



TransGrid

Summary: Maintaining compliance with performance standards applicable to Darlington Point substation secondary systems

RIT-T – Project Specification Consultation Report

Region: South Western

Date of issue: 22 September 2020

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Summary

TransGrid is applying the Regulatory Investment Test for Transmission (RIT-T) to options for maintaining reliable secondary systems at Darlington Point substation. Publication of this Project Specification Consultation Report (PSCR) represents the first step in the RIT-T process.

Darlington Point substation will continue to play a central role in the safe and reliable operation of the power system throughout and after the transition to a low-carbon electricity future. Located in the Riverina agricultural irrigation area inclusive of Leeton, the centre of the rice growing district in NSW, it forms part of the Southern New South Wales network which has been identified as an area of interest for new renewable connections¹.

Darlington Point substation is a customer connection point supplying the Essential Energy 132 kV network in the Riverina region and is the starting point for the 220 kV network supplying Far West NSW and interconnects to Victoria at Red Cliffs.

TransGrid has identified that the secondary systems at Darlington Point substation have reached a condition that reflects the end of serviceable life. As it is superseded by new technology at the manufacturer level and the existing technology becomes obsolete, spare parts become scarce and the ability of any primary asset connected to the substation to reliably operate will be at risk.

Identified need: meet the service level required under the National Electricity Rules for protection schemes

Secondary systems are used to control, monitor, protect and secure communication to facilitate safe and reliable network operation.² They are necessary to operate the transmission network and prevent damage to primary assets when adverse events occur.

Provision of redundant protection schemes to ensure the transmission system is adequately protected is a Network Performance Requirement under Schedule 5.1 of the National Electricity Rules (NER), therefore the condition issues affecting the secondary systems at Darlington Point substation must be addressed.

The Network Performance Requirements, set out in Schedule 5.1 of the NER, place an obligation on Transmission Network Service Providers (TNSPs) to provide redundant protection schemes to ensure the transmission system is adequately protected. Schedule 5.1.9(c) of the NER requires a TNSP to provide sufficient primary and back-up protection systems, including any communications facilities and breaker fail protection systems, to ensure that a fault of any type anywhere on its transmission system is automatically disconnected.

Additionally, TNSPs are required to disconnect the unprotected primary systems where secondary systems fault lasts for more than eight hours (for planned maintenance) or 24 hours (for unplanned outages). TNSPs must also ensure that all protection systems for lines at a voltage above 66 kV are well-maintained so as to be available at all times other than for short periods (less than eight hours), while the maintenance of protection systems is being carried out.³ In the event of an unplanned outage, AEMO's Power System Security Guidelines require that the primary network assets must be taken out of service within 24 hours.⁴

Furthermore, as per clause 4.11.1 of the NER, remote monitoring and control systems are required to be maintained in accordance with the standards and protocols determined and advised by AEMO.

¹ Darlington Point substation is located within the South-West Energy Zone, one of three Renewable Energy Zones (REZ) prioritised by the NSW Government

² As per Schedule 5.1 of the NER.

³ As per S5.1.2.1(d) of the NER.

⁴ Australian Energy Market Operator. "Power System Security Guidelines, 20 September 2019." Melbourne: Australian Energy Market Operator, 2019.39. Accessed 15 May 2020. https://www.aemo.com.au/-/media/Files/Electricity/NEM/Security_and_Reliability/Power_System_Ops/Procedures/SO_OP_3715---Power-System-Security-Guidelines.pdf

A failure of the secondary systems would involve replacement of the failed component or taking the affected primary assets, such as lines and transformers, out of service.

Though replacement of failed secondary systems component is a possible interim measure, the approach is not sustainable as the stock of spare components will deplete due to the technology no longer being manufactured or supported. Once all spares are used, replacement will cease to be a viable option to meet performance standards stipulated in clause 4.6.1 of the NER.

If the failure to provide functional secondary systems due to technology obsolescence, on the 220/330kV secondary systems components, is not addressed by a technically and commercially feasible credible option in sufficient time (by 2022/23), the likelihood of not recovering from secondary systems faults and not maintaining compliance with NER performance requirements will increase. TransGrid has assessed that the 132kV secondary system assets do not warrant replacement under this proposed project, and although benefits would be further derived from modernisation of monitoring and control systems it is considered non-prudent expenditure before 2022/23.

The proposed investment will enable TransGrid to continue to meet the standards for secondary systems availability set out in the NER, and to avoid the impacts of taking primary assets out of service. Consequently, it is considered a reliability corrective action under the RIT-T.

A reliability corrective action differs from a 'market benefits'-driven RIT-T in that the preferred option is permitted to have negative net economic benefits on account of it being required to meet an externally imposed obligation on the network business.

Credible options considered

In this PSCR, TransGrid has put forward for consideration credible options that would meet the identified need from a technical, commercial, and project delivery perspective.⁵

These are summarised in the following table.

