

OPTIONS EVALUATION REPORT (OER)



Western Sydney Development

OER- 00000001687 revision 0.0

Ellipse project no(s): P0010077

TRIM file: [TRIM No]

Project reason: Reliability - To meet overall network reliability requirements

Project category: Prescribed - Augmentation

Approvals

Author	Ronny Schnapp	Network & Connection Analysis Engineer
Reviewed	Charbel Lahoud	Network & Connection Analysis Engineer
Endorsed	Vincent Ong	Network & Connection Analysis Manager
	Azil Khan	Investment Analysis Manager
	Garrie Chubb	Investment Support Manager
Approved	Nalin Pahalawaththa	Manager Power System Analysis
Date submitted for approval	8 December 2016	

Change history

Revision	Date	Amendment
0	18/11/2016	Initial issue
1	8/12/2016	Clarified risk cost breakdown

1. Need/opportunity

Demand in the Sydney South West Sector (SWS) and the Broader Western Sydney Employment Area (BWSEA) (which includes the future airport site at Badgerys Creek) is expected to increase beyond the capability of Endeavour Energy's sub-transmission network in the coming decades. Refer to [NOS-1687](#) and the NSW Government's [websites](#)^{1,2,3} for more details.

Endeavour Energy has analysed existing infrastructure, evaluated options, and has concluded that an additional 132 kV injection point in the form of a new 132 kV switching station in close proximity to TransGrid's Kemps Creek 500/330 kV Substation or Badgerys Creek Airport 132 kV Bulk Supply Point (BSP) needs to be established to accommodate the increased area load. Badgerys Creek Airport is expected to require electricity supply from 2023 in order to enable it to begin operations in 2025.

2. Related needs/opportunities

Nil.

3. Options

Base case

This option is to 'do nothing', that is no capital investment to provide supply to the SWS, BWSEA and Badgerys Creek airport developments.

As outlined in [NOS-1687](#), the risk cost of not addressing this Need is therefore composed of the following components:

The risk cost of not addressing this Need is therefore composed of the following components:

- > exposing customer load of 20 MW to risk of being unsupplied.
- > damage to TransGrid's reputation (negative media coverage).
- > litigation by customers/consumer groups.

The total cost of these risks has been calculated in TransGrid's Investment Risk Tool thus:

VCR Risk Cost (Unserved Energy)

$VCR \text{ risk cost} = \text{load at risk} * \text{probability of Badgerys Creek airport going unsupplied for one day}^4 * VCR^5$

$\therefore VCR \text{ risk cost} = 20 \text{ MW} * 24 \text{ hrs} * \$44,720/\text{MWh}$

$\therefore VCR \text{ risk cost} = \$21.47 \text{ million per annum}$

Reliability Risk Cost

$Reliability \text{ risk cost} = VCR \text{ risk cost} + \text{litigation costs}$

$\therefore Reliability \text{ risk cost} = \$21.47\text{m} + \$0.5\text{m}^6 = \$21.97 \text{ million per annum}$

¹ <http://www.planning.nsw.gov.au/Plans-for-your-area/Priority-Growth-Areas-and-Precincts/South-West-Priority-Growth-Area>

² http://westernsydneyairport.gov.au/resources/key_documents/

³ <http://www.planning.nsw.gov.au/Plans-for-your-area/Priority-Growth-Areas-and-Precincts/Western-Sydney-Employment-Area>

⁴ This is a snapshot of the risk cost during a single day of summer 2022/23.

⁵ TransGrid's Investment Risk Tool bases the Value of Customer Reliability (VCR) on figures published by AEMO in its *Value of Customer Reliability Review - Final Report*, September 2014. In this case we use the industrial load figure of \$44,720/MWh.

⁶ This component is an assumed litigation risk cost.

