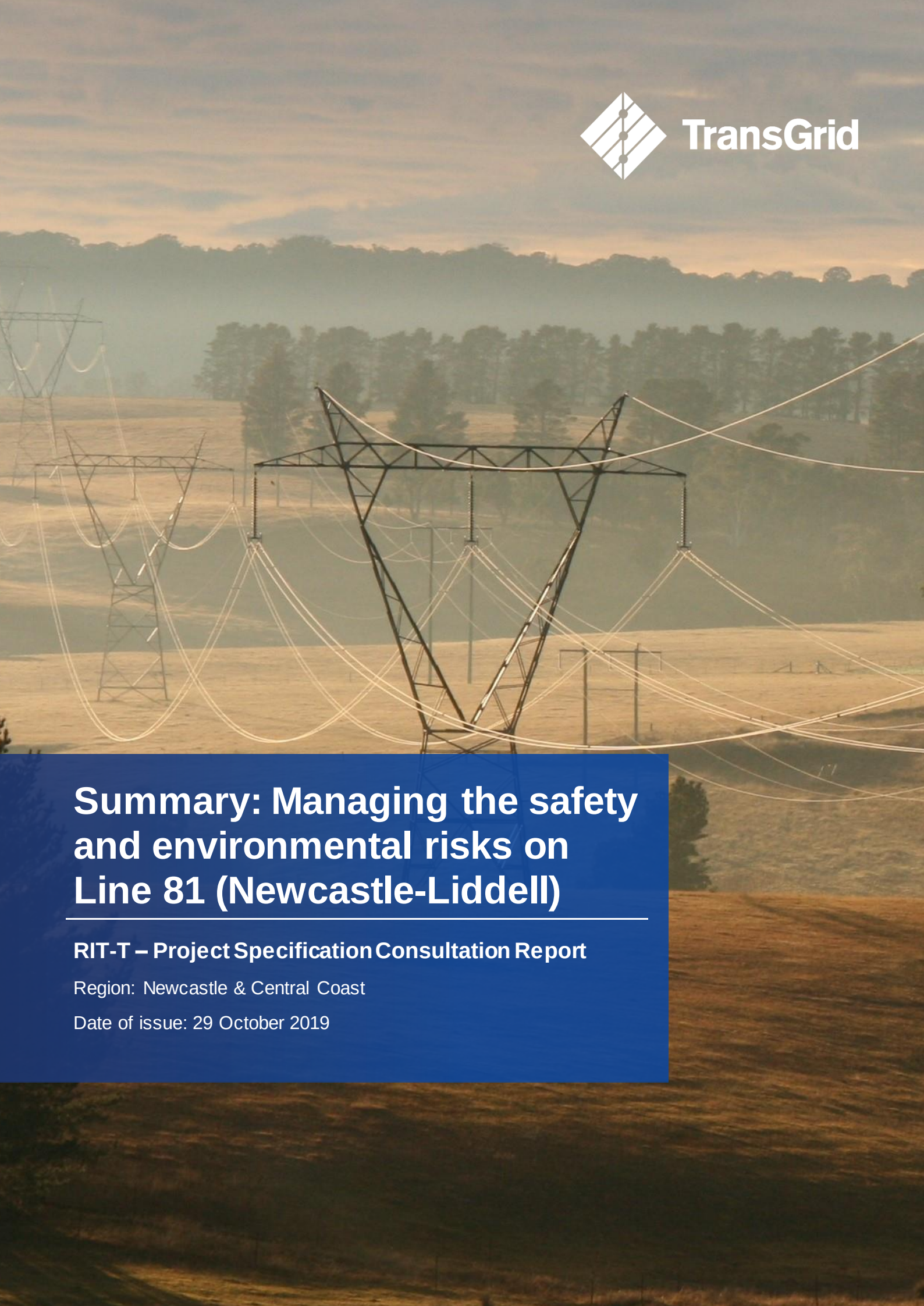


Summary: Managing the safety and environmental risks on Line 81 (Newcastle-Liddell)

RIT-T – Project Specification Consultation Report

Region: Newcastle & Central Coast

Date of issue: 29 October 2019

Summary

TransGrid is applying the Regulatory Investment Test for Transmission (RIT-T) to options for mitigating safety and environmental risks caused by the deteriorating condition of Line 81. Publication of this Project Specification Consultation Report (PSCR) represents the first step in the RIT-T process.