Table 1 Summary of the credible options

Option	Description	Capital cost (\$m 2020/21)	Operating costs (\$ per year)	Remarks
Option 1	Strategic asset replacement	~ 4.2 (+/- 25%) between 2020/21 and 2033/34	~ 6,000	Technically and commercially feasible but does not address technological obsolescence beyond 2023 and is therefore not practicable.

⁵ As per clause 5.15.2(a) of the NER.

Option	Description	Capital cost (\$m 2020/21)	Operating costs (\$ per year)	Remarks
Option 2	Complete in-situ replacement	~5.4 (+/- 25%) by 2022/23 for the 220/330kV assets and ~1.4 (+/- 25%) for the 132kV assets between 2023/24 and 2033/34	~ 5,000	Preferred option, would maintain regulatory obligations and provide highest net economic benefits
Option 3	IEC-61850 replacement ⁶	~ 7.9 (+/- 25%)	~ 10,000	Would maintain regulatory obligations but provide less benefits

Non-network options are not able to assist in this RIT-T

TransGrid does not consider non-network options to be commercially and technically feasible to assist with meeting the identified need for this RIT-T. Non-network options are not able to meet NER obligations to provide redundant secondary systems and ensure that the transmission system is adequately protected.

Implementing Option 2 will meet relevant regulatory obligations

Implementation of Option 2 will enable TransGrid to meet regulatory obligations set out in Schedule 5.1 and clauses 4.11.1, 4.6.1(b)⁷ of the NER to provide redundant secondary systems and ensure that the transmission system is adequately protected. Consequently, it will also ensure the performance standards applicable to Darlington Point substation secondary systems are met.

Option 2 delivers highest net economic benefits

In all scenarios, highest net economic benefits result from implementing Option 2. Option 2 is the most efficient option to ensure reliability of the secondary systems at Darlington Point substation and mitigate its risks of prolonged failure. Sensitivity testing finds that Option 2 delivers the most net economic benefits under all sensitivities undertaken by TransGrid.

Draft conclusion

The implementation of Option 2, complete in-situ replacement of protection, market metering and control systems of secondary systems at the Darlington Point substation, is the most efficient technically and commercially feasible option at this draft stage of the RIT-T process. Option 2 can be implemented in sufficient time to meet the identified need by 2022/23, and is therefore the preferred option presented in this PSCR.

⁶ International Electrotechnical Commission (IEC), "IEC 61850 standard for Power Utility Automation," accessed 14 May 2020. <http://www.iec.ch/smartgrid/standards/>

⁷ As per clause 4.6.1(b) of the NER, AEMO must ensure that there are processes in place that will allow the determination of fault levels for normal operation of the power system and in anticipation of all credible contingency events and protected events that AEMO considers may affect the configuration of the power system, so that AEMO can identify any busbar which could potentially be exposed to a fault level which exceeds the fault current ratings of the circuit breakers associated with that busbar.

The estimated capital cost of this option is approximately \$6.8 million. Routine operating and maintenance costs are approximately \$5,000 per year.

The works will be undertaken between 2020/21 and 2022/23. Planning (including commencement of the RIT-T) commenced in 2019/20 and is due to conclude in 2020/21. The detailed design will commence in 2020/21 with procurement and delivery of the identified assets planned to start in 2021/22. All works will be completed by 2022/23.

Necessary outages of relevant assets in service will be planned appropriately in order to complete the works with minimal impact on the network.

Exemption from preparing a Project Assessment Draft Report

Subject to additional credible options being identified during the consultation period, publication of a Project Assessment Draft Report (PADR) is not required for this RIT-T as TransGrid considers its investment in relation to the preferred option to be exempt from that part of the process under NER clause 5.16.4(z1). Production of a PADR is not required due to:

- > the estimated capital cost of the proposed preferred option being less than \$43 million⁸;
- > the PSCR states:
 - the proposed preferred option (including reasons for the proposed preferred option)
 - the RIT-T is exempt from producing a PADR
 - the proposed preferred option and any other credible option will not have material market benefits⁹ except for voluntary load curtailment and involuntary load shedding
- > the RIT-T proponent considers that there were no PSCR submissions identifying additional credible options that could deliver a material market benefit; and
- > the PACR must address any issues raised in relation to the proposed preferred option during the PSCR consultation.

Submissions and next steps

The purpose of this PSCR is to set out the reasons TransGrid proposes that action be taken, present the options that address the identified need, outline the technical characteristics that non-network options will need to provide, and allow interested parties to make submissions and provide input to the RIT-T assessment.

TransGrid welcomes written submissions on materials contained in this PSCR. Submissions are particularly sought on the credible options presented and from potential proponents of non-network options that could meet the technical requirements set out in this PSCR. Submissions are due on 16 December 2020.

Submissions should be emailed to TransGrid's Regulation team via RIT-TConsultations@transgrid.com.au.¹⁰ In the subject field, please reference 'Darlington Point secondary systems PSCR.'

