

OPTIONS EVALUATION REPORT (OER)



Various Locations VT Renewal Program

OER 000000001442 revision 5.0

Ellipse project no.: P0008397

TRIM file: [TRIM No]

Project reason: Capability - Asset Replacement for end of life condition

Project category: Prescribed - Asset Renewal Strategies

Approvals

| | | |
|------------------------------------|------------------|------------------------------|
| Author | Evan Lamplough | Substations Asset Strategist |
| Endorsed | Tony Gray | Substations Asset Manager |
| | Azil Khan | Investment Analysis Manager |
| Approved | Lance Wee | Manager, Asset Strategy |
| Date submitted for approval | 15 December 2016 | |

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 |

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): \$1.20m

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.

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 | 8.2 | 0 | 0.3 | 13.9 | |

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 |
| | Replacement of CVTs | 7.4 | 26.9 |

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

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 |
| | Do nothing - CVTs | 18 | 618 | N/A | N/A | N/A |
| A | Replacement of MVTs | 0 | 0 | N/A | 433 | 2,909 |
| | Replacement of CVTs | 2 | 171 | N/A | 16 | 447 |

Table 4 – Reasonably practicable test (\$ thousand)

| Option | Network Safety Risk Reduction ² | Annualised CAPEX | Reasonably practicable ³ ? |
|--------|--|------------------|---------------------------------------|
| A | Replacement of MVTs | 1,595 | Refer to Attachment 1 |
| | Replacement of CVTs | 95 | 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 not required as this is an asset replacement project with no augmentation component.

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 \$16.90m.

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 DENILQUIN 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 - SFAIRP/ALARP and 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 - SFAIRP/ALARP and 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 assets.

Table 7: Summary of CVT quantities

| Voltage (kV) | Number of replacements |
|--------------|------------------------|
| 132 | 42 |
| 220 | 7 |
| 330 | 104 |
| 500 | 3 |
| Total | 156 |

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.
- > The 9 CVTs installed at Lower Tumut are combined Current Transformer (CT) and Voltage Transformer (VT) units and have therefore have been Capex as 2 and 1/3 times the normal CVT replacement due to requirement to install new standalone CTs and VTs. So, the total capex required for the 9 combined units is the standard cost for 21 CVTs (or 7 three phase replacements).
- > 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 | 2,440,917 |
| 2 | CMSBFW1AB | EC00002455 | 41 SYDNEY SOUTH 330KV FEEDER | 330 | Yes - SFAIRP/ALARP and Economic | 2,440,917 |
| 3 | CMSBFW1AB | EC00002456 | 41 SYDNEY SOUTH 330KV FEEDER | 330 | Yes - SFAIRP/ALARP and Economic | 2,440,917 |
| 4 | SWSBKH3C1 | EC00007499 | X2 BURONGA 220KV FEEDER BAY | 220 | Yes - SFAIRP/ALARP and Economic | 552,211 |
| 5 | COSWW11D1 | EC00017669 | 76 SYDNEY SOUTH 330KV FEEDER BAY | 330 | Yes - SFAIRP/ALARP and Economic | 403,543 |
| 6 | COSWW11D1 | EC00017667 | 76 SYDNEY SOUTH 330KV FEEDER BAY | 330 | Yes - SFAIRP/ALARP and Economic | 403,543 |
| 7 | COSWW11D1 | EC00017668 | 76 SYDNEY SOUTH 330KV FEEDER BAY | 330 | Yes - SFAIRP/ALARP and Economic | 403,543 |

