INVESTMENT GOVERNANCE COMMITTEE PAPER FOR MEETING 27 AUGUST 2020

ITEM 3.1:	**PROJECT APPROVAL – CABRAMURRA SUPPLY RESTORATION**	**FOR DECISION**

Presenter: [redacted]
Date Prepared: 20 August 2020

Recommendation

That the Investment Governance Committee ("IGC") endorse and the Chief Executive Officer approve:

1. The proposed *Cabramurra supply restoration* project, that has been endorsed by the Network Steering Committee ("NSC") with an estimated cost of $6.0M.

Summary

The attached paper (attachment 1) is the paper titled '*Item 4.2: Cabramurra Supply Options – Supplementary Paper'* that was submitted to the Network Steering Committee ("NSC") for endorsement with the recommended option. The committee requested further information when the paper was original submitted at a previous committee meeting and supplementary information has been included in the endorsed paper. The NSC endorsed the recommended '*Option 2 – "Install a 330/11kV Transformer at Upper Tumut Switching Station (UTSS)'* with estimated cost of $6.0M

[redacted]

Background

Supply to Cabramurra township, the Selwyn Ski Resort, and the Selwyn communications tower was lost when the January 2020 bushfires damaged the existing 33kV powerline from Providence Portal to Cabramurra.

In the solution developed for the project a wide range of options were considered. As part of the option development extensive consultation with stakeholders was undertaken included with Snowy Hydro Limited (SHL), National Parks & Wildlife Service through SHL, Selwyn Ski fields, Selwyn Communications tower tenants and Transgrid.

[redacted]

The full detail of the project proposal is available in attachment 1 of this paper

Discussion

The NSC is satisfied that it has completed its due diligence on behalf of the IGC and has endorsed option 3 2 as recommended by the paper certifier. Table 1 is a summary of options from the NSC paper and the full detail is available in the attachments in the NSC paper on page 4-12.

Table 1 - Summary of Options and Cost Estimate

Options Considered:		Assessment	40-Year PVC ($M)	Market Benefit NPV ($M)	Cost $M
1.	Supply from Ravine Substation	Not feasible	NA	NA	NA
2.	Install a 330/11kV Transformer at Upper Tumut Switching Station (UTSS)	Preferred option [redacted]	[redacted]	-12.4	6.0
3.	Rebuild the 33kV Powerline from Providence Portal to Cabramurra using Composite Poles	Lower initial cost but higher NPV		-13.5	[redacted]
4.	Stand Alone Power System and Microgrid (SAPS)	Cost prohibitive		-29.1	
5.	Maintain Snowy Hydro Auxiliary Supplies to Cabramurra	Not feasible	NA	NA	NA

[redacted]

Implications

Risks

Table 2 is the summary of the project risks identify in the original paper.

[redacted]

[redacted]

Financial

[redacted]

Next Steps

[redacted]

[redacted]

Attachment:

1. ITEM 4.2: CABRAMURRA SUPPLY OPTIONS – SUPPLEMENTARY PAPER

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Finalised PDF Paper Attached on the follow page

ITEM 4.2: **CABRAMURRA SUPPLY OPTIONS – SUPPLEMENTARY PAPER** **FOR DECISION**

Presenter: [redacted]

Date Prepared: 7 August 2020

Recommendation

1. That the Network Steering Committee endorse the recommendation of this Supplementary Paper to proceed with the recommended option (Option 2 - UTSS), noting it has the most positive outcome under mostly all cost sensitivities, for both Essential Energy [redacted] and NER Market Benefit financial evaluations subject to:-

   - [redacted]

2. That the Network Steering Committee approve partial funding of Option 2 – "*Install a 330/11kV Transformer at Upper Tumut Switching Station (UTSS)*" having an:

   - Upfront Cost to Essential Energy of $6.0M
   - [redacted]
   - Market Benefit NPV of -$12.4M

[redacted]

Summary

Supply to Cabramurra, the Selwyn Ski Resort, and the Selwyn communications tower was lost when the January 2020 bushfires damaged the existing 33kV powerline from Providence Portal to Cabramurra.

In consultation with Snowy Hydro the decision was made to rely on the Snowy Hydro backup (station auxiliaries) to Cabramurra, to allow for the investigation of options other than rebuilding the existing fire-damaged 33kV powerline.

This Supplementary Paper presents further explanation, detail, and quantification of issues [redacted] particular to Option 2 – 'Supply from UTSS via a 330/11kV transformer'.

[redacted]

Background

For reference, Figure 1 is a geographical diagram illustrating the location of the key sites and associated power supply connectivity.

On the 6th of January 2020, the Dunns Road bushfire swept through the Kosciusko National Park, damaging 65% of structures on the 33kV powerline from Providence Portal to Selwyn and Cabramurra. This resulted in loss of power supply to Cabramurra, the Selwyn ski resort, and the Selwyn communications tower. Two thirds of the buildings at the Cabramurra village were lost in the fires, as was the entire Selwyn Ski Resort.

[redacted]

Supply to Cabramurra has been restored by Snowy Hydro from its Tumut 1 and Tumut 2 power station auxiliary supplies, and supply to the Selwyn communications tower has been restored via a diesel generator which charges a battery system (SAPS). Selwyn Ski Resort is closed.

[redacted]

[redacted]

A Discussion Paper was presented to the April 2020 NSC, with agreement to progress a more detailed costing of the more viable supply restoration options.

