Appendix 3. Renewable energy zones

December 2021

Appendix to Draft 2022 ISP for the National Electricity Market

Important notice

Purpose

This is Appendix 3 to the Draft 2022 *Integrated System Plan* (ISP), available at https://aemo.com.au/energy-systems/major-publications/integrated-system-plan-isp.

AEMO publishes this Draft 2022 ISP under the National Electricity Rules. This publication has been prepared by AEMO using information available at 15 October 2021. Information made available after this date may have been included in this publication where practical.

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Version control

Version	Release date	Changes
1.0	10/12/2021	Initial release.

Draft ISP Appendices

Contents

Figures

A3.1 Introduction

Renewable Energy Zones (REZs), including Offshore Wind Zones (OWZs), are high-quality resource areas where clusters of large-scale renewable energy projects can be developed using economies of scale.

As coal-fired power stations retire, significant investment in renewable generation will be required, with a resulting need for network expansion to unlock REZs across all National Electricity Market (NEM) regions. AEMO's *Integrated System Plan* (ISP) modelling has considered both network and generation investments to determine an optimal plan for each REZ, which can adapt over time based on four future scenarios.

This Appendix 3 provides detail on these REZs and the variable renewable energy (VRE) development opportunities within them. It sets out:

- **A3.2 REZ candidates**
  - A map of the 35 short-listed REZs and four OWZs across eastern Australia that AEMO has identified following rigorous consultation.
  - An overview of how these candidate zones were identified.
- **A3.3 REZ development overview** to help NEM stakeholders visualise the scale and speed of expected VRE development projected in all scenarios:
  - An overview of expected VRE development across the NEM, highlighting the REZs of greatest near-term interest.
  - 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).
- **A3.4 REZ scorecards** to help NEM stakeholders target detailed data for specific REZs:
  - Individual scorecards for each REZ arranged by state, including assessments of resource quality, network capability, and preferred timing across scenarios for additional generation capacity.

A3.2 REZ candidates

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 must-have requirements to enable the connection of new resources (particularly inverter-based equipment) and ensure continued power system security.

REZ candidates were initially developed in consultation with stakeholders for the 2018 ISP[1] and used as inputs to the ISP model. REZ candidates have been continuously updated and refined through the 2020 ISP and 2021 IASR consultation process. Futher details on the selection of REZ candidates is detailed in the IASR[2], and the 35 REZ and four OWZs studied are shown in Figure 1. Details and costs of REZ augmentation options are detailed in the Transmission Cost Report[3].

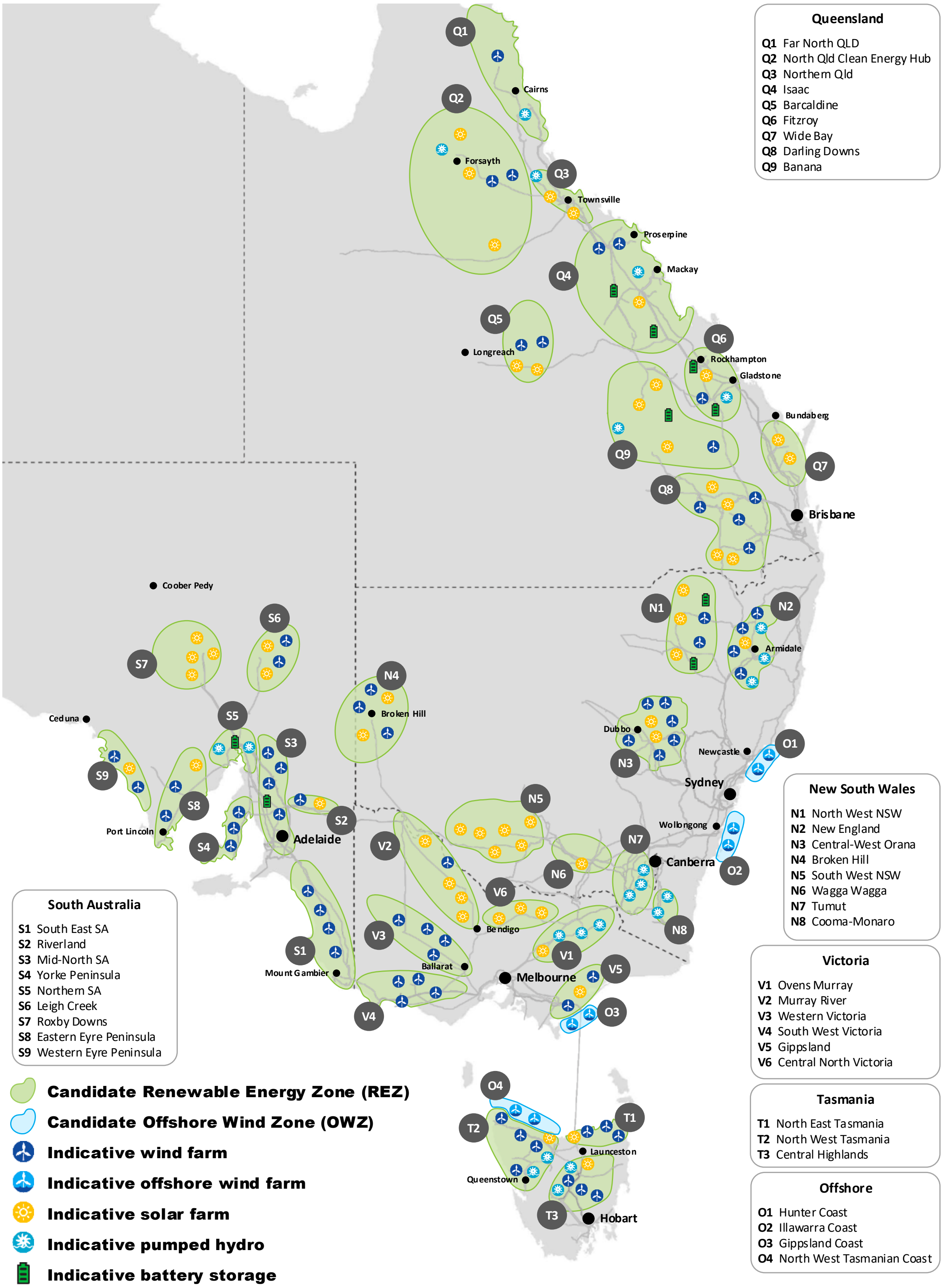
Renewable energy developers and network companies should consider opportunities for early and active engagement with communities, land title holders and affected persons as part of the detailed designs for REZs.

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

[2] At https://aemo.com.au/energy-systems/major-publications/integrated-system-plan-isp/2022-integrated-system-plan-isp/current-inputs-assumptions-and-scenarios.

[3] At https://aemo.com.au/-/media/files/major-publications/isp/2021/transmission-cost-report.pdf?la=en.

Figure 1 2022 renewable energy zone and offshore wind zone candidates



A3.3 REZ development overview

The following section presents AEMO's prioritisation and development of identified REZs within each NEM region. AEMO has worked with state governments as part of defining the locations and renewable resources within the REZs in each state. Factors that 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 and correlation with other favourable REZs.
- Cost of developing or augmenting the transmission network.
- Proximity to the load centre.
- Social licence for development of the generation, storage and associated network.

Under every scenario – *Progressive Change, Step Change, Slow Change and Hydrogen Superpower* – large increases in VRE are needed. Targeted and strategic investment is required to balance resources across states and unlock much needed REZs.

There is already approximately 15 GW of utility scale VRE installed in the NEM, and approximately another 5 GW is expected to be operational over the next few years, as either committed or anticipated projects[4]. Allowing for the strong growth in DER, Australia will still need an additional 50 GW to 550 GW of new VRE by 2050, depending on the scenario, much of it built in REZs.

Figure 2 to Figure 5 show the forecast geographical dispersion of VRE for 2029-30, 2039-40 and 2049-50 for each scenario. In the next decade, more wind capacity is needed to complement the strong uptake of distributed PV. Once there is sufficient storage and network investment to take advantage of cheaper solar resources, grid-scale solar is projected to accelerate again.

[4] Data is as of July 2021, AEMO Generation Information Page, at https://www.aemo.com.au/energy-systems/electricity/nationalelectricity-market-nem/nem-forecasting-and-planning/forecasting-and-planning-data/generation-information. Definitions of committed and anticipated are included in each Generation Information update.

Figure 2 Forecast geographic dispersion of new VRE developments in the *Step Change* scenario in 2029-30 (left), 2039-40 (middle), 2049-50 (right)

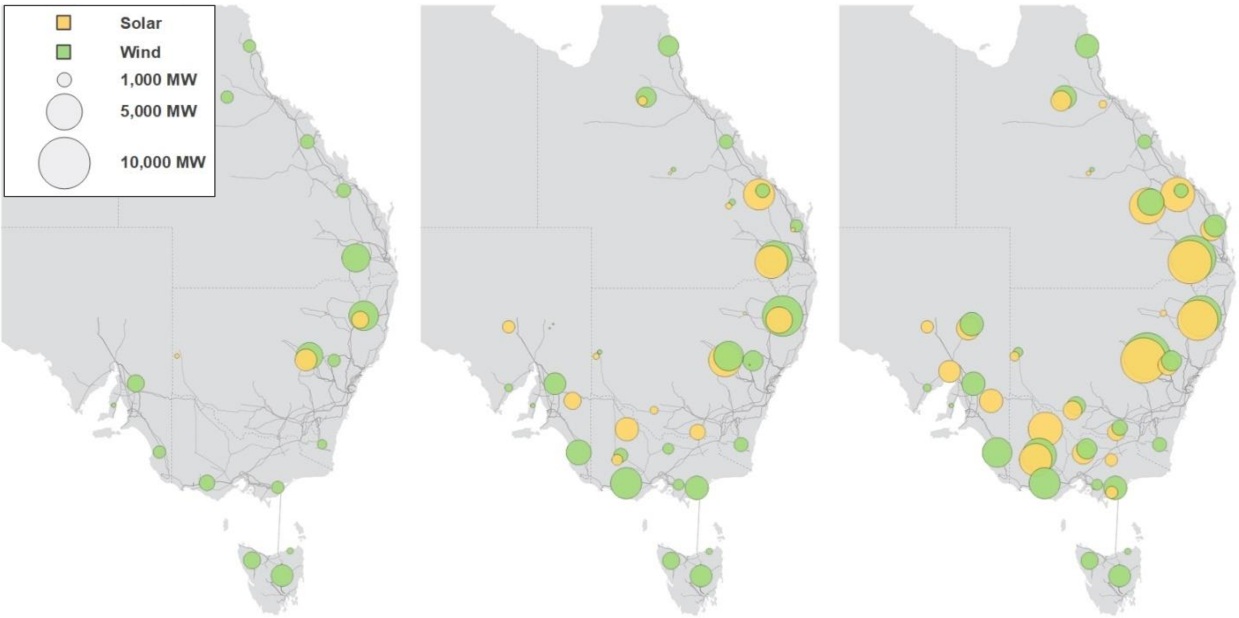


Figure 3 Forecast geographic dispersion of new VRE developments in the *Progressive Change* scenario in 2029-30 (left), 2039-40 (middle), 2049-2050 (right)

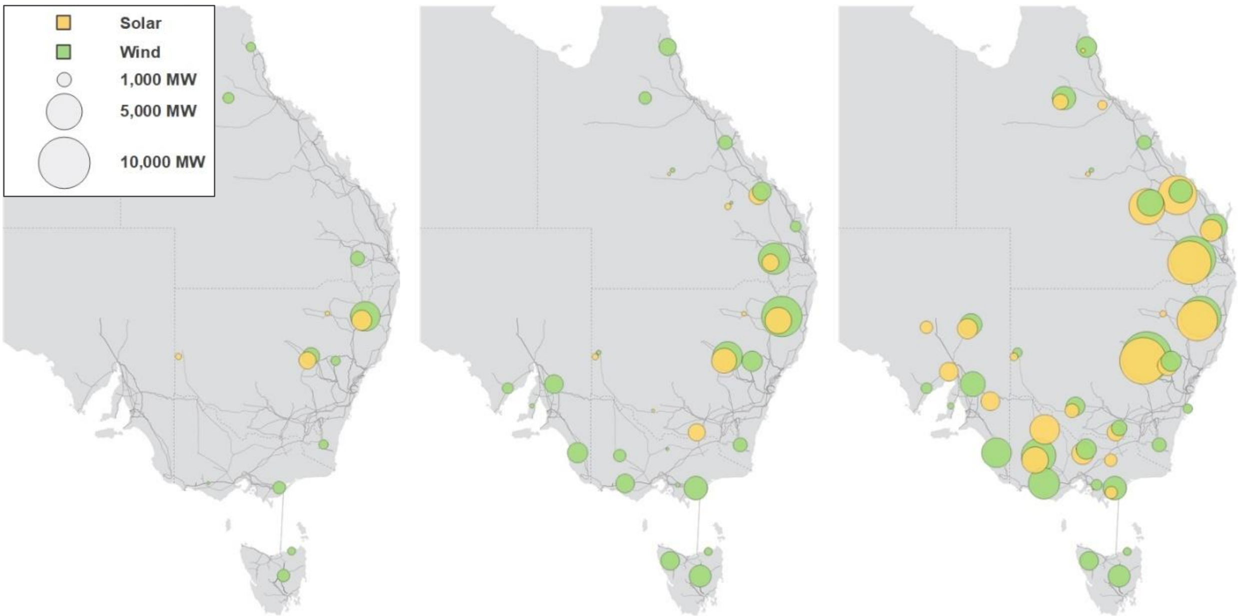


Figure 4 Forecast geographic dispersion of new VRE developments in the *Slow Change* scenario in 2029-30 (left), 2039-40 (middle), 2049-50 (right)

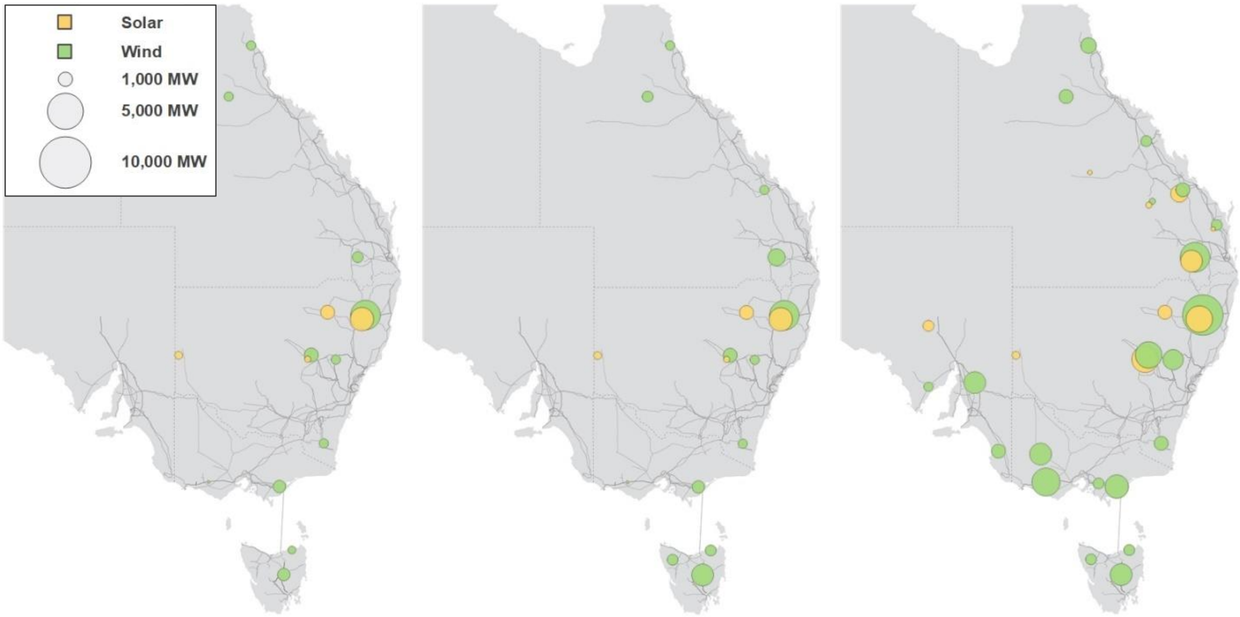
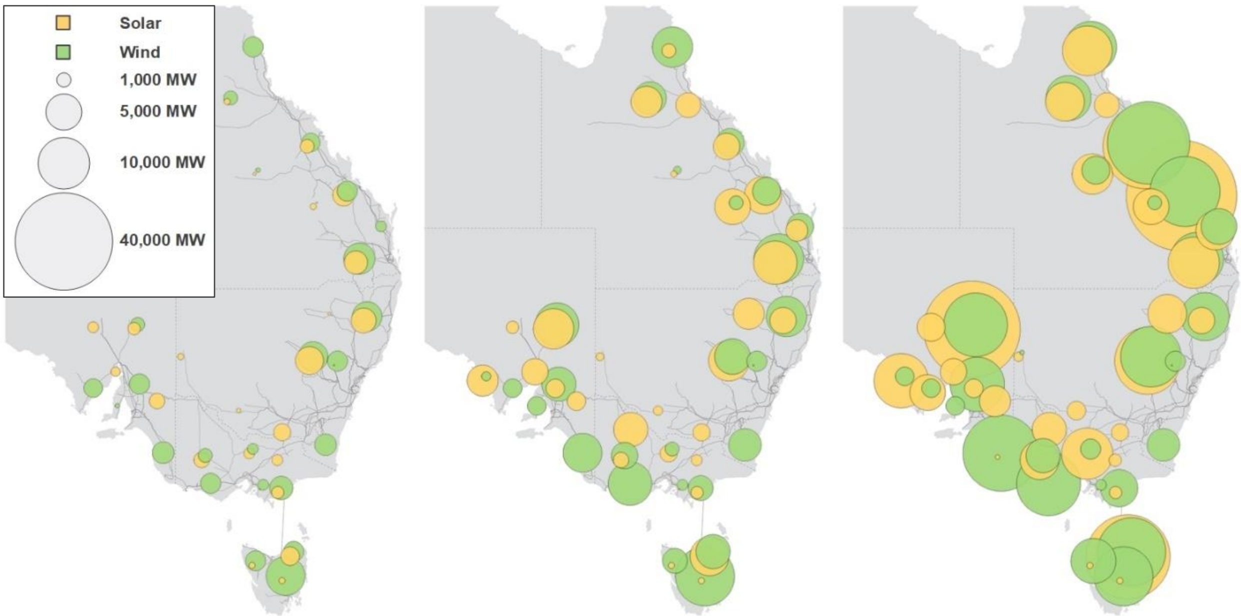


Figure 5 Forecast geographic dispersion of new VRE developments in the *Hydrogen Superpower* scenario for 2029-30 (left), 2039-40 (middle) and 2049-50 (right)

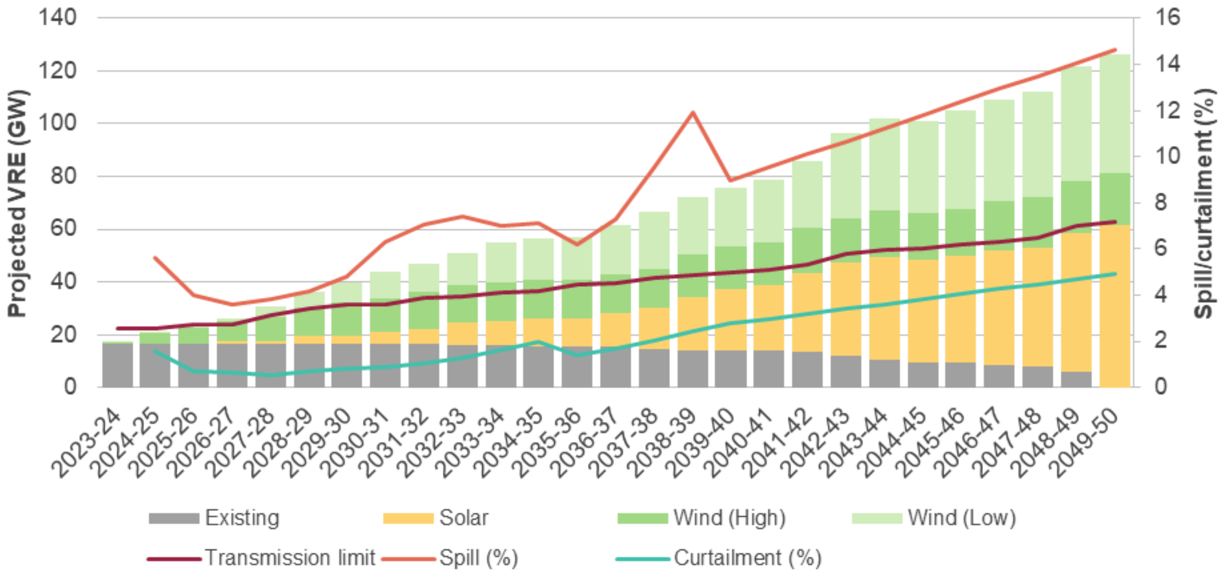


A3.3.1 Diversity of resources in REZs

In the Draft 2022 ISP, AEMO optimised investment in wind, solar and transmission development within each REZ. This optimisation allowed for the consideration of resource diversity and economic levels of energy spill[5] and curtailment[6] to maximise the development of VRE while minimising the transmission network expansion.

As an example, Figure 6 shows the cumulative utility-scale VRE for REZs across the NEM for the *Step Change* scenario, and the transmission network capacity required to facilitate this VRE development. To accommodate the projected utility-scale VRE[7] of approximately 127 GW by 2050, transmission network capacity of just over 63 GW[8] is required. With a transmission capacity of less than half the utility-scale VRE projected, transmission curtailment is still approximately 5%.

Figure 6 Projected utility-scale VRE in REZ for the NEM, the transmission network capacity to facilitate this development together with the economic spill and transmission curtailment



Note: Curtailment and economic spill are interpolated between 2039-40 and 2048-49. The transmission limit does not include upgrades required to alleviate group constraints.

A3.3.2 REZ development

This section provides a high-level overview of long-term REZ development across the NEM. Detailed projections for individual REZs are provided in section A3.4. Transmission augmentations required to facilitate these large VRE developments is described in more detail in Appendix 5.

[5] Economic spill happens when generation reduces output due to market price.

[6] Curtailment happens when generation is curtailed due to transmission network congestion.

[7] Figures referring to "utility-scale VRE" do not include DER, for example rooftop PV.

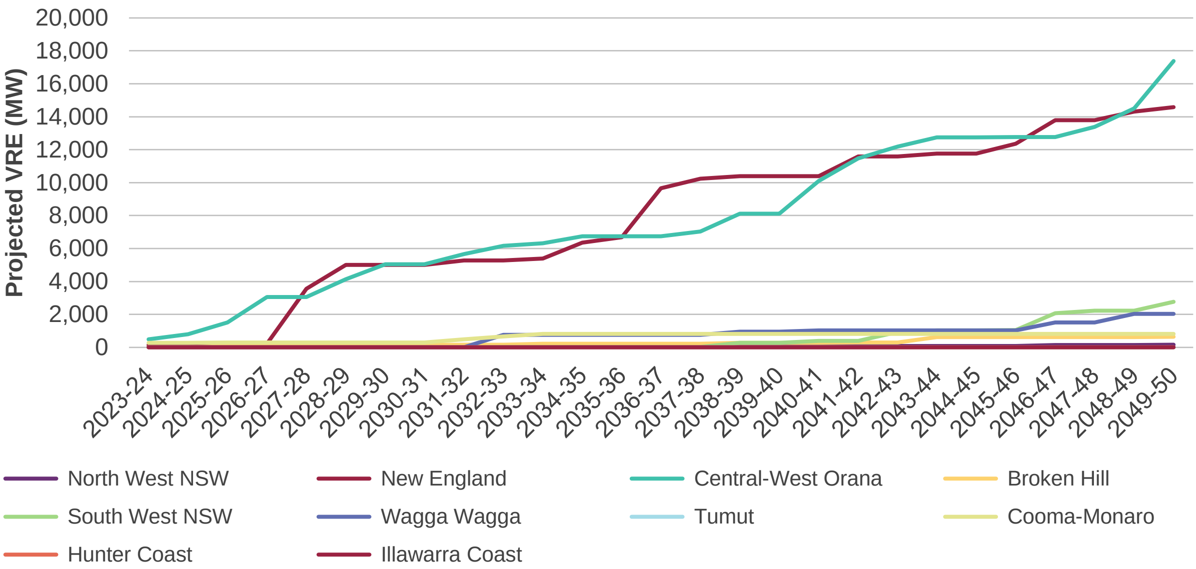
[8] These results are preliminary and AEMO will further refine network requirements for final 2022 ISP.