Constructed in 1964, Line 81 is a 330 kV transmission line which spans approximately 100km between Newcastle substation and Liddell 330 kV switching station. The transmission line is comprised of 288 steel tower structures and forms part of the network that provides a key link between approximately 4,400 MW of existing generation in the Hunter Valley and Newcastle.

Line 81 will continue to play a central role in supporting the flow of energy between regions to take advantage of naturally-diverse weather patterns, and in the safe and reliable operation of the power system throughout and after the transition to a low-carbon electricity future.

As coal mines in the area expanded, portions of Line 81 were realigned with approximately 24% of the structures being constructed after 1986. Consequently, those post-1986 structures are not affected by corrosion to the same degree as the earlier towers.

A significant proportion of the pre-1986 steel transmission structures of Line 81 are impacted by various levels of deterioration and corrosion. The affected components include tower steelwork, foundations and earthing, insulators, conductor fittings, earthwire and associated fittings. This greatly increases the likelihood of transmission structure failures, conductor drop, and subsequent bushfire and safety risks.

Table 1 Condition issues along Line 81 and their consequences

Issue	Impact
Ground line corrosion of steel at footing	Steel corrosion of critical member, can lead to structural failure of tower
Buried concrete foundations	Accelerated corrosion of critical member
Corrosion of earth strap	Possible transfer potential, earth current and voltage gradient issues, can lead to serious injury or possible fatality
Rusting of tower steel members	Structural failure
Corroded fasteners	Structural failure
Corroded and damaged disc insulators	Conductor drop
Faulty composite insulators	Flashover (line outage)
Corroded earthwire and fittings	Conductor drop
Conductor dampers	Accelerated fatigue of conductor due to vibration
Earthwire dampers	Accelerated fatigue of conductor due to vibration

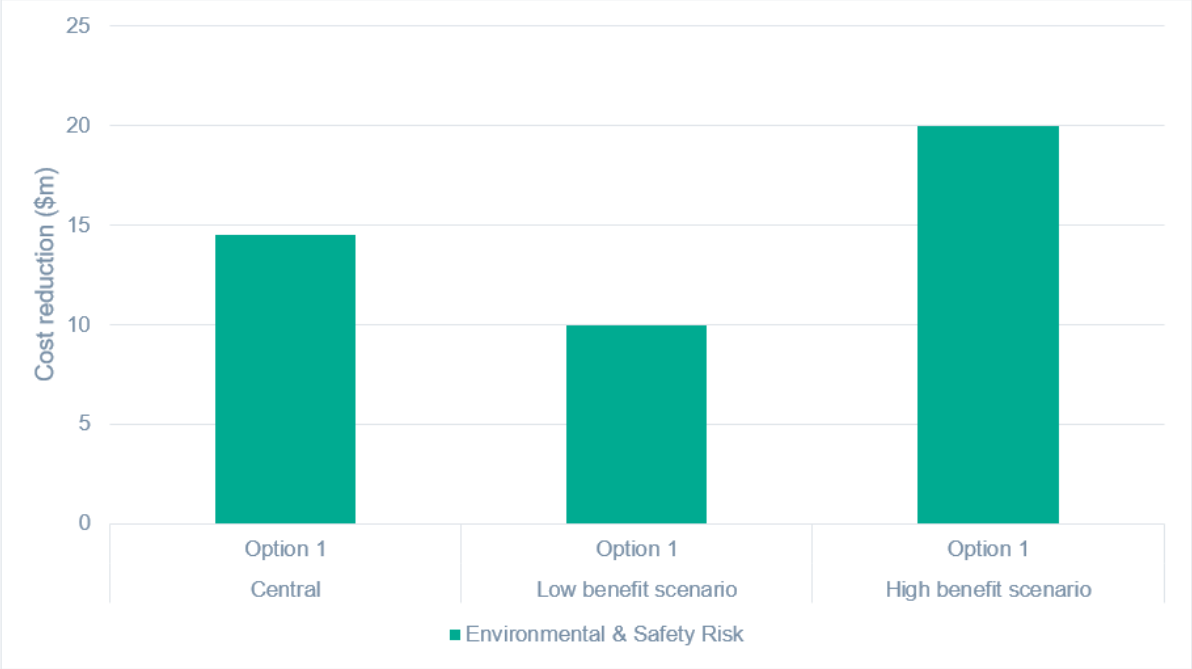
As the asset condition deteriorates over time, the likelihood of failure and subsequent risks may increase should these issues not be addressed.

