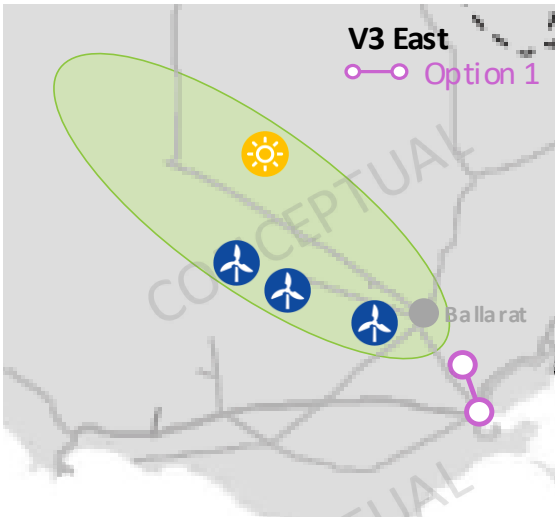
Scenario	2029-30		2039-40		2049-50	
	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill
Progressive Change	-	9%	-	16%	-	11%
Step Change	-	8%	-	15%	2%	28%
Green Energy Exports	5%	33%	2%	21%	2%	23%

V3 – Western Victoria

Summary

The Western Victoria REZ has B grade wind resource quality. The existing and committed renewable generation within this REZ exceeds 1.9 GW, all of which is from wind generation.
The Western Renewables Link uprated (WRL)[48] is an anticipated project, and significantly increases the ability for renewable generation to connect in this zone. VNI West further increases the network capability in this REZ.

REZ augmentation options shown take into account the WRL (uprate) scope as part of the VNI West RIT-T utilising 500 kV from Sydenham to Bulgana.



Existing network capability

The current REZ transmission limits for existing and new VRE before any network upgrade in Western Victoria is split between two modelling constraints:

- V3 East – approximately 600 MW for peak demand and summer typical conditions and 800 MW for winter reference condition.
- V3 West – approximately 780 MW for peak demand and summer typical conditions and 980 MW for winter reference condition.

REZ grouping

Coordination of generation infrastructure is required.	The modelling outcomes identify this zone for development of wind generation in the mid-2030s across the *Step Change* and *Progressive Change* scenarios. This build is brought forward under the *Green Energy Exports* scenario. Community consultation is ongoing for WRL and VNI West.

Metrics

Resource	**Solar**			**Wind**		
Resource Quality	E			B		
Renewable Potential (MW)	400			2,600		
Demand Correlation	**2029-30**	**2039-40**	**2049-50**	**2029-30**	**2039-40**	**2049-50**
	F	F	F	A	A	A
MLF Robustness	**2029-30**		**2034-35**		**2039-40**	
	A		A		A	

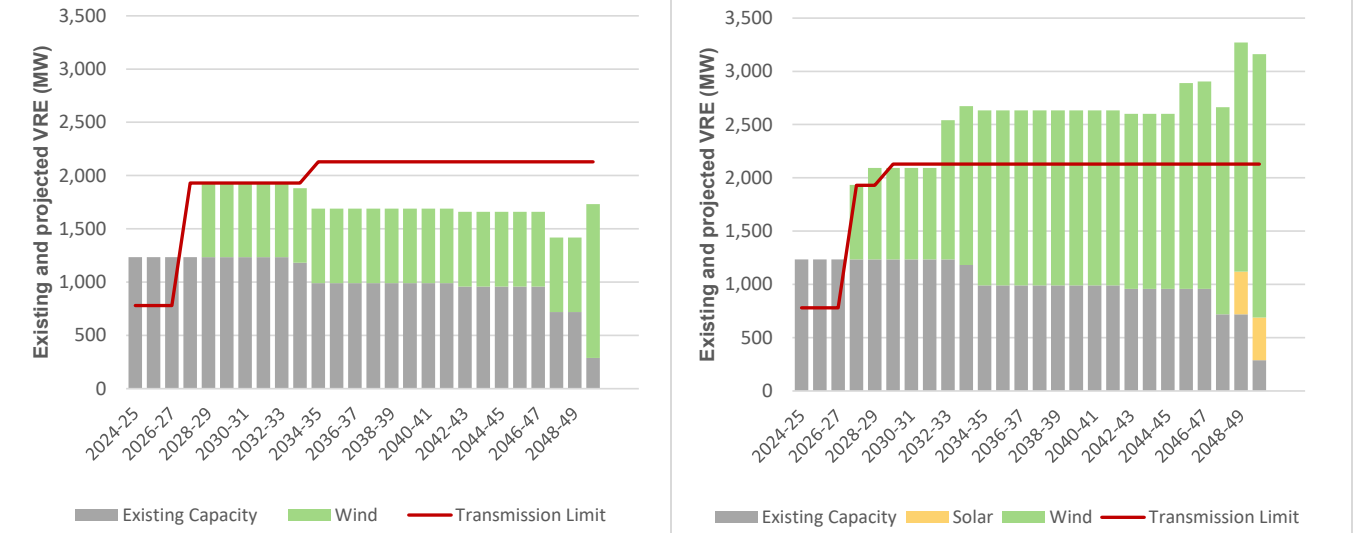
Climate hazard			
Temperature score	D	**Bushfire score**	D

