1. Background

Alinta Energy announced in June 2015 that it intended to retire the Northern Power Station (NPS) and operation of NPS ceased on 9 May 2016.

NPS provided transmission network voltage support in the Upper North, Mid North and the Eyre Peninsula regions of South Australia and its closure is expected to create significant challenges for transmission network voltage control in these regions.

2. Identified need

Since the 2015 announcement by Alinta Energy, ElectraNet has identified potential network adequacy and security limitations resulting from the withdrawal of NPS. These studies, and a review of past operational experience, have revealed three types of limitation expected to occur under certain credible demand and generation scenarios – as summarised in the table below.[1]

These three limitations, together, comprise the identified need for this RIT-T.

Limitation	Description	Illustrative number of times relevant conditions are met
Insufficient reactive power margin (Schedule 5.1.8 of the NER)	At times of high 275 kV customer demand drawn from Davenport, moderate to high system demand, and low wind generation in the Mid North region, reactive power reserve margins may not be met at the Davenport 275 kV connection point.	38 times/year
Voltage collapse (Section 4.2.6 Schedule 5.1.8 of the NER)	When operating in certain N-1[2] conditions, the system would be at risk of voltage collapse for the loss of a second critical 275 kV line. Further, during system normal conditions (ie, all network elements in-service), switching a 50 Mvar reactor into service at Davenport at times of low wind generation in the Mid North of South Australia may cause a voltage collapse.	N-1 conditions expected for 216 hours per year (on average) During N-1 conditions, unplanned loss of a second critical 275 kV line is expected to occur at a rate of 1.47 faults/year
Over-voltage (Schedule 5.1a.4 and Figure S5.1a.1 of the NER)	Operating the Davenport 275 kV connection point voltage above 1.05 pu (which occurs for the majority of the time to mitigate against the risk of voltage collapse for 275 kV customers supplied by Davenport) is expected to result in over-voltage at times of low wind generation in the Mid North for the loss of the 275 kV customer demand drawn from Davenport at times of low system demand.	296 times/year (note that this assumes that the Para reactor or one of the Para SVCs is out of service) Most severe at times of minimum demand (currently 800 MW)

[1] These limitations are also discussed in: AEMO and ElectraNet, *Update to Renewable Energy Integration in South Australia*, Joint AEMO and ElectraNet report, February 2016, p. 35.

[2] The system is considered to be operating in an N-1 condition if any one network element (eg, a critical 275 kV line) is out of service.

ElectraNet uses its best endeavours to plan, develop and operate the transmission network to meet the standards imposed by the NER in relation to the quality of transmission services such that there will be no requirements to shed load to achieve these standards under normal and reasonably foreseeable operating conditions[3].

While the ETC is silent on the timeframe within which ElectraNet must meet a required standard in the event of a significant generation withdrawal, such as the closure of NPS, clause 2.11 of the ETC deals with changes in forecast agreed maximum demand and requires ElectraNet to meet the required standard within 3 years of the identified future breach date. ElectraNet has discussed the intent of this clause with ESCOSA and confirmed that this period should also apply in the context of the NPS closure, ie, that ElectraNet must address the identified need within 3 years of Alinta Energy's closure of NPS (by 9 May 2019).

3. Identified credible options

ElectraNet has identified five credible options that it considers may address the identified need. A summary of these five options is provided in the table below.

Option	Indicative capital cost	Indicative O&M cost	Construction timetable; commissioning date
Option 1: Install 2x ±50-100 Mvar SVCs at Davenport	$30-50m	2% of capital cost	1-2 years; can be delivered by 9 May 2019
Option 2: Install 2x ±50-100 Mvar STATCOMs at Davenport	$30-50m	2% of capital cost	1-2 years; can be delivered by 9 May 2019
Option 3: Install small modular STATCOMs and switched capacitors at Davenport	$20-40m	2% of capital cost	1-2 years; can be delivered by 9 May 2019
Option 4: Install synchronous condensers at Davenport	$50-100m	>2% of capital cost	1-2 years; can be delivered by 9 May 2019
Option 5: Convert the existing NPS generators to synchronous condensers	Not practicable to provide at this stage	Not practicable to provide at this stage	Not practicable to provide at this stage Should there be a proponent for this option, it is expected that it can be delivered by 9 May 2019

Each of the five credible options is expected to be both technically and commercially feasible and able to be implemented in sufficient time to meet the identified need.

In order to protect the network from potential voltage collapse prior to when a credible option can be commissioned, ElectraNet put in place an interim under-voltage load shedding scheme in April 2016. ElectraNet also intends to implement a control scheme to perform automatic switching of the three 275 kV reactors at Davenport during 2016.

[3] In accordance with the quality of supply and system reliability service standards specified in the South Australian Electricity Transmission Code (ETC).

However, these measures are only considered to be interim measures because they rely on shedding load under reasonably foreseeable operating conditions, which is inconsistent with clause 2.1.1 of the South Australian Electricity Transmission Code. Therefore, they cannot be considered to meet the identified need on an ongoing basis.

ElectraNet notes that NPS has had periods of reduced operations previously, but that these were during times when wider operating conditions did not result in an unmanageable reactive power margin at the Davenport 275 kV connection point, voltage collapse or overvoltage.

ElectraNet expects that future operating conditions will increase the risk of these limitations occurring; i.e., load drawn from the Davenport to Olympic Dam 275 kV transmission line is expected to increase and minimum system demand is expected to fall with the increasing penetration of solar PV in South Australia. ElectraNet therefore considers that the permanent closure of NPS, as opposed to the previous temporary shutdown of NPS, necessitates this RIT-T.

4. Consideration of market benefits

While this RIT-T is being undertaken as a reliability corrective action, ElectraNet notes that there are a number of important wider market benefits that may be generated in addressing the immediate reliability concerns. These market benefits include:

- improving frequency management in South Australia;
- mitigating against reducing fault levels in South Australia; and
- reducing constraints on Eyre Peninsula wind farms due to increased voltage limitations in this region.

These market benefits are intended to be estimated as part of the Project Assessment Draft Report (PADR) analysis for each credible option assessed.

5. Submissions

ElectraNet welcomes written submissions on the PSCR, which are due on or before Friday, 4 November. Submissions are particularly sought on the credible options presented and other non-network options.

Submissions should be emailed to consultation@electranet.com.au. Submissions will be published on the ElectraNet website. If you do not wish your submission to be made publicly available please clearly specify this at the time of lodging your submission.

A PADR, including full option analysis, is expected to be published by the end of February 2016.