

Capacity modelling in the Integrated System Plan

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Topics for discussion

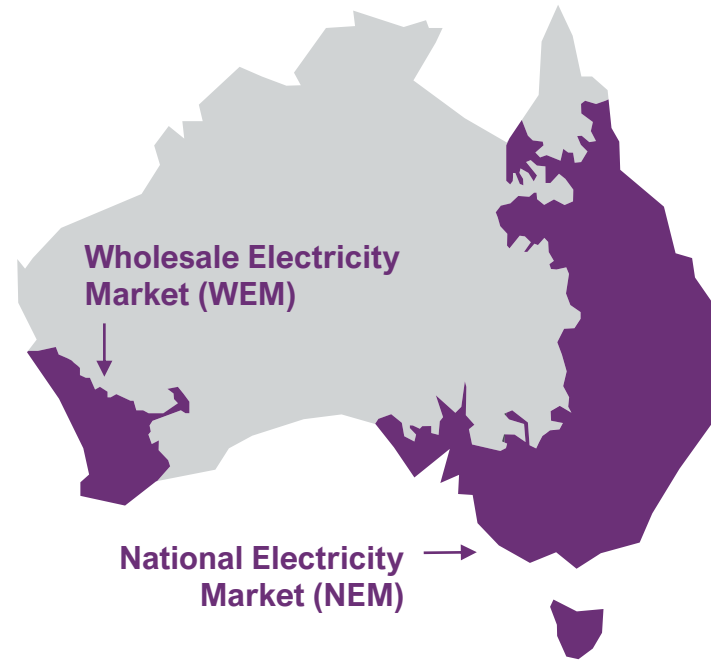
1. Who is AEMO?
2. The 2024 Integrated System Plan (ISP)
3. ISP Modelling Methodology
4. Modelling Electricity Networks within the Capacity Expansion Model
5. Developing and Consulting on Inputs

About AEMO

- AEMO is a member-based, not-for-profit organisation.
- We are the independent energy market and system operator for the National Electricity Market (NEM) and the WA Wholesale Electricity Market (WEM), and system planner for the NEM.
- 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)

Who we are and what we do

Operating energy systems

- Real-time operation
- System service and security management, monitoring and review
- Engineering analysis , support and modelling
- Operating reserves, gas supply adequacy and operation forecasting
- Emergency and outage management
- Cyber security



Operating energy markets

- Participant registration and accreditation
- Retail market operations and procedures
- Metering
- Settlements, prudential and payments
- Market monitoring, advice and analysis



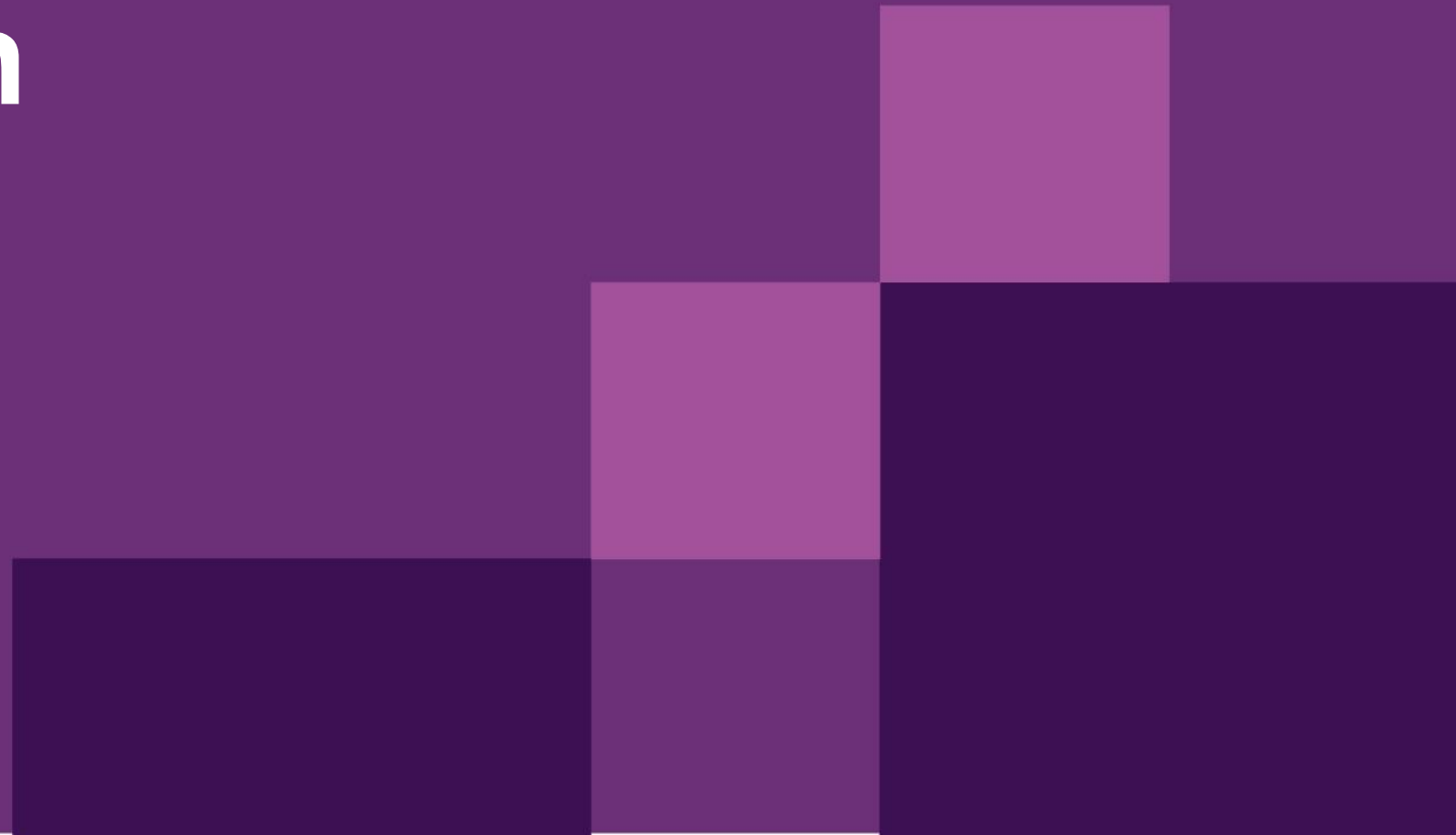
Enable the energy transition

- **Energy system forecasting, modelling and planning**
- Network connection enablement
- Technical analysis and resource adequacy assessments
- Statutory and Government policy support and integration
- Energy system and market reform consultation and project delivery

