

Future Market Design

Lessons from the physical reality for the future market

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The ISP describes the least cost energy transition

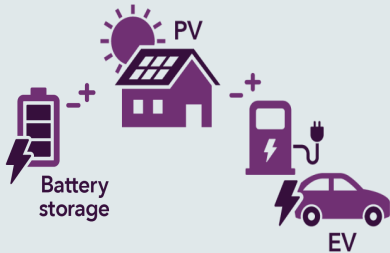


- **A whole-of-system plan** that meets power system needs in the long-term interests of the consumers of electricity.
- **Maximises value to end consumers** by designing the lowest cost, secure and reliable energy system, capable of meeting any emissions trajectory determined by policy makers at an acceptable level of risk.
- **Utilises the opportunities provided from existing technologies and anticipated innovations** in Distributed Energy Resources (DER), large-scale generation, networks and coupled sectors, such as gas and transport.
- **Aims to inform policy makers, investors, consumers, researchers and other energy stakeholders** about the necessary regulations, technical standards, investments and other initiatives required to build and operate Australia's future power system.

Profound Changes by 2040



- 63% of coal-fired generation to retire.



- Distributed energy generation capacity is expected to **double or even triple**.
- DER will provide up to 22% of total energy.

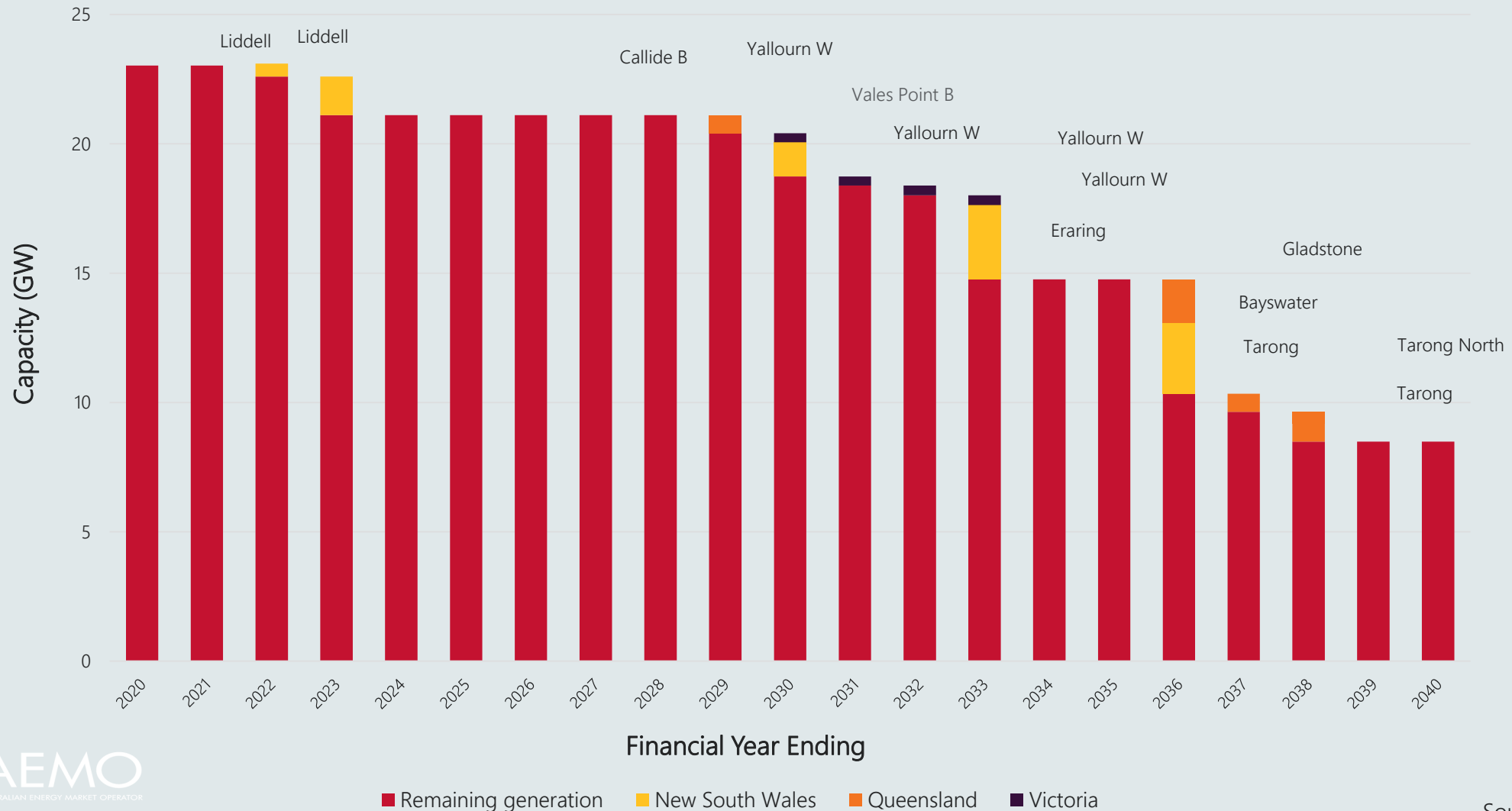


- More than 30 GW of new variable renewable energy is needed to replace coal-fired generation



- Five to 21 GW of new dispatchable resources are needed to back up renewables.

