

Project EnergyConnect - Market Integration



Information Session

13 April 2026

Hosted by Hugo Klingenberg, ElectraNet



ProjectEnergyConnect.com.au

Agenda

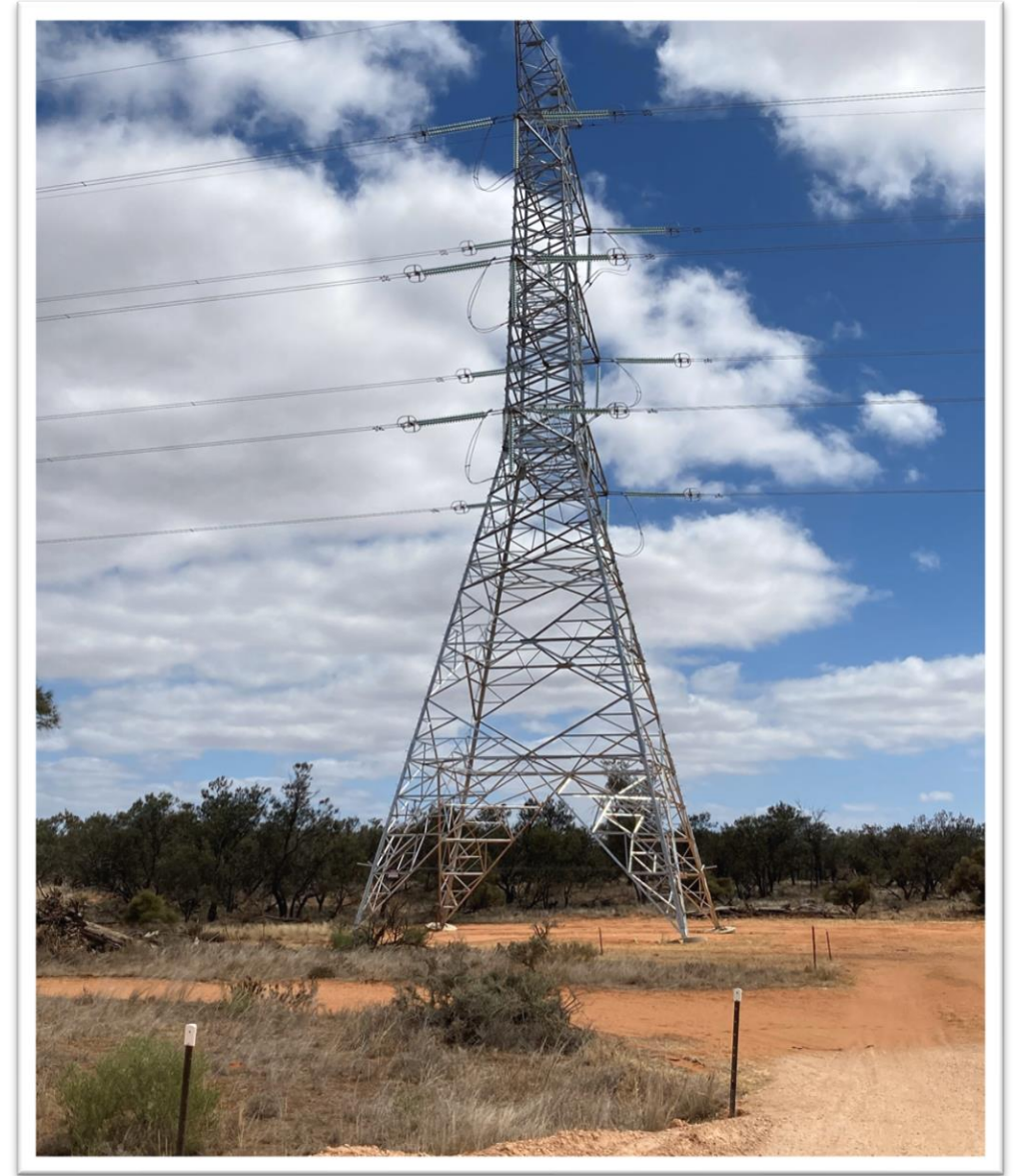
Item	Presenter	Time allocation
Purpose and timeline	ElectraNet	10 mins
Constraint formulation and market integration	AEMO	30 mins
Phase shifting transformer	Transgrid	15 mins
South Australian Interconnector Trip Remedial Action Scheme (SAIT-RAS)	ElectraNet	15 mins
Q&A	All	30 mins

