OPTIONS EVALUATION REPORT (OER)

FY24-28 Palisade Renewal

OER- N2562 revision 0.0

Ellipse project no(s):
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Approvals

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Change history

Revision	Date	Amendment
0	11/11/2021	First Issue

Executive summary

Palisade gates and fences are currently installed on the perimeter of the majority of sites in TransGrid's network. This type of construction has been installed at sites assessed as a Critical or High security risk in alignment with the Network Security Assessment Methodology.

Palisade gates are experiencing increasing failure rates due to a number of factors including age based wear and tear as well as design issues. Moreover, a number of safety and security related incidents have occurred at TransGrid and in the industry due to defective palisade gate installations or the reduced capability of palisade fencing due to the advent of portable power tools. The gate mechanisms in some instances were unable to sufficiently support the weight of the fence, leading to gate collapse. Consequently, the majority of swing gates across the network have had safety slings installed as an interim solution to reduce the consequence of gate collapse following a network-wide audit. These gates have become a safety hazard requiring addressing.

There is a need to address internal and public health and safety risks associated with a portion of our palisade gate fleet and better meet our responsibilities under the Work Health Safety Act 2011 as a Person Conducting a Business or Undertaking (PCBU). TransGrid is also required to demonstrate that it has taken all reasonably practicable steps to ensure that network safety is addressed as a component under its Electricity Network Safety Management System (ENSMS).

A number of options have been considered to address this need including implementing welded mesh solutions instead of palisade. As welded mesh is lighter than palisade, it poses a lower safety risk for staff and third parties and will likely have a longer life compared to palisade systems. Welded mesh requires a longer period of time to affect a fence breach, and also enables CCTV detection and monitoring through the fence line to allow for earlier recognition and alarming.

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

Table 1 - Evaluated options ($ million)

Option	Description	Direct capital cost	Overheads	Total capital cost[1]	Weighted NPV	Rank
Option A	Upgrade palisade gate mechanisms only	7.79	0.16	7.95	-1.63	2
Option B	Retrofit with welded mesh gate reusing mechanism	Option is not technically feasible				
Option C	Replace with welded mesh gate (incl. mechanism)	7.53	0.65	8.18	-0.56	1
Option D	Replace entire palisade perimeter (gates and fencing with) welded mesh	124.73	4.68	129.41	-80.49	3

It is the recommendation that Option C – Replace with welded mesh gate be scoped in detail. This option was found to have the highest net economic benefit while also enabling TransGrid to continue to meet its obligations in work health and safety for personnel as well as public safety.

[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

TransGrid is bound by our Public Safety obligations to mitigate the risk to the public by installing a secure facility to prevent intrusion and subsequent injury for a live high voltage site. Palisade gates and fences are currently installed on the perimeter of the majority of sites in TransGrid's network.

Palisade gates are experiencing increasing failure rates due to a number of factors including:

- Aged based deterioration of mechanical parts
- Excessive wear and tear on mechanical parts
- Former design and/or installation related issues

Moreover, a number of safety and security related incidents have occurred at TransGrid and in the industry due to defective palisade gate installations or the reduced capability of palisade fencing due to the advent of portable power tools. In severe cases these gates have been known to collapse upon manual operation, and as a result WorkSafe has issued a relevant safety warning/notice that remains currently in effect. TransGrid has carried out an audit of all palisade swing gates across network and as an interim solution safety slings have been installed on gates identified as defective to reduce the consequence of gate failure. These gates have become a safety hazard requiring addressing.

Operational issues associated with sliding gates also poses a security and safety risk. Where gates fail to operate electrically, there is a risk of injury to personnel operating the gate manually. In cases where the gate fails to close, there is a heightened risk of unauthorised public entry to live high voltage sites.

There is a need to address internal and public health and safety risks associated with a portion of our palisade gate fleet and better meet our responsibilities under the Work Health Safety Act 2011 as a Person Conducting a Business or Undertaking (PCBU). Also, TransGrid is required to demonstrate that it has taken all reasonably practicable steps to ensure that network safety is addressed as a component under its Electricity Network Safety Management System (ENSMS). The primary objectives to be addressed by the ENSMS include, as taken from the regulatory instruments:

- The safety of members of the public
- The safety of persons working on networks, and
- The protection of property (whether or not belonging to a network operator)
- The management of safety risks arising from loss of electricity supply.