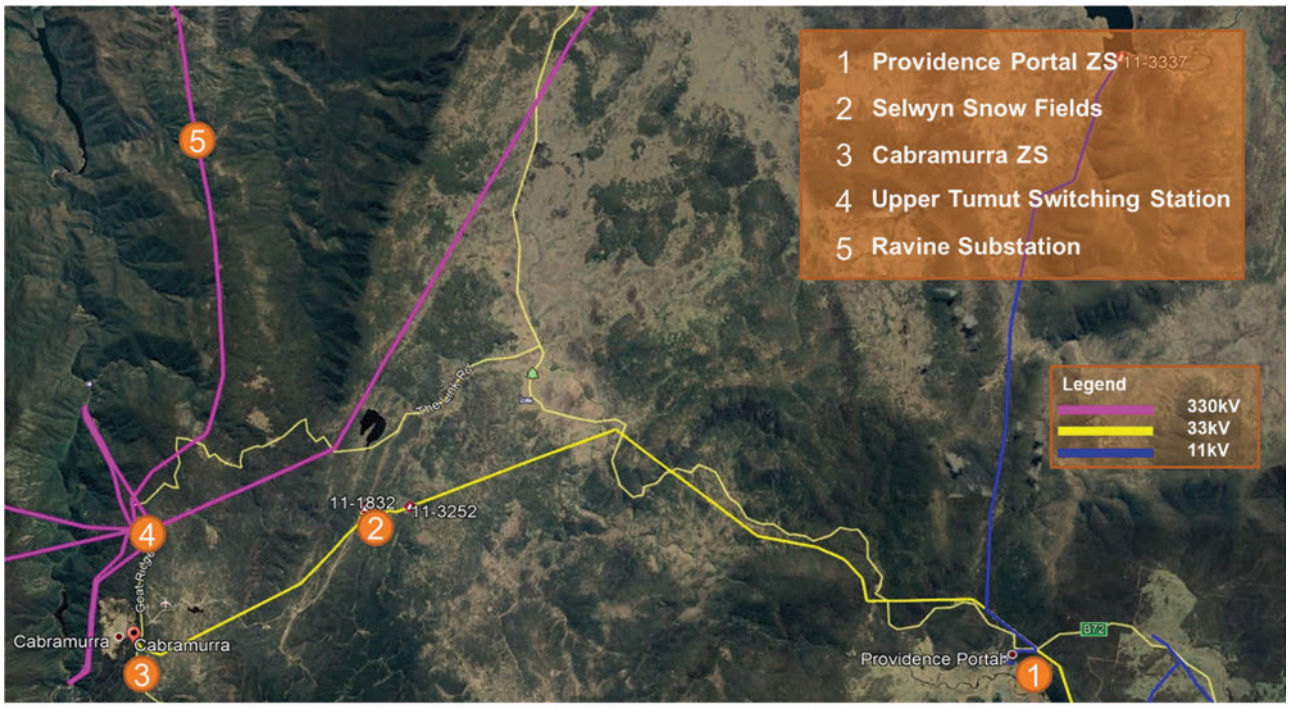


Figure 1: Pre-Bushfire Supply Network from Providence Portal to Cabramurra

[redacted]

Five options to restore supply have been assessed for technical, economic, societal viability (following NER processes), [redacted]

These are:

1. Supply from Ravine Substation
2. Install a 330/11kV Transformer at Upper Tumut Switching Station (UTSS)
3. Rebuild the 33kV Powerline from Providence Portal to Cabramurra using Composite Poles
4. Stand Alone Power System and Microgrid (SAPS)
5. Maintain Snowy Hydro Auxiliary Supplies to Cabramurra

Following assessment of the base cases for each Option, two unfeasible options have been ruled out, these are Option 1 and Option 5. Since the July 2020 NSC meeting and after further review, Option 2 and Option 3 are still the main front-runners.

To Recap on the Front-Running Options

Option 2: Install a 330/11kV Transformer at Upper Tumut Switching Station (UTSS)

This Option involves sourcing a local 11kV supply from the TransGrid 330kV UTSS switching station near Cabramurra. It involves TransGrid providing a 330kV CB bay connection, with Essential Energy constructing and owning a 330/11kV transformer, single 11kV CB, 11kV overhead line to Cabramurra and overhead 11kV powerline to Selwyn. [redacted]

There are two feasible options for the 11kV section of powerline from Upper Tumut Switching Station to Cabramurra:

1. An overhead powerline using a more environmentally friendly covered conductor (CCT) to reduce vegetation clearing along a winding service roadway corridor, or
2. An underground cable.

[redacted]

The significant benefits of this Option are:

- Improved reliability due to the 330kV supply security over that as originally serviced from Cooma via a lengthy, sometimes inaccessible overhead network, and
- Lower environmental impact on the National Park, and
- [redacted]

[redacted]

Option 2 has an:

- **Upfront Cost to Essential Energy of $6.0M**
- [redacted]
- **Market Benefit NPV of -$12.4M**

Option 3: Rebuild the 33kV powerline from Providence Portal to Cabramurra Using Composite Poles

This Option involves the rebuilding of the 33kV powerline from Providence Portal to Cabramurra using Composite (resin/fibreglass) poles.

The benefits of this Option are:

- Restoring the 33kV powerline could be achieved relatively quickly compared to the other options, [redacted]
- The powerline is less exposed to bushfire damage due to the use of composite poles, and
- The only remedial action required following a bushfire, would be to reapply a sacrificial protective coating on the composite poles at minimal cost.

While this option has a lower initial cost, it has substantially higher ongoing costs than the other options, including vegetation management. Inherently, it has a lower level of reliability given the 100km of 66kV line and 34km of 33kV line which supply to Cabramurra and Selwyn originally depended upon. These factors have been accounted for in the analysis.