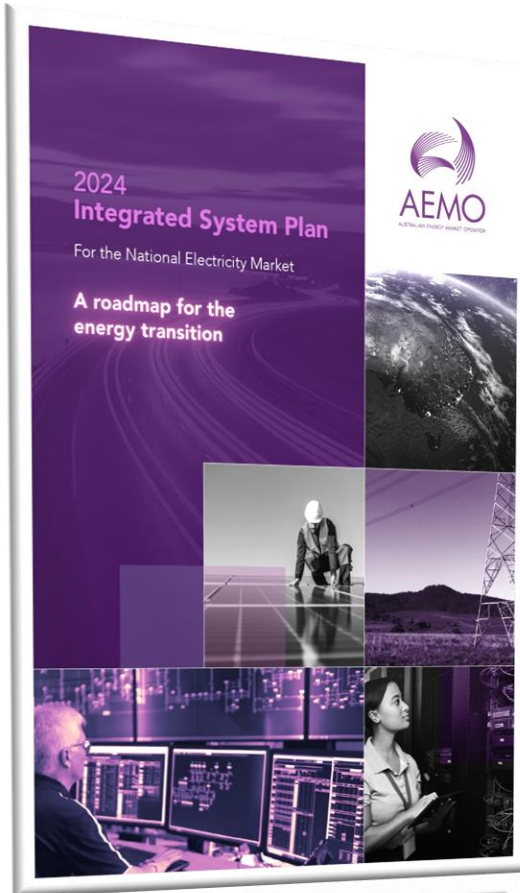




The 2024 Integrated System Plan

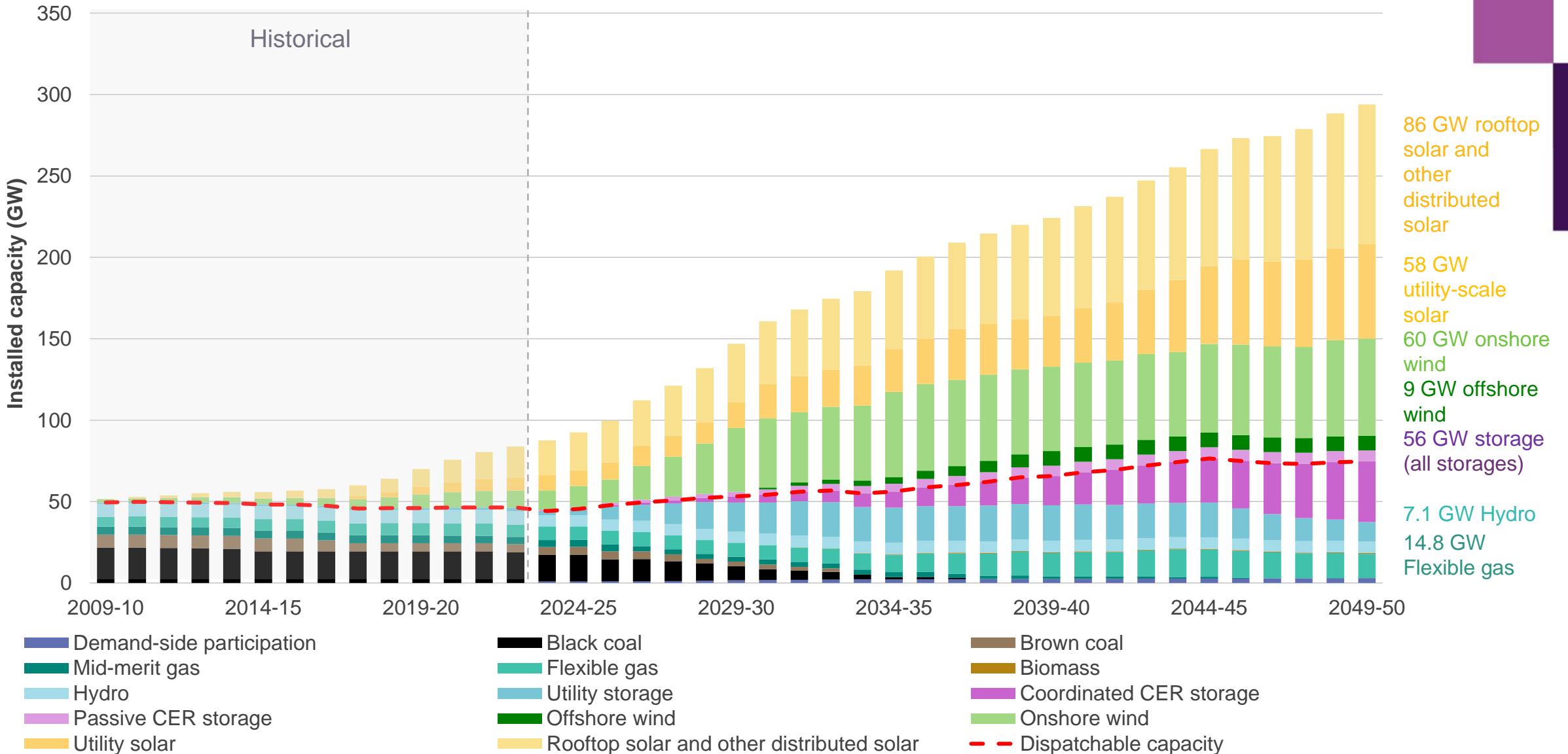


The Integrated System Plan is a roadmap for the energy transition



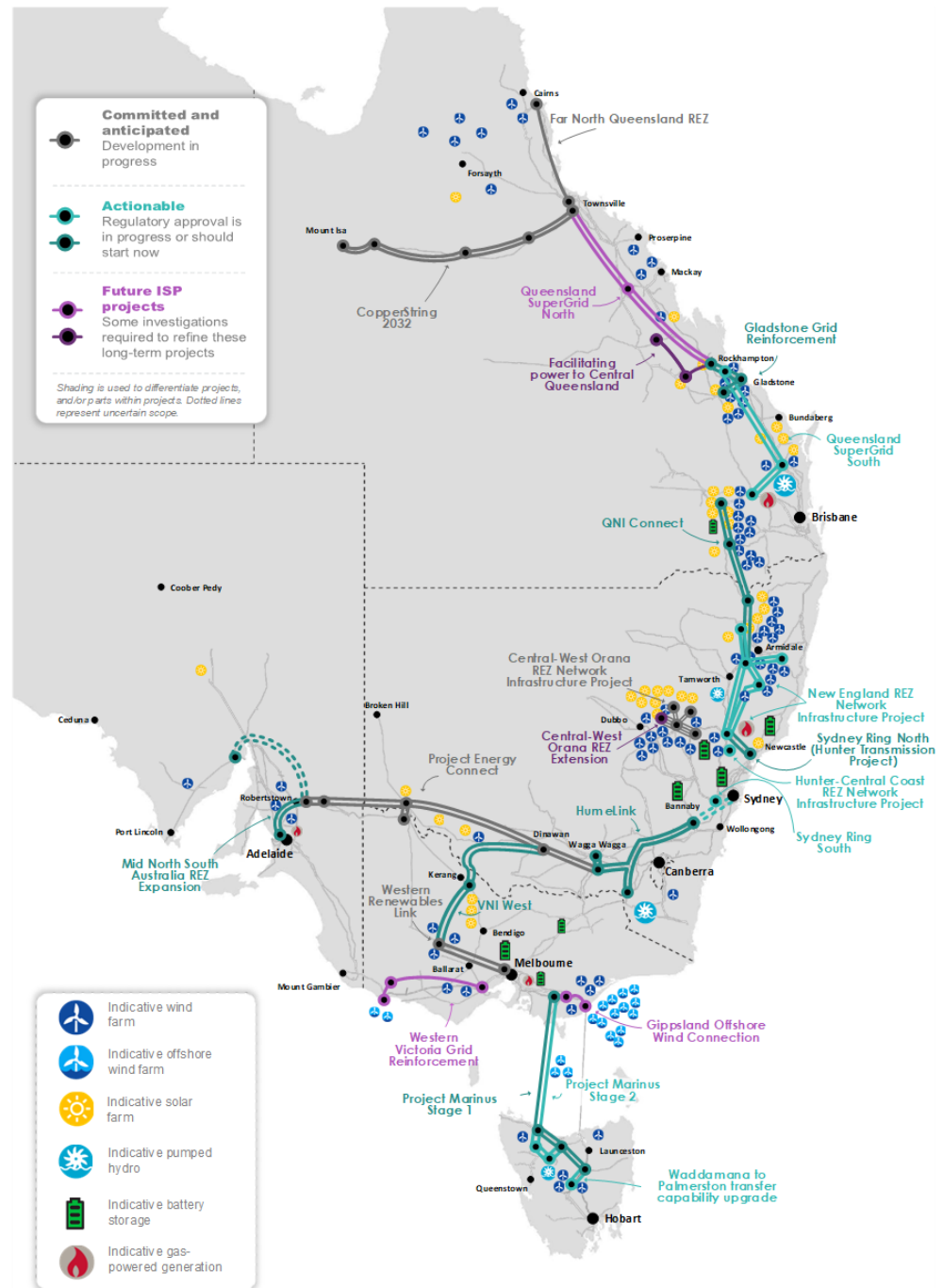
- A roadmap for the National Electricity Market (NEM) energy transition.
- Optimal development path for reaching net zero by 2050.
- Least-cost path for transition within Commonwealth and State policies.
- Provides expert information for a range of stakeholders.
