System Strength RIT-T

Project Assessment Draft Report (PADR) public webinar briefing

This event will be recorded and the recording published on AEMO's website

12 May 2025

We acknowledge the Traditional Custodians of the land, seas and waters across Australia. We honour the wisdom of Aboriginal and Torres Strait Islander Elders past and present and embrace future generations.

We acknowledge that, wherever we work, we do so on Aboriginal and Torres Strait Islander lands. We pay respect to the world's oldest continuing culture and First Nations peoples' deep and continuing connection to Country, and hope that our work can benefit both people and Country.

'Journey of unity: AEMO's Reconciliation Path' by Lani Balzan

AEMO Group is proud to have launched its first Reconciliation Action Plan in May 2024. 'Journey of unity: AEMO's Reconciliation Path' was created by Wiradjuri artist Lani Balzan to visually narrate our ongoing journey towards reconciliation – a collaborative endeavour that honours First Nations cultures, fosters mutual understanding, and paves the way for a brighter, more inclusive future.

Read our RAP

Agenda

1. Introduction
   - RIT-T process
   - The identified need
2. The approach
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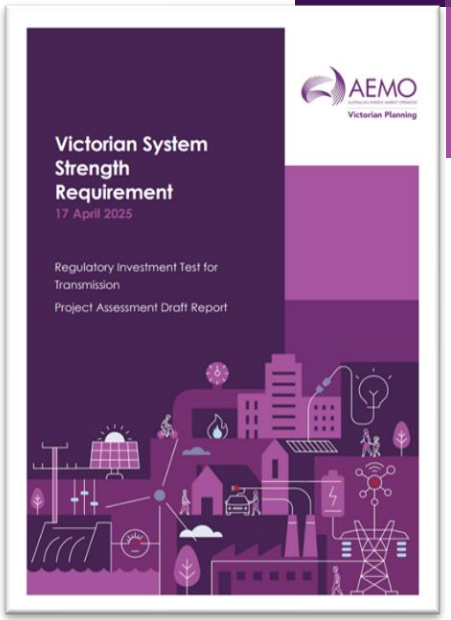
   - Inputs and assumptions overview
   - Market modelling and option portfolios development approach
   - Option costs
3. Option portfolios overview
   - Option development
   - Option portfolio assessment
4. The proposed preferred option and pathway forward
5. Next steps
6. Questions and Answers



Relevant material:

- All RIT-T reports and supporting material are available on AEMO's website.

Ask your questions:

- Submit questions at www.Sli.do with code #AEMO

1. Introduction

RIT-T purpose and process

- The purpose of this Regulatory Investment Test for Transmission (RIT-T) is to identify the preferred option that secures enough system strength services to meet the AEMO set standards from 2 December 2025 onwards
- AVP prepared the Project Assessment Draft Report (PADR), which was published 17 April 2025, in accordance with the requirements of NER 5.16.
- The PADR represents the second step in the formal RIT-T process and follows the Project Specification Consultation Report (PSCR) published in July 2023, and the accompanying request for information (RFI) for proponents of non-network solutions that helped inform the assessment of options to address this requirement
- PADR consultation concludes 30 May 2025 and AVP is targeting Project Assessment Conclusion Report (PACR) publication in early-August 2025
- Procurement is set to commence in parallel with the PACR preparation

The identified need

- In October 2021, the AEMC introduced new rules for managing system strength in the power system

- These rules introduced new obligations on AVP, as the System Strength Service Provider (SSSP) for Victoria, to use reasonable endeavors to plan system strength services to:
  - Maintain the **minimum three-phase fault level** specified by AEMO at each system strength node in Victoria (that is, meet the minimum level of system strength)
  - Achieve stable voltage waveforms for the forecast future inverter-based resource (IBR) connections projected by AEMO in steady state conditions and following credible contingencies or protected events (that is, meet the **efficient level** of system strength)

- The identified need for this RIT-T is to procure sufficient system strength services to ensure the system strength standard as per NER S5.1.14 is met for both forecast minimum and efficient levels at each of the Victorian system strength nodes from 2 December 2025 onwards

2. The approach

RFI and PSCR consultation submissions informed PADR approach and solutions

PSCR submissions informed PADR approach

- further specification of the identified need
- option value and the timing of options
- modelling and sensitivities
- how inter-regional assets are assessed
- the location of new system strength resources
- consideration of high benefit network reinforcement solutions
- real-time data and broader issues in procuring system strength
- engaging with other SSSPs to ensure a consistent approach