New South Wales

In New South Wales, over 38 GW of new utility-scale wind and solar VRE generation is projected as being required by 2050 to assist in replacing retiring coal capacity. Figure 7 shows the utility-scale VRE projected for each REZ in New South Wales under the *Step Change* scenario. This modelling indicates:

- From the start of the study horizon, there is an immediate increase in VRE in the Central-West Orana REZ, with 3,000 MW installed by 2026-27. By 2029-30 this has increased to 5,000 MW, and by 2039-40 is at 10,000 MW.
- Starting from 2026-27 significant VRE begins to be installed in the New England REZ, with installed capacity developing at a rate similar to that of the Central-West Orana REZ, also with 5,000 MW by 2029-30 and 10,000 MW by 2039-40.
- Other REZs in New South Wales such as Wagga Wagga and Cooma-Monaro also see smaller developments later in the study horizon, and account for less than 20% of the total projected utility-scale VRE developments in New South Wales. No offshore wind development is projected in the *Step Change* scenario 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* scenario



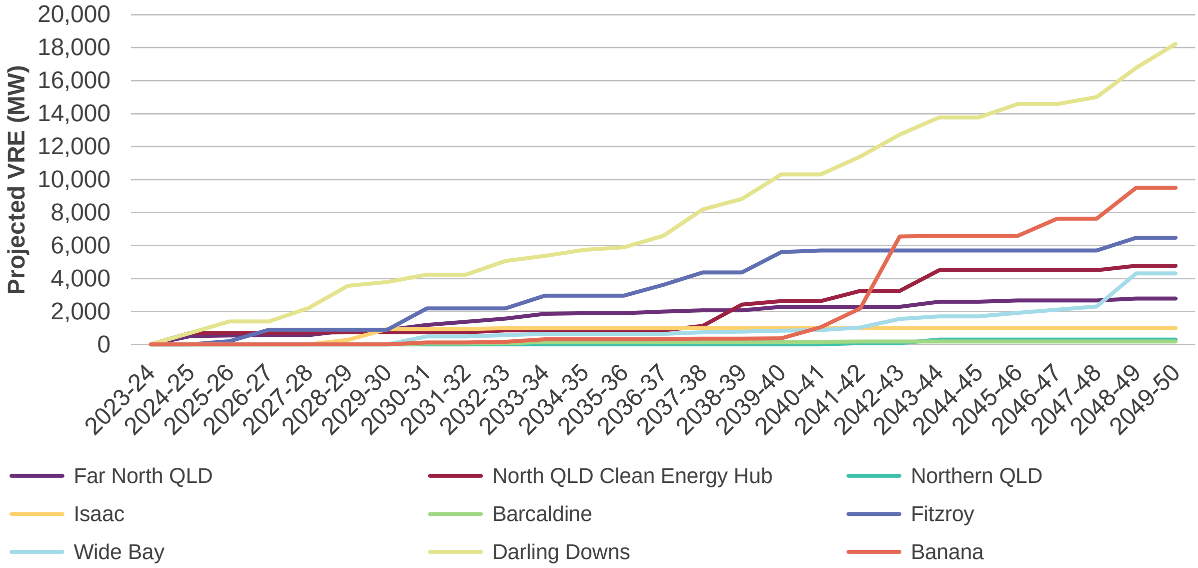
Queensland

In Queensland over 47 GW of new utility-scale wind and solar VRE generation is projected as being required by 2050 to assist in replacing retiring generation. Figure 8 shows the utility-scale VRE projected for each REZ in Queensland under the *Step Change* scenario. This modelling indicates:

- VRE developments are spread across the state over a number of REZs, including Far North Queensland and the North Queensland Energy Hub, Fitzroy and Wide Bay, and Darling Downs.
- Darling Downs sees the largest amount of projected new VRE capacity, with immediate developments taking advantage of spare network capacity, and with 4,000 MW new VRE by 2030, and 10,000 MW by 2040.

- The Banana REZ is projected to see developments after 2040, with 8,500 MW new VRE capacity by 2050.

Figure 8 Queensland utility-scale VRE development in REZs for the *Step Change* scenario

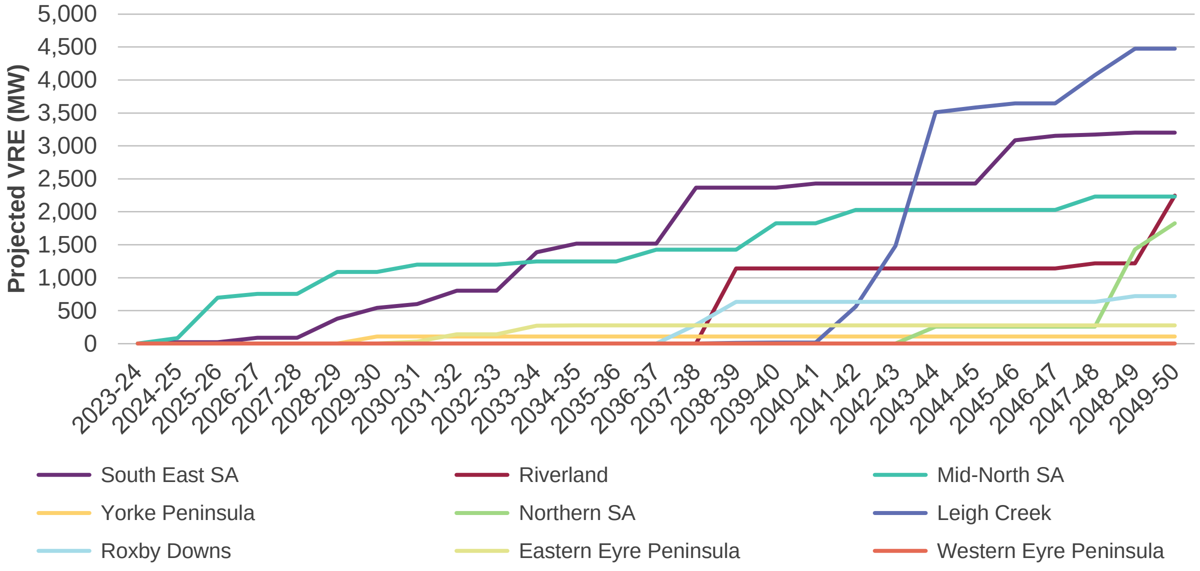


South Australia

In South Australia, over 15 GW of new utility-scale wind and solar VRE generation is projected as being required by 2050 to assist in replacing retiring gas generation capacity, and to utilise the additional capacity provided by the Project EnergyConnect interconnector. Figure 9 shows the utility-scale VRE projected for each REZ in South Australia under the *Step Change* scenario. This modelling indicates:

- The projected VRE is dispersed over many REZs throughout South Australia, with the largest share of development occurring in the South East SA and Mid-North SA REZs due to the high-quality wind resource.
- The Mid-North SA REZ sees an immediate increase in VRE, with an additional 1,000 MW by 2029-30, and 2,000 MW by 2039-40.
- The South East SA REZ starts to see new VRE capacity builds after 2025-26, with 1,500 MW new capacity by 2034-35 and 2,500 MW by 2039-40.
- The Leigh Creek REZ is projected to see developments after 2039-40, with 4,500 MW new VRE capacity by 2049-50.

Figure 9 South Australia utility-scale VRE development in REZs for the *Step Change* scenario



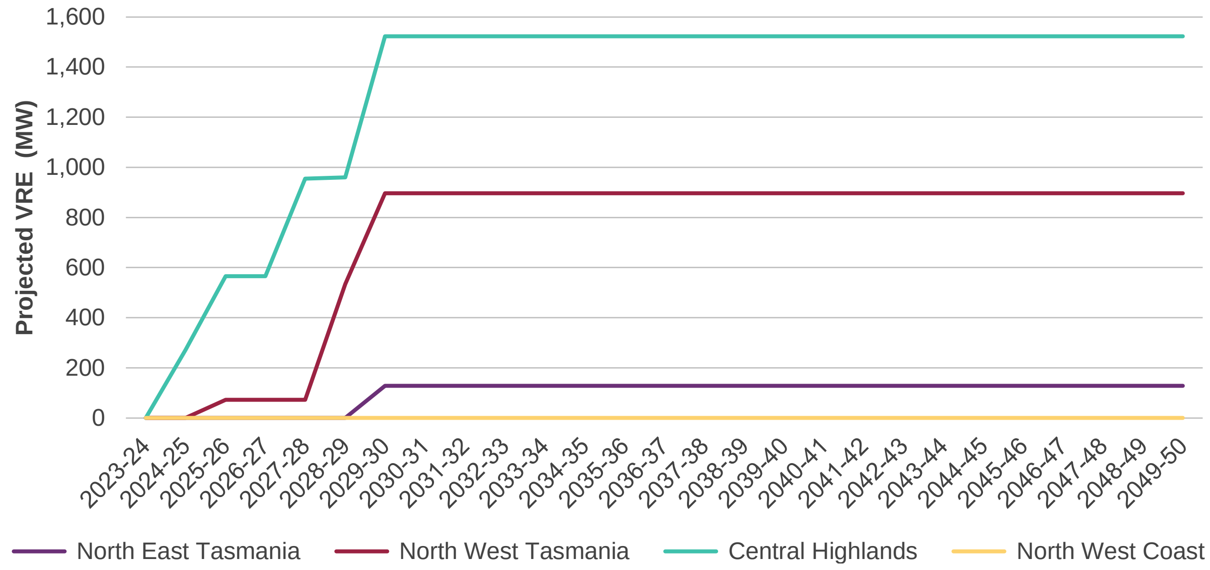
Tasmania

In Tasmania, over 2,500 MW of new utility-scale wind VRE is projected as being required by 2029-30, utilising transmission capacity released by the development of Marinus Link Cable 1 and Cable 2.

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

- 1,500 MW of new wind is projected for the Central Highlands REZs by 2029-30.
- 900 MW of new wind is projected for the North West Tasmania REZs by 2029-30.
- No further additional utility-scale VRE capacity is forecast as required after 2029-30.
- No offshore wind development is projected in Tasmania in any scenario.

Figure 10 Tasmania VRE development in REZs for the *Step Change* scenario



Victoria

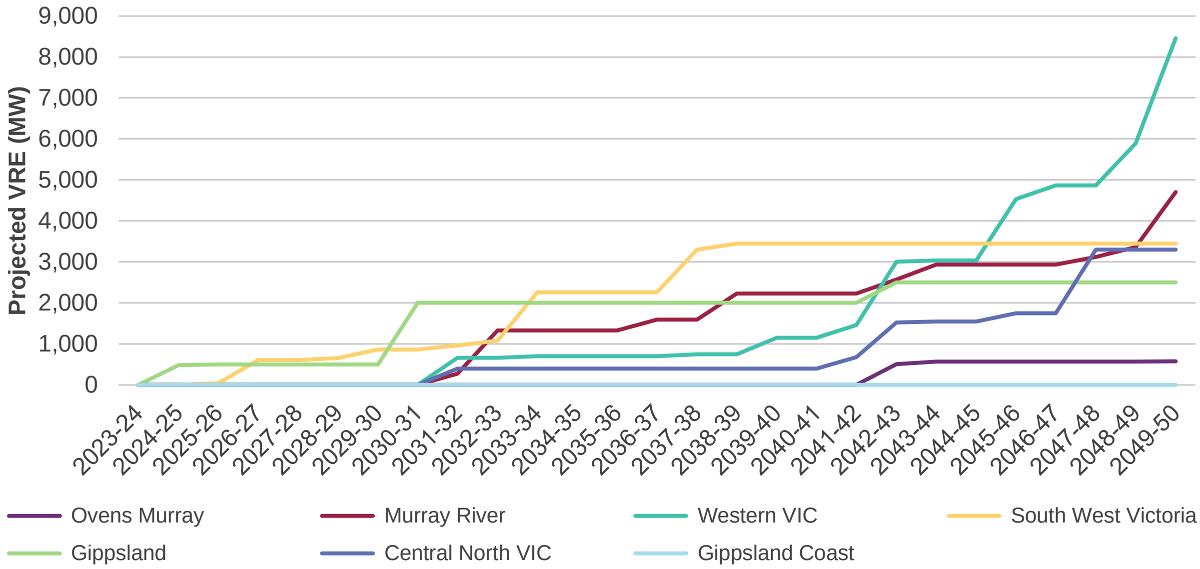
In Victoria, over 23,000 MW of new utility-scale wind and solar VRE is projected as being required by 2049-50 to assist in replacing retiring generation.

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

- Approximately 3,000 MW new utility-scale VRE is forecast as required in Victoria by 2029-30. This new VRE is located in the South West Victoria and Gippsland REZs only, utilising the existing spare network capacity.
- Up to 2,000 MW develops in the Murray River and Western Victoria in the early 2030s, utilising the additional REZ network capacity from VNI West. Both these REZs show larger developments after 2040, with 8,500 MW in Western Victoria and 4,700 MW in Murray River by 2050.
- After 2040, new utility-scale VRE is projected to connect to the Central North Victoria and South West Victoria, with up to 3,500 MW in both by 2050.

No offshore wind development is projected in Victoria in any scenario.

Figure 11 Victoria VRE development in REZs for the *Step Change* scenario



A3.4 REZ scorecards

A3.4.1 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="2">REZ report card details</th></tr>
<tr><td colspan="2">REZ assessments</td></tr>
<tr><td>REZ grouping</td><td>REZs are grouped into the following:
REZs where design and community engagement is progressing.
REZs where the coordination of generation infrastructure may be required.
REZs where the coordination of generation and transmission infrastructure may be required (REZ Design Report).
REZs where infrastructure coordination can start later.</td></tr>
<tr><td colspan="2">Renewable resources</td></tr>
<tr><td>Map legend</td><td>Indicative generation is shown based on the resource availability:<table><tr><td>Wind</td><td>Offshore Wind</td><td>Solar</td><td>Hydro</td></tr></table><table><tr><td>The green shading shows the indicative geographic area of the REZ. Augmentation options shown are described in more detail in the Transmission Cost Report[9].</td><td></td></tr></table></td></tr>
<tr><td>Resource quality</td><td>Solar average capacity factor based on nine reference years:<table><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></table>Wind average capacity factor based on nine reference years:<table><tr><td>≥45%</td><td>≥40%</td><td>≥35%</td><td>≥30%</td><td><30%</td></tr><tr><td>A</td><td>B</td><td>C</td><td>D</td><td>E</td></tr></table>Correlation between demand 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:<table><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></table></td></tr>
<tr><td>Renewable resources</td><td>Estimated potential REZ size in MW based on the geographical size and resource quality in the REZ. Additional MWs above the resource limit is allowed for within the market modelling, but this incurs a penalty factor to try take into account likely social license and community support costs.</td></tr>
<tr><td colspan="2">Climate hazard</td></tr>
<tr><td></td><td>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 OWZs consider the area on land that the OWZ is expected to connect.<table><tr><th>Score</th><th>Description</th></tr><tr><td>A</td><td>Once in 10-year maximum temperature projections range between 28°C and 38°C for the years 2030 and 2050.</td></tr></table></td></tr>
</table>

[9] At https://aemo.com.au/-/media/files/major-publications/isp/2021/transmission-cost-report.pdf?la=en.

REZ report card details		
	B	Once in 10-year maximum temperature projections range between 30°C and 44°C for the years 2030 and 2050.
	C	Once in 10-year maximum temperature projections range between 32°C and 48°C for the years 2030 and 2050.
	D	Once in 10-year maximum temperature projections range between 34°C and 50°C for the years 2030 and 2050.
	E	Once in 10-year maximum temperature projections range between 44°C and 52°C for the years 2030 and 2050.
Bushfire	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 OWZs consider the area on land that the OWZ is expected to connect.	
	Score	**Description**
	A	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.
	B	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.
	C	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.
	D	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.
	E	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.
Variable generation outlook		
Scenario	Long term market simulations of different scenarios named *Progressive Change*, *Step Change*, *Slow* and *Hydrogen*.	
Existing/committed and anticipated generation	The existing, committed and anticipated generation as of 13/7/2021, based on the advised Not Summer capacities[C].	
Projected variable generation	Long-term market simulations 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 least-cost development paths. All values are round to nearest 50 MW.	
Transmission expansion forecasts		
Transmission curtailment	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%.	
Economic spill	Economic spill happens when generation reduces output due to market price. It is represented as a percentage of VRE and rounded to nearest 1%.	

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.

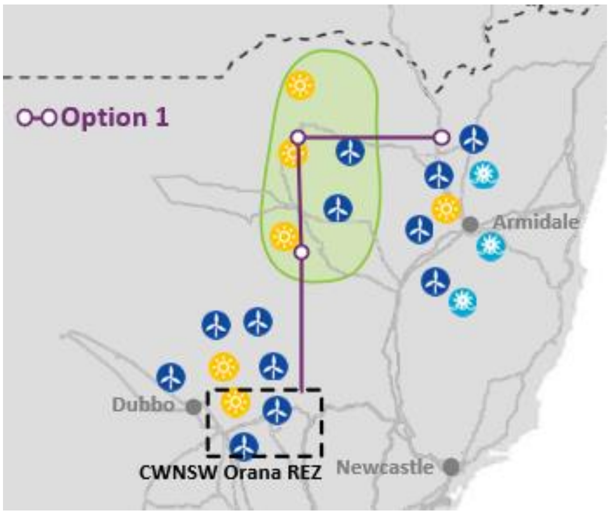
A3.4.2 New South Wales

N1 – North West NSW

Summary

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

If generation significantly increases in NWNSW and New England REZs, increased connection capacity between the two REZs may be required. The sharing of resources across the network augmentation will allow for better transmission utilisation and reduction in transmission build.



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 12 years.

Renewable resources

Resource	Solar			Wind		
Resource Quality	B			D		
Renewable Potential (MW)	6,385			-		
Demand Correlation	2029-30	2030-40	2049-50	2029-30	2030-40	2049-50
	F	F	F	B	B	B

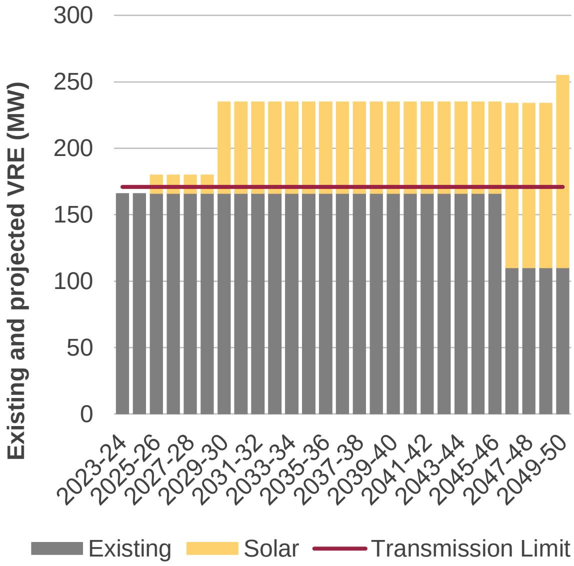
Climate hazard

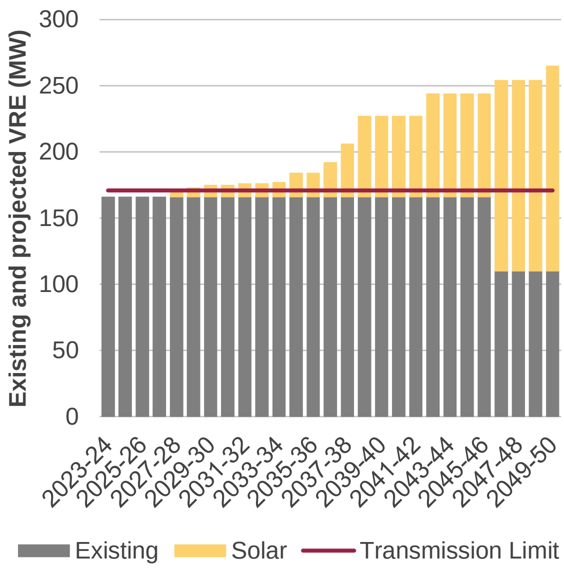
Temperature score	D	Bushfire score	E

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	56/110/0	50	50	150	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	150				
Slow Change		850	850	850				
Hydrogen Superpower		50	4,150	6,400				

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





VRE curtailment

Scenario	2030		2040		2050	
	Transmission curtailment	**Economic spill**	**Transmission curtailment**	**Economic spill**	**Transmission curtailment**	**Economic spill**
Progressive Change	4%	44%	8%	23%	5%	46%
Step Change	-	19%	5%	35%	4%	56%
Slow Change	18%	67%	45%	32%	34%	43%
Hydrogen Superpower	1%	36%	14%	9%	11%	17%

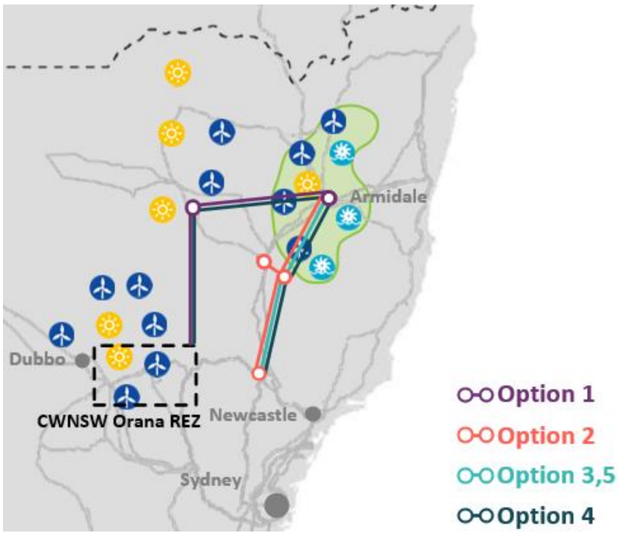
N2 – New England

Summary

The *NSW Electricity Infrastructure Investment Act 2020* has legislated this REZ to be declared with an intended 8,000 MW of additional transmission network capacity.

New England is located to the east of and along the existing QNI[†]. This REZ has moderate to good wind and solar resources 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.

The sharing of resources across the network augmentation will allow for better transmission utilisation and reduction in transmission build



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	A registration of interest, initiated by the NSW Government, closed on 23 July 2021[‡]. This was the first step in engaging the industry to help inform network design.

Renewable resources

Resource	Solar			Wind		
Resource quality	D			C		
Renewable potential (MW)	2,985			7,400		
Demand correlation	**2029-30**	**2030-40**	**2049-50**	**2029-30**	**2030-40**	**2049-50**
	F	F	F	B	B	B

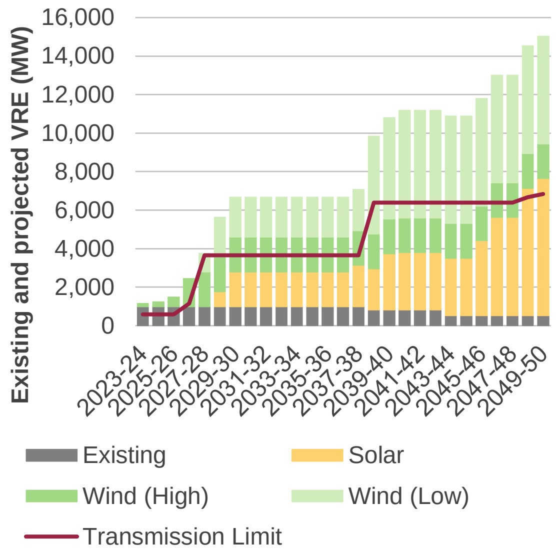
Climate hazard

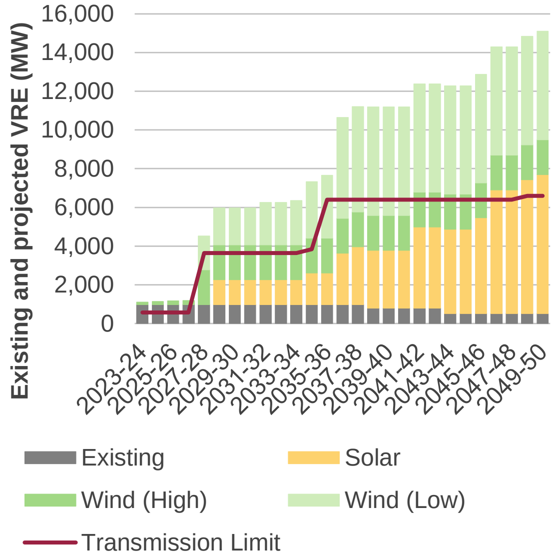
Temperature score	C	**Bushfire score**	E

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	20/515/0	1,800	2,950	7,100	442/0/0	3,900	7,050	7,400
Step Change		1,300	3,000	7,200		3,700	7,400	7,400
Slow Change		2,300	2,300	3,000		4,000	4,000	7,400
Hydrogen Superpower		2,600	3,000	3,000		3,900	7,400	10,350

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





VRE curtailment

Scenario	2030		2040		2050	
	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill
Progressive Change	2%	6%	2%	1%	6%	2%
Step Change	2%	2%	3%	2%	7%	3%
Slow Change	2%	16%	4%	1%	2%	3%
Hydrogen Superpower	5%	3%	3%	3%	3%	9%

† Options shown are a subset of the Central New South Wales to Northern New South Wales flow path options.
‡ New South Wales Government New England Expression of Interest, available at https://www.energy.nsw.gov.au/renewables/renewable-energy-zones#-why-is-the-nsw-government-delivering-renewable-energy-zones-.

