

OPTIONS EVALUATION REPORT (OER)



Various Locations CB Renewal Program

OER 000000001337 revision 3.0

Ellipse project no.: P0007878

TRIM file: [TRIM No]

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

Project category: Prescribed - Replacement

Approvals

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Date submitted for approval	30 November 2016	

Change history

Revision	Date	Amendment
0	24 June 2016	Initial issue
1	29 June 2016	Update to 2016/17 dollars and SFAIRP/ALARP data
2	28 October 2016	Amendment
3	30 November 2016	Update to format

1. Need/opportunity

A number of Circuit Breakers (CBs) are approaching end of life in the regulatory period from 2018-2023. Risk reduction measures such as: replacement; refurbishment; or holding additional spares - are needed to properly manage the overall risk profile of the organisation.

Since publication of the Need Statement, replacement of six circuit breakers is brought forward into 2013-2018 period due to urgent condition issues and recent failures.

2. Related Needs/opportunities

Separate programs for current transformers, voltage transformers and disconnectors are being developed and should be considered when packaging work. Current transformers are particularly relevant given their association with the breaker.

Each circuit breaker replacement identified should be considered in the context of other site requirements when considering delivery.

3. Options

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

Base Case

Base Case is the “do nothing” approach which will run the circuit breakers to failure. The associated total risk cost is \$23.4m per annum. Reliability is the key driver of the calculated risk.

There are 237 CBs identified in total. Circuit breakers identified can be replaced with either like for like (live head) circuit breaker or a Dead Tank type circuit breaker. Assessment for the most optimal replacement type is done for each CB:

- > Group 1 CBs (and its associated current transformers) will be replaced with a Dead Tank Circuit Breaker (DTCB). These 69 circuit breakers have their associated CTs identified for replacement under the Current Transformer (CT) renewal program (Need 1338);
- > Group 2 CBs will be replaced with the conventional like for like type using a ‘live head’ circuit breaker. There are 168 circuit breakers belonging to this group;

3.1 Group 1 CBs – two replacement options

Option A — Replace with dead tank circuit breaker [[OFR 1337B](#), [OFS 1337B](#)]

For those circuit breakers where their associated CTs also require replacement, this option is the replacement of both the circuit breaker and its associated CTs using a DTCB. Option Feasibility Study (OFS) estimate cost is \$107.76m which is assuming all CBs identified will be replaced with DTCB. However, after economic assessment, 69 CBs are considered. Using the unit costs provided in the OFS, the expected capital costs of this option for this group of CBs is calculated as \$24.4m.

Operating costs have been estimated at \$21.57k for routine maintenance and minimal defect maintenance per annum for this option. Within the total risk cost, reliability cost is the most significant driver of the residual total risk cost.

Option B — Replace with a conventional circuit breaker and conventional CT

The other replacement option for this group of CBs is to replace the CB and its associated CT as separate individual replacement.

[OFS 1337A](#) cost is \$64.7m which is assuming all CBs identified will be replaced with like to like conventional CBs. 69 CBs are included in this group as stated in Option A above. Using the unit costs provided in the OFS, the expected capital costs of this option for this group of CBs is calculated as \$14.91m.

[OFS 1338A](#) cost is \$32.4m which is assuming all CTs identified will be replaced with like to like conventional CTs. 69 CBs' associated CTs are included in this group as stated in Option A above. Using the unit costs provided in the OFS, the expected capital costs of this option for this group of CTs is calculated as \$13.1m.

The combine total expected capital cost of this option is calculated as \$28m.

Operating costs have been estimated to be similar to the operating cost for Option A above.

3.2 Group 2 CBs – only one option exists

Option C — Replace with a conventional circuit breaker (ie without replacing the adjacent CTs) [[OFR 1337A](#), [OFS 1337A](#)]

Similar to Option B, this option is for the replacement for like for like conventional circuit breaker (except without CTs). OFS estimate cost is \$64.7m which is assuming all CBs identified will be replaced with like to like conventional CBs. However, after economic assessment, 167 CBs replacements are included. Using the unit costs provided in the OFS, the expected capital costs of this option for this group of CBs is calculated as \$40.72m.

