

OPTIONS EVALUATION REPORT (OER)

Canberra 132 kV Connection of ActewAGL Strathnairn ZS

OER 000000001443 revision 3.0



Ellipse project description: Canberra 132 kV ActewAGL Connection of New West Belconnen Zone Substation

TRIM file: [TRIM No]

Project reason: Other - Customer request

Project category: Prescribed - Connection

Approvals

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Date submitted for approval	9 December 2016	

Change history

Revision	Date	Amendment
0	24/06/2016	Initial Issue
1	27/10/2016	Formatting changes
2	28/10/2016	Updated load at risk
3		Rename of ActewAGL ZS from "West Belconnen" to "Strathnairn" Changed Need Date based on advice from customer Clarified all risk cost breakdowns

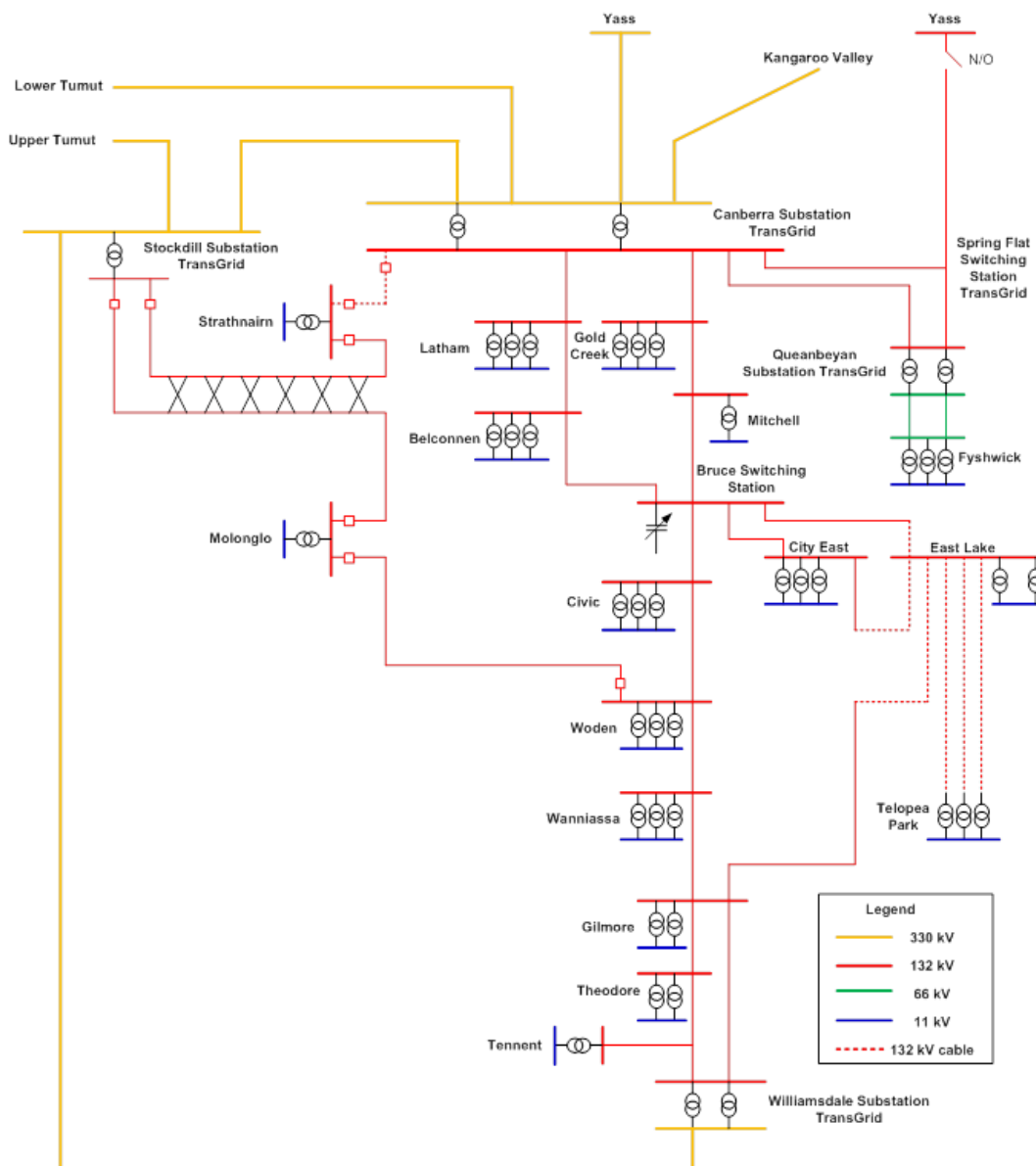
1. Need/opportunity

As part of the Joint Planning process, ActewAGL advised TransGrid of its intent to construct a new Strathnairn Zone Substation (ZS) adjacent to TransGrid's Canberra 330/132 kV Substation by 2020, to meet the timeline set out by the ACT Government for the development of a new West Belconnen residential precinct. This Need Date of 2020 will be monitored via the Joint Planning process. See [NOS-1443 for details](#).¹