- Serves regulatory purpose of identifying ‘actionable’ projects which should progress as urgently as possible.

Six times today's utility-scale wind and solar, and five times today's consumer energy resources, by 2050

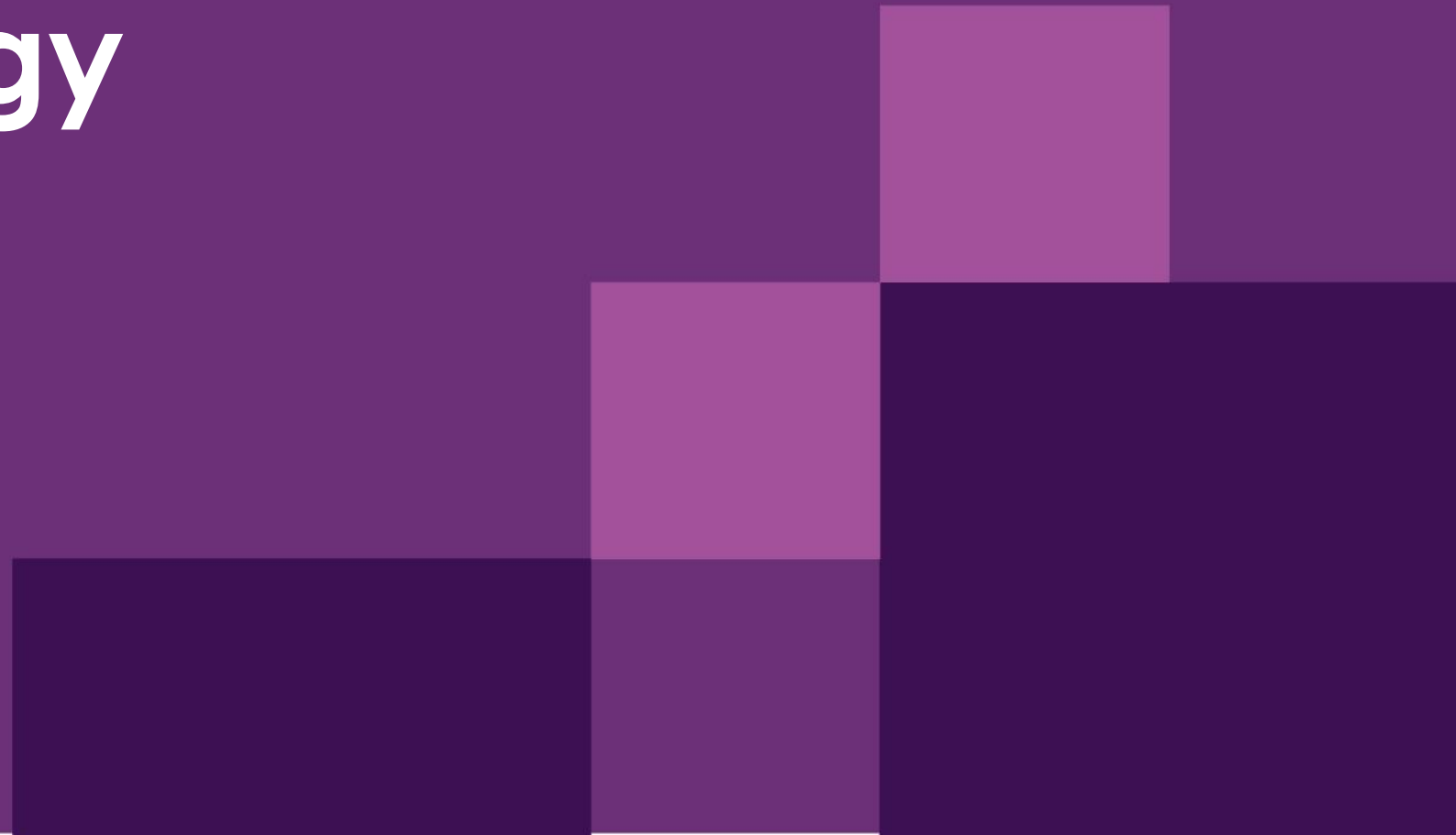


Close to 10,000 kilometres of transmission will be needed by 2050

This map shows indicative new generation and storage in 2040, and transmission projects that include new transmission lines, increase capacity by 500 MW or more, and are required in all scenarios by 2050.



