OPTIONS EVALUATION REPORT (OER)

Various Locations VT Renewal Program

OER 000000001442 revision 6.0

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

Approvals

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Date submitted for approval	8 November 2017	

Change history

Revision	Date	Amendment
0	5 June 2016	Initial issue
1	23 June 2016	Clarification of CVT replacement scope, NPV calculations and Capex value, ALARP methodology and associated tables including VTs to be replaced
2	24 June 2016	CVT capex values (& associated total Capex and NPV figures) updated
3	20 October 2016	CVT capex values (and associated total Capex, NPV and ALARP figures) updated, SFAIRP/ALARP methodology, minor wording and specific CVTs to be replaced included in attachment
4	10 November 2016	Updated asset replacement list and associated Capex, risk and evaluation figures
5	30 November 2016	Update to format
6	1 December 2016	Minor update to format (dollar values)
7	15 December 2016	Minor amendment to correct un-escalated dollars statement & 18/19 refs
8	08 November 2017	Updated CVT risk cost following incentive cost removal, ALARP values from new methodology, CVT type fault inclusion and CVT risk and CVT Capex values updated.

1. Need/opportunity

Voltage Transformers (VTs) are essential for the operation of the high voltage network and are used to provide the main system voltage at a level which can be used in protection, metering, indication and control functions.

An increased risk of VT failure results from deterioration in condition and this leads to an increased risk cost. This risk cost should be addressed once it is beyond acceptable levels to ensure ongoing and safe reliability of supply.

2. Related Needs/opportunities

Separate programs for other substation assets are being developed and should be considered when packaging work.

3. Options

All dollar values in this document are expressed in un-escalated 2016/17 dollars.

The Options Screening Report outlines the options which were not considered to address this Need. The option which was not considered feasible is refurbishment since it would not successfully reduce the risk associated with this Need. The two remaining options are included in this evaluation.

Base Case

The Base Case is the do nothing option whereby the VTs will be run-to-failure without prior consideration of replacement. This option has the following ongoing risk costs (per annum) associated with it:

- Magnetic Voltage Transformers (MVTs): $3.70m
- Capacity Voltage Transformers (CVTs): $1.05m

Even after the run-to-failure strategy has been implemented the nominated VTs will still then be required, since the network must be restored to normal operation. However, the impact of this may be greater than the risk above, due to increased costs associated with urgent and unplanned work.

Option A — Replacement of VTs [OFR 1442A, OFS 1442A]

This option involves the replacement of identified VTs in order to reduce the risk of failure and the associated risks.

There is a reduction in Opex associated with defect work resulting from the replacement of the MVTs. This has been estimated using the historic defect costs for the assets with available data and then increasing to account for missing historical data and assumed increasing defect rate in the future.

The costing in the Option Feasibility Study (OFS) has assumed all units are 3 phase replacements and provided the details for the reduction in cost when this is not the case (for example single phase VT installations). This has been accounted for in the calculation of actual capex required for this option. The Capex value in the OFS has been adjusted to suit the number of individual assets which are recommended to be replaced based on the following evaluations.

VT failure and replacement data has been modelled and the asset type has been determined to have a relatively constant failure rate through the early part of its life before increasing due to aging of components which will inevitably lead to failure of the asset. Additionally, there are some CVTs which are expected to fail due to known type issues (Trench TEMP) or have existing leaks (three 500kV CVTs at Eraring Substation) which will accelerate their failure. The exact timing and corresponding risk is not known and therefore risk cost is not known, however a portion of these CVTs have been included in the replacement program. The known type fault on the Haefley CVTs

has also been addressed in this option (refer to the needs statement which highlights recent additional failures of this type resulting in these having a higher assessed risk of failure).

4. Evaluation

Evaluation of the proposed options has been completed using both commercial considerations and the ALARP (as low as reasonably practical) regulatory requirements. The results of these evaluations are outlined below.

4.1 Commercial evaluation

The result of commercial evaluation for each of the options is summarised in Table 1.

Table 1 – Commercial evaluation ($ million)

Option	Description	Total capex	Annual opex[1]	Annual post project risk cost	Economic NPV @10%	Rank
Base Case	Do nothing and run-to-failure	N/A	N/A	4.9	N/A	2
A	Replacement of MVTs	8.8	(0.04)	0	30.4	1
	Replacement of CVTs	8.0	0	0.3	12.4	

The Net Present Value (NPV) analysis (discounted to June 2019) assumes that each asset replacement listed in Attachment 1 occurs during the 5 year regulatory period. The timing of the replacements should generally occur with the highest NPV replacements first. The asset life of the new VTs is 45 years and the NPV analysis has been completed over a 30 year timeframe (including the initial investment period) and the residual value of the VTs have been included in the final year cash flow.

The economic evaluation is based on:

> a discount rate of 10%

Sensitivities on economic Net Present Value (NPV) for the option with changing discount rates are shown in Table 2.

The sensitivity analysis is based on TransGrid's current Australian Energy Regulator (AER)-determined pre-tax real regulatory Weighted Average Cost of Capital (WACC) of 6.75% and an upper bound of 13%. The sensitivity analysis demonstrates a strongly positive NPV for the range of discount rates considered, however the number of individual asset replacements which are NPV positive reduces with the higher discount rate and increases with the lower discount rate.

Table 2 – Discount rate sensitivities ($ million)

Option	Description	Economic NPV @13%	Economic NPV @6.75%
A	Replacement of MVTs	18.9	51.9

[1] The Opex savings associated with the replacement of MVTs represent the savings in reduced number of defects

Option	Description	Economic NPV @13%	Economic NPV @6.75%
	Replacement of CVTs	6.4	24.6

4.2 SFAIRP/ALARP evaluation

Options to reduce the network safety risk as per the risk treatment hierarchy have been considered in other lifecycle stages of the asset, and it has been determined that no reasonably practicable options exist to reduce the risk further than those capital investment options listed in Table 1.

Evaluation of the proposed options has been completed against the SFAIRP (So Far As Is Reasonably Practicable)/ALARP (As Low As Reasonably Practical) obligation, as required by the Electricity Supply (Safety and Network Management) Regulation 2014 and the Work Health and Safety Act 2011. The Key Hazardous Events and the disproportionality multipliers considered in the evaluation are as follows:

- Catastrophic failure of asset/uncontrolled discharge or contact with electricity/ unauthorised access to site - 3 times the safety risk and 10% of the reliability risk (applicable to safety)
- Unplanned outage of High Voltage (HV) equipment - 10% of the reliability risk (applicable to safety)

The results of this evaluation are summarised in the tables below which includes those assets which are considered reasonably practicable (refer to Attachments for the result of the evaluation for each individual asset).

Table 3 – Annual risk calculations ($ thousand)

Option		Annual Residual Risk			Annual Risk Savings		
		Safety Risk	Reliability Risk	Bushfire Risk	Safety Risk	Reliability Risk	Bushfire Risk
Base	Do nothing - MVTs	433	2,909	N/A	N/A	N/A	N/A
	Do nothing - CVTs	30	869	N/A	N/A	N/A	N/A
A	Replacement of MVTs	0	0	N/A	433	2,909	N/A
	Replacement of CVTs	5	252	N/A	25	616	N/A

Table 4 – Reasonably practicable test ($ thousand)

Option		Network Safety Risk Reduction[2]	Annualised CAPEX	Reasonably practicable[3]?
A	Replacement of MVTs	1,595	627	Refer to Attachment 1
	Replacement of CVTs	137	577	Refer to Attachment 2

The SFAIRP/ALARP evaluation has been completed for each individual asset. A summary of the results of the test included in Table 4 and the result for each individual asset is provided in Attachments 1 and 2.