Option 3 has an:

- [redacted]
- **Market Benefit NPV of -$13.5M**

Discussion

Summary of the Options – Revised Financial Analysis

A summary of the Base Case Revised Financial Analysis for the options since the July NSC is shown in Table 1 below:

Options Considered		Essential Energy Evaluation		Market Benefit	
		Upfront Cost EE ($M)	40-Year EE PVC ($M)	Upfront Cost ($M)	40-Year NPV ($M)
2.	330/11kV Transformer	[redacted]			($12.4)
3.	Rebuild 33kV Line				($13.5)
4.	SAPS and Microgrid				($29.1)

Table 1: Options (Base Case) - August NSC Revised Financial Analysis

Options Considered		Assessment	July NSC		August NSC	
			40-Year PVC ($M)	Market Benefit NPV ($M)	40-Year PVC ($M)	Market Benefit NPV ($M)
1.	Ravine 33kV Supply	Not feasible	NA	NA	NA	NA
2.	330/11kV Transformer	Preferred option [redacted]	[redacted]			-$12.4M
3.	Rebuild 33kV Line	Lower initial cost but higher NPV				-$13.5M
4.	SAPS and Microgrid	Cost prohibitive				-$29.1M
5.	SHL Supply	Not feasible	NA	NA	NA	NA

Table 2: Options (Base Case) – July and August NSC Comparative Financial Analysis

As mentioned previously, Option 2 and Option 3 are still the most favourable in mostly all cases, as can be observed from the highlighted data in both Table 1 and Table 2 above.

Recommended Option

The recommended option, Option 2 aligns with Essential Energy's key strategic initiatives in that it has a strong correlation with the Customers need for a safe, reliable and low risk supply compared to that which existed prior to the recent bushfires. [redacted] as it offers a more environmentally sustainable stance for both the Customer and Essential Energy, particularly should the supply be undergrounded.

[redacted]

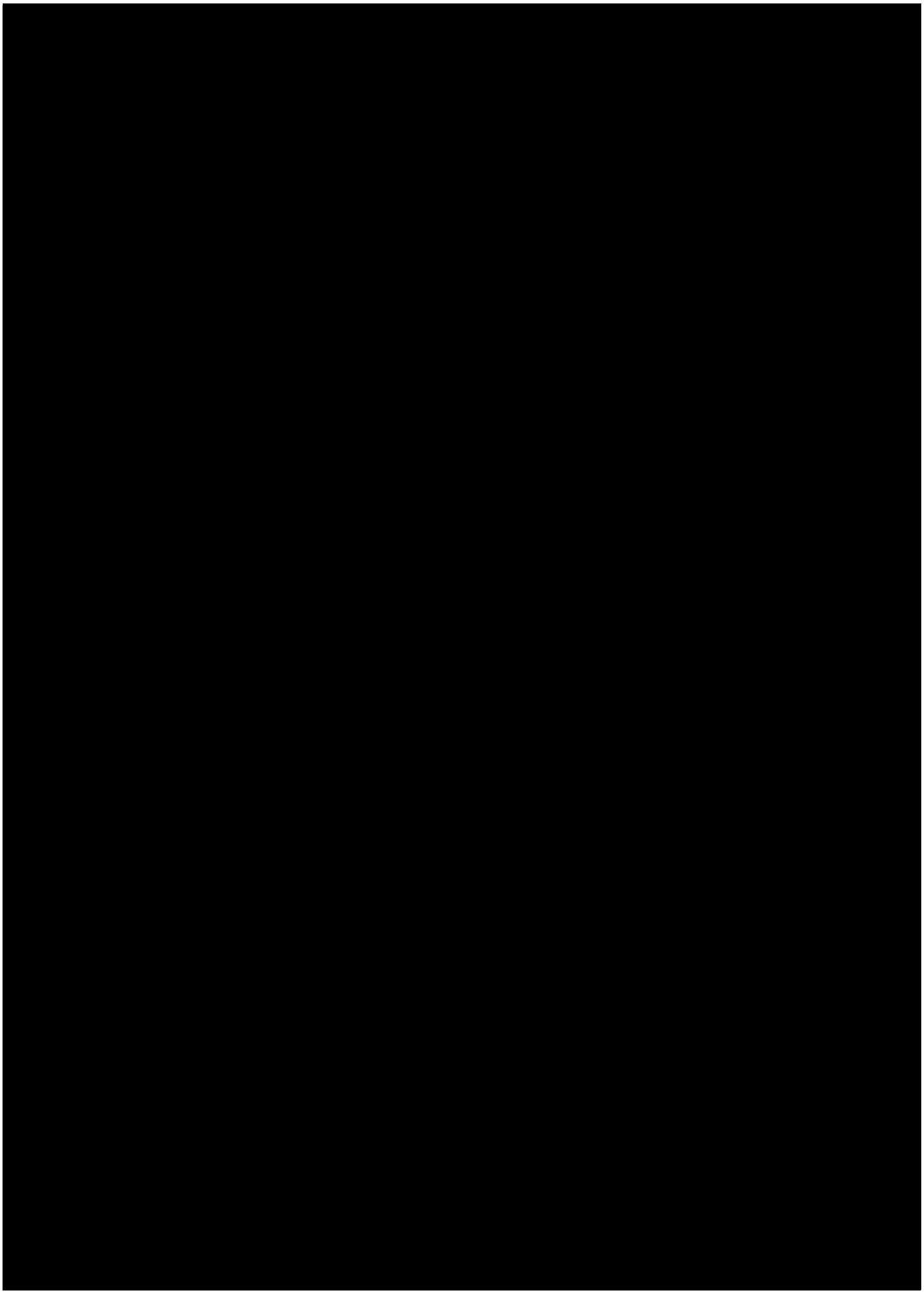
This option is also arguably the most secure supply option, as it sources supply from the nearby 330kV network to service Cabramurra, Selwyn Ski Resort, and communications tower.