| No. | Equipment Reference | PIC Number | Equipment Description | Volts | Replace based on evaluation | NPV @ 10%, as at Jun'18 |
|-----|---------------------|------------|-------------------------------------|-------|---------------------------------|-------------------------|
| 8 | NNSBAY1AF1 | EC00004545 | 32 SYDNEY WEST 330KV FEEDER BAY | 330 | Yes - SFAIRP/ALARP and Economic | 189,584 |
| 9 | NNSBAY1AF1 | EC00004546 | 32 SYDNEY WEST 330KV FEEDER BAY | 330 | Yes - SFAIRP/ALARP and Economic | 189,584 |
| 10 | NNSBAY1AF1 | EC00004544 | 32 SYDNEY WEST 330KV FEEDER BAY | 330 | Yes - SFAIRP/ALARP and Economic | 189,584 |
| 11 | NNSLD11AC1 | EC00024620 | 82 TOMAGO 330KV FEEDER BAY | 330 | Yes - SFAIRP/ALARP and Economic | 188,052 |
| 12 | NNSLD11AC1 | EC00024618 | 82 TOMAGO 330KV FEEDER BAY | 330 | Yes - SFAIRP/ALARP and Economic | 188,052 |
| 13 | NNSLD11AC1 | EC00024619 | 82 TOMAGO 330KV FEEDER BAY | 330 | Yes - SFAIRP/ALARP and Economic | 188,052 |
| 14 | NNSTOM1J1 | EC00007458 | 82 LIDDELL 330KV FEEDER BAY | 330 | Yes - SFAIRP/ALARP and Economic | 166,167 |
| 15 | NNSTOM1J1 | EC00007460 | 82 LIDDELL 330KV FEEDER BAY | 330 | Yes - SFAIRP/ALARP and Economic | 166,167 |
| 16 | NNSTOM1J1 | EC00007459 | 82 LIDDELL 330KV FEEDER BAY | 330 | Yes - SFAIRP/ALARP and Economic | 166,167 |
| 17 | CMSSE11P1 | A02051/5 | 28 SYDNEY NORTH 330KV FEEDER BAY | 330 | Yes - SFAIRP/ALARP and Economic | 155,035 |
| 18 | CMSSE11P1 | A02051/3 | 28 SYDNEY NORTH 330KV FEEDER BAY | 330 | Yes - SFAIRP/ALARP and Economic | 155,035 |
| 19 | CMSSE11P1 | A02051/4 | 28 SYDNEY NORTH 330KV FEEDER BAY | 330 | Yes - SFAIRP/ALARP and Economic | 155,035 |
| 20 | NNSVP11GB1 | TG007633 | NO1 SECTION 330KV GENERATOR BUSBAR | 330 | Yes - SFAIRP/ALARP and Economic | 154,920 |
| 21 | NNSTRE2C1 | B01978/2 | 964 PORT MACQUARIE 132KV FEEDER BAY | 132 | Yes - SFAIRP/ALARP and Economic | 103,114 |
| 22 | CMSDPT2X | EC00002940 | 98F MT TERRY 132KV FEEDER | 132 | Yes - Economic | 83,458 |
| 23 | CMSDPT2X | EC00002938 | 98F MT TERRY 132KV FEEDER | 132 | Yes - Economic | 83,458 |
| 24 | CMSDPT2X | EC00002939 | 98F MT TERRY 132KV FEEDER | 132 | Yes - Economic | 83,458 |
| 25 | COSBER2J | B01330/3 | 94B WELLINGTON 132KV FEEDER BAY | 132 | Yes - SFAIRP/ALARP and Economic | 81,218 |
| 26 | COSBER2J | B01330/1 | 94B WELLINGTON 132KV FEEDER BAY | 132 | Yes - SFAIRP/ALARP and Economic | 81,218 |
| 27 | COSBER2J | B01330/2 | 94B WELLINGTON 132KV FEEDER BAY | 132 | Yes - SFAIRP/ALARP and Economic | 81,218 |
| 28 | CMSAVS1A | A05947/6 | 17 MACARTHUR 330KV FEEDER | 330 | Yes - Economic | 61,082 |
| 29 | CMSAVS1A | A05947/7 | 17 MACARTHUR 330KV FEEDER | 330 | Yes - Economic | 61,082 |
| 30 | NNSMRK1D1 | EC00012421 | 88 TAMWORTH 330KV FEEDER BAY | 330 | Yes - Economic | 54,917 |
| 31 | NNSMRK1D1 | EC00012422 | 88 TAMWORTH 330KV FEEDER BAY | 330 | Yes - Economic | 54,917 |

