

NEED/OPPORTUNITY STATEMENT (NOS)



Various Locations CB Renewal Program

NOS- 000000001337 revision 4.0

Ellipse project no.: P0007878

TRIM file: D2016/03089

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

Project category: Prescribed - Replacement

Approvals

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Date submitted for approval	21 November 2016	

Change history

Revision	Date	Amendment
0	29 March 2016	Initial issue
1	28 October 2016	Minor changes in scope and risk cost summary - consistency with OER
2	15 November 2016	Five circuit breakers eliminated from Attachment 2 of this document
3	21 November 2016	Update to format

1. Background

Circuit breakers are essential for the control and protection of the high voltage network. They are required to switch both load currents and fault currents.

TransGrid has a population of circuit breakers installed over a range of voltages and years and that use a variety of technologies. The circuit breakers are located across the network and their duty cycle, environmental exposure and loading also varies. Finally the individual impact of their failure varies with location in the network.

Failure of a circuit breaker to operate will result in an uncleared fault that must be cleared with a larger outage (via local back up protection operation) and possible loss of customer load. A risk also exists of causing system instability. Explosive failure will also result in an uncleared fault but also has risks associated with staff injury, collateral damage and creation of additional trips.

Management of these risks is considered in this Need and Opportunity Statement.

2. Need/opportunity

Around 237 circuit breakers (around 15% of the total population) are approaching end of life in the regulatory period from 2019-2023. Risk reduction measures such as: replacement; refurbishment; or holding additional spares - are needed to properly manage the overall risk profile of the organisation. The associated total risk cost is \$23.4m per annum.

The overall steps in the assessment are as follows:

1. Available condition data has been analysed to assess the remaining life/failure risk of each circuit breaker. This assessment takes into account defect rates; age; operations count; defect cost; reactive switching duty; condition monitoring data; and insulation type. For details, please refer to Circuit Breaker Health Index Method Description (D2016/02430).
2. Consequences for each failure mode are assessed based on criticality in the network and estimated risk to personnel and the environment.
3. The combination of consequence and probability of failure are combined to estimate risk cost for each circuit breaker.
4. The spare availability for high risk circuit breakers has been assessed.
5. Risk reduction options such as refurbishment and replacement are evaluated.
6. Replacement strategy on Dead Tank Circuit Breakers is determined.

The attached table provides the outcome of the above analysis.

Note that in general, the circuit breakers that are assessed to require replacement are typically aged and/or in poor condition. Past experience with the cost of parts and expertise from suppliers where required is a substantial proportion of the cost of a new circuit breaker. An overhaul also does not remove the risk that a separate component will fail due to a separate mechanism and hence, overhaul is less relevant for older circuit breakers due to deterioration from environmental exposure and wear.

- > This Need Statement includes those circuit breakers programmed to be completed by June 2023.

3. Related needs/opportunities

Similar assessments of plant risk cost have been completed for instrument transformers, transmission lines and secondary systems. The opportunities (additional benefits) associated with replacing the targeted circuit breakers with dead tank type circuit breaker is detailed in the replacement strategy (D2015/07219).

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

4. Recommendation

It is recommended that options be considered to address the identified need.

Attachment 1 – Risk costs summary

Summary of results is attached below. Refer to supporting document in PDGS for full risk assessment.