Implications

[redacted]

[redacted]

Quantifications of Risks



[redacted]

Total Connection and Forecast Pass Through Costs

[redacted] Market Benefits is a concept from the RIT-D and considers how projects impact customer price. For this reason, the total connection and pass through costs of the project have been assessed under a RIT-D evaluation
Below is a comparison of the Essential Energy and NPV using each methodology.

Options Considered		Essential Energy Evaluation		Market Benefit	
		Upfront Cost EE ($M)	40-Year EE PVC ($M)	Upfront Cost ($M)	40-Year NPV ($M)
2.	330/11kV Transformer	[redacted]			($12.4)
3.	Rebuild 33kV Line				($13.5)
4.	SAPS and Microgrid				($29.1)

Table 3: Options (Base Case) – Revised Financial Analysis

Referring to Table 3, it can be seen in both the EE and RIT-D analysis, Option 3 has a lower upfront cost; however, Option 2 has a lower lifetime cost (Present Value Cost).

The two components associated with network pricing that will be impacted differently by the options include:

1. Transmission Use of System Charge (TUOS)
2. Distribution Use of System Charge (DUOS)

[redacted]

Updated Financial Analysis

There have been several minor changes and inclusions in the financial analysis since the July NSC Paper which have improved the completeness of the analysis. In general, the inclusions have increased the cost estimate for each option, with the major changes summarised below:

- All Options – Included Market Benefit from Losses
- Option 2 – Included risks and O&M for overhead 11kV line from UTSS to Cabramurra
- Option 2 – Improved estimate of fuel cost for generation needed for single transformer failure
- Option 3 – Added risks to 33kV network between fire damaged section and Providence Portal (3km)
- Option 4 – Increased the value of Energy from SAPS in line with AEMO FY20 Figures

A Summary of the Options Financial Analysis is shown in Table 4 below:

Options Considered		Assessment	July NSC		August NSC	
			40-Year PVC ($M)	Market Benefit NPV ($M)	40-Year PVC ($M)	Market Benefit NPV ($M)
1.	Ravine 33kV Supply	Not feasible	NA	NA	NA	NA
2.	330/11kV Transformer	Preferred option [redacted]	[redacted]	[redacted]	[redacted]	-$12.4M
3.	Rebuild 33kV Line	Lower initial cost but higher NPV				-$13.5M
4.	SAPS and Microgrid	Cost prohibitive				-$29.1M
5.	SHL Supply	Not feasible	NA	NA	NA	NA

Table 4: Options Financial Analysis

It can be observed from Table 4 that these incremental changes have not changed the ranking or comparative difference between the options.

Table 5 below provides an updated first five years' worth of incremental costs and opex savings, including taxation implications, as well as the total Essential Energy Project lifetime Present Value of Costs.

($000) Nominal	2020	2021	2022	2023	2024	2025	Total Life
Year	0	1	2	3	4	5	Life Time (40 years)
Incremental opex (savings)		[redacted]					
Capital Expenditure							
Earnings Before Interest, Tax, Depreciation and Amortisation ("EBITDA")							
Earnings Before Interest and Tax ("EBIT")							
Net Operating Profit After Tax (NOPAT)							
Discounted Cash flow							

Table 5: Essential Energy Internal Costs & Savings (Option 2: Install 330/11kV Transformer at UTSS)

Sensitivities

Analysis has been performed to determine the sensitivity of each option to key parameters. In this case the variation in cost due to a change in Discount Rate, Capital Cost, Maintenance Cost and Value of Unserved Energy have been evaluated. The analysis has been performed in the RIT-D market benefits calculation to show the overall impact on customers with the results summarised below:

25% Increase in Sensitivities (RIT-D NPV $M)	Discount Rate	Capital Cost	Maintenance Costs	VUE
Option 2 - 330/11kV Transformer UTSS	[redacted]			
Option 3 - Restore 33kV Line				
Option 4 - Cabramurra SAPS Selwyn 11kV				