Table 2 below identifies extracts from other regulatory instruments, standard and guidelines that state the need to protect the safety of members of public.

Table 2 Regulatory Compliance Requirements

Identified need	*Regulatory Instruments*
Regulatory compliance examples (non-exhaustive)	**Network safety** - Obligation for network operators to ensure safety of transmission systems under: **1. Electricity Supply (Safety and Network Management) Regulation 2014 (NSW)** > Section 5: 'A network operator must take all reasonable steps to ensure that the design, construction, commissioning, operation and decommissioning of its network (or any part of its network) is safe.' **2. Utilities (Technical Regulation) (Electricity Transmission Supply Code) Approval 2016 (No 1) (ACT)** > 2.2 (3): Ensure the safe management of the electricity transmission network to avoid injury to any person or damage to property and the environment.

Identified need	Regulatory Instruments
	> Section 5.1: An electricity transmission utility must have an electricity network safety management system consistent with the principles and requirements set out in AS 5577 Electricity Network Safety Management Systems. (2) These principles and requirements are summarised as, but are not limited to: (a) the protection of the electricity transmission network; (b) the safety of persons working on or near the electricity transmission network; (c) the safety of the public and the protection of any property near the electricity transmission network; > Section 5.2 (2): Planning and design considerations by the electricity transmission utility must include but are not limited to: (a) issues such as safety of persons;

Alternate solutions to palisade should also be considered to address this need. Welded mesh gates and fencing are also being installed at sites requiring high security implementations. As welded mesh is lighter than palisade, it poses a lower safety risk for staff and third parties and will likely have a longer life compared to palisade systems. Welded mesh requires a longer period of time to affect a fence breach, and also enables CCTV detection and monitoring through the fence line to allow for earlier recognition and alarming.

The current estimate of palisade gates requiring renewal between 2023/24 and 2027/28 is 84.

2. Related needs/opportunities

The following need may benefit from coordination with these works:

> Need N2553 – FY24-28 Building Refurbishment

3. Options

3.1 Base case

The Base Case for this need is to continue with TransGrid's business as usual operations and maintenance (O&M). However, swing gates that are currently slung are deemed to already be in a failed state. The Base Case assumes that at a minimum, remediation works are to be carried out for these swing gates as the safety sling is merely an interim solution to reduce the likelihood of severe injury upon gate collapse. The minimum remediation work required has been determined to be upgrading the palisade gate mechanism (as in Option A below) due to it being the lowest cost solution identified in the feasibility studies. Thus, a portion of the Base Case involves capital expenditure for upgrading the gate mechanism for 73 palisade swing gates across TransGrid's network. This is factored into the evaluation of each option.

The Base case does not address the following issues:

> Significant defect rate being observed for slide gates at various sites across the network. Gate issues can have a significant operational impact as well as posing a security risk if the gate is unable to be closed. Where gates fail to operate electrically, there is a risk of injury to personnel operating the gate manually. In cases where the gate fails to close, there is a heightened risk of unauthorised public entry to live high voltage sites.

> Limited life extension (up to 15 years) achieved by upgrading the mechanism as it is expected that similar issues will eventually reoccur due to the significant weight of the gate.

3.2 Options evaluated

Option A — Upgrade palisade gate mechanisms [NOSA N2562, OFS N2562]

This option involves upgrading the main vehicle access palisade gate mechanisms at various sites across TransGrid. Existing palisade gate panels are to be reused where practicable.

This option will deliver benefits by achieving the following:

- Addressing the safety risk associated with the swing gates that are currently slung while minimising costs.
- Reduction in corrective maintenance costs for the identified slide gates which are exhibiting high rates of operational failure. The public and worker safety risk associated with slide gate failures will also be reduced.

This option provides the least benefits compared to other options considered. Moreover, it is expected that similar mechanical issues will eventually reoccur due to the significant weight of the gate. The anticipated life expectancy is 15 years.

It is anticipated that the works will commence and be completed in 2023/24.