Purpose and Timeline

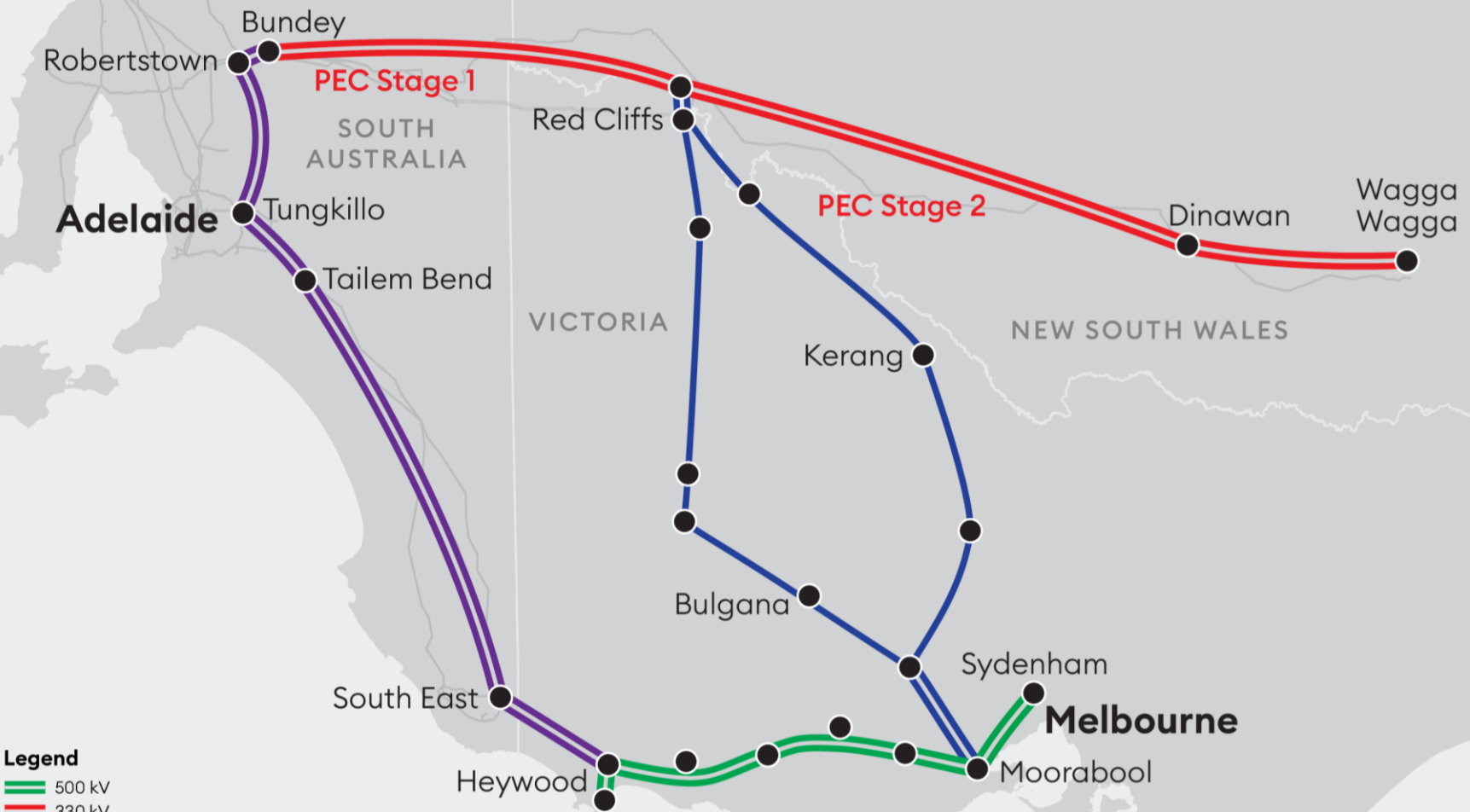
Hugo Klingenberg - ElectraNet

Purpose

- The purpose of the session is for AEMO, Transgrid and ElectraNet to provide an industry briefing update on Project EnergyConnect (PEC)
- Updates also provided through the [Project EnergyConnect website](#), as well as existing industry forums as appropriate



Project EnergyConnect



- 150 MW capacity has been released across PEC Stage 1 (PEC-1) (in both directions)
- Construction on the 700 km NSW section of PEC Stage 2 (PEC-2) is nearing completion
- PEC-2 to be completed and in service by the last quarter of 2026
- Inter-network testing will then commence (End Oct 2026) for release of up to 800 MW, subject to availability of suitable test conditions & successful test outcomes

Interconnector	Nominal Limit	Nominal Combined Limit	Combined Transfer Limit
Heywood Connector (HIC)	+/- 650 MW	+/- 1450 MW	+ 1300 MW
Project EnergyConnect (PEC)	+/- 800 MW		- 1450 MW

Status summary

- PEC Stage 1 (PEC-1) is in service with 150 MW of capacity released in both directions
- PEC-2 inter-network tests can only start once the following pre-requisites have been met:

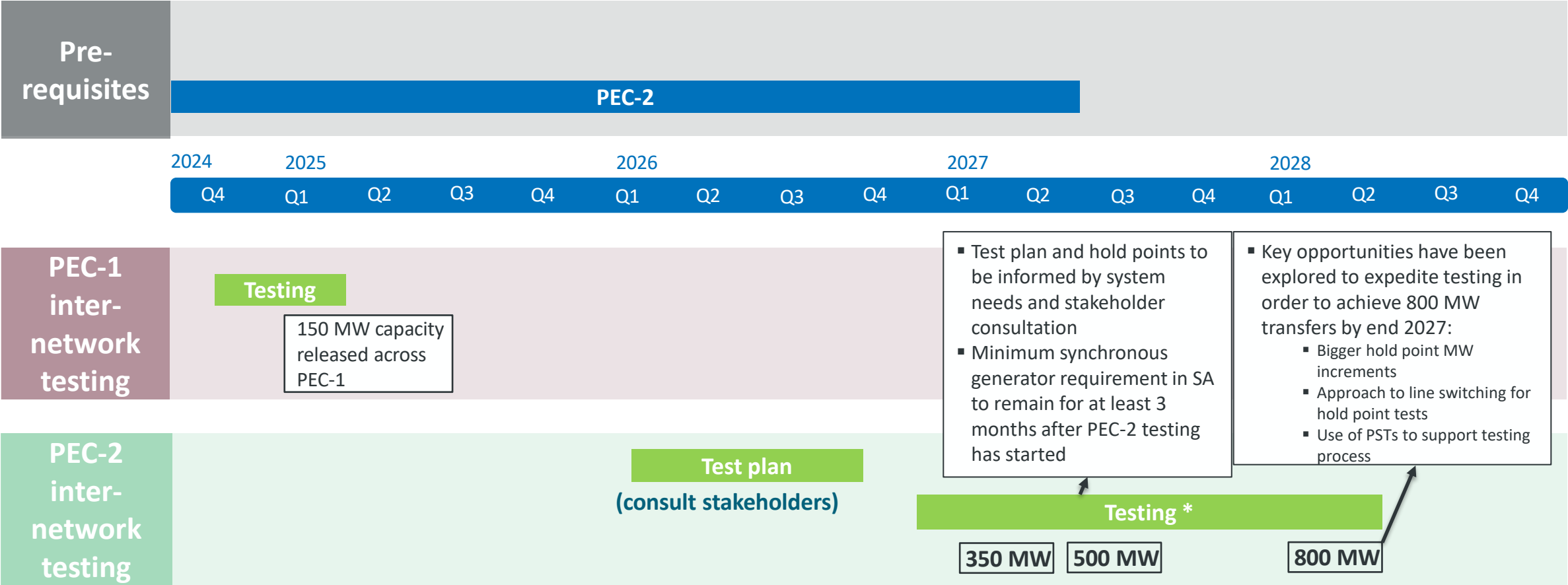
Pre-requisites	PEC-2 status
AEMO market systems are ready	On track
All network infrastructure is 'AEMO asset ready'	Expected end October 2026
Relevant Special Protection Schemes have been reviewed / commissioned	On track
Limits advice has been provided by TNSPs and developed into constraint equations by AEMO	On track

- AEMO is converting limits advice into constraint equations
- Explored opportunities to expedite PEC-2 inter-network testing, with Test Plan expected to be published soon for consultation