Operating costs have been estimated at \$0.05m for routine maintenance and minimal defect maintenance per annum for this option. Within the total risk cost, reliability cost is the most significant driver of the residual total risk cost.

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 the technically feasible options is summarised in Table 1.

Table 1 – Commercial evaluation – Group 1 CBs (\$ million)

Option	Description	Total capex	Annual opex	Annual post project risk cost	Economic NPV @10%	Rank
Base Case	Do nothing and run-to-failure	N/A	N/A	9.35	N/A	3
A	Replace with DTCB	24.4	0.02	0.014	98.96	1
B	Replace with conventional breaker and CT	28.01	0.02	0.05	95.22	2

For the remaining circuit breakers, their associated CTs are not identified as requiring replacement. In this case, there is only one option. The commercial evaluation of the technically feasible options for the rest of the CBs is set out in Table 2.

Table 2 – Commercial evaluation – Group 2 CBs (like for like) (\$ million)

Option	Description	Total capex	Annual opex	Annual post project risk cost	Economic NPV @10%	Rank
Base Case	Do nothing and run-to-failure	N/A	N/A	14.1	N/A	2
C	Replace with conventional breaker	40.72	0.05	0.03	96.1	1

Note: The Opex savings associated with the replacement of breakers result from anticipated reduction in the number of defects; and from routine maintenance reductions.

The Net Present Value (NPV) analysis (discounted to June 2019) assumes that each asset replacement occurs over the 5 year regulatory period. The timing of the replacements should generally occur with the highest NPV replacements first as these will generally have the highest risks and will derive the greatest benefit.

The commercial evaluation is based on:

- > a 10% discount

Sensitivities on economic NPV for the options with changing discount rates are shown in Tables 3 and 4.

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 3 – Discount rate sensitivities – Group 1 CBs (DTCB) (\$ million)

Option	Description	Economic NPV @13%	Economic NPV @6.75%
A	Replace with DTCB	59.9	175.23
B	Replace with conventional breaker and CT	56.56	170.83

Table 4 – Discount rate sensitivities – Group 2 CBs (like for like) (\$ million)

Option	Description	Economic NPV @13%	Economic NPV @6.75%
C	Replace with conventional breaker (without CT)	58.76	165.93

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)

There are 236 CBs which should be replaced to meet the ALARP test. The result for each individual asset is provided in Attachment 1.

A summary of Capex and safety risk reduction of the CBRs (including both like for like type and DTCB type) is shown in Tables 5 and 6 below:

Table 5 – Annual risk calculations (\$ thousand)

Option	Annual Residual Risk			Annual Risk Savings		
	Safety Risk	Reliability Risk	Bushfire Risk	Safety Risk	Reliability Risk	Bushfire Risk
Base	10	1	0	N/A	N/A	N/A
A	0	12	385	8,025	0	12
B	2	47	384	7,990	2	47
C	1	25	630	11,710	1	25

Table 6 – Reasonably practicable test (\$ thousand)

Option	Network Safety Risk Reduction ¹	Annualised CAPEX	Reasonably practicable ² ?
A	1,957	542	Refer to Attachment 1 for each individual assessment
B	1,949	622	Refer to Attachment 1 for each individual assessment
C	3,060	910	Refer to Attachment 1 for each individual assessment

4.3 Preferred option

The outcome of the SFAIRP/ALARP evaluation is that Option A is the preferred option as it is reasonably practicable and provides the greatest network safety risk reduction, and is therefore required to satisfy the organisation's SFAIRP/ALARP obligations.

Based on both the economic evaluation and the ALARP evaluation, the preferred option is Option A for group 1 CBs and Option C for group 2 CBs.