Existing generators have to be replaced



DER expected contribution by 2040 – central to step change scenario

Rooftop PV generation capacity



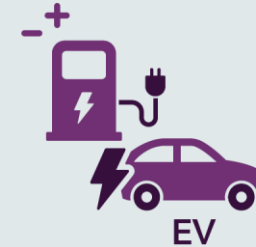
32 GW to **50 GW**

Embedded battery storage capacity (incl VPPs)



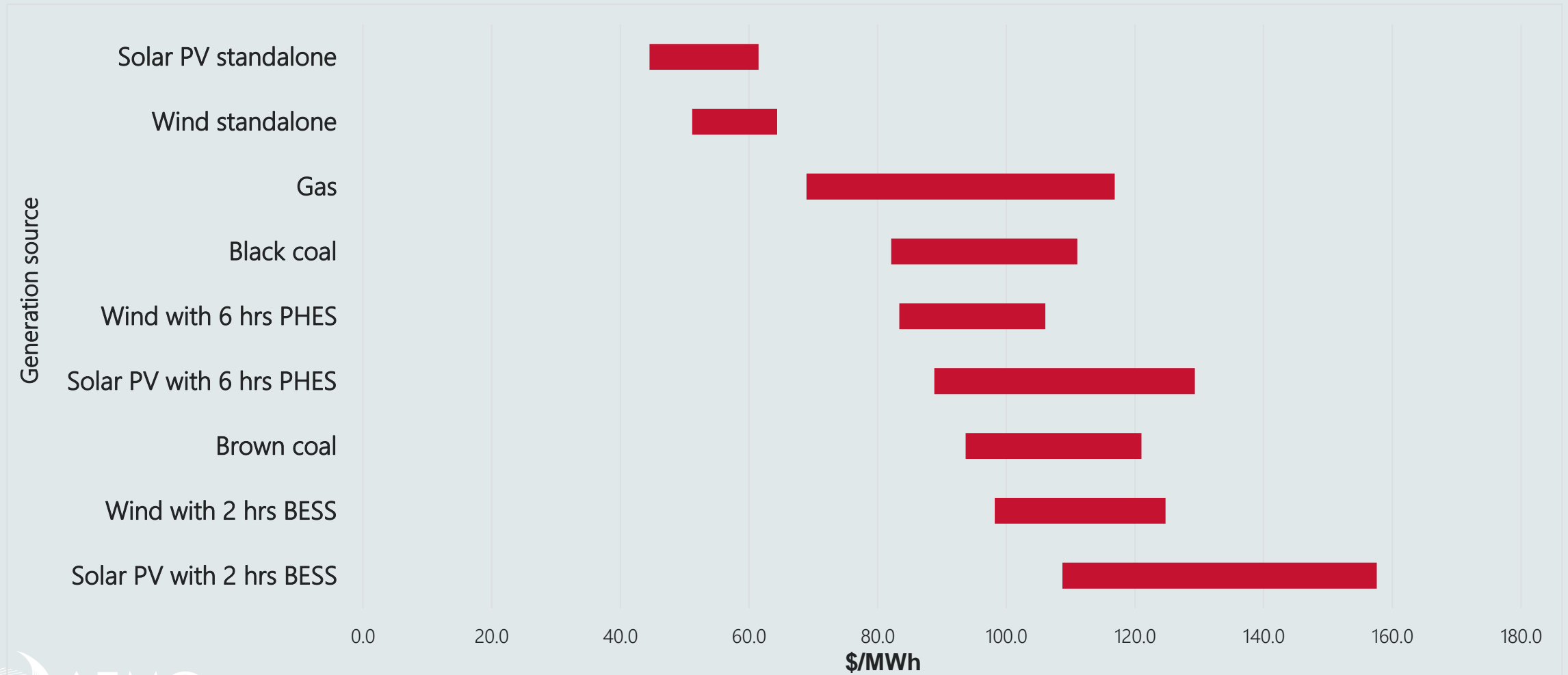
17 GW to **30 GW**

Electric vehicle electricity consumption

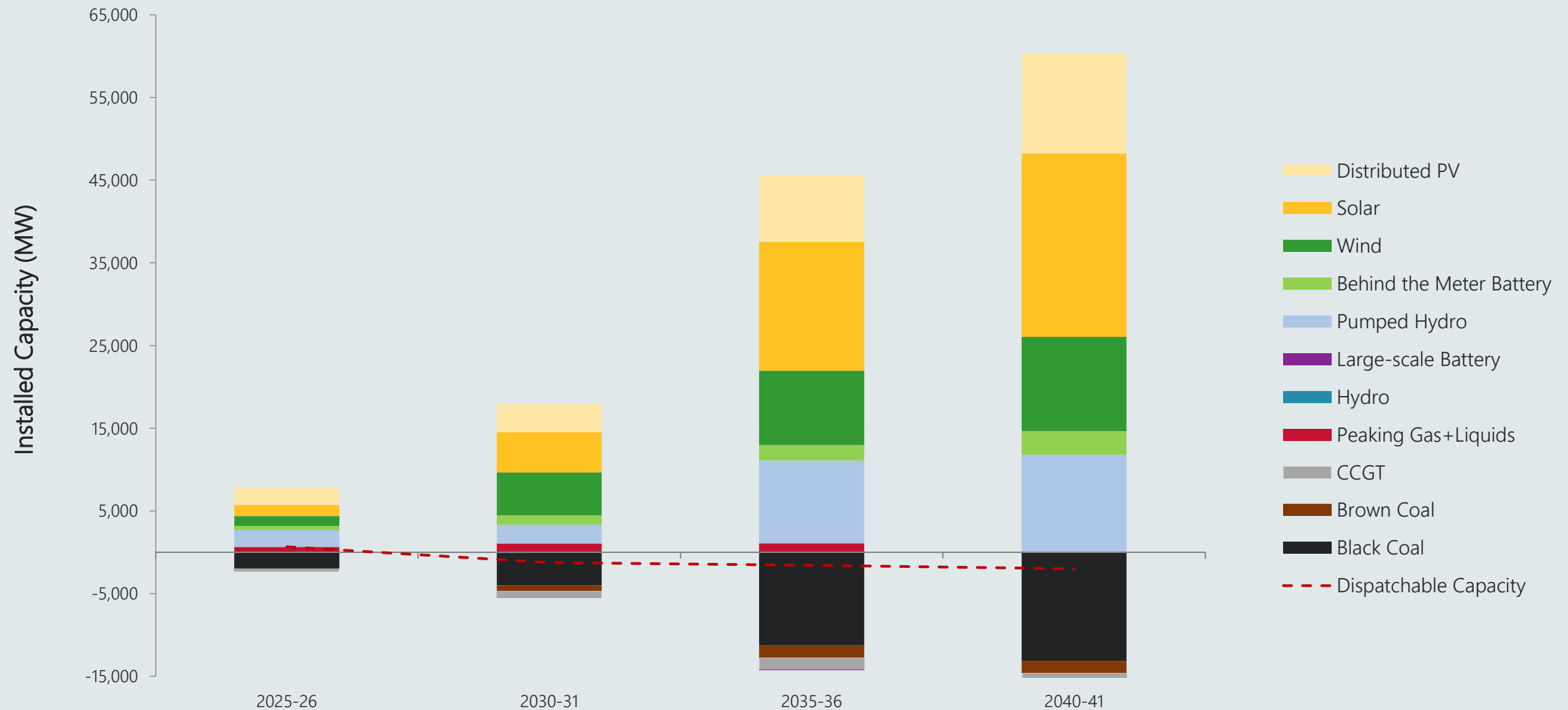


18 TWH to **31 TWH**

Remainder of supply gap created by retiring generators expected to be filled by firmed renewables