VRE outlook

	Solar PV (MW)				**Wind (MW)**			
	Existing/ committed/ anticipated	**Projected**			**Existing/ committed/ anticipated**	**Projected**		
		2029-30	**2039-40**	**2049-50**		**2029-30**	**2039-40**	**2049-50**
Progressive Change	119	-	-	-	1,934	700	700	1,450
Step Change		-	-	400		850	1,650	2,450
Green Energy Exports		300	300	300		2,300	2,300	2,300

[48] The scope of this project, which will unlock renewable energy resources, reduce network congestion, and improve utilisation of existing assets in western parts of Victoria, was updated as an outcome of the VNI West options analysis - resulting in a higher capacity and harnessing a 1,460 MW of renewable capacity rather than the original design of 600 MW."

Transmission access expansion forecast for *Progressive Change* (left) and *Step Change* (right)



Note: The transmission access expansion forecasts show the results for V3 West group constraint augmentation, which includes VRE projections for V3 West (no VRE is built in V3 East).

VRE curtailment

Scenario	2029-30		2039-40		2049-50	
	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill
Progressive Change	-	1%	-	12%	-	6%
Step Change	-	1%	-	10%	-	10%
Green Energy Exports	-	18%	-	12%	-	12%

V4 – South West Victoria

Summary

The South West Victoria REZ has grade C wind resource quality in close proximity to the 500 kV and 220 kV networks in the area. The total committed and in-service wind generation in the area exceeds 3 GW.

The Victorian Government has announced that VicGrid will provide a coordinated transmission connection point for offshore wind near Portland[49].

VicGrid is currently undertaking consultation on the development of this infrastructure and AEMO will continue to co-ordinate with VicGrid on this matter.

Existing network capability

The current REZ transmission limits for existing and new VRE before any network upgrade in South West Victoria are limited by voltage stability, and this REZ was modelled with the SWV1 group constraint.

This limit is approximately 1,850 MW prior to commissioning of the Victorian Government's RDP: Mortlake turn in project[50].

REZ grouping

Transmission and generation infrastructure coordination may be required.	Preparatory activities relating to 500 kV upgrade options have been prepared by AEMO Victorian Planning as inputs to the 2024 ISP.

Metrics

Resource	**Solar**			**Wind**		
Resource Quality	F			C		
Renewable Potential (MW)	-			3,442		
Demand Correlation	**2029-30**	**2039-40**	**2049-50**	**2029-30**	**2039-40**	**2049-50**
	F	F	F	A	A	A
MLF Robustness	**2029-30**		**2034-35**		**2039-40**	
	A		A		A	

Climate hazard

Temperature score	C	**Bushfire score**	D

VRE outlook

	Solar PV (MW)				**Wind (MW)**			
	Existing/ committed/ anticipated	**Projected**			**Existing/ committed/ anticipated**	**Projected**		
		2029-30	**2039-40**	**2049-50**		**2029-30**	**2039-40**	**2049-50**
Progressive Change	There is no existing, committed or anticipated solar generation for this REZ. The modelling outcomes, for all scenarios, did not project any additional solar for this REZ.				3,300	-	-	1,300
Step Change						800	850	3,050
Green Energy Exports						2,050	2,100	4,500

[49] See https://engage.vic.gov.au/project/offshore-wind-transmission-in-gippsland-and-portland/page/development-and-engagement-roadmap.

[50] RDP Stage 1: Mortlake turn-in alleviates an existing voltage constraint between Moorabool and Mortlake 500 kV terminal stations. The turn-in project, when combined with Cressy terminal station (constructed as part of the Golden Plains Wind Farm committed generation project), is expected to allow up to 1,500 MW of additional generation output under optimal network conditions and, on average, 1,100 MW of additional generation output during peak summer periods following its commissioning. See https://aemo.com.au/-/media/files/electricity/nem/planning_and_forecasting/vapr/2023/2023-victorian-annual-planning-report.pdf?la=en and http://www.gazette.vic.gov.au/gazette/Gazettes2022/GG2022S547.pdf.

Transmission access expansion forecast for *Progressive Change* (left) and *Step Change* (right)

Note: The transmission access expansion forecasts show the results for SWV1 group constraint augmentation, which includes VRE projections for V4 and V8.

VRE curtailment

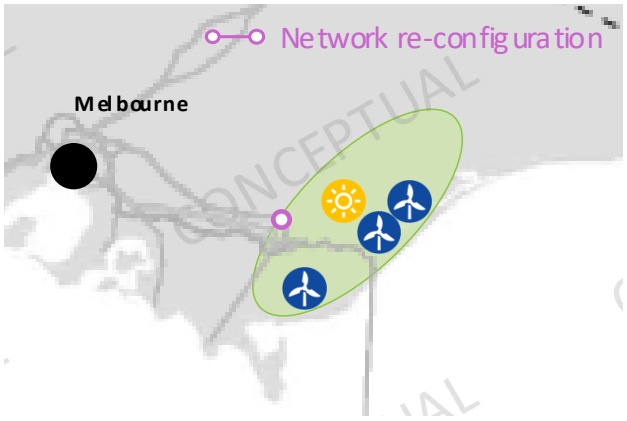
Scenario	2029-30		2039-40		2049-50	
	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill
Progressive Change	-	1%	-	11%	-	6%
Step Change	-	1%	-	8%	-	7%
Green Energy Exports	-	16%	-	7%	-	7%

V5 - Gippsland

Summary

The Gippsland REZ has C grade wind resource quality, in proximity to the 500 kV networks.

