ElectraNet

10 April 2019

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Transmission and Gas Branch
Australian Energy Regulator
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Dear Sebastian

AER Information Request – SAET RIT-T Dispute

Thank you for your letter dated 2 April 2019, which requested information on the Special Protection Scheme (SPS) proposed in the SA Energy Transformation RIT-T Project Assessment Conclusions Report (PACR), specifically:

- What are the technical requirements of an SPS to ensure South Australia remains synchronously connected to the National Electricity Market (NEM) following the non-credible loss of either the Heywood interconnector or the proposed new interconnector while combined imports or exports across the interconnectors are at the maximum of 1300 MW;
- Since the publication of the Project Specification Consultation Report (PSCR), what process has ElectraNet undertaken in developing the SPS;
- What other measures are likely to be required to manage system security, for example limiting transfer capabilities/flows on either the proposed interconnector or Heywood; and
- Given the detailed design of any transmission project is not available prior to the successful completion of the RIT-T, what is the process to develop, approve and commission the final scheme?

We respond to each of these questions in turn below.

Technical Requirements for SPS

Objective of the SPS

The objective of the SPS is to keep South Australia connected to the NEM and operating securely following the non-credible loss of either the double circuit Heywood Interconnector or the new South Australia to New South Wales Interconnector, while importing or exporting power from South Australia.

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Limits to Transfer Capacity

Modelled limits have been imposed on the combined power transfer across the existing Heywood and proposed interconnector, to manage system security as shown in the table below.

Interconnector	Nominal Limit	Nominal Combined Limit	Applied Combined Limit in the PACR
Heywood	+/- 750 MW	+/- 1550 MW	+1300/-1450 MW
Proposed SA to NSW	+/- 800 MW		

+ Import into SA; - Export from SA

Typically, power networks are planned and operated to nominal limits which are derived from credible contingency limits i.e. +/-1550 MW in this case. However, in this case the modelled capability of the two interconnectors has been curtailed by 250 MW for import and 100 MW for export, to ensure that system security is always maintained.

Consistent with this, the economic benefits of the interconnector have been modelled for the purposes of the PACR assuming that this transfer limit is in place.

Action on non-credible loss of either interconnector

On detection of the non-credible loss of either interconnector, the following actions will need to be taken to keep the system parameters (primarily transient and voltage stability) within limits:

- While importing, battery systems (BESSs) to be rapidly discharged, and limited load shedding will be initiated; and
- While exporting, battery systems to be rapidly charged, and generation plant will be tripped.

Status of SPS development since the PSCR

Since publication of the PSCR, ElectraNet has carried out relevant system studies, identified design principles and undertaken preliminary design of the SPS as summarised below.

System Studies

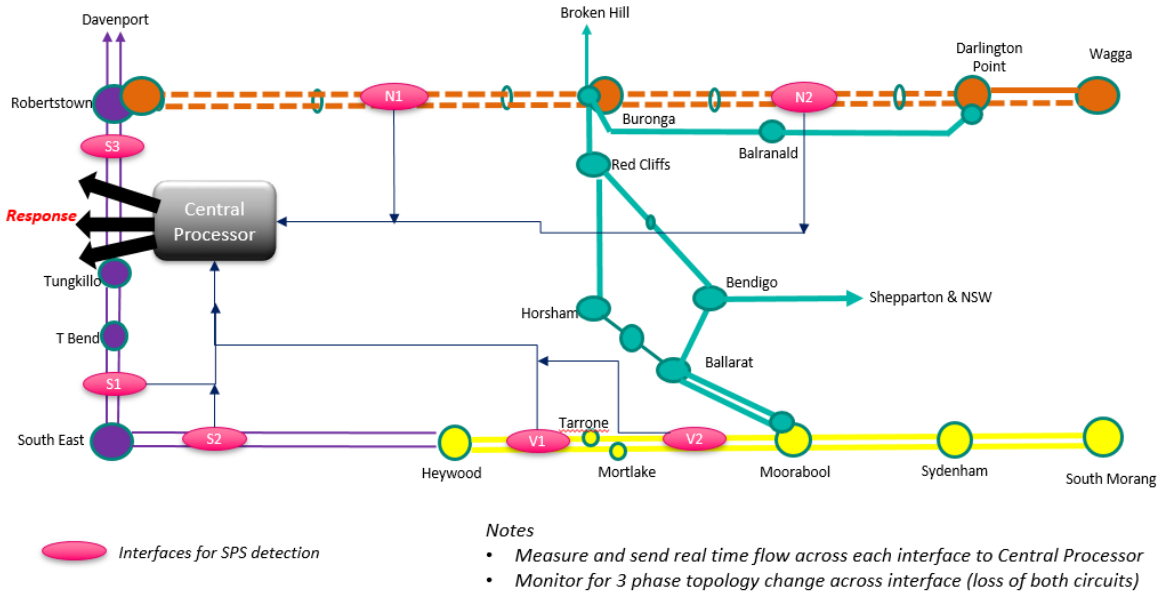
Power system studies have been undertaken for various operating conditions to test the operation of the SPS and ensure the South Australian power system remains connected securely with the NEM, without causing any other technical issues which may put system security at risk.

