Powerlink Queensland

Summary
Project Specification Consultation Report

30 July 2021

Managing voltages in South East Queensland

Summary

An increase in the uptake of roof top solar systems and more efficient energy devices within South East Queensland requires Powerlink to take action

The uptake of rooftop solar systems within Queensland has been one of the highest per capita rates in the world, with over 700,000 installed rooftop PV systems totalling an aggregate statewide capacity of more than 3,300MW.

While the cumulative effect of small-scale renewable energy has reduced average demand and energy consumption, power produced by embedded solar installations has also significantly reduced the minimum demand profile during daylight hours[1].

In addition to the falling minimum daytime demand, the installation of more energy efficient devices has also resulted in the load becoming more capacitive, particularly during the traditional early morning low load period between midnight and dawn, causing an increase in the reactive charging of overhead lines.

A decline in the amount of traditional synchronous generation being dispatched during the low demand periods has also meant the system has less capacity to absorb reactive power and hence help maintain safe voltage levels.

The combination of a declining minimum demand during the day, increasing capacitive nature of the load and the loss of system capacity to absorb reactive power, has created a growing reactive power surplus in both the distribution and transmission networks, particularly during low demand periods. This has resulted in an increased voltage profile and a growing potential for sustained over-voltage events.

Over-voltage events can result in equipment damage, loss of supply and safety issues. The Rules specify allowable over-voltage limits and require Powerlink to take action to ensure these limits are not exceeded in order to maintain the power system in a secure state. Surplus reactive power, measured in MVArs, is increasingly having to be absorbed by transmission connected plant such as shunt reactors, dynamic Static Var Compensators (SVCs) and generators.

However, with present reactive plant at capacity, Powerlink is having to manage these limits by switching out of feeders. This operational solution is now at its technical limit and is not considered a sustainable strategy. Switching out feeders on an on-going regular basis impacts system strength and reliability of supply, impacts the market by increasing transmission losses and accelerates the ageing of primary plant.

Insufficient reactive capacity in the South East Queensland section of the grid is also making it increasingly difficult to obtain outages of reactive plant for maintenance and project work, increasing the likelihood of Powerlink breaching its responsibilities as a Transmission Network Service Provider (TNSP) under the Rules, as well as its Transmission Authority reliability and service standards.

Powerlink is required to apply the RIT-T to this investment

The identified need to manage voltages within allowable limits requires Powerlink to apply the RIT-T.

The proposed investment is to meet reliability and service standards specified within Powerlink's Transmission Authority and to ensure Powerlink's ongoing compliance with Schedule 5.1 of the Rules, and is classified as a 'reliability corrective action'[2].

As the identified need is not discussed in the most recent Integrated System Plan (ISP), it is subject to the application and consultation process for RIT-T projects not defined as *actionable ISP projects*[3].

[1] AEMO 2020 Electricity Statement of Opportunities, page 4
[2] The Rules clause 5.10.2, Definitions, reliability corrective action
[3] Refer to Clause 5.16.2 of the NER

Powerlink has presented three credible network options in this Project Specification Consultation Report (PSCR) to maintain the existing electricity services, ensuring an ongoing reliable, safe and cost effective supply to customers in the area.

As the preferred option is below $43 million, and the modelled changes in ancillary service costs and potential network losses do not change the ranking of the options, Powerlink has adopted the expedited process for non-ISP projects for this RIT-T[4]. Changes in ancillary service costs and potential network losses have been modelled in the Base Case risk costs and included in the NPV analysis of the options.

A non-credible Base Case has been developed against which to compare the credible options

Consistent with the Australian Energy Regulator's (AER's) RIT-T Application Guidelines for non-ISP projects, the assessment undertaken in this PSCR compares the net present value (NPV) of the credible network options identified to address the emerging risk-costs of a "do-nothing" Base Case.

The Base Case is modelled as a **non-credible** option where the emerging issue of non-compliant over-voltage events is managed via the ongoing switching out of feeders and the dispatch of generation units in the greater South East Queensland network to absorb reactive power under light load conditions. The standby and usage charges associated with dispatching this generation capacity forms the market costs of the "do nothing" Base Case.

Proposed network options to address the identified need

As the need arises from a combination of factors across two networks, Powerlink as the TNSP and Energex as the DNSP, have conducted a joint assessment of the emerging over-voltage issues in SEQ to develop potential network options.

The proposed network options, along with their NPVs relative to the Base Case are summarised in Table 1. The absolute NPVs of the Base Case and the credible network options are shown in Figure 1.

Table 1 illustrates that the two transmission options have a net economic benefit relative to the non-credible Base Case.