ISP Modelling Methodology



ISP modelling methodology

Inputs, Assumptions and Scenarios

Network Analysis

Detailed Long-Term (DLT) Model

Time-sequential Model

Single-stage Long term (SSLT) Model

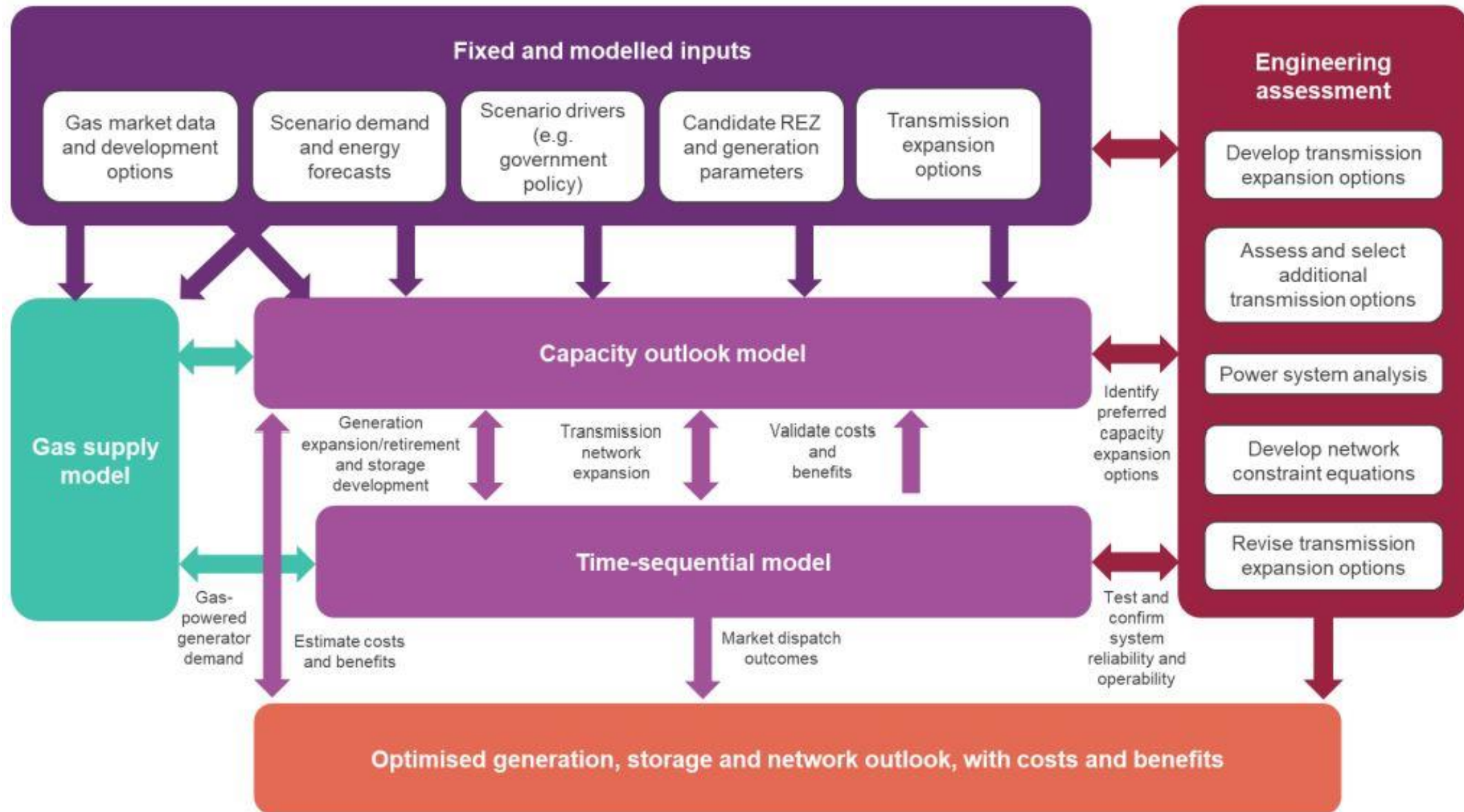
- Least-cost linear programming
- Sampled chronology
- One-step solve of the whole modelling horizon
- Co-optimization of transmission and generation builds
- Simplified hydro representation
- One weather pattern

- Electricity optimization
- Least-cost linear programming
- Fitted chronology
- Multi-step solve
- Transmission augmentations are tested
- Simplified hydro representation
- One weather pattern

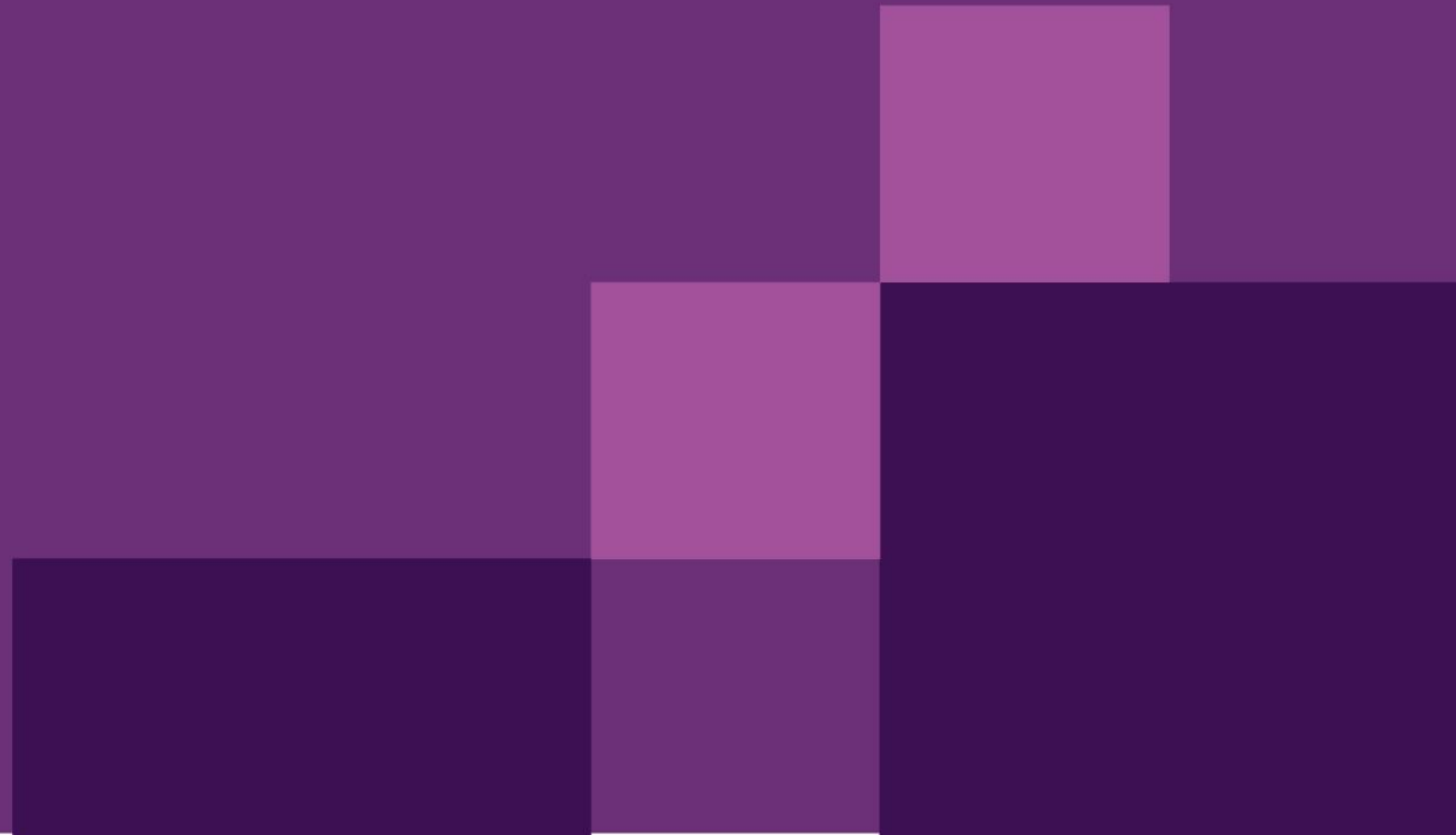
- Electricity optimization
- SRMC bidding
- Time-sequential
- Detailed hydro representation
- Monte Carlo method for outages
- Fully constrained
- 8 weather patterns and 2 maximum demand targets

