SA Transmission Network Voltage Control - Summary

RIT-T Project Specification Consultation Report

DECEMBER 2022

ElectraNet

Copyright and Disclaimer

Summary

South Australia remains at the forefront of the global energy transformation. This is bringing with it a range of challenges as renewable energy sources such as solar, wind and storage and distributed energy resources in homes and businesses continue to displace traditional generation and drive two-way power flows across the network.

The transmission network is playing an essential role in helping to manage an increasingly complex power system, providing important system services, that are being lost as conventional thermal generation decommits, to ensure safe, secure, reliable and affordable supply of electricity to customers into the future.

The **identified need** of this RIT-T is to ensure sufficient static and dynamic voltage control capability within South Australia to satisfy S5.1a.4, S5.1.4 and S5.1.8 of the National Electricity Rules (NER).

This is a reliability corrective action requiring ElectraNet to identify the lowest cost technically feasible option that meets the identified need.

A forecast shortfall in reactive power management capability is emerging across the network due to a range of factors as the energy system continues to evolve, including:

- The need to offset 1200 Mvar of transmission line charging on the transmission network during low or zero demand conditions caused by distributed solar PV offsetting demand (at higher load levels, transmission line charging is typically offset by transmission line reactive power losses and by inductive customer demand)
- An increasingly frequent need to offset transmission line charging by using up the reserve dynamic capability on the network that is needed to manage credible and non-credible contingency events
- An emerging trend of connected loads becoming less inductive (to the point of becoming capacitive) across the day reducing the network's capability to offset line charging
- An increase in rapid daily load fluctuations caused by intermittent distributed solar PV (e.g. due to rapidly changing cloud cover) as well as the more predicable forecast daily load profile dominated by distributed solar PV, which requires increased automation of reactive and voltage control plant to manage the consequent voltage changes
- Forecast closures of metropolitan thermal generators leading to a loss of voltage control capability

The gap in voltage control capability is estimated as 200-400 Mvar reactive power support capability in the Adelaide Metropolitan region and 50-100 Mvar in the South East of South Australia.

We have identified **three credible network options** that are technically and economically feasible and meet the identified need. These options include transmission and distribution connected static and dynamic reactive power control.

Each of the three options will address the identified need by increasing the amount of reactive power available in the Adelaide Metropolitan and South East regions. During normal system conditions this will enable ElectraNet's existing SVCs at Para and South East to be operated at an output level of between 25 Mvar (inductive) and 0 Mvar, reserving the remainder of their dynamic reactive power capability for emergency control of the system following disturbances caused by the occurrence of critical contingencies. The options achieve this as follows:

- Option 1 involves the installation of switchable 275 kV reactors in the Adelaide Metropolitan and South East regions. Appropriate switching of these reactors during normal system conditions will enable the Para and South East SVCs to be operated within the desired normal operating range

- Option 2 involves the installation of dynamic reactive devices (such as additional SVCs) in the Adelaide Metropolitan region and a switchable 275 kV reactor installed in the South East region. Appropriate operation of the new dynamic reactive devices and switching of the new South East reactor will enable the Para and South East SVCs to be operated within the desired normal operating range
- Option 3 involves the installation of switchable 66 kV reactors in the Adelaide Metropolitan region and switchable 33 kV reactors installed in the South East region. Appropriate switching of these reactors during normal system conditions will enable the Para and South East SVCs to be operated within the desired normal operating range.

The required capacity of reactive power support will be further assessed and confirmed in the PADR for this RIT-T. The options available will also be refined in terms of their scopes and cost estimates to determine the optimal scope, including consideration of a combination of transmission and distribution options.

We consider that **non-network options** may also be able to assist in meeting the identified need. The identified need could be supported by the following, connected in the right locations on the South Australian network:

- Virtual power plants providing an aggregated voltage control response, and
- Generators or Battery Energy Storage Systems providing a service in excess of their Generator Performance Standards.

The full PSCR is available from ElectraNet's website.

ElectraNet welcomes written submissions on this Project Specification Consultation Report (PSCR) by 17 March 2023. Submissions are sought on the options presented, any other credible options available to address the identified need, the classification of this identified need for reliability corrective action and the assessment of materiality of market benefit categories.

Submissions should be emailed to consultation@electranet.com.au. Submissions will be published unless a proponent marks their submission (or part of it) as confidential at the time of the submission.

The Project Assessment Draft Report (PADR), which is the second stage of the RIT-T process, will include a full options analysis. We expect to publish it by the end of June 2023.

.

ElectraNet