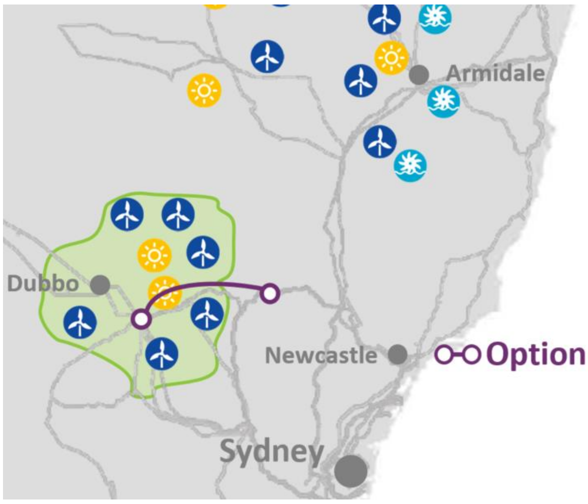
N3 – Central West Orana

Summary

The Central West Orana REZ is electrically close to the Sydney load centre and has moderate wind and solar resources.

Central West Orana REZ has been identified by the New South Wales Government as the state's first pilot REZ[†]. The *NSW Electricity Infrastructure Investment Act 2020* legislates the REZ be declared with an intended 3,000 MW of additional transmission network capacity.

Due to the nature of the project, which is currently going through consultation on corridor selection, specific information on the project is not able to be provided, but it is expected to include new transmission lines connecting to a 500 kV and 330 kV loop in the vicinity of the Central-West Orana REZ indicative location.



Note: The transmission study corridor is currently under consultation. More information is available at https://energy.nsw.gov.au/renewables/renewable-energy-zones.

Existing network capability

The project to establish the Central West Orana REZ is considered anticipated, and as such the existing network capability is approximately 3,900 MW.

REZ grouping

REZ design and community engagement is progressing	In May 2020, the NSW Department of Planning, Industry and Environment called for renewable energy, energy storage and emerging energy project proponents to register their interest in being part of the first pilot REZ. They received expression of interest of 27,000 W of new generation and storage projects[‡]. Consultations with local communities and regional stakeholders have been initiated by New South Wales Government. In early November 2021, Central-West Orana was formally declared a Renewable Energy Zone as the first step to formalising the REZ under the *Electricity Infrastructure Investment Act 2020*.

Renewable resources

Resource	**Solar**			**Wind**		
Resource quality	C			C		
Renewable potential (MW)	6,850			3,000		
Demand correlation	**2029-30**	**2030-40**	**2049-50**	**2029-30**	**2030-40**	**2049-50**
	F	F	F	B	B	C

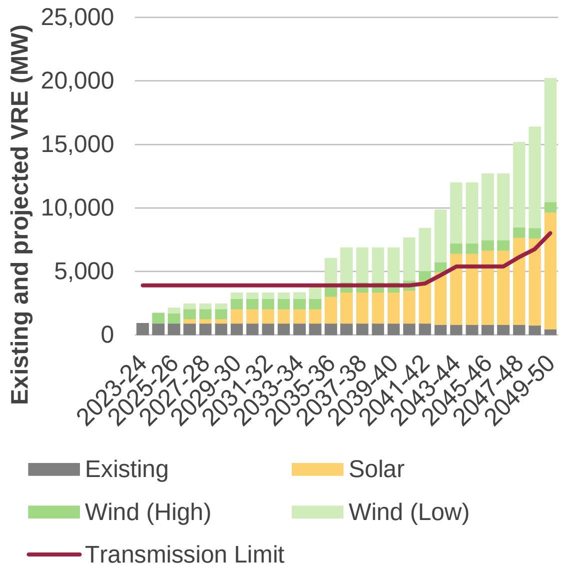
Climate hazard

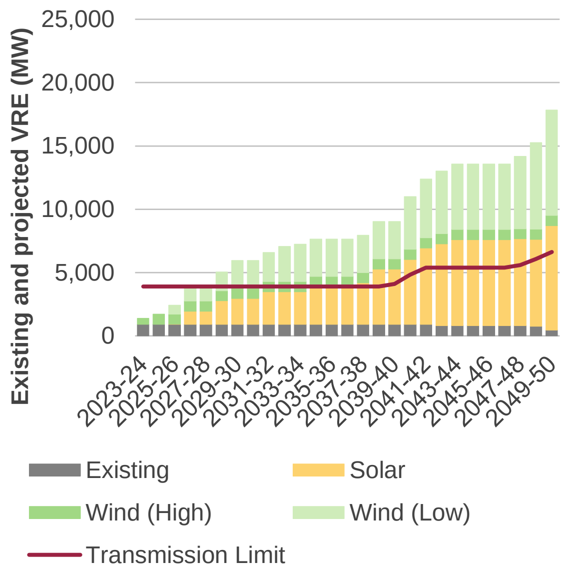
Temperature score	C	**Bushfire score**	E

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	446/0/361	1,150	2,450	9,200	113/0/0	1,250	3,500	10,550
Step Change		2,050	4,400	8,250		3,000	3,750	9,150
Slow Change		200	200	3,100		800	800	3,000
Hydrogen Superpower		3,200	6,850	18,200		3,800	5,500	15,200

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





VRE curtailment

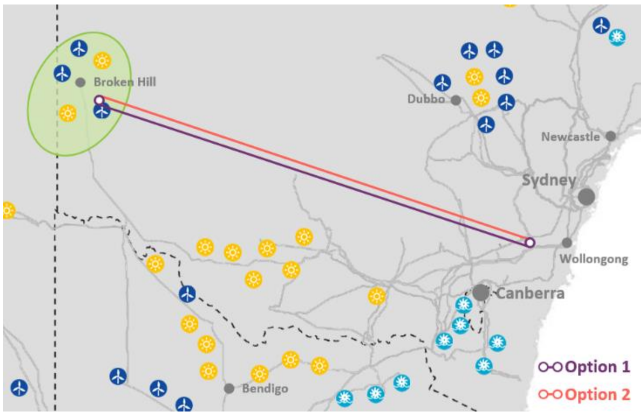
Scenario	2030		2040		2050	
	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill
Progressive Change	-	16%	1%	5%	9%	4%
Step Change	-	4%	5%	9%	11%	8%
Slow Change	-	28%	-	4%	1%	11%
Hydrogen Superpower	3%	3%	7%	10%	4%	20%

† See https://energy.nsw.gov.au/renewables/renewable-energy-zones#-centralwest-orana-renewable-energy-zone-pilot-.
‡ New South Wales Government Central-West Orana REZ at: https://www.energy.nsw.gov.au/renewables/renewable-energy-zones#-centralwest-orana-renewable-energy-zone-.

N4 – Broken Hill

Summary

Broken Hill REZ has excellent solar resources. 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 no additional 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 12 years.

Renewable resources

Resource	Solar			Wind		
Resource quality	B			D		
Renewable potential (MW)	8,000			5,100		
Demand correlation	2029-30	2030-40	2049-50	2029-30	2030-40	2049-50
	F	F	E	B	B	C

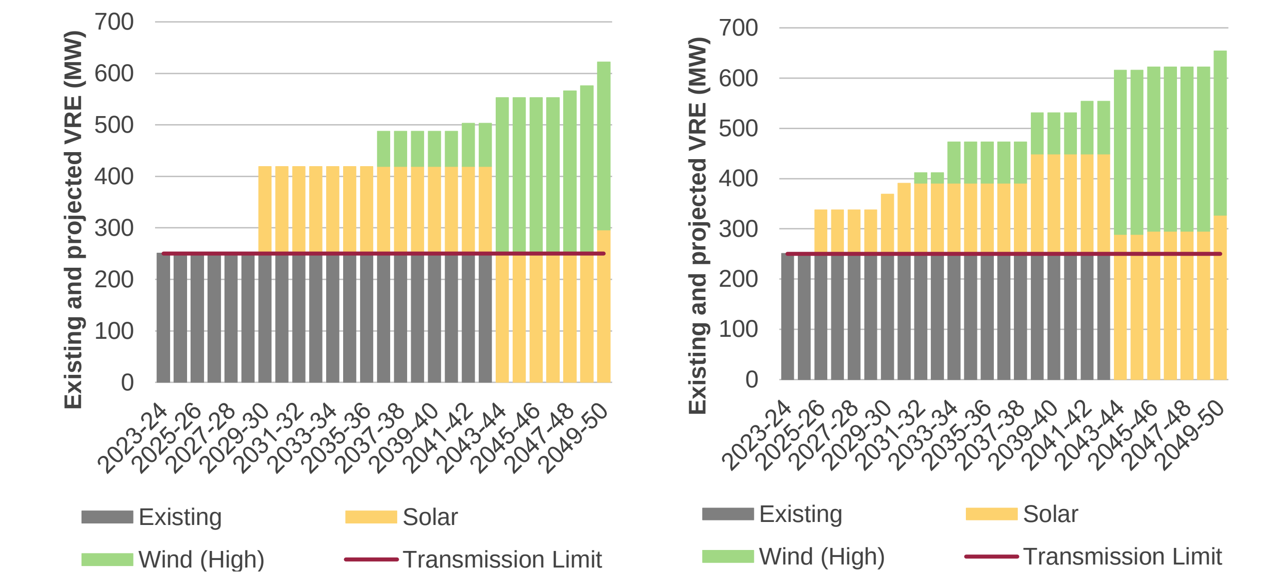
Climate hazard

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	53/0/0	200	200	300	198/0/0	-	100	350
Step Change		100	200	350		-	100	350
Slow Change		200	200	300		-	-	-
Hydrogen Superpower		200	200	400		-	-	100

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



VRE curtailment

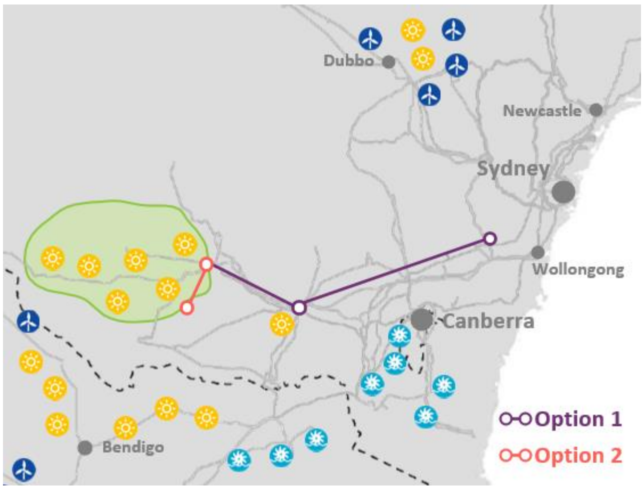
Scenario	2030		2040		2050	
	Transmission curtailment	**Economic spill**	**Transmission curtailment**	**Economic spill**	**Transmission curtailment**	**Economic spill**
Progressive Change	1%	19%	2%	8%	4%	37%
Step Change	-	6%	3%	18%	4%	41%
Slow Change	1%	40%	4%	7%	1%	26%
Hydrogen Superpower	2%	14%	1%	38%	3%	60%

N5 – South West NSW

Summary

The South West REZ has good solar resource and incorporates the Darlington Point substation which marks the transition from 330 kV to 220 kV. Further west, the 220 kV links to North West Victoria and Broken Hill.

This REZ is one of three REZs which are being targeted for further development under the NSW Electricity Infrastructure Roadmap.



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, one option for VNI West (Kerang route) would also increase the capacity of this REZ.

REZ grouping

REZ design and community engagement is progressing	A registration of interest, initiated by the NSW Government, closed on 24 November 2021†. This was the first step in engaging the industry to help inform network design.

Renewable resources

Resource	Solar			Wind		
Resource quality	C			E		
Renewable potential (MW)	3,964			4,300		
Demand correlation	2029-30	2030-40	2049-50	2029-30	2030-40	2049-50
	F	F	F	B	B	B

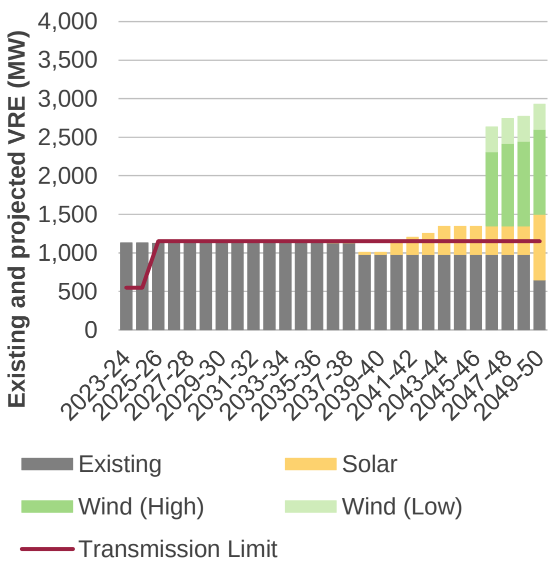
Climate hazard

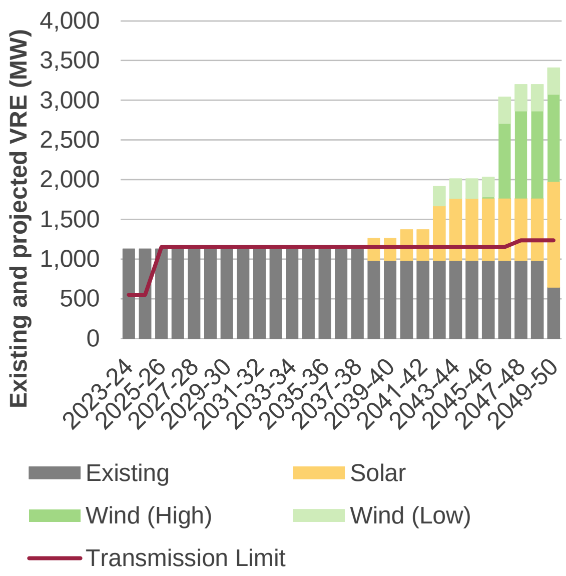
Temperature score	E	Bushfire score	D

VRE outlook

	Solar PV (MW)				Wind (MW)			
	Existing/ committed/ anticipated	Projected 2029-30	Projected 2039-40	Projected 2049-50	Existing/ committed/ anticipated	Projected 2029-30	Projected 2039-40	Projected 2049-50
Progressive Change	972/37/85	-	50	850	-	-	-	1,450
Step Change		-	300	1,350		-	-	1,450
Slow Change		-	-	-		-	-	-
Hydrogen Superpower		100	300	1,350		-	-	-

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





VRE curtailment

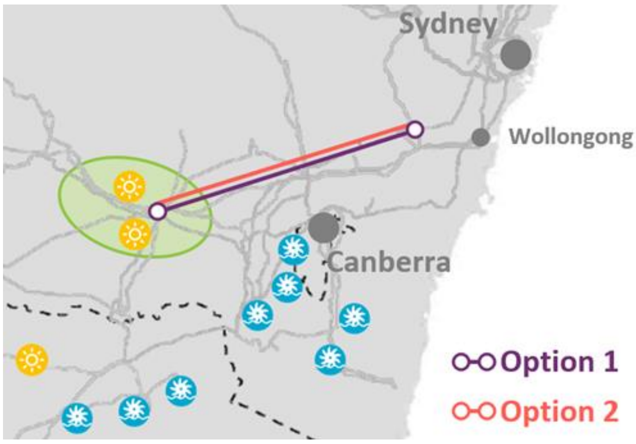
Scenario	2030		2040		2050	
	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill
Progressive Change	-	13%	-	5%	3%	27%
Step Change	-	1%	1%	13%	5%	32%
Slow Change	-	37%	-	14%	-	15%
Hydrogen Superpower	1%	3%	-	35%	5%	52%

† New South Wales Government South-West REZ registration of Interest, available at https://www.energy.nsw.gov.au/renewables/renewable-energy-zones#-southwest-renewable-energy-zone-.

N6 – Wagga Wagga

Summary

This REZ extends to the west of Wagga Wagga and has moderate wind and solar resources.



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 upon HumeLink as a pre-requisite.

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 *Progressive Change* and *Step Change* scenarios. This build is brought forward under the *Hydrogen Superpower* scenario. This REZ could benefit from early community engagements and from coordination of generation.

Renewable resources

Resource	Solar			Wind		
Resource quality	C			E		
Renewable potential (MW)	1,028			1,000		
Demand correlation	2029-30	2030-40	2049-50	2029-30	2030-40	2049-50
	F	F	F	B	B	C

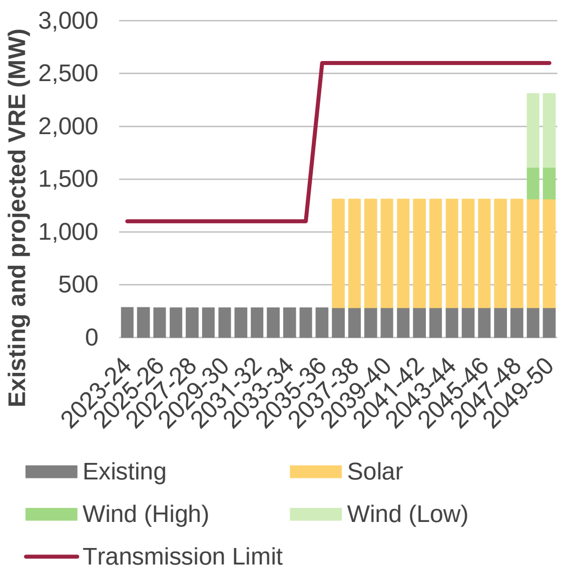
Climate hazard

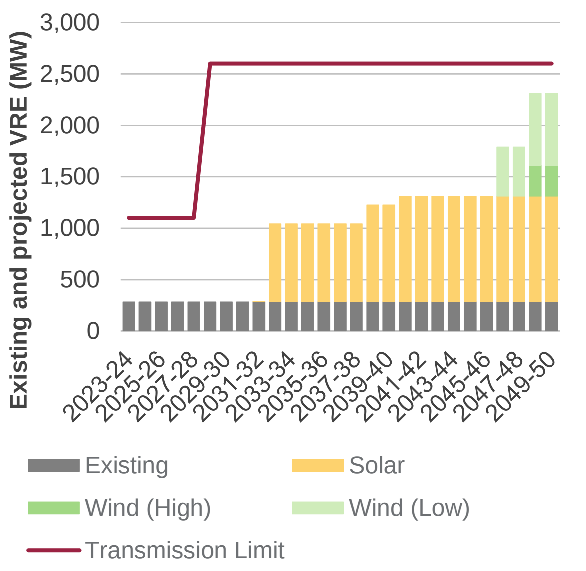
Temperature score		Bushfire score	

VRE outlook

	Solar PV (MW)				Wind (MW)			
	Existing/ committed/ anticipated	Projected 2029-30	Projected 2039-40	Projected 2049-50	Existing/ committed/ anticipated	Projected 2029-30	Projected 2039-40	Projected 2049-50
Progressive Change	121/163/0	-	1,050	1,050	-	-	-	1,000
Step Change		-	950	1,050		-	-	1,000
Slow Change		-	-	-		-	-	-
Hydrogen Superpower		1,050	1,050	1,050		-	-	-

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





VRE curtailment

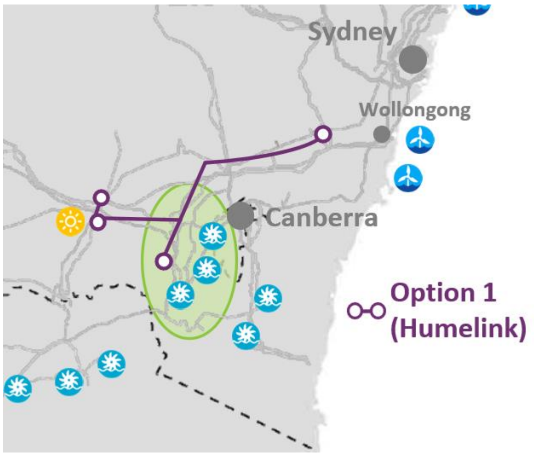
Scenario	2030		2040		2050	
	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill
Progressive Change	-	20%	-	2%	-	14%
Step Change	-	21%	-	18%	-	10%
Slow Change	-	38%	-	16%	-	15%
Hydrogen Superpower	-	11%	-	20%	-	15%

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, which is currently undergoing a RIT-T†, 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

Infrastructure coordination is not urgent	Modelling outcomes indicate a low likelihood that significant investment in VRE and transmission infrastructure will be optimally required in the next 12 years.

Renewable resources

Resource	Solar			Wind		
Resource quality	D			B		
Renewable potential (MW)	-			-		
Demand correlation	2029-30	2030-40	2049-50	2029-30	2030-40	2049-50
	F	F	F	C	C	C

Climate hazard

Temperature score	C	Bushfire score	E

VRE outlook

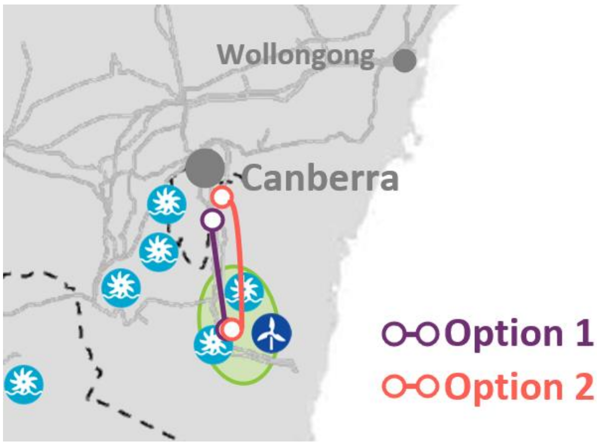
	Solar PV (MW)				Wind (MW)			
	Existing/ committed/ anticipated	Projected			Existing/ committed/ anticipated	Projected		
		2029-30	2039-40	2049-50		2029-30	2039-40	2049-50
Progressive Change	There is no existing, committed or anticipated solar generation for this REZ. The modelling outcomes, for all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

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.

† See 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 moderate to good quality wind resources.	
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.	

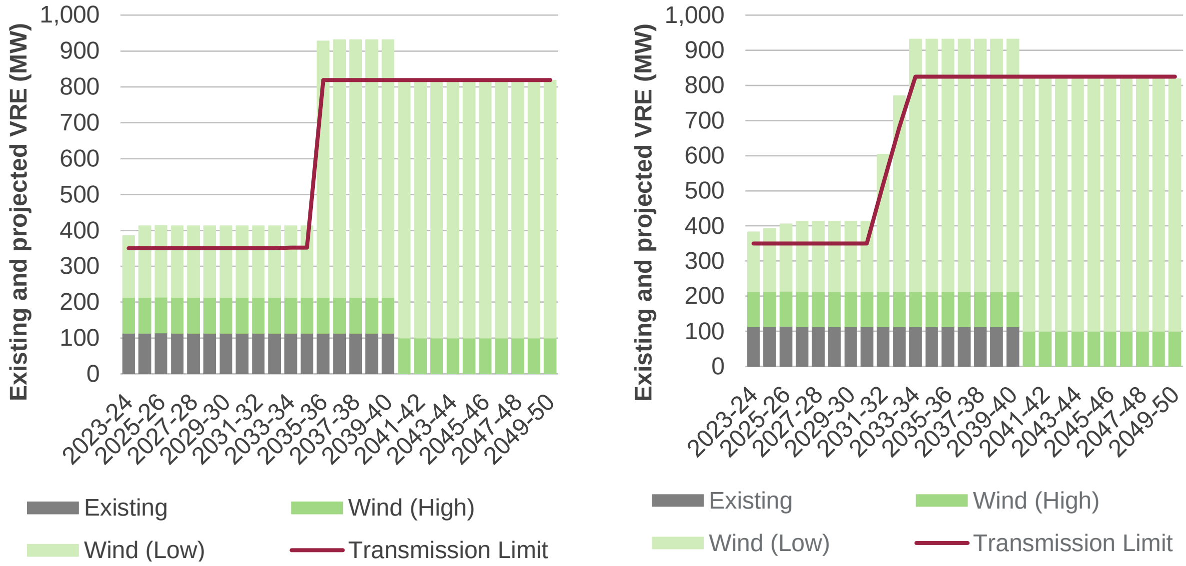
REZ grouping	
Coordination of generation and infrastructure may be required	The modelling outcomes identify this zone for development of wind generation in the 2020s for all scenarios. This REZ could benefit from early community engagements and from the coordination of generation.

Renewable resources						
Resource	**Solar**			**Wind**		
Resource quality	D			B		
Renewable potential (MW)	-			300		
Demand correlation	**2029-30**	**2030-40**	**2049-50**	**2029-30**	**2030-40**	**2049-50**
	F	F	E	C	C	C

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.				113/0/0	300	800	800
Step Change						300	800	800
Slow Change						300	300	800
Hydrogen Superpower						1,750	4,100	4,100

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



VRE curtailment

Scenario	2030		2040		2050	
	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill
Progressive Change	1%	7%	1%	4%	-	4%
Step Change	1%	3%	1%	2%	-	16%
Slow Change	1%	17%	1%	2%	-	4%
Hydrogen Superpower	1%	1%	-	11%	-	12%

O1 – Hunter Coast

Summary

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

Existing network capability

Newcastle has multiple 330 kV lines already connected, and is situated near to the Sydney load centre. Network capacity is shared with local gas generation and hydro generation output. The current network transmission limit is approximately 10,000 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.