Asset Class	Total Risk Cost (RP2)	Need Date
Circuit Breakers	\$23,415,017	2023

Attachment 2 - Circuit breakers included in this Need Statement

Bay Ref	PIC	Voltage	Fault rating
CMSDPT1E1	EC00022821	330	50
CMSDPT2L	EC00005299	132	50
CMSDPT2Q	EC00005415	132	50
CMSING1AC	EC00013641	330	50
CMSSE11C1	EC00017382	330	50
CMSSE11N3	EC00017392	330	50
CMSSYS1D1	EC00017375	330	50
COSMPP1F	EC00013838	132	31.5
COSMTP1A2	EC00017041	330	50
COSMTP1A3	EC00017038	330	50
COSMTP1B2	EC00017040	330	50
COSMTP1C5	EC00018743	330	50
COSMTP1F5	EC00022686	330	50
COSMTP1G2	EC00017042	330	50
COSPMA2F	EC00006809	132	31.5
COSPMA2G	EC00006811	132	31.5
COSWL11A1	EC00002795	330	50
COSWL12A	EC00002801	132	31.5
COSWL12B	EC00002802	132	31.5
NNSKS22H	EC00009354	132	31.5
NNSMRK2A	EC00003190	132	31.5
NNSMRK2B	EC00006575	132	31.5
NNSMRK2F	EC00002296	132	31.5
NNSMRK2G	EC00006573	132	31.5
NNSMRK2H	EC00006574	132	31.5
NNSNEW1A1	EC00008101	330	50

Bay Ref	PIC	Voltage	Fault rating
NNSTOM1H	EC00018742	330	50
NNSTRE4F	EC00008343	66	25
NNSTRE4G	EC00008345	66	25
NNSTRE4H	EC00008344	66	25
NNSTRE4J	EC00004303	66	25
NNSTRE4L	EC00004306	66	25
NNSWRH2F	EC00013842	132	31.5
NTSAR12B1	A08178/1	132	21.8
NTSAR14J	A08180/4	66	13
NTSINV2A1	EC00005969	132	31.5
NTSINV2B1	EC00005970	132	31.5
NTSINV2G2	EC00005967	132	31.5
NTSINV4K	EC00007538	66	25
NTSMRE2A1	EC00006699	132	31.5
NTSMRE2B1	EC00006701	132	31.5
NTSMRE4B	EC00006751	66	25
NTSMRE4L	EC00006750	66	25
NTSNB22G	EC00008293	132	31.5
NTSTTF2B1	A08108/2	132	21.8
SWSANM2A1	EC00003291	132	31.5
SWSANM2B1	EC00003290	132	31.5
SWSANM2E	EC00003292	132	31.5
SWSANM2G	EC00003293	132	31.5
SWSDN22A1	A07198/1	132	21.8
SWSDNT1A1	EC00017387	330	50
SWSDNT1B1	EC00017390	330	50
SWSDNT1C1	EC00017385	330	50
SWSDNT1D1	EC00017386	330	50

Bay Ref	PIC	Voltage	Fault rating
SWSDNT2L	EC00006569	132	31.5
SWSJDA2H	EC00007252	132	31.5
SWSWG24Q	EC00007837	66	25
SYSCA12C2	EC00001370	132	50
SYSCA12P3	EC00001371	132	50
SYSMRNCHB	EC00022698	330	50
SYSMRU2A1	EC00008470	132	31.5
SYSMRU2B1	EC00008471	132	31.5
SYSMRU2D	EC00008472	132	31.5
SYSMRU2F	EC00008469	132	31.5
SYSMRU4A	EC00007858	66	25
SYSMRU4B	EC00007854	66	25
SYSMRU4F	EC00007865	66	25
SYSMRU4L	EC00007856	66	25
SYSMRU4M	EC00007857	66	25
NNSBAY1AF2	EC00008121	330	50
SWSGRF2H	EC00005962	132	31.5
NNSTOM1J2	EC00008097	330	50
CMSDPT2X	EC00005301	132	50
NNSTOM1B2	EC00008096	330	50
NNSTOM1G2	EC00008104	330	50
COSBER4Q	EC00004628	66	25
NNSTOM1J3	EC00008103	330	50
NNSTOM1B3	EC00008105	330	50
NNSTOM1C3	EC00008100	330	50
NNSTOM1G3	EC00008106	330	50
CMSSYW2YC	ETA4809	132	50
SYSMRNDB2	EC00022697	330	50