Option B — Retrofit with welded mesh gate [NOSA N2562, OFS N2562B]

This option involves retrofitting the main vehicle access palisade gate with a welded mesh gate, at various sites across TransGrid and reusing as many components as possible.

The feasibility study for this option has determined that this option is not technically feasible and hence this option has not been pursued further.

Option C — Replace with welded mesh gate [NOSA N2562, OFS N2562C]

This option involves replacing the main vehicle access palisade gate with a welded mesh gate, at various sites across TransGrid. The scope includes:

- Retrofitting the gate with welded mesh panel(s)
- Renewal of all required components (e.g. motor, hinges and bolts, tracks and runners)

This option will deliver benefits by achieving the following:

- Addressing the safety risk associated with the swing gates that are currently slung.
- Reduction in corrective maintenance costs for the identified slide gates which are exhibiting high rates of operational failure. The public and worker safety risk associated with slide gate failures will also be minimised.

As welded mesh is lighter than palisade, it poses a lower safety risk for staff and third parties and is expected to have a longer life (25 years) compared to upgrading the palisade system.

It is anticipated that the works will commence and be completed in 2023/24.

Option D — Replace all components with welded mesh [NOSA N2562, OFS N2562D]

This option involves replacing all gates and fencing with a welded mesh solution, at various sites across TransGrid. The scope includes.

This option will deliver benefits by achieving the following:

- Addressing the safety risk associated with the swing gates that are currently slung.
- Reduction in corrective maintenance costs associated with the gates as well as the fencing at the identified sites. The public and worker safety risk associated with slide gate failures will also be minimised.
- As welded mesh is lighter than palisade, it poses a lower safety risk for staff and third parties and will likely have a longer life compared to upgrading the palisade system.
- Improvement in site security as welded mesh provides a longer delay to power tools for accessing a site and facilitates CCTV detection and monitoring through the fence line to allow for earlier recognition and alarming.

This option provides the most benefits compared to the other options being considered. However, the capital expenditure required is significantly larger which will impact the cost effectiveness of the solution.

It is anticipated that the works will commence in 2023/24 and completed in 2024/25.

Option E — Combination of gate and fence renewal

This option involves replacing the fencing and gates with a welded mesh solution at high risk sites to address safety and security issues and gates only at lower risk sites to address safety across TransGrid. The scope will be extrapolated from the feasibility studies and subsequent evaluation of the other options to balance capital against benefits for electricity consumers and security requirements for the network.

3.3 Options considered and not progressed

Table 3 - Option considered but not progressed

Option	Reason for not progressing
Asset Retirement	This can only be achieved through retirement of the associated assets within the targeted sites, which is not technically or commercially feasible.

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.

Table 4 – Scenario assumptions

Parameter	Central scenario	Lower bound scenario	Higher bound scenario
Discount rate	4.8%	7.37%	2.23%
Capital cost	100%	125%	75%
Operating expenditure benefit	100%	75%	125%
Risk costs benefit	100%	75%	125%
Other benefit	100%	75%	125%
Scenario weighting	**50%**	**25%**	**25%**

Parameters used in this commercial evaluation:

Table 5 - Parameters used in commercial evaluation

Parameter	Parameter Description	Value used for this evaluation
Discount year	Year that dollar values are discounted to	2020/21
Base year	The year that dollar value outputs are expressed in real terms	2020/21 dollars
Period of analysis	Number of years included in economic	15 years

Parameter	Parameter Description	Value used for this evaluation
	analysis with remaining capital value included as terminal value at the end of the analysis period.	
Safety disproportionality	Multiplier of the safety risk cost included in NPV analysis to demonstrate implementation of obligation to reduce safety to ALARP.	Refer to section 4.3 for details.

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

4.2 Commercial evaluation results

The commercial evaluation of the technically and commercially feasible options is set out in Table 6. Details appear in Appendix A.