[2] The Network Safety Risk Reduction is calculated as 6 x Bushfire Risk Reduction + 3 x Safety Risk Reduction + 0.1 x Reliability Risk Reduction

[3] Reasonably practicable is defined as whether the annualised CAPEX is less than the Network Safety Risk Reduction

4.3 Preferred option

The outcome of the SFAIRP/ALARP evaluation is that Option A is the preferred option for the relevant assets as it is reasonably practicable and is therefore required to satisfy the organisation's SFAIRP/ALARP obligations.

The outcome of the economic evaluation is also to implement Option A for the particular assets which have a positive NPV.

Capital and operating expenditure

The operational savings associated with decreased defect costs of the new assets has been included. There are no other ongoing capital expenditure considerations beyond the initial asset replacement project.

Regulatory Investment Test

A Regulatory Investment Test for Transmission (RIT-T) is unlikely to be required but confirmation should be sought from Asset Management.

5. Recommendation

It is recommended that Project Approval Documents be prepared to implement Option A for the MVTs included in Attachment 1 and the CVTs included in Attachment 2, with a total Capex of $16.76m.

Attachment 1 – MVTs

Table 5 provides a summary of the MVTs requiring replacement and Table 6 shows the result of the economic and SFAIRP/ALARP evaluations for each individual assets.

Table 5 – Summary of MVT quantities

Voltage (kV)	Number of replacements
11	1
22	12
33	22
66	68
132	29
220	4
330	6
Total	**142**

Table 6 should be read in conjunction with the following notes:

- The “Replace based on evaluation” column confirms if replacement is required based on either SFAIRP/ALARP or economic evaluation.
- Some VTs are nominated for replacement based on the combined NPV of all phases within a bay, for example if two phases are positive and one is negative and the total for that project is positive.

Table 6 – MVTs requiring replacement

No.	Equipment Reference	PIC Number	Equipment Description	Voltage	Replace based on evaluation	NPV @ 10%, as at Jun'19
1	SWSDN24L2	A07185/4	844 BARHAM 66KV FEEDER BAY	66	Yes - SFAIRP/ALARP and Economic	2,565,316
2	SWSBKH7G	EC00009662	NO4 RAILWAY TOWN 22KV FEEDER	22	Yes - SFAIRP/ALARP and Economic	2,353,127
3	SWSBKH3C1	EC00014999	X2 BURONGA 220KV FEEDER BAY	220	Yes - SFAIRP/ALARP and Economic	2,014,593
4	SWSBKH7L	EC00009658	NO7 WEST 22KV FEEDER	22	Yes - SFAIRP/ALARP and Economic	1,897,689
5	SWSBKH3E1	EC00015000	X4 BROKEN HILL MINES 220KV FEEDER BAY	220	Yes - SFAIRP/ALARP and Economic	1,056,536
6	SWSBKH3E1	EC00015002	X4 BROKEN HILL MINES 220KV FEEDER BAY	220	Yes - SFAIRP/ALARP and Economic	1,056,536
7	CMSSE11B2	EC00001025	NO2 TRANSFORMER 330/132/16KV TRANSF BAY	132	Yes - SFAIRP/ALARP and Economic	1,076,113

No.	Equipment Reference	PIC Number	Equipment Description	Voltage	Replace based on evaluation	NPV @ 10%, as at Jun'19
8	CMSSE11B2	EC00001026	NO2 TRANSFORMER 330/132/16KV TRANSF BAY	132	Yes - SFAIRP/ALARP and Economic	1,076,113
9	CMSSE11B2	EC00001024	NO2 TRANSFORMER 330/132/16KV TRANSF BAY	132	Yes - SFAIRP/ALARP and Economic	1,076,113
10	SWSTU24K1	A07238/1	NO1 SECTION 66KV BUSBAR	66	Yes - SFAIRP/ALARP and Economic	788,898
11	SWSTU24K2	A07238/2	NO2 SECTION 66KV BUSBAR	66	Yes - SFAIRP/ALARP and Economic	788,898
12	SWSBKH3E1	EC00015001	X4 BROKEN HILL MINES 220KV FEEDER BAY	220	Yes - SFAIRP/ALARP and Economic	654,698
13	NNSTOM1C1	EC00003361	NO3 TRANSFORMER 330KV BAY	330	Yes - SFAIRP/ALARP and Economic	433,722
14	NNSTOM1C1	EC00003359	NO3 TRANSFORMER 330KV BAY	330	Yes - SFAIRP/ALARP and Economic	433,722
15	NNSTOM1C1	EC00003360	NO3 TRANSFORMER 330KV BAY	330	Yes - SFAIRP/ALARP and Economic	433,722
16	NNSTOM1A	EC00003366	NO1 TRANSFORMER 330KV CB BAY	330	Yes - SFAIRP/ALARP and Economic	412,783
17	NNSTOM1A	EC00003367	NO1 TRANSFORMER 330KV CB BAY	330	Yes - SFAIRP/ALARP and Economic	412,783
18	NNSVP12E3	EC00024291	95T/STN TX 3/TIE TX 1 COMMON EQUIP BAY	132	Yes - SFAIRP/ALARP and Economic	440,301
19	NNSMRK2F	EC00005332	95U SINGLETON 132KV FEEDER	132	Yes - SFAIRP/ALARP and Economic	387,964
20	NNSMRK2F	EC00005333	95U SINGLETON 132KV FEEDER	132	Yes - SFAIRP/ALARP and Economic	387,964
21	NNSMRK2F	EC00005334	95U SINGLETON 132KV FEEDER	132	Yes - SFAIRP/ALARP and Economic	387,964
22	SWSYA26BB1	A07428/1	NO1 SECTION 33KV BUSBAR	33	Yes - SFAIRP/ALARP and Economic	360,325
23	SWSYA26BB3	A07428/2	NO3 SECTION 33KV BUSBAR	33	Yes - SFAIRP/ALARP and Economic	360,325
24	NNSTOM1A	EC00003368	NO1 TRANSFORMER 330KV CB BAY	330	Yes - SFAIRP/ALARP and Economic	316,961
25	NTSAR14N	A08182/7	665 ARMIDALE 66 SS - 66KV FEEDER	66	Yes - SFAIRP/ALARP and Economic	245,873
26	NTSTTF7BA1	A08109/1	NO1 SECTION 22KV BUSBAR	22	Yes - SFAIRP/ALARP and Economic	237,547
27	NTSTTF7BA3	A08109/2	NO3 SECTION 22KV BUSBAR	22	Yes - SFAIRP/ALARP and Economic	237,547
28	SWSDN24G2	A07185/3	822 MOULAMEIN TEE DENI 66KV FEEDER BAY	66	Yes - SFAIRP/ALARP and Economic	172,129
29	SWSDN24K2	A07184/2	845 DENILIQUIN 66 - 66KV FEEDER BAY	66	Yes - SFAIRP/ALARP and Economic	172,129