Bay Ref	PIC	Voltage	Fault rating
COSPMA4J	EC00006539	66	25
CMSBFW1A1	EC00017361	330	50
SWSDN22B1	A07198/2	132	21.8
CMSBFW1B1	EC00017362	330	50
COSMPP2H	EC00007380	66	40
COSMPP1G	EC00005972	132	31.5
SYSMRNCFB	EC00022690	330	50
SYSMRNCGB	EC00022699	330	50
SYSMRNDFB	EC00022692	330	50
SYSMRNDHB	EC00022696	330	50
SWSDN24J	EC00007839	66	25
CMSSYS1S4	EC00017374	330	50
SWSGRF6J	EC00013341	33	29
CMSSYW2W	ETA3617	132	50
SWSTU24L	A07244/5	66	13
NTSCOF4T	T00157/3	66	25
NTSCOF4Y2	T00158/3	66	25
COSWL11F3	EC00002798	330	50
NTSCOF4BB4	T00157/2	66	25
NTSCOF4V2	T00158/2	66	25
SYSMRU4J	EC00007864	66	25
COSFB22J	EC00002295	132	31.5
NTSMRE2E2	EC00006700	132	31.5
NTSMRE2G2	EC00006702	132	31.5
NTSINV2C2	EC00005965	132	31.5
NTSINV4BB2	EC00007540	66	25
NTSKLK4N	EC00009079	66	25
NTSMRE4J	EC00006748	66	25

Bay Ref	PIC	Voltage	Fault rating
CMSDPT2J1	EC00005297	132	50
CMSDPT2K	EC00005298	132	50
CMSSYN2W	ETA1707	132	50
NTSCOF4J	T00156/2	66	25
SWSANM2C1	EC00003295	132	31.5
CMSING4C2	EC00007773	66	40
SWSJDA2A	EC00007251	132	31.5
NTSCOF4BB2	T00156/3	66	25
SWSANM2J	EC00003294	132	31.5
COSPMA4L	EC00006540	66	25
SWSJDA2B	EC00007253	132	31.5
COSPMA4F	EC00006544	66	25
NTSKLK4P2	EC00007859	66	25
COSMPP1A1	EC00005971	132	31.5
COSMPP1D	EC00013839	132	31.5
CMSING4F2	EC00007770	66	40
COSPMA4B	EC00006543	66	25
NNSTGH2F	EC00009228	132	50
NTSKLK4L	EC00009078	66	25
NTSMRE4A	EC00006745	66	25
NTSMRE4G	EC00006744	66	25
SWSDN24M1	EC00007852	66	25
COSMPP1E	EC00005977	132	31.5
COSPMA4N	EC00007874	66	25
COSMPP2G	EC00007377	66	45
COSPMA4H	EC00004206	66	25
COSPMA4G	EC00006541	66	25
CMSLP11A1	EC00008114	330	50

Bay Ref	PIC	Voltage	Fault rating
CMSING4F1	EC00007776	66	40
CMSDPT2R	EC00005300	132	50
SYSMRU4K	EC00007866	66	25
COSMPP1B1	EC00005976	132	31.5
SYSMRU4H1	EC00007861	66	25
NNSMRK2E	EC00003194	132	31.5
COSMPP2A	EC00007375	66	40
COSMPP2B	EC00007376	66	40
NTSCOF2G	EC00009355	132	31.5
COSMPP2K	EC00007379	66	40
CMSSYS1K	EC00017365	330	50
CMSSYS1N2	EC00017379	330	50
COSPMA4A	EC00006542	66	25
NTSINV4M	EC00007541	66	25
NTSAR12F1	A08179/1	132	21.8
NNSBAY1AE2	EC00008120	330	50
NTSMRE4K	EC00006749	66	25
NTSINV4A	EC00007536	66	25
CMSLP11H2	EC00008110	330	50
NTSINV4B	EC00007539	66	25
CMSLP11B1	EC00008109	330	50
CMSLP11E3	EC00008108	330	50
CMSLP11H3	EC00008111	330	50
CMSDPT2P	EC00002826	132	50
NNSMRK2J	EC00006572	132	31.5
CMSSYS2W	ETA2581	132	40
CMSLP11E2	EC00008112	330	50
CMSDPT2J2	ETA7274	132	50