RFI submissions informed PADR options development

- 65 — Offers from existing generator owners in Victoria proposing existing synchronous generating units
- 9 — Synchronous condenser submissions from five separate proponents
- 1 — Compressed air storage system
- 1 — Pumped hydro energy storage system
- 19 — Grid-forming BESS proposals
- 14 — Separate proponents for grid-forming BESS proposals
- 1 — Magnetically controlled shunt reactor solution
- 1 — Combined synchronous condenser and STATCOM solution

Inputs and assumptions

- The amount of system strength required has been aligned to the AEMO 2024 System Strength Report released in December 2024

- In line with this, key PADR modelling assumptions predominately stem from:
  - 2024 ISP Step Change modelling results
  - 2024 ISP Inputs and Assumptions Workbook, or 2023 IASR where otherwise not available

- Short run marginal cost (SRMC) bidding applied, AER Guidance Note suggestion

- Minimum synchronous unit commitment was applied:
  - As a proxy for a more realistic dispatch while maintaining an SRMC bidding approach
  - To provide a form of system strength constraint for the other states

Market modelling and option portfolios development approach

Reference Case

- Energy only dispatch
- No system strength constraints or solutions

Base Case

- Included system strength constraints but no new system strength solutions
- Identified system strength gaps relative to the Reference Case

Option Portfolios Development

- Excel® model utilised a $/MVA of fault level contribution approach to identify the least cost additional solutions required to fill system strength gaps relative to the Reference Case
- Grouped least-cost solutions into Option Portfolios, acknowledging no single solution can meet the full requirements

Option Portfolios market modelling assessment

- Four Option Portfolios and an offshore wind self-remediation sensitivity were assessed through market modelling
- Market modelling accounts for some more detailed assumptions not considered in the Option Portfolio development Excel® model

Option costs

- Capital and O&M costs are predominately based on AEMO's Transmission Cost Database (TCD) and IASR; exceptions include:
  - Grid-following to grid-forming BESS conversion cost; a $2M flat capex is applied based on RFI submissions
  - Where no specific asset O&M cost was included in the TCD, 1% of capex per annum has been applied
  - Synchronous unit start-up costs, which predominately came from RFI responses where not available in the IASR

- The cost of existing generation consists of changes in fuel, fixed and variable O&M, start-up and emissions costs
  - Emissions costs were post-processed to avoid altering the SRMC merit order dispatch, per AER Guidance Note

- Sunk costs and wealth transfers do not impact the RIT-T assessment
  - Capex of existing, committed, anticipated and ISP forecast units (sync-gens, sync-cons and GFM BESS) are treated as sunk costs and are therefore not added as additional RIT-T capital/O&M costs
    - Converting existing grid-following BESS to grid-forming included a once-off $2M capex cost (covering NER 5.3.9 procedural changes)
  - Non-network proponent offer costs above the economic cost estimated for the RIT-T have been treated as a wealth transfer and therefore do not impact RIT-T net benefit calculations
  - The procurement process will aim to identify the specific lowest cost solutions and the ultimate cost to consumers will be determined from these costs

3. Option portfolios overview

Option development

- Minimum Fault Level:
  - Existing, committed and anticipated synchronous generation
  - Conversion of existing units to be able to operate in synchronous condenser mode
  - New synchronous condenser projects
  - New synchronous generation projects

- Efficient Level:
  - As above, plus existing, committed and anticipated grid-forming BESS
  - New grid-forming BESS and other inverter-based projects
    - Where BESS are forecast within the ISP capacity requirements, these are treated as anticipated

