Transforming the NEM:
a future energy mix of firmed renewables

Australian Hydrogen Council

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Group Manager – Forecasting

We acknowledge the Traditional Owners of country throughout Australia and recognise their continuing connection to land, waters and culture.

We pay respect to Elders past, present and emerging.

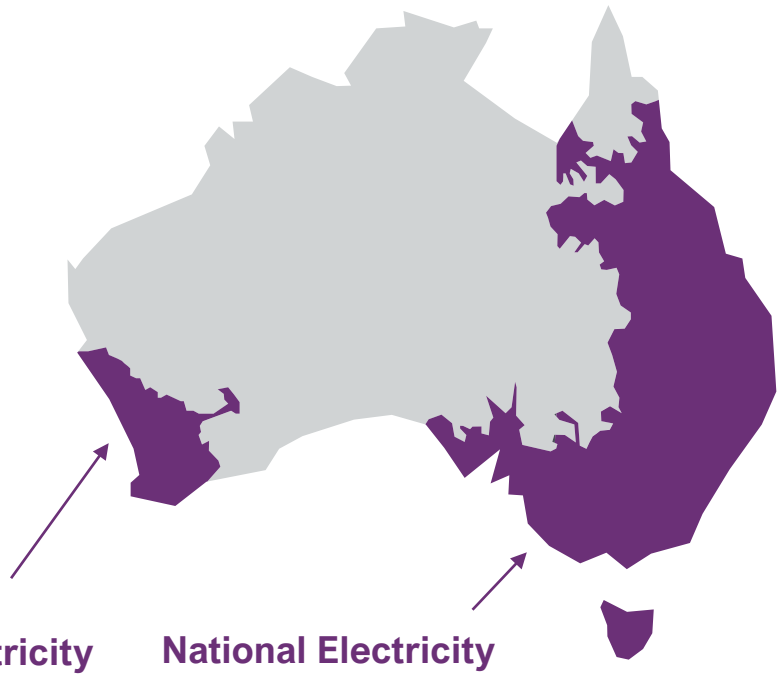
The Australian Energy Market Operator (AEMO)

AEMO is a member-based, not-for-profit organisation.

We are the **independent energy market and system operator and system planner** for the National Electricity Market and the Wholesale Electricity Market.

We also operate retail and wholesale gas markets across south-eastern Australia and Victoria's gas pipeline grid.

Electricity



Gas

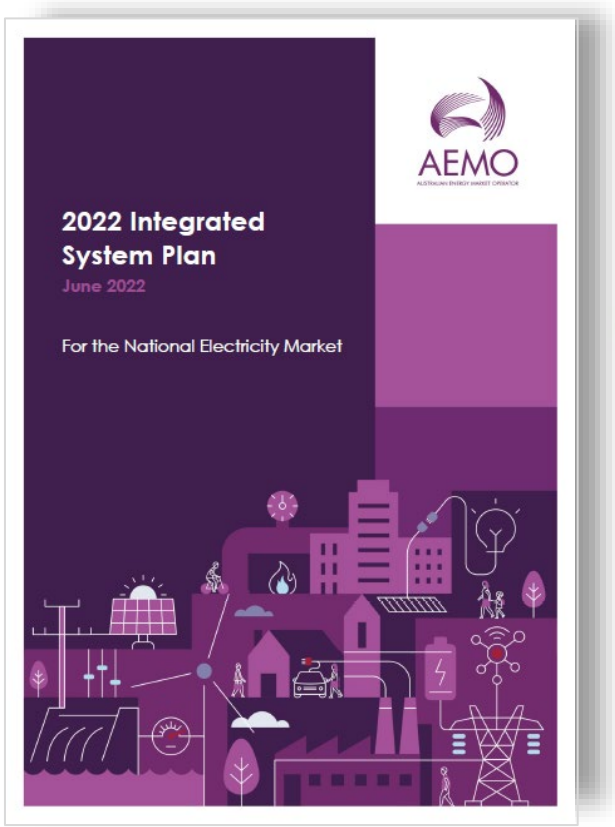
Declared Wholesale Gas Market (DWGM)

Short Term Trading Market (STTM)

and

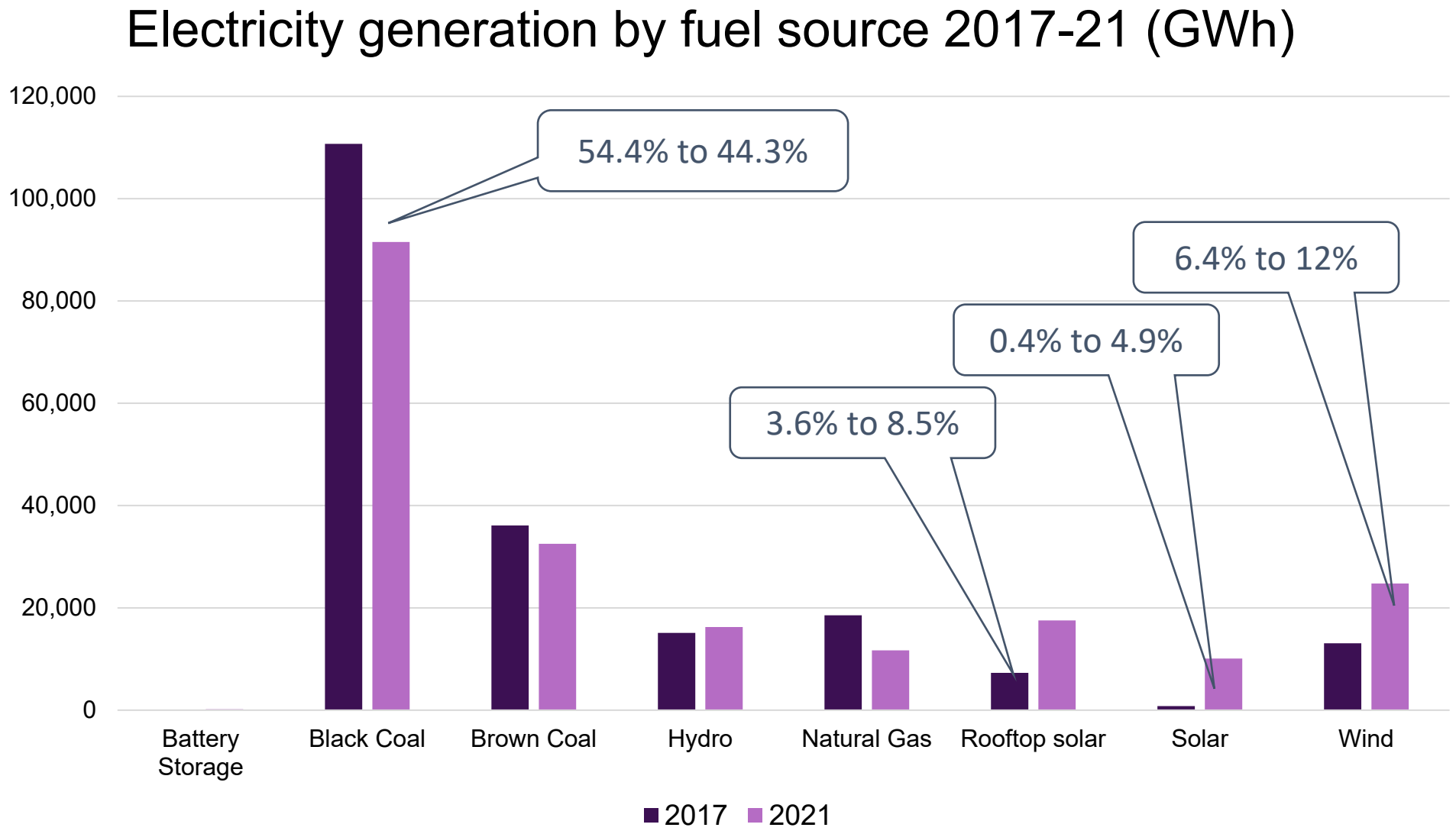
Gas Supply Hub (GSH)