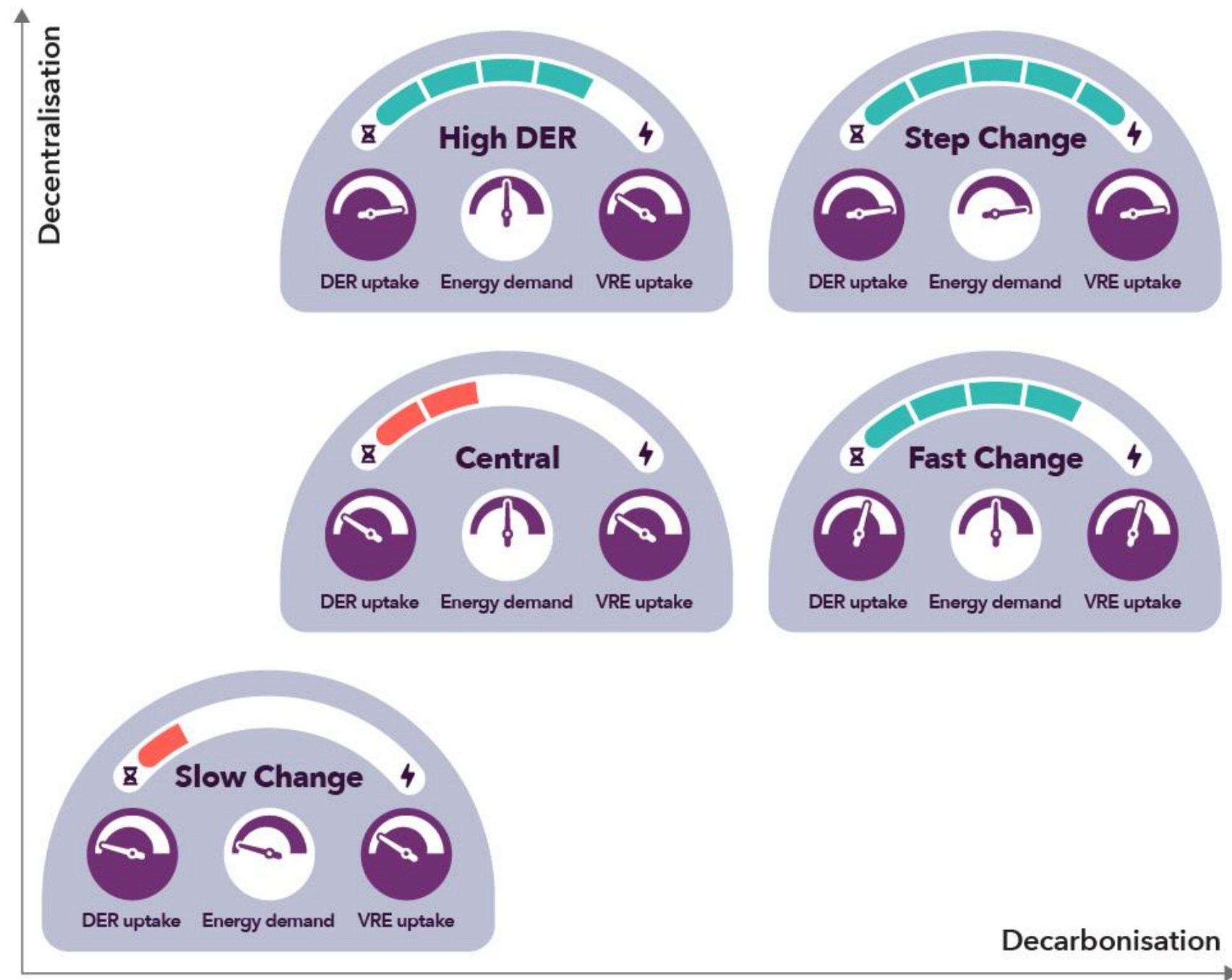
Forecast change in generation capacity in the NEM – central scenario



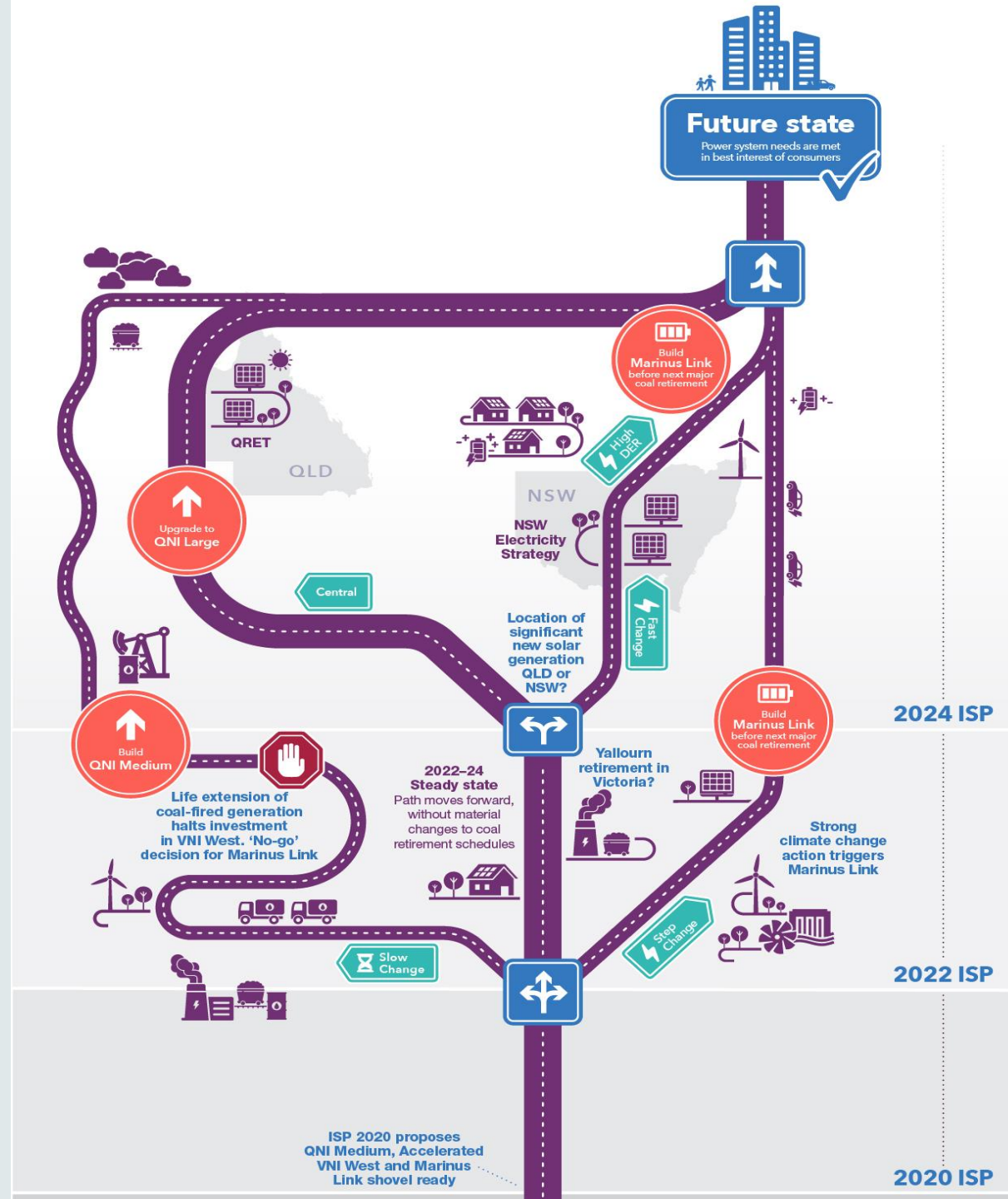
Physical needs to be met by the Future Market