The Victorian Government has announced that VicGrid will provide a coordinated transmission connection point for offshore wind near the Gippsland Coast[51]. VicGrid is currently undertaking consultation on the development of this infrastructure and AEMO will continue to coordinate with VicGrid on this matter.



Existing network capability

The transmission limit of the Gippsland REZ is included in the 'SEVIC1' group constraint which also includes VRE generation from V7 (Gippsland Coast), existing generation at Loy Yang and Hazelwood 500 kV substations, and import from Tasmania to Victoria, and has a 6,000 MW limit.

The SEVIC1 limit does not include the potential for connection of new generation at the Yallourn 220 kV substation.

Due to the high capacity of the network in this REZ (with four 500 kV and six 220 kV lines from Latrobe Valley to Melbourne designed to transport energy from major Victorian brown coal power stations), significant generation can be accommodated. However, limitations exist at key points of 500/220 kV transformation.

REZ grouping

Coordination of design and community engagement is underway	The modelling outcomes identify this zone for development of wind generation in the late 2030s across the *Step Change* and *Progressive Change* scenarios. This build is brought forward under the *Green Energy Exports* scenario.

Metrics

Resource	**Solar**			**Wind**		
Resource Quality	E			C		
Renewable Potential (MW)	500			2,000		
Demand Correlation	**2029-30**	**2039-40**	**2049-50**	**2029-30**	**2039-40**	**2049-50**
	F	F	F	B	B	A
MLF Robustness	**2029-30**		**2034-35**		**2039-40**	
	A		A		A	

Climate hazard

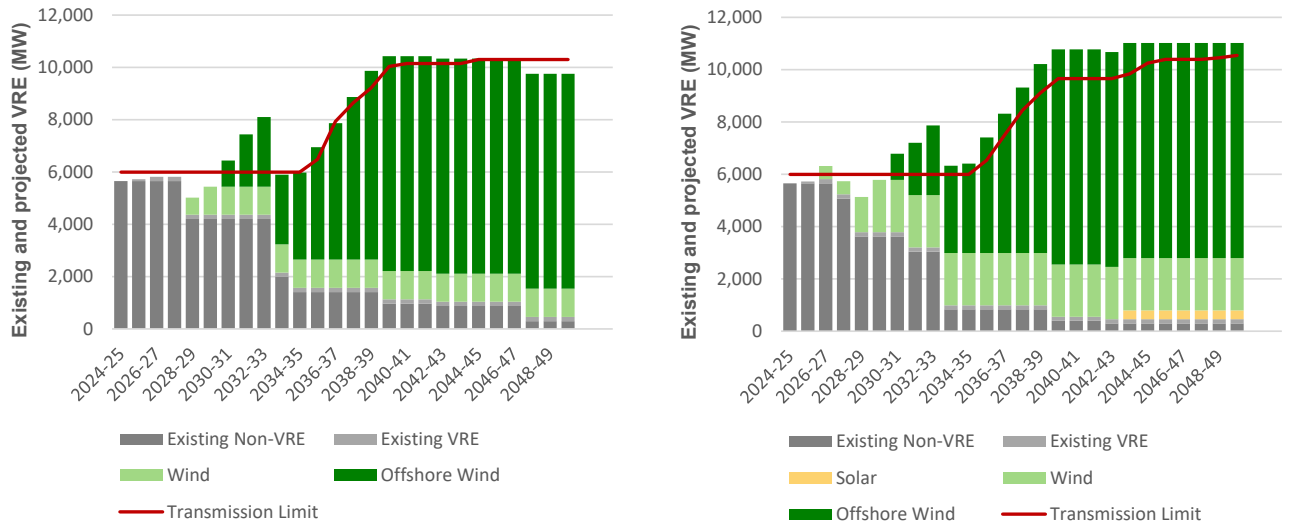
Temperature score	C	**Bushfire score**	D

VRE outlook

	Solar PV (MW)				**Wind (MW)**			
	Existing/ committed/ anticipated	**Projected**			**Existing/ committed/ anticipated**	**Projected**		
		2029-30	**2039-40**	**2049-50**		**2029-30**	**2039-40**	**2049-50**
Progressive Change	160	-	-	-	-	1,100	1,100	1,100
Step Change		-	-	350		2,000	2,000	2,000
Green Energy Exports		2,650	2,650	9,850		5,100	5,100	5,100

[51] See https://engage.vic.gov.au/project/offshore-wind-transmission/page/development-and-engagement-roadmap.

Transmission access expansion forecast for *Progressive Change* (left) and *Step Change* (right)



Note: The transmission access expansion forecasts show the results for SEVIC1 group constraint augmentation, which includes VRE projections for V5 and V7 as well as the effect of Basslink and Project Marinus flows between Tasmania and Victoria.