About the Integrated System Plan (ISP)

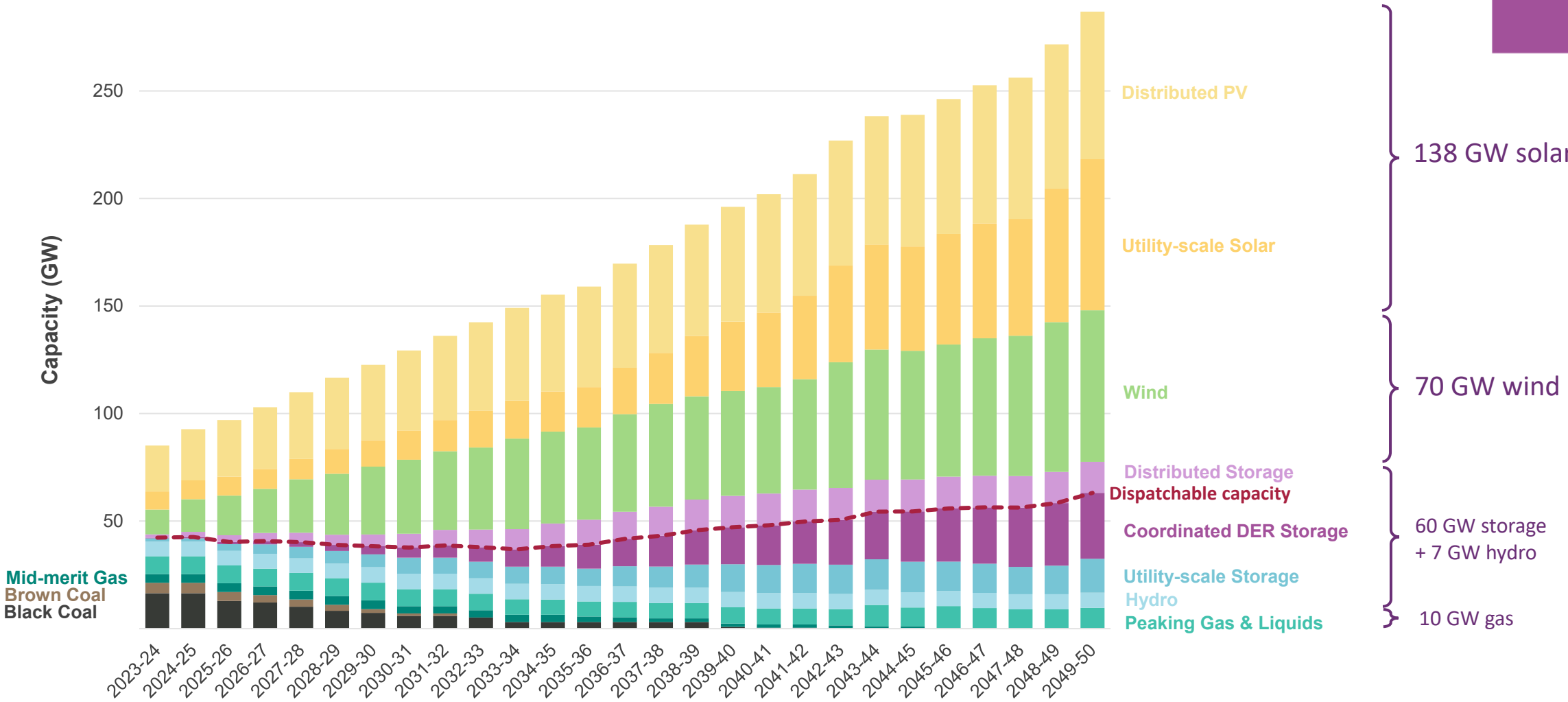


- **Whole-of-system** plan
- Informs policy makers, investors, consumers, researchers and other energy stakeholders
- Serves regulatory purpose of justifying actionable and future new transmission
- Maximises value to end consumers
- Optimal development plan/roadmap for electricity transmission