Renewable resources

Resource	Solar			Offshore wind		
Resource quality	-			B		
Renewable potential (MW)	-			10,000		
Demand correlation	2029-30	2030-40	2049-50	2029-30	2030-40	2049-50
	-	-	-	B	B	C

Climate hazard

Temperature score	To be determined for final ISP	**Bushfire score**	To be determined for final ISP

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	N/A				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								
Slow Change								
Hydrogen Superpower								

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.

O2 – Illawarra Coast

Summary

The Illawarra Coast OWZ has been identified for the offshore wind resource potential in relatively shallow waters close to shore, with a connection point near to the Sydney load centre.

To be able to facilitate large amounts of offshore wind connecting in this part of the 330 kV network, it is anticipated that expansion will be required to connect to the 500 kV backbone.

Existing network capability

Dapto has multiple 330 kV lines already connected and is situated near to the Sydney load centre. Network capacity is shared with local gas generation and hydro generation output. The current network capacity is approximately 1,000 MW.

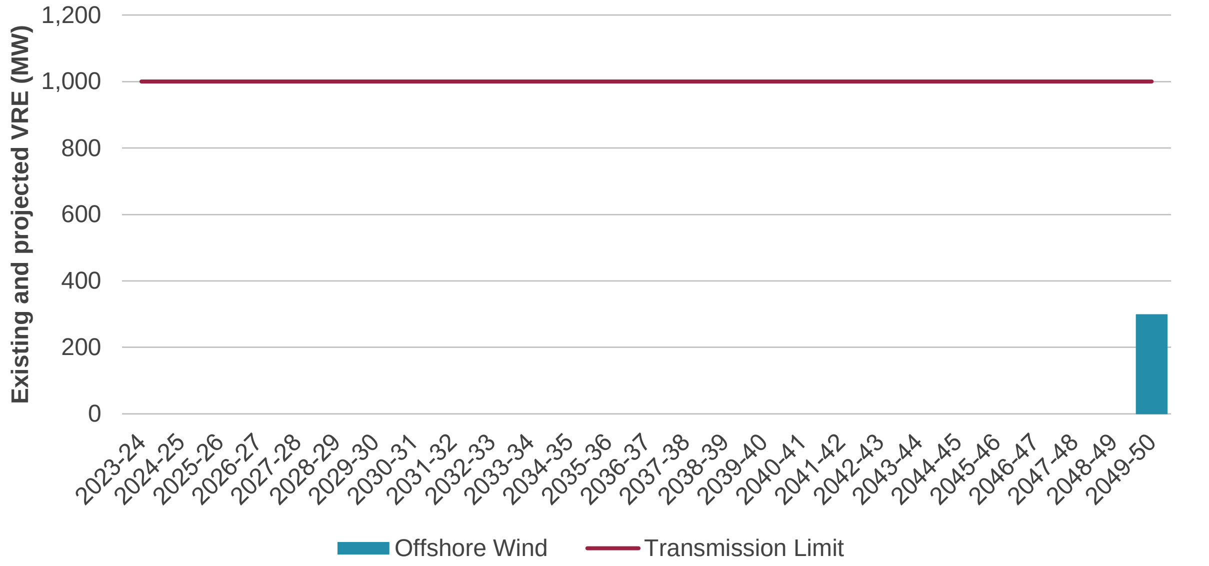
REZ grouping	
Infrastructure coordination can start later	Modelling outcomes indicate a low likelihood that significant investment in VRE and transmission infrastructure will be optimally required in the next 12 years.

Renewable resources						
Resource	**Solar**			**Offshore wind**		
Resource quality	-			B		
Renewable potential (MW)	-			10,000		
Demand correlation	**2029-30**	**2030-40**	**2049-50**	**2029-30**	**2030-40**	**2049-50**
	N/A	N/A	N/A	C	C	C

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	N/A				-	-	-	299
Step Change						-	-	-
Slow Change						-	-	-
Hydrogen Superpower						-	-	-

Transmission access expansion forecast for *Progressive Change*



Note: There is no projected VRE in *Step Change* scenario. Therefore, no transmission expansion occurs in this REZ for the *Step Change* scenario to facilitate VRE connection in this zone.

VRE curtailment

Scenario	2030		2040		2050	
	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill
Progressive Change	-	-	-	-	-	22%
Step Change	No VRE is projected under *Step Change*, *Slow* and *Hydrogen Superpower* scenarios, thus no curtailment occurs.					
Slow Change						
Hydrogen Superpower						

A3.4.3 Queensland

Q1 – Far North QLD

Summary

The Far North Queensland (FNQ) REZ is at the most northerly section of Powerlink's network. It has excellent wind and moderate solar resources and has existing hydroelectric power stations.

Three options are proposed that progressively increase network capacity and allow for upgrades based on where generation develops.

Existing network capability

Maximum export capability from the FNQ REZ is limited by voltage stability for a contingency of a Ross to Chalumbin 275 kV circuit. The existing network will allow for a total of approximately 750 MW of VRE to be connected.

Output from this REZ can also be limited by network capacity further south which can result in the need for additional network augmentations. Output from this REZ is included in the NQ1, NQ2 and NQ3 Group Constraints to take this into account.

Powerlink has also recently announced plans for upgrades to transmission networks in the Q1 REZ as part of the Northern Queensland Renewable Energy Zone[10]. AEMO considers this to be an anticipated project.

REZ grouping

Coordination of generation and transmission infrastructure may be required (REZ Design Report).	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. The draft outcomes indicate that this REZ may require a REZ Design Report to coordinate generation and transmission infrastructure and early community engagement.

Renewable resources

Resource	Solar			Wind		
Resource quality	C			A		
Renewable potential (MW)	1,100			2,280		
Demand correlation	2029-30	2030-40	2049-50	2029-30	2030-40	2049-50
	F	F	E	C	B	C

Climate hazard

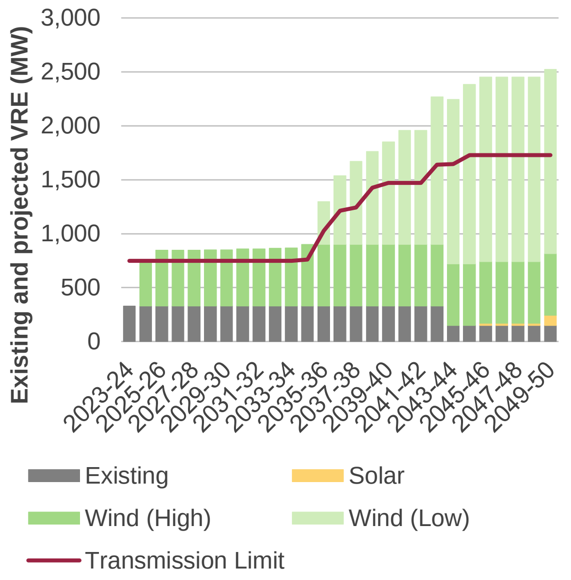
Temperature score	B	Bushfire score	A

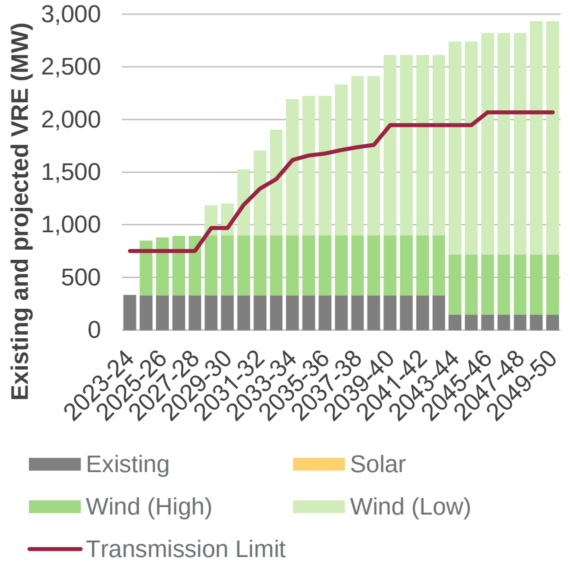
VRE outlook

	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	-	-	-	100	180/150/0	500	1,500	2,300
Step Change		-	-	-		850	2,300	2,800
Slow Change		-	-	-		500	550	1,350
Hydrogen Superpower		-	1,100	13,300		2,300	8,650	14,100

[10] Powerlink. *Queensland Renewable Energy Zones*, at https://www.powerlink.com.au/queensland-renewable-energy-zones.

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





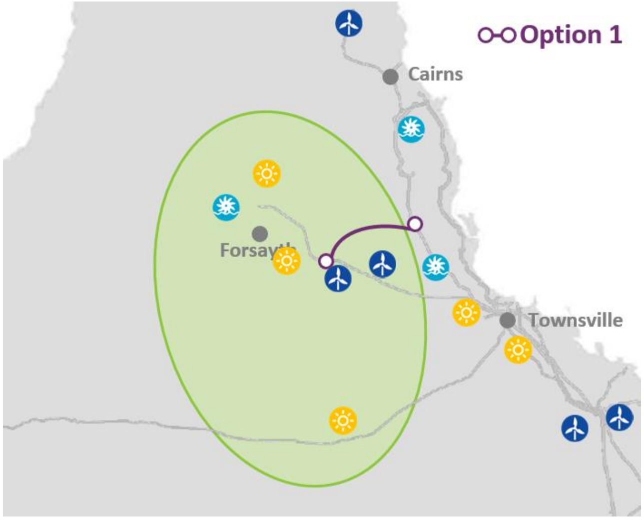
VRE curtailment

Scenario	2029-30		2039-40		2049-50	
	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill
Progressive Change	-	-	2%	5%	3%	24%
Step Change	2%	9%	3%	12%	5%	19%
Slow Change	-	-	1%	7%	3%	5%
Hydrogen Superpower	3%	8%	1%	7%	2%	31%

Q2 – North Queensland Clean Energy Hub

Summary

The Clean Energy Hub REZ is at the north-western section of Powerlink's network and has excellent wind and solar resources.



Existing network capability

Currently the REZ is supplied via a 132 kV line from Ross. Interest in this area includes the development of Kidston pumped storage project, for which Powerlink has recently received a 'Notice to Proceed' to develop a single-circuit 275 kV line†. Due to there being only a single circuit line, maximum output may be limited to the largest allowable generator contingency size.

Output from this REZ can also be limited by network capacity further south which can result in the need for additional network augmentations. Output from this REZ is included in the NQ1, NQ2 and NQ3 group constraints.

REZ grouping

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

Renewable resources

Resource	**Solar**			**Wind**		
Resource quality	A			B		
Renewable potential (MW)	8,000			18,600		
Demand correlation	**2029-30**	**2030-40**	**2049-50**	**2029-30**	**2030-40**	**2049-50**
	F	F	E	B	B	B

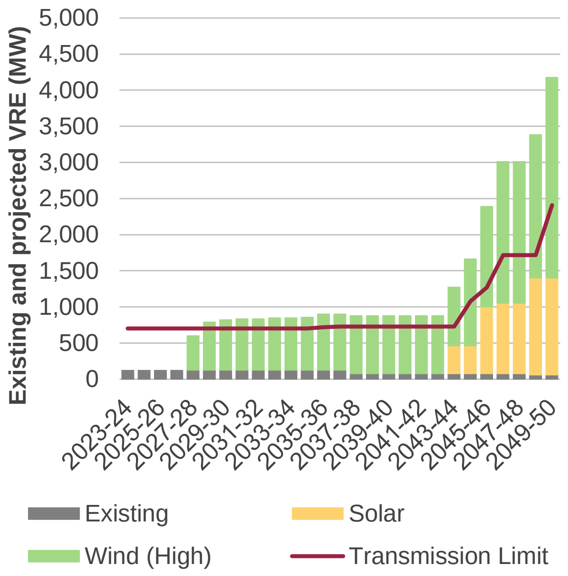
Climate hazard

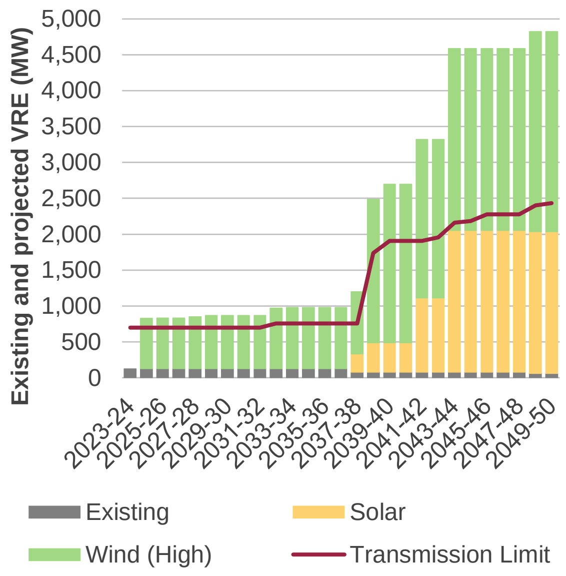
Temperature score	D	**Bushfire score**	C

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	67/15/0	-	-	1,350	0/43/0	700	800	2,800
Step Change		-	400	2,000		750	2,200	2,800
Slow Change		-	-	-		500	650	1,150
Hydrogen Superpower		250	4,950	8,000		1,050	5,700	10,800

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





VRE curtailment

Scenario	2030		2040		2050	
	Transmission curtailment	**Economic spill**	**Transmission curtailment**	**Economic spill**	**Transmission curtailment**	**Economic spill**
Progressive Change	-	2%	1%	6%	3%	14%
Step Change	1%	6%	1%	12%	2%	19%
Slow Change	-	3%	-	5%	1%	5%
Hydrogen Superpower	1%	12%	3%	9%	3%	27%

† Powerlink, Genex-Kidston connection project, at https://www.powerlink.com.au/projects/genex-kidston-connection-project.

Q3 – Northern Queensland

Summary

The North Queensland REZ encompasses Townsville and the surrounding area. It has good quality solar and wind resources and is situated close to the high capacity 275 kV network. There are already a number of existing utility-scale solar generation projects operational within this REZ.

Existing network capability

Due to the existing high voltage infrastructure, there are no augmentation options specifically for this REZ. Existing network capacity can allow for up to approximately 1,200 MW of new generator connections, shared between Q1, Q2 and Q3.

Output from this REZ can be limited by network capacity further south which can result in the need for additional network augmentations. Output from this REZ is included in the NQ1, NQ2 and NQ3 group constraints.

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.

Renewable resources

Resource	Solar			Wind		
Resource quality	B			C		
Renewable potential (MW)	3,400			-		
Demand correlation	2029-30	2030-40	2049-50	2029-30	2030-40	2049-50
	F	F	E	B	B	B

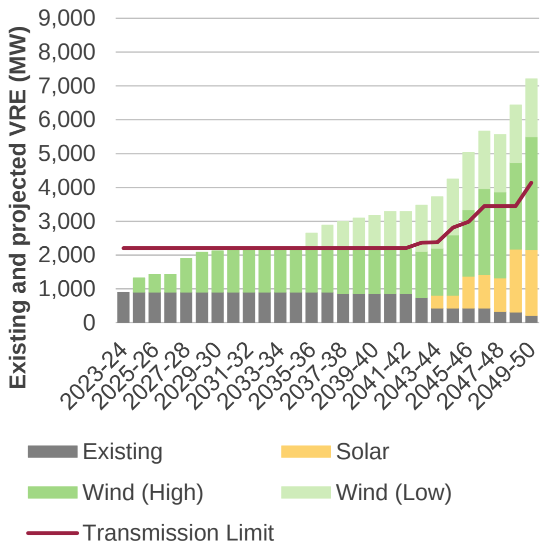
Climate hazard

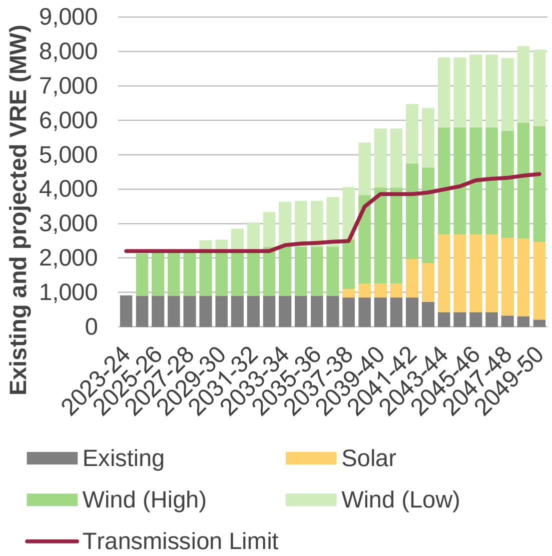
Temperature score	C	Bushfire score	E

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	448/0/0	-	-	500	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		-	-	300				
Slow		-	-	-				
Hydrogen Superpower		-	3,400	3,400				

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





Note: Q3 forecast shows results for the NQ1 group constraint augmentation.

VRE curtailment

Scenario	2030		2040		2050	
	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill
Progressive Change	-	18%	-	1%	-	49%
Step Change	-	3%	-	5%	-	45%
Slow Change	-	30%	-	2%	-	-
Hydrogen Superpower	-	1%	-	2%	-	-

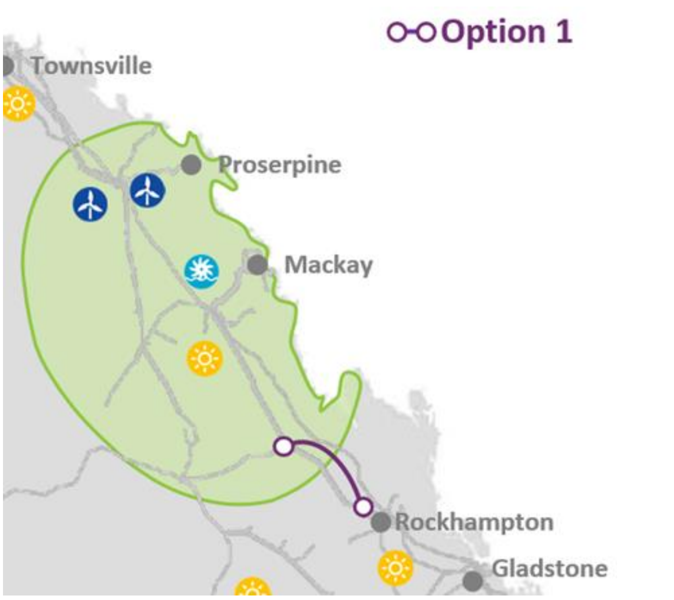
Transmission curtailment for this REZ is not captured. The transmission infrastructure required to upgrade this REZ increase capacity on the 275 kV back bone for the connection of Q1, Q2 and Q3.

Q4 – Isaac

Summary

The Isaac REZ has good wind and solar resources covering Collinsville and Mackay and has a number of utility-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.



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 and NQ3 group constraint augmentations that facilitate power from Q1 to Q5 to be transmitted south to the load centres.

The network has the ability to support up to a total of 2,500 MW of generation across the REZs in northern Queensland, depending on the level of storage in these REZs.

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.

Renewable resources

Resource	**Solar**			**Wind**		
Resource quality	B			C		
Renewable potential (MW)	6,900			3,800		
Demand correlation	**2029-30**	**2030-40**	**2049-50**	**2029-30**	**2030-40**	**2049-50**
	F	F	E	B	B	C

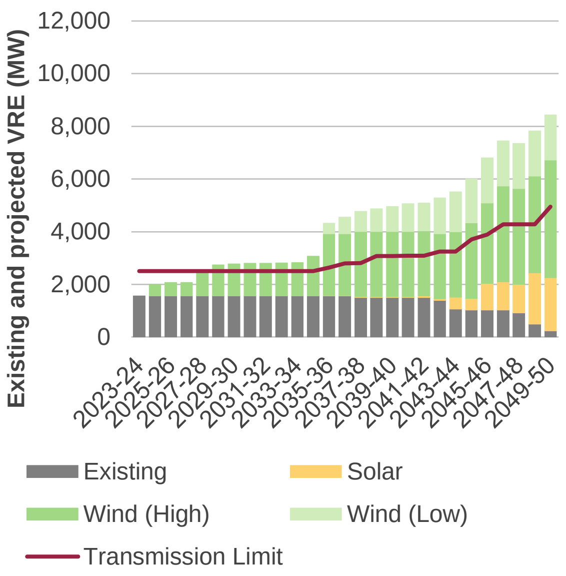
Climate hazard

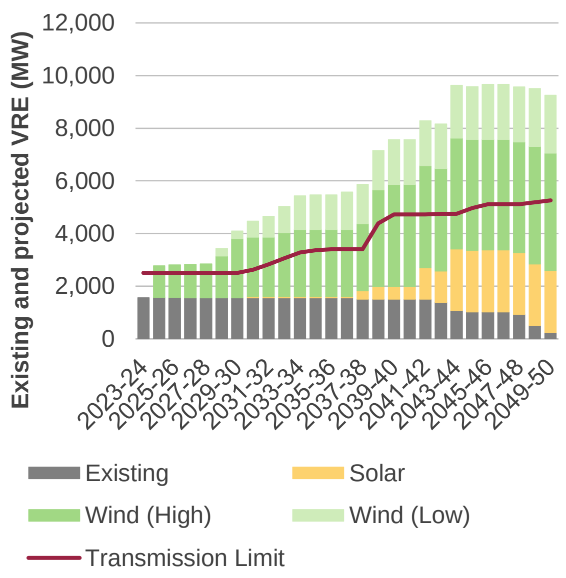
Temperature score	C	**Bushfire score**	C

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	622/0/0	-	-	-	-	-	1,000	1,000
Step Change		-	-	-		950	1,000	1,000
Slow Change		-	-	-		-	-	650
Hydrogen Superpower		1,000	3,500	36,050		1,750	3,800	34,000

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





Note: Q4 forecast shows results for the NQ2 group constraint augmentation, which includes VRE projections for Q1, Q2, Q3, Q4 and Q5.

VRE curtailment

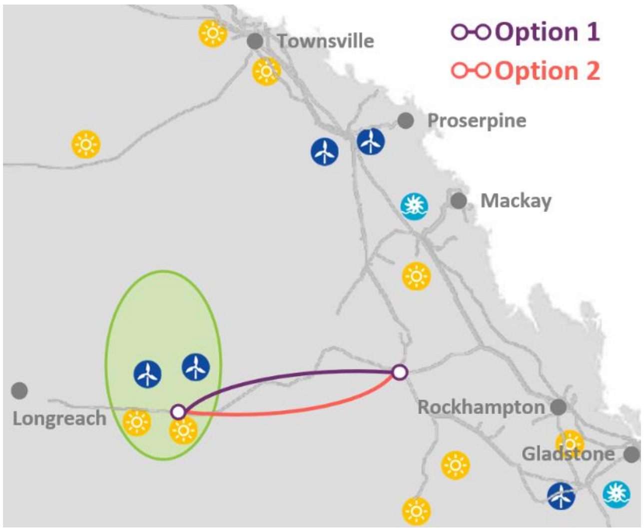
Scenario	2030		2040		2050	
	Transmission curtailment	**Economic spill**	**Transmission curtailment**	**Economic spill**	**Transmission curtailment**	**Economic spill**
Progressive Change	-	17%	-	1%	-	-
Step Change	-	8%	-	1%	-	3%
Slow	-	27%	-	2%	-	1%
Hydrogen Superpower	-	11%	-	18%	-	10%

Transmission curtailment for this REZ is not captured. The transmission infrastructure required to upgrade this REZ increase capacity on the 275 kV back bone for the connection of Q1, Q2, Q3, Q4 and Q5.

Q5 - Barcaldine

Summary

This REZ has excellent solar resources and moderate wind resources but is located a long way from the Queensland transmission backbone. Barcaldine REZ has not been identified as having significant potential pumped hydro capability.



Existing network capability

This REZ is fed via a 132 kV line from Lilyvale. A total of 100 MW of inverter-based generation is already installed on this long radial 132 kV network.

Currently there is no spare network capacity available within the Barcaldine REZ. Output from this REZ can be limited by network capacity further south which can result in the need for additional network augmentations. Output from this REZ is included in the NQ2 and NQ3 group constraints to take this into account.

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.