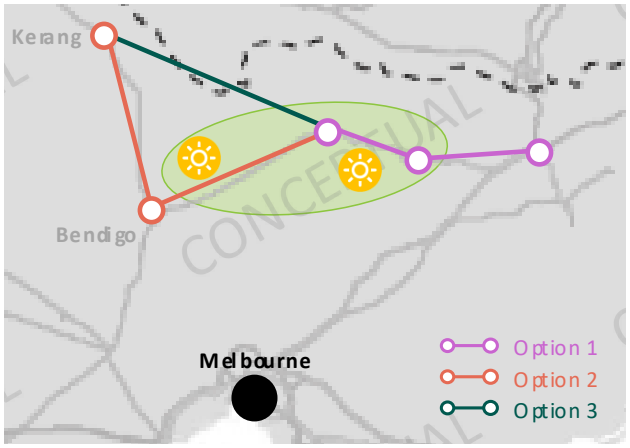
VRE curtailment

Scenario	2029-30		2039-40		2049-50	
	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill
Progressive Change	-	1%	-	18%	-	10%
Step Change	-	-	-	11%	-	11%
Green Energy Exports	-	8%	-	5%	-	7%

V6 – Central North Victoria

Summary

The Central North Victoria REZ has grade C and D solar and wind resource quality. In addition to the currently in service and committed solar farms, there are enquires for over 1 GW of additional solar.



Existing network capability

The current REZ transmission limits for existing and new VRE before any network upgrade in Central North Victoria are approximately 650 MW for peak demand and summer typical conditions and 1,300 MW for the winter reference condition.

REZ grouping

Infrastructure coordination can start later.	Modelling outcomes indicate a low likelihood that significant investment in VRE and transmission infrastructure will be optimally required in the next 12 years.

Metrics

Resource	**Solar**			**Wind**		
Resource Quality	C			D		
Renewable Potential (MW)	1,700			1,600		
Demand Correlation	**2029-30**	**2039-40**	**2049-50**	**2029-30**	**2039-40**	**2049-50**
	F	F	F	A	A	A
MLF Robustness	**2029-30**		**2034-35**		**2039-40**	
	C		C		C	

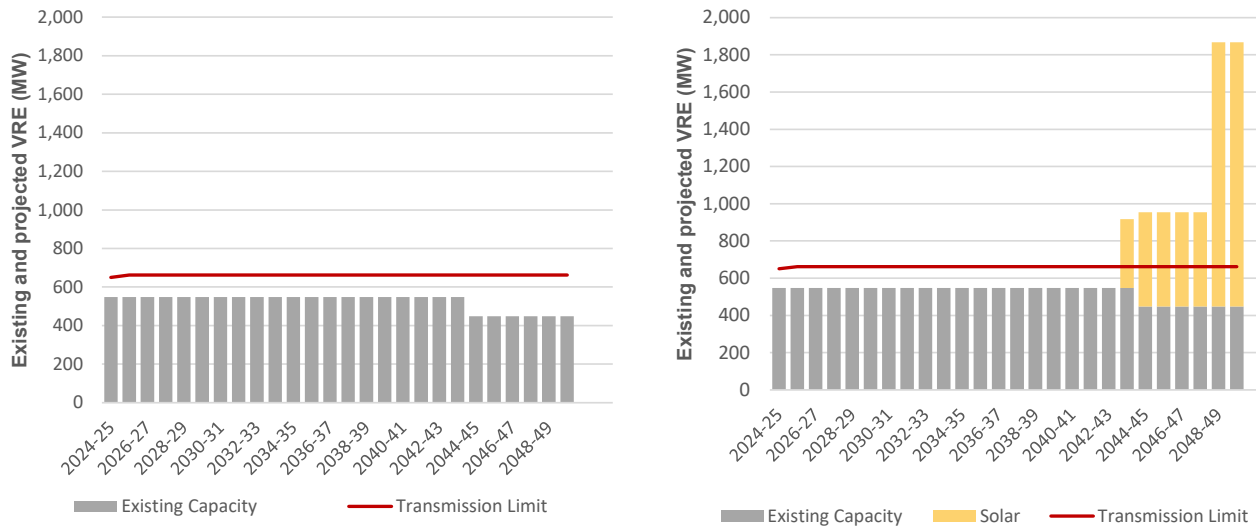
Climate hazard

Temperature score	D	**Bushfire score**	D

VRE outlook

	Solar PV (MW)				**Wind (MW)**			
	Existing/ committed/ anticipated	**Projected**			**Existing/ committed/ anticipated**	**Projected**		
		2029-30	**2039-40**	**2049-50**		**2029-30**	**2039-40**	**2049-50**
Progressive Change	548	-	-	-	-	-	-	-
Step Change		-	-	1,400		-	-	-
Green Energy Exports		1,050	1,200	1,600		1,200	1,200	1,200

Transmission access expansion forecast for *Progressive Change* (left) and *Step Change* (right)



VRE curtailment

Scenario	2029-30		2039-40		2049-50	
	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill
Progressive Change	-	9%	-	18%	-	13%
Step Change	-	8%	-	19%	4%	42%
Green Energy Exports	3%	32%	1%	19%	1%	25%