Table 6 - Commercial evaluation ($ million)

Option	Capital Cost PV	Central scenario NPV	Lower bound scenario NPV	Higher bound scenario NPV	Weighted NPV	Ranking
Option A	6.91	-1.83	-4.78	1.95	-1.63	2
Option B	Option is not technically feasible [2]					
Option C	7.11	-0.77	-3.99	3.28	-0.56	1
Option D	109.85	-81.54	-104.46	-54.43	-80.49	3
Option E	Option is not applicable (see Note below)					

Note: It was intended that the scope for option E would be extrapolated from the feasibility studies and subsequent evaluation of the other options considered to achieve the most cost effective solution per site. However, as the evaluation of Option D has shown that replacement of the palisade fencing is not commercially viable at any of the targeted sites, this option has been deemed not applicable.

The evaluation focuses on the operational expenditure benefits (through reduction in corrective defects) achieved by upgrading or replacing the targeted assets. The safety risk to personnel and the public associated with gate failures has not been quantified. However, addressing this Need would deliver additional benefits by minimising these unquantified risks.

4.3 ALARP evaluation

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 the regulation obligations and TransGrid's business risk appetite. Under the Electricity Supply (Safety and Network Management) Regulation 2014 Section 5 'A network operator must take all reasonable steps to ensure that the design, construction, commissioning, operation and decommissioning of its network (or any part of its network) is safe.' TransGrid maintains an ENSMS to meet this obligation.[3]

[2] The feasibility study for Option B determined that the option is not technically feasible and hence could not be evaluated further.

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

TransGrid considers that ALARP is demonstrated if, where reasonably practicable the hazard has been eliminated or where this is not reasonably practicable:

(a) All risk treatment options have been considered

(b) A risk treatment option has not been implemented only if the cost of doing so is grossly disproportionate to the benefit gained

(c) Opportunity for further safety improvement has been assessed

It should also be noted that AS 5577 requires that the option that provides safety risk reduction benefit should be progressed irrespective of cost, until an acceptable level of residual risk is achieved. There is significant uncertainty in the quantification of the safety risk as it relies on probability assumptions around public and staff behaviour. As such, safety risk has not been quantified and in this case the evaluation has focused only on opex benefits achieved by renewing the gates. Under the scenario where palisade gates are not renewed, it is considered TransGrid cannot demonstrate with confidence that a similar level of safety outcome is being achieved when compared with replacing.

On this basis the proposed investment is recommended to progress as it is considered a reasonable treatment option that has the opportunity for further safety improvement.

4.4 Preferred option

The preferred option to meet the identified need by 2027/28 is Option C. This option involves replacing the main vehicle access palisade gate with a welded mesh gate at targeted sites. It is the most commercially viable solution to enable TransGrid to continue to meet its obligations in public safety as well as work health and safety for personnel.

Capital and Operating Expenditure

There is negligible difference in predicted ongoing planned routine operational expenditure between the option and the Base Case.

Resultant corrective maintenance, particularly for the identified slide gates, under the base case strategy is anticipated to result in higher expenditure over the upcoming regulatory period. Delivery of proposed works under Option C will reduce the risk of increasing direct defect response costs.

These operating expenditure benefits have been captured in the commercial evaluation.

Regulatory Investment Test

The program and estimate allows for the appropriate Regulatory approvals as required.

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 benefits (including avoided costs and safety disproportionality tests) of the preferred option exceeds the annualised costs of the option. The commencement year is determined based on the required project disbursement to the meet the commissioning year based on the OFS.

The results of optimal timing analysis is:

- Optimal commissioning year: 2023/24
- Commissioning year annual benefit: $3.67 million
- Annualised cost: $0.57 million

Based on the optimal timing, the project is expected to commence in the 2023/24-2027/28 Regulatory Period.

6. Recommendation

It is the recommendation that Option C – Replace with weld mesh gate be scoped in detail.

The total project cost is $8.18 million including an amount of $1 million to progress the project from DG1 to DG2.