| No. | Equipment Reference | PIC Number | Equipment Description | Volts | Replace based on evaluation | NPV @ 10%, as at Jun'18 |
|-----|---------------------|------------|--------------------------------|-------|---------------------------------|-------------------------|
| 32 | SWSWG11F1 | A07119/3 | 62 JINDERA 330KV FEEDER BAY | 330 | Yes - SFAIRP/ALARP and Economic | 51,354 |
| 33 | SWSWG11F1 | A07119/2 | 62 JINDERA 330KV FEEDER BAY | 330 | Yes - SFAIRP/ALARP and Economic | 51,354 |
| 34 | SWSWG11F1 | A07119/1 | 62 JINDERA 330KV FEEDER BAY | 330 | Yes - SFAIRP/ALARP and Economic | 51,354 |
| 35 | NNSVP11AF1 | EC00020755 | 23 MUNMORAH 330KV FEEDER BAY | 330 | Yes - SFAIRP/ALARP and Economic | 45,286 |
| 36 | COSCW22F | A01109/2 | 999YASS330-132KVFEEDERBAY | 132 | Yes - SFAIRP/ALARP and Economic | 44,565 |
| 37 | COSCW22F | A01109/1 | 999YASS330-132KVFEEDERBAY | 132 | Yes - SFAIRP/ALARP and Economic | 44,565 |
| 38 | COSCW22F | A01109/3 | 999YASS330-132KVFEEDERBAY | 132 | Yes - SFAIRP/ALARP and Economic | 44,565 |
| 39 | CMSDPT2F | EC00006217 | 98W MT TERRY 132KV FEEDER | 132 | Yes - Economic | 43,857 |
| 40 | SWSYA22G | A07432/2 | 99JGRIFFITH132KVFEEDER | 132 | Yes - SFAIRP/ALARP and Economic | 40,728 |
| 41 | SWSYA22G | A07432/4 | 99JGRIFFITH132KVFEEDER | 132 | Yes - SFAIRP/ALARP and Economic | 40,728 |
| 42 | SWSYA22G | A07432/3 | 99JGRIFFITH132KVFEEDER | 132 | Yes - SFAIRP/ALARP and Economic | 40,728 |
| 43 | NNSMRK1C1 | EC00003087 | 83 LIDDELL 330KV FEEDER BAY | 330 | Yes - Economic | 40,391 |
| 44 | NNSMRK1C1 | EC00003085 | 83 LIDDELL 330KV FEEDER BAY | 330 | Yes - Economic | 40,391 |
| 45 | NNSMRK1C1 | EC00003086 | 83 LIDDELL 330KV FEEDER BAY | 330 | Yes - Economic | 40,391 |
| 46 | CMSSE11E1 | A02051/2 | A1 SECTION 330KV BUSBAR | 330 | Yes - SFAIRP/ALARP and Economic | 33,550 |
| 47 | CMSSE11F1 | A02051/1 | B1 SECTION 330KV BUSBAR | 330 | Yes - SFAIRP/ALARP and Economic | 33,550 |
| 48 | SWSUT11Q | ETA8219 | 330kVABus-No.2SectionBusbar | 330 | Yes - Economic | 33,508 |
| 49 | COSWL11D1 | EC00004543 | 79 WOLLAR 330KV FEEDER BAY | 330 | Yes - Economic | 33,152 |
| 50 | COSWL11D1 | EC00004541 | 79 WOLLAR 330KV FEEDER BAY | 330 | Yes - Economic | 33,152 |
| 51 | COSWL11D1 | EC00004542 | 79 WOLLAR 330KV FEEDER BAY | 330 | Yes - Economic | 33,152 |
| 52 | SWSUT11V1 | ETA8226 | 2Yass330-330kVFeederBay | 330 | Yes - SFAIRP/ALARP and Economic | 32,805 |
| 53 | SWSUT11V1 | ETA8227 | 2Yass330-330kVFeederBay | 330 | Yes - SFAIRP/ALARP and Economic | 32,805 |
| 54 | SWSUT11V1 | ETA8228 | 2Yass330-330kVFeederBay | 330 | Yes - SFAIRP/ALARP and Economic | 32,805 |
| 55 | CMSSYW2S | A03122/9 | 93Z BLACKTOWN 132KV FEEDER BAY | 132 | Yes - SFAIRP/ALARP and Economic | 30,675 |