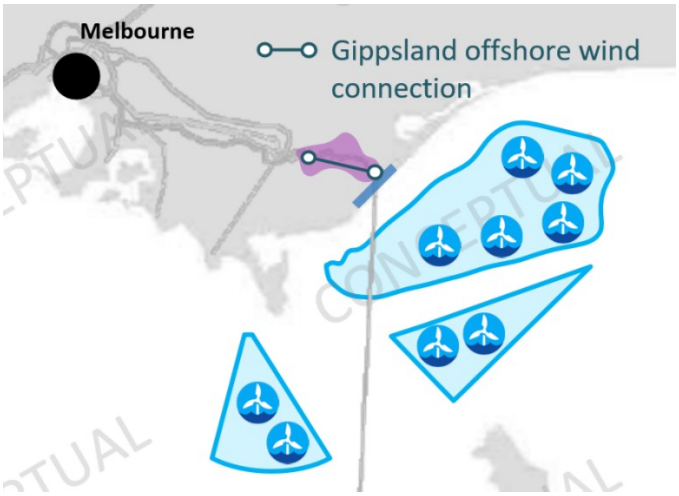
V7 – Gippsland Coast

Summary

The Gippsland Coast REZ has been identified for offshore wind resource potential in relatively shallow waters, with a connection point close to existing 500 kV networks at Loy Yang/Hazelwood. There is currently significant interest in this area, but proposed projects have not developed sufficiently to be considered anticipated. The Victorian Government has announced that VicGrid will provide a coordinated transmission connection point for offshore wind near the Gippsland Coast[52]. New transmission lines will also be developed where needed to link the common connection points with the existing energy grid.

AEMO understands that transmission augmentation projects for Gippsland Coast REZ are likely to be delivered as a dedicated asset of some kind. This has been treated similar to a generation connection asset in the ISP model, rather than like a network augmentation.

VicGrid is currently undertaking consultation on the development of this infrastructure and AEMO will continue to co-ordinate with VicGrid on this matter.



Existing network capability

Gippsland Coast REZ requires connection to the 500 kV network in the Gippsland REZ, and was modelled as part of the SEVIC1 group constraint which also includes VRE generation from V5 (Gippsland), existing generation at Loy Yang and Hazelwood 500 kV substations, and import from Tasmania to Victoria, and has a 6,000 MW limit.

REZ grouping

Design and community engagement are progressing.	Following consultation, the Federal Minister for Climate Change and Energy declared an area off Gippsland, Victoria, as suitable for offshore renewable energy on 19 December 2022 under the *Offshore Electricity Infrastructure Act 2021*[53]. VicGrid is currently undertaking consultation on the development of connection infrastructure.

Metrics

Resource	**Offshore Wind (fixed)**			**Offshore Wind (floating)**		
Resource Quality	A			A		
Renewable Potential (MW)	54,996			5,000		
Demand Correlation	**2029-30**	**2039-40**	**2049-50**	**2029-30**	**2039-40**	**2049-50**
	B	B	A	B	B	A
MLF Robustness	**2029-30**		**2034-35**		**2039-40**	
	A*		A		A	

*The MLF robustness values for the V7 Gippsland Coast REZ reflect its connection to the V5 Gippsland REZ.

Climate hazard

Temperature score	C	**Bushfire score**	D

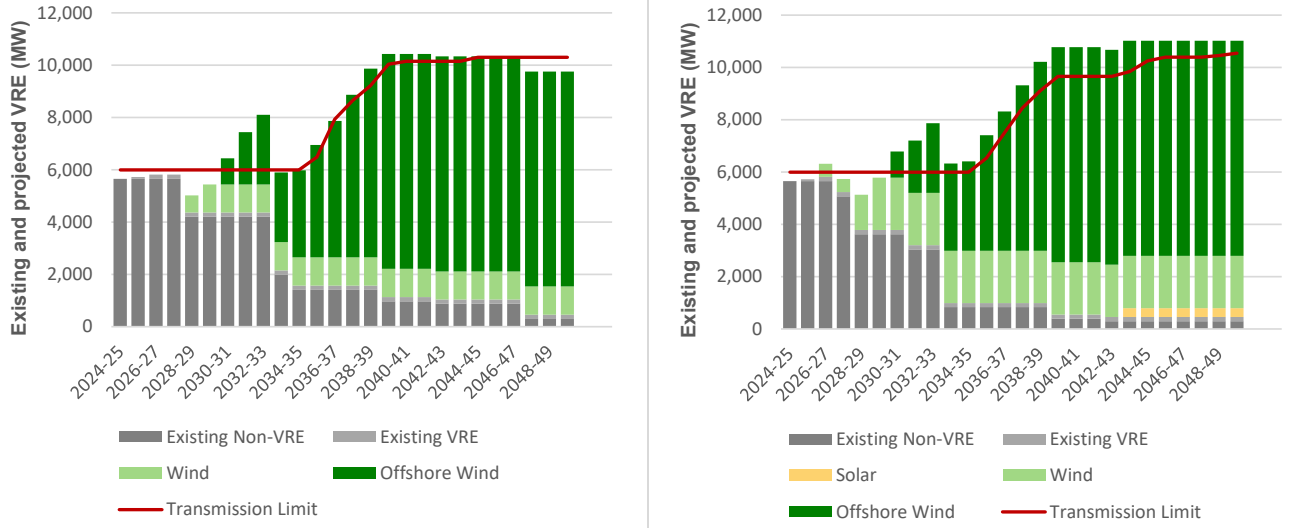
[52] See https://www.energy.vic.gov.au/renewable-energy/vicgrid/offshore-wind-transmission/gippsland-offshore-wind.