- Transmission constraint creation and analysis
- Transmission connection costs
- System strength and inertia requirements
- Thermal limits and upgrade options
- Voltage, transient and oscillatory stability limits and upgrade options

Overview of the ISP modelling methodology

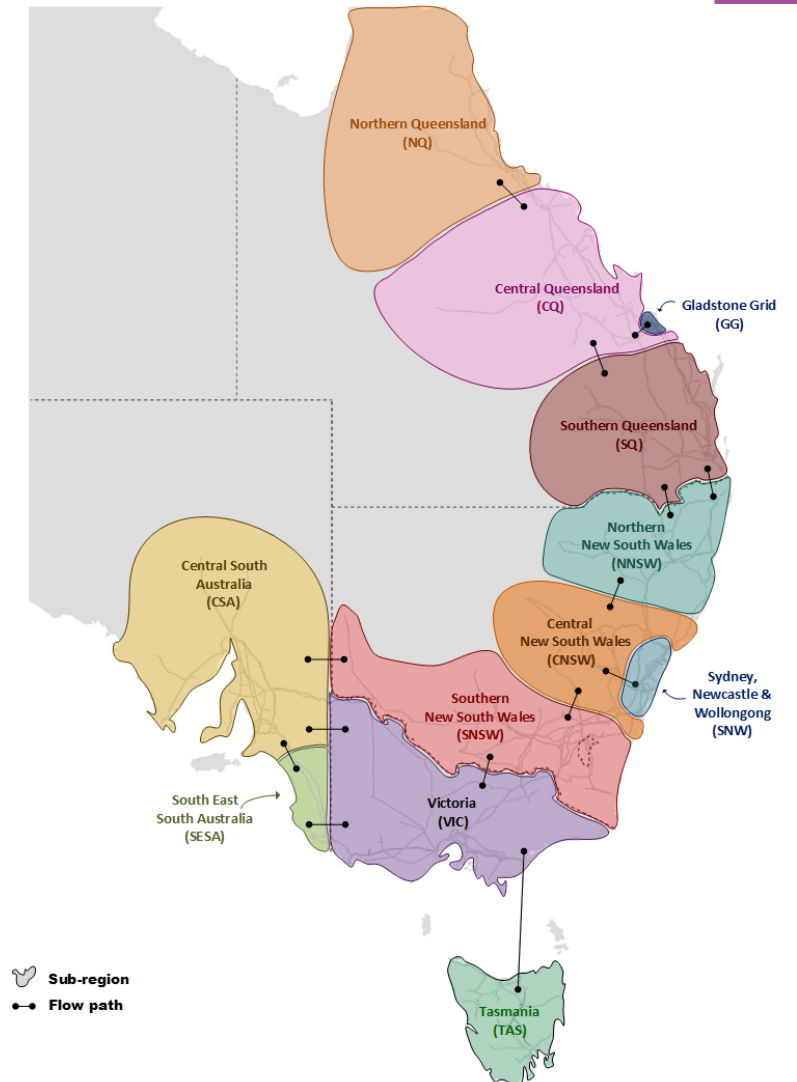
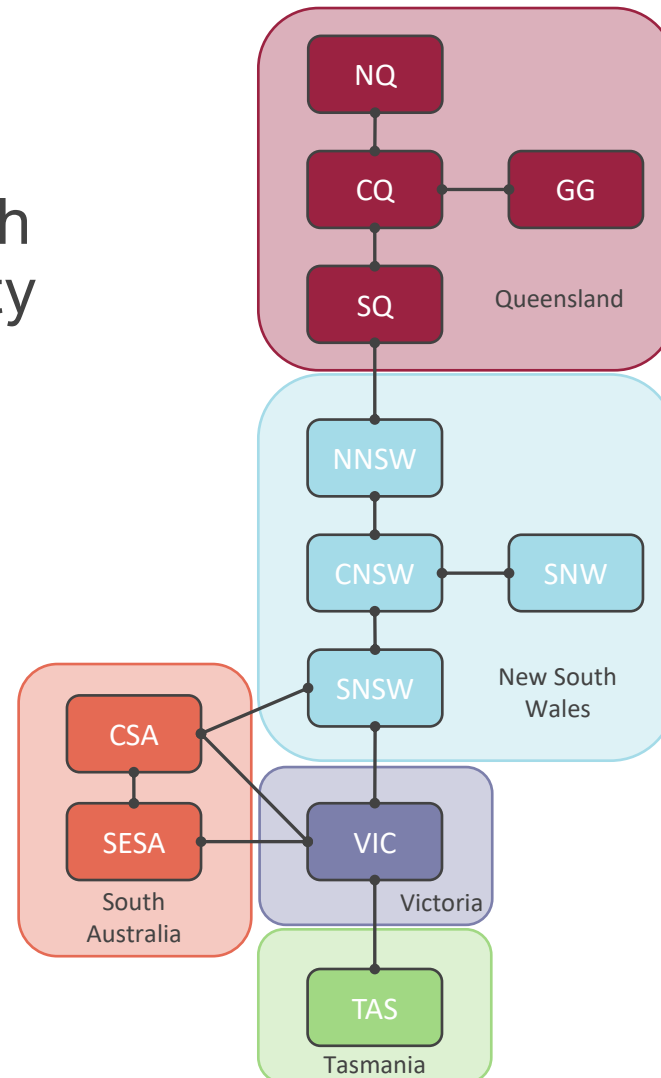