All studies undertaken to date have indicated that the system is secure following the SPS action and that all system technical parameters are within limits.

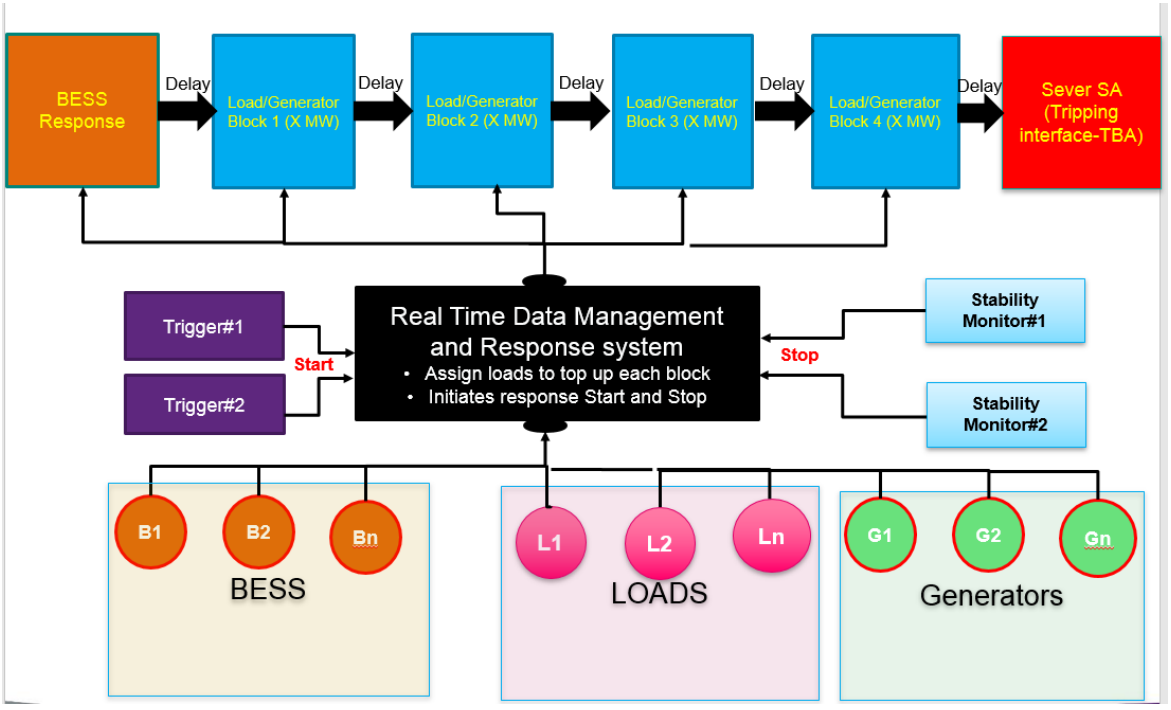
SPS Concept Design

The concept for the SPS is based on detection of loss of either interconnector from Robertstown, Tungkillo and South East in South Australia all the way through to Moorabool in Victoria and Darlington Point in New South Wales.