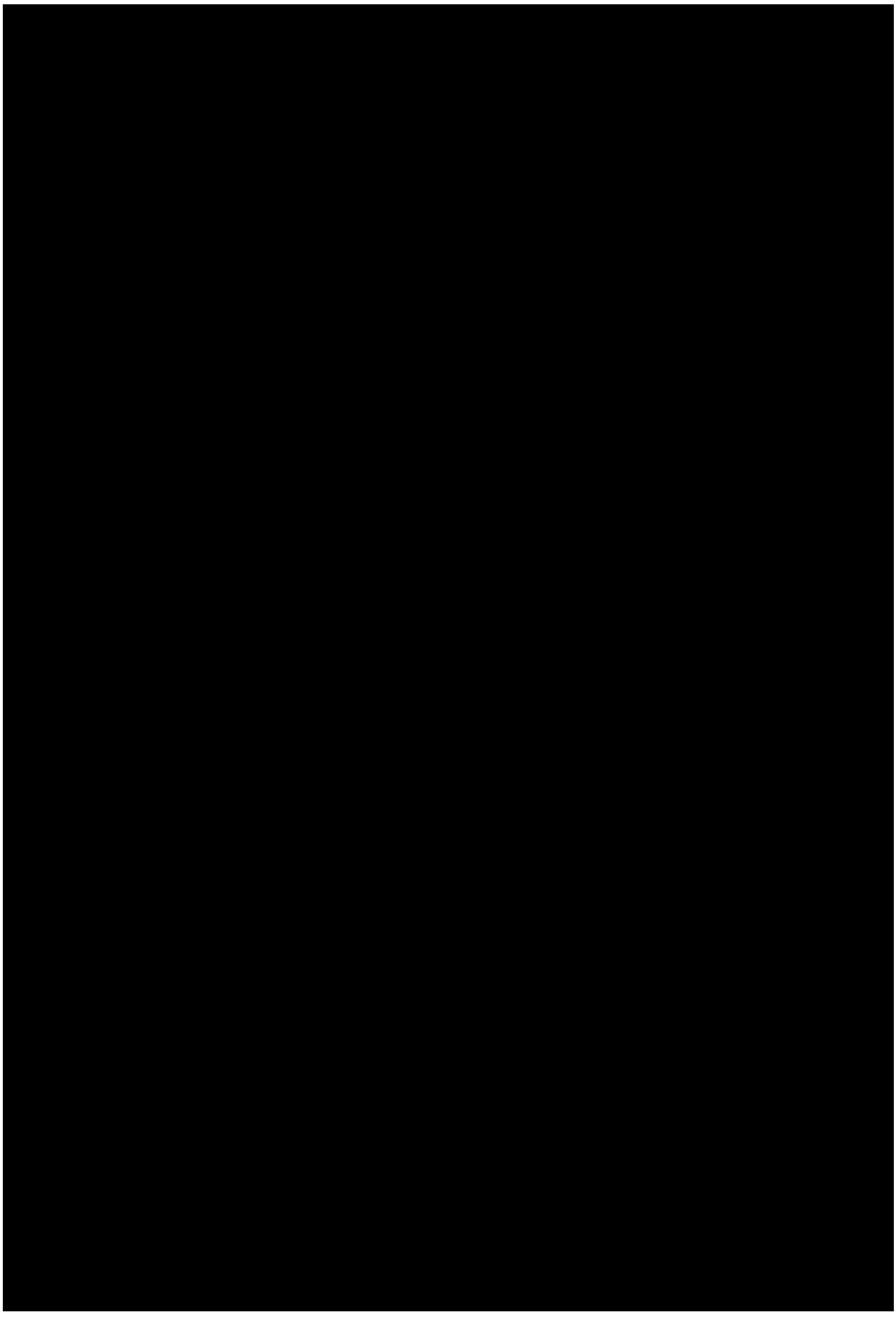
Table 6: 25% Increase in Sensitivities

From Table 6, Option 2 is best value for all sensitivities apart from a 25% increase in capital cost. [redacted]

25% Decrease in Sensitivities (RIT-D NPV $M)	Discount Rate	Capital Cost	Maintenance Costs	VUE
Option 2 - 330/11kV Transformer UTSS	[redacted]			
Option 3 - Restore 33kV Line				
Option 4 - Cabramurra SAPS Selwyn 11kV				

Table 7: 25% Decrease in Sensitivities

From Table 7, Option 2 would be better value in all sensitivities apart from a 25% decrease in the Value of Unserved Energy. [redacted]



Appendix 3: Data for Cabramurra Supply Option Analysis

The following data was used in the financial evaluation of options to restore supply to Cabramurra. [redacted]

[redacted]

Capital Expenditure

[redacted]

Description of Work	Cost	Confidence	Provided by
TG UTSS 330kV Line Bay	[redacted]	Desktop Design	TransGrid
EE UTSS Transformer		Desktop Design	Network Design Development
EE 11kV OH to Cabramurra 3km		Desktop Design	Network Design Development
EE 11kV Line to Selwyn 8km (PD)		Desktop Design	Network Design Development
EE 11kV Line Selwyn to Comms 11kV (0.7km)		Desktop Design	Network Design Development
TG UTSS 330kV Line Bay		Desktop Design	TransGrid
EE 33kV Line 27km 33kV composite poles		Desktop Design	Network Design Development
Cabramurra 1.5MW Wind Turbine		Desktop Design	[redacted]
Cabramurra 4MW Solar		Desktop Design	
Cabramurra 9MWh Battery		Desktop Design	
2.5MW Gas Gen		Desktop Design	
EE 11kV Line to Selwyn 8km (PD)		Desktop Design	Network Design Development
EE 11kV Line Selwyn to Comms 11kV (0.7km)		Desktop Design	Network Design Development

Market Benefits

[redacted]

Description of Work	Value	Confidence	Provided by
SHL Cabramurra 33/11kV Substation	[redacted]	Quote	[redacted]
SHL Cabramurra 11kV Kiosk		Quote	
SAPS Generation Value ($/MWh)		Actual	AER Web Site
Annual Saved Distribution Losses (DLF)		Calculated	Load Flow Model
Annual Saved Marginal Loss Factors		Calculated	AEMO Web Site

