TransGrid

# Summary: Meeting demand growth in the Greater Macarthur area

## RIT-T – Project Specification Consultation Report

Region: Greater Sydney

Date of issue: 5 June 2020

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# Summary

TransGrid is applying the Regulatory Investment Test for Transmission (RIT-T) to options for meeting forecast demand growth in the Greater Macarthur area in Sydney's south-west going forward. Publication of this Project Specification Consultation Report (PSCR) represents the first step in the RIT-T process.

The Endeavour Energy 66 kV network in the Greater Macarthur area is currently supplied by:

> one 250 MVA 330/66 kV transformer at TransGrid's Macarthur substation
> two 120 MVA 132/66 kV transformers at Endeavour Energy's Nepean substation.

A single 375 MVA 330/132 kV transformer at TransGrid's Macarthur substation also provides 132 kV supply to Endeavour Energy's Nepean substation via the tail-ended high capacity 9L1 Macarthur to Nepean 132 kV circuit.

In addition, the normally open 9L4/93X and 9L5/93Y 132 kV circuits provide a limited level of backup to Nepean at 132 kV from Sydney West and Liverpool. The level of backup available from these feeders is progressively being reduced as load growth in the South West Priority Growth Area materialises.

## Identified need: meeting demand growth in the Greater Macarthur area

Endeavour Energy has experienced unprecedented growth in new customer connections in the last five years driven by the growth in the greenfield housing market. Continued growth in demand within the Greater Macarthur area is forecast to result in network constraints that, if unaddressed, will result in significant involuntary load shedding to end consumers.

A summary of these constraints, and their network implications, are as follows:

> A forced outage of the Macarthur 330/66 kV transformer at times of peak demand would cause:
  – Endeavour Energy's Nepean 132/66 kV transformers to exceed their contingency rating of 127 MVA
  – Endeavour Energy's 132 kV 9L1 line to Nepean to exceed its thermal contingency rating of 358 MVA
  – TransGrid's Macarthur 330/132 kV transformer to exceed its contingency rating of 412.5 MVA
> A forced outage of the Macarthur 330/132 kV transformer at times of peak demand would cause TransGrid's Macarthur 330/66 kV transformer to exceed its short-time step rating.

For the constraints relating to a forced outage of the Macarthur 330/132 kV transformer, transfer of Campbelltown load to Ingleburn would provide some relief to this constraint in the next few years.

These constraints are forecast to result in significant Expected Unserved Energy (EUE) if nothing is done. Avoiding this EUE is the key driver for this RIT-T.

While there are several embedded generators in the area, these sources are not considered to be an effective means of reducing the EUE in light of both response capability and forecast load growth. Generation predominantly occurs using gas that is created from coal mining activity, with very limited gas storage capability that would enable the generators to adequately respond to periods of high demand and/or loss of infrastructure.

## Assessment of credible options

TransGrid considers that there are two feasible network options from a technological and project delivery perspective.

Option 1 - installation of a second 330/66 kV transformer at Macarthur substation - will require the following works to be carried out by TransGrid:

- provision of a 250 MVA 330/66 kV transformer, including compound, switchgear, oil containment and all other necessary HV gear
- establishment of a 330 kV busbar to allow cut in of the second 330/66 kV transformer into the existing 330 kV mesh
- appropriate secondary systems for transformer control and protection are to be installed for the new transformer and switchbay
- integration of Automatic Voltage Regulation (AVR) for the new transformer with the existing 330/66 kV transformer control system
- upgrade of 110 V DC battery banks and chargers to meet new capacity

Option 2 - permanent transfer Campbelltown load to the Ingleburn BSP- will require the following works to be carried out by Endeavour Energy and TransGrid:

- installation of a new feeder switchbay at Ingleburn 66 kV busbar – TransGrid
- installation of a new bus section and a new feeder bay at Campbelltown – Endeavour Energy
- a new 66 kV feeder between Ingleburn and Campbelltown – Endeavour Energy
- appropriate secondary system works for new 66 kV feeder and feeder bays – Endeavour Energy

The risk of future unserved energy under Option 1 is assessed to be effectively zero. With Option 2, residual risks of unserved energy will re-emerge from 2023, based on current forecasts by Endeavour Energy. This has not been quantified in this RIT-T, as Option 2 is not the preferred option and additional risk of unserved energy will make it less favourable.

The estimated capital cost of the Option 1 and 2 are $8.88 million and $35 million[1] respectively. The estimated operating costs for both options are assumed to be two per cent of the capital cost. Both options are expected to be commissioned by June 2022, which aligns with the optimal commissioning date.