This is shown in the following schematic diagram.



The figure below shows the design concept of the scheme which takes real time information from battery systems, loads and generators, processes information in real time and ensures that sufficient response is available in the pre-defined blocks for rapid response to trigger events. There are also stability monitoring devices which indicate when to stop the response, when the system returns to a secure state.



SPS Design Principles

The following principles will be applied to ensure robust performance of the scheme:

- To provide a high level of dependability, the scheme shall comprise of redundant, substation hardened hardware platforms – no single failure shall prevent the scheme from operating when it is required to do so;

- To provide a high level of security the scheme shall comprise of two independent detection devices, configured in a two-out-of-two detection logic – no single failure shall cause the scheme to operate when it is not required to do so;
- The scheme shall communicate over redundant and diverse communication paths which will be continuously monitored;
- The hardware deployed in the scheme will incorporate a high level of supervisory and diagnostic functions to provide a remote indication of any failure;
- Appropriate response will be initiated based on the amount of MW lost due to loss of an interconnector;
- Real time measurement and processing of enabled load and battery data will ensure that adequate and timely response is always available. Response from batteries will be prioritised over load shedding; and
- The scheme will be designed to operate for all foreseeable prevailing network conditions including during network outages along the interconnector corridors and will be capable of expansion to include additional resources as they become available.

Consultation

As the detection of an event the SPS needs to respond to involves obtaining signals from TransGrid and AEMO (as system operator and Victorian planner), these TNSPs have been engaged in the development of the concept and preliminary design of the SPS.

Other Relevant Information

- System Integrity Protection Scheme (SIPS)

  ElectraNet has developed and successfully commissioned the System Integrity Protection Scheme (SIPS) in December 2017. This was recommended by AEMO following the SA system black event in 2016.

- Wide Area Protection Scheme (WAPS) – under development

  Following the recommendation by AEMO in its Power System Frequency Risk Review (PSFRR) in June 2018, ElectraNet is developing the WAPS scheme, to enhance the performance of the existing SIPS.[1]

The WAPS requires a pilot project to test the efficacy of Phasor Measurement Units (PMUs) to detect an event and initiate an appropriate response. A pilot project is part of the development process. It is expected that a significant amount of work and learnings from the WAPS will be leveraged in developing the SPS for the new interconnector.

Other Measures to Manage System Security

Transfer capabilities on both the new interconnector and Heywood interconnector will be managed in accordance with the operation of the SPS, as outlined above. More broadly, a range of further measures are being undertaken to manage power system security.

[1] AEMO, *Power System Frequency Risk Review Report*, June 2018, pp. 32-4.

Several changes to regulations and policies affecting both the NEM as a whole and South Australia specifically have recently been made with respect to system security, frequency control and system strength.[2]

Following completion of our RIT-T in February 2019, further regulatory changes to improve power system security in South Australia and the NEM more broadly are being progressed and include:

- *AEMO request for protected event declaration*

  As recommended in its 2018 PSFRR, AEMO has requested that the Australian Energy Market Commission (AEMC) Reliability Panel declare the loss of multiple transmission elements causing generation disconnection in South Australia during forecast destructive wind conditions as a new "Protected Event" to help AEMO maintain power system security and avoid islanding.[3] ElectraNet commented in support of this proposal.