Appendix A – Option Summaries

Project Description	FY24-28 Palisade Renewal		
Option Description	Option A - Upgrade palisade gate mechanism		
Project Summary			
Option Rank	*2*	Investment Assessment Period	*15*
Asset Life	*15*	NPV Year	2020/21
Economic Evaluation			
NPV @ Central Benefit Scenario (PV, $m)	-1.83	Annualised CAPEX @ Central Benefit Scenario ($m)	Annualised Capex - Standard (Business Case) 0.76
NPV @ Lower Bound Scenario (PV, $m)	-4.78	Network Safety Risk Reduction ($m)	Network Safety Risk Reduction 0.00
NPV @ Higher Bound Scenario (PV, $m)	1.95	ALARP	ALARP Compliant? No
NPV Weighted (PV, $m)	-1.63	Optimal Timing	Optimal timing (Business Case) 2023/24
Cost (Central Scenario)			
Total Capex ($m)	7.95	Cost Capex (PV,$m)	6.91
Terminal Value ($m)	0.00	Terminal Value (PV,$m)	0.00
Risk (Central Scenario)	**Pre**	**Post**	**Benefit**
Reliability (PV,$m)	Reliability Risk (Pre) 0.00	Reliability Risk (Post) 0.00	Pre – Post 0.00
Financial (PV,$m)	Financial Risk (Pre) 0.00	Financial Risk (Post) 0.00	Pre – Post 0.00
Operational/Compliance (PV,$m)	Operational Risk (Pre) 0.00	Operational Risk (Post) 0.00	Pre – Post 0.00
Safety (PV,$m)	Safety Risk (Pre) 0.00	Safety Risk (Post) 0.00	Pre – Post 0.00
Environmental (PV,$m)	Environmental Risk (Pre) 0.00	Environmental Risk (Post) 0.00	Pre – Post 0.00
Reputational ($m)	Reputational Risk (Pre) 0.00	Reputational Risk (Post) 0.00	Pre – Post 0.00
Total Risk (PV,$m)	Total Risk (Pre) 0.00	Total Risk (Post) 0.00	Pre – Post 0.00
OPEX Benefit (PV,$m)			OPEX Benefit 0.00
Other benefit (PV,$m)			Incremental Net Benefit 5.08
Total Benefit (PV,$m)			Business Case Total Benefit 5.08

Project Description	FY24-28 Palisade Renewal		
Option Description	Option C - Replace with welded mesh gate		
Project Summary			
Option Rank	*1*	Investment Assessment Period	*15*
Asset Life	*25*	NPV Year	2020/21
Economic Evaluation			
NPV @ Central Benefit Scenario (PV, $m)	-0.77	Annualised CAPEX @ Central Benefit Scenario ($m)	Annualised Capex - Standard (Business Case) 0.57
NPV @ Lower Bound Scenario (PV, $m)	-3.99	Network Safety Risk Reduction ($m)	Network Safety Risk Reduction 0.00
NPV @ Higher Bound Scenario (PV, $m)	3.28	ALARP	ALARP Compliant? No
NPV Weighted (PV, $m)	-0.56	Optimal Timing	Optimal timing (Business Case) 2023/24
Cost (Central Scenario)			
Total Capex ($m)	8.18	Cost Capex (PV,$m)	7.11
Terminal Value ($m)	2.95	Terminal Value (PV,$m)	1.27
Risk (Central Scenario)	**Pre**	**Post**	**Benefit**
Reliability (PV,$m)	Reliability Risk (Pre) 0.00	Reliability Risk (Post) 0.00	Pre – Post 0.00
Financial (PV,$m)	Financial Risk (Pre) 0.00	Financial Risk (Post) 0.00	Pre – Post 0.00
Operational/Compliance (PV,$m)	Operational Risk (Pre) 0.00	Operational Risk (Post) 0.00	Pre – Post 0.00
Safety (PV,$m)	Safety Risk (Pre) 0.00	Safety Risk (Post) 0.00	Pre – Post 0.00
Environmental (PV,$m)	Environmental Risk (Pre) 0.00	Environmental Risk (Post) 0.00	Pre – Post 0.00
Reputational ($m)	Reputational Risk (Pre) 0.00	Reputational Risk (Post) 0.00	Pre – Post 0.00
Total Risk (PV,$m)	Total Risk (Pre) 0.00	Total Risk (Post) 0.00	Pre – Post 0.00
OPEX Benefit (PV,$m)			OPEX Benefit 0.00
Other benefit (PV,$m)			Incremental Net Benefit 5.08
Total Benefit (PV,$m)			Business Case Total Benefit 5.08