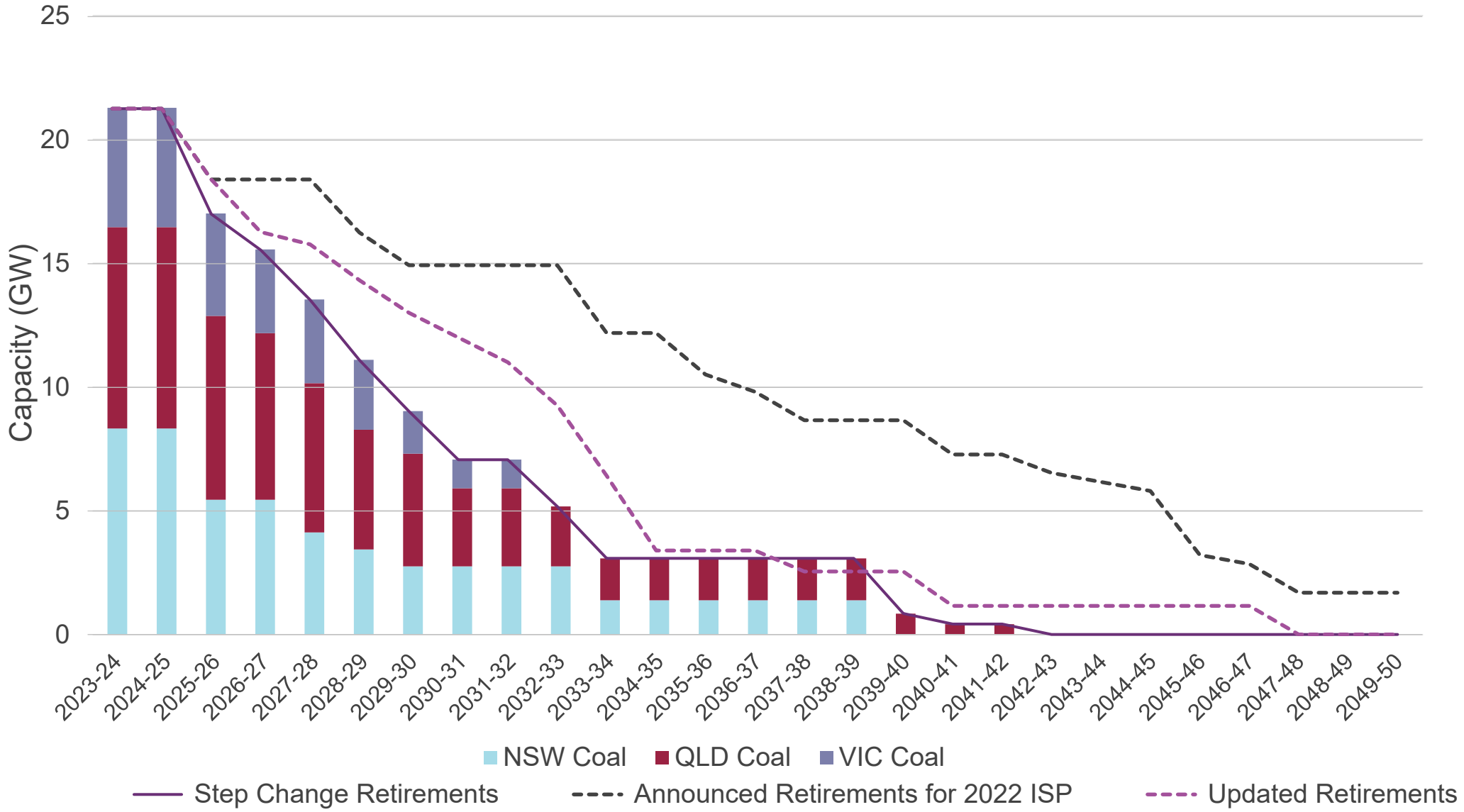
The NEM is decarbonising



Renewable capacity to at least double every decade from now to 2050…

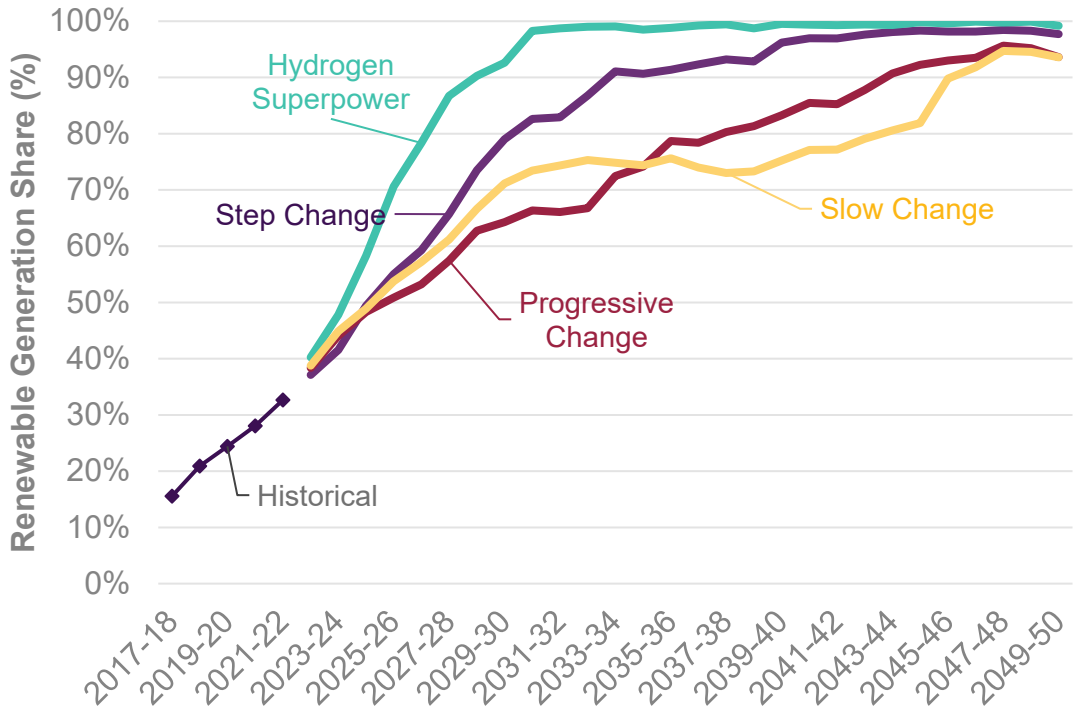


Coal likely to withdraw within the next decade or two…