As shown in Figure 1 below, the new ZS will also be supplied via a connection from TransGrid's planned Stockdill 330/132 kV Substation ([Need DCN335](#)).

ActewAGL has estimated the forecast demand to be supplied from Strathnairn ZS to grow at a rate of around 1.5 MVA per year for 30 years.

Figure 1: Proposed ACT Transmission Network Arrangement in 2020



¹ Need/opportunity Statement 1443 - Canberra 132 kV Connection of ActewAGL Strathnairn ZS, <http://thewire/projects/prew/000000001443/Shared%20Documents/Milestone%20Documents/NS-000000001443.docx>, accessed 8 December 2016.

2. Related needs/opportunities

> [Need DCN238 - Canberra Substation Condition – Need Date 2020](#)

This Need is at post-PAD stage and the approved project is for a piecemeal replacement of Canberra Substation, to be completed by 2020.

> [Need 1695 - ActewAGL Molonglo Establishment – Need Date 2021](#)

This Need is for the connection of a new Molonglo zone substation to TransGrid's A-1 Canberra to Woden line.

3. Options

Base Case

The base case under this Need is to “do nothing”. In practice, this means refraining from any capital investment, i.e. not facilitating the connection of ActewAGL's Strathnairn ZS.

As outlined in [NOS-1443](#), the risk cost of not addressing this Need is therefore composed of the following components:

- > exposing customer load of 4.56 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 (Unserviced Energy)

$$VCR \text{ risk cost} = \text{load at risk} * \text{probability of Strathnairn going unsupplied for one day}^2 * VCR^3$$

$$\therefore VCR \text{ risk cost} = 4.56 \text{ MW} * 24 \text{ hrs} * \$26,930/\text{MWh}$$

$$\therefore VCR \text{ risk cost} = \$2.95 \text{ million per annum}$$

Reliability Risk Cost

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

$$\therefore Reliability \text{ risk cost} = \$2.95\text{m} + \$0.01\text{m}^4 = \$2.96 \text{ million per annum}$$

Financial Risk Cost

$$Financial \text{ risk cost} = \text{internal investigation costs} = \$10,000^5$$

Reputational Risk Cost

$$Reputational \text{ risk cost} = \text{external consultations \& communications costs} = \$33,000^6$$

Total Risk Cost

$$Total \text{ risk cost} = Reliability \text{ risk cost} + Financial \text{ risk cost} + Reputational \text{ risk cost}$$

$$\therefore Total \text{ risk cost} = \$3.0 \text{ million per annum}$$

² This is a snapshot of the risk cost during a single day of summer 2022/23.

³ 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 residential figure of \$26,930/MWh.

⁴ This component is an assumed litigation risk cost of this event.

⁵ This component is an assumed financial risk cost of this event.

⁶ This component is an assumed reputational risk cost of this event.

Option A — 132 kV Connection of ActewAGL's Proposed West Belconnen (Strathnairn) ZS <OFR-1443A> <OFS-1443A>

The following works are required by TransGrid under this option:

- > Replacement of all HV switchgear including CB and CT in either bay 2J or 2H, and installation of cable sealing ends for the connection of ActewAGL's new 132 kV underground cable (UGC) to the new Strathnairn ZS.
- > Connection of ActewAGL's new 132 kV UGC to the chosen switchbay.
- > Installation and commissioning of all necessary secondary systems in the chosen switchbay.