No.	Equipment Reference	PIC Number	Equipment Description	Voltage	Replace based on evaluation	NPV @ 10%, as at Jun'19
30	NNSTRE4L	EC00004359	867 OCC FAILFORD 66KV FEEDER	66	Yes - SFAIRP/ALARP and Economic	169,972
31	SWSGRF6P2	A07373/2	NO2 SECTION 33KV BUSBAR	33	Yes - SFAIRP/ALARP and Economic	157,868
32	NNSNEW1B2	A09355/3	NO2 330KV TRANSFORMER BAY	132	Yes - SFAIRP/ALARP and Economic	140,416
33	NNSNEW1B2	A09355/1	NO2 330KV TRANSFORMER BAY	132	Yes - SFAIRP/ALARP and Economic	140,416
34	NNSNEW1B2	A09355/2	NO2 330KV TRANSFORMER BAY	132	Yes - SFAIRP/ALARP and Economic	140,416
35	NNSNEW1C2	A09355/5	NO3 330KV TRANSFORMER BAY	132	Yes - SFAIRP/ALARP and Economic	140,377
36	NNSNEW1C2	A09355/6	NO3 330KV TRANSFORMER BAY	132	Yes - SFAIRP/ALARP and Economic	140,377
37	NNSTRE4G	A09100/2	862/1 KEW TEE JOHNS RIVER 66KV FDR	66	Yes - SFAIRP/ALARP and Economic	137,045
38	NTSKLK4K	A08413/1	0825 KOOLKHAN PS 66KV FEEDER	66	Yes - SFAIRP/ALARP and Economic	130,567
39	NNSPMQ6P	EC00006512	708 OWEN ST NO2 33KV FEEDER	33	Yes - SFAIRP/ALARP and Economic	126,887
40	NNSMRK1A1	EC00005358	NO1 330KV TRANSFORMER BAY	132	Yes - SFAIRP/ALARP and Economic	124,297
41	NNSMRK1A1	EC00005356	NO1 330KV TRANSFORMER BAY	132	Yes - SFAIRP/ALARP and Economic	124,297
42	NNSMRK1A1	EC00005357	NO1 330KV TRANSFORMER BAY	132	Yes - SFAIRP/ALARP and Economic	124,297
43	NTSAR14H	A08182/4	661 OAKY PS 66KV FEEDER	66	Yes - SFAIRP/ALARP and Economic	123,721
44	NNSMRK2E	EC00005359	95H MUSWELLBROOK 132KV FEEDER	132	Yes - SFAIRP/ALARP and Economic	122,034
45	NNSMRK2E	EC00005361	95H MUSWELLBROOK 132KV FEEDER	132	Yes - SFAIRP/ALARP and Economic	122,034
46	NNSMRK2E	EC00005360	95H MUSWELLBROOK 132KV FEEDER	132	Yes - SFAIRP/ALARP and Economic	122,034
47	NNSTRE4E	EC00013271	861 WHITBREAD ST ZONE SS 66KV FEEDER	66	Yes - SFAIRP/ALARP and Economic	115,428
48	NNSTRE4E	EC00013296	861 WHITBREAD ST ZONE SS 66KV FEEDER	66	Yes - SFAIRP/ALARP and Economic	115,428
49	SWSJDA1A2	EC00007297	NO1 TRANSFORMER 330KV TRANSF BAY	132	Yes - SFAIRP/ALARP and Economic	109,176
50	SWSJDA1B2	EC00007294	NO2 TRANSFORMER 330KV TRANSF BAY	132	Yes - SFAIRP/ALARP and Economic	109,176
51	NTSCOF4R	T00148/3	706 SOUTH COFFS HARBOUR 66KV FEEDER	66	Yes - SFAIRP/ALARP and Economic	108,382

No.	Equipment Reference	PIC Number	Equipment Description	Voltage	Replace based on evaluation	NPV @ 10%, as at Jun'19
52	SWSMUR8A3	TG004986	No.1 Section 11kV Bus at 11kV Building	11	Yes - SFAIRP/ALARP and Economic	106,933
53	SWSBKH7H	EC00007583	NO5 TALC ST-2 22KV FEEDER	22	Yes - SFAIRP/ALARP and Economic	95,781
54	SWSBKH7K	EC00020244	NO6 TALC ST-1 22KV FEEDER	22	Yes - SFAIRP/ALARP and Economic	95,781
55	NNSNEW1C2	A09355/4	NO3 330KV TRANSFORMER BAY	132	Yes - SFAIRP/ALARP and Economic	91,956
56	SYSMRU4K	EC00004187	83A MURRUMBURRAH 66KV FEEDER	66	Yes - SFAIRP/ALARP and Economic	92,897
57	NNSTRE6Q	EC00004308	NO5 COUNCIL KANANGRA DRIVE 33KV FEEDER	33	Yes - SFAIRP/ALARP and Economic	92,057
58	CMSING4J	EC00009475	864 MACQUARIE FIELDS 66KV FEEDER BAY	66	Yes - SFAIRP/ALARP and Economic	90,336
59	CMSING4J	EC00009476	864 MACQUARIE FIELDS 66KV FEEDER BAY	66	Yes - SFAIRP/ALARP and Economic	90,336
60	CMSING4J	EC00009477	864 MACQUARIE FIELDS 66KV FEEDER BAY	66	Yes - SFAIRP/ALARP and Economic	90,336
61	SYSCA12K	A06597/2	NO1 WODEN 132KV FEEDER	132	Yes - SFAIRP/ALARP and Economic	87,302
62	SYSCA12K	A06597/3	NO1 WODEN 132KV FEEDER	132	Yes - SFAIRP/ALARP and Economic	87,302
63	SYSCA12K	A06597/1	NO1 WODEN 132KV FEEDER	132	Yes - SFAIRP/ALARP and Economic	87,302
64	NNSPMQ6V	EC00009205	712 ROCKS FERRY TEE 33KV FEEDER	33	Yes - SFAIRP/ALARP and Economic	83,759
65	NNSTRE6L	A08612/2	NO3 COUNCIL WINGHAM 33KV FEEDER	33	Yes - SFAIRP/ALARP and Economic	82,536
66	NTSGN22B2	EC00006966	NO2 TRANSFORMER 132KV TRANSFORMER BAY	66	Yes - SFAIRP/ALARP and Economic	82,345
67	SWSBKH7F	EC00009664	NO3 SOUTH 22KV FEEDER	22	Yes - SFAIRP/ALARP and Economic	81,057
68	NNSTRE6B	A09219/8	NO2 33KV TRANSFORMER CB BAY	33	Yes - SFAIRP/ALARP and Economic	78,728
69	SWSFNY2A	EC00013276	NO1 TRANSFORMER 66KV CB BAY	66	Yes - SFAIRP/ALARP and Economic	77,391
70	NNSPMQ6E	EC00009199	701 ROCKS FERRY 33KV FEEDER	33	Yes - SFAIRP/ALARP and Economic	76,263
71	NNSKS26S2	EC00004310	NO3 SECTION 33KV BUSBAR	33	Yes - SFAIRP/ALARP and Economic	74,446
72	SYSMRU4L	EC00009896	890 YOUNG 66KV FEEDER	66	Yes - SFAIRP/ALARP and Economic	74,651
73	SYSMRU4L	EC00009897	890 YOUNG 66KV FEEDER	66	Yes - SFAIRP/ALARP and Economic	74,651