Renewable resources

Resource	**Solar**			**Wind**		
Resource quality	A			D		
Renewable potential (MW)	8,000			3,900		
Demand correlation	**2029-30**	**2030-40**	**2049-50**	**2029-30**	**2030-40**	**2049-50**
	F	F	E	B	B	C

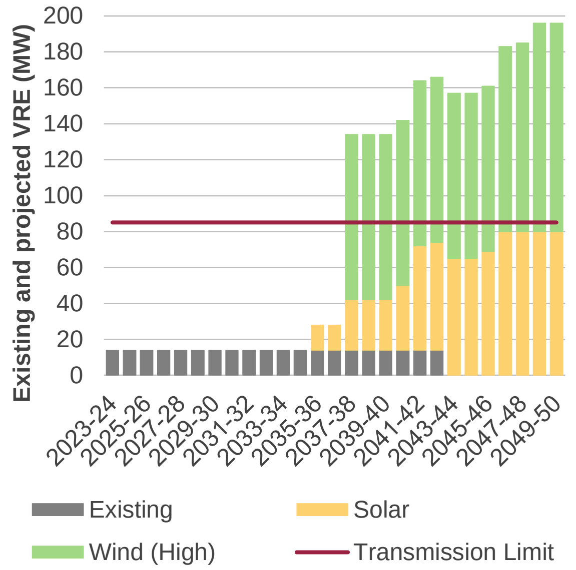
Climate hazard

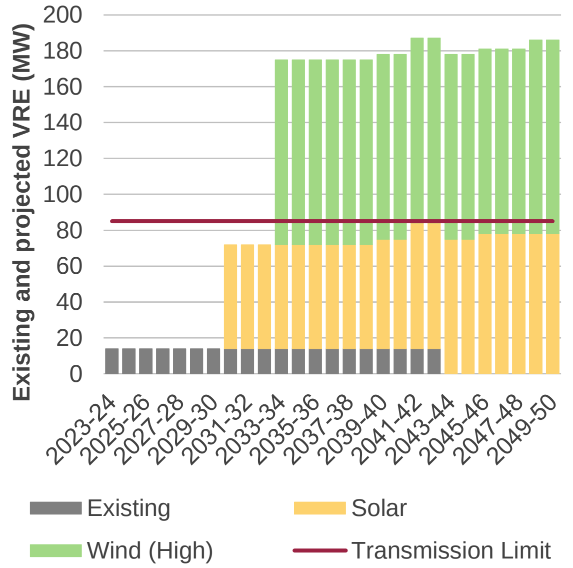
Temperature score	D	**Bushfire score**	C

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	14/0/0	-	50	100	-	-	100	100
Step Change		-	50	100		-	100	100
Slow Change		-	-	100		-	-	-
Hydrogen Superpower		50	150	8,000		100	250	3,900

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





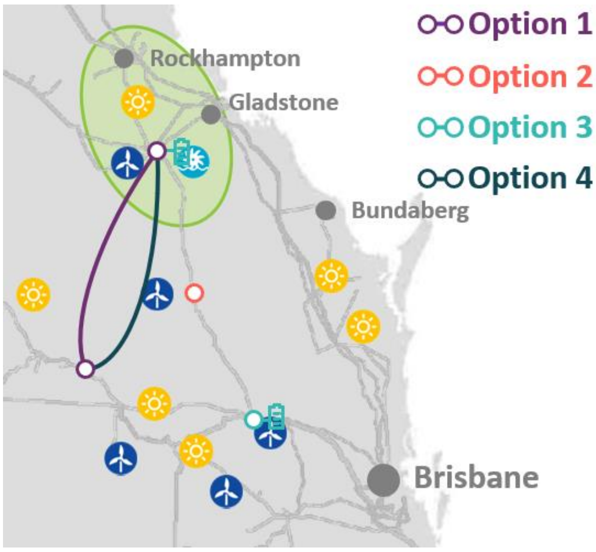
VRE curtailment

Scenario	2030		2040		2050	
	Transmission curtailment	**Economic spill**	**Transmission curtailment**	**Economic spill**	**Transmission curtailment**	**Economic spill**
Progressive Change	-	34%	-	13%	1%	55%
Step Change	-	26%	1%	38%	1%	51%
Slow Change	-	47%	-	24%	-	32%
Hydrogen Superpower	2%	31%	2%	44%	1%	53%

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 good solar and wind resources.



Existing network capability

The network has the ability to support up to 2,100 MW of power transfer from Central Queensland to Southern Queensland which is defined as the transient stability limit of the network (for a contingency of Calvale–Halys 275 kV circuit).

Due to the existing high voltage infrastructure, there are no augmentation options specifically for this REZ. The associated augmentations are the NQ3 group constraint augmentations that facilitate power from Q1 to Q6 to be transmitted south to the load centres.

REZ grouping

Coordination of generation and transmission infrastructure may be required (REZ Design Report).	The modelling outcomes identify this zone for VRE development before 2035 across most scenarios. The draft outcomes indicate that this REZ may require a REZ Design Report to facilitate the coordinate of generation and transmission infrastructure, and for early community engagement.

Renewable resources

Resource	**Solar**			**Wind**		
Resource quality	B			C		
Renewable potential (MW)	7,533			3,500		
Demand correlation	**2029-30**	**2030-40**	**2049-50**	**2029-30**	**2030-40**	**2049-50**
	F	F	F	A	A	B

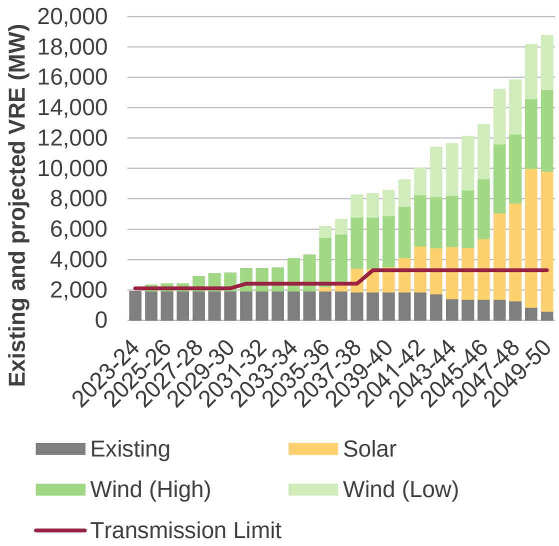
Climate hazard

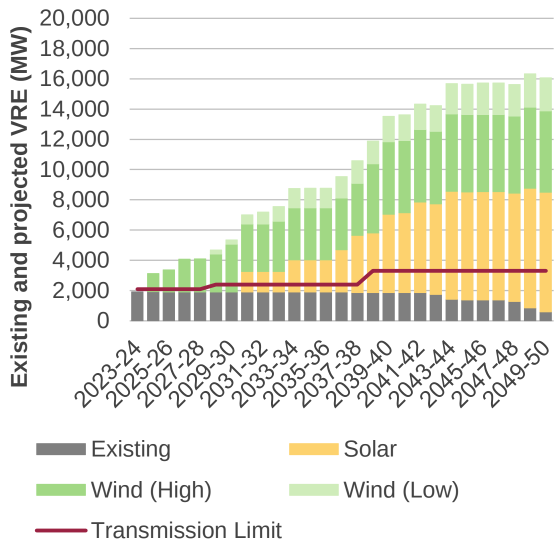
Temperature score	C	**Bushfire score**	B

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	0/0/349	-	1,650	7,200	-	-	1,600	2,800
Step Change		-	4,700	5,550		900	900	900
Slow Change		-	-	1,550		-	500	900
Hydrogen Superpower		2,350	6,500	59,050		2,000	3,800	24,300

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





Note: Q6 forecast shows results for the NQ3 group constraint augmentation, including projected VRE for all REZs north of the NQ3; this includes Q1, Q2, Q3, Q4, Q5 and Q6. The transmission limit is modelled using the CNQ-SQ flowpath limit as opposed to a static number.

VRE curtailment

Scenario	2030		2040		2050	
	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill
Progressive Change	-	16%	-	3%	-	3%
Step Change	-	8%	-	1%	-	4%
Slow Change	-	31%	-	10%	-	6%
Hydrogen Superpower	-	7%	-	10%	-	13%

Transmission curtailment for this REZ is not captured. The transmission infrastructure required to upgrade this REZ increase capacity on the 275 kV back bone for the connection of Q1, Q2, Q3, Q4, Q5 and Q6

Q7 – Wide Bay

Summary

The Wide Bay area has moderate solar resources and already has a number of large solar generators operational within the REZ.

There is difficultly getting easements in this residential area, hence this would require a rebuild of the existing single-circuit lines as double-circuits to help reduce those challenges around obtaining easements, should the generation interest exceed the current network capacity.

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 can support up to approximately 500 MW of generation connecting in the area north of Brisbane up to Gympie.

REZ grouping

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

Renewable resources

Resource	Solar			Wind		
Resource quality	C			D		
Renewable potential (MW)	2,200			1,100		
Demand correlation	2029-30	2030-40	2049-50	2029-30	2030-40	2049-50
	F	F	F	B	B	B

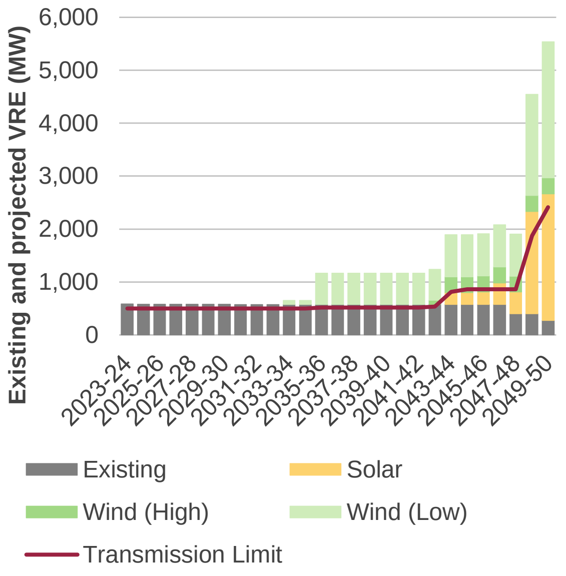
Climate hazard

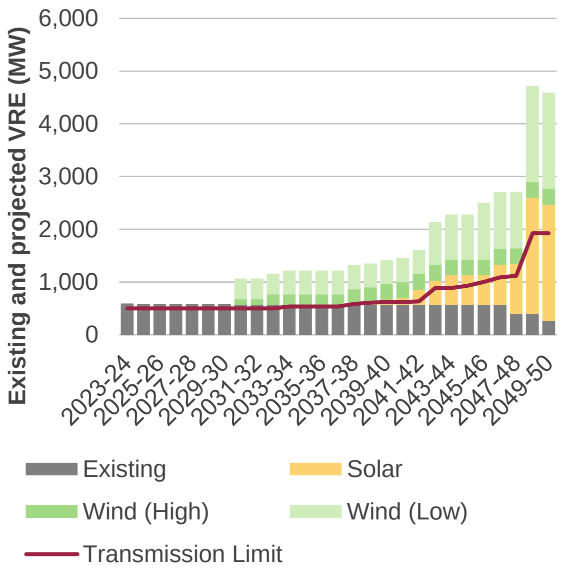
Temperature score	B	Bushfire score	E

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	131/176/274	-	-	2,400	-	-	600	2,850
Step Change		-	100	2,200		-	750	2,100
Slow Change		-	-	150		-	-	500
Hydrogen Superpower		-	2,250	7,050		500	3,250	5,950

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





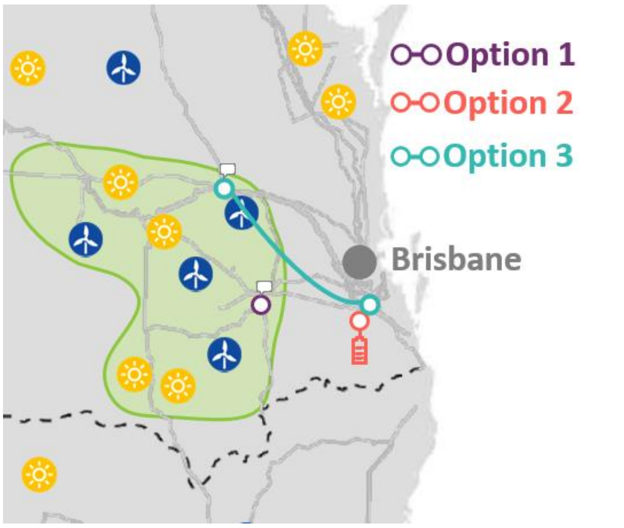
VRE curtailment

Scenario	2030		2040		2050	
	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill
Progressive Change	1%	29%	4%	10%	2%	27%
Step Change	1%	17%	2%	25%	3%	30%
Slow Change	-	32%	1%	13%	1%	17%
Hydrogen Superpower	3%	17%	1%	19%	2%	28%

Q8 – Darling Downs

Summary

The Darling Downs REZ extends from the border of NSW around Dumaresq, up to Columboola within the Surat region of Queensland, and has good solar and wind resources. 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. Furthermore, the ultimate retirement of generation within this REZ will allow for increased VRE connections.

Under high demand conditions, this corridor can only facilitate 1,300 MW into the greater SEQ area from generation connected around the Bulli Creek area. Generation connected around the Halys area will be required to allow the full 3,000 MW REZ capacity to be able to be utilised. The Middle Ridge site is very constrained – further investigation is required to determine the feasibility of any expansion of this substation.

REZ grouping

Coordination of generation and transmission infrastructure may be required (REZ Design Report).	The modelling outcomes identify this zone for development of wind generation in the mid to late 2020s under all scenarios. The draft outcomes indicate that this REZ may require a REZ Design Report to facilitate the coordinate of generation and transmission infrastructure, and for early community engagement.

Renewable resources

Resource	**Solar**			**Wind**		
Resource quality	C			C		
Renewable potential (MW)	6,992			5,600		
Demand correlation	**2029-30**	**2030-40**	**2049-50**	**2029-30**	**2030-40**	**2049-50**
	F	F	F	A	A	B

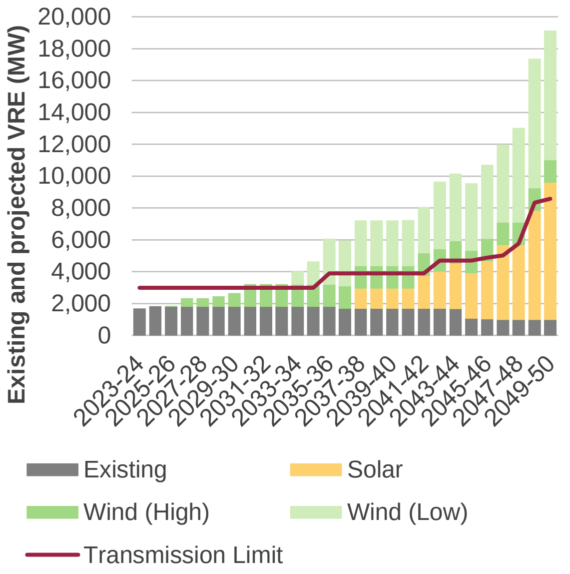
Climate hazard

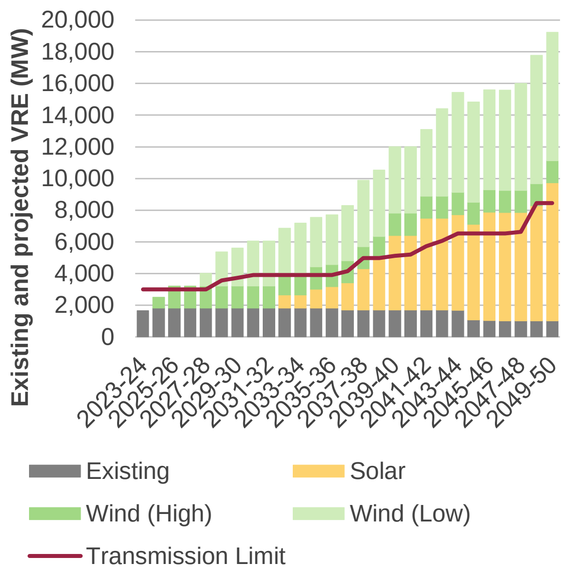
Temperature score	C	**Bushfire score**	E

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	293/921/146	-	1,250	8,600	453/0/0	850	4,250	9,500
Step Change		-	4,700	8,700		3,800	5,600	9,500
Slow Change		-	-	2,300		600	1,400	3,800
Hydrogen Superpower		2,450	8,500	12,150		4,400	11,300	13,100

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





VRE curtailment

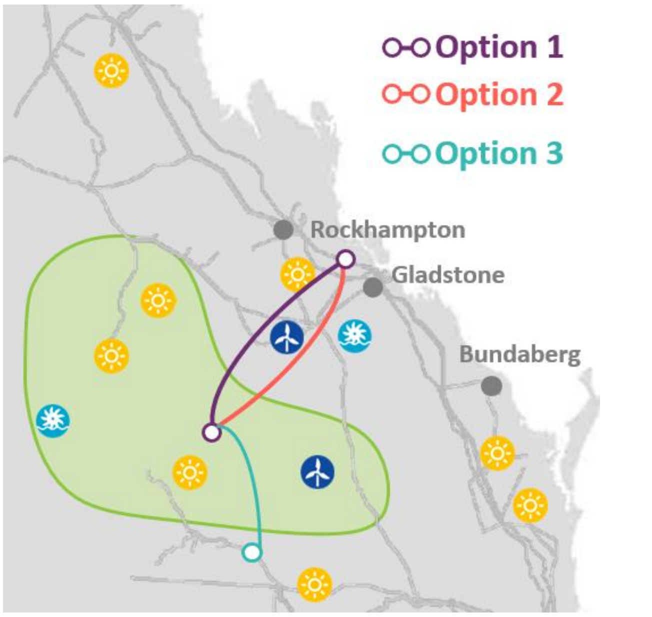
Scenario	2030		2040		2050	
	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill
Progressive Change	-	8%	1%	2%	7%	-
Step Change	-	3%	6%	5%	7%	2%
Slow Change	-	10%	-	2%	1%	4%
Hydrogen Superpower	4%	2%	4%	1%	5%	5%

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 moderate wind and excellent solar resources. There are currently no generators and very little high voltage network in this area.

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.



Existing network capability

There is very little high voltage network in the area currently. There is some low capacity 132 kV network on the edge of the REZ to support the townships of Moura and Biloela.

There is very little spare capacity within the current network, which does not extend very far into the REZ.

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.

Renewable resources

Resource	**Solar**			**Wind**		
Resource quality	B			D		
Renewable potential (MW)	6,100			3,400		
Demand correlation	**2029-30**	**2030-40**	**2049-50**	**2029-30**	**2030-40**	**2049-50**
	F	F	F	A	A	B

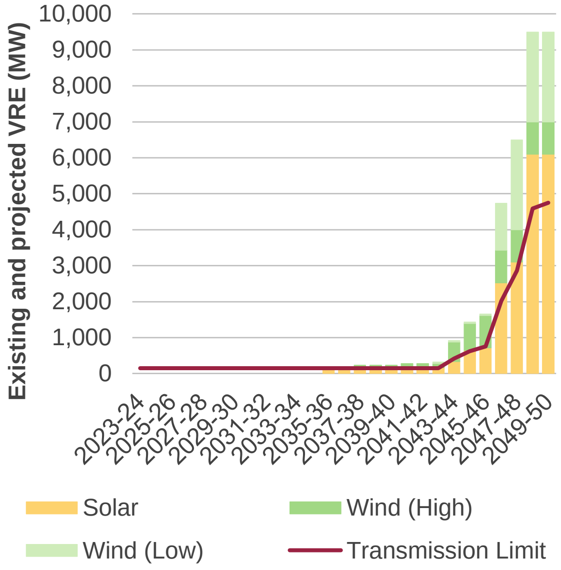
Climate hazard

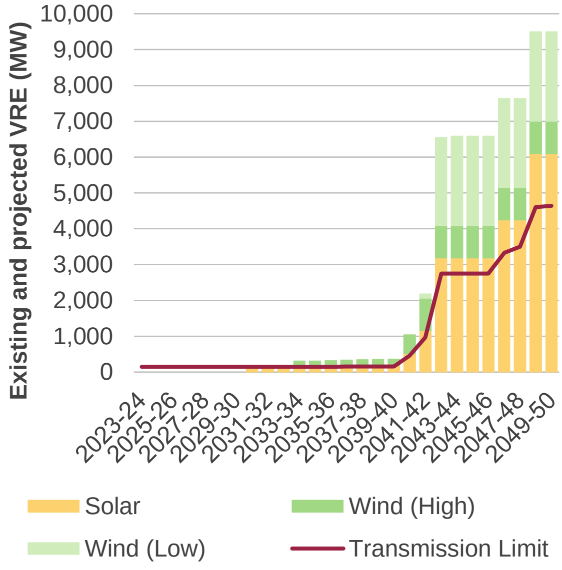
Temperature score	C	**Bushfire score**	B

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	-	-	150	6,100	-	-	50	3,400
Step Change		-	200	6,100		-	200	3,400
Slow Change		-	-	150		-	-	150
Hydrogen Superpower		150	6,100	6,100		-	900	900

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





VRE curtailment

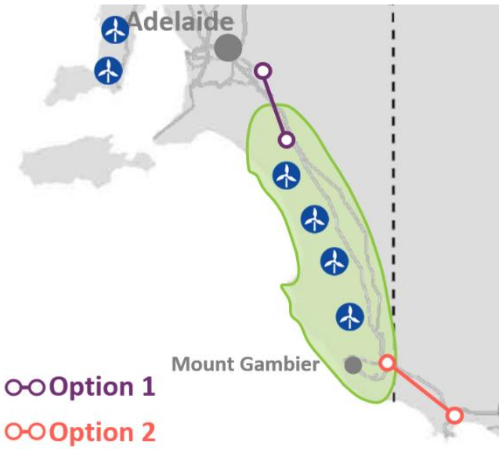
Scenario	2030		2040		2050	
	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill
Progressive Change	-	-	0%	29%	6%	6%
Step Change	-	-	2%	33%	6%	11%
Slow Change	-	-	-	-	1%	30%
Hydrogen Superpower	1%	45%	8%	10%	5%	25%

A3.4.4 South Australia

S1 – South East SA

Summary

The South East SA REZ lies on the major 275 kV route of the South Australia – Victoria Heywood interconnector. The REZ has moderate to good quality wind resources, as evidenced by the high proportion of wind generation (over 300 MW) in or near the South East border with Victoria.



Existing network capability

The existing network capacity of this REZ is 400 MW. Further network augmentation is required to allow additional generation to be built. Network augmentations would be smaller if generation is located relatively close to Adelaide, and larger if located further south towards Mount Gambier.

REZ grouping

Coordination of generation and transmission infrastructure may be required (REZ Design Report).	The modelling outcomes identify this zone for development of wind generation before 2035 in all scenarios except for the *Slow Change scenario*. The draft outcomes indicate that this REZ may require a REZ Design Report to facilitate the coordination of generation and transmission infrastructure, and for early community engagement.

Renewable resources

Resource	**Solar**			**Wind**		
Resource quality	E			C		
Renewable potential (MW)	100			3,200		
Demand correlation	**2029-30**	**2030-40**	**2049-50**	**2029-30**	**2030-40**	**2049-50**
	F	F	E	C	C	C

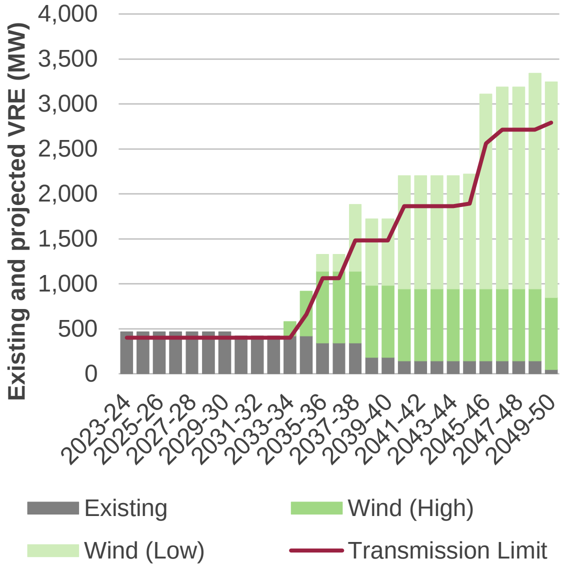
Climate hazard

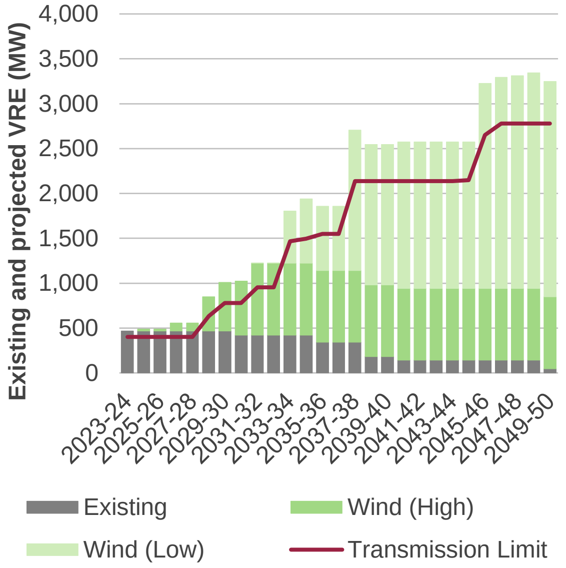
Temperature score	D	**Bushfire score**	D

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	95/0/47	-	-	-	325/0/0	-	1,550	3,200
Step Change		-	-	-		550	2,350	3,200
Slow Change		-	-	-		-	-	800
Hydrogen Superpower		-	-	100		1,850	5,750	21,450

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





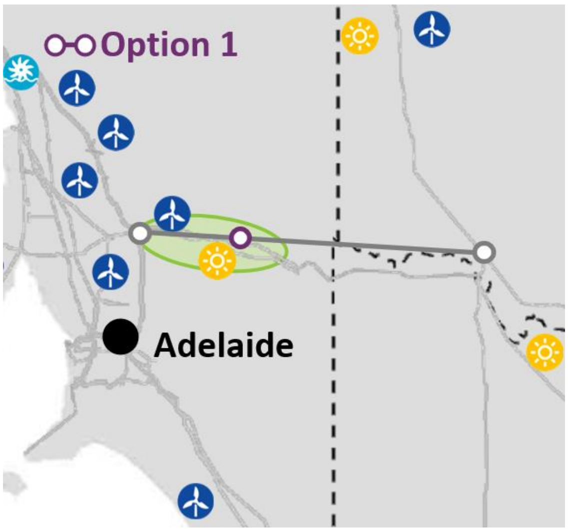
VRE curtailment

Scenario	2030		2040		2050	
	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill
Progressive Change	-	18%	-	8%	1%	14%
Step Change	-	8%	-	12%	-	16%
Slow Change	-	37%	-	32%	-	9%
Hydrogen Superpower	1%	5%	2%	12%	4%	21%

S2 - Riverland

Summary

The Riverland REZ is on the South Australian side of the proposed Project EnergyConnect route. It has good solar quality resources.