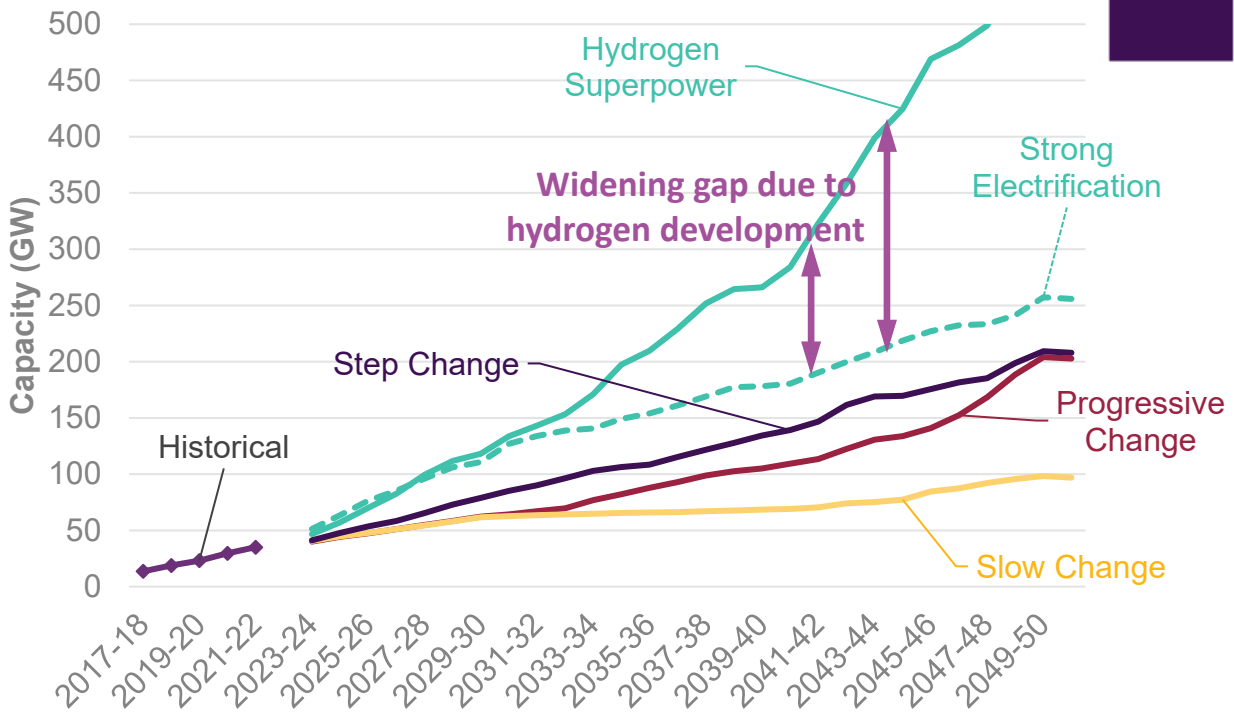


Renewable energy penetration significantly increasing across all scenarios

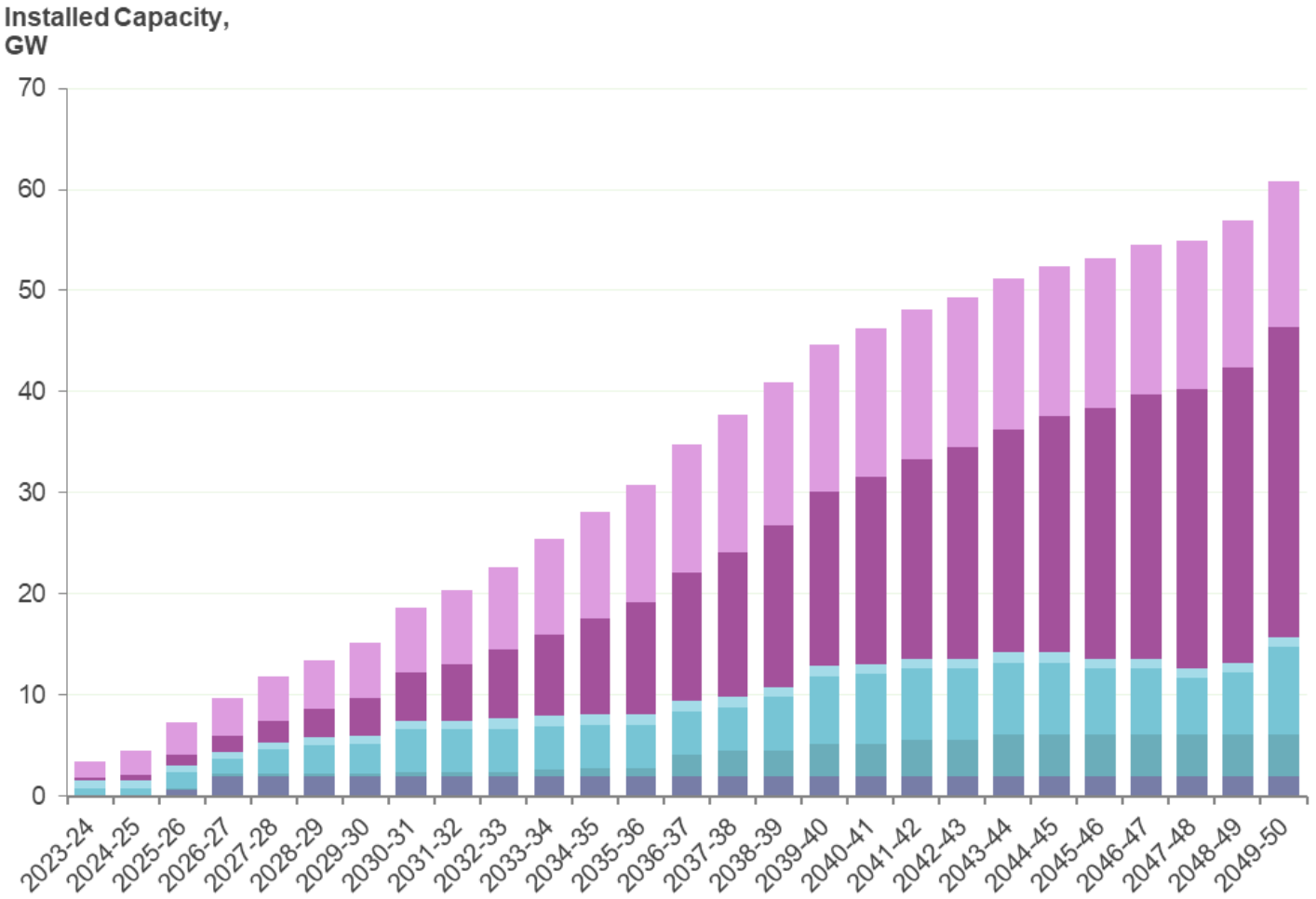
Renewable energy penetration (%)