## Non-network options may be able to help mitigate the effects of network constraints

The objective of any non-network solution for this RIT-T should be to obtain a sufficient net peak demand reduction in the target area supplied by the Macarthur BSP and Nepean substation to manage the load at risk in order to defer or avoid the network option of installing a second 250 MVA 330/66 kV transformer at Macarthur BSP (preferred option). This PSCR provides detail on the technical characteristics that any non-network solutions would need to provide to help meet the identified need.

Proponents of non-network options are encouraged to make submissions on any non-network option they believe can address, or contribute to, the identified need. Proponents are encouraged to reach out and contact TransGrid as soon as practicable about potential solutions, and ahead of preparing a formal submission.

## Net economic benefits of the options have been assessed 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 economic benefits of the options being considered. All scenarios (low, central and high)

[1] High-level cost estimate provided by Endeavour Energy

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.

A key expected driver of the net economic benefits is the Value of Customer Reliability (VCR) and the underlying demand forecast since avoided EUE is the primary market benefit. TransGrid has applied a VCR estimate of $43.03/kWh in the central scenario and +/-30 per cent for the other two scenarios, which is consistent with the AER's VCR review released in December 2019.[2]

A summary of the key variables in each scenario is provided in the table below.

**Table 1 Summary of scenarios**

| Variable | Central | Low net economic benefits | High net economic benefits |
|---|---|---|---|
| Capital and operating costs | Base estimate | Base estimate + 25% | Base estimate - 25% |
| Demand forecasts | Based on POE50 demand forecast | Based on POE90 demand forecast | Based on POE10 demand forecast |
| Value of Customer Reliability (VCR) | The AER's VCR | The AER's VCR – 30% | The AER's VCR + 30% |
| Discount rate | 5.90% | 8.95% | 2.85% |

TransGrid consider that the central scenario is most likely since it is based primarily on a set of expected assumptions. TransGrid have therefore assigned this scenario a weighting of 50 per cent, with the other two scenarios being weighted equally with 25 per cent each.

## Implementing Option 1 is the most efficient way of meeting forecast demand growth

The table below summarises the net economic benefit in NPV terms for the options considered across the three scenarios, as well as on a weighted basis. The net economic benefit is the gross less the costs, all expressed in present value terms.

The table below demonstrates that the options considered provides an expected net economic benefit under the central and high benefits scenario, as well as on a weighted basis.

While the net economic benefits are marginally negative under the low scenario, TransGrid notes that this scenario comprises an extreme combination of assumptions, including low avoided unserved energy, high capital costs and a high commercial discount rate.

On a weighted basis, Option 1 is estimated to deliver approximately $93.5 million in net benefits and is considered the preferred option.

[2] The central estimate of $43.03/kWh reflects an inflation adjustment to the load weighted VCR estimate for NSW and ACT ($42.12/kWh). The confidence interval selected is also drawn from the AER's VCR review. AER, *Value of Customer Reliability Review – Final report*, December 2019, pp 71 (Table 5.22) & 84. https://www.aer.gov.au/system/files/AER%20-%20Values%20of%20Customer%20Reliability%20Review%20-%20Final%20Report%20-%20December%202019.pdf.

**Table 2 Estimated net economic benefit for each option, present value ($m 2019/20)**

| Option | Low benefits scenario | Central scenario | High benefits scenario | Weighted | Ranking |
|---|---|---|---|---|---|
| Option 1 – Installation of a second 330/66 kV transformer at Macarthur substation | -2.2 | 62.7 | 250.7 | 93.5 | 1 |
| Option 2 - Permanent transfer Campbelltown load to the Ingleburn BSP | -33.9 | 37.5 | 232.7 | 68.4 | 2 |

Sensitivity testing finds that, while the results are most sensitive to the assumed discount rate and adjustments to expected unserved energy estimates, Option 1 is still found to deliver strongly positive net benefits over a range of alternate assumptions regarding key parameters. Option 1 delivers the most benefit under all scenarios and sensitivities.

## Draft conclusion

Option 1 has been identified as the preferred option for addressing the identified need in this PSCR. Option 1 involves the installation of a second 330/66 kV transformer at the Macarthur substation. This option is described in section 3 and is estimated to have a capital cost of $8.88 million. In addition, Option 1 is expected to be commissioned by June 2022.

Option 1 is the preferred option in accordance with NER clause 5.16.1(b) because it is the credible option that maximises the net present value of the net economic benefit to all those who produce, consume and transport electricity in the market.

## Exemption from preparing a Project Assessment Draft Report (PADR)

NER clause 5.16.4(z1) provides for a TNSP to be exempt from producing a Project Assessment Draft Report (PADR) for a particular RIT-T application, in the following circumstances:

- if the estimated capital cost of the preferred option is less than $43 million;
- if the TNSP identifies in its PSCR its proposed preferred option, together with its reasons for the preferred option and notes that the proposed investment has the benefit of the clause 5.16.4(z1) exemption; and
- if the TNSP considers that the proposed preferred option and any other credible options in respect of the identified need will not have a material market benefit for the classes of market benefit specified in clause 5.16.1(c)(4), with the exception of market benefits arising from changes in voluntary and involuntary load shedding.