Identified need: managing safety and environmental risks from corrosion on Line 81

A considerable number of the steel tower structures supporting Line 81 have reached a condition that reflects they are nearing the end of serviceable life. The assets affected by corrosion-related issues pose risk to supply, environment, and safety as a consequence of potential structural failure, conductor drop, and earthing safety hazards. Further deterioration of the condition of these assets increases these risks.

Figure E-1 provides a breakdown of gross benefits estimated to be delivered by the proposed investment. The figure shows almost all of the benefits are derived from avoided risk of bushfires (ie 'environmental risk').

Figure 1 Components of gross economic benefits, present value ($m 2019/20)



TransGrid manages and mitigates bushfire and safety risk to ensure they are below risk tolerance levels or 'As Low As Reasonably Practicable' ('ALARP'), in accordance with TransGrid's obligations under the New South Wales *Electricity Supply (Safety and Network Management) Regulation 2014* and TransGrid's Electricity Network Safety Management System (ENSMS).[1]

Using TransGrid's risk cost framework, the risks on safety and environment are sufficient such that their mitigation is warranted. The safety and environment risk costs from corrosion of steel components of the structures or 'members', insulators and fittings is estimated to be $350,000 per year.[2]

[1] TransGrid's ENSMS follows the International Organization for Standardization's ISO31000 risk management framework which requires following hierarchy of hazard mitigation approach.

[2] This determination of yearly risk costs is based on TransGrid's Network Asset Risk Assessment Methodology and incorporates variables such as likelihood of failure/exposure, various types of consequence costs and corresponding likelihood of occurrence.

Under the ALARP test with the application of a gross disproportionate factor[3] the weighted benefits are expected to exceed the cost. TransGrid's analysis concludes that the costs are less than the weighted benefits from mitigating bushfire and safety risks. The proposed investment will enable TransGrid to continue to manage and operate this part of the network to a safety and risk mitigation level of ALARP. 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.[4]

These are summarised in the following table.

Table 2 Summary of the credible options

Option	Description	Capital costs ($m)	Operating and maintenance cost ($ per year)	Remarks
Option 1	Line refurbishment	7.9 (± 25%)	65,000	Most economical and preferred option
Option 2	Line decommissioning and dismantling	27.3 (± 25%)	0	Not progressed due to significant costs

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, as non-network options will not mitigate the safety and environment risk posed as a result of corrosion-related asset deterioration.

Options addressed under three different scenarios

The assessment was conducted under three net economic benefits scenarios. These are plausible scenarios which reflect different assumptions about the future market development and other factors that are expected to affect the relative market benefits of the options being considered. All scenarios (low, central and high) involve a number of assumptions that result in the lower bound, the expected, and the upper bound estimates for present value of net economic benefits respectively.

[3] In accordance with the framework for applying the ALARP principle, a disproportionality factor of 6 has been applied to risk cost figures. The values of the disproportionality factors were determined through a review of practises and legal interpretations across multiple industries, with particular reference to the works of the UK Health and Safety Executive. The methodology used to determine the disproportionality factors in this PSCR is in line with the principles and examples presented in the AER Replacement Planning Guidelines and is consistent with TransGrid's Revised Revenue Proposal 2018/19- 2022/23.

[4] As per clause 5.15.2(a) of the NER.