PEC capacity release – key dates

Estimated dates and hold points for inter-network testing



* Subject to availability of suitable test conditions & successful test outcomes

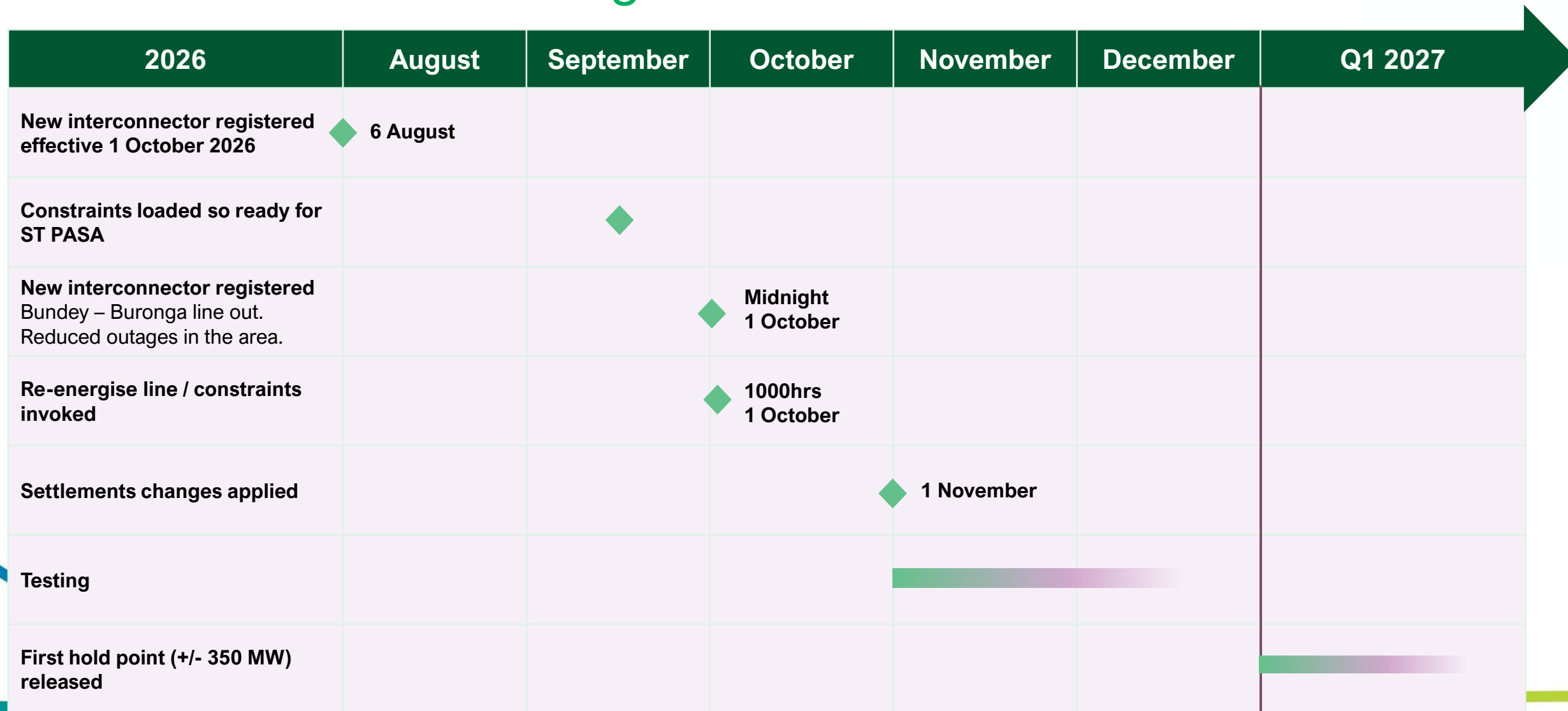
Constraint formulation and market integration

Ben Blake - AEMO

Overview

- Timeline for PEC-2 changes
- Geographic Overview
- Details on the changeover in September
- Market integration and changes
- Testing
- Loop flows and constraint changes

Timeline for PEC-2 changes



PEC Geographic Overview and Interconnectors



Transition to new interconnector

Preparation

- No NSW/SA outage bookings during transition
- Change freeze on system normal constraints in NSW, Vic and SA (starts 21 Sep)
- PD/ST PASA cutover confirmation
- EMS / Constraints data load
- Invoke PEC 1 outage constraints
- Switch Line 6F out of service (**evening prior**)

GO LIVE

Midnight

- Pre-dispatch cutover
- Market / Registration changes are effective

1000hrs

- Switch Line 6F into service
- Loop constraints operational

Monitoring

- Review operation
- Outages with PEC-1 and new interconnector
- PEC stage 2 testing

Market Integration & Settlements

- **Registration** – New interconnector NSW1-SA1. Flow from NSW to SA positive.
- **Dispatch**
 - Update to automated negative residue management (NRM) – from 1 Oct
 - New price scaling process
 - Interconnector limit setter changes to ignore loop constraints. Loop equations will bind all the time
- **Settlements**
 - New negative interregional settlement residue (IRSR) methodology - implementation of AEMC rule change – 1 Nov (backdated to 1 Oct)
 - Inclusion of PEC interconnector in the Settlement Residue Auction (SRA)
- **MLF** - calculations include PEC and a loop flow equation.

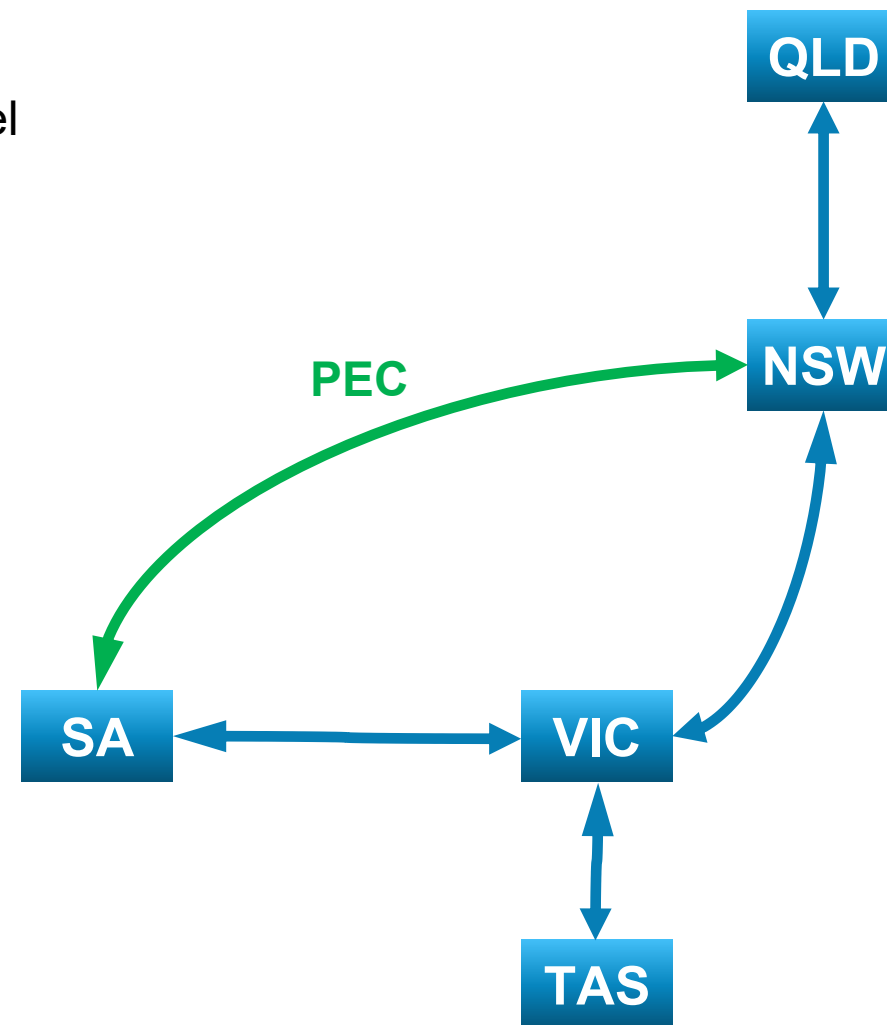
Inter-network testing

- Objective to increase NSW-SA capacity to 800MW in both directions.
- Three hold points: +/-350MW, +/-500MW and +/-800MW.
- PEC test program will be published for consultation May 2026.
- Internetwork Testing commencement Nov 2026.
- Q1 2027 - First hold point (+/- 350 MW) released.