No.	Equipment Reference	PIC Number	Equipment Description	Voltage	Replace based on evaluation	NPV @ 10%, as at Jun'19
74	SYSMRU4L	EC00009898	890 YOUNG 66KV FEEDER	66	Yes - SFAIRP/ALARP and Economic	74,651
75	SWSBKH7A	EC00007581	NO1 TRANSFORMER 22KV CB BAY	22	Yes - SFAIRP/ALARP and Economic	73,913
76	SWSBKH7B	EC00007582	NO2 TRANSFORMER 22KV CB BAY	22	Yes - SFAIRP/ALARP and Economic	73,913
77	NTSKLK4P1	A08447/1	0896 MACLEAN 66KV FEEDER BAY	66	Yes - SFAIRP/ALARP and Economic	70,671
78	SWSJDA1A2	EC00007295	NO1 TRANSFORMER 330KV TRANSF BAY	132	Yes - SFAIRP/ALARP and Economic	69,513
79	SWSJDA1A2	EC00007296	NO1 TRANSFORMER 330KV TRANSF BAY	132	Yes - SFAIRP/ALARP and Economic	69,513
80	SWSJDA1B2	EC00007292	NO2 TRANSFORMER 330KV TRANSF BAY	132	Yes - SFAIRP/ALARP and Economic	69,513
81	SWSJDA1B2	EC00007293	NO2 TRANSFORMER 330KV TRANSF BAY	132	Yes - SFAIRP/ALARP and Economic	69,513
82	NTSCOF4R	T00148/2	706 SOUTH COFFS HARBOUR 66KV FEEDER	66	Yes - SFAIRP/ALARP and Economic	70,344
83	NTSCOF4R	T00148/1	706 SOUTH COFFS HARBOUR 66KV FEEDER	66	Yes - SFAIRP/ALARP and Economic	70,344
84	NNSTRE6H	A09387/2	7G2 HARRINGTON Tee COOPERNOOK	33	Yes - SFAIRP/ALARP and Economic	67,605
85	NNSTRE6F	ETA5596	NO1 COUNCIL BOOTAWA 33KV FEEDER	33	Yes - SFAIRP/ALARP and Economic	67,883
86	NTSKLK2B2	EC00009055	NO2 TRANSFORMER 132KV TRANSFORMER BAY	66	Yes - SFAIRP/ALARP and Economic	67,159
87	NTSKLK2B2	EC00009053	NO2 TRANSFORMER 132KV TRANSFORMER BAY	66	Yes - SFAIRP/ALARP and Economic	67,159
88	NTSKLK2B2	EC00009054	NO2 TRANSFORMER 132KV TRANSFORMER BAY	66	Yes - SFAIRP/ALARP and Economic	67,159
89	SWSDN24M2	EC00009902	NO6 MOAMA 66KV FEEDER BAY	66	Yes - SFAIRP/ALARP and Economic	64,866
90	SWSDN24M2	EC00009903	NO6 MOAMA 66KV FEEDER BAY	66	Yes - SFAIRP/ALARP and Economic	64,866
91	SWSDN24M2	EC00009904	NO6 MOAMA 66KV FEEDER BAY	66	Yes - SFAIRP/ALARP and Economic	64,866
92	SWSDN24A	A07185/1	NO1 TRANSFORMER 66KV CB BAY	66	Yes - SFAIRP/ALARP and Economic	61,635
93	SWSDN24B	A07185/2	NO2 TRANSFORMER 66KV CB BAY	66	Yes - SFAIRP/ALARP and Economic	61,635
94	NNSTRE4E	EC00013283	861 WHITBREAD ST ZONE SS 66KV FEEDER	66	Yes - SFAIRP/ALARP and Economic	63,745
95	SYSMRU4A	EC00009860	NO1 TRANSFORMER 66KV CB BAY	66	Yes - SFAIRP/ALARP and Economic	63,545

No.	Equipment Reference	PIC Number	Equipment Description	Voltage	Replace based on evaluation	NPV @ 10%, as at Jun'19
96	SYSMRU4A	EC00009859	NO1 TRANSFORMER 66KV CB BAY	66	Yes - SFAIRP/ALARP and Economic	63,545
97	SYSMRU4A	EC00009861	NO1 TRANSFORMER 66KV CB BAY	66	Yes - SFAIRP/ALARP and Economic	63,545
98	NNSTRE4C	EC00004353	NO3 66KV TRANSFORMER CB BAY	66	Yes - SFAIRP/ALARP and Economic	60,483
99	NNSTRE6A	A09387/3	NO1 33KV TRANSFORMER CB BAY	33	Yes - SFAIRP/ALARP and Economic	56,086
100	NTSGN24H	EC00006954	88K GUNNEDAH 66 SS - 66KV FEEDER	66	Yes - SFAIRP/ALARP and Economic	56,190
101	NTSGN24H	EC00006957	88K GUNNEDAH 66 SS - 66KV FEEDER	66	Yes - SFAIRP/ALARP and Economic	56,190
102	SWSFNY2F	EC00013288	84B FINLEY 66KV FEEDER	66	Yes - SFAIRP/ALARP and Economic	54,802
103	SWSFNY2G2	EC00013308	84A JERILDERIE 66KV FEEDER BAY	66	Yes - SFAIRP/ALARP and Economic	54,802
104	NNSPMQ6T	EC00006511	711 CLEARWATER CRESCENT 33KV FEEDER	33	Yes - SFAIRP/ALARP and Economic	54,700
105	SYSMRU4M	EC00009893	836 COOTAMUNDRA 66KV FEEDER	66	Yes - SFAIRP/ALARP and Economic	53,721
106	SYSMRU4M	EC00009894	836 COOTAMUNDRA 66KV FEEDER	66	Yes - SFAIRP/ALARP and Economic	53,721
107	SYSMRU4M	EC00009895	836 COOTAMUNDRA 66KV FEEDER	66	Yes - SFAIRP/ALARP and Economic	53,721
108	SWSBKH7M	EC00009663	NO8 COCKBURN 22KV FEEDER	22	Yes - SFAIRP/ALARP and Economic	52,181
109	NTSCOF4T	EC00009379	705 SOUTH COFFS HARBOUR 66KV FEEDER	66	Yes - SFAIRP/ALARP and Economic	52,062
110	NTSCOF4T	EC00009380	705 SOUTH COFFS HARBOUR 66KV FEEDER	66	Yes - SFAIRP/ALARP and Economic	52,062
111	NTSCOF4T	EC00009381	705 SOUTH COFFS HARBOUR 66KV FEEDER	66	Yes - SFAIRP/ALARP and Economic	52,062
112	NNSPMQ2B2	EC00009575	NO2 TRANSFORMER 132KV TRANSFORMER BAY	33	Yes - SFAIRP/ALARP and Economic	47,414
113	SYSMRU4K	EC00004185	83A MURRUMBURRAH 66KV FEEDER	66	Yes - SFAIRP/ALARP and Economic	47,681
114	SYSMRU4K	EC00004186	83A MURRUMBURRAH 66KV FEEDER	66	Yes - SFAIRP/ALARP and Economic	47,681
115	SYSMRU4G	EC00009884	83D MURRUMBURRAH 66KV FEEDER	66	Yes - SFAIRP/ALARP and Economic	43,470
116	SYSMRU4G	EC00009885	83D MURRUMBURRAH 66KV FEEDER	66	Yes - SFAIRP/ALARP and Economic	43,470
117	SYSMRU4G	EC00009886	83D MURRUMBURRAH 66KV FEEDER	66	Yes - SFAIRP/ALARP and Economic	43,470