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.

¹ The Network Safety Risk Reduction is calculated as 6 x Bushfire Risk Reduction + 3 x Safety Risk Reduction + 0.1 x Reliability Risk Reduction

² Reasonably practicable is defined as whether the annualised CAPEX is less than the Network Safety Risk Reduction

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 for circuit breakers with positive NPV listed in Attachment 1. (Note: Attachment 1 includes CBs from both groups.)

Total CAPEX is estimated at \$65.12m (\$24.4m for Group 1 plus \$40.72m for Group 2).

Attachment 1

Table 7 shows the circuit breakers included in this Option review.

Table 7 – CBs

Equipment Reference	PIC Number	NPV @ 10%, as at Jun'18	Voltage	Fault Rating	Replacement Type	Alarp Test
NNSMRK2G	EC00006573	9,591,708	132	31.5	DTCB	Yes
SWSDN22A1	A07198/1	7,524,459	132	21.8	DTCB	Yes
SYSMRU2F	EC00008469	6,494,561	132	31.5	DTCB	Yes
NNSTOM1H	EC00018742	6,474,636	330	50	DTCB	Yes
SYSMRNCHB	EC00022698	5,112,495	330	50	DTCB	Yes
SYSMRU2D	EC00008472	4,452,298	132	31.5	DTCB	Yes
CMSDPT1E1	EC00022821	4,146,754	330	50	DTCB	Yes
SWSANM2G	EC00003293	3,393,189	132	31.5	DTCB	Yes
NTSMRE2A1	EC00006699	3,113,862	132	31.5	DTCB	Yes
NTSNB22G	EC00008293	2,928,058	132	31.5	DTCB	Yes
SYSMRU2A1	EC00008470	2,730,934	132	31.5	DTCB	Yes
SYSMRU2B1	EC00008471	2,386,556	132	31.5	DTCB	Yes
CMSSE11C1	EC00017382	2,253,906	330	50	DTCB	Yes
NTSINV2B1	EC00005970	2,078,969	132	31.5	DTCB	Yes
NTSMRE2B1	EC00006701	1,933,808	132	31.5	DTCB	Yes
SWSANM2E	EC00003292	1,799,764	132	31.5	DTCB	Yes
SWSANM2B1	EC00003290	1,755,457	132	31.5	DTCB	Yes
SWSDNT2L	EC00006569	1,688,551	132	31.5	DTCB	Yes
SWSANM2A1	EC00003291	1,677,264	132	31.5	DTCB	Yes
COSWL11A1	EC00002795	1,549,415	330	50	DTCB	Yes
NTSINV2A1	EC00005969	1,502,943	132	31.5	DTCB	Yes
NNSNEW1A1	EC00008101	1,500,614	330	50	DTCB	Yes
NNSMRK2B	EC00006575	1,454,226	132	31.5	DTCB	Yes
NNSMRK2A	EC00003190	1,329,946	132	31.5	DTCB	Yes
NTSINV2G2	EC00005967	1,304,556	132	31.5	DTCB	Yes
NTSMRE4L	EC00006750	1,238,493	66	25	DTCB	Yes
NNSTRE4J	EC00004303	1,220,042	66	25	DTCB	Yes
SYSMRU4L	EC00007856	1,075,284	66	25	DTCB	Yes
SWSWG24Q	EC00007837	898,285	66	25	DTCB	Yes

