OPTIONS EVALUATION REPORT (OER)

Associated Works to Facilitate Replacement of Ausgrid 132 kV Cables 9SA and 92P at Beaconsfield Substation

OER- 000000001440 revision 6.0

Ellipse project no(s):
TRIM file: [TRIM No]

Project reason: Capability - Asset Replacement for end of life condition
Project category: Prescribed - Replacement

Approvals

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Date submitted for approval	6 August 2021	

Change history

Revision	Date	Amendment
5	6/08/2021	Update to new template and align with updated NOSA

Executive summary

Ausgrid has informed TransGrid that it plans to replace 132 kV cables 9SA and 92P Beaconsfield to Campbell St and Beaconsfield to Belmore Park. To remain compliant with the Distributor Connection Agreement, it will be necessary that the Ausgrid cables 9SA and 92P either remain connected or be replaced with an alternate supply capability. Ausgrid has decided to replace the existing cables with new ones of similar capability.

Ausgrid has requested via a formal Work Request that TransGrid carry out appropriate works to disconnect the existing cables and connect and commission the new cables at the Beaconsfield Substation end.

The assessment of the options considered to address the need appears in Table 1.

Table 1 - Evaluated options

Option	Description	Direct capital cost ($m)	Network and corporate overheads ($m)	Total capital cost[1] ($m)	Weighted NPV (PV, $m)	Rank
Option A	Associated Works to Facilitate Replacement of Ausgrid 132 kV Cables 9SA and 92P at Beaconsfield Substation	0.142	0.081	0.223	94.6	1

The preferred option is Option A. Other options were considered and did not progress see section 3.3.

The preferred option was selected because this is the only option that meets the identified need, is technically feasible and has significantly higher Net Present Value compared to the Do-Nothing option.

[1] Total capital cost is the sum of the direct capital cost and network and corporate overheads. Total capital cost is used in this OER for all analysis.

1. Need/opportunity

Ausgrid has informed TransGrid that as the outcome of Ausgrid 2020 DAPR, it plans to replace 132 kV cables 9SA and 92P Beaconsfield to Campbell St and Beaconsfield to Belmore Park, respectively, in 2028. The replacement is being considered as "like-for-like" and solely driven by the condition of the cables.

To remain compliant with the Distributor Connection Agreement, it will be necessary that the Ausgrid cables 9SA and 92P either remain connected or be replaced with an alternate supply capability. Ausgrid has decided to replace the existing cables with new ones of similar capability.

The Inner Sydney area has a modified N-2 redundancy requirement, and a shared Expected Unserved Energy (EUE) requirement for the four TransGrid Bulk Supply Points within the area.

Ausgrid has requested via a formal Work Request that TransGrid carry out appropriate works to disconnect the existing cables and connect and commission the new cables at the Beaconsfield Substation end.

If TransGrid does not proceed with this project there will be an impact on customers through reduced reliability and higher unserved energy.

2. Related needs/opportunities

- Need 43 – Powering Sydney's Future
  - Need 1440 is independent of Need 43. These Needs are related only in that they apply to the same geographical area.