No.	Equipment Reference	PIC Number	Equipment Description	Voltage	Replace based on evaluation	NPV @ 10%, as at Jun'19
118	NTSGN22B2	EC00006970	NO2 TRANSFORMER 132KV TRANSFORMER BAY	66	Yes - SFAIRP/ALARP and Economic	42,655
119	NTSGN22B2	EC00006983	NO2 TRANSFORMER 132KV TRANSFORMER BAY	66	Yes - SFAIRP/ALARP and Economic	42,655
120	NNSPMQ2A2	A09387/1	NO1 TRANSFORMER 132KV TRANSFORMER BAY	33	Yes - SFAIRP/ALARP and Economic	39,898
121	SYSMRU4F	EC00009914	837 JUGIONG 66KV FEEDER	66	Yes - SFAIRP/ALARP and Economic	39,412
122	SYSMRU4F	EC00009915	837 JUGIONG 66KV FEEDER	66	Yes - SFAIRP/ALARP and Economic	39,412
123	SYSMRU4F	EC00009916	837 JUGIONG 66KV FEEDER	66	Yes - SFAIRP/ALARP and Economic	39,412
124	NNSPMQ6G	EC00009201	703 BORONIA ST TEE 33KV FEEDER	33	Yes - SFAIRP/ALARP and Economic	37,677
125	NNSPMQ6N	EC00009202	707 BORONIA ST NO2 33KV FEEDER	33	Yes - SFAIRP/ALARP and Economic	37,677
126	NNSPMQ6S	EC00009203	710 CLEARWATER CRESCENT 33KV FEEDER	33	Yes - SFAIRP/ALARP and Economic	37,677
127	NNSTRE4D	A09386/1	NO4 66KV TRANSFORMER CB BAY	33	Yes - SFAIRP/ALARP and Economic	35,024
128	NNSVP12F3	EC00024307	957/STN TX 4/TIE TX 2 COMMON EQUIP BAY	132	Yes - SFAIRP/ALARP and Economic	32,699
129	SWSTU24F	A07239/1	828 GUNDAGAI 66KV FEEDER	66	Yes - Economic	30,157
130	SWSBKH7V	EC00009660	NO1 22KV BUS VT BAY	22	Yes - SFAIRP/ALARP and Economic	31,591
131	SWSBKH7W	EC00009659	NO2 22KV BUS VT BAY	22	Yes - SFAIRP/ALARP and Economic	31,591
132	NNSTRE6N	EC00009562	33kV FREQ INJECTION	33	Yes - SFAIRP/ALARP and Economic	28,460
133	NTSGN24H	EC00006963	88K GUNNEDAH 66 SS - 66KV FEEDER	66	Yes - SFAIRP/ALARP and Economic	25,981
134	SWSFNY2F	EC00013305	84B FINLEY 66KV FEEDER	66	Yes - SFAIRP/ALARP and Economic	25,096
135	SWSFNY2F	EC00013294	84B FINLEY 66KV FEEDER	66	Yes - SFAIRP/ALARP and Economic	25,096
136	SWSFNY2G2	EC00013295	84A JERILDERIE 66KV FEEDER BAY	66	Yes - SFAIRP/ALARP and Economic	25,096
137	SWSFNY2G2	EC00013313	84A JERILDERIE 66KV FEEDER BAY	66	Yes - SFAIRP/ALARP and Economic	25,096
138	NNSKS24G1	A08614/1	NO1 SECTION 66KV BUSBAR	66	Yes - SFAIRP/ALARP and Economic	22,517
139	NNSKS24G2	A08614/2	NO3 SECTION 66KV BUSBAR	66	Yes - SFAIRP/ALARP and Economic	22,517

No.	Equipment Reference	PIC Number	Equipment Description	Voltage	Replace based on evaluation	NPV @ 10%, as at Jun'19
140	NNSKS26S1	TG006926	NO1 SECTION 33KV BUSBAR	33	Yes - Economic	8,359
141	SWSFNY2A	EC00013285	NO1 TRANSFORMER 66KV CB BAY	66	Yes - SFAIRP/ALARP (and 3ph +ve)	-320
142	SWSFNY2A	EC00013287	NO1 TRANSFORMER 66KV CB BAY	66	Yes - SFAIRP/ALARP (and 3ph +ve)	-320

Attachment 2 – CVTs

Table 7 provides a summary of the CVTs requiring replacement and Table 8 shows the result of the economic and SFAIRP/ALARP evaluations for each individual asset.

Table 7: Summary of CVT quantities

Voltage (kV)	Number of replacements
132	28
220	10
330	122
500	3
Total	163

Table 8 should be read in conjunction with the following notes:

- The “Replace based on evaluation” column confirms if replacement is required based on either SFAIRP/ALARP or economic evaluation.
- Some CVTS with specific condition issues require replacement despite the negative NPV, since the risk cost does not accurately quantify the assessed risk. Refer to “Replace based on Evaluation” column and further explanation included in section 3.

Table 8 – CVTs requiring replacement

No.	Equipment Reference	PIC Number	Equipment Description	Volts	Replace based on evaluation	NPV @ 10%, as at Jun'18
1	CMSBFW1AB	EC00002457	41 SYDNEY SOUTH 330KV FEEDER	330	Yes - SFAIRP/ALARP and Economic	$2,433,766
2	CMSBFW1AB	EC00002455	41 SYDNEY SOUTH 330KV FEEDER	330	Yes - SFAIRP/ALARP and Economic	$2,433,766
3	CMSBFW1AB	EC00002456	41 SYDNEY SOUTH 330KV FEEDER	330	Yes - SFAIRP/ALARP and Economic	$2,433,766
4	SWSBKH3C1	EC00007499	X2 BURONGA 220KV FEEDER BAY	220	Yes - Economic	$552,211
5	COSWW11D1	EC00017669	76 SYDNEY SOUTH 330KV FEEDER BAY	330	Yes - Economic	$395,589
6	COSWW11D1	EC00017667	76 SYDNEY SOUTH 330KV FEEDER BAY	330	Yes - Economic	$395,589
7	COSWW11D1	EC00017668	76 SYDNEY SOUTH 330KV FEEDER BAY	330	Yes - Economic	$395,589
8	NNSBAY1AF1	EC00004545	32 SYDNEY WEST 330KV FEEDER BAY	330	Yes - Economic	$189,584
9	NNSBAY1AF1	EC00004546	32 SYDNEY WEST 330KV FEEDER BAY	330	Yes - Economic	$189,584
10	NNSBAY1AF1	EC00004544	32 SYDNEY WEST 330KV FEEDER	330	Yes - Economic	$189,584