Reliability Values

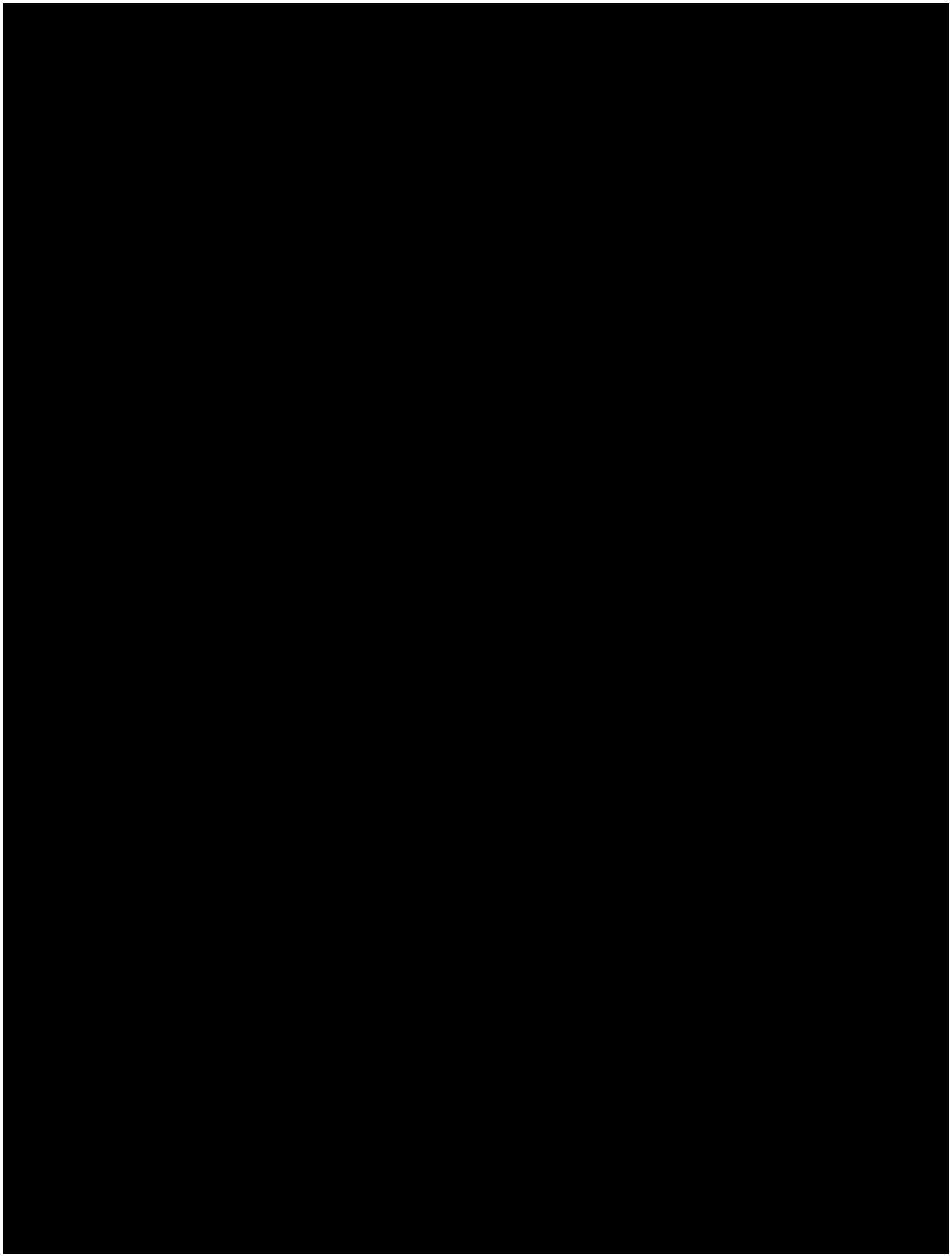
[redacted]

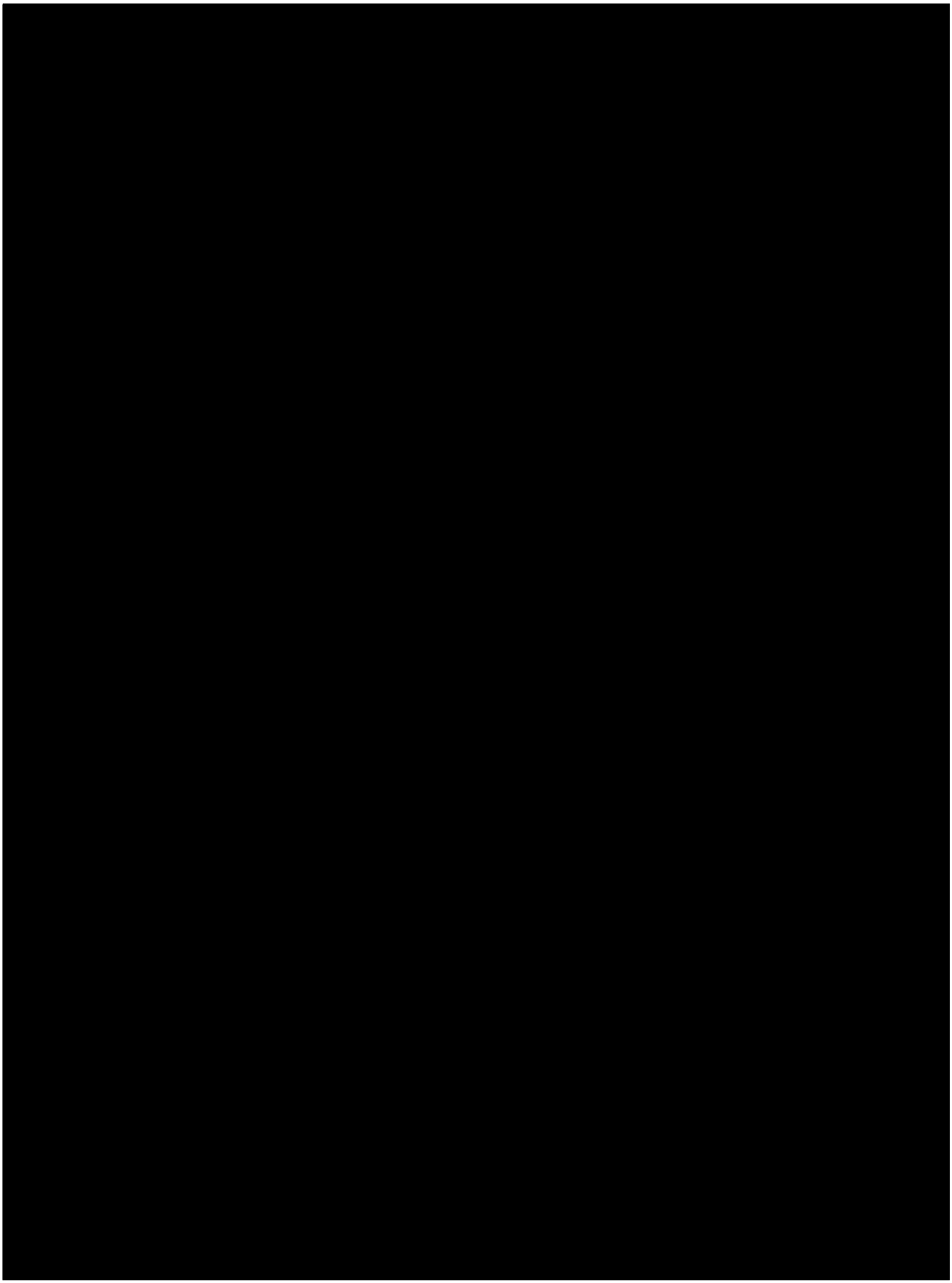
Rate	Value	Confidence	Provided by
Value of Customer Reliability	[redacted]	Actual	AER
66kV shielded line outage rate (Fault/100km/annum)		Industry Standard	[redacted]
33kV and 11kV line outage rate (fault/100km/annum)		Actual	Network Reliability
33kV and 11kV line restoration time (Hours)		Actual	Network Reliability
Selwyn Average Demand (kW)		Actual	Metering Data
Selwyn Energy Usage / Annum (kW)		Actual	Metering Data
Selwyn / Cabramurra Average Demand (kW)		Actual	Metering Data
Selwyn / Cabramurra Energy Usage / Annum (kWh)		Actual	Metering Data