| No. | Equipment Reference | PIC Number | Equipment Description | Volts | Replace based on evaluation | NPV @ 10%, as at Jun'18 |
|-----|---------------------|------------|---|-------|-----------------------------------|-------------------------|
| 56 | CMSSYW2S | A03122/7 | 93Z BLACKTOWN 132KV FEEDER BAY | 132 | Yes - SFAIRP/ALARP and Economic | 30,675 |
| 57 | CMSSYW2S | A03122/8 | 93Z BLACKTOWN 132KV FEEDER BAY | 132 | Yes - SFAIRP/ALARP and Economic | 30,675 |
| 58 | CMSSE11E2 | A02051/7 | A2 SECTION 330KV BUSBAR | 330 | Yes - SFAIRP/ALARP and Economic | 27,422 |
| 59 | CMSSE11F2 | A02051/6 | B2 SECTION 330KV BUSBAR | 330 | Yes - SFAIRP/ALARP and Economic | 27,422 |
| 60 | SWSWG12H2 | A07115/6 | 9R5 WAGGA NORTH 132KV FEEDER BAY | 132 | Yes - SFAIRP/ALARP and Economic | 24,549 |
| 61 | SWSWG12H2 | A07115/5 | 9R5 WAGGA NORTH 132KV FEEDER BAY | 132 | Yes - SFAIRP/ALARP and Economic | 24,549 |
| 62 | CMSRGV1D1 | EC00006087 | 38 SYDNEY WEST 330KV FEEDER BAY | 330 | Yes - Economic | 21,173 |
| 63 | SWSLT11G1 | ETA6462 | L1 Tumut 3 330kV Feeder Bay (Units 1-2) | 330 | Yes - Economic (CVDs 7/3 x Capex) | 15,557 |
| 64 | SWSLT11G1 | ETA6463 | L1 Tumut 3 330kV Feeder Bay (Units 1-2) | 330 | Yes - Economic (CVDs 7/3 x Capex) | 15,557 |
| 65 | SWSLT11G1 | ETA6464 | L1 Tumut 3 330kV Feeder Bay (Units 1-2) | 330 | Yes - Economic (CVDs 7/3 x Capex) | 15,557 |
| 66 | SWSLT11H1 | ETA6458 | L3 Tumut 3 330kV Feeder Bay (Units 3-4) | 330 | Yes - Economic (CVDs 7/3 x Capex) | 15,557 |
| 67 | SWSLT11H1 | ETA6465 | L3 Tumut 3 330kV Feeder Bay (Units 3-4) | 330 | Yes - Economic (CVDs 7/3 x Capex) | 15,557 |
| 68 | SWSLT11H1 | ETA6382 | L3 Tumut 3 330kV Feeder Bay (Units 3-4) | 330 | Yes - Economic (CVDs 7/3 x Capex) | 15,557 |
| 69 | SWSLT11J1 | ETA6468 | L5 Tumut 3 330kV Feeder Bay (Units 5-6) | 330 | Yes - Economic (CVDs 7/3 x Capex) | 15,557 |
| 70 | SWSLT11J1 | ETA6466 | L5 Tumut 3 330kV Feeder Bay (Units 5-6) | 330 | Yes - Economic (CVDs 7/3 x Capex) | 15,557 |
| 71 | SWSLT11J1 | ETA6467 | L5 Tumut 3 330kV Feeder Bay (Units 5-6) | 330 | Yes - Economic (CVDs 7/3 x Capex) | 15,557 |
| 72 | CMSSYS1N1 | EC00002312 | 12 LIVERPOOL 330KV FEEDER BAY | 330 | Yes - Economic | 20,982 |
| 73 | CMSSYS1N1 | EC00002311 | 12 LIVERPOOL 330KV FEEDER BAY | 330 | Yes - Economic | 20,982 |
| 74 | CMSSYS1N1 | EC00002310 | 12 LIVERPOOL 330KV FEEDER BAY | 330 | Yes - Economic | 20,982 |
| 75 | SWSUT11P | ETA8218 | 330kVABus-No.1SectionBusbar | 330 | Yes - Economic | 20,816 |
| 76 | SWSYA22J | A07432/7 | 99FURANQUINTY132KVFEEDER | 132 | Yes - Economic | 20,161 |
| 77 | SWSYA22J | A07432/6 | 99F URANQUINTY 132KV FEEDER | 132 | Yes - Economic | 20,161 |
| 78 | SWSYA22J | A07432/5 | 99FURANQUINTY132KVFEEDER | 132 | Yes - Economic | 20,161 |
| 79 | CMSKCR1A3 | EC00010757 | 37 MACARTHUR 330KV FEEDER BAY | 330 | Yes - Economic | 20,306 |