Financial Risk Cost

Financial risk cost = internal investigation costs = \$50,000⁷

Reputational Risk Cost

Reputational risk cost = external consultations & communications costs = \$487,500⁸

Total Risk Cost

Total risk cost = Reliability risk cost + Financial risk cost + Reputational risk cost

∴ Total risk cost = \$22.5 million per annum

Option A — Establishment of a 132 kV injection point at Kemps Creek 500/330 kV Substation [OSA 1687, OFS 1687A]

This option involves the initial establishment of a 132 kV switching station at Kemps Creek 500/330 kV Substation, with a view to establish a future 330/132 kV substation when required to meet the growing SWS and BWSEA demand.

This option includes:

- > Construction of a 132 kV busbar including busbar disconnectors.
- > Construction of four (4) 132 kV line switchbays, including CBs, CTs, VTs and all other necessary HV plant.
- > Installation of all necessary secondary systems to accommodate the connection of four Endeavour Energy-owned 132 kV feeders.

This option has been assessed for feasibility in [OFS-1687A](#). The estimated un-escalated capital cost of the option is \$13 million in 2016-17 AUD.

The post-project risk cost of Option A is assessed to be zero. This is based on the extremely low probability of failure of the new injection point considering TransGrid historical outage rates and restoration times for switchbays. The post-option risk cost is therefore composed of the VCR risk cost, thus:

VCR Risk Cost (Unserved Energy)

*VCR risk cost = load at risk * probability of outage of line to Badgerys Creek⁹ * VCR*

$$\therefore VCR \text{ risk cost} = 20 \text{ MW} * \frac{[\text{connection point outage rate}] * [\text{connection point outage duration}]}{[\text{Total hours in a year}]} * \$44,720/\text{MWh}$$

$$\therefore VCR \text{ risk cost} = 20 \text{ MW} * \frac{0.073 * 1}{8760} * \$44,720/\text{MWh}$$

∴ VCR risk cost = \$0 per annum

Option B — Establishment of a new 330/132 kV substation near Badgerys Creek Airport [OSA 1687, no OFS]

This option is for a 330/132 kV substation looped into the 330 kV 39 Sydney West to Bannaby transmission line near Badgerys Creek. This would involve significant land/easement acquisitions by both TransGrid and Endeavour Energy for a new 330/132 kV substation and at least four (4) 132 kV transmission line routes to the airport, the SWS and the BWSEA. .

The exorbitant cost of this option and the difficulty in acquiring the necessary easements make this option not credible and it is not being considered further.

⁷ This component is an assumed financial risk cost.

⁸ This component is an assumed reputational risk cost.

⁹ Based on TransGrid historical outage rates for connection points (7.3%) and restoration time (1 hour).

Option C — Non-network solution to supply Badgerys Creek airport, SWS and BWSEA [OSA 1687, no OFS]

The only feasible non-network option is local generation. A previous proposal for generation by Snowy Hydro Ltd. within the Sydney air shed resulted in environmental conditions that made it not commercially viable. Therefore, this option is not being considered further.

4. Evaluation

The commercial evaluation of the credible options is summarised in Table 1.

Table 1: Commercial Evaluation of the Technically Feasible Options

Option	Description	Total capex (\$ m)	Annual opex (\$ m)	Annual post project risk cost (\$ m)	Economic NPV @ 10% (\$ m)	Financial NPV @10% (\$ m)	Rank
Base case	'Do nothing' – Do not supply the new development areas	-	-	22.5	-	-	2
A	Establishment of a 132 kV injection point at Kemps Creek 500/330 kV Substation	13.0	0.26	0	129.48	(-4.86)	1

The commercial evaluation is based on:

- > a 10% discount rate
- > a life of the investment of 50 years and a corresponding residual/terminal value
- > Discount rate sensitivities based on TransGrid's current AER-determined pre-tax real regulatory WACC of 6.75 percent and 13% appear in Table 3.