Project Description	FY24-28 Palisade Renewal		
Option Description	Option D - Replace all components with welded mesh		
Project Summary			
Option Rank	*3*	Investment Assessment Period	*15*
Asset Life	*25*	NPV Year	2020/21
Economic Evaluation			
NPV @ Central Benefit Scenario (PV, $m)	-81.54	Annualised CAPEX @ Central Benefit Scenario ($m)	Annualised Capex - Standard (Business Case) 9.00
NPV @ Lower Bound Scenario (PV, $m)	-104.46	Network Safety Risk Reduction ($m)	Network Safety Risk Reduction #N/A
NPV @ Higher Bound Scenario (PV, $m)	-54.43	ALARP	ALARP Compliant? No
NPV Weighted (PV, $m)	-80.49	Optimal Timing	Optimal timing (Business Case) >2027/28
Cost (Central Scenario)			
Total Capex ($m)	129.41	Cost Capex (PV,$m)	109.85
Terminal Value ($m)	51.76	Terminal Value (PV,$m)	22.26
Risk (Central Scenario)	**Pre**	**Post**	**Benefit**
Reliability (PV,$m)	Reliability Risk (Pre) 0.00	Reliability Risk (Post) 0.00	Pre – Post 0.00
Financial (PV,$m)	Financial Risk (Pre) 0.00	Financial Risk (Post) 0.00	Pre – Post 0.00
Operational/Compliance (PV,$m)	Operational Risk (Pre) 0.00	Operational Risk (Post) 0.00	Pre – Post 0.00
Safety (PV,$m)	Safety Risk (Pre) 0.00	Safety Risk (Post) 0.00	Pre – Post 0.00
Environmental (PV,$m)	Environmental Risk (Pre) 0.00	Environmental Risk (Post) 0.00	Pre – Post 0.00
Reputational ($m)	Reputational Risk (Pre) 0.00	Reputational Risk (Post) 0.00	Pre – Post 0.00
Total Risk (PV,$m)	Total Risk (Pre) 0.00	Total Risk (Post) 0.00	Pre – Post 0.00
OPEX Benefit (PV,$m)			OPEX Benefit 0.00
Other benefit (PV,$m)			Incremental Net Benefit 6.05
Total Benefit (PV,$m)			Business Case Total Benefit 6.05

Appendix B – Forecasted Replacement Quantities

Listed below are 127 network sites with palisade gate issues that are to be addressed in this Need under Option C.

Site Code	Site Name	Site Type	Main Gate Type	Cost	Weight NPV
ALB	Albury	Substation	Slide	$79,727	-$49,933
AR1	Armidale	Substation	Slide	$79,727	-$4,176
AVS	Avon	Substation	Swing	$53,107	$14,952
BAD	Baldy Peak	Radio Repeater Site	Swing	$53,107	$1,879
BAY	Bayswater	Substation	Slide	$79,727	-$10,712
BBY	Bannaby	Substation	Slide	$79,727	-$17,249
BER	Beryl	Substation	Slide	$79,727	-$49,933
BFD	Beaconsfield	Substation	Slide	$79,727	-$36,859
BKH	Broken Hill	Substation	Swing	$53,107	$1,879
BOS	South Boambee	Switching Station	Swing	$53,107	$1,879
BRA	Mt Burra	Radio Repeater Site	Swing	$53,107	$1,879
BRG	Buronga	Substation	Swing	$53,107	$1,879
CA1	Canberra	Substation	Slide	$79,727	-$23,786
CLY	Coleambally	Substation	Swing	$53,107	$1,879
CNR	Mt Coonambro	Radio Repeater Site	Swing	$53,107	$1,879
COA	Cooma	Substation	Swing	$53,107	$1,879
COF	Coffs Harbour	Substation	Swing	$53,107	$47,636
CRW	Currawarna	Radio Repeater Site	Swing	$53,107	$1,879
CW2	Cowra	Substation	Slide	$79,727	-$43,396
DFT	Darkes Forest	Radio Repeater Site	Swing	$53,107	$1,879
DMQ	Dumaresq	Switching Station	Swing	$53,107	$1,879
DN2	Deniliquin	Substation	Slide	$79,727	-$43,396
DNT	Darlington Point	Substation	Swing	$53,107	$14,952