| No. | Equipment Reference | PIC Number | Equipment Description | Volts | Replace based on evaluation | NPV @ 10%, as at Jun'18 |
|-----|---------------------|------------|---------------------------------|-------|---------------------------------|-------------------------|
| 80 | COSWW11E1 | EC00017673 | 77 INGLEBURN 330KV FEEDER BAY | 330 | Yes - Economic | 19,499 |
| 81 | COSWW11E1 | EC00017671 | 77 INGLEBURN 330KV FEEDER BAY | 330 | Yes - Economic | 19,499 |
| 82 | COSWW11E1 | EC00017672 | 77 INGLEBURN 330KV FEEDER BAY | 330 | Yes - Economic | 19,499 |
| 83 | COSWW11E1 | EC00017675 | 77 INGLEBURN 330KV FEEDER BAY | 330 | Yes - Economic | 19,499 |
| 84 | NNSVP11MB1 | TG007632 | NO1 SECTION 330KV MAIN BUSBAR | 330 | Yes - Economic | 20,372 |
| 85 | SWSUT11J1 | ETA8214 | 65Murray330kVFeederBay | 330 | Yes - Economic | 18,199 |
| 86 | SWSUT11J1 | ETA8215 | 65Murray330kVFeederBay | 330 | Yes - Economic | 18,199 |
| 87 | SWSUT11J1 | ETA8216 | 65Murray330kVFeederBay | 330 | Yes - Economic | 18,199 |
| 88 | SWSDNT3E2 | EC00015403 | X5/1 BALRANALD 220KV FEEDER BAY | 220 | Yes - Economic | 16,894 |
| 89 | SWSDNT3E2 | EC00015405 | X5/1 BALRANALD 220KV FEEDER BAY | 220 | Yes - Economic | 16,894 |
| 90 | CMSKVS1E | A05698/1 | NO3 SECTION 330KV BUSBAR | 330 | Yes - Economic | 15,773 |
| 91 | CMSKVS1F | A05698/2 | NO4 SECTION 330KV BUSBAR | 330 | Yes - Economic | 15,773 |
| 92 | CMSAVS1B | A05947/1 | 16 MARULAN 330KV FEEDER | 330 | Yes - Economic | 13,849 |
| 93 | CMSAVS1B | A05946/1 | 16 MARULAN 330KV FEEDER | 330 | Yes - Economic | 13,849 |
| 94 | CMSAVS1B | A05947/2 | 16 MARULAN 330KV FEEDER | 330 | Yes - Economic | 13,849 |
| 95 | CMSDPT2K | EC00005382 | 981 BELLAMBI CREEK 132KV FEEDER | 132 | Yes - Economic | 12,816 |
| 96 | CMSDPT2K | EC00005380 | 981 BELLAMBI CREEK 132KV FEEDER | 132 | Yes - Economic | 12,816 |
| 97 | CMSDPT2K | EC00005381 | 981 BELLAMBI CREEK 132KV FEEDER | 132 | Yes - Economic | 12,816 |
| 98 | CMSAVS1C | A05947/5 | 10 DAPTO 330KV FEEDER | 330 | Yes - Economic | 12,933 |
| 99 | CMSAVS1C | A05947/3 | 10 DAPTO 330KV FEEDER | 330 | Yes - Economic | 12,933 |
| 100 | CMSAVS1C | A05947/4 | 10 DAPTO 330KV FEEDER | 330 | Yes - Economic | 12,933 |
| 101 | SWSWG12K | A07113/5 | 993 GADARA 132KV FEEDER | 132 | Yes - SFAIRP/ALARP and Economic | 12,062 |
| 102 | SWSWG12K | A07114/9 | 993 GADARA 132KV FEEDER | 132 | Yes - SFAIRP/ALARP and Economic | 12,062 |
| 103 | SWSWG12K | A07114/7 | 993 GADARA 132KV FEEDER | 132 | Yes - SFAIRP/ALARP and Economic | 12,062 |
| 104 | SWSWG12U | A07113/3 | 996 A.N.M. 132KV FEEDER BAY | 132 | Yes - SFAIRP/ALARP and Economic | 11,472 |