[53] At https://www.dcceew.gov.au/energy/renewable/offshore-wind/areas/gippsland.

VRE outlook

	Offshore Wind – fixed (MW)				Offshore Wind - floating (MW)			
	Existing/ committed/ anticipated	Projected			Existing/ committed/ anticipated	Projected		
		2029-30	2039-40	2049-50		2029-30	2039-40	2049-50
Progressive Change	There is no existing, committed or anticipated fixed offshore wind generation for this REZ.	-	8,200	8,200	There is no existing, committed or anticipated floating offshore wind generation for this REZ. The modelling outcomes, for all scenarios, did not project any floating offshore wind for this REZ.			
Step Change		-	8,200	8,200				
Green Energy Exports		-	8,200	8,200				

Transmission access expansion forecast for *Progressive Change* (left) and *Step Change* (right)



Note: The transmission access expansion forecasts show the results for SEVIC1 group constraint augmentation, which includes VRE projections for V5 and V7 as well as the effect of Basslink and Project Marinus flows between Tasmania and Victoria.

VRE curtailment

Scenario	2029-30		2039-40		2049-50	
	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill
Progressive Change	-	-	-	6%	-	2%
Step Change	-	-	-	4%	-	3%
Green Energy Exports	-	-	-	2%	-	4%

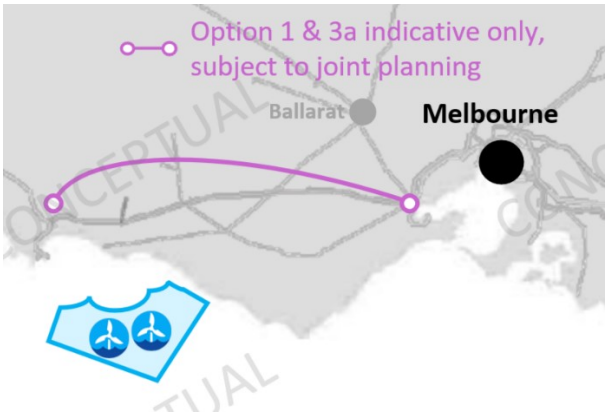
V8 – Southern Ocean

Summary

The Southern Ocean REZ has been identified for offshore wind resource potential in relatively shallow waters, with a connection point close to existing 500 kV networks at Alcoa Portland (APD)/Heywood.

The Victorian Government has announced that VicGrid will provide a coordinated transmission connection point near Portland[54].

VicGrid is currently undertaking consultation on the development of this infrastructure and AEMO will continue to co-ordinate with VicGrid on this matter.



Existing network capability

The network capacity available for V8 is the same as V4 South West Victoria. REZ augmentation options are common to those shown for V4 and V8, and this REZ has been modelled as part of the SWV1 group constraint.

REZ grouping

Design and community engagement are progressing.	The Federal Minister for Climate Change and Energy declared a proposed[55] area in the Southern Ocean off Victoria and South Australia for offshore renewable energy, including offshore wind, on 6 March 2024. VicGrid is currently undertaking consultation on the development of connection infrastructure.

Metrics

Resource	**Offshore Wind (fixed)**			**Offshore Wind (floating)**		
Resource Quality	A			A		
Renewable Potential (MW)	780			3,330		
Demand Correlation	**2029-30**	**2039-40**	**2049-50**	**2029-30**	**2039-40**	**2049-50**
	A	A	A	A	A	A
MLF Robustness	**2029-30**		**2034-35**		**2039-40**	
	A*		A		A	

* The MLF robustness values for the V8 Southern Ocean REZ reflect its connection to the V4 South West Victoria REZ.