Loop Flows

- NEMDE and PASA have a simple “hub and spoke” model
- Both **must** cater for the loop flows with PEC-2
- New loop flow constraints being developed
 - Complex! Testing in AEMO’s NEM Simulator
- Will change for different network configurations
- Start with “L” and always invoked
- Not needed for new PASA



Constraint changes

- Guide: if V-SA, Murraylink, Broken Hill Solar on LHS → PEC term
- General impact of PEC-2
- Updated Wagga voltage limits / Heywood
- Updated thermals in SA, NSW and Vic
- Removal of FCAS limits for Heywood outages
- Changes to outages in SW NSW and Nth Vic
- Change to how interconnector factors calculated



Handy links

- [IRSR arrangements for transmission loops](#)
- [PEC Market Integration](#)
- [Congestion Information Resource](#)

Phase shifting transformers

Michael Bradbery / John Hele - Transgrid









Oct 2, 2025
11:59 AM UTC +10:00

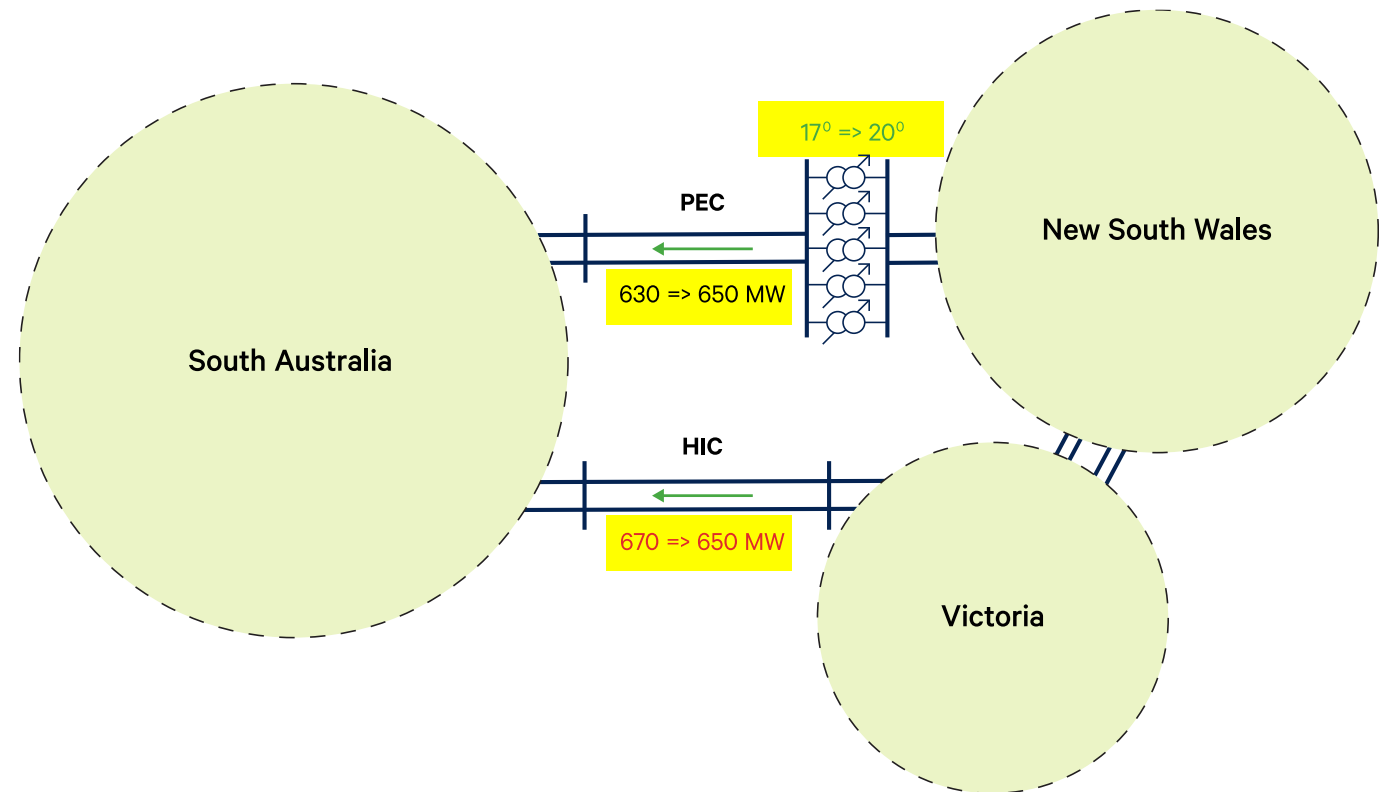
Transgrid
PEC



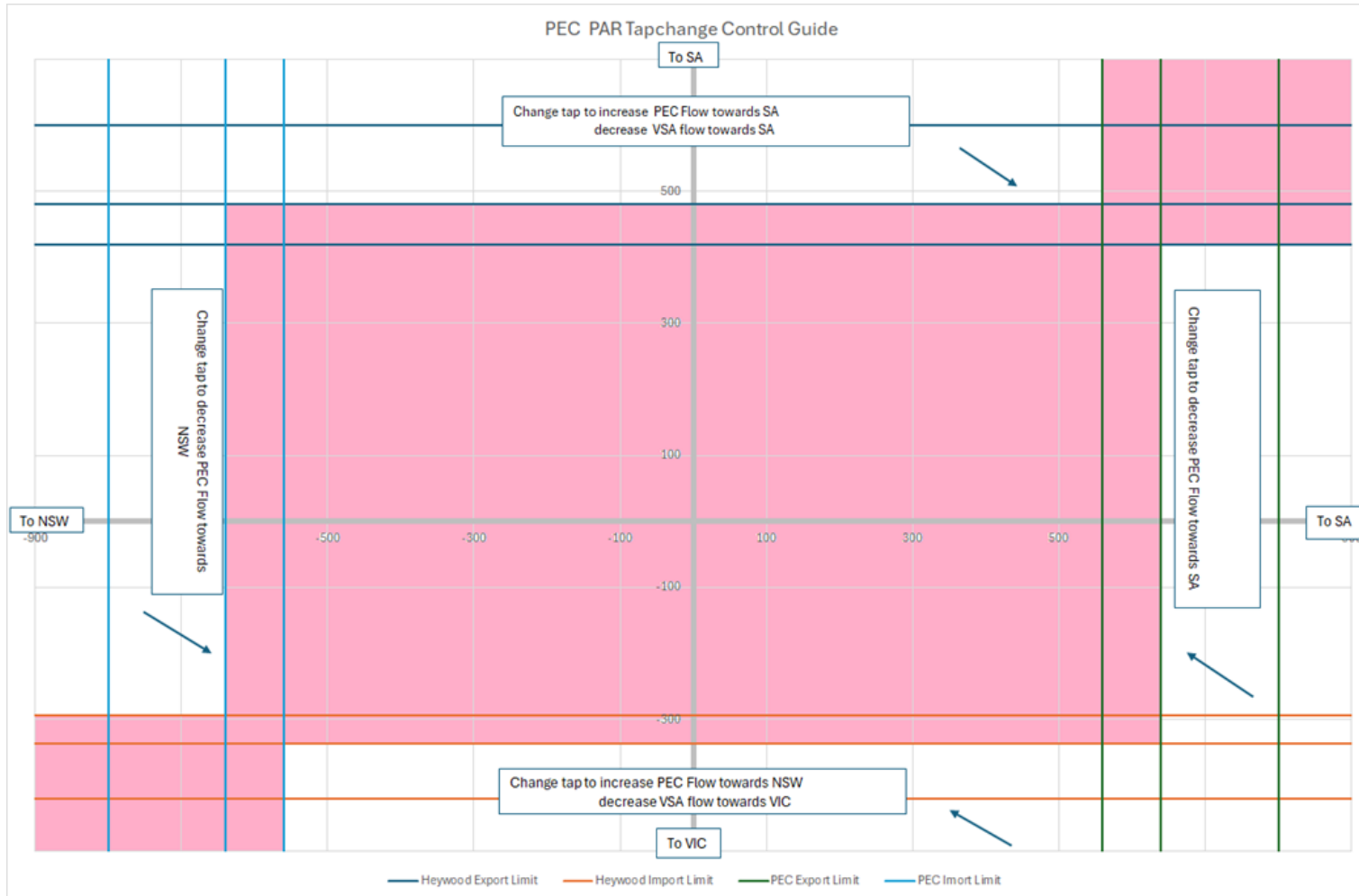
Phase Shifting Transformers (PSTs): Expected operation