| No. | Equipment Reference | PIC Number | Equipment Description | Volts | Replace based on evaluation | NPV @ 10%, as at Jun'18 |
|-----|---------------------|------------|---|-------|---------------------------------|-------------------------|
| 105 | SWSWG12U | A07113/2 | 996 A.N.M. 132KV FEEDER BAY | 132 | Yes - SFAIRP/ALARP and Economic | 11,472 |
| 106 | SWSWG12J | A07115/1 | 99X WAGGA 132KV SS - 132KV FEEDER BAY | 132 | Yes - SFAIRP/ALARP and Economic | 11,472 |
| 107 | SWSWG12J | A07115/2 | 99X WAGGA 132KV SS - 132KV FEEDER BAY | 132 | Yes - SFAIRP/ALARP and Economic | 11,472 |
| 108 | SWSWG12J | A07115/3 | 99X WAGGA 132KV SS - 132KV FEEDER BAY | 132 | Yes - SFAIRP/ALARP and Economic | 11,472 |
| 109 | CMSKCR1A3 | EC00010759 | 37 MACARTHUR 330KV FEEDER BAY | 330 | Yes - Economic | 11,974 |
| 110 | NNSTRE2H | A09096/3 | 963 TOMAGO 330 TEE HAWKS NEST 132KV FDR | 132 | Yes - Economic | 10,459 |
| 111 | NNSTRE2H | A09096/1 | 963 TOMAGO 330 TEE HAWKS NEST 132KV FDR | 132 | Yes - Economic | 10,459 |
| 112 | NNSTRE2H | A09096/2 | 963 TOMAGO 330 TEE HAWKS NEST 132KV FDR | 132 | Yes - Economic | 10,459 |
| 113 | CMSLP11H1 | EC00006081 | 30 SYDNEY WEST 330KV FEEDER BAY | 330 | Yes - Economic | 11,172 |
| 114 | CMSLP11H1 | EC00006091 | 30 SYDNEY WEST 330KV FEEDER BAY | 330 | Yes - Economic | 11,172 |
| 115 | CMSLP11E1 | EC00006075 | 12 SYDNEY SOUTH 330KV FEEDER BAY | 330 | Yes - Economic | 11,172 |
| 116 | CMSLP11E1 | EC00006101 | 12 SYDNEY SOUTH 330KV FEEDER BAY | 330 | Yes - Economic | 11,172 |
| 117 | CMSLP11E1 | EC00006099 | 12 SYDNEY SOUTH 330KV FEEDER BAY | 330 | Yes - Economic | 11,172 |
| 118 | CMSLP11H1 | EC00006077 | 30 SYDNEY WEST 330KV FEEDER BAY | 330 | Yes - Economic | 11,172 |
| 119 | SWSBRG3D2 | EC00015416 | X5/3 BALRANALD 220KV FEEDER BAY | 220 | Yes - Economic | 10,017 |
| 120 | SWSBRG3D2 | EC00015417 | X5/3 BALRANALD 220KV FEEDER BAY | 220 | Yes - Economic | 10,017 |
| 121 | SWSBRG3D2 | EC00015415 | X5/3 BALRANALD 220KV FEEDER BAY | 220 | Yes - Economic | 10,017 |
| 122 | SWSJDA1D1 | EC00007269 | 060 WODONGA 330KV FEEDER BAY | 330 | Yes - Economic | 10,407 |
| 123 | SWSJDA1D1 | EC00007268 | 060 WODONGA 330KV FEEDER BAY | 330 | Yes - Economic | 10,407 |
| 124 | SWSJDA1D1 | EC00007270 | 060 WODONGA 330KV FEEDER BAY | 330 | Yes - Economic | 10,407 |
| 125 | COSMTP1B1 | EC00006113 | 330KV 72 WELLINGTON FEEDER BAY | 330 | Yes - Economic | 10,051 |
| 126 | COSMTP1B1 | EC00006114 | 330KV 72 WELLINGTON FEEDER BAY | 330 | Yes - Economic | 10,051 |