Table 3 Summary of the scenarios

Variable / Scenario	Central	Low benefit scenario	High benefit scenario
Scenario weighting	*50%*	*25%*	*25%*
Network capital costs	Base estimate	Base estimate + 25%	Base estimate - 25%
Environment and safety risk costs	Base estimate	Base estimate - 25%	Base estimate + 25%
Discount rate	5.9%	7.2%	4.60%

Implementing Option 1 will meet relevant environmental and safety obligations

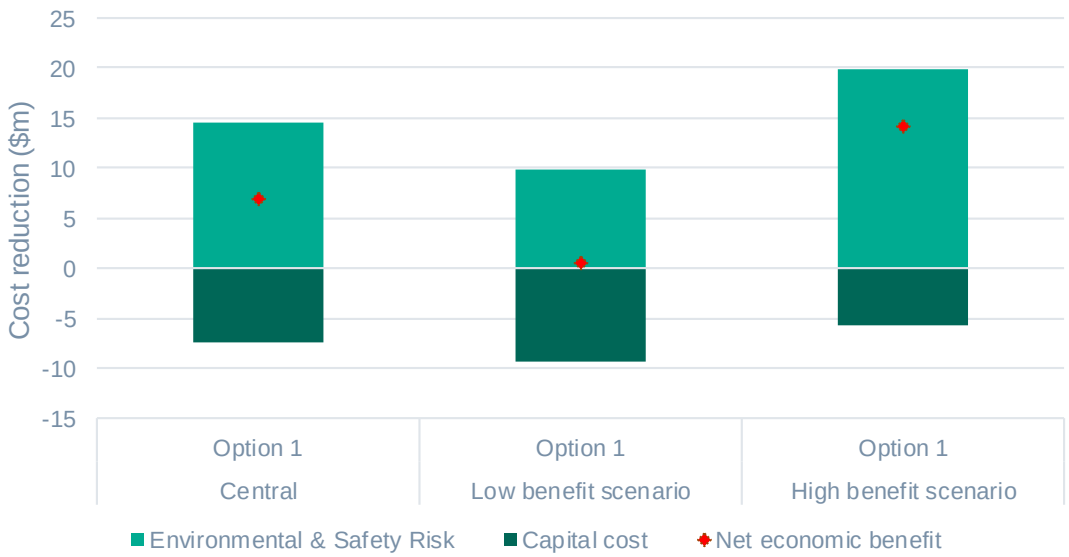
Applying the ALARP principle to manage and mitigate bushfire and safety risks, TransGrid determines that its obligations under the New South Wales *Electricity Supply (Safety and Network Management) Regulation 2014* and TransGrid's ENSMS will be met by implementing Option 1 by 2022/23. Under this principle, risks are mitigated unless it is possible to demonstrate that the cost involved in further reducing the risk would be grossly disproportionate to the benefits gained.

Under the net economic benefits test both Option 1 and Option 2 are negative with Option 2 to a greater magnitude (more negative/greater extent). Under the ALARP principle all scenarios under Option 1 are positive but Option 2 remains negative. This is shown in Figure E-2.

Under the ALARP principle, all scenarios under Option 1 are positive. This is shown in Figure 2.

In accordance with the ALARP principle, disproportionality factors have been applied on the risks shown in this figure to just below the level which the community, government and law would consider risk reduction expenditure to be grossly disproportionate.

Figure 2 As Low as Reasonably Practicable Test, present value ($m 2019/20)



Option 1 reasonably mitigates environmental risk under all sensitivities considered

The figures below illustrate that while the results are most sensitive to the environmental risk cost estimates, it is still reasonable to make investments to mitigate the risk.

Figure 3 Sensitivities of net present value using the ALARP test

Draft conclusion

The implementation of Option 1, a scope of works involving refurbishment of the line, is the most efficient technically and commercially feasible option at this draft stage of the RIT-T process. Option 1 can be implemented in sufficient time to meet the identified need by 2022/23, and is therefore the preferred option presented in this PSCR. Moving forward with this option is the most prudent and economically efficient solution to manage and mitigate bushfire risk to the ALARP level.

Option 1 consists of works on:

- insulators
- conductor fittings and vibration dampers
- earthwire fittings and dampers
- earthwire replacement
- replacement of tower members, ladders and nuts & bolts
- tower member painting
- tower earthing
- tower danger signage and climbing deterrents
- remediation of tower foundations

The estimated capital expenditure associated with this option is $7.9 million ± 25%.

The works will be undertaken between 2019/20 and 2020/21. Planning and procurement (including completion of the RIT-T) will occur in 2019/20, while project delivery and construction will occur in 2020/21. All

works will be completed in accordance with the relevant standards by 2020/21 with minimal modification to the wider transmission assets.