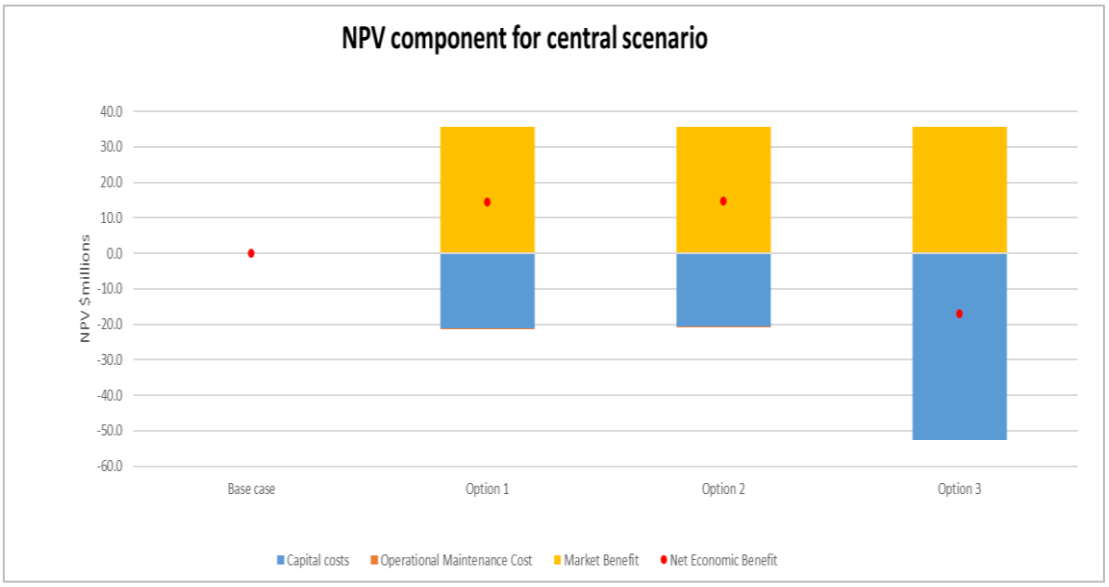
Table 1: Summary of the credible network options

Option	Description	Total costs ($m) 2020/21	Net Economic Benefit ($m)
1	Install a total of 3x 120MVAr bus reactors at Woolooga, Blackstone and Greenbank Substations in Powerlink's South East Queensland Transmission Network from 2022	30.29	14.27
2	Install a total of 3x 120MVAr bus reactors at Woolooga, Blackstone and Belmont Substations in Powerlink's South East Queensland Transmission Network from 2022	29.61	14.69
3	Install 11 x reactors with a total 335MVAr capacity on the Energex Network in the Sunshine Coast, Gold Coast and Brisbane areas from 2022	80.50	-17.12

Note: Powerlink is the proponent of options 1 and 2, while Energex is the proponent of option 3.

[4] In accordance with clause 5.16.4(z1) of the Rules and S4.1 AER Regulatory investment test for transmission application guidelines, August 2020

Figure 1: NPV of Base Case and Credible Network Options



The Base Case is not a credible option, in that it does not allow Powerlink to continue to maintain compliance with the requirements of relevant regulatory instruments and the Rules.

Taking into account capital, operational maintenance and market benefits, Option 2 delivers the greatest net economic benefit, providing a $14.69 million net economic benefit in NPV terms when compared to the Base Case over the 20-year analysis period.

Option 2 has been identified as the preferred network option

The preferred network option involves installing three 120MVar reactors at the Blackstone, Woolooga and Belmont Substations by 2025. Powerlink is the proponent of this network option.

Under this option, installation and commissioning of the reactors will be completed by 2025.

Powerlink welcomes the potential for non-network options to form part or all of the solution

Powerlink welcomes submissions from proponents who consider they could offer a potential non-network solution by 2025.

A non-network option that avoids the proposed installation of the new reactors would need to replicate, in part or full, the support that the reactors deliver to the network in South East Queensland, on a cost effective and ongoing basis.

Lodging a submission with Powerlink

Powerlink is seeking written submissions on this Project Specification Consultation Report on or before Friday, 29 October 2021, particularly on the credible option presented[5].

Please address submissions to:

Roger Smith
Manager Network and Alternate Solutions
Powerlink Queensland
PO Box 1193
VIRGINIA QLD 4014
Tel: (07) 3860 2328

Submissions can be emailed to: networkassessments@powerlink.com.au

[5] Powerlink's website has detailed information on the types of engagement activities, which may be undertaken during the consultation process. These activities focus on enhancing the value and outcomes of the RIT-T engagement process for customers and non-network providers

Contact us

Registered office	33 Harold St Virginia Queensland 4014 Australia
Postal address:	GPO Box 1193 Virginia Queensland 4014 Australia
Contact:	Roger Smith Manager Network and Alternate Solutions
Telephone	(+617) 3860 2328 (during business hours)
Email	networkassessments@powerlink.com.au
Internet	www.powerlink.com.au