Equipment Reference	PIC Number	NPV @ 10%, as at Jun'18	Voltage	Fault Rating	Replacement Type	Alarp Test
SYSMRU4M	EC00007857	737,967	66	25	DTCB	Yes
COSWL12A	EC00002801	717,243	132	31.5	DTCB	Yes
COSWL12B	EC00002802	717,243	132	31.5	DTCB	Yes
SYSMRU4B	EC00007854	710,263	66	25	DTCB	Yes
SYSMRU4A	EC00007858	702,563	66	25	DTCB	Yes
CMSSYS1D1	EC00017375	694,915	330	50	DTCB	Yes
COSMPP1F	EC00013838	692,046	132	31.5	DTCB	Yes
NTSMRE4B	EC00006751	531,885	66	25	DTCB	Yes
SYSMRU4F	EC00007865	453,131	66	25	DTCB	Yes
SYSCA12C2	EC00001370	426,425	132	50	DTCB	Yes
NTSAR12B1	A08178/1	419,453	132	21.8	DTCB	Yes
CMSSE11N3	EC00017392	418,514	330	50	DTCB	Yes
NNSTRE4L	EC00004306	411,300	66	25	DTCB	Yes
SYSCA12P3	EC00001371	402,361	132	50	DTCB	Yes
NTSAR14J	A08180/4	399,791	66	13	DTCB	Yes
NNSTRE4H	EC00008344	392,053	66	25	DTCB	Yes
SWSNT1A1	EC00017387	381,348	330	50	DTCB	Yes
SWSNT1B1	EC00017390	381,348	330	50	DTCB	Yes
NNSMRK2F	EC00002296	379,454	132	31.5	DTCB	Yes
CMSDPT2Q	EC00005415	377,310	132	50	DTCB	Yes
NNSWRH2F	EC00013842	357,812	132	31.5	DTCB	Yes
COSMTP1B2	EC00017040	307,147	330	50	DTCB	Yes
NTSTTF2B1	A08108/2	297,582	132	21.8	DTCB	Yes
COSPMA2G	EC00006811	280,440	132	31.5	DTCB	Yes
NNSTRE4G	EC00008345	256,215	66	25	DTCB	Yes
SWSNT1C1	EC00017385	240,593	330	50	DTCB	Yes
COSPMA2F	EC00006809	237,609	132	31.5	DTCB	Yes
SWSNT1D1	EC00017386	225,634	330	50	DTCB	Yes
CMSING1AC	EC00013641	223,958	330	50	DTCB	Yes
NNSKS22H	EC00009354	220,728	132	31.5	DTCB	Yes
NTSINV4K	EC00007538	198,699	66	25	DTCB	Yes
COSMTP1C5	EC00018743	188,081	330	50	DTCB	Yes
COSMTP1G2	EC00017042	188,081	330	50	DTCB	Yes
COSMTP1A2	EC00017041	188,007	330	50	DTCB	Yes

Equipment Reference	PIC Number	NPV @ 10%, as at Jun'18	Voltage	Fault Rating	Replacement Type	Alarp Test
COSMTP1A3	EC00017038	187,545	330	50	DTCB	Yes
NNSMRK2H	EC00006574	155,594	132	31.5	DTCB	Yes
COSMTP1F5	EC00022686	112,621	330	50	DTCB	Yes
SWSJDA2H	EC00007252	101,070	132	31.5	DTCB	Yes
NNSTRE4F	EC00008343	30,792	66	25	DTCB	Yes
CMSDPT2L	EC00005299	4,562	132	50	DTCB	Yes
CMSSYW2YC	ETA4809	2,224,479	132	50	POW	Yes
CMSSYN2W	ETA1707	791,789	132	50	POW	Yes
CMSDPT2J2	ETA7274	71,472	132	50	POW	Yes
NTSTA11L	ETA3889	66,185	330	50	POW	Yes
NNSER06B	ETA7010	38,286	66	40	POW	Yes
NTSLSM2G	ETA7245	32,907	132	50	POW	Yes
CMSSE12JS	ETA3331	32,526	132	50	POW	Yes
COSWL12W	ETA5148	30,400	132	40	POW	Yes
NTSAR11H3	EC00022703	11,348	330	50	POW	Yes
COSWL11D2	EC00002797	10,799	330	50	POW	Yes
CMSKCR1Q	ETA3963	10,016	330	50	POW	Yes
CMSKCR1R	ETA3964	10,016	330	50	POW	Yes
NNSBAY1AF2	EC00008121	6,316,457	330	50		Yes
SWSGRF2H	EC00005962	2,786,910	132	31.5		Yes
NNSTOM1J2	EC00008097	2,738,216	330	50		Yes
CMSDPT2X	EC00005301	2,618,037	132	50		Yes
NNSTOM1B2	EC00008096	2,611,728	330	50		Yes
NNSTOM1G2	EC00008104	2,611,728	330	50		Yes
COSBER4Q	EC00004628	2,584,546	66	25		Yes
NNSTOM1J3	EC00008103	2,414,768	330	50		Yes
NNSTOM1B3	EC00008105	2,301,707	330	50		Yes
NNSTOM1C3	EC00008100	2,301,707	330	50		Yes
NNSTOM1G3	EC00008106	2,301,707	330	50		Yes
SYSMRNDDB2	EC00022697	2,077,255	330	50		Yes
COSPMA4J	EC00006539	2,076,981	66	25		Yes
CMSBFW1A1	EC00017361	1,907,449	330	50		Yes
SWSDN22B1	A07198/2	1,864,788	132	21.8		Yes
CMSBFW1B1	EC00017362	1,815,408	330	50		Yes