No.	Equipment Reference	PIC Number	Equipment Description	Volts	Replace based on evaluation	NPV @ 10%, as at Jun'18
			BAY			
11	NNSLD11AC1	EC00024620	82 TOMAGO 330KV FEEDER BAY	330	Yes - Economic	$188,052
12	NNSLD11AC1	EC00024618	82 TOMAGO 330KV FEEDER BAY	330	Yes - Economic	$188,052
13	NNSLD11AC1	EC00024619	82 TOMAGO 330KV FEEDER BAY	330	Yes - Economic	$188,052
14	NNSTOM1J1	EC00007458	82 LIDDELL 330KV FEEDER BAY	330	Yes - Economic	$166,167
15	NNSTOM1J1	EC00007460	82 LIDDELL 330KV FEEDER BAY	330	Yes - Economic	$166,167
16	NNSTOM1J1	EC00007459	82 LIDDELL 330KV FEEDER BAY	330	Yes - Economic	$166,167
17	CMSSE11P1	A02051/5	28 SYDNEY NORTH 330KV FEEDER BAY	330	Yes - Economic	$144,334
18	CMSSE11P1	A02051/3	28 SYDNEY NORTH 330KV FEEDER BAY	330	Yes - Economic	$144,334
19	CMSSE11P1	A02051/4	28 SYDNEY NORTH 330KV FEEDER BAY	330	Yes - Economic	$144,334
20	NNSVP11GB1	TG007633	NO1 SECTION 330KV GENERATOR BUSBAR	330	Yes - Economic	$136,256
21	CMSDPT2X	EC00002940	98F MT TERRY 132KV FEEDER	132	Yes - Economic	$83,458
22	CMSDPT2X	EC00002938	98F MT TERRY 132KV FEEDER	132	Yes - Economic	$83,458
23	CMSDPT2X	EC00002939	98F MT TERRY 132KV FEEDER	132	Yes - Economic	$83,458
24	NNSTRE2C1	B01978/2	964 PORT MACQUARIE 132KV FEEDER BAY	132	Yes - Economic	$75,861
25	NNSMRK1D1	EC00012421	88 TAMWORTH 330KV FEEDER BAY	330	Yes - Economic	$54,917
26	NNSMRK1D1	EC00012422	88 TAMWORTH 330KV FEEDER BAY	330	Yes - Economic	$54,917
27	COSBER2J	B01330/3	94B WELLINGTON 132KV FEEDER BAY	132	Yes - Economic	$53,965
28	COSBER2J	B01330/1	94B WELLINGTON 132KV FEEDER BAY	132	Yes - Economic	$53,965
29	COSBER2J	B01330/2	94B WELLINGTON 132KV FEEDER BAY	132	Yes - Economic	$53,965
30	CMSAVS1A	A05947/6	17 MACARTHUR 330KV FEEDER	330	Yes - Economic	$50,380
31	CMSAVS1A	A05947/7	17 MACARTHUR 330KV FEEDER	330	Yes - Economic	$50,380
32	CMSDPT2F	EC00006217	98W MT TERRY 132KV FEEDER	132	Yes - Economic	$43,857
33	SWSLT11G1	ETA6462	L1 Tumut 3 330kV Feeder Bay (Units 1-2)	330	Yes - Economic	$42,378
34	SWSLT11G1	ETA6463	L1 Tumut 3 330kV Feeder Bay (Units 1-2)	330	Yes - Economic	$42,378
35	SWSLT11G1	ETA6464	L1 Tumut 3 330kV Feeder Bay (Units 1-2)	330	Yes - Economic	$42,378

No.	Equipment Reference	PIC Number	Equipment Description	Volts	Replace based on evaluation	NPV @ 10%, as at Jun'18
36	SWSLT11H1	ETA6458	L3 Tumut 3 330kV Feeder Bay (Units 3-4)	330	Yes - Economic	$42,378
37	SWSLT11H1	ETA6465	L3 Tumut 3 330kV Feeder Bay (Units 3-4)	330	Yes - Economic	$42,378
38	SWSLT11H1	ETA6382	L3 Tumut 3 330kV Feeder Bay (Units 3-4)	330	Yes - Economic	$42,378
39	SWSLT11J1	ETA6468	L5 Tumut 3 330kV Feeder Bay (Units 5-6)	330	Yes - Economic	$42,378
40	SWSLT11J1	ETA6466	L5 Tumut 3 330kV Feeder Bay (Units 5-6)	330	Yes - Economic	$42,378
41	SWSLT11J1	ETA6467	L5 Tumut 3 330kV Feeder Bay (Units 5-6)	330	Yes - Economic	$42,378
42	NNSMRK1C1	EC00003087	83 LIDDELL 330KV FEEDER BAY	330	Yes - Economic	$40,391
43	NNSMRK1C1	EC00003085	83 LIDDELL 330KV FEEDER BAY	330	Yes - Economic	$40,391
44	NNSMRK1C1	EC00003086	83 LIDDELL 330KV FEEDER BAY	330	Yes - Economic	$40,391
45	SWSWG11F1	A07119/3	62 JINDERA 330KV FEEDER BAY	330	Yes - Economic	$39,867
46	SWSWG11F1	A07119/2	62 JINDERA 330KV FEEDER BAY	330	Yes - Economic	$39,867
47	SWSWG11F1	A07119/1	62 JINDERA 330KV FEEDER BAY	330	Yes - Economic	$39,867
48	COSWL11D1	EC00004543	79 WOLLAR 330KV FEEDER BAY	330	Yes - Economic	$33,152
49	COSWL11D1	EC00004541	79 WOLLAR 330KV FEEDER BAY	330	Yes - Economic	$33,152
50	COSWL11D1	EC00004542	79 WOLLAR 330KV FEEDER BAY	330	Yes - Economic	$33,152
51	CMSSYW2S	A03122/9	93Z BLACKTOWN 132KV FEEDER BAY	132	Yes - SFAIRP/ALARP and Economic	$30,675
52	CMSSYW2S	A03122/7	93Z BLACKTOWN 132KV FEEDER BAY	132	Yes - SFAIRP/ALARP and Economic	$30,675
53	CMSSYW2S	A03122/8	93Z BLACKTOWN 132KV FEEDER BAY	132	Yes - SFAIRP/ALARP and Economic	$30,675
54	NNSVP11AF1	EC00020755	23 MUNMORAH 330KV FEEDER BAY	330	Yes - Economic	$25,948
55	SWSYA22G	A07432/2	99JGRIFFITH132KVFEEDER	132	Yes - Economic	$25,676
56	SWSYA22G	A07432/4	99JGRIFFITH132KVFEEDER	132	Yes - Economic	$25,676
57	SWSYA22G	A07432/3	99JGRIFFITH132KVFEEDER	132	Yes - Economic	$25,676
58	CMSRGV1D1	EC00006087	38 SYDNEY WEST 330KV FEEDER BAY	330	Yes - Economic	$21,173
59	CMSSYS1N1	EC00002312	12 LIVERPOOL 330KV FEEDER BAY	330	Yes - Economic	$20,982
60	CMSSYS1N1	EC00002311	12 LIVERPOOL 330KV FEEDER BAY	330	Yes - Economic	$20,982
61	CMSSYS1N1	EC00002310	12 LIVERPOOL 330KV FEEDER BAY	330	Yes - Economic	$20,982
62	CMSKCR1A3	EC00010757	37 MACARTHUR 330KV FEEDER	330	Yes - Economic	$20,306