Modelling Electricity Networks within the Capacity Expansion Model

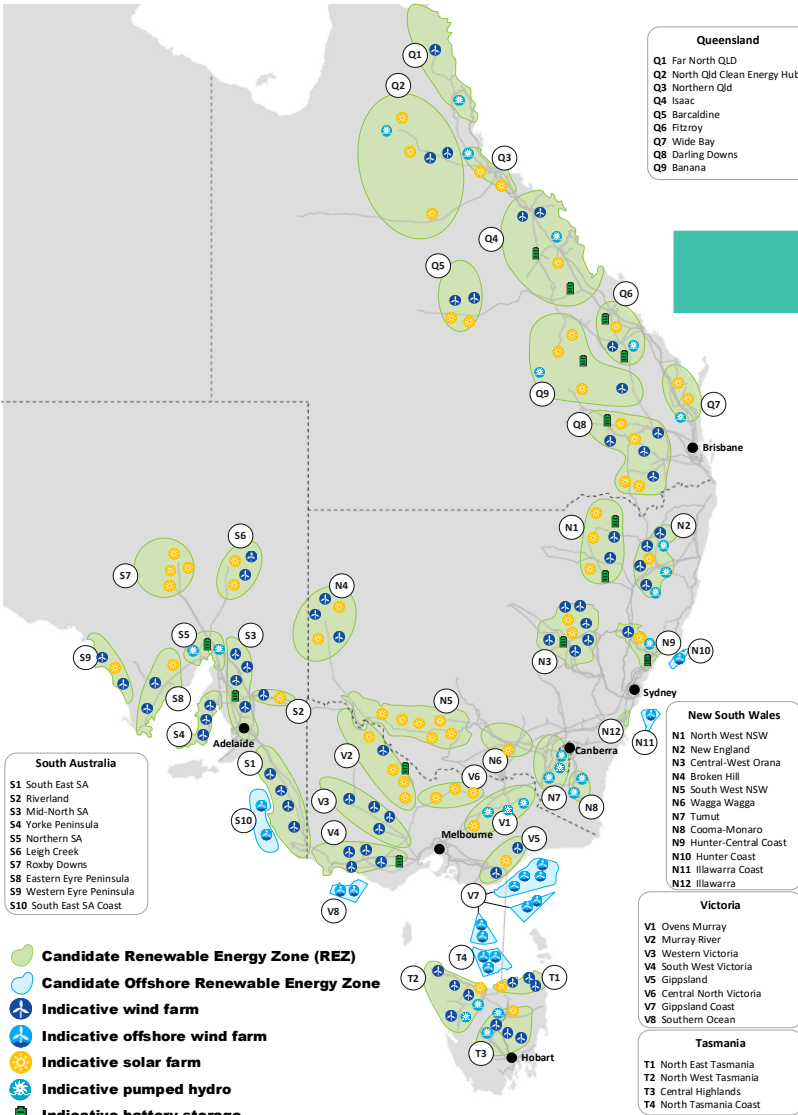


Spatial representation of the energy system

- Model complexity needs to balance spatial complexity with transmission capability and load/resource variations