- PST allows balancing of power flow sharing across the PEC and Heywood (HIC) Interconnectors
- Taps can be manually or automatically changed to divert flows between HIC and PEC when one of them gets closer to limits
- At times of high transfer, each PST tap change is expected to vary PEC flow by about 10 MW with PEC-1, and about 20 MW with PEC-2

Example	PST tap angle (degrees)	HIC (MW)	PEC (MW)	Combined transfer (MW)
SA import	17	670	630	1300
	20	650	650	1300
	40	510	780	1290
	0	780	520	1300
SA export	-25	730	710	1450
	-28	710	730	1450
	-40	640	810	1450
	0	890	530	1420



Phase Shifting Transformers (PSTs): Control Strategy Overview

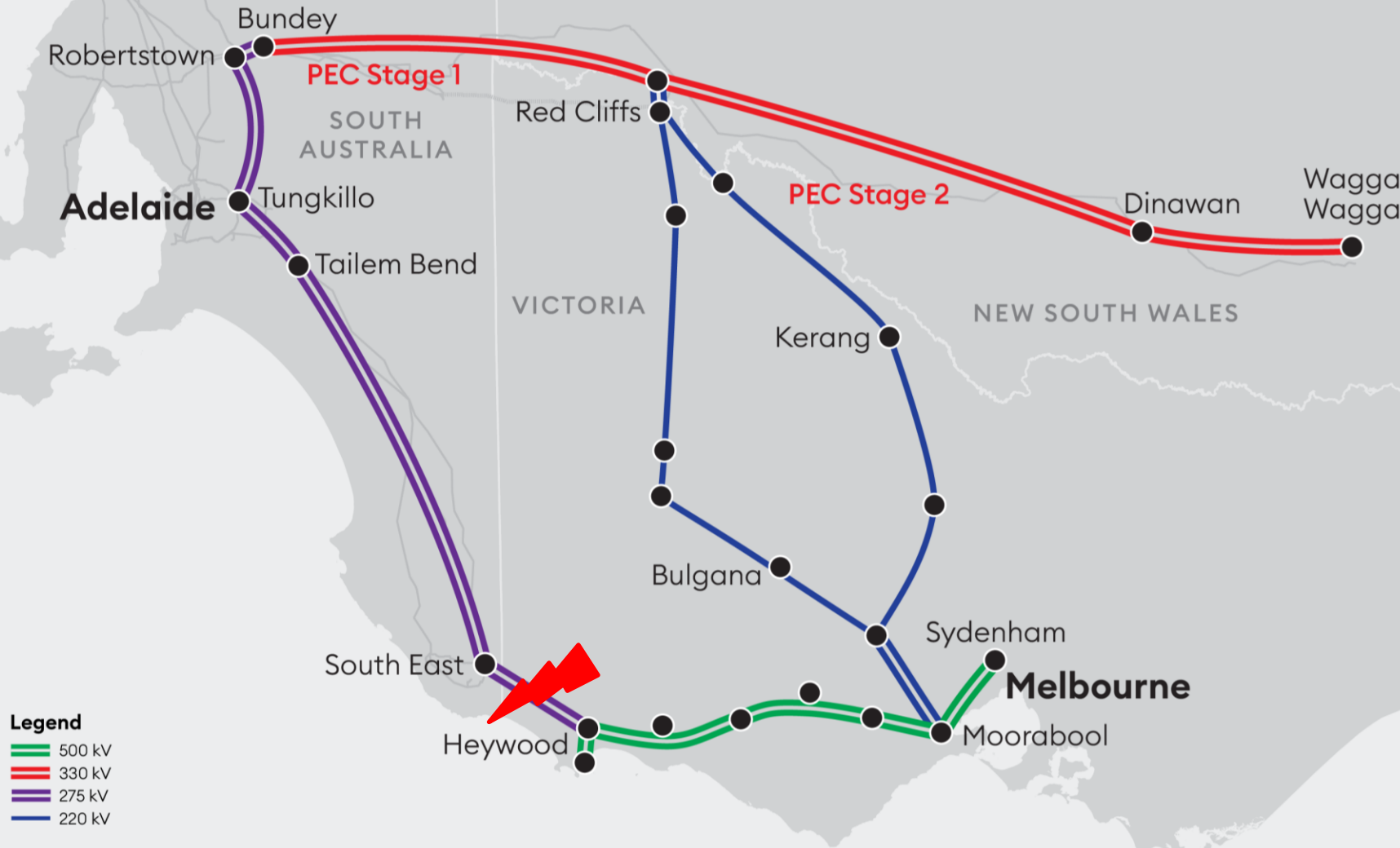


- System normal conditions: PSTs operated in Auto mode to enable automated power flow balancing across the HIC and PEC interconnectors
- Auto mode: PST tap changer will operate when one interconnector is above 80% of its telemetered limit, while the other is below 70% of its telemetered limit (white areas in the figure)
- The tap changer will not operate when the interconnectors are not approaching constraints or are equally constrained (pink areas in the figure).
- Non-Auto control mode will be activated under abnormal or high-risk system conditions. Under Non-Auto mode, the PSTs will be manually controlled by Transgrid under AEMO's instruction.
- PEC and Heywood Interconnector limits are expected to be telemetered from AEMO's dispatch engine via ICCP link to Transgrid's SCADA for implementation.