- Manage rapidly rising minimum demand issues
- Unlock full capabilities of Distributed Energy Resources (DER)
- Maintain existing and induce new dispatchable capacity
- Understand unit commitment a day ahead to maximise secure renewable dispatch and enable fast ramps
- Slow down decline of system inertia
- Create an incentive to maintain system strength
- Enhance system resilience

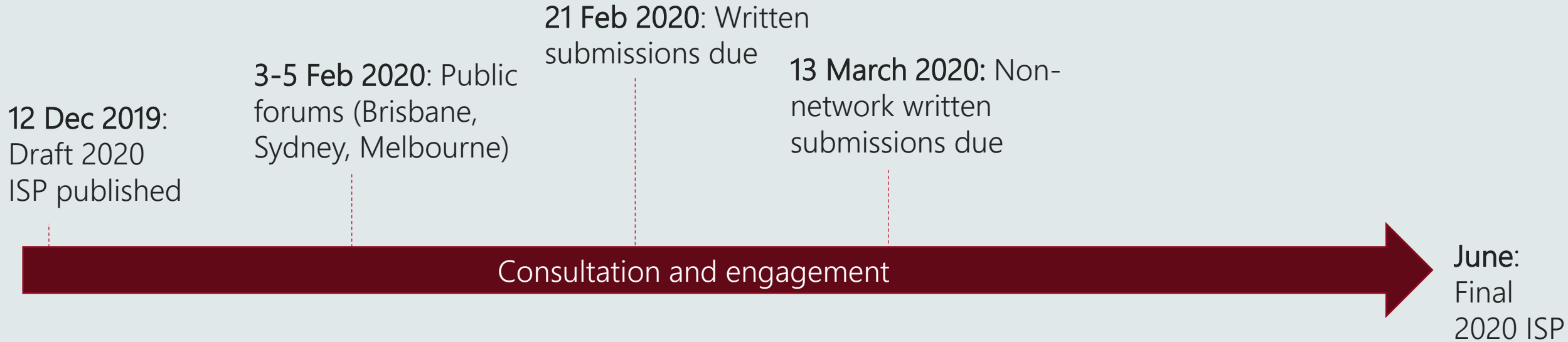
Five scenarios - capturing the possible development pathway scenarios



Dynamic
'roadmap' with
clear signposts for
decision making as
the future unfolds



We want your input



AEMO welcomes your feedback on:

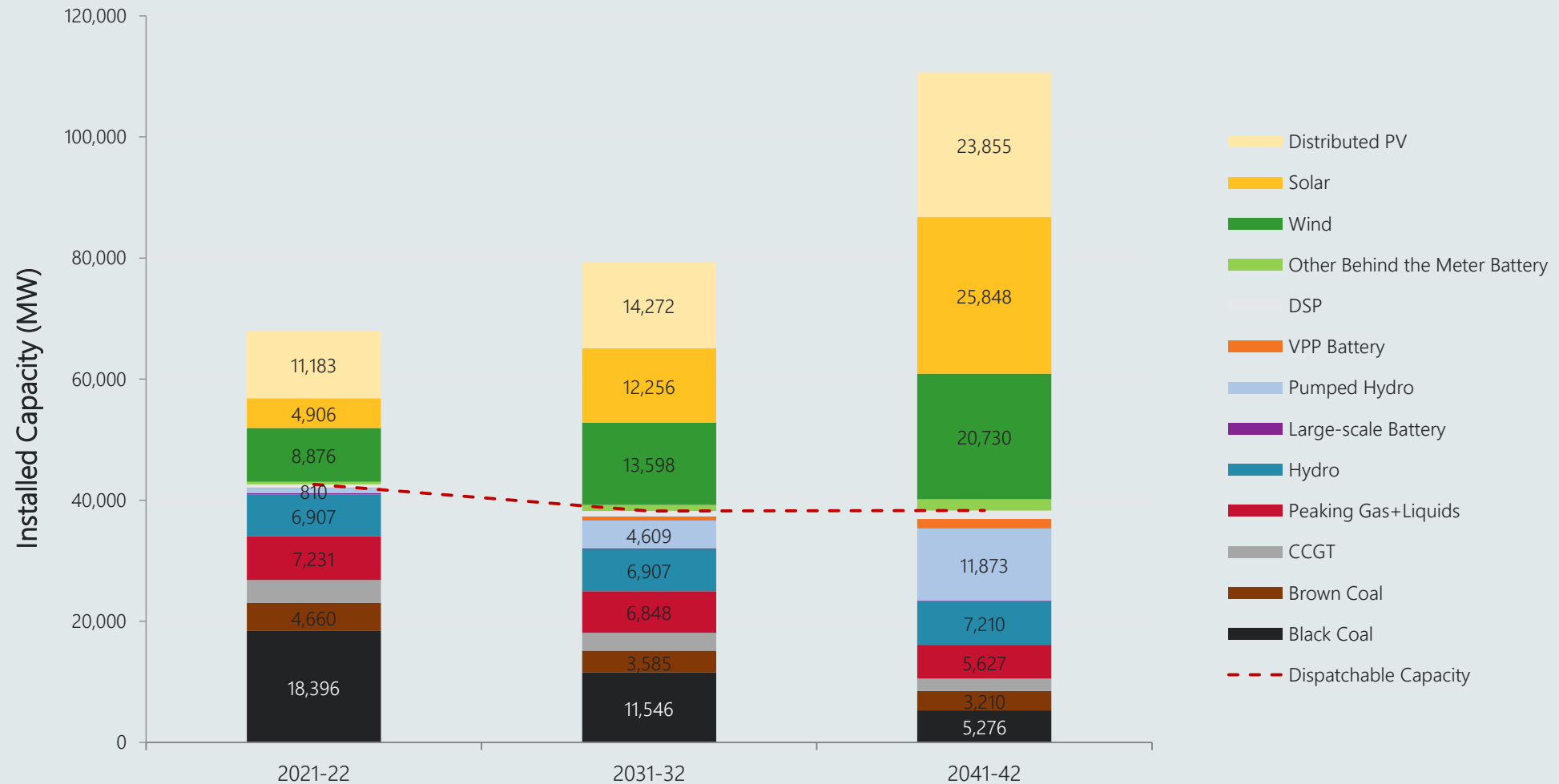
- Aspects of the Draft 2020 ISP that require further or clearer explanation
- Development options for Australia's future energy system
- Renewable Energy Zones