3. Options

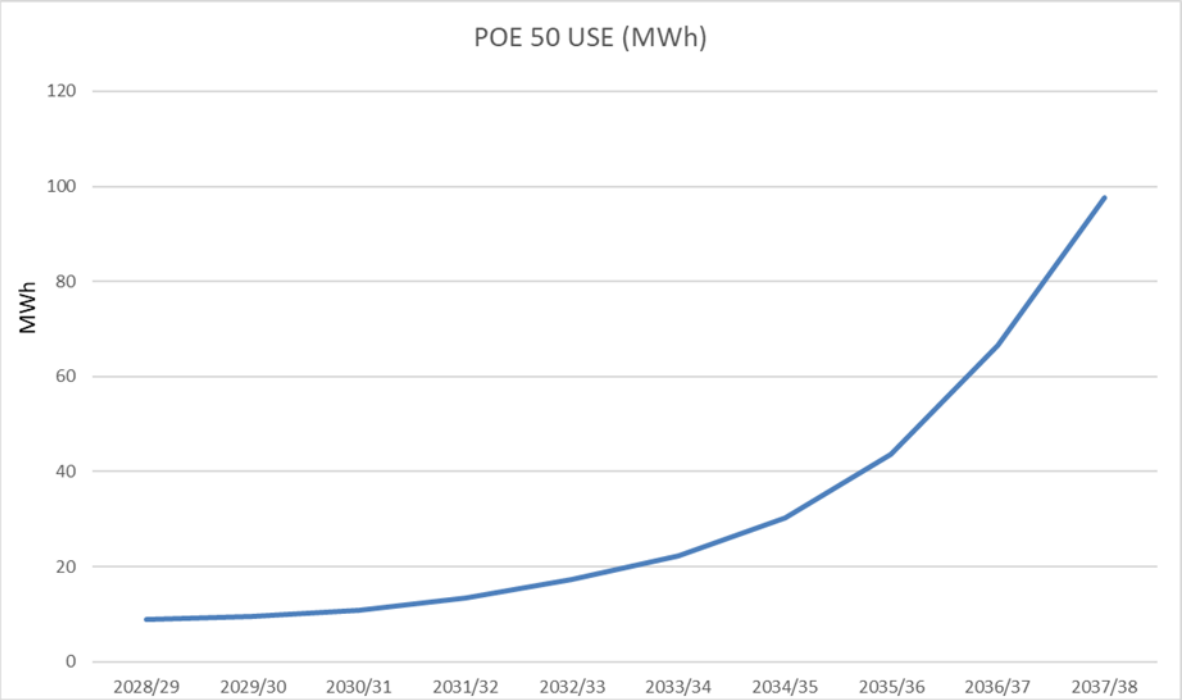
3.1 Base case

The base case under this Need is to not facilitate the connection of Ausgrid's replacement cables at Beaconsfield Substation. The base case assumes this will result in Ausgrid permanently disconnecting cables 9SA and 92P in 2028 (the planned replacement date), which will reduce the capacity of Ausgrid's network in the CBD and eastern suburbs areas.

The load around the CBD and eastern suburbs will be at risk under a modified N-2 contingency if cable 9SA and 92P are disconnected. This risk is a result of the need to shed load under modified N-2 contingency conditions (the simultaneous loss of cable 42 and cable 90Y) in order to contain loads to within ratings of the remaining in-service cables. This will result in significant Expected Unserved Energy (EUE) as shown in Figure 1. Studies have shown that the limit of supply capacity to the Sydney inner-metropolitan supply network[2] will be reduced to 646 MW, which is below the forecast peak loading in Ausgrid's POE50 2020 forecast.

[2] Known as the Inner Metro network, and includes the following Ausgrid Zone Substations: City Central, City South, City North, Pyrmont, Darling Harbour, Campbell St, Surry Hills, Dalley St, Rose Bay, Double Bay, Waverley, Belmore Park and Clovelly.

Figure 1 – EUE for Do Nothing option



3.2 Options evaluated

Option A — Associated Works to facilitate replacement of Ausgrid 132 kV Cables 9SA and 92P at Beaconsfield Substation OFR-1440A, OFS1440A

The following works are required by TransGrid under this option:

- Connect the two newly installed Ausgrid cables at Beaconsfield Substation. Disconnect the existing 9SA and 92P cables at Beaconsfield Substation.
- Make any necessary upgrades/changes to secondary systems at Beaconsfield Substation, including metering and control systems.

All works for this option are subject to Ausgrid timelines but are expected to occur in 2028.

The expected commissioning date for this option is 2027/28.

The expected expenditure profile for this option is obtained using MTWO Estimating System. The estimates in the table below have an uncertainty of ± 25% and exclude capitalised interest.

Table 2 – Option A expected expenditure

	Total Project Cost ($M)	FY2027/28 ($M)
Estimated P50 Cost non-escalated ($2020-21)	0.223	0.223

It is expected that an amount up to $50k is required to progress the project from DG1 to DG2. This will cover completion of concept designs, scoping activities, establishment of project agreement with SHL, obtaining environmental approval, and procurement of major plant equipment.

This project is expected to be completed in an estimate 11 months following the approval of DG1.

3.3 Options considered and not progressed

We considered two other options that were not progressed as they were considered not technically or economically feasible. These options are outlined in the table below.

Option	Reason for not progressing
Achieve transmission reliability standards through alternate transmission augmentation	The cost of building new transmission network to increase supply to BSPs in the Inner Metro system is significantly more expensive than the options evaluated.
Non-network solutions	Non-network solutions were also considered but no cost-effective non-network solutions were identified.