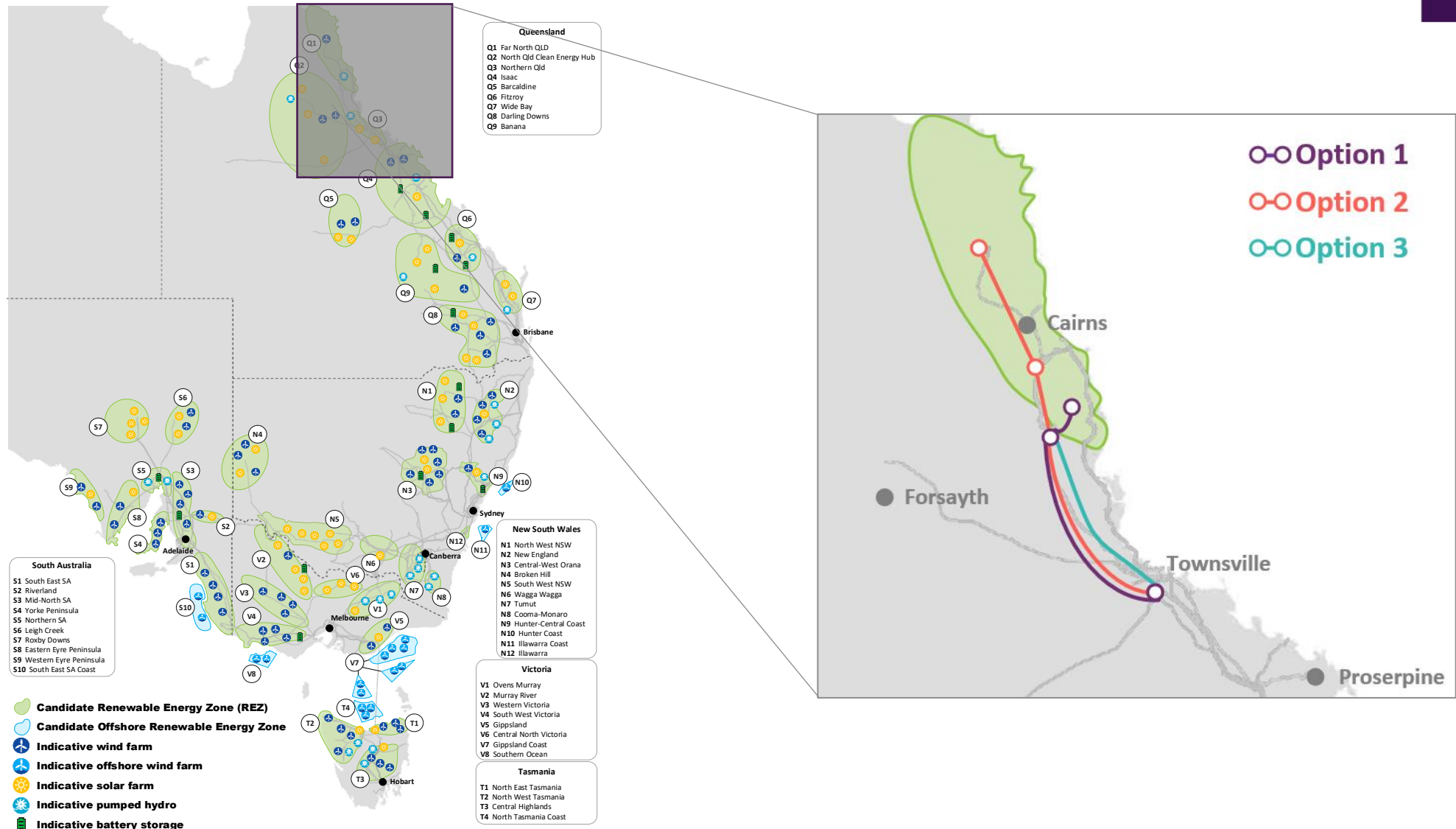
REZ limit modelling



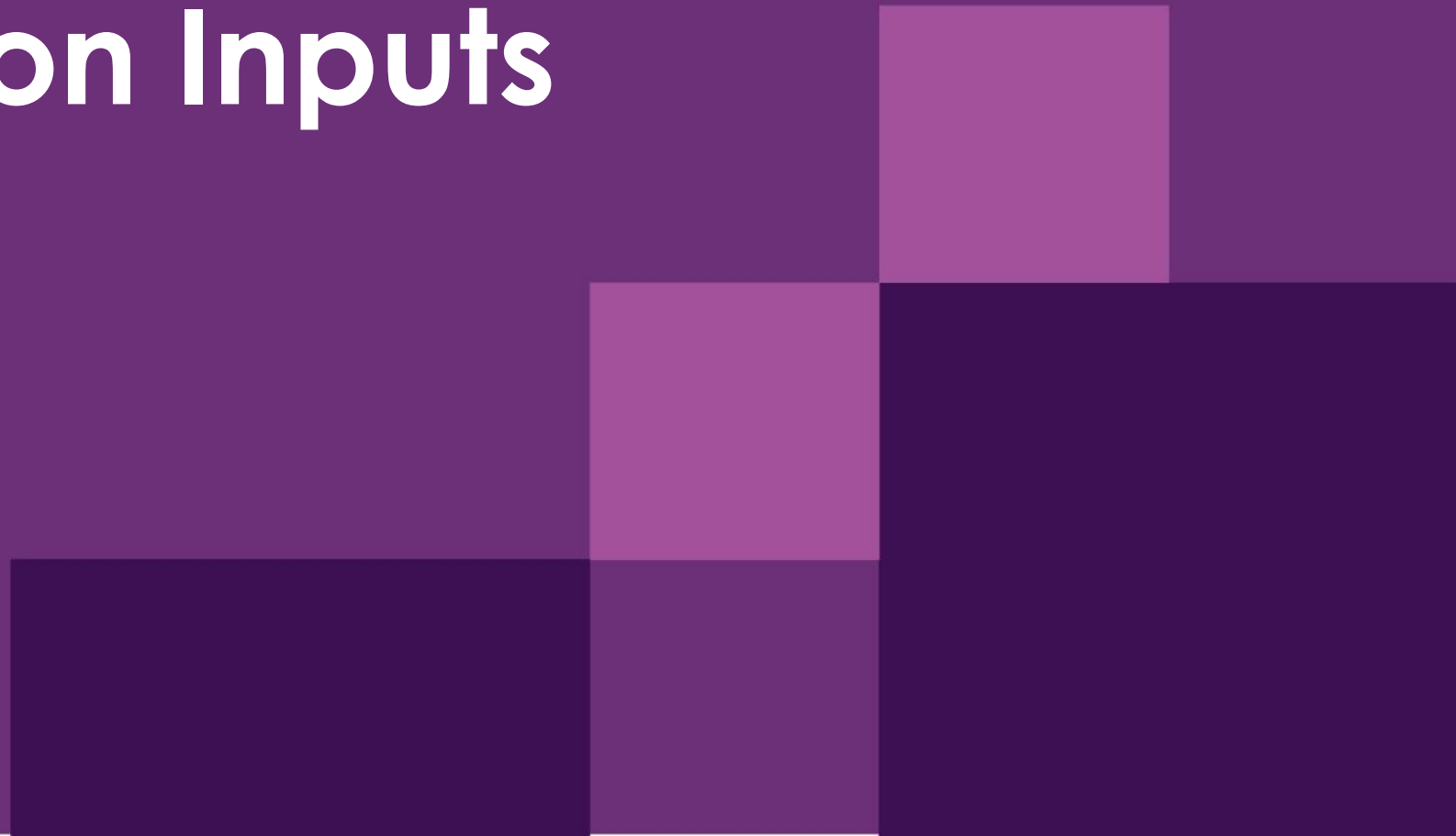
Numbers to be used in the ISP Modelling

REZ ID	REZ Name	Wind generation total limits (MW)				Solar PV Limits (MW)	Network expansion cost (\$m/MW)
		High	Medium	Offshore - fixed	Offshore - floating		
N1	North West NSW	-	-			6,385	2.82
N2	New England	1,800	5,600			2,985	0.37
N3	Central-West Orana	800	2,200			6,850	0.16
N4	Broken Hill	1,300	3,800			8,000	2.61
N5	South West NSW	1,000	2,900			2,256	0.57
N6	Wagga Wagga	300	700			1,028	-
N7	Tumut	-	-			-	-
N8	Cooma-Monaro	100	200			-	1.02
N9	Hunter-Central Coast	400	1,000			516	0.12
N10	Hunter Coast	-	-	-	7,420	-	0.46
N11	Illawarra Coast	-	-	2,288	6,940	-	0.41