South Australian Interconnector Trip Remedial Action Scheme (SAIT-RAS)

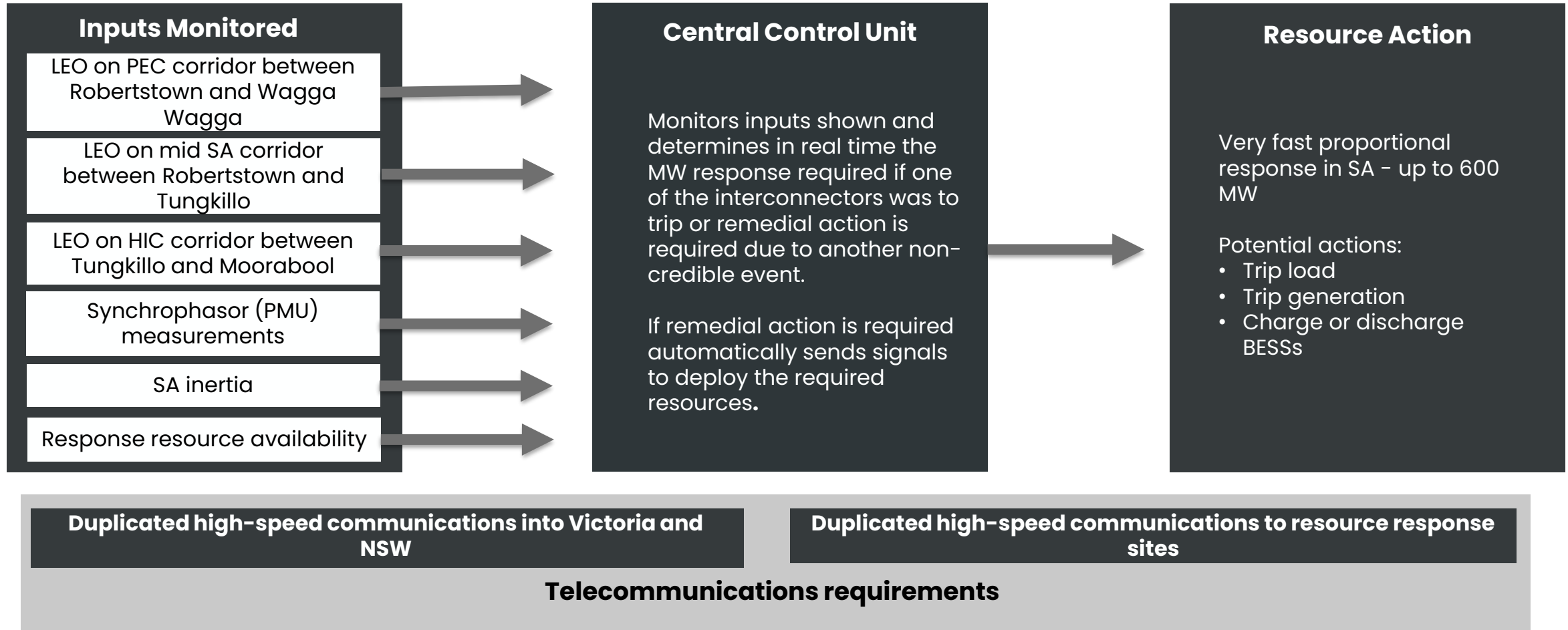
Hugo Klingenberg - ElectraNet

PEC-2: Managing non-credible events



- PEC will significantly reduce the risk of South Australia separating from the rest of the National Electricity Market (NEM)
- However, it introduces a new non-credible contingency
 - If either of the two interconnectors is lost (both circuits of an interconnector) under high power transfer conditions, the other could overload and trip
 - Tripping of both interconnectors would result in the separation of South Australia from the NEM and likely lead to a state-wide black system

SAIT RAS – Key concepts



SA– South Australia **LEO**– Line End Open **PEC**– Project EnergyConnect **HIC**– Heywood Interconnector **BESS**– Battery Energy Storage System