Climate hazard

Temperature score	C	**Bushfire score**	D

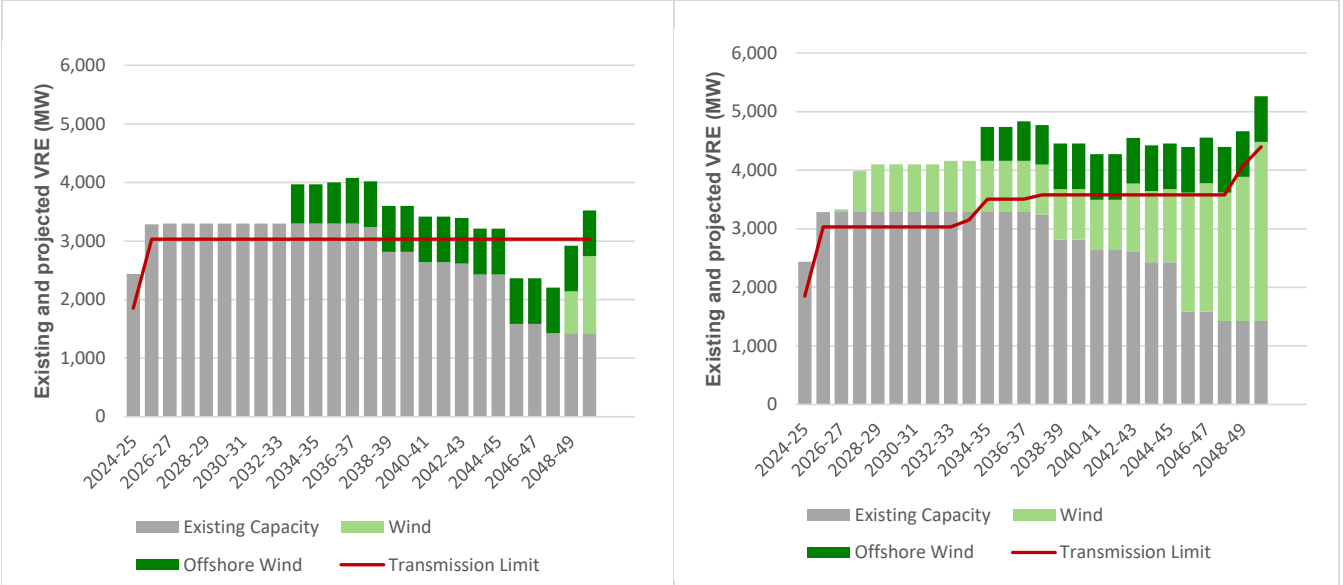
VRE outlook

	Offshore Wind – fixed (MW)				**Offshore Wind - floating (MW)**			
	Existing/ committed/ anticipated	**Projected**			**Existing/ committed/ anticipated**	**Projected**		
		2029-30	**2039-40**	**2049-50**		**2029-30**	**2039-40**	**2049-50**
Progressive Change	There is no existing, committed or anticipated fixed offshore wind generation for this REZ.	-	780	780	There is no existing, committed or anticipated floating offshore wind generation for this REZ. The modelling outcomes, for all scenarios, did not project any floating offshore wind for this REZ.			
Step Change		-	780	780				
Green Energy Exports		-	780	780				

[54] See https://engage.vic.gov.au/project/offshore-wind-transmission-in-gippsland-and-portland/page/development-and-engagement-roadmap.

[55] At https://consult.dcceew.gov.au/oei-southern-ocean.

Transmission access expansion forecast for *Progressive Change* (left) and *Step Change* (right)



Note: The transmission access expansion forecasts show the results for SWV1 group constraint augmentation, which includes VRE projections for V4 and V8.

VRE curtailment

Scenario	2029-30		2039-40		2049-50	
	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill
Progressive Change	-	-	-	14%	-	5%
Step Change	-	-	-	10%	-	10%
Green Energy Exports	-	-	-	9%	-	11%

Glossary

This glossary has been prepared as a quick guide to help readers understand some of the terms used in the ISP. Words and phrases defined in the National Electricity Rules (NER) have the meaning given to them in the NER. This glossary is not a substitute for consulting the NER, the Australian Energy Regulator's (AER's) Cost Benefit Analysis Guidelines, or AEMO's *ISP Methodology*.

Term	Acronym	Explanation
Actionable ISP project	-	Actionable ISP projects optimise benefits for consumers if progressed before the next ISP. A transmission project (or non-network option) identified as part of the ODP and having a delivery date within an actionable window. For newly actionable ISP projects, the actionable window is two years, meaning it is within the window if the project is needed within two years of its earliest in-service date. The window is longer for projects that have previously been actionable. Project proponents are required to begin newly actionable ISP projects with the release of a final ISP, including commencing a RIT-T.
Actionable New South Wales project and actionable Queensland project	-	A transmission project (or non-network option) that optimises benefits for consumers if progressed before the next ISP, is identified as part of the ODP, and is supported by or committed to in New South Wales Government or Queensland Government policy and/or prospective or current legislation.
Anticipated project	-	A generation, storage or transmission project that is in the process of meeting at least three of the five commitment criteria (planning, construction, land, contracts, finance), in accordance with the AER's Cost Benefit Analysis Guidelines. Anticipated projects are included in all ISP scenarios.
Candidate development path	CDP	A collection of development paths which share a set of potential actionable projects. Within the collection, potential future ISP projects are allowed to vary across scenarios between the development paths. Candidate development paths have been shortlisted for selection as the ODP and are evaluated in detail to determine the ODP, in accordance with the ISP Methodology.
Capacity	-	The maximum rating of a generating or storage unit (or set of generating units), or transmission line, typically expressed in megawatts (MW). For example, a solar farm may have a nominal capacity of 400 MW.
Committed project	-	A generation, storage or transmission project that has fully met all five commitment criteria (planning, construction, land, contracts, finance), in accordance with the AER's Cost Benefit Analysis Guidelines. Committed projects are included in all ISP scenarios.
Consumer energy resources	CER	Generation or storage assets owned by consumers and installed behind-the-meter. These can include rooftop solar, batteries and electric vehicles (EVs). CER may include demand flexibility.
Consumption	-	The electrical energy used over a period of time (for example a day or year). This quantity is typically expressed in megawatt hours (MWh) or its multiples. Various definitions for consumption apply, depending on where it is measured. For example, underlying consumption means consumption being supplied by both CER and the electricity grid.
Cost-benefit analysis	CBA	A comparison of the quantified costs and benefits of a particular project (or suite of projects) in monetary terms. For the ISP, a cost-benefit analysis is conducted in accordance with the AER's Cost Benefit Analysis Guidelines.
Counterfactual development path	-	The counterfactual development path represents a future without major transmission augmentation. AEMO compares candidate development paths against the counterfactual to calculate the economic benefits of transmission.
Demand	-	The amount of electrical power consumed at a point in time. This quantity is typically expressed in megawatts (MW) or its multiples. Various definitions for demand, depending on where it is measured. For example, underlying demand means demand supplied by both CER and the electricity grid.