Option portfolio assessment

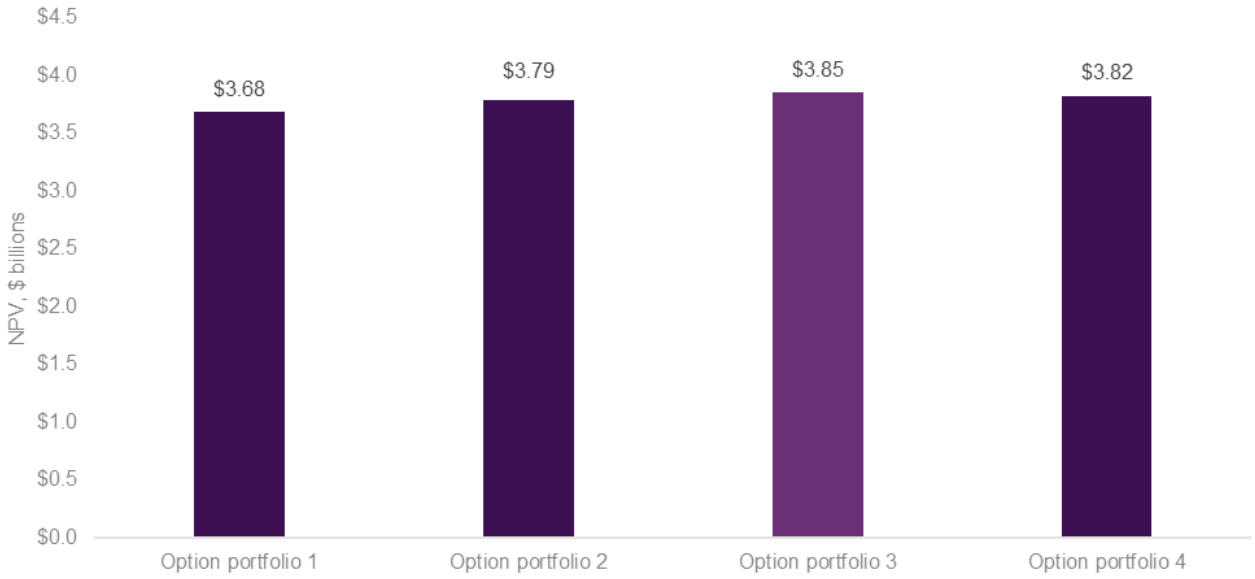
- Four credible option portfolios for this RIT-T were created and evaluated. This approach groups various solutions from the RFI and additional network options, recognising that no single solution can meet all the requirements on its own
- Each of the option portfolios allow additional technologies from the previous portfolio:
  - Option portfolio 1 includes existing generation plus committed/anticipated grid-forming (GFM) BESS and new SynCons, and conversion of generation to operate as SynCon
  - Option portfolio 2 is the technologies under option portfolio 1 plus upgrading committed and anticipated grid-following (GFL) BESS to GFM BESS and an additional (small) GFM BESS
  - Option portfolio 3 is the technologies under option portfolio 2 plus a 400 MW BESS from the IBR forecasts
  - Option portfolio 4 is the technologies under option portfolio 3, but expedites two new synchronous condensers

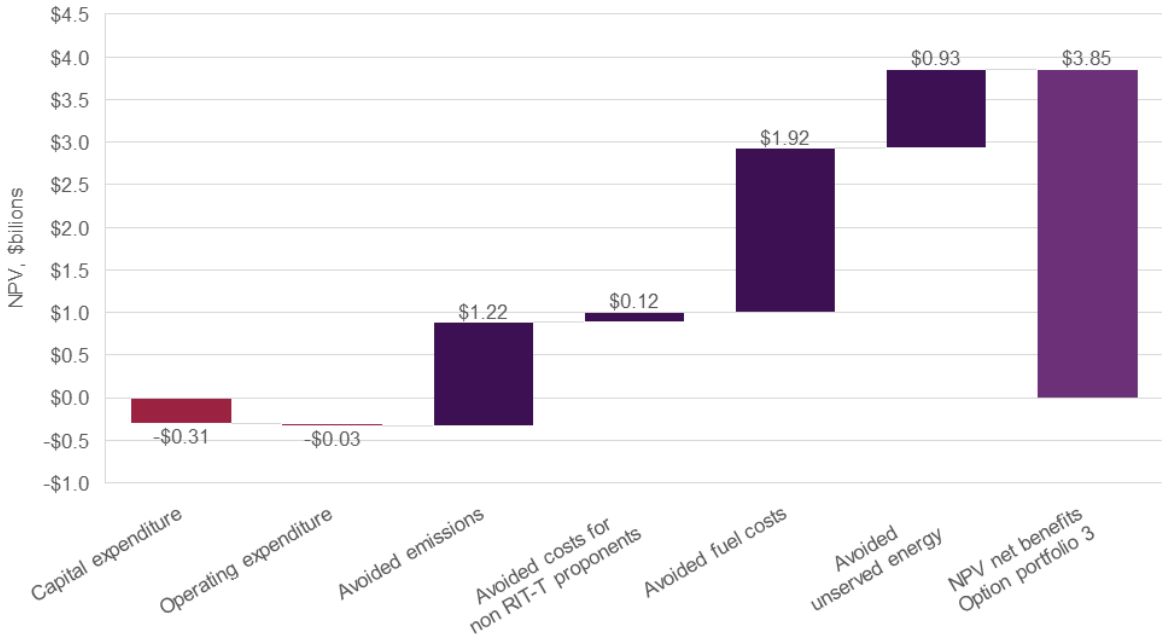
Each option portfolio was assessed against the base case that assumes only existing synchronous generators and existing system strength contracts are available to provide system strength.