At the conclusion of the consultation process, all submissions received will be published on TransGrid's website. If you do not wish for your submission to be made public, please clearly specify this at the time of lodgement.

Should TransGrid consider that no additional credible options were identified during the consultation period, TransGrid intends to produce a Project Assessment Conclusions Report (PACR) that addresses all

⁸ Varied from \$35m to \$43m based on the AER Final Determination: Cost threshold review November 2018.14. Accessed 20 May 2020 <https://www.aer.gov.au/networks-pipelines/guidelines-schemes-models-reviews/cost-thresholds-review-for-the-regulatory-investment-tests-2018>

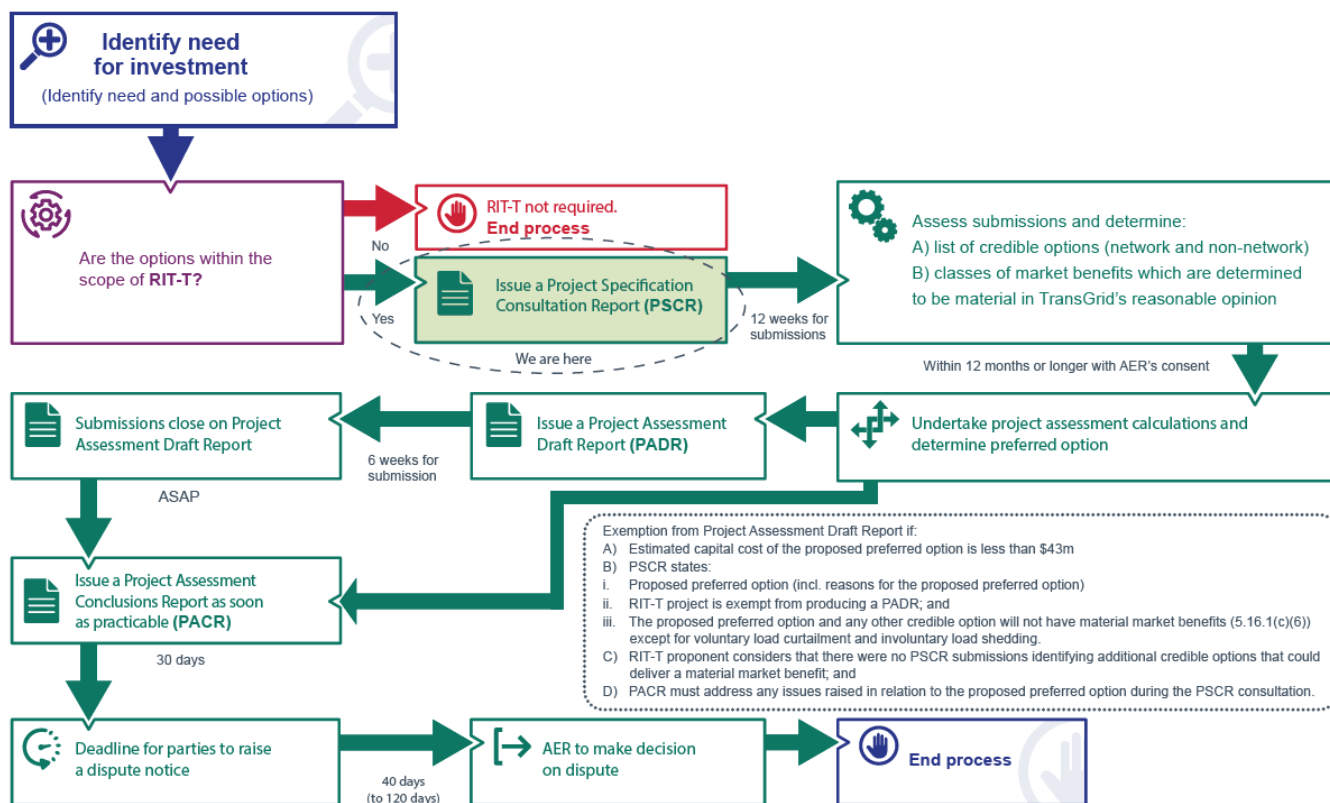
⁹ As per clause 5.16.1(c)(6)

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submissions received including any issues in relation to the proposed preferred option raised during the consultation period.¹¹ Subject to additional credible options being identified, TransGrid anticipates publication of a PACR in January 2021.

To read the full Project Specification Consultation Report visit the [Regulatory Investments Test page](#) on TransGrid’s website.

Figure 1 This PSCR is the first stage of the RIT-T process¹²



¹¹ In accordance with NER clause 5.16.4(z2).

¹² Australian Energy Market Commission. "Replacement expenditure planning arrangements, Rule determination". Sydney: AEMC, 18 July 2017.65. Accessed 14 May 2020. <https://www.aemc.gov.au/sites/default/files/content/89fbf559-2275-4672-b6ef-c2574eb7ce05/Final-rule-determination.pdf>