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. Once Project EnergyConnect is commissioned, approximately 800 MW can be accommodated.

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.

Renewable resources

Resource	**Solar**			**Wind**		
Resource quality	C			E		
Renewable potential (MW)	4,000			1,400		
Demand correlation	**2029-30**	**2030-40**	**2049-50**	**2029-30**	**2030-40**	**2049-50**
	F	F	E	B	B	B

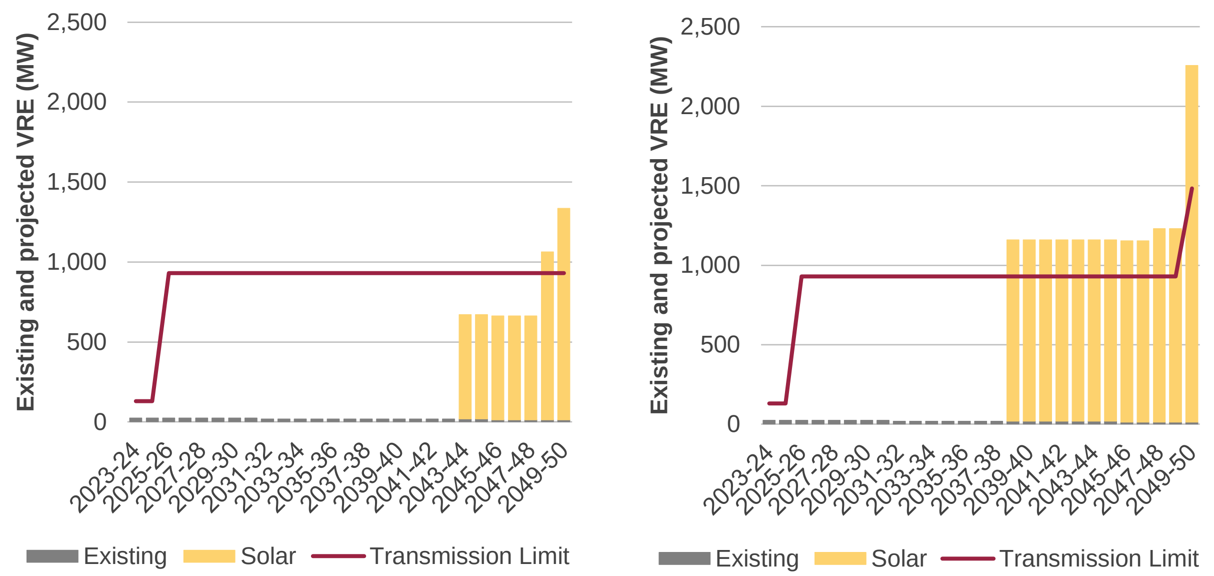
Climate hazard

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	*0/25/0*	-	-	1,350	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		-	1,150	2,250				
Slow Change		-	-	-				
Hydrogen Superpower		1,000	1,500	4,000				

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



VRE curtailment

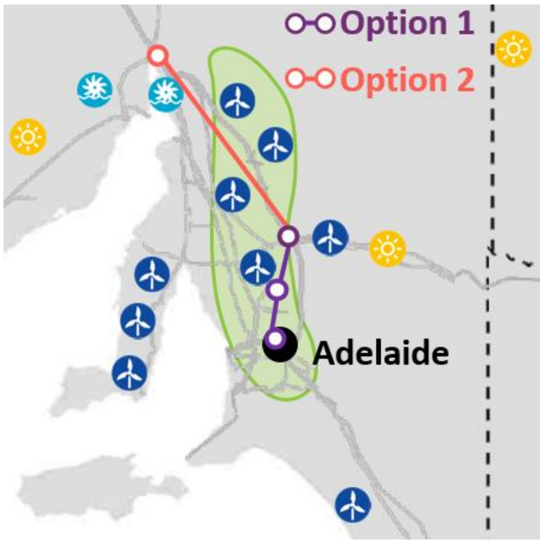
Scenario	2030		2040		2050	
	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill
Progressive Change	-	31%	-	12%	3%	46%
Step Change	-	16%	4%	24%	11%	22%
Slow Change	-	43%	-	36%	-	42%
Hydrogen Superpower	1%	18%	7%	50%	5%	59%

S3 – Mid-North SA

Summary

The Mid-North SA REZ has moderate quality wind and solar resources. There are several major wind farms in service in this REZ, totalling > 950 MW installed 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

This REZ can accommodate approximately 1,000 MW additional generation along the 275 kV corridor.

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

REZ grouping

Coordination of generation and transmission infrastructure may be required (REZ Design Report).	The modelling outcomes identify this zone for development of wind generation in the mid-2020s under the *Step Change* and *Hydrogen* scenarios and the 2030s under the *Progressive Change* scenario. The draft outcomes indicate that this REZ may require a REZ Design Report to facilitate the coordinate of generation and transmission infrastructure, and for early community engagement.

Renewable resources

Resource	**Solar**			**Wind**		
Resource quality	D			C		
Renewable potential (MW)	1,300			4,600		
Demand correlation	**2029-30**	**2030-40**	**2049-50**	**2029-30**	**2030-40**	**2049-50**
	F	F	E	C	C	C

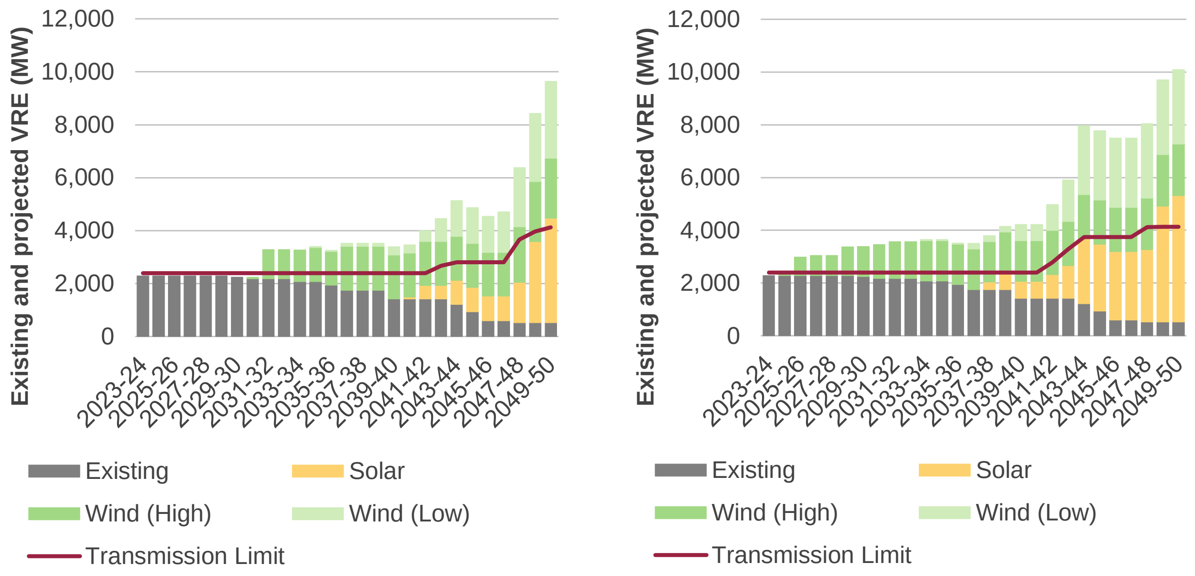
Climate hazard

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	0/0/0	-	-	-	1,335/0/0	-	1,450	2,650
Step Change		-	-	-		1,100	1,800	2,250
Slow Change		-	-	-		-	-	1,950
Hydrogen Superpower		-	1,300	1,300		1,700	4,600	12,350

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



Note: S3 forecast shows results for the MN1 group constraint augmentation.

VRE curtailment

Scenario	2030		2040		2050	
	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill
Progressive Change	-	6%	-	2%	-	19%
Step Change	-	5%	-	11%	-	18%
Slow	-	16%	-	8%	-	5%
Hydrogen Superpower	1%	4%	1%	16%	1%	28%

† Additional augmentation is required in Mid-North when the combination of generation in S3, S4, S5, S6, S7, S8, S9 >2,400 MW.

S4 – Yorke Peninsula

Summary

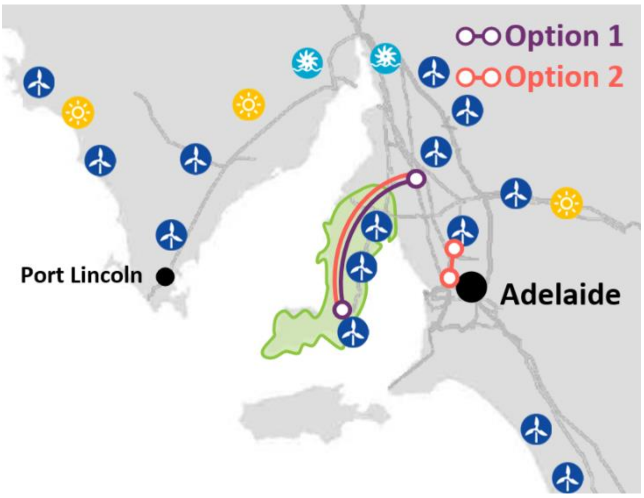
The Yorke Peninsula REZ has good quality wind resources.

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 no additional network capacity. Transmission augmentation is required to connect any significant additional generation in this REZ.

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



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.

Renewable resources

Resource	Solar			Wind		
Resource quality	D			C		
Renewable potential (MW)	-			1,400		
Demand correlation	2029-30	2030-40	2049-50	2029-30	2030-40	2049-50
	F	F	E	C	C	C

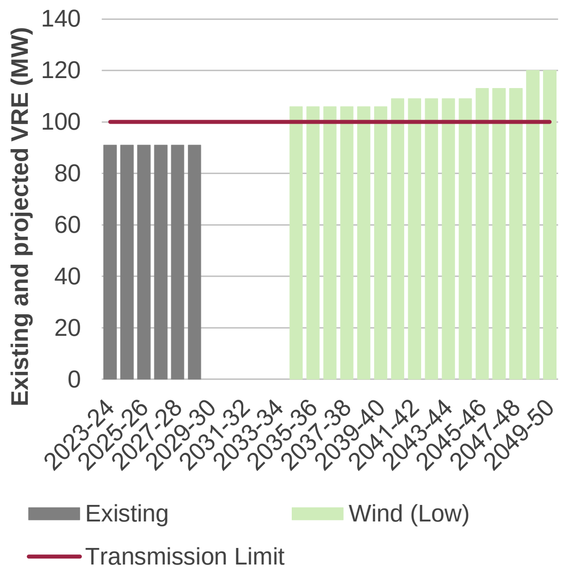
Climate hazard

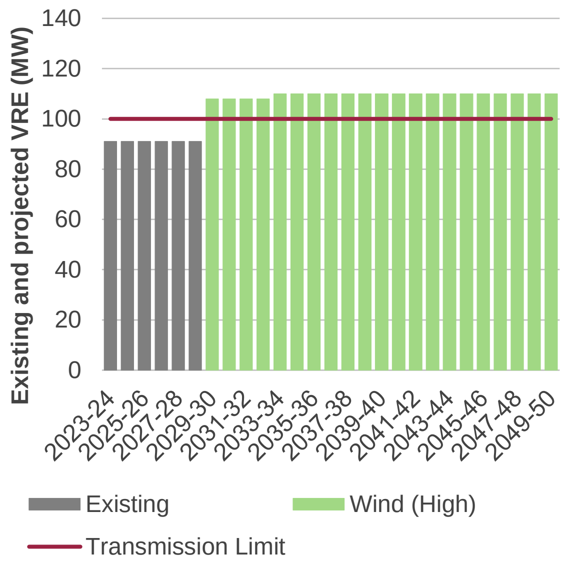
Temperature score	D	Bushfire score	C

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.				111/0/0	-	100	100
Step Change						100	100	100
Slow						-	-	-
Hydrogen Superpower						100	1,400	1,400

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





VRE curtailment

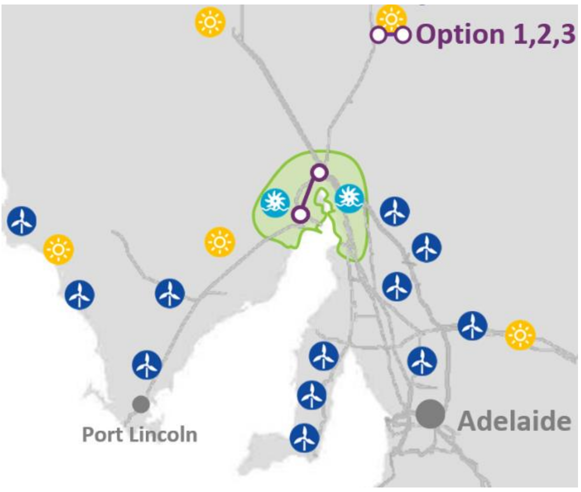
Scenario	2030		2040		2050	
	Transmission curtailment	**Economic spill**	**Transmission curtailment**	**Economic spill**	**Transmission curtailment**	**Economic spill**
Progressive Change	-	-	-	22%	-	54%
Step Change	-	18%	-	38%	-	62%
Slow	-	-	-	-	-	-
Hydrogen Superpower	-	17%	-	43%	-	34%

† Additional augmentation is required in Mid-North when the combination of generation in S3, S4, S5, S6, S7, S8, S9 >2,400 MW.

S5 – Northern SA

Summary

The Northern SA REZ has good solar and moderate wind resources. 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[†].

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.

Renewable resources

Resource	Solar			Wind		
Resource quality	C			C		
Renewable potential (MW)	2,900			-		
Demand correlation	2029-30	2030-40	2049-50	2029-30	2030-40	2049-50
	F	F	E	C	C	C

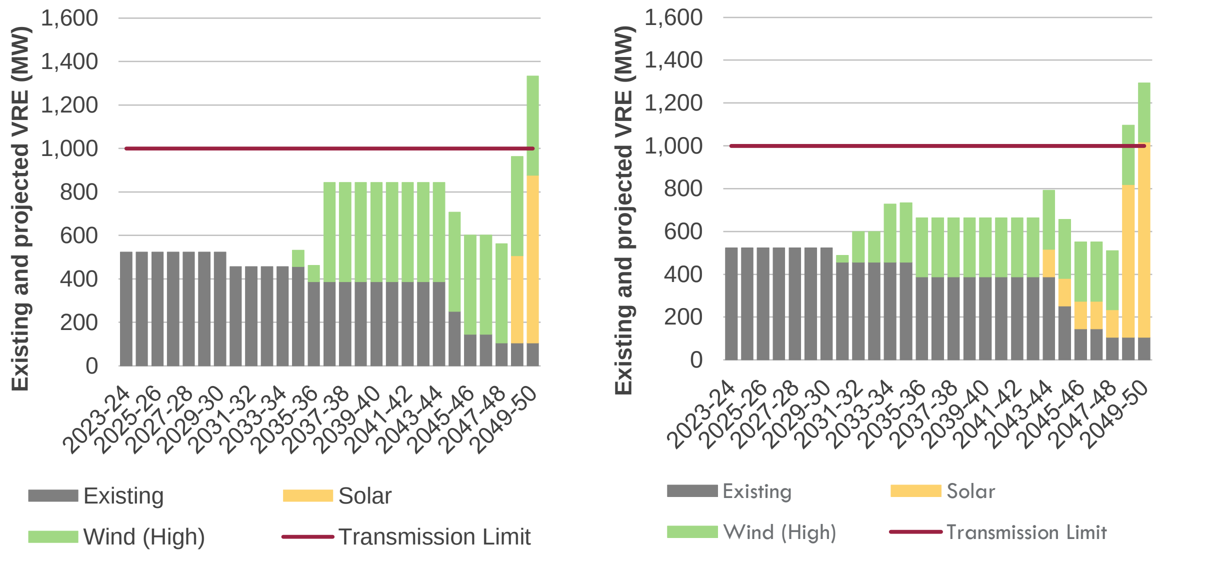
Climate hazard

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	270/0/79	-	-	1,550	126/86/210	The modelling outcomes, for all scenarios, did not project any additional wind for this REZ.		
Step Change		-	-	1,800				
Slow Change		-	-	-				
Hydrogen Superpower		300	2,900	2,900				

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	2030		2040		2050	
	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill
Progressive Change	-	14%	-	6%	-	29%
Step Change	-	7%	-	9%	-	44%
Slow Change	-	-	-	-	-	-
Hydrogen Superpower	-	12%	7%	25%	1%	55%

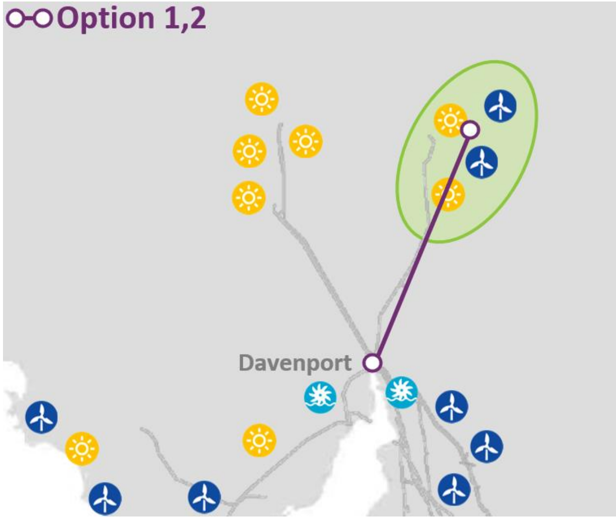
† Additional augmentation is required in Mid-North when the combination of generation in S3, S4, S5, S6, S7, S8, S9 >2,400 MW or in Eyre Peninsula when S5, S8, S9 > 500 MW.

S6 – Leigh Creek

Summary

The Leigh Creek REZ is located between 150 and 350 km north-east of Davenport. It has excellent solar resources and good wind resources.

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†.

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.

Renewable resources

Resource	Solar			Wind		
Resource quality	A			B		
Renewable potential (MW)	6,500			2,400		
Demand correlation	2029-30	2030-40	2049-50	2029-30	2030-40	2049-50
	F	F	E	C	C	C

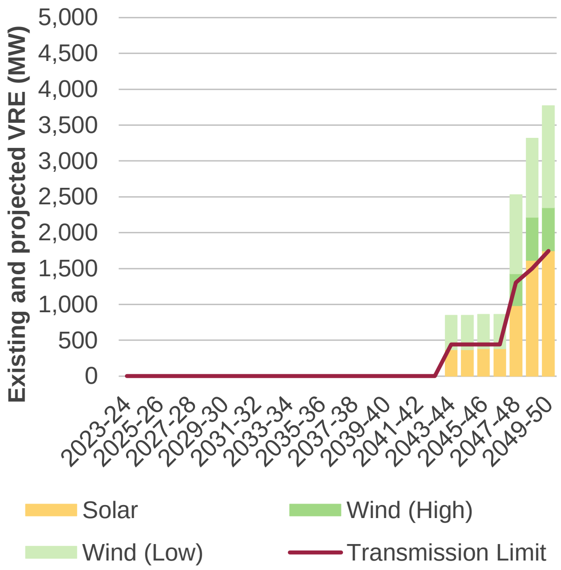
Climate hazard

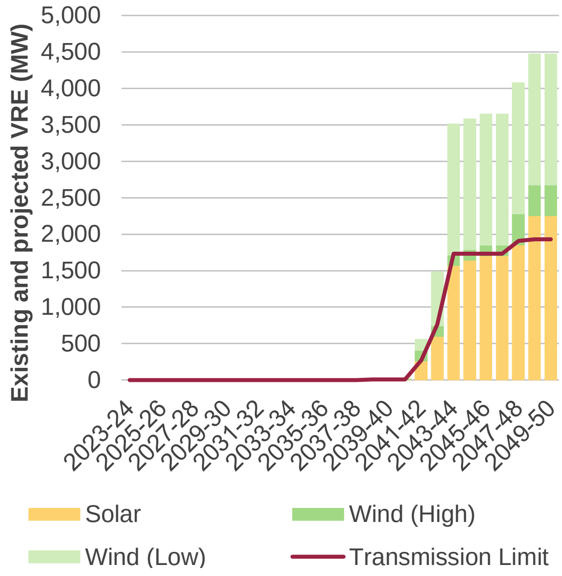
Temperature score	D	Bushfire score	C

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	-	-	-	1,750	-	-	-	2,000
Step Change		-	-	2,250		-	-	2,200
Slow Change		-	-	-		-	-	-
Hydrogen Superpower		600	7,300	40,350		750	8,400	17,200

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





VRE curtailment

Scenario	2030		2040		2050	
	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill
Progressive Change	-	-	-	-	4%	15%
Step Change	-	-	-	59%	2%	31%
Slow Change	-	-	-	-	-	-
Hydrogen Superpower	4%	11%	6%	4%	11%	7%

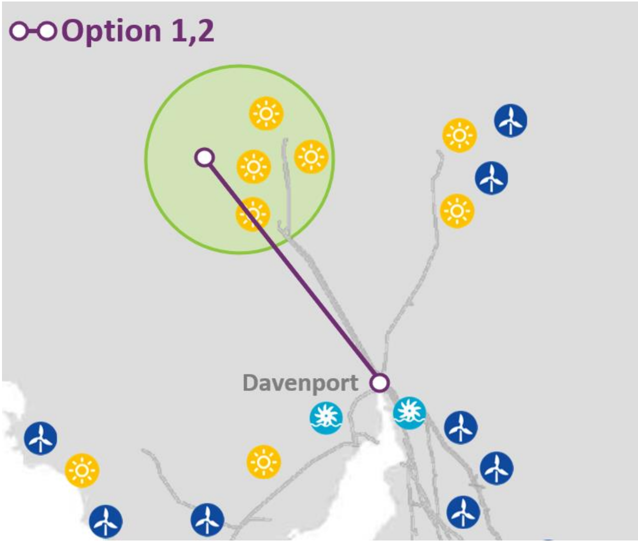
† Additional augmentation is required in Mid-North when the combination of generation in S3, S4, S5, S6, S7, S8, S9 >2,400 MW.

S7 – Roxby Downs

Summary

The Roxby Downs REZ is located a few hundred kilometres north-west of Davenport. It has excellent solar resources. 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†.

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.