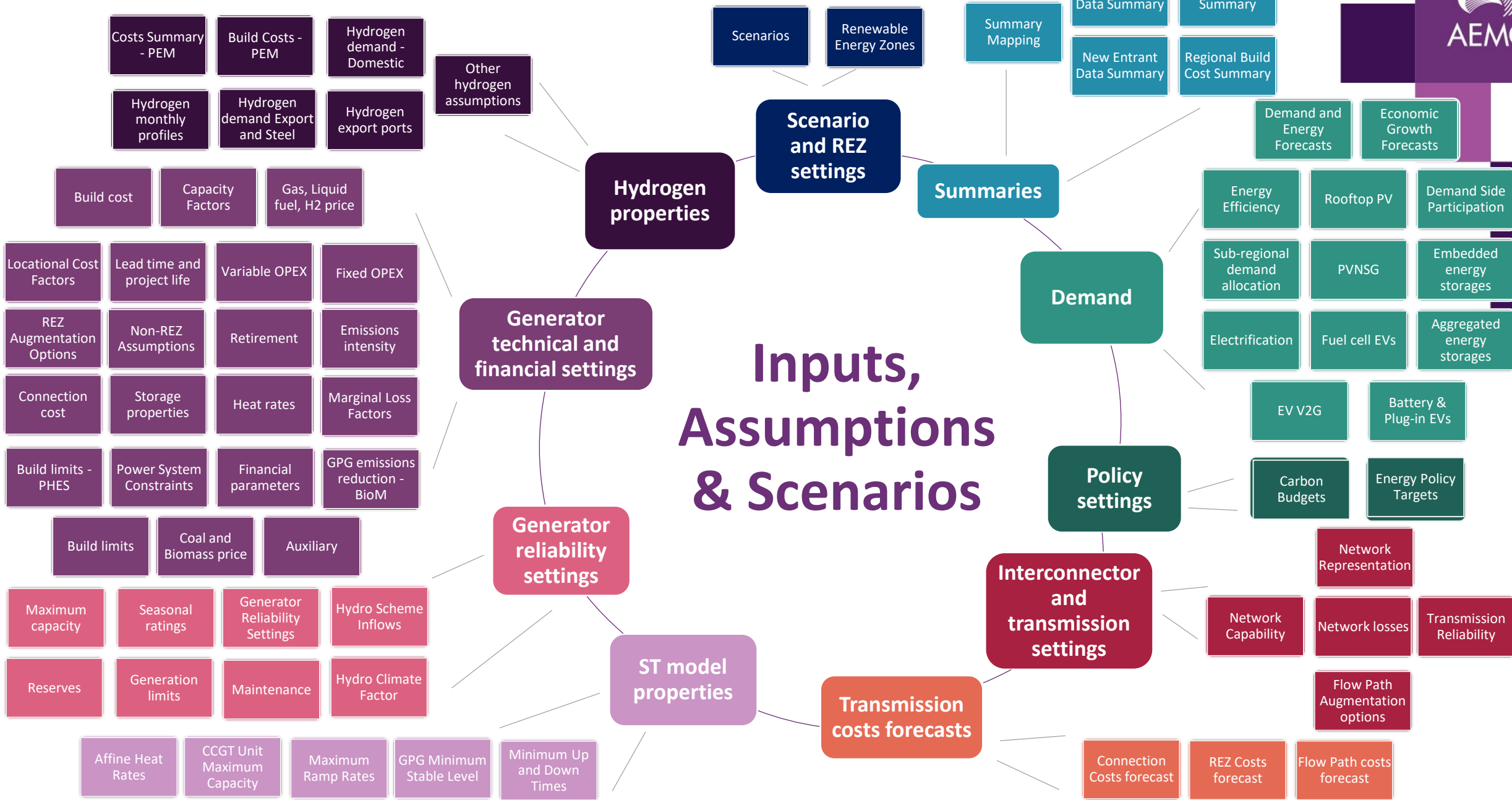
How could we develop a renewable energy zone?



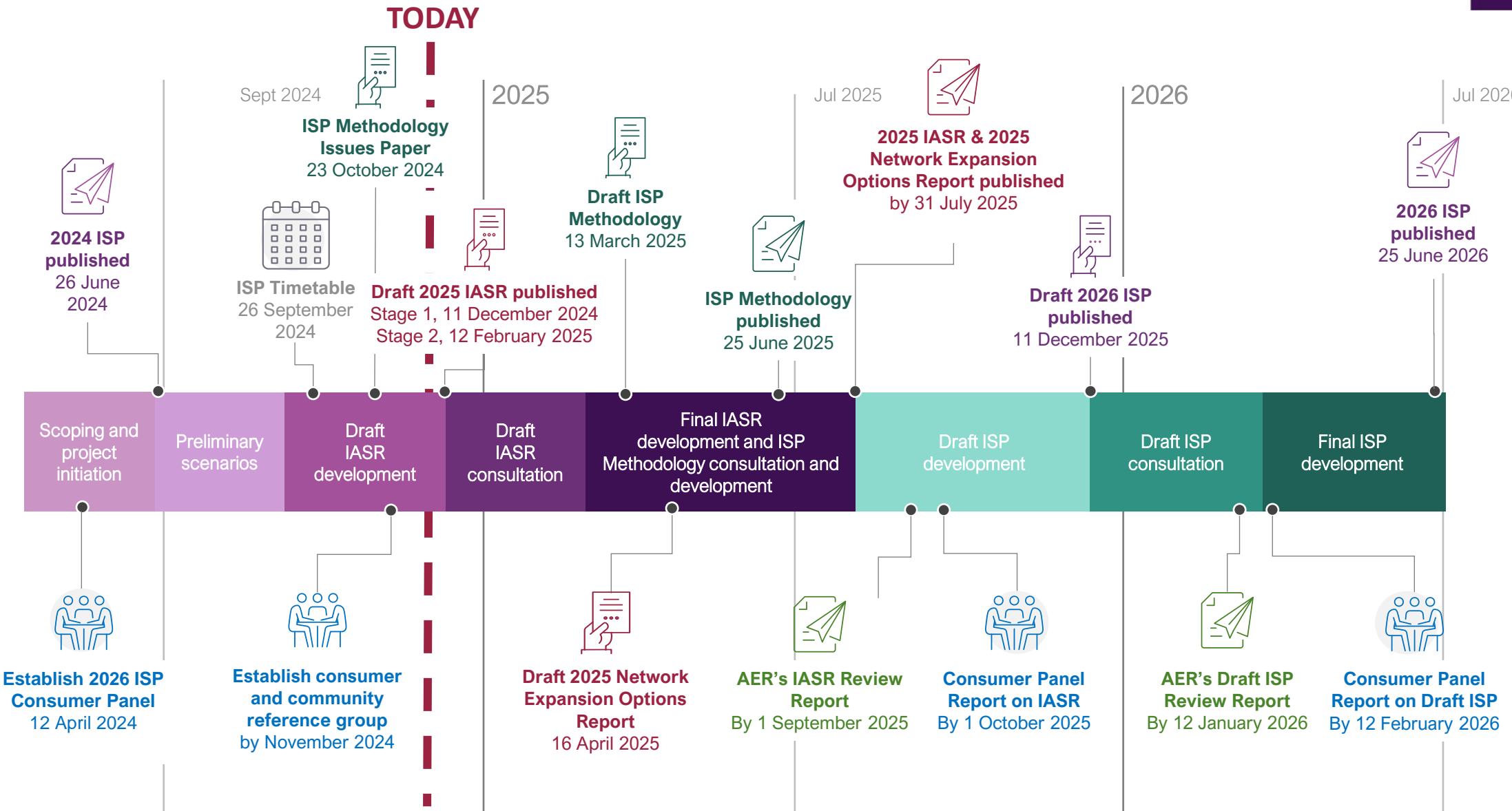
Developing and Consulting on Inputs



Many inputs and assumptions make up the IASR



The two-year ISP development cycle



Further details on the ISP

- ISP Fact Sheet:

<https://aemo.com.au/energy-systems/major-publications/integrated-system-plan-isp/integrated-system-plan-fact-sheet>

- ISP Methodology:

<https://aemo.com.au/energy-systems/major-publications/integrated-system-plan-isp/2024-integrated-system-plan-isp/isp-methodology>

- 2024 ISP Inputs and Assumptions:

<https://aemo.com.au/energy-systems/major-publications/integrated-system-plan-isp/2024-integrated-system-plan-isp/current-inputs-assumptions-and-scenarios>

- Full 2024 ISP documentation:

<https://aemo.com.au/en/energy-systems/major-publications/integrated-system-plan-isp/2024-integrated-system-plan-isp>