This option has been assessed for feasibility in [OFS-1443A](#). The estimated un-escalated capital cost of the option is \$1.58 million ± 25% 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 connection 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)

$$VCR \text{ risk cost} = \text{load at risk} * \text{probability of outage of Strathnairn connection at Canberra}^7 * VCR$$

$$VCR \text{ risk cost} = \text{load at risk} * \frac{[\text{connection point outage rate}] * [\text{connection point outage duration}]}{[\text{Total hours in a year}]} * VCR$$

$$VCR \text{ risk cost} = 4.56 \text{ MW} * \frac{0.073 * 1}{8760} * \$26,930/\text{MWh}$$

$$\therefore VCR \text{ risk cost} = 4.56 \text{ MW} * 0 * \$26,930/\text{MWh}$$

$$\therefore VCR \text{ risk cost} = \$0 \text{ per annum}$$

Non-network Solutions

No feasible non-network solutions have been identified to address this Need.

⁷ Based on TransGrid historical outage rates for connection points (7.3%) and restoration time (1 hour).

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)	Yearly Opex (\$m)	Yearly Post Project Risk Cost (\$m)	Economic NPV (\$m)	Financial NPV (\$m)	Rank
Base case	'Do nothing' (Do not make new connection).	-	-	2.85	-	-	2
A	132 kV Connection of ActewAGL's Proposed Strathnairn ZS (and associated works)	1.58	0.032	0.00	21.20	(-1.32)	1

The commercial evaluation is based on:

- (a) a 10% discount rate
- (b) a life of the investment of 15 years and a corresponding residual/terminal value
- (c) 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 for the preferred option, A:

Table 3: Discount rate sensitivities (\$ million)

Option	Description	Economic NPV @ 13%	Economic NPV @ 6.75%
A	132 kV Connection of ActewAGL's Proposed Strathnairn ZS (and associated works)	15.81	30.47

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.

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 \$0.032 million, escalated at a rate of 2.9% per annum.⁸

Regulatory Investment Test – Transmission (RIT-T)

The preferred option is not subject to the RIT-T as it is below the \$6 million threshold required.

⁸ TransGrid Success Database as at May 2016.

5. Recommendation

Based on the economic evaluation and compliance obligation mentioned above, Option A is the preferred option, as it is least cost and meets all of TransGrid and ActewAGL's statutory and regulatory obligations for transmission of electricity in the ACT.

Furthermore, Option A:

- > enables TransGrid to meet its supply obligations under the National Electricity Rules.
- > significantly reduces TransGrid's risk exposure and reduces the risk from \$3m per year to zero.

It is therefore recommended that an RPS be completed for the construction of a new 132 kV line switchbay at Canberra BSP for the connection of ActewAGL's proposed Strathnairn ZS, and to meet all ACT reliability standards.

Appendix A - Financial and Economic Evaluation Reports

Project_Option Name

Need 1440 - 132 kV Connection

1. Financial Evaluation (excludes VCR benefits)

NPV @ standard discount rate	10.00%	-\$1.32m	NPV / Capital (Ratio)	-0.83
NPV @ upper bound rate	13.00%	-\$1.31m	Pay Back Period (Yrs)	Not measurable
NPV @ lower bound rate (WACC)	6.75%	-\$1.31m	IRR%	-3.97%

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%	\$21.20m	NPV / Capital (Ratio)	13.42
NPV @ upper bound rate	13.00%	\$15.81m	Pay Back Period (Yrs)	Not measurable
NPV @ lower bound rate (WACC)	6.75%	\$30.47m	IRR%	97.75%

Benefits

Risk cost	As Is	To Be	Benefit	VCR Benefit	\$2.95m
Systems (reliability)	\$2.96m	\$0.00m	\$2.96m	ENS Penalty	\$0.00m
Financial	\$0.01m	\$0.00m	\$0.01m	All other risk benefits	\$0.05m
Operational/compliance	\$0.00m	\$0.00m	\$0.00m	Total Risk benefits	\$3.00m
People (safety)	\$0.00m	\$0.00m	\$0.00m	Benefits in the financial NPV*	\$0.05m
Environment	\$0.00m	\$0.00m	\$0.00m	*excludes VCR benefits	
Reputation	\$0.03m	\$0.00m	\$0.03m	Benefits in the economic NPV**	\$3.00m
Total Risk benefits	\$3.00m	\$0.00m	\$3.00m	**excludes ENS penalty	
Cost savings and other benefits			\$0.00m		
Total Benefits			\$3.00m		

Other Financial Drivers

Incremental opex cost pa (no depreciation)	-\$0.03m	Write-off cost	\$0.00m
Capital - initial \$m	-\$1.58m	Major Asset Life (Yrs)	40.00 Yrs
Residual Value - initial investment	\$0.51m	Re-investment capital	\$0.00m
Capitalisation period	3.00 Yrs	Start of the re-investment period	0.00 Yrs