Table 3 — Discount rate sensitivities (\$ million)

Option	Description	Economic NPV @ 13% (\$ m)	Economic NPV @ 6.75% (\$ m)
A	Establishment of a 132 kV injection point at Kemps Creek 500/330 kV Substation	91.61	196.85

4.1 ALARP evaluation

An ALARP assessment is triggered by the following hazard and the disproportionate factor:

- > Unplanned outage of HV equipment → 3 times the safety risk reduction and taking 10% of the reliability risk reduction as being applicable to safety.

However, as this will only produce 30% of the benefit derived in the economic evaluation, a full ALARP evaluation will not produce an alternative preferred solution.

4.2 Preferred option

The preferred option is Option A – Establishment of a 132 kV injection point at Kemps Creek 500/330 kV Substation, as it is the only feasible option which enables TransGrid to meet the planning requirements contained in Schedule 5.1 of the National Electricity Rules, as well as significantly reduces TransGrid’s risk exposure and reduces the risk from \$22.5m per year to zero.

Capital and operating expenditure

The yearly incremental operating expenditure of Option A is estimated to be 2% of the upfront capital cost of the option, which equates to \$0.26 million, escalated at a rate of 2.9% per annum.

Regulatory Investment Test

Option B will be subject to the RIT-T process as it has an estimated cost greater than the mandated \$6 million threshold

5. Recommendation

Based on the economic evaluation above, Option A is the preferred option to address the Need as it:

- > enables TransGrid to meet its supply obligations under the National Electricity Rules.
- > significantly reduces TransGrid’s risk exposure and reduces the risk from \$22.5m per year to zero.

It is therefore recommended that Option B advance to the project scoping phase and DG1 approval.

Attachment 1 – Commercial evaluation report

Project_Option Name

1687 - Western Sydney Development - Option A

1. Financial Evaluation (excludes VCR benefits)

NPV @ standard discount rate	10.00%	-\$4.86m	NPV / Capital (Ratio)	-0.37
NPV @ upper bound rate	13.00%	-\$5.46m	Pay Back Period (Yrs)	0.04 Yrs
NPV @ lower bound rate (WACC)	6.75%	-\$3.26m	IRR%	3.79%

2. Economic Evaluation (includes VCR benefits but excludes tax benefits from non-cash transactions, ENS penalty and overall tax cost)

NPV @ standard discount rate	10.00%	\$129.48m	NPV / Capital (Ratio)	9.96
NPV @ upper bound rate	13.00%	\$91.61m	Pay Back Period (Yrs)	Not measurable
NPV @ lower bound rate (WACC)	6.75%	\$196.85m	IRR%	88.76%

Benefits

Risk cost	As Is	To Be	Benefit	VCR Benefit	
<i>Systems (reliability)</i>	\$21.97m	\$0.00m	\$21.97m	ENS Penalty	\$0.00m
<i>Financial</i>	\$0.05m	\$0.00m	\$0.05m	All other risk benefits	\$1.03m
<i>Operational/compliance</i>	\$0.00m	\$0.00m	\$0.00m	Total Risk benefits	\$22.50m
<i>People (safety)</i>	\$0.00m	\$0.00m	\$0.00m	Benefits in the financial NPV*	\$1.03m
<i>Environment</i>	\$0.00m	\$0.00m	\$0.00m	*excludes VCR benefits	
<i>Reputation</i>	\$0.49m	\$0.00m	\$0.49m	Benefits in the economic NPV**	\$22.50m
Total Risk benefits	\$22.50m	\$0.00m	\$22.50m	**excludes ENS penalty	
Cost savings and other benefits			-\$0.00m		
Total Benefits			\$22.50m		

Other Financial Drivers

Incremental opex cost pa (no depreciation)	-\$0.26m	Write-off cost	\$0.00m
Capital - initial \$m	-\$13.00m	Major Asset Life (Yrs)	50.00 Yrs
Residual Value - initial investment	\$6.24m	Re-investment capital	\$0.00m
Capitalisation period	4.00 Yrs	Start of the re-investment period	0.00 Yrs