Renewable resources

Resource	Solar			Wind		
Resource quality	A			D		
Renewable potential (MW)	3,400			-		
Demand correlation	2029-30	2030-40	2049-50	2029-30	2030-40	2049-50
	F	F	E	B	B	C

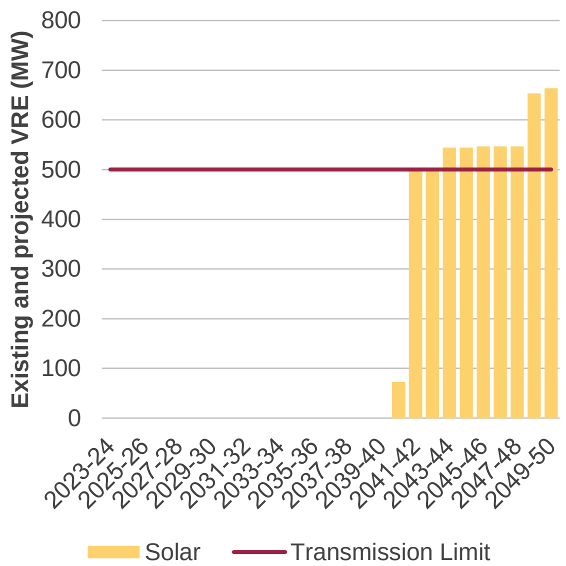
Climate hazard

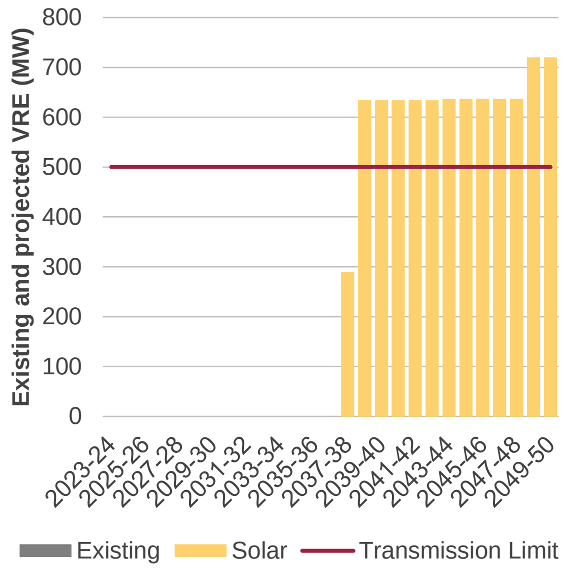
Temperature score	E	Bushfire score	C

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	-	-	-	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		-	650	700				
Slow Change		-	-	550				
Hydrogen Superpower		550	750	3,400				

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





VRE curtailment

Scenario	2030		2040		2050	
	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill
Progressive Change	-	-	-	-	5%	36%
Step Change	-	-	4%	34%	4%	50%
Slow Change	-	-	-	-	1%	27%
Hydrogen Superpower	2%	28%	3%	61%	3%	65%

† Additional augmentation is required in Mid-North when the combination of generation in S3, S4, S5, S6, S7, S8, S9 >2,400 MW.

S8 – Eastern Eyre Peninsula

Summary	
The Eastern Eyre Peninsula REZ has moderate to good quality wind resources. The Eyre Peninsula Link is a committed project that will replace 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 will be built to operate at 275 kV, however it will be energised at 132 kV upon commissioning. This project is due to be completed by December 2022.	
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[‡].	

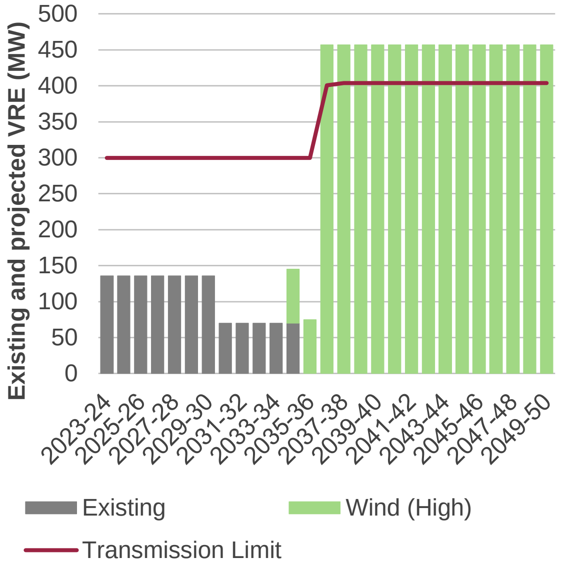
REZ grouping	
Infrastructure coordination can start later	Modelling outcomes indicate a low likelihood that significant investment in VRE and transmission infrastructure will be optimally required in the next 12 years.

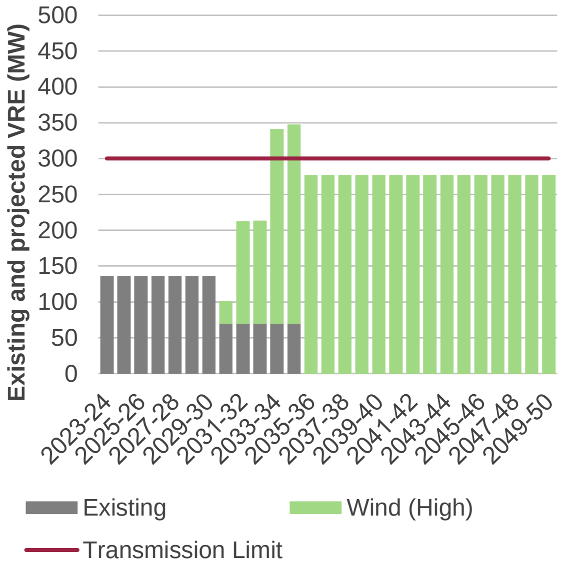
Renewable resources						
Resource	**Solar**			**Wind**		
Resource quality	D			C		
Renewable potential (MW)	5,000			2,300		
Demand correlation	**2029-30**	**2030-40**	**2049-50**	**2029-30**	**2030-40**	**2049-50**
	F	F	E	B	B	C

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	-	-	-	-	136/0/0	-	450	450
Step Change		-	-	-		-	300	300
Slow Change		-	-	-		-	-	300
Hydrogen Superpower		-	-	5,000		1,400	1,400	1,400

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





VRE curtailment

Scenario	2030		2040		2050	
	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill
Progressive Change	-	10%	-	10%	-	33%
Step Change	-	7%	-	28%	-	42%
Slow Change	-	19%	-	-	-	21%
Hydrogen Superpower	1%	11%	-	24%	2%	50%

† The committed Eyre Peninsula Electricity Supply Options RIT project is expected for completion by December 2022 and is assumed in the existing network capacity. See https://www.aer.gov.au/system/files/AER%20-%20Eyre%20Peninsula%20Electricity%20Supply%20Options%20RIT-T%20Determination.pdf.
‡ Additional augmentation is required in Mid-North when the combination of generation in S3, S4, S5, S6, S7, S8, S9 >2,400 MW or in Eyre Peninsula when S5, S8, S9 > 500 MW.

S9 – Western Eyre Peninsula

Summary

The Western Eyre Peninsula REZ shares the same electrical network as the Eastern Eyre Peninsula. It has good solar and moderate wind resources. 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[†].

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.

Renewable resources

Resource	Solar			Wind		
Resource quality	C			C		
Renewable potential (MW)	4,000			1,500		
Demand correlation	2029-30	2030-40	2049-50	2029-30	2030-40	2049-50
	F	F	E	C	C	C

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	-	-	-	-	-	-	-	-
Step Change		-	-	-		-	-	-
Slow Change		-	-	-		-	-	-
Hydrogen Superpower		-	4,000	12,250		-	400	1,500

Transmission access expansion forecast

The modelling outcomes for this REZ does not forecast any VRE under *Progressive Change* and *Step Change* scenario.

VRE curtailment

Scenario	2030		2040		2050	
	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill
Progressive Change	-	-	-	-	-	-
Step Change	-	-	-	-	-	-

Slow Change	-	-	-	-	-	-
Hydrogen Superpower	-	-	13%	20%	12%	26%

† Additional augmentation is required in Mid-North when the combination of generation in S3, S4, S5, S6, S7, S8, S9 >2,400 MW or in Eyre Peninsula when S5, S8, S9 > 500 MW.

A3.4.5 Tasmania

T1 – North East Tasmania

Summary

This REZ has excellent quality wind resources. North East Tasmania is distanced from the proposed Marinus Link augmentations and therefore upgrades are not influenced by the proposed new interconnector.

Existing network capability

Currently there is no capacity on the 110 kV network from Hadspen to Derby. There is approximately 270 MW of network capacity available at George Town.

REZ grouping

Infrastructure coordination is not urgent	Modelling outcomes indicate a low likelihood that significant investment in VRE and transmission infrastructure will be optimally required in the next 12 years.

Renewable resources

Resource	**Solar**			**Wind**		
Resource quality	F			A		
Renewable potential (MW)	300			1,400		
Demand correlation	**2029-30**	**2030-40**	**2049-50**	**2029-30**	**2030-40**	**2049-50**
	F	F	E	C	C	C

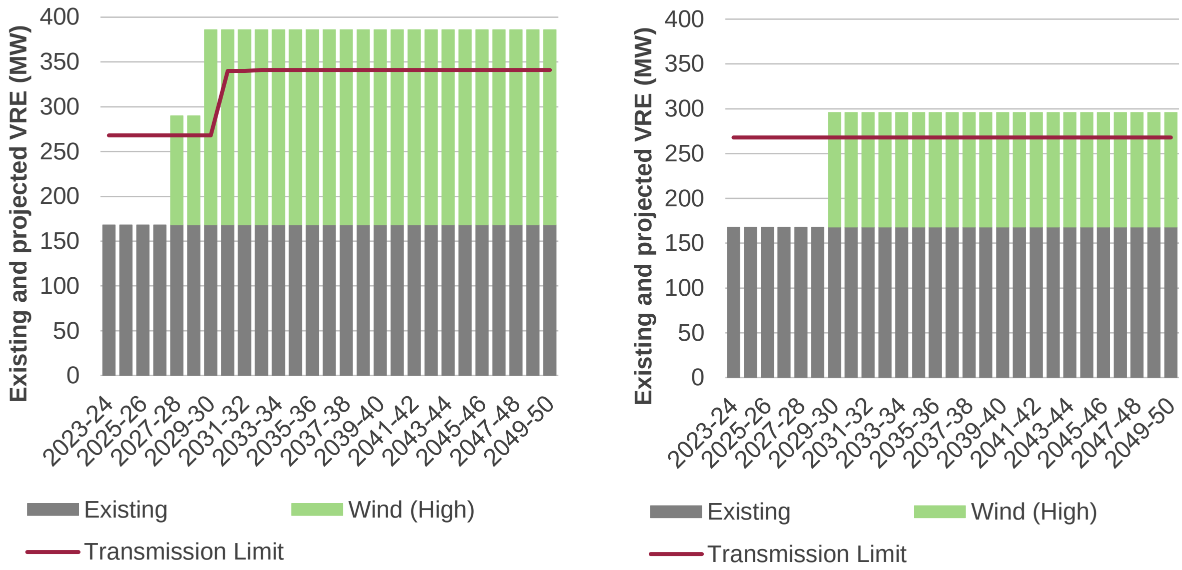
Climate hazard

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	-	-	-	-	168/0/0	200	200	200
Step Change		-	-	-		150	150	150
Slow Change		-	-	-		250	350	350
Hydrogen Superpower		1,100	5,050	23,350		1,400	3,750	15,500

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



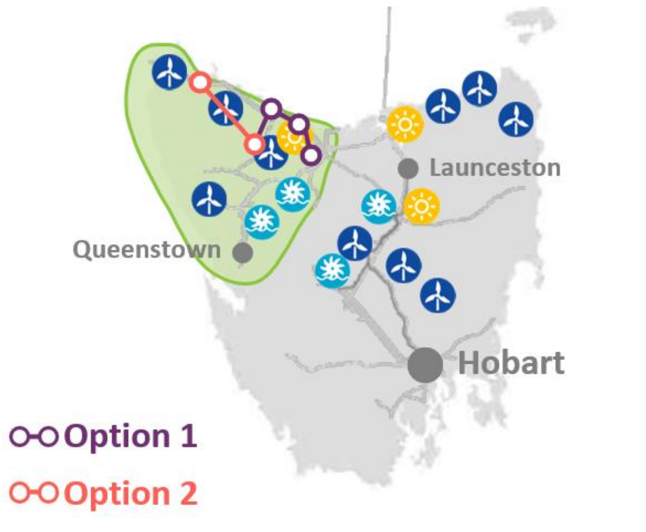
VRE curtailment (%)

Scenario	2030		2040		2050	
	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill
Progressive Change	7 %	7 %	1 %	8 %	1 %	21 %
Step Change	-	10 %	-	17 %	-	23 %
Slow Change	6 %	24 %	11 %	14 %	3 %	7 %
Hydrogen Superpower	2 %	8 %	2 %	8 %	8 %	4 %

T2 – North West Tasmania

Summary

This REZ has excellent quality wind resources and good pumped hydro resources. The North West Tasmania augmentation options are highly dependent on Marinus Link, with some REZ network capacity increase already included in the proposed Marinus Link AC augmentations.



Existing network capability

The current REZ transmission limit before any network upgrade in North West Tasmania is approximately 592 MW. Future REZ generators are assumed to have a runback scheme in place post contingency to reduce generation output within network capacity for lines currently covered by the Network Control System Protection Scheme (NCSPS), but not for new transmission lines.

REZ grouping

Coordination of generation and transmission infrastructure may be required (REZ Design Report).	The modelling outcomes identify this zone for development of wind generation, timed with the development of Marinus Link which increases the transmission limit in this REZ. The draft outcomes indicate that this REZ may require a REZ Design Report to facilitate the coordinate of generation and transmission infrastructure, and for early community engagement.

Renewable resources

Resource	**Solar**			**Wind**		
Resource quality	F			A		
Renewable potential (MW)	**150**			**5,000**		
Demand correlation	**2029-30**	**2030-40**	**2049-50**	**2029-30**	**2030-40**	**2049-50**
	F	F	E	C	C	C

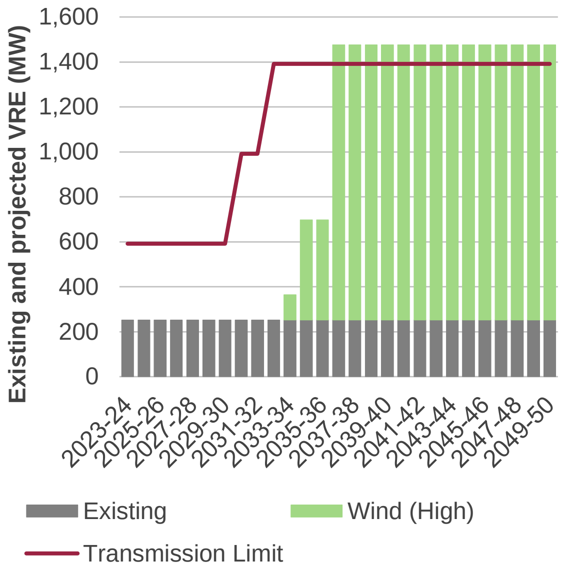
Climate hazard

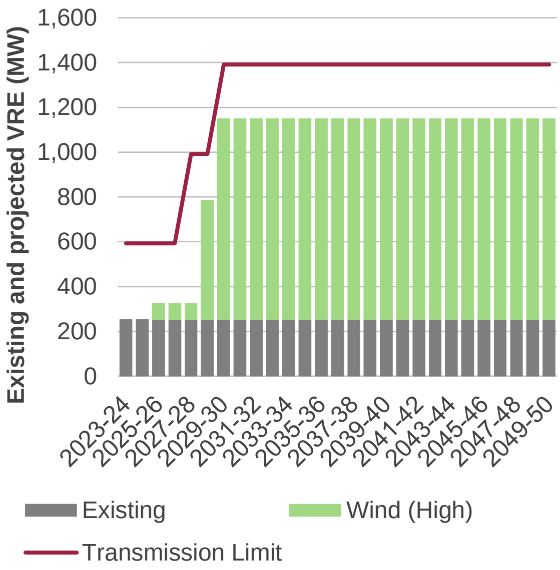
Temperature score	A	**Bushfire score**	A

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	-	-	-	-	251/0/0	-	1,200	1,200
Step Change		-	-	-		900	900	900
Slow Change		-	-	-		-	350	350
Hydrogen Superpower		150	150	150		1,300	1,950	6,550

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





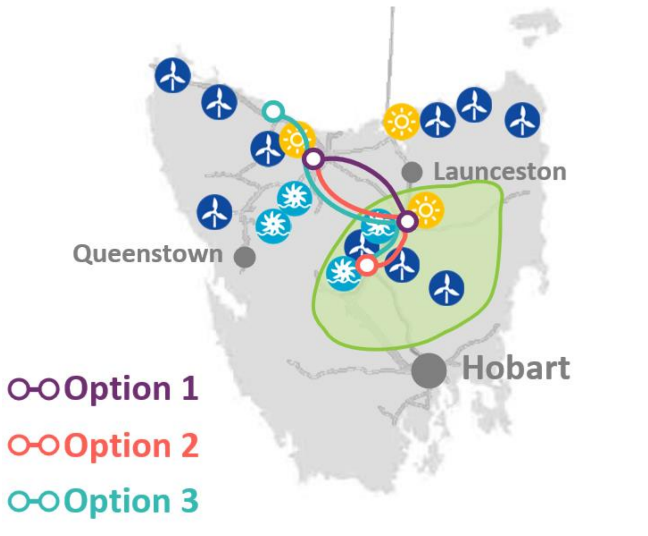
VRE curtailment (%)

Scenario	2030		2040		2050	
	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill
Progressive Change	-	-	-	1 %	-	3 %
Step Change	-	2 %	-	3 %	-	7 %
Slow Change	-	9 %	-	9 %	-	9 %
Hydrogen Superpower	1 %	2 %	1 %	8 %	-	22 %

T3 – Central Highlands

Summary

This REZ has excellent quality wind resources and has good pumped hydro resources. It is located close to major load centres at Hobart. The Tasmania Central Highlands augmentation options are influenced by the Marinus Link augmentations.



Existing network capability

The current network capacity before upgrade in the Central Highlands is approximately 620 MW across Liapootah, Waddamana and Palmerston.

Note that a runback scheme is not considered for any new transmission lines.

REZ grouping

Coordination of generation and transmission infrastructure may be required (REZ Design Report).	The modelling outcomes identify this zone for development of wind generation, timed with the development of Marinus Link which increases the transmission limit in this REZ. The draft outcomes indicate that this REZ may require a REZ Design Report to facilitate the coordinate of generation and transmission infrastructure, and for early community engagement.

Renewable resources

Resource	**Solar**			**Wind**		
Resource quality	F			A		
Renewable potential (MW)	150			3,400		
Demand correlation	**2029-30**	**2030-40**	**2049-50**	**2029-30**	**2030-40**	**2049-50**
	F	F	E	C	C	C

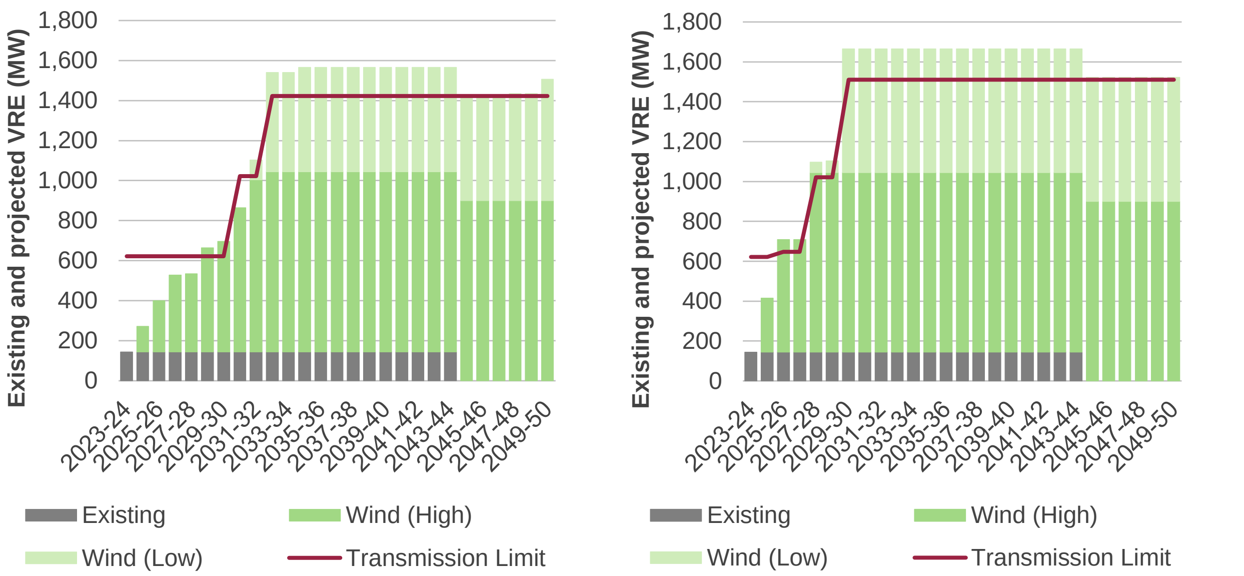
Climate hazard

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	-	-	-	-	144/0/0	550	1,400	1,500
Step Change		-	-	-		1,500	1,500	1,500
Slow Change		-	-	-		550	1,450	1,450
Hydrogen Superpower		150	150	150		4,700	11,450	11,450

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



VRE curtailment

Scenario	2030		2040		2050	
	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill
Progressive Change	1 %	5 %	1 %	3 %	-	8 %
Step Change	1 %	2 %	-	6 %	-	13 %
Slow Change	1 %	17 %	1 %	8 %	-	4 %
Hydrogen Superpower	1 %	1 %	-	3 %	-	9 %

O4 – North West Tasmania Coast

Summary

The North West Tasmania Coast OWZ 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.

Existing network capability

North West Tasmania coast REZ connects to the 220 kV network within the North West REZ. The REZ transmission network limit is included in the North West REZ limit of 592 MW.

REZ grouping

Infrastructure coordination is not urgent	Modelling outcomes indicate a low likelihood that significant investment in VRE and transmission infrastructure will be optimally required in the next 12 years.

Renewable resources

Resource	**Solar**			**Offshore wind**		
Resource quality	-			A		
Renewable potential (MW)	-			10,000		
Demand correlation	**2029-30**	**2030-40**	**2049-50**	**2029-30**	**2030-40**	**2049-50**
	-	-	-	C	C	C

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	N/A				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								
Slow Change								
Hydrogen Superpower								

Transmission access expansion forecast and VRE curtailment

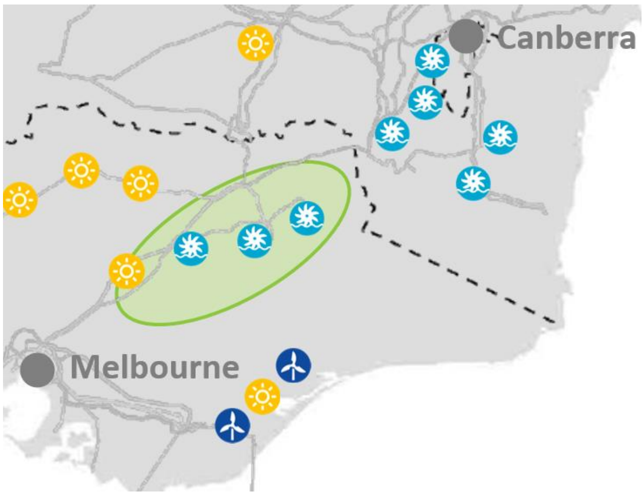
There is no existing, committed, anticipated VRE projects for this REZ and the modelling outcomes, for all scenarios, did not project any additional VRE for this REZ. Therefore, no VRE curtailment or transmission expansion occurs in this REZ.

A3.4.6 Victoria

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 is not urgent	Modelling outcomes indicate a low likelihood that significant investment in VRE and transmission infrastructure will be optimally required in the next 12 years.

Renewable resources

Resource	Solar			Wind		
Resource quality	E			A		
Renewable potential (MW)	1,000			-		
Demand correlation	2029-30	2030-40	2049-50	2029-30	2030-40	2049-50
	F	F	F	C	C	C

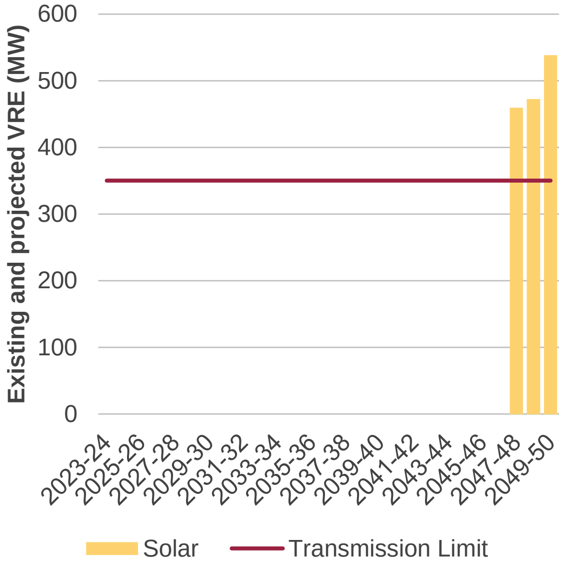
Climate hazard

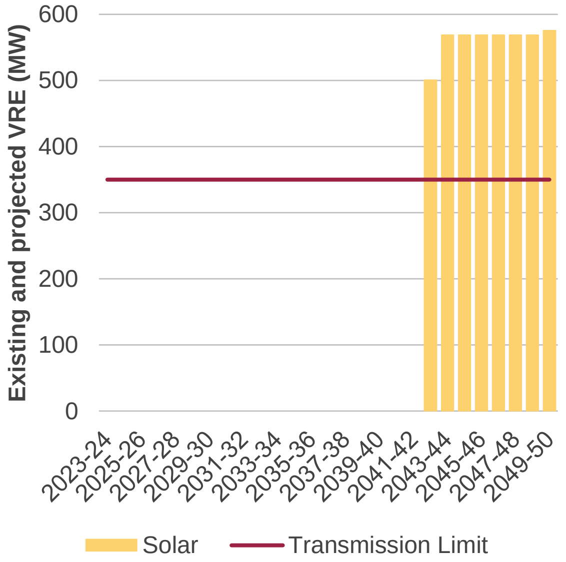
Temperature score	B	Bushfire score	E

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	-	-	-	550	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				
Slow Change		-	-	-				
Hydrogen Superpower		400	500	650				

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





VRE curtailment

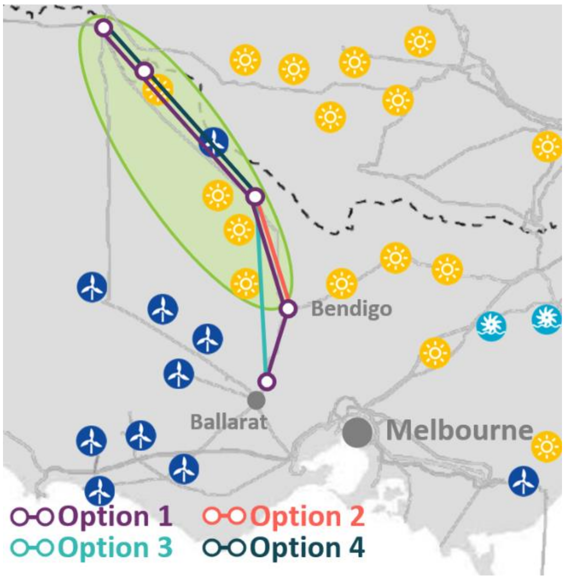
Scenario	2030		2040		2050	
	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill
Progressive Change	-	-	-	-	10%	27%
Step Change	-	-	-	-	13%	19%
Slow Change	-	-	-	-	-	-
Hydrogen Superpower	4%	10%	6%	32%	21%	15%

V2 – Murray River

Summary

The Murray River REZ has good solar resources. Despite being remote and electrically weak, this REZ has attracted significant investment in solar generation. Voltage stability and thermal limits currently restrict the output of generators within this REZ.