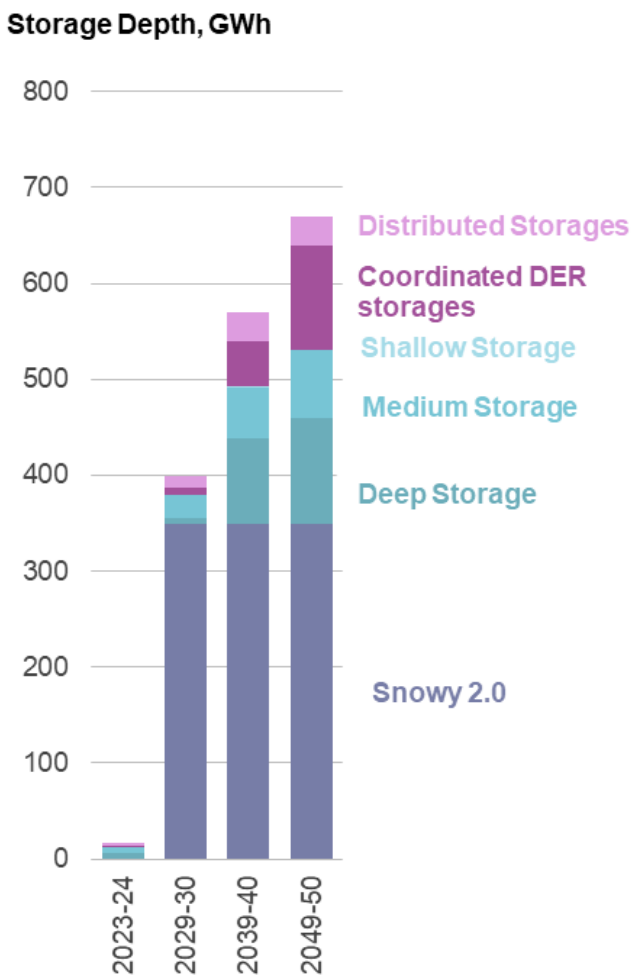


Renewable energy capacity (GW)



…requiring firming capacity from storage of all depths…





Expected changes to 2050

Storage capacity

to increase by a factor of 30

(Batteries, virtual power plants, pumped hydro.)

NOW	2030	2050
2 GW	15 GW	61 GW

Grid-scale wind and solar

to increase 9-fold

NOW	2030	2050
16 GW	44 GW	141 GW

Distributed solar PV

to increase 5-fold

NOW	2030	2050
15 GW	35 GW	69 GW

Electricity usage from the grid

to nearly double

NOW	2030	2050
180 TWh	184 TWh	320 TWh

Gas-fired peaking plants

to increase

While current mid-merit plants will all retire within that period.