TransGrid considers that its investment in relation to Option 1 is exempt from producing a PADR under NER clause 5.16.4(z1).

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.

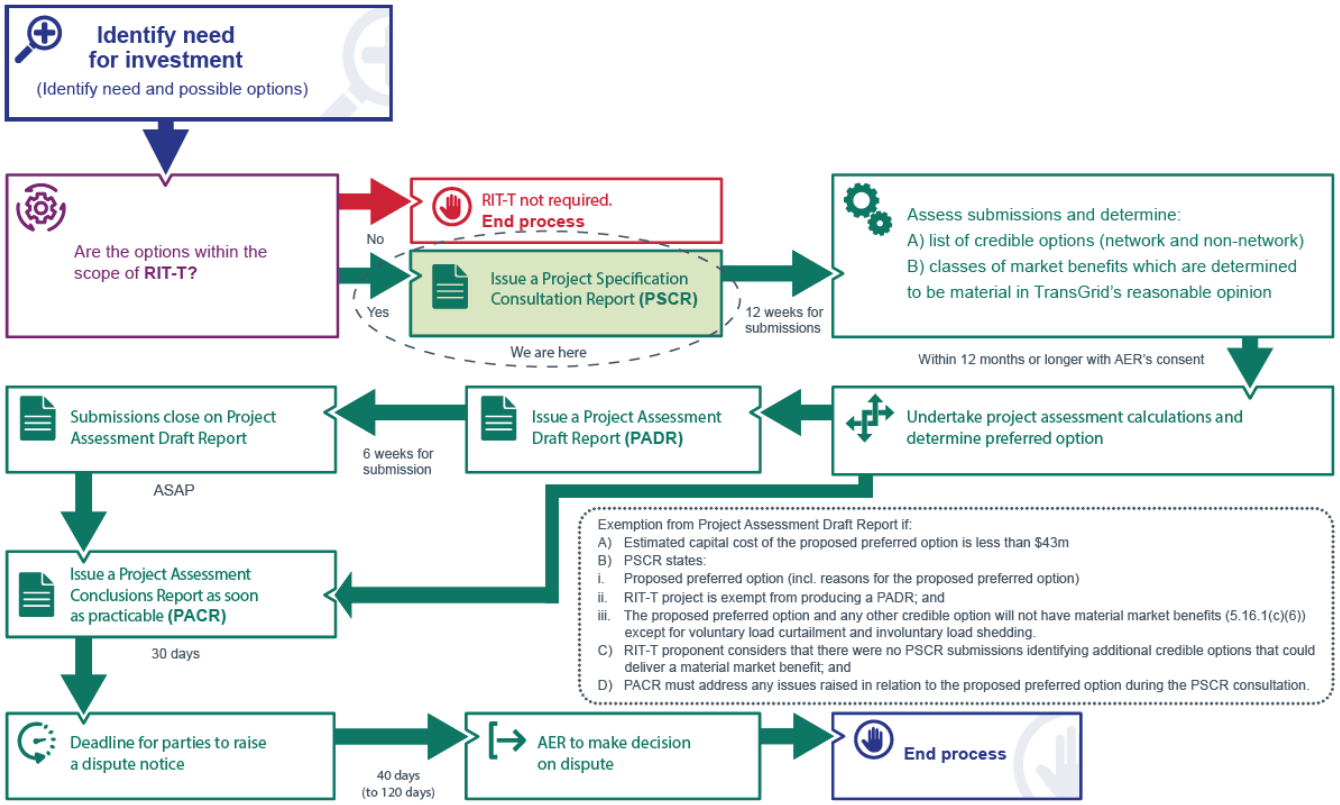
Should TransGrid consider that no additional credible options were identified during the consultation period, TransGrid intends to produce a Project Assessment Conclusions Report (PACR) that addresses all

submissions received including any issues in relation to the proposed preferred option raised during the consultation period.[3]

## Submissions and next steps

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

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




TransGrid welcomes written submissions on materials contained in this PSCR. Submissions are due on or before 31 August 2020. Submissions should be emailed to TransGrid's Regulation team via RIT-TConsultations@transgrid.com.au. In the subject field, please reference 'Greater Macarthur Area PSCR'.

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

Subject to submissions received on this PSCR, a Project Assessment Conclusions Report (PACR), including full option analysis, is expected to be published in September 2020.

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

[3] In accordance with NER clause 5.16.4(z2).