- Factors influencing candidate development paths



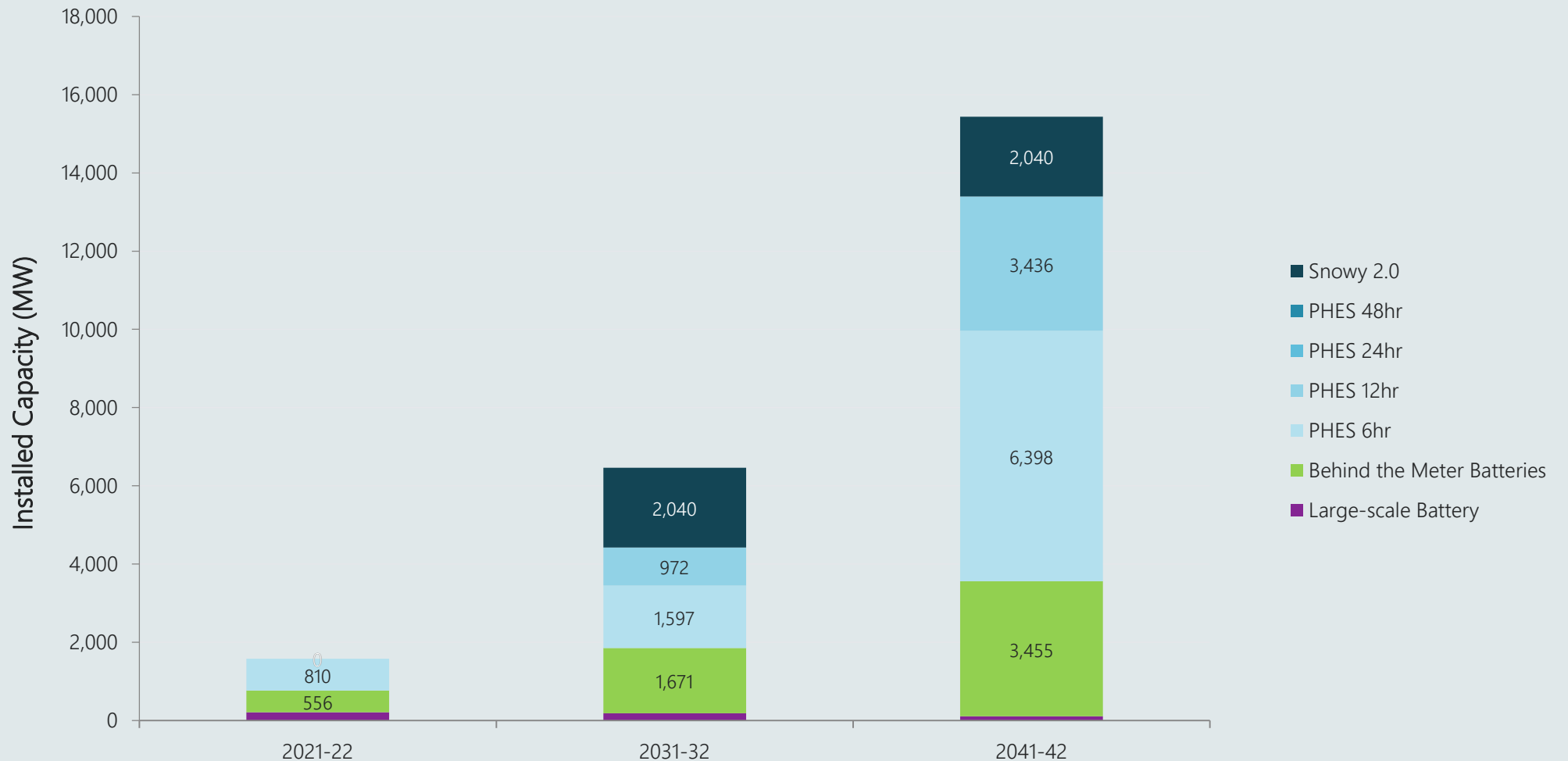
Strategic transmission investments are needed to unlock Renewable Energy Zones (REZ)