The proposed VNI West project could upgrade transfer capability between Victoria and New South Wales via Kerang, and significantly increase the ability for renewable generation to connect in this zone.



Existing network capability

No additional capacity to connect new generation.

REZ grouping

Coordination of generation and transmission infrastructure may be required (REZ Design Report).	The modelling outcomes identify this zone for development of solar generation in the early 2030s in the *Step Change* scenario and in the early 2040s for *Progressive Change*. The draft outcomes indicate that this REZ may require a REZ Design Report to facilitate the coordinate of generation and transmission infrastructure, and for early community engagement.

Renewable resources

Resource	**Solar**			**Wind**		
Resource quality	C			D		
Renewable potential (MW)	4,700			-		
Demand correlation	**2029-30**	**2030-40**	**2049-50**	**2029-30**	**2030-40**	**2049-50**
	F	F	F	C	C	C

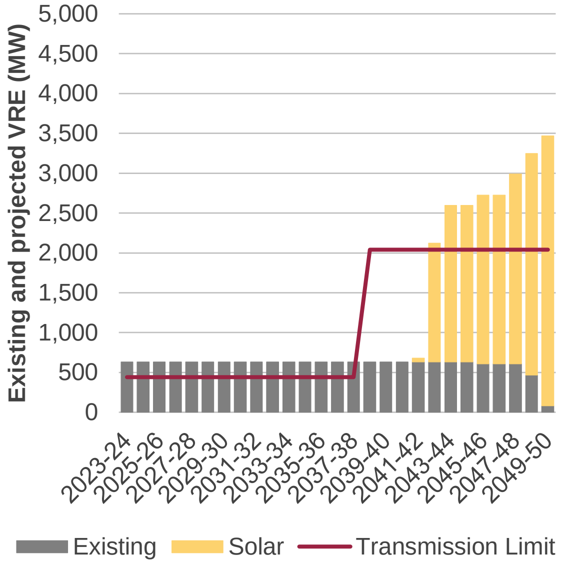
Climate hazard

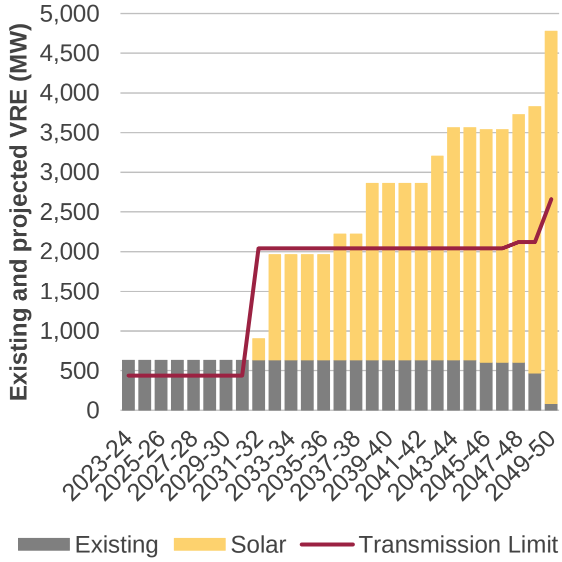
Temperature score	E	**Bushfire score**	C

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	607/27/0	-	-	3,400	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		-	2,250	4,700				
Slow Change		-	-	-				
Hydrogen Superpower		-	4,600	4,700				

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





VRE curtailment

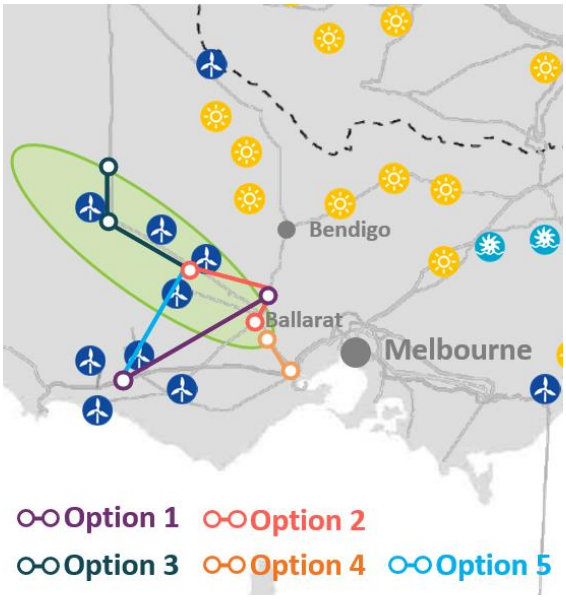
Scenario	2030		2040		2050	
	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill
Progressive Change	7%	26%	-	4%	14%	16%
Step Change	10%	8%	11%	2%	16%	16%
Slow Change	3%	52%	4%	38%	-	43%
Hydrogen Superpower	10%	10%	16%	12%	7%	20%

V3 – Western Victoria

Summary

The Western Victoria REZ has good to excellent quality wind resources. The existing and committed renewable generation within this REZ exceeds 1 GW, all of which is from wind generation. The current network is constrained and cannot support any further connection of renewable generation without transmission augmentation.

The Western Victoria Transmission Network Project is an anticipated project, with the preferred option to expand generation within this zone.



Existing network capability

Network capacity is anticipated to be sufficient for existing and committed generation following completion of the Western Victoria Transmission Network Project.

REZ grouping

Coordination of generation infrastructure may be required	The modelling outcomes identify this zone for development of solar and wind generation across all scenarios. This REZ could benefit from early community engagement and from the coordination of generation.

Renewable resources

Resource	Solar			Wind		
Resource quality	E			B		
Renewable potential (MW)	400			2,600		
Demand correlation	2029-30	2030-40	2049-50	2029-30	2030-40	2049-50
	F	F	E	B	B	C

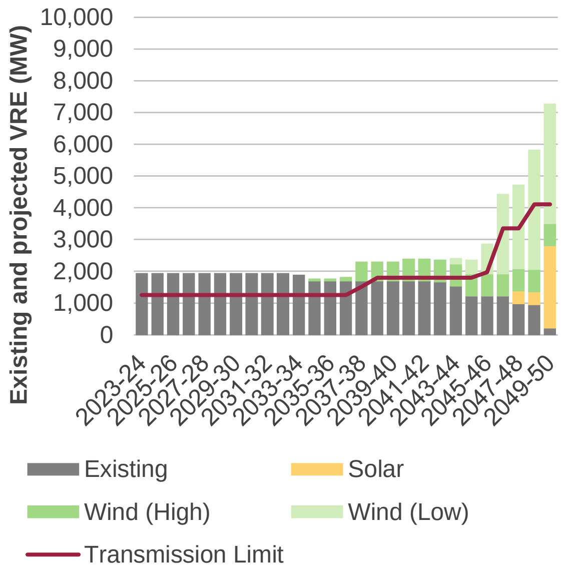
Climate hazard

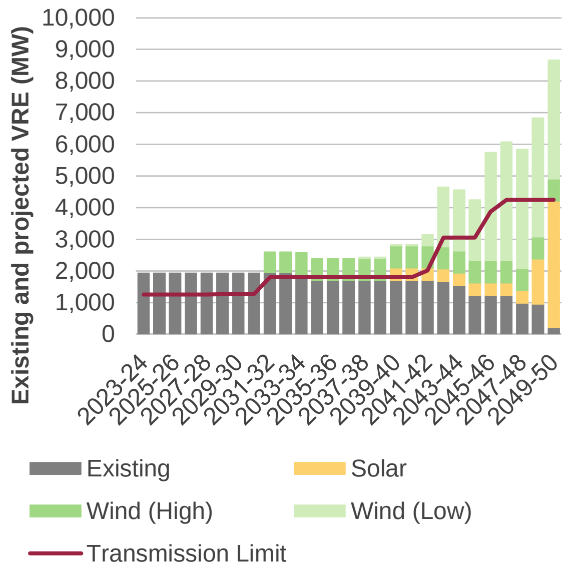
Temperature score	D	Bushfire score	D

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	-	-	-	2,600	1,726/209/0	-	600	4,500
Step Change		-	400	4,000		-	750	4,500
Slow Change		-	-	-		-	-	1,800
Hydrogen Superpower		800	800	5,450		700	2,600	4,350

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





VRE curtailment

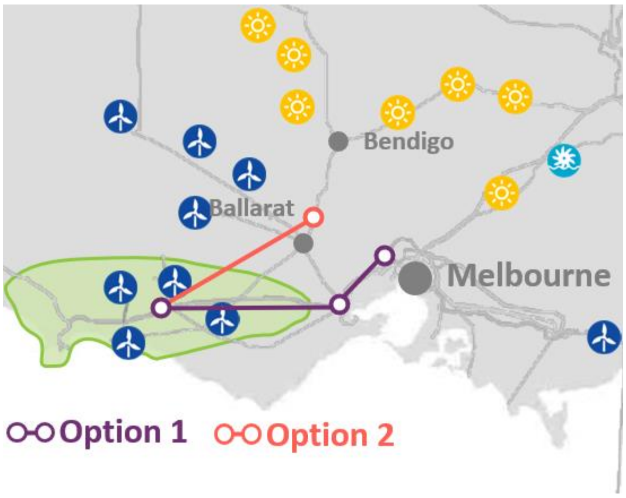
Scenario	2030		2040		2050	
	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill
Progressive Change	4%	6%	1%	2%	2%	5%
Step Change	3%	3%	2%	6%	3%	5%
Slow Change	4%	14%	1%	7%	-	4%
Hydrogen Superpower	5%	3%	1%	11%	7%	20%

V4 – South West Victoria

Summary

The South West Victoria REZ has moderate to good quality wind resources 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 2 GW.



Existing network capability

Currently the 220 kV network is already congested.

The current total network limit is approximately 2,500 MW for this REZ.

REZ grouping

Coordination of generation and transmission infrastructure may be required (REZ Design Report).	The modelling outcomes identify this zone for development of wind generation in the mid-2020s under the *Step Change* and *Hydrogen* scenarios and the 2030s under the *Progressive Change* scenario. The draft outcomes indicate that this REZ may require a REZ Design Report to facilitate the coordinate of generation and transmission infrastructure, and for early community engagement.

Renewable resources

Resource	**Solar**			**Wind**		
Resource quality	F			B		
Renewable potential (MW)	-			3,442		
Demand correlation	**2029-30**	**2030-40**	**2049-50**	**2029-30**	**2030-40**	**2049-50**
	F	F	E	C	C	C

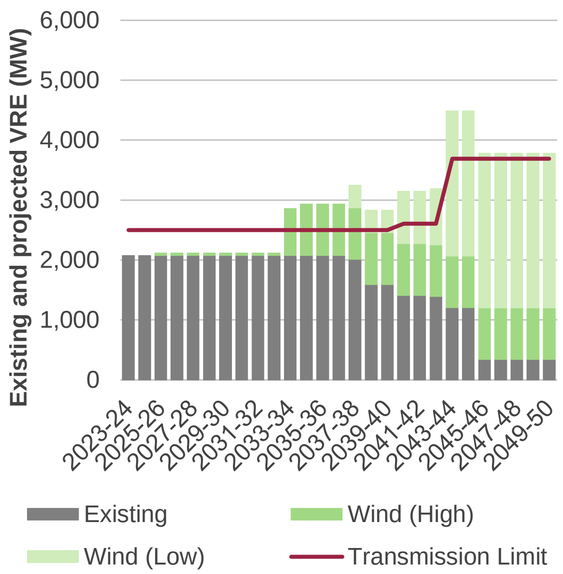
Climate hazard

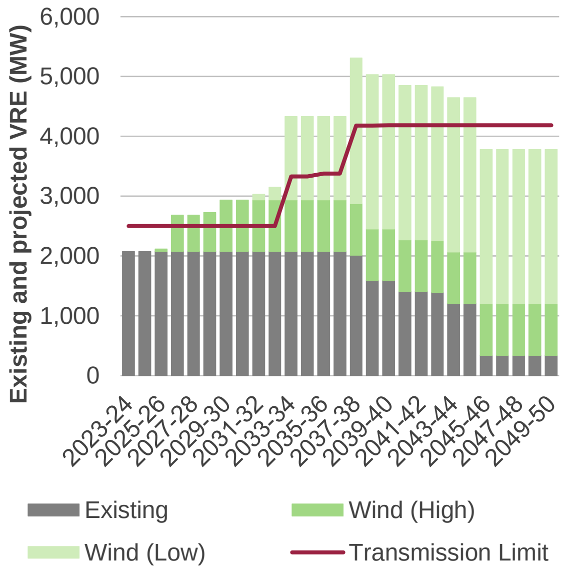
Temperature score	C	**Bushfire score**	D

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.				1,147/708/157	50	1,250	3,450
Step Change						850	3,450	3,450
Slow Change						50	50	2,850
Hydrogen Superpower						1,500	6,900	14,950

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





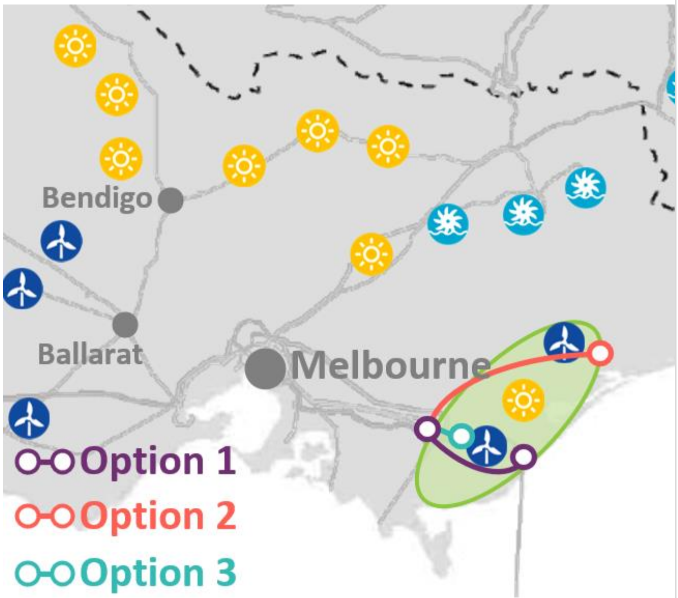
VRE curtailment

Scenario	2030		2040		2050	
	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill
Progressive Change	-	6%	-	5%	-	6%
Step Change	1%	5%	1%	5%	-	7%
Slow Change	-	11%	-	6%	2%	5%
Hydrogen Superpower	4%	3%	1%	6%	-	9%

V5 - Gippsland

Summary

The Gippsland REZ has moderate quality wind resources, in close proximity the 500 kV networks. There is currently significant wind generation interest in this area.



Existing network capability

Due to the strong network in this REZ (with multiple 500 kV and 220 kV lines from Latrobe Valley to Melbourne designed to transport energy from major Victorian brown coal power station), significant generation can be accommodated.

Approximately 2,000 MW of VRE can be accommodated prior to network augmentations. Options shown extend the network further to allow for easier connection of generation.

REZ grouping

Coordination of generation infrastructure may be required	The modelling outcomes identify this zone for development of mostly wind generation with large builds in the 2030s. This REZ could benefit from early community engagements and the coordination of generation.

Renewable resources

Resource	**Solar**			**Wind**		
Resource quality	F			C		
Renewable potential (MW)	500			2,000		
Demand correlation	**2029-30**	**2030-40**	**2049-50**	**2029-30**	**2030-40**	**2049-50**
	F	F	E	C	C	C

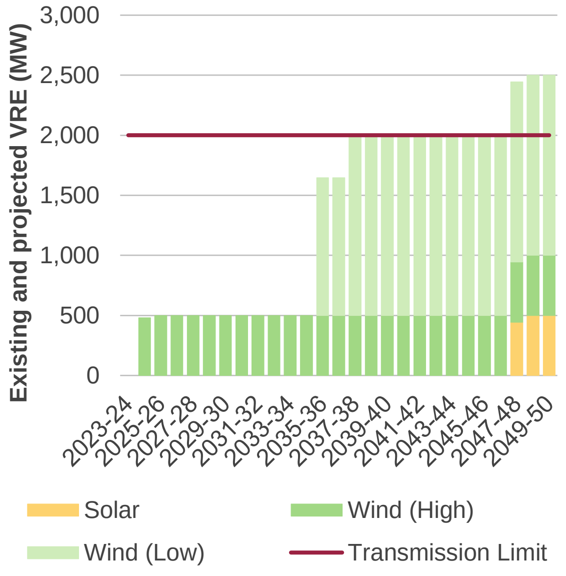
Climate hazard

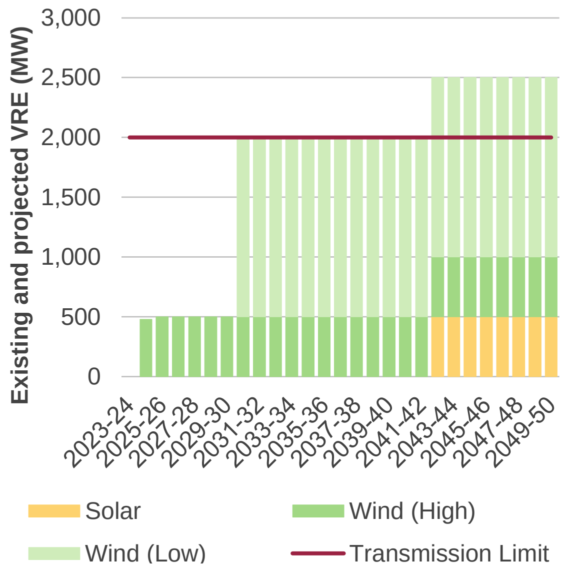
Temperature score	C	**Bushfire score**	D

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	-	-	-	500	-	500	2,000	2,000
Step Change		-	-	500		500	2,000	2,000
Slow Change		-	-	-		500	500	2,000
Hydrogen Superpower		500	500	500		2,000	2,150	5,100

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





VRE curtailment

Scenario	2030		2040		2050	
	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill
Progressive Change	-	9%	-	5%	-	6%
Step Change	-	5%	-	2%	-	10%
Slow Change	-	14%	-	7%	-	8%
Hydrogen Superpower	-	8%	-	17%	1%	22%

V6 – Central North Victoria

Summary

The Central North Victoria REZ has moderate quality wind and solar resources. In addition to the currently in service and committed solar farms, there are enquires for approximately 2.5 GW of additional solar.

Existing network capability

The current total network capacity in Central North Victoria is approximately 800 MW.

REZ grouping

Infrastructure coordination is not urgent	Modelling outcomes indicate a low likelihood that significant investment in VRE and transmission infrastructure will be optimally required in the next 12 years.

Renewable resources

Resource	Solar			Wind		
Resource quality	D			D		
Renewable potential (MW)	1,700			1,600		
Demand correlation	**2029-30**	**2030-40**	**2049-50**	**2029-30**	**2030-40**	**2049-50**
	F	F	F	B	B	B

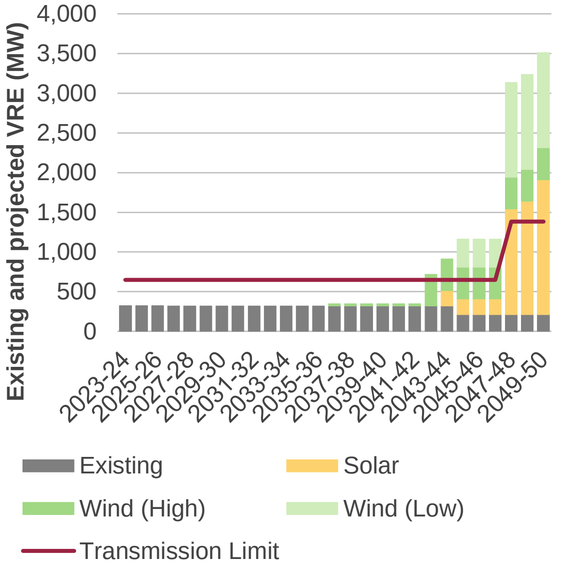
Climate hazard

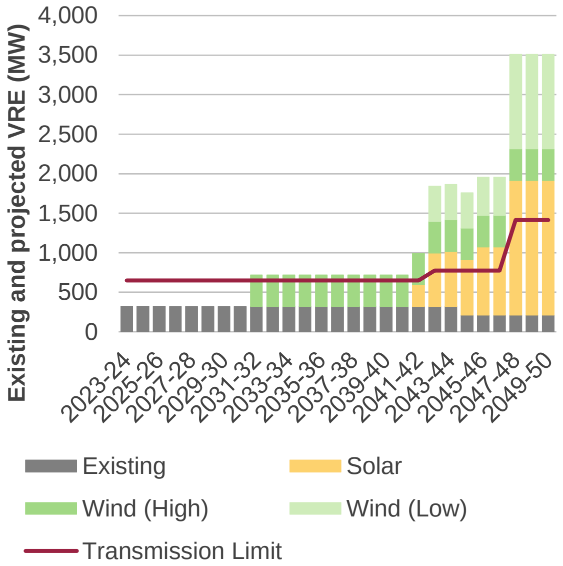
Temperature score	D	**Bushfire score**	D

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	240/72/0	-	-	1,700	-	-	50	1,600
Step Change		-	-	1,700		-	400	1,600
Slow Change		-	-	-		-	-	-
Hydrogen Superpower		450	1,050	10,000		400	700	1,600

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





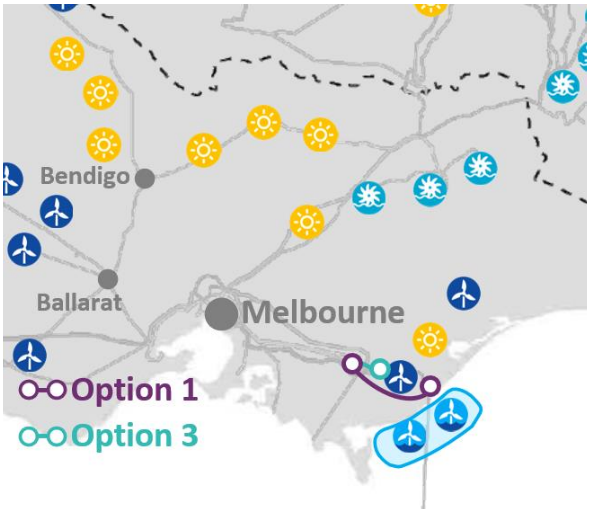
VRE curtailment

Scenario	2030		2040		2050	
	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill	Transmission curtailment	Economic spill
Progressive Change	-	22%	-	4%	9%	10%
Step Change	-	8%	-	3%	7%	15%
Slow Change	-	33%	-	20%	-	45%
Hydrogen Superpower	3%	15%	6%	20%	14%	6%

O3 – Gippsland Coast

Summary

The Gippsland Coast OWZ has been identified for the offshore wind resource potential in relatively shallow waters close to shore, with a connection point close to existing 500 kV networks. There is currently significant interest in this area, including a large offshore wind farm of 2,000 MW, but projects have not developed sufficiently at this stage to be considered anticipated.



Existing network capability

Gippsland offshore REZ connects to the 500 kV network in the Gippsland REZ, which has a 2,000 MW transmission network limit.

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.

Renewable resources

Resource	Solar			Offshore wind		
Resource quality	-			A		
Renewable potential (MW)	-			10,000		
Demand correlation	2029-30	2030-40	2049-50	2029-30	2030-40	2049-50
	N/A	N/A	N/A	C	C	C

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	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								
Slow Change								
Hydrogen Superpower								

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.