Site Code	Site Name	Site Type	Main Gate Type	Cost	Weight NPV
DPT	Dapto	Substation	Slide	$79,727	-$36,859
ELS	Ellsmore	Radio Repeater Site	Swing	$53,107	$1,879
EMH	Emerald Hill	Radio Repeater Site	Swing	$53,107	$1,879
EMV	Emmaville	Radio Repeater Site	Swing	$53,107	$1,879
ER0	Eraring	Substation	Slide	$79,727	-$10,712
FIL	Finley	Radio Repeater Site	Swing	$53,107	$1,879
FNY	Finley	Substation	Slide	$79,727	-$36,859
GAD	Gadara	Substation	Swing	$53,107	$1,879
GN2	Gunnedah	Substation	Slide	$79,727	-$17,249
GNS	Glen Innes	Substation	Swing	$53,107	$1,879
GRD	Girard	Radio Repeater Site	Swing	$53,107	$1,879
GTH	Guthega	Switching Station	Swing	$53,107	$8,416
GUL	Gullen Range	Radio Repeater Site	Swing	$53,107	$1,879
GUR	Gullen Range	Switching Station	Swing	$53,107	$1,879
HHR	Hammond Hill	Radio Repeater Site	Swing	$53,107	$8,416
HIR	High Range	Radio Repeater Site	Swing	$53,107	$1,879
HKH	Hawk Hill	Radio Repeater Site	Swing	$53,107	$1,879
HLD	Holroyd	Substation	Slide	$79,727	-$43,396
HRS	Hay	Radio Repeater Site	Swing	$53,107	$1,879
HTG	Hallam Trig	Radio Repeater Site	Swing	$53,107	$1,879
HU2	Lake Hume Village	Substation	Swing	$53,107	$1,879
ING	Ingleburn	Substation	Slide	$79,727	-$36,859
INV	Inverell	Substation	Slide	$79,727	-$23,786
KCR	Kemps Creek	Substation	Slide	$79,727	$2,361
KJG	Kurrajong	Radio Repeater Site	Swing	$53,107	$1,879
KLK	Koolkhan	Substation	Slide	$79,727	-$23,786

Site Code	Site Name	Site Type	Main Gate Type	Cost	Weight NPV
KS2	Kempsey	Substation	Slide	$79,727	-$36,859
KVS	Kangaroo Valley	Substation	Swing	$53,107	$14,952
LDA	Lerida	Radio Repeater Site	Swing	$53,107	$1,879
LP1	Liverpool	Substation	Slide	$79,727	$2,361
LSM	Lismore	Substation	Slide	$79,727	-$10,712
LT1	Lower Tumut	Switching Station	Slide	$79,727	-$36,859
MAC	Menangle	Substation	Slide	$79,727	-$17,249
MBH	Murrumburrah	Radio Repeater Site	Swing	$53,107	$1,879
MCA	Mt Coramba	Radio Repeater Site	Swing	$53,107	$1,879
MCN	Mt Canobolas	Radio Repeater Site	Swing	$53,107	$1,879
MDL	Mt Darling	Radio Repeater Site	Swing	$53,107	$1,879
MGY	Mt Grey	Radio Repeater Site	Swing	$53,107	$1,879
MLB	Mt Lambie	Radio Repeater Site	Swing	$53,107	$1,879
MLG	Mallanganee	Radio Repeater Site	Swing	$53,107	$1,879
MMH	Mt Meehan	Radio Repeater Site	Swing	$53,107	$1,879
MMK	Mt McKenzie	Radio Repeater Site	Swing	$53,107	$1,879
MMQ	Mt Macquarie	Radio Repeater Site	Swing	$53,107	$1,879
MN1	Munmorah	Substation	Slide	$79,727	$2,361
MNY	Munyang	Substation	Swing	$53,107	$1,879
MPP	Mt Piper	Substation	Slide	$79,727	-$30,323
MRE	Moree	Substation	Slide	$79,727	-$17,249
MRK	Muswellbrook	Substation	Swing	$53,107	$34,563
MRU	Murrumburrah	Radio Repeater Site	Slide	$79,727	-$43,396
MRW	Merriwa	Radio Repeater Site	Swing	$53,107	$1,879
MSG	Mt Spring	Radio Repeater Site	Swing	$53,107	$1,879
MTP	Mt Piper	Substation	Slide	$79,727	-$30,323