No.	Equipment Reference	PIC Number	Equipment Description	Volts	Replace based on evaluation	NPV @ 10%, as at Jun'18
			BAY			
63	COSCW22F	A01109/2	999YASS330-132KVFEEDERBAY	132	Yes - Economic	$20,158
64	COSCW22F	A01109/1	999YASS330-132KVFEEDERBAY	132	Yes - Economic	$20,158
65	COSCW22F	A01109/3	999YASS330-132KVFEEDERBAY	132	Yes - Economic	$20,158
66	SWSUT11V1	ETA8226	2Yass330-330kVFeederBay	330	Yes - Economic	$16,752
67	SWSUT11V1	ETA8227	2Yass330-330kVFeederBay	330	Yes - Economic	$16,752
68	SWSUT11V1	ETA8228	2Yass330-330kVFeederBay	330	Yes - Economic	$16,752
69	CMSSE11E1	A02051/2	A1 SECTION 330KV BUSBAR	330	Yes - Economic	$13,489
70	CMSSE11F1	A02051/1	B1 SECTION 330KV BUSBAR	330	Yes - Economic	$13,489
71	CMSSE11E2	A02051/7	A2 SECTION 330KV BUSBAR	330	Yes - Economic	$13,489
72	CMSSE11F2	A02051/6	B2 SECTION 330KV BUSBAR	330	Yes - Economic	$13,489
73	SWSWG12H2	A07115/6	9R5 WAGGA NORTH 132KV FEEDER BAY	132	Yes - Economic	$13,063
74	SWSWG12H2	A07115/5	9R5 WAGGA NORTH 132KV FEEDER BAY	132	Yes - Economic	$13,063
75	CMSDPT2K	EC00005382	981 BELLAMBI CREEK 132KV FEEDER	132	Yes - Economic	$12,816
76	CMSDPT2K	EC00005380	981 BELLAMBI CREEK 132KV FEEDER	132	Yes - Economic	$12,816
77	CMSDPT2K	EC00005381	981 BELLAMBI CREEK 132KV FEEDER	132	Yes - Economic	$12,816
78	CMSKCR1A3	EC00010759	37 MACARTHUR 330KV FEEDER BAY	330	Yes - Economic	$11,974
79	COSWW11E1	EC00017673	77 INGLEBURN 330KV FEEDER BAY	330	Yes - Economic	$11,544
80	COSWW11E1	EC00017671	77 INGLEBURN 330KV FEEDER BAY	330	Yes - Economic	$11,544
81	COSWW11E1	EC00017672	77 INGLEBURN 330KV FEEDER BAY	330	Yes - Economic	$11,544
82	COSWW11E1	EC00017675	77 INGLEBURN 330KV FEEDER BAY	330	Yes - Economic	$11,544
83	CMSLP11H1	EC00006081	30 SYDNEY WEST 330KV FEEDER BAY	330	Yes - Economic	$11,172
84	CMSLP11H1	EC00006091	30 SYDNEY WEST 330KV FEEDER BAY	330	Yes - Economic	$11,172
85	CMSLP11E1	EC00006075	12 SYDNEY SOUTH 330KV FEEDER BAY	330	Yes - Economic	$11,172
86	CMSLP11E1	EC00006101	12 SYDNEY SOUTH 330KV FEEDER BAY	330	Yes - Economic	$11,172
87	CMSLP11E1	EC00006099	12 SYDNEY SOUTH 330KV FEEDER	330	Yes - Economic	$11,172

No.	Equipment Reference	PIC Number	Equipment Description	Volts	Replace based on evaluation	NPV @ 10%, as at Jun'18
			BAY			
88	CMSLP11H1	EC00006077	30 SYDNEY WEST 330KV FEEDER BAY	330	Yes - Economic	$11,172
89	SWSJDA1D1	EC00007269	060 WODONGA 330KV FEEDER BAY	330	Yes - Economic	$10,407
90	SWSJDA1D1	EC00007268	060 WODONGA 330KV FEEDER BAY	330	Yes - Economic	$10,407
91	SWSJDA1D1	EC00007270	060 WODONGA 330KV FEEDER BAY	330	Yes - Economic	$10,407
92	SWSDNT3E2	EC00015403	X5/1 BALRANALD 220KV FEEDER BAY	220	Yes - Economic	$10,342
93	SWSDNT3E2	EC00015405	X5/1 BALRANALD 220KV FEEDER BAY	220	Yes - Economic	$10,342
94	COSMTP1B1	EC00006113	330KV 72 WELLINGTON FEEDER BAY	330	Yes - Economic	$10,051
95	COSMTP1B1	EC00006114	330KV 72 WELLINGTON FEEDER BAY	330	Yes - Economic	$10,051
96	COSMTP1B1	EC00006111	330KV 72 WELLINGTON FEEDER BAY	330	Yes - Economic	$10,051
97	SWSBRG3D2	EC00015416	X5/3 BALRANALD 220KV FEEDER BAY	220	Yes - Economic	$10,017
98	SWSBRG3D2	EC00015417	X5/3 BALRANALD 220KV FEEDER BAY	220	Yes - Economic	$10,017
99	SWSBRG3D2	EC00015415	X5/3 BALRANALD 220KV FEEDER BAY	220	Yes - Economic	$10,017
100	SWSUT11J1	ETA8214	65Murray330kVFeederBay	330	Yes - Economic	$9,615
101	SWSUT11J1	ETA8215	65Murray330kVFeederBay	330	Yes - Economic	$9,615
102	SWSUT11J1	ETA8216	65Murray330kVFeederBay	330	Yes - Economic	$9,615
103	CMSING1C1	EC00004527	78 SYDNEY SOUTH 330KV FEEDER BAY	330	Yes - Economic	$8,118
104	CMSING1C1	EC00004526	78 SYDNEY SOUTH 330KV FEEDER BAY	330	Yes - Economic	$8,118
105	CMSING1C1	EC00004528	78 SYDNEY SOUTH 330KV FEEDER BAY	330	Yes - Economic	$8,118
106	SWSYA22J	A07432/7	99FURANQUINTY132KVFEEDER	132	Yes - Economic	$5,109
107	SWSYA22J	A07432/6	99F URANQUINTY 132KV FEEDER	132	Yes - Economic	$5,109
108	SWSYA22J	A07432/5	99FURANQUINTY132KVFEEDER	132	Yes - Economic	$5,109
109	NNSLD11AK1	EC00015387	84 TAMWORTH 330KV FEEDER BAY	330	Yes - Economic	$5,078
110	NNSLD11AK1	EC00015386	84 TAMWORTH 330KV FEEDER BAY	330	Yes - Economic	$5,078
111	NNSLD11AK1	EC00015385	84 TAMWORTH 330KV FEEDER	330	Yes - Economic	$5,078