Forecast installed capacity in the NEM – central scenario



Forecast storage and dispatchable capacity development – central scenario



However, there is only 13 GW of connection capacity left to accommodate 30 GW of resources

Scenario	Total	Vic	Qld	NSW	SA	Tas
Central	15	0.3	3.7	8.7	2.3	0
High DER	12.9	0.2	4.2	6.4	2.1	0
Fast Change	20.6	0.3	6.9	11.2	2.3	0
Step Change	29.4	2	10.5	13.4	2.3	1.1
Slow Change	0					

Developing REZ in a well targeted approach

RENEWABLE ENERGY ZONES






Q1 Far North Qld
Q2 North Qld Clean Energy Hub
Q3 Northern Qld
Q4 Isaac
Q5 Barcardine
Q6 Fitzroy
Q7 Wide Bay
Q8 Darling Downs

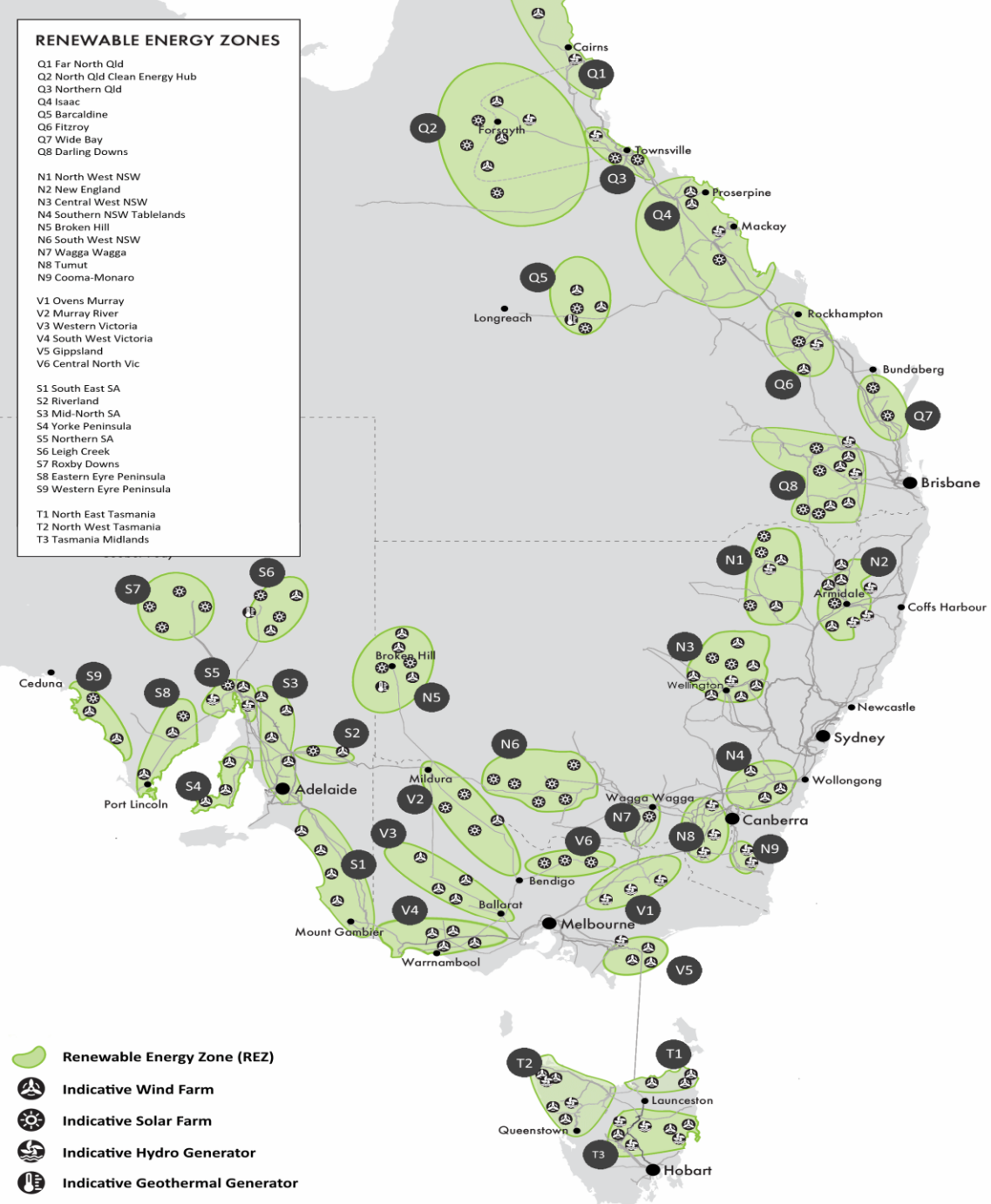
N1 North West NSW
N2 New England
N3 Central West NSW
N4 Southern NSW Tablelands
N5 Broken Hill
N6 South West NSW
N7 Wagga Wagga
N8 Tumut
N9 Cooma-Monaro