| No. | Equipment Reference | PIC Number | Equipment Description | Volts | Replace based on evaluation | NPV @ 10%, as at Jun'18 |
|-----|---------------------|------------|---------------------------------------|-------|---|-------------------------|
| 127 | COSMTP1B1 | EC00006111 | 330KV 72 WELLINGTON FEEDER BAY | 330 | Yes - Economic | 10,051 |
| 128 | SWSANM2J | EC00003287 | 99Z ALBURY 132KV FEEDER | 132 | Yes - Economic | 9,300 |
| 129 | SWSANM2J | EC00003288 | 99Z ALBURY 132KV FEEDER | 132 | Yes - Economic | 9,300 |
| 130 | SWSANM2J | EC00003286 | 99Z ALBURY 132KV FEEDER | 132 | Yes - Economic | 9,300 |
| 131 | CMSKVS1D1 | A05691/3 | 3W CAPITAL WIND FARM 330KV FEEDER BAY | 330 | Yes - Economic | 9,775 |
| 132 | CMSKVS1D1 | A05691/1 | 3W CAPITAL WIND FARM 330KV FEEDER BAY | 330 | Yes - Economic | 9,775 |
| 133 | SWSWG12Q | A07114/3 | 99W WAGGA 132KV SS - 132KV FEEDER BAY | 132 | Yes - Economic | 8,770 |
| 134 | SWSWG12Q | A07114/1 | 99W WAGGA 132KV SS - 132KV FEEDER BAY | 132 | Yes - Economic | 8,770 |
| 135 | SWSWG12Q | A07114/2 | 99W WAGGA 132KV SS - 132KV FEEDER BAY | 132 | Yes - Economic | 8,770 |
| 136 | CMSKVS1G1 | A05691/6 | 18 DAPTO 330KV FEEDER BAY | 330 | Yes - Economic | 8,666 |
| 137 | CMSKVS1G1 | A05691/5 | 18 DAPTO 330KV FEEDER BAY | 330 | Yes - Economic | 8,666 |
| 138 | CMSING1C1 | EC00004527 | 78 SYDNEY SOUTH 330KV FEEDER BAY | 330 | Yes - Economic | 8,118 |
| 139 | CMSING1C1 | EC00004526 | 78 SYDNEY SOUTH 330KV FEEDER BAY | 330 | Yes - Economic | 8,118 |
| 140 | CMSING1C1 | EC00004528 | 78 SYDNEY SOUTH 330KV FEEDER BAY | 330 | Yes - Economic | 8,118 |
| 141 | SWSDNT3E2 | EC00015407 | X5/1 BALRANALD 220KV FEEDER BAY | 220 | Yes - Economic | 6,035 |
| 142 | CMSRGV1C1 | ETA2332 | 31 BAYSWATER 330KV FEEDER BAY | 330 | Yes - Trench Type fault (placeholder replacement) | -22,014 |
| 143 | CMSRGV1C1 | ETA2329 | 31 BAYSWATER 330KV FEEDER BAY | 330 | Yes - Trench Type fault (placeholder replacement) | -22,014 |
| 144 | CMSRGV1C1 | ETA2331 | 31 BAYSWATER 330KV FEEDER BAY | 330 | Yes - Trench Type fault (placeholder replacement) | -22,014 |
| 145 | CMSSYN1M | ETA2334 | 28 SYDNEY EAST 330KV FEEDER BAY | 330 | Yes - Trench Type fault (placeholder replacement) | -9,342 |
| 146 | CMSSYN1M | ETA2333 | 28 SYDNEY EAST 330KV FEEDER BAY | 330 | Yes - Trench Type fault (placeholder replacement) | -9,342 |
| 147 | CMSSYN1M | ETA2335 | 28 SYDNEY EAST 330KV FEEDER BAY | 330 | Yes - Trench Type fault (placeholder replacement) | -9,342 |
| 148 | CMSSYN1N | ETA2362 | 27 SYDNEY EAST 330KV FEEDER BAY | 330 | Yes - Trench Type fault (placeholder replacement) | -9,342 |
| 149 | CMSSYN1N | ETA2364 | 27 SYDNEY EAST 330KV FEEDER BAY | 330 | Yes - Trench Type fault (placeholder replacement) | -9,342 |
| 150 | CMSSYN1N | ETA2359 | 27 SYDNEY EAST 330KV FEEDER BAY | 330 | Yes - Trench Type fault (placeholder replacement) | -9,342 |