NOW	2050
7 GW	10 GW

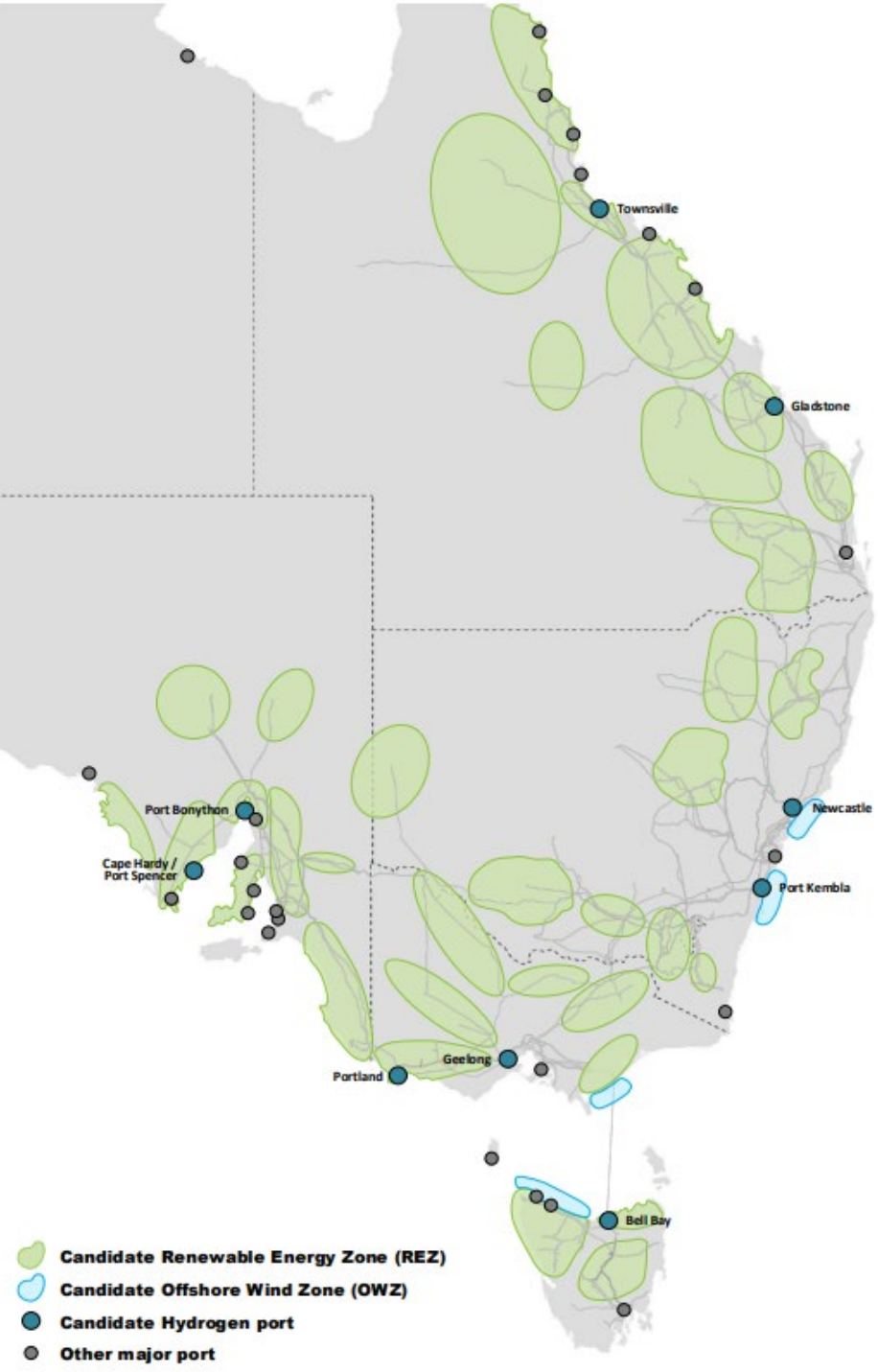
Coal generation

to be withdrawn

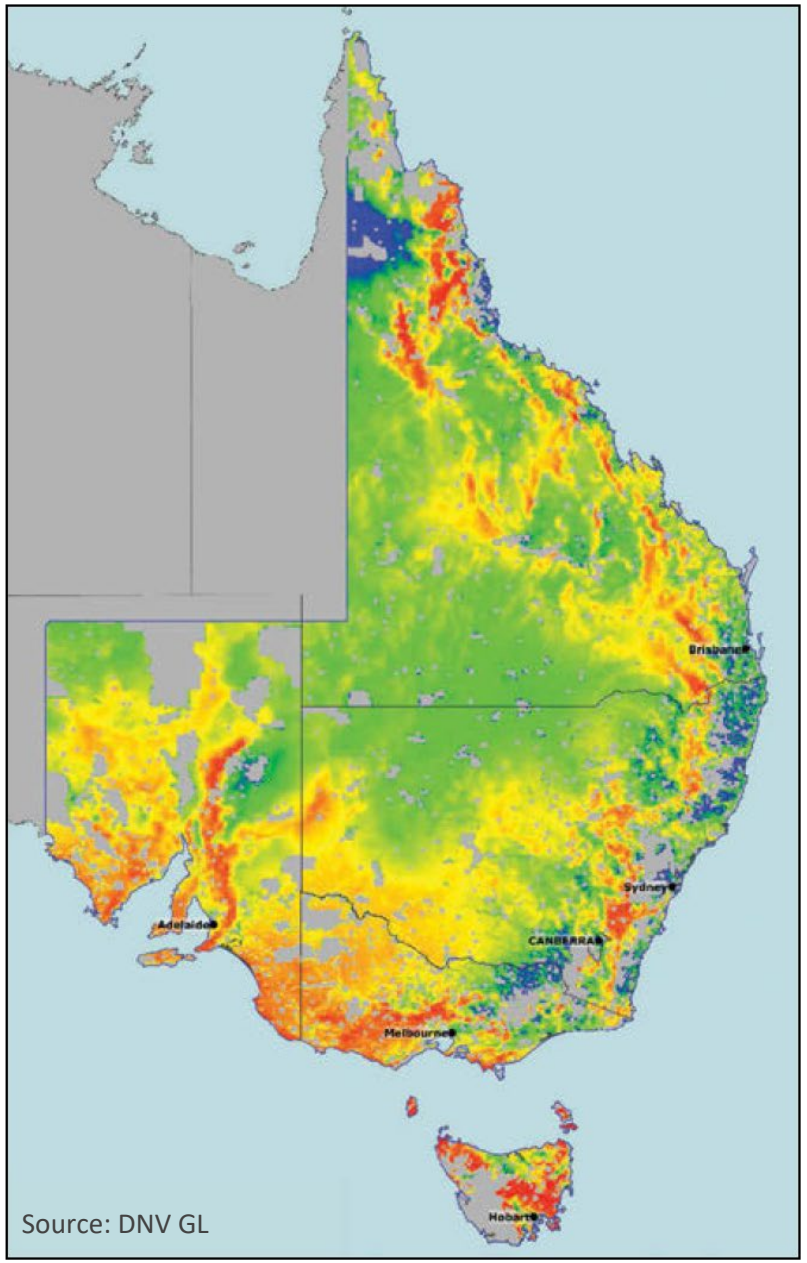
Capacity to be retired by:

2030	2043
60%	100%

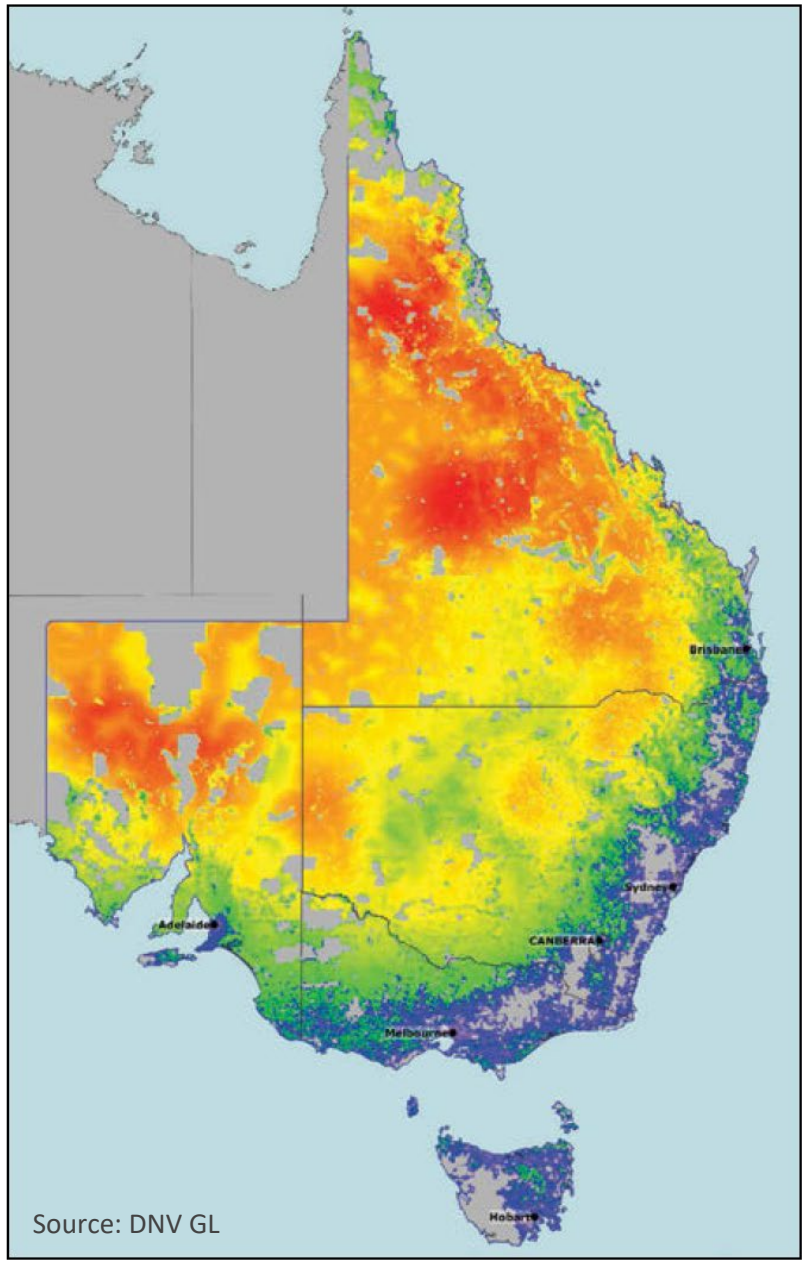
Coordinating new renewable generation into Renewable Energy Zones



Renewable Energy Zones are areas where clusters of large-scale renewable energy can be developed using economies of scale.