Bay Ref	PIC	Voltage	Fault rating
CMSDPT2A2	EC00002829	132	50
NTSAR14Q2	A08180/8	66	13
NTSTA11L	ETA3889	330	50
CMSING4C3	EC00007769	66	40
CMSING4D3	EC00007772	66	40
CMSSYS1C1	EC00017364	330	50
CMSSYW1G	EC00023736	330	50
SWSJDA2G	EC00007255	132	31.5
NNSMRK1AD	EC00008130	330	50
NNSMRK1BD	EC00008128	330	50
NNSTGH2E	EC00009246	132	50
NTSLSM2G	ETA7245	132	50
CMSSE12JS	ETA3331	132	50
COSPMA2E	EC00006810	132	31.5
COSWL12W	ETA5148	132	40
COSMPP2L	EC00007378	66	40
CMSSE11P2	EC00017389	330	50
CMSSE11P3	EC00017381	330	50
CMSSE11N2	EC00017376	330	50
CMSSYW1L2	EC00024723	330	50
CMSSYS1E1	EC00017366	330	50
NTSCOF4R	T00170/1	66	25
COSPMA2H	EC00006808	132	31.5
NNSKS22K	EC00009353	132	31.5
NTSCOF4P	T00157/1	66	25
SWSJDA2F	EC00007254	132	31.5
NNSMRK1BC	EC00008129	330	50
NNSMN11A2	EC00022041	330	50

Bay Ref	PIC	Voltage	Fault rating
SWSWG11F2	EC00023338	330	50
CMSSYS1N3	EC00017368	330	50
CMSSYS1L	EC00017367	330	50
SYSMRN1H	EC00022694	330	50
NNSNEW1P3	EC00008098	330	50
NNSNEW1K	EC00008107	330	50
COSMPP1H	EC00005973	132	31.5
SWSWG11L2	EC00018741	330	50
CMSSYS1A1	EC00017373	330	50
NNSMN11C1	EC00022049	330	50
NNSBAY1BC2	EC00008125	330	50
NNSMN11C2	EC00022047	330	50
SYSGTH1G	ETA8724	132	31.5
NNSBAY1BD2	EC00008122	330	50
NTSAR11H3	EC00022703	330	50
COSWL11D2	EC00002797	330	50
CMSKCR1Q	ETA3963	330	50
CMSKCR1R	ETA3964	330	50
CMSSYS1J3	EC00017378	330	50
NNSMN11A3	EC00022039	330	50
SWSDNT1G2	EC00017384	330	50
COSMTP1C2	EC00022685	330	50
COSMTP1F2	EC00022688	330	50
NNSNEW1G	EC00008102	330	50
COSMTP1F3	EC00022689	330	50
COSMTP1C3	EC00022684	330	50
SYSMRN1F	EC00022691	330	50
SYSMRNDGB	EC00022695	330	50

Bay Ref	PIC	Voltage	Fault rating
CMSSYS1H2	EC00017371	330	50
SYSGTH1J	ETA8730	132	31.5
CMSSE11F	EC00017380	330	50
CMSSE11B1	EC00017391	330	50
NNSNEW1F	EC00012797	330	50
SYSMRN1G	EC00022693	330	50
COSMTP1G5	EC00022687	330	50
COSMTP1B3	EC00017039	330	50
NNSMN11AE2	EC00022046	330	50
NNSMN11C3	EC00022043	330	50
NNSMN11BE2	EC00022050	330	50
NNSMN11BF2	EC00022044	330	50
SYSMRU4G	EC00007853	66	25
NNSER06B	ETA7010	66	40