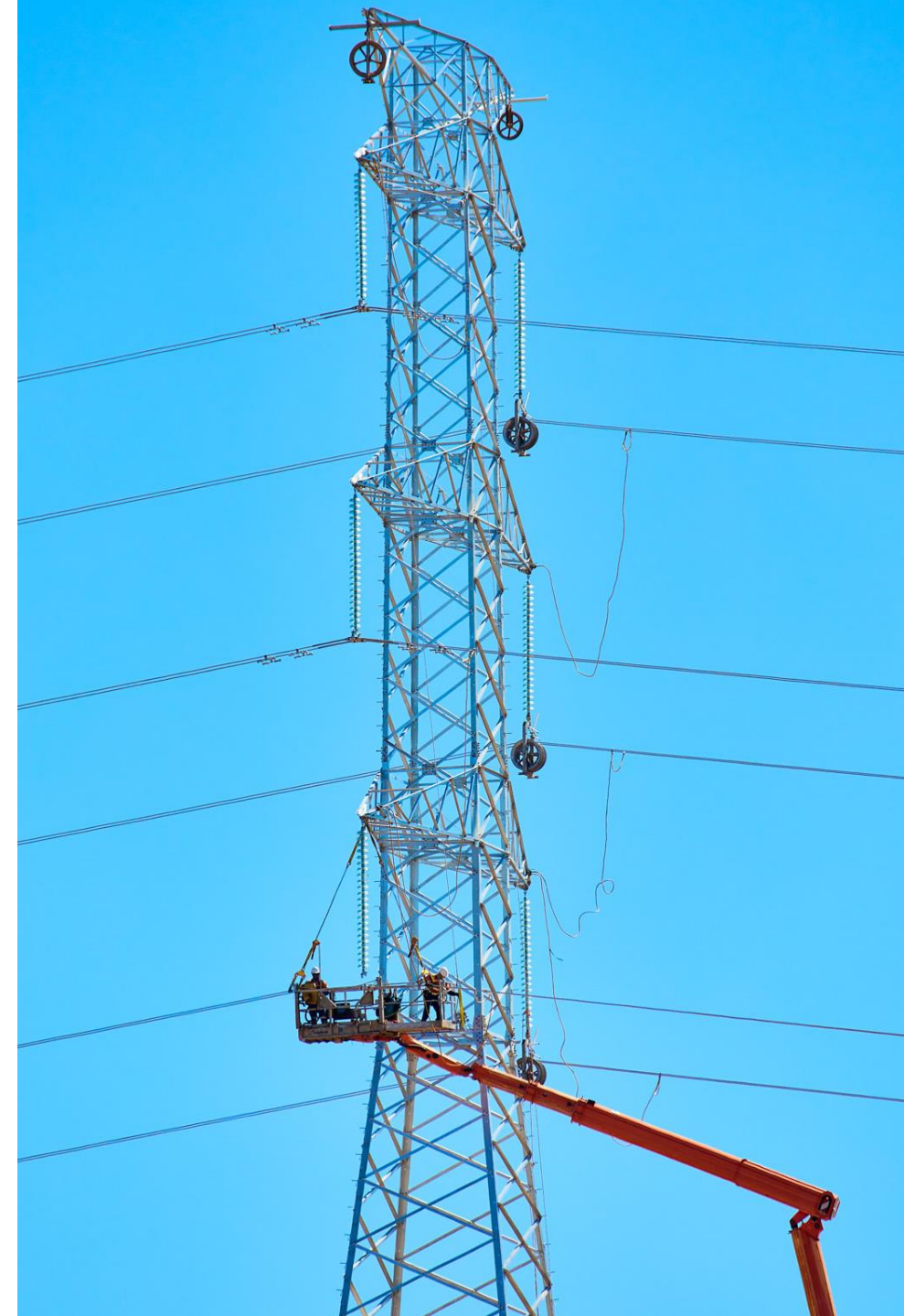
SAIT RAS and new connections

■ Relevant publications

- [PEC Connections Messaging](#)
- [PEC Connections Framework](#)
- [SAIT RAS and Transmission Connections in South Australia](#)

“SAIT RAS relies on responses from loads, generators and BESSs to be effective. This means that the response from these connections must be predictable. In the first instance, any connection must remain connected for a non-credible loss of either the Heywood or PEC interconnector. If this cannot be achieved for a new connection, the size and location of the connection will have to be reconsidered or the connection arrangements be refined”

- [Interface Between Battery Energy Storage Systems and SAIT RAS](#)
- Early engagement with ElectraNet / Transgrid / VicGrid is key to determine the impact on your connection



Q&A

Thank You!



System Integration Steering Committee:

Hugo Klingenberg, ElectraNet

Kasia Kulbacka, Transgrid

Teresa Smit, AEMO

Ashley Lloyd, VicGrid



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Reference Slides

Governance of System Integration activities

- System Integration Steering Committee (SISC) has responsibility for system integration activities, including stakeholder engagement as required
- The SISC is overseen by an Executive SISC comprising relevant ElectraNet, AEMO, Transgrid and VicGrid Executives and Project Directors

Key objectives of PEC System Integration Steering Committee

- Collaboration across AEMO, ElectraNet, Transgrid and VicGrid to coordinate timely PEC integration into the National Electricity Market (NEM)
- Provide governance and reporting in accordance with National Electricity Rules (NER) frameworks and meet all requirements of clause 5.7.7 of the NER
- Achieve combined transfer limit across both the Heywood and PEC interconnectors of 1,300 MW import into South Australia and 1,450 MW export. The project is designed to achieve these transfer levels with consideration of non-credible loss of either interconnector

Project EnergyConnect

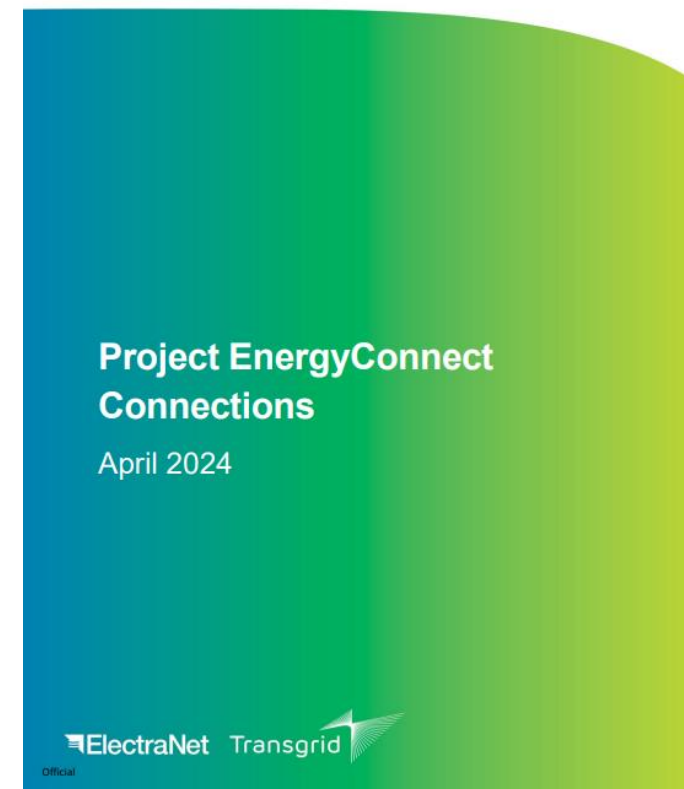
- PEC is a geographically diverse second Alternating Current (AC) interconnector that will significantly increase the transfer capability between South Australia and the rest of the National Electricity Market
- This will increase access to other regions and increase competition in the wholesale electricity market putting downward pressure on electricity prices

Interconnector	Nominal Limit (MW)	Nominal Combined Limit (MW)	Combined Transfer Limit ¹
Heywood Interconnector (HIC)	+/- ² 650	+/- 1450	+ 1300
Project EnergyConnect (PEC)	+/- 800		- 1450

1. Combined transfer limit dependent on transient system stability and sufficient loads and generators in the SAIT RAS
2. + import into SA
- export from SA
3. Current transfer limit is SA-VIC: 700 MW, VIC-SA: 750 MW
4. Transmission augmentation information: <https://aemo.com.au/en/energy-systems/electricity/national-electricity-market-nem/nem-forecasting-and-planning/forecasting-and-planning-data/transmission-augmentation-information>