4. The preferred option

Option Portfolio 3 is the top-ranked option

- All options are found to deliver substantial net market benefits – Option 3 is the top-ranked option
- Accelerating new plant able to operate as synchronous condensers is not found to deliver net benefits
- Upgrading significant additional committed/anticipated GFL BESS to be GFM (Option 2) is found to be effectively second-ranked
- Option 3 being preferred is found to be robust to a range of sensitivity tests – VER, SynCon/GFM-upgrade costs & discount rates





Option Portfolio 3 components

Contracting existing synchronous condensers/machines	Contracting new synchronous condensers/machines	Contracting grid-forming BESS
Varying level of services required from 2 December 2025 onwards	Two 250 MVA units by FY29 (Hazelwood) + One 250 MVA unit by FY31 (Hazelwood) + One 250 MVA unit by FY34 (Hazelwood) + One 250 MVA unit by FY35 (Giffard)	900 MW by FY28 (Moorabool) + 350 MW by FY29 (Hazelwood) + 350 MW by FY32 (Moorabool) + 900 MW by FY32 (Hazelwood) + 300 MW by FY33 (Moorabool) + 65 MW by FY35 (Red Cliffs)

Changes to Option 3 if Victorian offshore wind self-remediates…

Avoided

1x Giffard (Gippsland) Offshore Wind Hub 500 kV SynCon from 2035

Deferred

500 MW of GFL to GFM BESS upgrades at Hazelwood

350 MW of GFL to GFM BESS upgrades at Moorabool (from 2032 to 2034)

400 MW of generic ISP BESS at Hazelwood (from 2032 to 2033)

Added

500 MW of generic ISP BESS at Thomastown in 2033

Proposed pathway forward

	2025 Tendering		Future Tendering		
Option 3	3 syncons, 900 MW of GFM BESS near Moorabool, 350 MW of GFL BESS (upgraded to be GFM) near Hazelwood **&** Utilising existing generator units **&** Upgrading some existing generator units to be capable of operating in syncon mode	+	3 syncons **&** If two key BESS conditions are met: 1. 400 MW GFM BESS becoming 'anticipated/ 'committed' to provide system strength by 2032 2. A significant capacity of 'anticipated'/ 'committed' GFL BESS agreeing to upgrade to be GFM by 2033	=	**Greatest net benefit / least cost** Proposed preferred option 6 syncons (total)
Option 2	2025 Tendering (as above, includes the first 3 syncons)	+	If only the 2nd BESS condition is met, contract that GFM BESS and tender for 4 syncons (includes 1 syncon in place of not contracting 400 MW GFM BESS)	=	MCC alternative path 1 7 syncons (total)
Option 1	2025 Tendering (as above, includes the first 3 syncons)	+	If no BESS conditions are met tender for 7 syncons (includes 4 syncons in place of not contracting 1,615 MW GFM BESS)	=	MCC alternative path 2 10 syncons (total)

Pivoting to an alternative option would require AER approval of a 'Material Change in Circumstance (MCC)'

5. Next steps

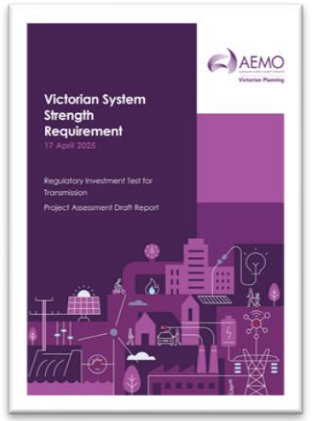
Next steps – 2025 key dates

RIT-T

30 May	early August	early Sept	2 Dec
PADR submissions due via email to AVP_RIT-T @aemo.com.au	PACR publication	RIT-T dispute period closes 30 days post PACR publication	System Strength obligation

Procurement

mid May	July	2 Dec	Q4
Phase 1* Tender release (existing services)	Phase 2 Tender-Market sounding (Services from new or converted assets)	System Strength obligation	Phase 2 Tender release



RIT-T reports and supporting material are available on AEMO's website.

* Note Initial procurement is a closed tender only to proponents of existing synchronous generators and existing synchronous condensers with spare (uncontracted) capacity

Questions and answers

Submit your questions at www.sli.do using code #AEMO