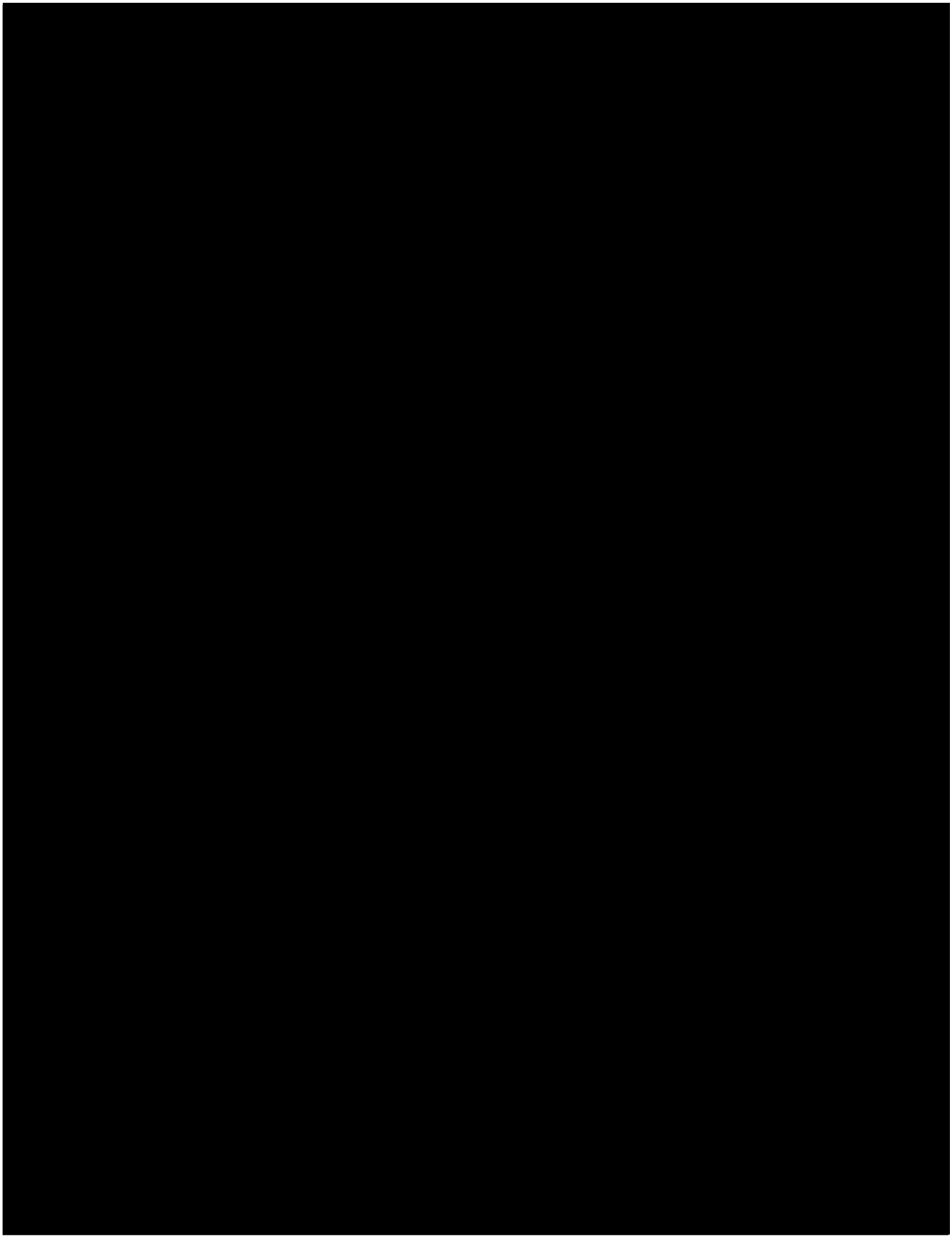
Operational Costs

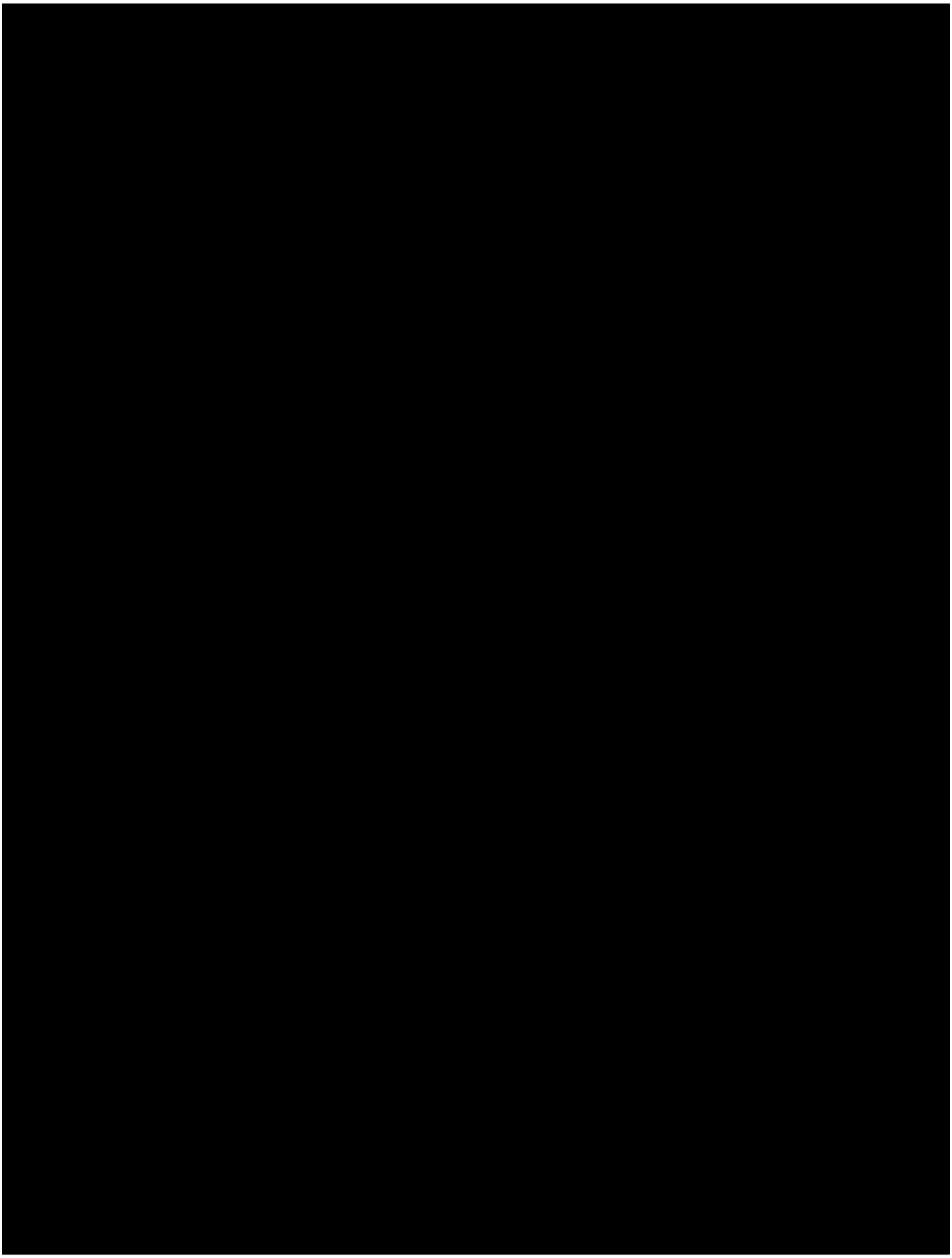
[redacted]

Description of Work	Value	Confidence	Provided by/Basis for Estimate
Decommissioning and Removal of Line 849	[redacted]	Design Estimate	Network Design Development
OH Line Maintenance	[redacted]% capital	Agreed Value	Network Maintenance Manager
Substation Maintenance	[redacted]% capital	Agreed Value	Network Substation Manager
Line Inspection per pole	[redacted]	Actual	Asset Inspection Manager
Number of 33kV poles / km	[redacted]	Estimate	Standard Rural Construction
Inspection cycle (Years)	[redacted]	Actual	Asset Inspection Manager
Increase Average Line Inspection Costs	[redacted]	Agreed Value	Asset Inspection
Veg Management Rate veg span	[redacted]	Actual	[redacted]
Spans to cut Adaminaby to Cabramurra (36km)	[redacted]	Actual	[redacted]
Veg Cycle (Years)	[redacted]	Actual	[redacted]
Generator Hire 1MVA ($/day)	[redacted]	Quote	[redacted]
Generator Diesel Fuel Usage (L/kWh)	[redacted]	Design Estimate	[redacted]
Diesel Cost ($/L)	[redacted]	Market Rate	Market Rate
SAPS Fuel [redacted] L/annum)	[redacted]	Design Estimate	[redacted]









Recommendation

1. That the Network Steering Committee endorse the recommendation of this Supplementary Paper to proceed with the recommended option (Option 2 - UTSS), noting it has the most positive outcome under mostly all cost sensitivities, for both Essential Energy [redacted] and NER Market Benefit financial evaluations [redacted]
2. [redacted]
3. That the Network Steering Committee approve partial funding of Option 2 – "*Install a 330/11kV Transformer at Upper Tumut Switching Station (UTSS)*" having an:

- Upfront Cost to Essential Energy of $6.0M
- [redacted]
- Market Benefit NPV of -$12.4M

[redacted]

[redacted]

Next Steps

[redacted]

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