4. Evaluation

4.1 Commercial evaluation methodology

The economic assessment undertaken for this project includes three scenarios that reflect a central set assumptions based on current information that is most likely to eventuate (central scenario), a set of assumptions that give rise to a lower bound for net benefits (lower bound scenario), and a set of assumptions that give rise to an upper bound on benefits (higher bound scenario).

Assumptions for each scenario are set out in the table below.

Parameter	Central scenario	Lower bound scenario	Higher bound scenario
Discount rate	4.8%	7.37%	2.23%
Demand Growth	Medium (POE50)	Low (POE90)	High (POE10)
Capital cost	100%	125%	75%
Operating expenditure	100%	125%	75%
Value of Customer Reliability (VCR) [3]	100%	70%	130%
Scenario weighting	**50%**	**25%**	**25%**

Parameters used in this commercial evaluation:

Parameter	Parameter Description	Value used for this evaluation
Discount year	Year that dollar values are discounted to	FY2020/21
Base year	The year that dollar value outputs are expressed in real terms	FY2020/21 dollars
Period of analysis	Number of years included in economic analysis with remaining capital value included as terminal value at the end of	25 Years

[3] AER 2019 December VCR value escalated by CPI to 2020/21 dollars.

	the analysis period.	

The capex figures in this OER do not include any real cost escalation.

4.2 Commercial evaluation results

The commercial evaluation of the technically feasible options is set out in Table 3. Details appear in Appendix A.

Table 3 - Commercial evaluation (PV, $ million)

Option	Capital Cost PV	OPEX Cost PV	Central scenario NPV	Lower bound scenario NPV	Higher bound scenario NPV	Weighted NPV	Ranking
Option A	0.16	0.037	54.7	9.8	259	94.6	1

4.3 Preferred option

The preferred option is Option A. Under this option the following investments will be undertaken:

- Connect the two newly installed Ausgrid cables at Beaconsfield Substation. Disconnect the existing 9SA and 92P cables at Beaconsfield Substation.
- Make any necessary upgrades/changes to secondary systems at Beaconsfield Substation, including metering and control systems.

All works will occur in 2027/28, subject to Ausgrid maintaining the stated timelines for replacement of the two cables.

The preferred option was selected because this is the only option that meets the identified need, is technically feasible and has a significantly higher Net Present Value compared to the Do-Nothing option .

Capital and Operating Expenditure

The preferred option requires capital expenditure of $223k. No additional operating expenditure has been identified for this option.

The base case requires no capital or operating expenditure.

Regulatory Investment Test

A RIT-T is not required for this project as the capital expenditure is below the RIT-T threshold.

5. Optimal Timing

The test for optimal timing of the preferred option has been undertaken. The approach taken is to identify the optimal commissioning year for the preferred option where net cost is minimised while remaining compliant with all regulatory obligations.

The results of optimal timing analysis is:

- Optimal commissioning year: 2027/28
  - It is not feasible to commission the preferred option before Ausgrid installs the replacement cables in 2028.
  - Commissioning later than 2028 will result in significant USE.
- Commissioning year annual benefit: $407k
- Annualised cost: $12.6k

Based on the optimal timing, the project is expected to commence in the 2023-2028 Regulatory Period.

6. Recommendation

The recommendation is to progress with Option A. it is expected that this Project would incur a capital cost of approximately $223k in P50 non-escalated 2020/21 dollars. This option requires $50k of capex which is included in the project costs to progress the project to Decision Gate 2 (DG2).

Appendix A – Option Summaries – Option A

Project Description	***Associated Works to Facilitate Replacement of Ausgrid 132 kV Cables 9SA and 92P at Beaconsfield Substation***		
Option Description	Option A – Associated Works to Facilitate Replacement of Ausgrid 132 kV Cables 9SA and 92P at Beaconsfield Substation		
Project Summary			
Option Rank	1	Investment Assessment Period	25
Asset Life	40	NPV Year	2021
Economic Evaluation			
NPV @ Central Benefit Scenario (PV, $m)	54.7	Annualised CAPEX ($m)	
NPV @ Lower Bound Scenario (PV, $m)	9.8	Network Safety Risk Reduction ($m)	N/A
NPV @ Higher Bound Scenario (PV, $m)	259	ALARP	N/A
NPV Weighted (PV, $m)	94.6	Optimal Timing	2027/28
Cost			
Direct Capex ($m)	0.142	Network and Corporate Overheads ($m)	0.081
Total Capex ($m)	0.223	Cost Capex (PV,$m)	0.16
Terminal Value ($m)	0.13	Terminal Value (PV,$m)	0.041