Equipment Reference	PIC Number	NPV @ 10%, as at Jun'18	Voltage	Fault Rating	Replacement Type	Alarp Test
COSMPP2H	EC00007380	1,719,567	66	40		Yes
COSMPP1G	EC00005972	1,709,196	132	31.5		Yes
SYSMRNCFB	EC00022690	1,620,471	330	50		Yes
SYSMRNCGB	EC00022699	1,619,654	330	50		Yes
SYSMRNDFB	EC00022692	1,587,401	330	50		Yes
SYSMRNDHB	EC00022696	1,587,401	330	50		Yes
SWSDN24J	EC00007839	1,583,512	66	25		Yes
CMSSYS1S4	EC00017374	1,540,714	330	50		Yes
SWSGRF6J	EC00013341	1,302,443	33	29		Yes
CMSSYW2W	ETA3617	1,275,801	132	50		Yes
SWSTU24L	A07244/5	1,250,787	66	13		Yes
NTSCOF4T	T00157/3	1,215,485	66	25		Yes
NTSCOF4Y2	T00158/3	1,215,485	66	25		Yes
COSWL11F3	EC00002798	1,164,991	330	50		Yes
NTSCOF4BB4	T00157/2	1,156,395	66	25		Yes
NTSCOF4V2	T00158/2	1,156,395	66	25		Yes
SYSMRU4J	EC00007864	1,133,776	66	25		Yes
COSFB22J	EC00002295	1,045,167	132	31.5		Yes
NTSMRE2E2	EC00006700	1,037,365	132	31.5		Yes
NTSMRE2G2	EC00006702	1,005,732	132	31.5		Yes
NTSINV2C2	EC00005965	998,718	132	31.5		Yes
NTSINV4BB2	EC00007540	912,132	66	25		Yes
NTSKLK4N	EC00009079	855,599	66	25		Yes
NTSMRE4J	EC00006748	847,973	66	25		Yes
CMSDPT2J1	EC00005297	847,209	132	50		Yes
CMSDPT2K	EC00005298	816,714	132	50		Yes
NTSCOF4J	T00156/2	761,043	66	25		Yes
SWSANM2C1	EC00003295	756,083	132	31.5		Yes
CMSING4C2	EC00007773	755,752	66	40		Yes
SWSJDA2A	EC00007251	747,891	132	31.5		Yes
NTSCOF4BB2	T00156/3	722,063	66	25		Yes
SWSANM2J	EC00003294	718,575	132	31.5		Yes
COSPMA4L	EC00006540	674,515	66	25		Yes
SWSJDA2B	EC00007253	673,650	132	31.5		Yes