Source: DNV GL



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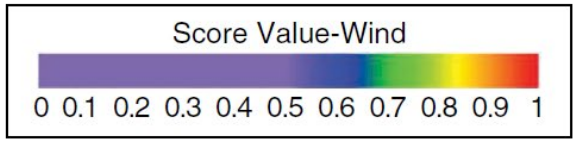
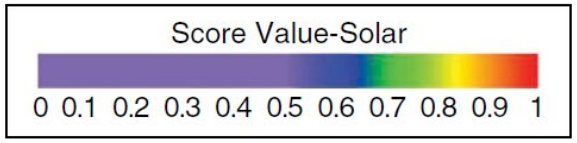
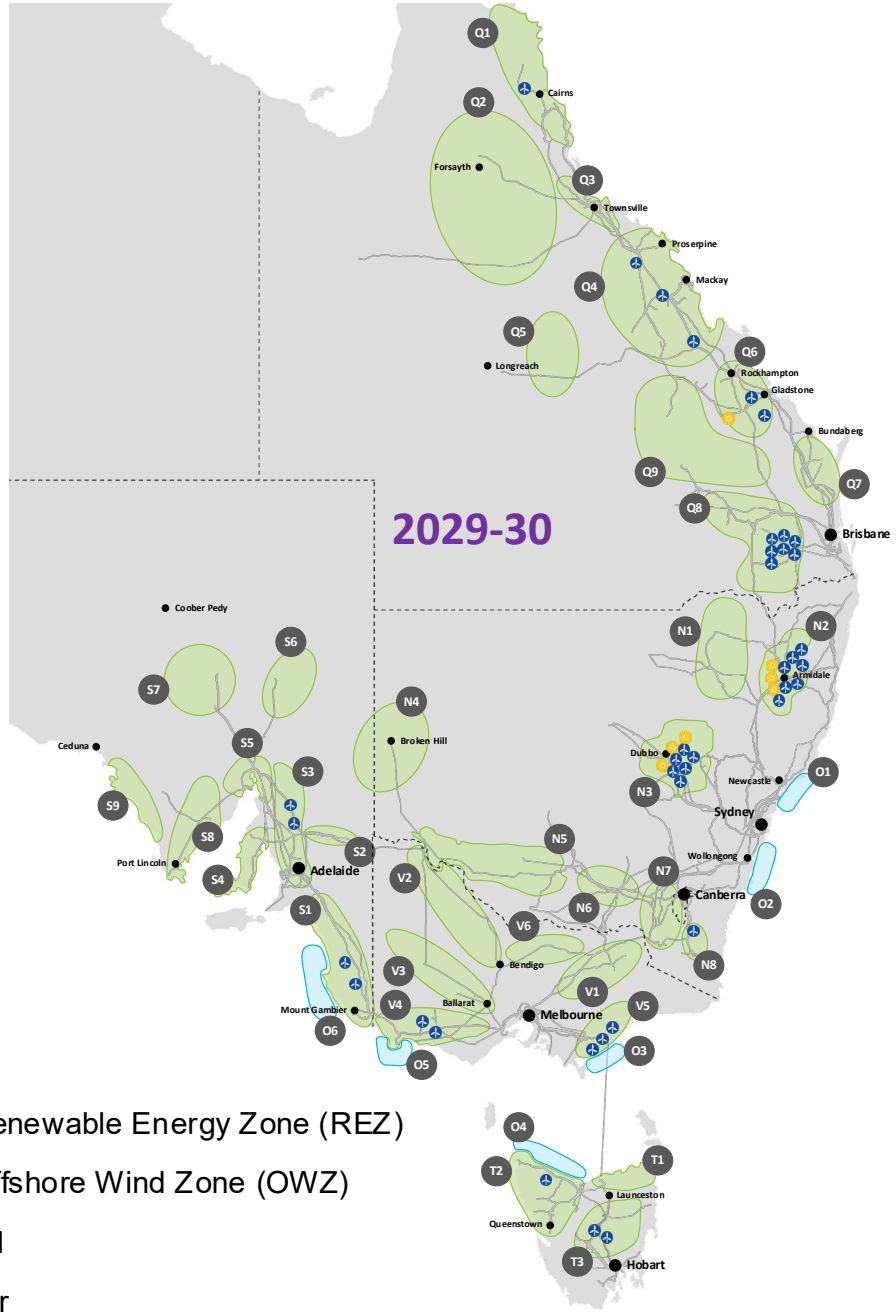
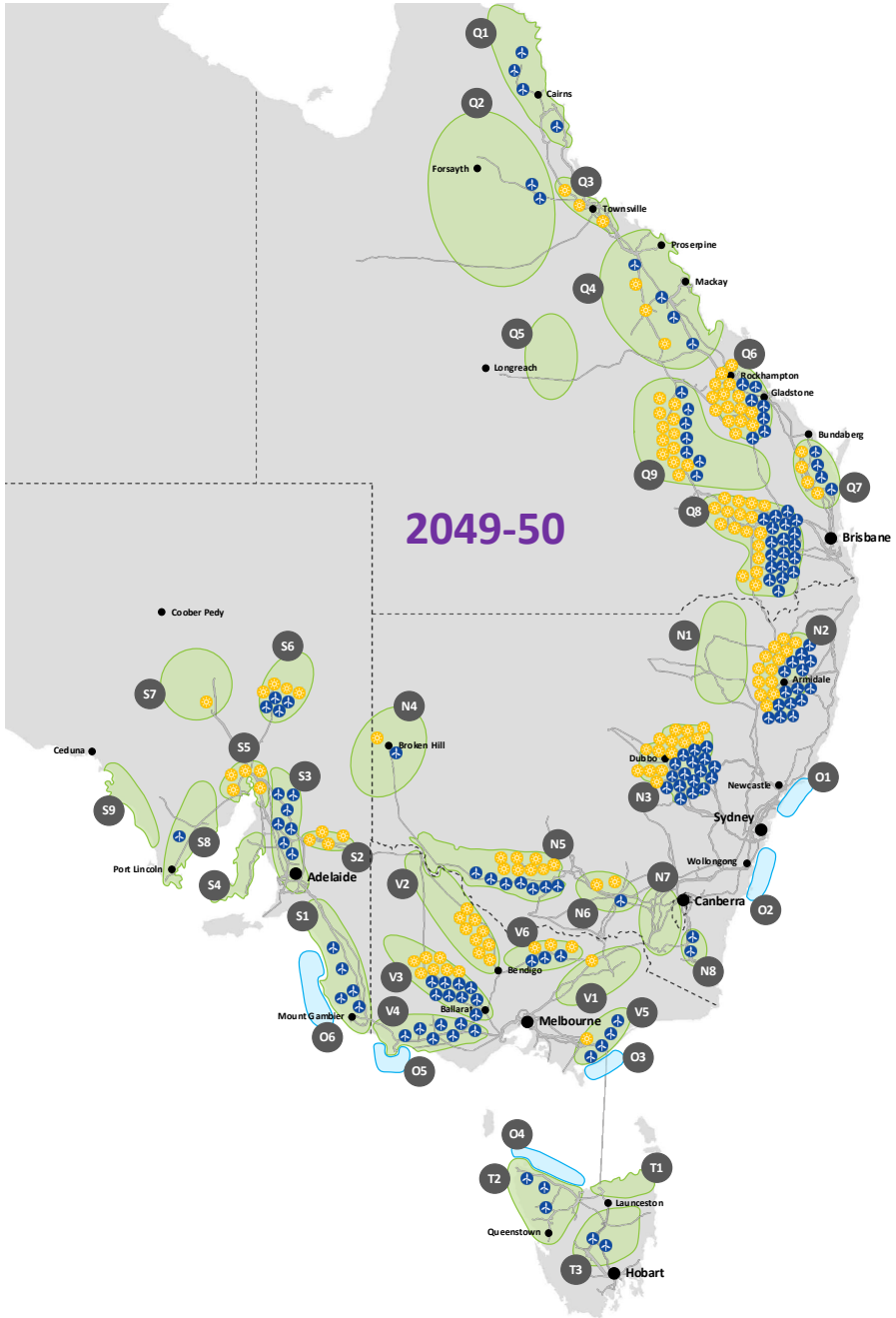