Site Code	Site Name	Site Type	Main Gate Type	Cost	Weight NPV
MUR	Murray	Substation	Swing	$53,107	$1,879
MVL	Macksville	Switching Station	Swing	$53,107	$1,879
NAM	Nambucca	Substation	Slide	$79,727	-$36,859
NB2	Narrabri	Substation	Slide	$79,727	-$36,859
NER	Nerriga	Radio Repeater Site	Swing	$53,107	$1,879
NEW	Newcastle	Substation	Slide	$79,727	$48,119
ONO	Orange North	Substation	Slide	$79,727	-$10,712
ORG	Orange	Substation	Slide	$79,727	-$30,323
PAN	Parrots Nest	Radio Repeater Site	Swing	$53,107	$1,879
PKS	Parkes	Substation	Swing	$53,107	$1,879
PMA	Panorama	Substation	Swing	$53,107	$28,026
PMQ	Port Macquarie	Substation	Slide	$79,727	-$23,786
QBY	Queanbeyan	Substation	Slide	$79,727	-$4,176
RAL	Rayleigh	Switching Station	Swing	$53,107	$1,879
RAZ	Razorback	Radio Repeater Site	Swing	$53,107	$1,879
RLP	Roches Loop	Radio Repeater Site	Swing	$53,107	$1,879
RRT	Robertson	Radio Repeater Site	Swing	$53,107	$1,879
RWR	Rookwood	Substation	Slide	$79,727	$2,361
SDE	Sydney East	Radio Repeater Site	Swing	$53,107	$14,952
SE1	Sydney East	Substation	Slide	$79,727	$35,045
SKC	Simpkins Creek	Radio Repeater Site	Swing	$53,107	$1,879
SNB	Snubba	Radio Repeater Site	Swing	$53,107	$1,879
SOM	Somersby	Radio Repeater Site	Swing	$53,107	$1,879
SQH	Square Head	Radio Repeater Site	Swing	$53,107	$1,879
SUL	Sugarloaf	Radio Repeater Site	Swing	$53,107	$14,952
SYN	Sydney North	Substation	Slide	$79,727	-$23,786

Site Code	Site Name	Site Type	Main Gate Type	Cost	Weight NPV
SYS	South Sydney	Substation	Slide	$79,727	$87,339
SYW	Sydney West	Substation	Slide	$79,727	$87,339
TA1	Tamworth	Substation	Slide	$79,727	-$23,786
TGH	Tuggerah	Substation	Slide	$79,727	$2,361
TMW	Tamworth	Substation	Swing	$53,107	$14,952
TOM	Tomago	Substation	Slide	$79,727	$28,508
TRE	Taree	Substation	Slide	$79,727	$8,898
TTF	Tenterfield	Substation	Swing	$53,107	$8,416
TU2	Tumut	Substation	Slide	$79,727	-$36,859
URQ	Uranquinty	Switching Station	Swing	$53,107	$1,879
UT1	Upper Tumut	Switching Station	Swing	$53,107	$1,879
VP1	Vales Point	Substation	Slide	$79,727	-$30,323
VYD	Vineyard	Substation	Slide	$79,727	-$17,249
WDL	Williamsdale	Substation	Slide	$79,727	-$36,859
WG1	Wagga Wagga	Substation	Swing	$53,107	$14,952
WG2	Wagga Wagga	Substation	Swing	$53,107	$8,416
WGN	Wagga North	Substation	Slide	$79,727	-$43,396
WL1	Wellington	Substation	Slide	$79,727	-$43,396
WLR	Wollar	Radio Repeater Site	Swing	$53,107	$1,879
WRS	Wellington	Radio Repeater Site	Swing	$79,727	-$10,712
WW1	Wallerawang 330kV	Substation	Slide	$53,107	$1,879
YA2	Yanco	Substation	Slide	$79,727	-$17,249
YPR	Mt Yarrahapinni	Radio Repeater Site	Swing	$79,727	-$30,323
YSN	Yass	Substation	Slide	$53,107	$1,879
YSR	Yass	Radio Repeater Site	Swing	$79,727	-$43,396