No.	Equipment Reference	PIC Number	Equipment Description	Volts	Replace based on evaluation	NPV @ 10%, as at Jun'18
			BAY			
112	CMSAVS1B	A05947/1	16 MARULAN 330KV FEEDER	330	Yes - Economic	$3,148
113	CMSAVS1B	A05946/1	16 MARULAN 330KV FEEDER	330	Yes - Economic	$3,148
114	CMSAVS1B	A05947/2	16 MARULAN 330KV FEEDER	330	Yes - Economic	$3,148
115	CMSAVS1C	A05947/5	10 DAPTO 330KV FEEDER	330	Yes - Economic	$2,232
116	CMSAVS1C	A05947/3	10 DAPTO 330KV FEEDER	330	Yes - Economic	$2,232
117	CMSAVS1C	A05947/4	10 DAPTO 330KV FEEDER	330	Yes - Economic	$2,232
118	NNSVP11MB1	TG007632	NO1 SECTION 330KV MAIN BUSBAR	330	Yes - Economic	$1,707
119	SWSDNT3E2	EC00015407	X5/1 BALRANALD 220KV FEEDER BAY	220	Yes - Economic	$1,058
120	SWSWG12K	A07113/5	993 GADARA 132KV FEEDER	132	Yes - Economic	$575
121	SWSWG12K	A07114/9	993 GADARA 132KV FEEDER	132	Yes - Economic	$575
122	SWSWG12K	A07114/7	993 GADARA 132KV FEEDER	132	Yes - Economic	$575
123	CMSKVS1D1	A05691/3	3W CAPITAL WIND FARM 330KV FEEDER BAY	330	Yes - Economic	$523
124	CMSKVS1D1	A05691/1	3W CAPITAL WIND FARM 330KV FEEDER BAY	330	Yes - Economic	$523
125	CMSSYN1M	ETA2334	28 SYDNEY EAST 330KV FEEDER BAY	330	Yes - Trench Type fault (placeholder replacement)	-$9,342
126	CMSSYN1M	ETA2333	28 SYDNEY EAST 330KV FEEDER BAY	330	Yes - Trench Type fault (placeholder replacement)	-$9,342
127	CMSSYN1M	ETA2335	28 SYDNEY EAST 330KV FEEDER BAY	330	Yes - Trench Type fault (placeholder replacement)	-$9,342
128	CMSSYN1N	ETA2362	27 SYDNEY EAST 330KV FEEDER BAY	330	Yes - Trench Type fault (placeholder replacement)	-$9,342
129	CMSSYN1N	ETA2364	27 SYDNEY EAST 330KV FEEDER BAY	330	Yes - Trench Type fault (placeholder replacement)	-$9,342
130	CMSSYN1N	ETA2359	27 SYDNEY EAST 330KV FEEDER BAY	330	Yes - Trench Type fault (placeholder replacement)	-$9,342
131	SWSWG11L1	EC00015382	63 DARLINGTON POINT 330KV FEEDER BAY	330	Yes - Haefley type fault	-$11,468
132	SWSWG11L1	EC00015383	63 DARLINGTON POINT 330KV FEEDER BAY	330	Yes - Haefley type fault	-$11,468
133	SWSWG11L1	EC00015384	63 DARLINGTON POINT 330KV FEEDER BAY	330	Yes - Haefley type fault	-$11,468
134	NNSTOM1D	EC00022169	NO4 TRANSFORMER 330KV CB BAY	330	Yes - Trench Type fault (placeholder replacement)	-$12,274
135	NNSTOM1D	EC00022168	NO4 TRANSFORMER 330KV CB BAY	330	Yes - Trench Type fault (placeholder replacement)	-$12,274

No.	Equipment Reference	PIC Number	Equipment Description	Volts	Replace based on evaluation	NPV @ 10%, as at Jun'18
136	NNSTOM1D	ETA2349	NO4 TRANSFORMER 330KV CB BAY	330	Yes - Trench Type fault (placeholder replacement)	-$21,840
137	CMSRGV1C1	ETA2332	31 BAYSWATER 330KV FEEDER BAY	330	Yes - Trench Type fault (placeholder replacement)	-$22,014
138	CMSRGV1C1	ETA2329	31 BAYSWATER 330KV FEEDER BAY	330	Yes - Trench Type fault (placeholder replacement)	-$22,014
139	CMSRGV1C1	ETA2331	31 BAYSWATER 330KV FEEDER BAY	330	Yes - Trench Type fault (placeholder replacement)	-$22,014
140	SWSBRG3G2	EC00015413	OX1 RED CLIFFS 220KV FEEDER BAY	220	Yes - Haefley type fault	-$26,370
141	SWSBRG3G2	EC00015414	OX1 RED CLIFFS 220KV FEEDER BAY	220	Yes - Haefley type fault	-$26,370
142	SWSBRG3G2	EC00015412	OX1 RED CLIFFS 220KV FEEDER BAY	220	Yes - Haefley type fault	-$26,370
143	SYSMRNCFQ	EC00015390	4 YASS 330 - 330KV FEEDER BAY	330	Yes - Haefley type fault	-$28,176
144	SYSMRNCFQ	EC00015388	4 YASS 330 - 330KV FEEDER BAY	330	Yes - Haefley type fault	-$28,176
145	SYSMRNCFQ	EC00015389	4 YASS 330 - 330KV FEEDER BAY	330	Yes - Haefley type fault	-$28,176
146	SYSMRNCGQ	EC00015396	8 DAPTO 330KV FEEDER BAY	330	Yes - Haefley type fault	-$28,518
147	SYSMRNCGQ	EC00015393	8 DAPTO 330KV FEEDER BAY	330	Yes - Haefley type fault	-$28,518
148	SYSMRNCGQ	EC00015394	8 DAPTO 330KV FEEDER BAY	330	Yes - Haefley type fault	-$28,518
149	SYSMRNCHQ	EC00015397	16 AVON 330KV FEEDER BAY	330	Yes - Haefley type fault	-$28,810
150	SYSMRNCHQ	EC00015392	16 AVON 330KV FEEDER BAY	330	Yes - Haefley type fault	-$28,810
151	SYSMRNCHQ	EC00015395	16 AVON 330KV FEEDER BAY	330	Yes - Haefley type fault	-$28,810
152	NNSTOM1H	EC00015380	95 NEWCASTLE 330KV FEEDER	330	Yes - Haefley type fault	-$29,608
153	NNSTOM1H	EC00015381	95 NEWCASTLE 330KV FEEDER	330	Yes - Haefley type fault	-$29,608
154	NNSTOM1H	EC00015379	95 NEWCASTLE 330KV FEEDER	330	Yes - Haefley type fault	-$29,608
155	NNSBAY0A2	EC00020827	NO1 TIE TRANSFORMER 500KV BAY	330	Yes - Haefley type fault	-$31,178
156	NNSBAY0A2	EC00020826	NO1 TIE TRANSFORMER 500KV BAY	330	Yes - Haefley type fault	-$31,178
157	NNSBAY0A2	EC00020825	NO1 TIE TRANSFORMER 500KV BAY	330	Yes - Haefley type fault	-$31,178
158	NNSBAY0B2	EC00020835	NO2 TIE TRANSFORMER 500KV BAY	330	Yes - Haefley type fault	-$31,178
159	NNSBAY0B2	EC00020828	NO2 TIE TRANSFORMER 500KV BAY	330	Yes - Haefley type fault	-$31,178
160	NNSBAY0B2	EC00020830	NO2 TIE TRANSFORMER 500KV BAY	330	Yes - Haefley type fault	-$31,178
161	NNSER00CE1	EC00008705	5A2 KEMPS CREEK 500KV FEEDER BAY	500	Yes - leaking Trench type	-$107,861

No.	Equipment Reference	PIC Number	Equipment Description	Volts	Replace based on evaluation	NPV @ 10%, as at Jun'18
162	NNSER00CF1	EC00008706	5A1 KEMPS CREEK 500KV FEEDER BAY	500	Yes - leaking Trench type	-$107,861
163	NNSER00CF1	EC00008711	5A1 KEMPS CREEK 500KV FEEDER BAY	500	Yes - leaking Trench type	-$107,861