- *Review of the Frequency Operating Standard*

  The AEMC Reliability Panel is expected to publish its final determination in April 2019 on its review of the frequency operating standard which sets requirements for frequency performance in the NEM and informs how AEMO operates the power system, including through applying constraints on generation dispatch and procuring ancillary services. This review builds upon the AEMC's 2018 Frequency control frameworks review and aims to maintain the safety and security of the NEM.[4]

- *Review of the System Black Event in South Australia on 28 September 2016*

  The AEMC will review the factors which contributed to the black system event and publish its findings following completion of the AER's final compliance report. The AEMC's review will build upon work conducted by the AER and AEMO, focused on the compliance of market participants with the requirements of the National Electricity Law and Rules and technical issues contributing to the event, respectively.[5]

- *Other regulatory changes*

  Further regulatory changes include reinstatement of the long notice Reliability and Emergency Reserve Trader (RERT) to allow an extended lead time for procuring reserves[6] and establishing a register of Distributed Energy Resources (DER) by end 2019 to provide AEMO with greater visibility and information including DER locations and trip settings.[7]

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2 These changes and their treatment within our RIT-T assessment are discussed in detail within Chapter 2 of the Project Assessment Draft Report (PADR).

3 Information on the AEMC's consultation is available at https://www.aemc.gov.au/market-reviews-advice/request-declaration-protected-event-november-2018.

4 Information on this consultation is available at https://www.aemc.gov.au/markets-reviews-advice/review-of-the-frequency-operating-standard.

5 Information on this review is available at https://www.aemc.gov.au/markets-reviews-advice/review-of-the-system-black-event-in-south-australi.

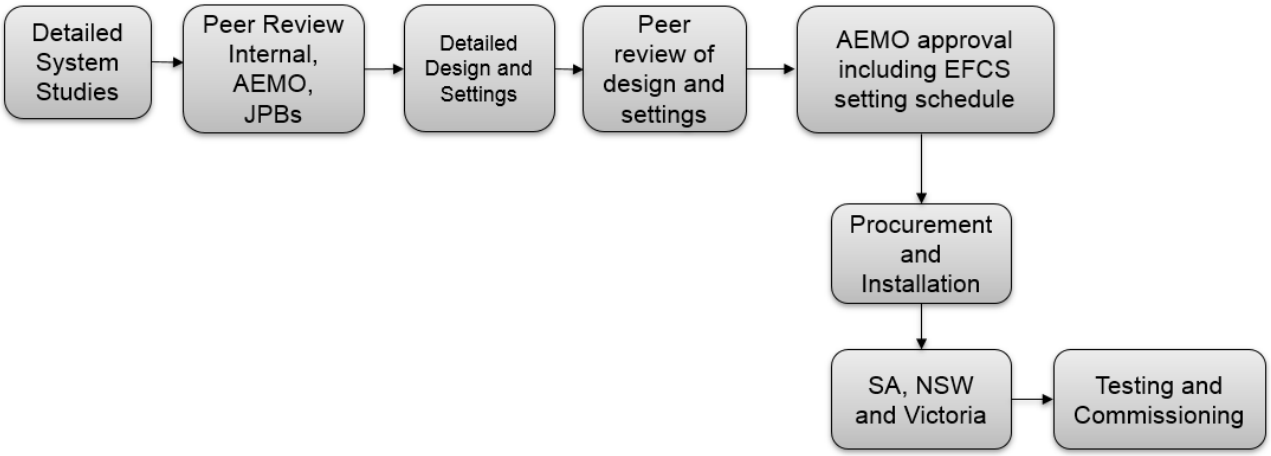
6 The AEMC finalised rule changes in June 2018 regarding this mechanism. See https://www.aemc.gov.au/rule-changes/reinstatement-long-notice-reliability-and-emergency-reserve-trader.

7 As provided for by the AEMC's September 2018 final determination available at https://www.aemc.gov.au/rule-changes/register-of-distributed-energy-resources.

Development and Approval of SPS

Detailed design of the SPS will be undertaken based on the preliminary design concepts and principles developed, following regulatory approval of Project EnergyConnect.

The design and approval process will include the steps shown in the following diagram.



We expect to use an independent expert consultant to undertake a peer review of the scheme during the development phase.

If you have any further questions, please call me on (08) 8404 7983.

Yours sincerely

Rainer Korte
Group Executive Asset Management