Equipment Reference	PIC Number	NPV @ 10%, as at Jun'18	Voltage	Fault Rating	Replacement Type	Alarp Test
COSPMA4F	EC00006544	668,689	66	25		Yes
NTSKLK4P2	EC00007859	616,735	66	25		Yes
COSMPP1A1	EC00005971	587,293	132	31.5		Yes
COSMPP1D	EC00013839	508,766	132	31.5		Yes
CMSING4F2	EC00007770	484,831	66	40		Yes
COSPMA4B	EC00006543	458,707	66	25		Yes
NNSTGH2F	EC00009228	456,043	132	50		Yes
NTSKLK4L	EC00009078	433,483	66	25		Yes
NTSMRE4A	EC00006745	406,577	66	25		Yes
NTSMRE4G	EC00006744	406,577	66	25		Yes
SWSDN24M1	EC00007852	390,602	66	25		Yes
COSMPP1E	EC00005977	351,625	132	31.5		Yes
COSPMA4N	EC00007874	325,390	66	25		Yes
COSMPP2G	EC00007377	312,067	66	45		Yes
COSPMA4H	EC00004206	308,126	66	25		Yes
COSPMA4G	EC00006541	300,351	66	25		Yes
CMSLP11A1	EC00008114	277,755	330	50		Yes
CMSING4F1	EC00007776	273,211	66	40		Yes
CMSDPT2R	EC00005300	249,575	132	50		Yes
SYSMRU4K	EC00007866	242,763	66	25		Yes
COSMPP1B1	EC00005976	231,976	132	31.5		Yes
SYSMRU4H1	EC00007861	229,518	66	25		Yes
NNSMRK2E	EC00003194	226,866	132	31.5		Yes
COSMPP2A	EC00007375	226,629	66	40		Yes
COSMPP2B	EC00007376	226,629	66	40		Yes
SYSMRU4G	EC00007853	220,374	66	25		Yes
NTSCOF2G	EC00009355	211,638	132	31.5		Yes
COSMPP2K	EC00007379	210,990	66	40		Yes
CMSSYS1K	EC00017365	202,668	330	50		Yes
CMSSYS1N2	EC00017379	202,475	330	50		Yes
COSPMA4A	EC00006542	200,046	66	25		Yes
NTSINV4M	EC00007541	194,482	66	25		Yes
NTSAR12F1	A08179/1	190,555	132	21.8		Yes
NNSBAY1AE2	EC00008120	187,335	330	50		Yes

Equipment Reference	PIC Number	NPV @ 10%, as at Jun'18	Voltage	Fault Rating	Replacement Type	Alarp Test
NTSMRE4K	EC00006749	156,836	66	25		Yes
NTSINV4A	EC00007536	124,506	66	25		Yes
CMSLP11H2	EC00008110	122,467	330	50		Yes
NTSINV4B	EC00007539	113,195	66	25		Yes
CMSLP11B1	EC00008109	106,423	330	50		Yes
CMSLP11E3	EC00008108	106,423	330	50		Yes
CMSLP11H3	EC00008111	106,423	330	50		Yes
CMSDPT2P	EC00002826	105,228	132	50		Yes
NNSMRK2J	EC00006572	101,751	132	31.5		Yes
CMSSYS2W	ETA2581	95,985	132	40		Yes
CMSLP11E2	EC00008112	90,720	330	50		Yes
CMSDPT2A2	EC00002829	70,350	132	50		Yes
NTSAR14Q2	A08180/8	68,159	66	13		Yes
CMSING4C3	EC00007769	65,546	66	40		Yes
CMSING4D3	EC00007772	57,196	66	40		Yes
CMSSYS1C1	EC00017364	47,243	330	50		Yes
CMSSYW1G	EC00023736	47,200	330	50		Yes
SWSJDA2G	EC00007255	42,380	132	31.5		Yes
NNSMRK1AD	EC00008130	35,036	330	50		Yes
NNSMRK1BD	EC00008128	35,036	330	50		Yes
NNSTGH2E	EC00009246	34,264	132	50		Yes
COSPMA2E	EC00006810	31,071	132	31.5		Yes
COSMPP2L	EC00007378	29,115	66	40		Yes
CMSSE11P2	EC00017389	27,407	330	50		Yes
CMSSE11P3	EC00017381	27,407	330	50		Yes
CMSSE11N2	EC00017376	27,407	330	50		Yes
CMSSYW1L2	EC00024723	27,301	330	50		Yes
CMSSYS1E1	EC00017366	26,868	330	50		Yes
NTSCOF4R	T00170/1	24,419	66	25		Yes
COSPMA2H	EC00006808	23,611	132	31.5		Yes
NNSKS22K	EC00009353	23,121	132	31.5		Yes
NTSCOF4P	T00157/1	22,667	66	25		Yes
SWSJDA2F	EC00007254	21,476	132	31.5		Yes
NNSMRK1BC	EC00008129	17,506	330	50		Yes