Term	Acronym	Explanation
Demand-side participation	DSP	The capability of consumers to reduce their demand during periods of high wholesale electricity prices or when reliability issues emerge. This can occur through voluntarily reducing demand, or generating electricity.
Development path	DP	A set of projects (actionable projects, future projects and ISP development opportunities) in an ISP that together address power system needs.
Dispatchable capacity	-	The total amount of generation that can be turned on or off, without being dependent on the weather. Dispatchable capacity is required to provide firming during periods of low variable renewable energy output in the NEM.
Distributed solar/ distributed PV	-	Solar photovoltaic (PV) generation assets that are not centrally controlled by AEMO dispatch. Examples include residential and business rooftop PV as well as larger commercial or industrial "non-scheduled" PV systems.
Firming	-	Grid-connected assets that can provide dispatchable capacity when variable renewable energy generation is limited by weather, for example storage (pumped-hydro and batteries) and gas-powered generation.
Future ISP project	-	A transmission project (or non-network option) that addresses an identified need in the ISP, that is part of the ODP, and is forecast to be actionable in the future.
Identified need	-	The objective a TNSP seeks to achieve by investing in the network in accordance with the NER or an ISP. In the context of the ISP, the identified need is the reason an investment in the network is required, and may be met by either a network or a non-network option.
ISP development opportunity	-	A development identified in the ISP that does not relate to a transmission project (or non-network option) and may include generation, storage, demand-side participation, or other developments such as distribution network projects.
Net market benefits	-	The present value of total market benefits associated with a project (or a group of projects), less its total cost, calculated in accordance with the AER's Cost Benefit Analysis Guidelines.
Non-network option	-	A means by which an identified need can be fully or partly addressed, that is not a network option. A network option means a solution such as transmission lines or substations which are undertaken by a Network Service Provider using regulated expenditure.
Optimal development path	ODP	The development path identified in the ISP as optimal and robust to future states of the world. The ODP contains actionable projects, future ISP projects and ISP development opportunities, and optimises costs and benefits of various options across a range of future ISP scenarios.
Regulatory Investment Test for Transmission	RIT-T	The RIT-T is a cost benefit analysis test that TNSPs must apply to prescribed regulated investments in their network. The purpose of the RIT-T is to identify the credible network or non-network options to address the identified network need that maximise net market benefits to the NEM. RIT-Ts are required for some but not all transmission investments.
Reliable (power system)	-	The ability of the power system to supply adequate power to satisfy consumer demand, allowing for credible generation and transmission network contingencies.
Renewable energy	-	For the purposes of the ISP, the following technologies are referred to under the grouping of renewable energy: "solar, wind, biomass, hydro, and hydrogen turbines". Variable renewable energy is a subset of this group, explained below.
Renewable energy zone	REZ	An area identified in the ISP as high-quality resource areas where clusters of large-scale renewable energy projects can be developed using economies of scale.
Renewable drought	-	A prolonged period of very low levels of variable renewable output, typically associated with dark and still conditions that limit production from both solar and wind generators.
Scenario	-	A possible future of how the NEM may develop to meet a set of conditions that influence consumer demand, economic activity, decarbonisation, and other parameters. For the 2024 ISP, AEMO has considered three scenarios: *Progressive Change*, *Step Change* and *Green Energy Exports*.

Term	Acronym	Explanation
Secure (power system)	-	The system is secure if it is operating within defined technical limits and is able to be returned to within those limits after a major power system element is disconnected (such as a generator or a major transmission network element).
Sensitivity analysis	-	Analysis undertaken to determine how modelling outcomes change if an input assumption (or a collection of related input assumptions) is changed.
Spilled energy	-	Energy from variable renewable energy resources that could be generated but is unable to be delivered. Transmission curtailment results in spilled energy when generation is constrained due to operational limits, and economic spill occurs when generation reduces output due to market price.
Transmission network service provider	TNSP	A business responsible for owning, controlling or operating a transmission network.
Utility-scale or utility		For the purposes of the ISP, 'utility-scale' and 'utility' refers to technologies connected to the high-voltage power system rather than behind the meter at a business or residence.
Value of greenhouse gas emissions reduction	VER	The VER estimates the value (dollar per tonne) of avoided greenhouse gas emissions. The VER is calculated consistent with the method agreed to by Australia's Energy Ministers in February 2024.
Virtual power plant	VPP	An aggregation of resources coordinated to deliver services for power system operations and electricity markets. For the ISP, VPPs enable coordinated control of CER, including batteries and electric vehicles.
Variable renewable energy	VRE	Renewable resources whose generation output can vary greatly in short time periods due to changing weather conditions, such as solar and wind.