V1 Ovens Murray
V2 Murray River
V3 Western Victoria
V4 South West Victoria
V5 Gippsland
V6 Central North Vic

S1 South East SA
S2 Riverland
S3 Mid-North SA
S4 Yorke Peninsula
S5 Northern SA
S6 Leigh Creek
S7 Roxby Downs
S8 Eastern Eyre Peninsula
S9 Western Eyre Peninsula

T1 North East Tasmania
T2 North West Tasmania
T3 Tasmania Midlands

-  Renewable Energy Zone (REZ)
-  Indicative Wind Farm
-  Indicative Solar Farm
-  Indicative Hydro Generator
-  Indicative Geothermal Generator



AEMO's consultation process

Consultation	Who	Description	Open	Close
Draft ISP Rules	ESB	<p>Converting the ISP into Action - Draft changes to the National Electricity Rules⁶³</p> <p>Submissions to: info@esb.org.au</p>	20-Nov-19	17-Jan-20
Draft ISP	AEMO	<p>General comments on the Integrated system plan for the NEM, draft report, including the proposed optimal development path.</p> <p>Call for submissions located within this Draft ISP document, Part E.</p> <p>Submissions to: isp@aemo.com.au</p>	12-Dec-19	21-Feb-20
QNI Medium & VNI West – call for non-network options	AEMO	<p>Submissions relating to non-network options for the QNI Medium and VNI West actionable ISP projects. Call for submissions located in separate notice published on AEMO website⁶⁴</p> <p>Submissions to: isp@aemo.com.au</p>	12-Dec-19	13-Mar-20
VNI West PSCR	AEMO	<p>Project specification consultation report for the Vic-NSW Interconnector West RIT-T⁶⁵</p> <p>Submissions to: VNIWestRITT@aemo.com.au</p>	12-Dec-19	13-Mar-20
Forecasting and planning Inputs and Assumptions	AEMO	<p>Forecasting and Planning inputs and assumptions for 2020⁶⁶</p> <p>Submissions to: forecasting.planning@aemo.com.au</p>	12-Dec-19	7-Feb-20

We would like to get your input

Your views on the development options and actions.

Has AEMO considered the most appropriate development options for Australia's future energy system?

Has AEMO properly described the identified need for upcoming actionable ISP projects?

What Renewable Energy Zones are best suited to further development?

Your views on the candidate and optimal development paths.

Has AEMO combined the development options into the most likely candidate development paths?

Are there any other factors that AEMO should take into account when assessing the merits of candidate development paths?

What, if any, additional factors should AEMO consider to assess the development and timing of VNI West?

Your views on the ISP document and consultation.

Are there any aspects of the Draft 2020 ISP that require further or clearer explanation so that results are transparent and can be easily understood?

What, if any, modifications should AEMO consider for the proposed 2020 ISP stakeholder engagement plan and timeline?

ISP - the benefits

- **Achieve power system needs** in the long-term interests of the consumers of electricity.
- **Design the lowest cost, secure and reliable energy system**, capable of meeting any emissions trajectory determined by policy makers at an acceptable level of risk.
- **Leverage value from existing technologies and anticipated innovations** in DER, large-scale generation, networks and coupled sectors, such as gas and transport.
- **Inform policy makers, investors, consumers, researchers and other energy stakeholders** about the necessary regulations, technical standards, investments and other initiatives required to build and operate Australia's future power system