Equipment Reference	PIC Number	NPV @ 10%, as at Jun'18	Voltage	Fault Rating	Replacement Type	Alarp Test
NNSMN11A2	EC00022041	16,051	330	50		Yes
SWSWG11F2	EC00023338	16,047	330	50		Yes
CMSSYS1N3	EC00017368	15,902	330	50		Yes
CMSSYS1L	EC00017367	15,902	330	50		Yes
SYSMRN1H	EC00022694	14,967	330	50		Yes
NNSNEW1P3	EC00008098	14,579	330	50		Yes
NNSNEW1K	EC00008107	14,579	330	50		Yes
COSMPP1H	EC00005973	14,514	132	31.5		Yes
SWSWG11L2	EC00018741	14,362	330	50		Yes
CMSSYS1A1	EC00017373	14,252	330	50		Yes
NNSMN11C1	EC00022049	13,706	330	50		Yes
NNSBAY1BC2	EC00008125	13,430	330	50		Yes
NNSMN11C2	EC00022047	12,838	330	50		Yes
SYSGTH1G	ETA8724	12,499	132	31.5		No
NNSBAY1BD2	EC00008122	11,596	330	50		Yes
CMSSYS1J3	EC00017378	8,480	330	50		Yes
NNSMN11A3	EC00022039	7,612	330	50		Yes
SWSDNT1G2	EC00017384	7,534	330	50		Yes
COSMTP1C2	EC00022685	6,869	330	50		Yes
COSMTP1F2	EC00022688	6,869	330	50		Yes
NNSNEW1G	EC00008102	6,857	330	50		Yes
COSMTP1F3	EC00022689	6,572	330	50		Yes
COSMTP1C3	EC00022684	6,498	330	50		Yes
SYSMRN1F	EC00022691	6,237	330	50		Yes
SYSMRNDGB	EC00022695	6,237	330	50		Yes
CMSSYS1H2	EC00017371	6,109	330	50		Yes
SYSGTH1J	ETA8730	5,664	132	31.5		No
CMSSE11F	EC00017380	5,572	330	50		Yes
CMSSE11B1	EC00017391	5,572	330	50		Yes
NNSNEW1F	EC00012797	5,172	330	50		Yes
SYSMRN1G	EC00022693	4,912	330	50		Yes
COSMTP1G5	EC00022687	4,765	330	50		Yes
COSMTP1B3	EC00017039	4,711	330	50		Yes
NNSMN11AE2	EC00022046	3,456	330	50		Yes

Equipment Reference	PIC Number	NPV @ 10%, as at Jun'18	Voltage	Fault Rating	Replacement Type	Alarp Test
NNSMN11C3	EC00022043	3,233	330	50		Yes
NNSMN11BE2	EC00022050	3,188	330	50		Yes
NNSMN11BF2	EC00022044	3,188	330	50		Yes