Necessary outages of affected line(s) in service will be planned appropriately in order to complete the works with minimal impact on the network.

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 material 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 or before 21 January 2020.

Submissions should be emailed to TransGrid's Regulation team via RIT-TConsultations@transgrid.com.au.[5] In the subject field, please reference 'PSCR Line 81 project.'

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 as per NER clause 5.16.4(z1). Production of a PADR is not required due to:

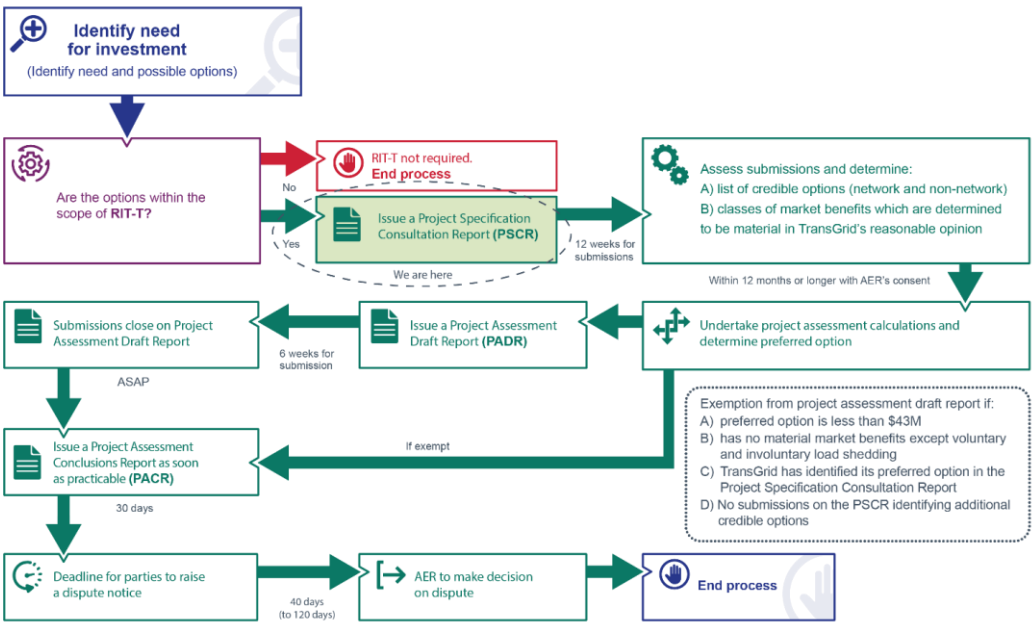
- preferred option being less than $43 million
- no market benefits except voluntary and involuntary load shedding
- preferred option has been identified in the PSCR
- no submissions on the PSCR identifying additional credible options.

Therefore, the next step in this RIT-T, following consideration of submissions received via the 12-week consultation period and any further analysis required, will be publication of a Project Assessment Conclusion Report (PACR). TransGrid anticipates publication of a PACR by 28 February 2020.

In accordance with NER clause 5.16.4(z1)(4), the exemption from producing a PADR will no longer apply if TransGrid considers that an additional credible option that could deliver a material market benefit is identified during the consultation period. Accordingly, if TransGrid considers that any additional credible options are identified, TransGrid will produce a PADR which includes a net present value (NPV) assessment of the net economic benefits of each additional credible option.

[5] TransGrid is bound by the Privacy Act 1988 (Cth). In making submissions in response to this consultation process, TransGrid will collect and hold your personal information such as your name, email address, employer and phone number for the purpose of receiving and following up on your submissions. If you do not wish for your submission to be made public, please clearly specify this at the time of lodgement. See section 1.2 for more details.

Figure 4 This PSCR is the first stage of the RIT-T process[6]



To read the full Project Specification Consultation Report visit the Regulatory Investments Test page on TransGrid's website.

[6] Australian Energy Regulator, *"Final determination on the 2018 cost thresholds review for the regulatory investment tests."* accessed 15 March 2019. https://www.aer.gov.au/communication/aer-publishes-final-determination-on-the-2018-cost-thresholds-review-for-the-regulatory-investment-tests