| No. | Equipment Reference | PIC Number | Equipment Description | Volts | Replace based on evaluation | NPV @ 10%, as at Jun'18 |
|-----|---------------------|------------|----------------------------------|-------|---|-------------------------|
| 151 | NNSER00CE1 | EC00008705 | 5A2 KEMPS CREEK 500KV FEEDER BAY | 500 | Yes - leaking Trench type | -107,861 |
| 152 | NNSER00CF1 | EC00008706 | 5A1 KEMPS CREEK 500KV FEEDER BAY | 500 | Yes - leaking Trench type | -107,861 |
| 153 | NNSER00CF1 | EC00008711 | 5A1 KEMPS CREEK 500KV FEEDER BAY | 500 | Yes - leaking Trench type | -107,861 |
| 154 | NNSTOM1D | EC00022169 | NO4 TRANSFORMER 330KV CB BAY | 330 | Yes - Trench Type fault (placeholder replacement) | -12,274 |
| 155 | NNSTOM1D | EC00022168 | NO4 TRANSFORMER 330KV CB BAY | 330 | Yes - Trench Type fault (placeholder replacement) | -12,274 |
| 156 | NNSTOM1D | ETA2349 | NO4 TRANSFORMER 330KV CB BAY | 330 | Yes - Trench Type fault (placeholder replacement) | -21,840 |