Managing connection interest

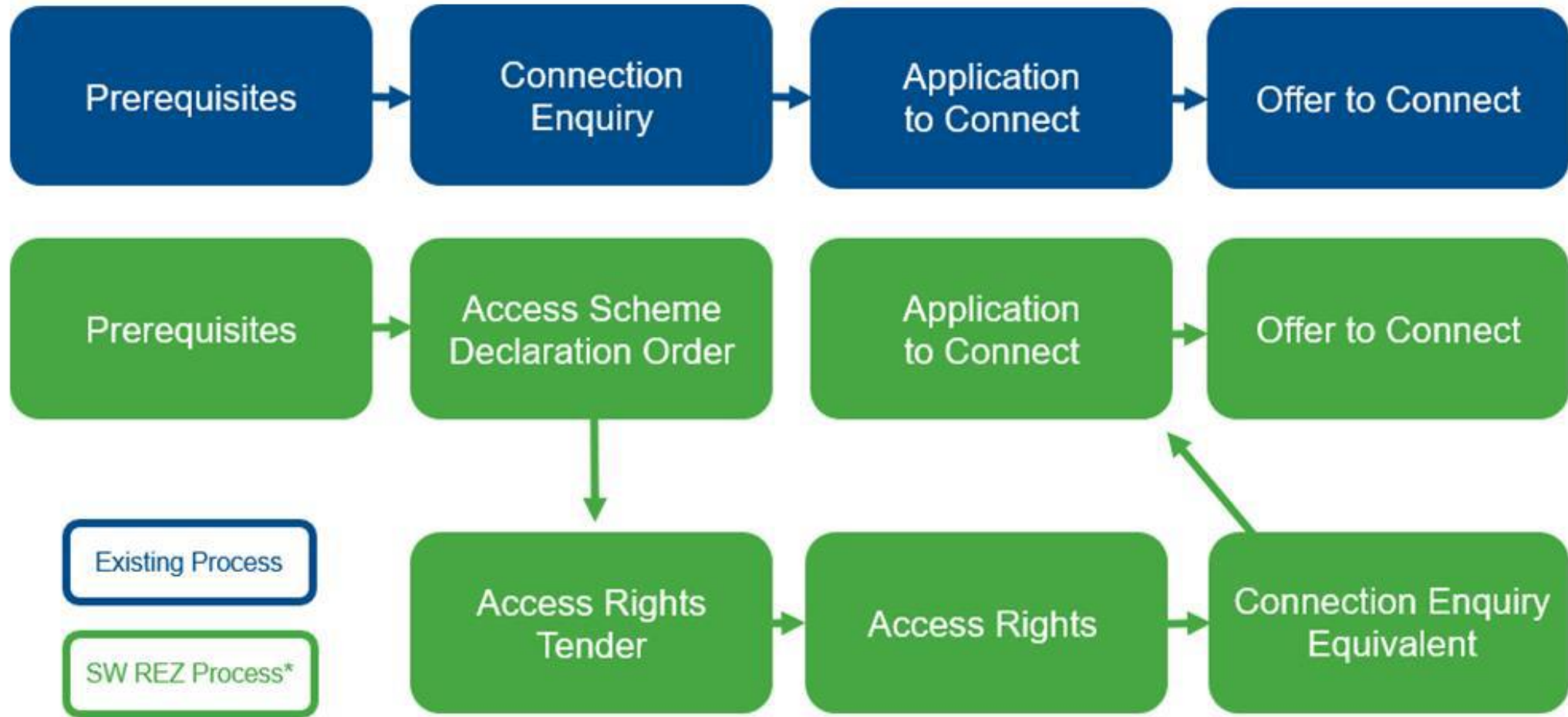
- There is a staged approach to progressing connections to PEC. A connections framework outlining pre-requisites for each connection project phase relative to PEC milestones is [available on Project EnergyConnect website](#).
- A connections update was [published on the PEC website](#) in April 2024 when the Connection Application pre-requisites were met.
- Participants can request PEC modelling data via the AEMO data request page
- Connections to certain sections of PEC network infrastructure in NSW will be subject to South-West REZ access arrangements (for details see: <https://www.energyco.nsw.gov.au/sw-rez>)
- The key Connection Assessment Transition Framework consists of the following milestones:
 - ☐ Connection enquiry pre-requisites (Complete)
 - ☐ Connection application pre-requisites (Complete)
 - ☐ 5.3.4A/B approval pre-requisites
 - ☐ Registration and commissioning pre-requisites



Draft connection assessment transition framework

Milestones	Connection Enquiry pre-requisites	Connection Application pre-requisites	5.3.4A/B approval pre-requisites	Registration and Commissioning pre-requisites
Status	Achieved in March 2023	Achieved in March 2024	In Progress	
PEC milestone	PEC formally achieves Considered status	PEC detailed design complete (design data available including functional requirements of South Australia Intertrip Remedial Action Scheme (SAIT RAS))	Detailed design of SAIT RAS finalised and complete	- SAITRAS commissioned and in service (including impact assessment on Heywood Interconnector) - PEC internetwork testing completed, and 500 MW transfer capacity released across PEC
PEC model maturity	- PEC planning models (PSS/E) available via AEMO data request - PEC PowerFactory model available	Standard or Detailed (S/D) data for Buronga and Dinawan synchronous condensers (syncons) available	PEC R1 dynamic models (PSS/E and PSCAD) available (including Buronga and Dinawan syncons)	PEC R2 dynamic models (PSS/E and PSCAD) available (including Buronga and Dinawan syncons)
PEC limit advice, Special Protection Schemes (SPS) and other considerations	Preliminary PEC Limit advice available	- Preliminary PEC limit advice available - Preliminary limit advice available for nearby key transmission lines - For connections to the NSW end of PEC, updated NSW SPS details (including preliminary impact on existing SPS in NSW) - SAIT RAS functional requirements available	- AEMO PEC constraint equations available. AEMO constraint equations available for nearby key transmission lines - For connections to the NSW end of PEC, updated NSW SPS details (including impact on existing SPS in NSW) - SAIT RAS impact assessment and coordination of any new control schemes by newly proposed connecting plant completed	- AEMO constraint equations for PEC and nearby key transmission lines available and active - SAIT RAS, NSW SPS details and limit advice updated based on connecting plant impacts

Proposed connection process after NSW South West REZ Declaration



* SW REZ process applies only for projects seeking connection to SW REZ 'access rights network'

AEMO's PEC market integration - dispatch

- Revise existing [automated Negative Residue Management \(NRM\)](#)
 - To ensure benefits flow to consumers from constructing and energising transmission loops and related transmission infrastructure, AEMO will not 'clamp' looped interconnectors to limit negative IRSR when 'net' loop IRSR is positive. Additionally, clamping would reduce the overall benefits of PEC by restricting the flow of electricity over the interconnector until negative IRSR is below the predefined threshold set by AEMO.
 - AEMO will introduce logic that permits the accumulation of negative IRSR on the VicSA, SA-Vic, SA-NSW, NSW-SA, NSW-Vic and Vic-NSW directional interconnectors while the net total of these residues ('loop-aggregate residue') remains positive. To implement this, a new Loop NRM Flag field will record the status of this aggregate residue, with a value of either 0 or 1. This change will occur in August 2026.
- Revise existing price-scaling algorithm to include a transmission loop. This change will occur in August 2026.
- PEC Stage 2 will be registered as a separate interconnector (NSW1-SA1). VNI and VIC-SA will revert to pre-PEC Stage 1 state.

More information:

- [AEMO Consultation on Automation of Negative Residue Management for the implementation of transmission loops](#)
- [AEMO Project Market Connect – Market Integration Project](#)

AEMO's PEC market integration - Settlements

AEMC published its final determination on the [inter-regional settlements residue arrangements for transmission loops \(IRSR rule\)](#) on 25 September 2025, and it commenced on 2 October 2025.

PEC will be a nominal 800 MW bidirectional interconnector between South Australia and New South Wales, with an additional connection to Victoria. This will require IRSR to be allocated across three sets of directional interconnectors, with the IRSR rule providing for a 'net trade' approach to allocation.

The IRSR rule includes transitional provisions (NER 11.188) for the:

- 'Loop operations start date', when PEC is represented as a separate directional interconnector in AEMO's dispatch systems (must occur between on 1 October and 2 November 2026).
- 'Loop settlements start date', when AEMO's settlement system is updated to allow settlements to occur for looped interconnectors under the new arrangements) (must occur between the 'loop operations start date' and 2 November 2026).

More information:

- [AEMC Inter-regional settlements residue arrangements for transmission loops](#)
- [AEMO Project Market Connect – Market Integration Project](#)