What factors might help to identify renewable energy zone candidates?

- Resource quality
- Correlation with demand
- Land parcel density
- Land cover
- Road access
- Terrain complexity
- Population density
- Protected areas
- Electricity network





Candidate Renewable Energy Zone (REZ)

Candidate Offshore Wind Zone (OWZ)

500 MW wind

500 MW solar

Queensland

Q1 Far North QLD
Q2 North Qld Clean Energy Hub
Q3 Northern Qld
Q4 Isaac
Q5 Barcaldine
Q6 Fitzroy
Q7 Wide Bay
Q8 Darling Downs
Q9 Banana

New South Wales

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

South Australia

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

Victoria

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

Tasmania

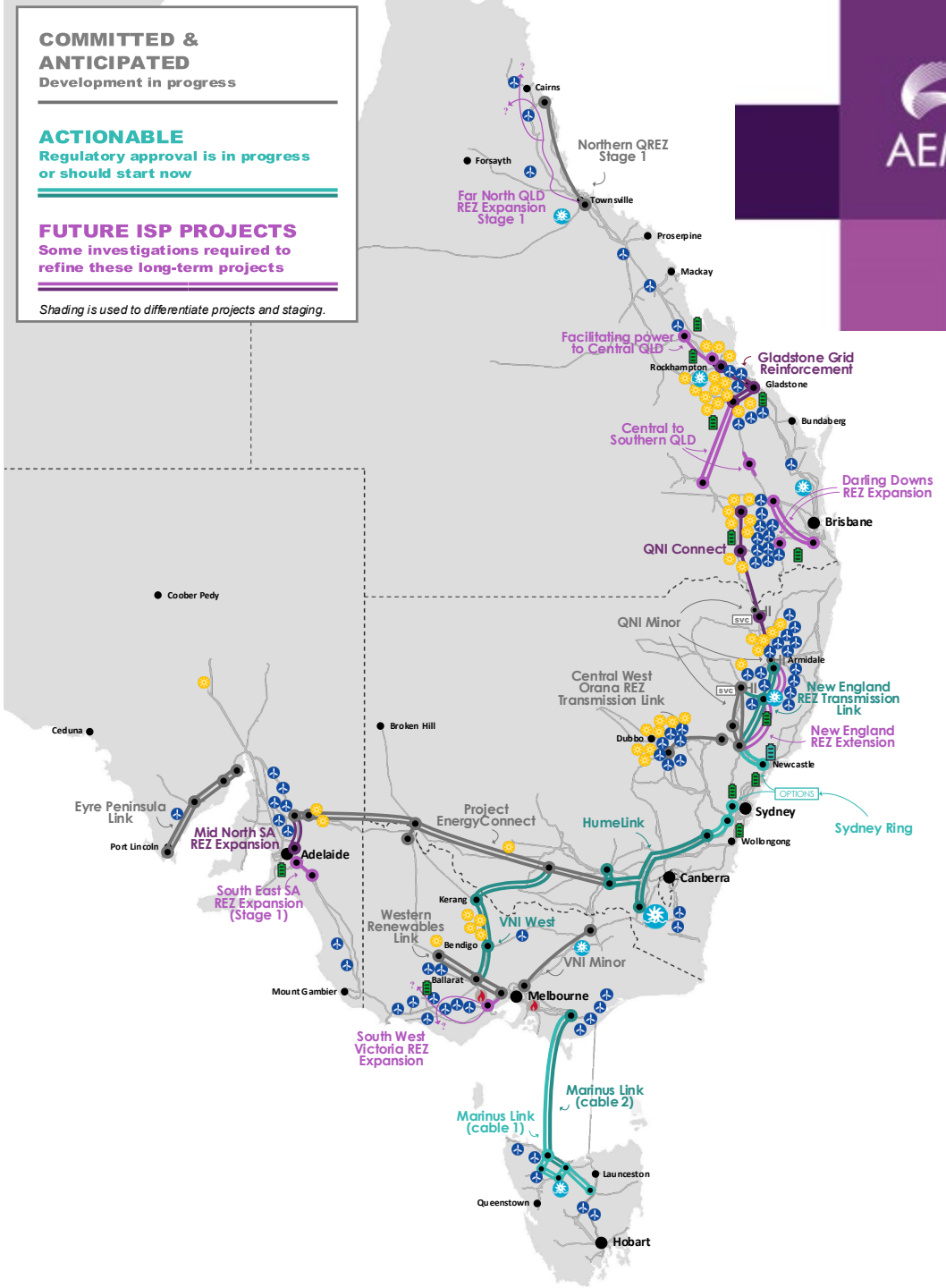
T1 North East Tasmania
T2 North West Tasmania
T3 Central Highlands

Offshore

O1 Hunter Coast
O2 Illawarra Coast
O3 Gippsland Coast
O4 North West Tasmanian Coast
O5 Portland Coast
O6 South East SA Coast

Transmission – the Optimal Development Path enables an efficient energy transition

- It delivers **≈$28 billion** in net market benefits
- Provides **investment certainty** and **flexibility** to reduce emissions faster if needed
- Improves reliability
- Helps **mitigate risks of earlier coal closures**, delayed generation, storage and transmission developments



Social licence

- Engagement with landholders, local communities and other stakeholders impacted by new infrastructure is vital for a successful energy transition
- Both for generation (REZs) and ISP transmission investments

ISP Consumer Panel and Community Advisory Council

Improve our understanding of the potential scope and impacts of social licence-related delays to infrastructure development

Contribute to and support AEMO's participation in the policy development processes around social licence challenges

AEMO

AUSTRALIAN ENERGY MARKET OPERATOR

For more information visit

aemo.com.au