

NEED/OPPORTUNITY STATEMENT (NOS)



Various Locations Bushing Renewal

NOS- 000000001525 revision 3.0

Ellipse project no.: P0008807

TRIM file: [TRIM No]

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

Project category: Prescribed - Replacement

Approvals

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Approved	Lance Wee	Manager, Asset Strategy
Date submitted for approval	23 November 2016	

Change history

Revision	Date	Amendment
0	23 May 2016	Initial issue
1	23 June 2016	Reviewed
2	28 October 2016	Minor scope change, risk cost summary updated - consistency with OER
3	23 November 2016	Update to format

1. Background

Bushings are essential component of the power transformers.

TransGrid has a population of bushings installed over a range of voltages and years and that use a variety of technologies. The bushings are installed on transformers 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.

Bushings usually fail in an explosive manner and the consequences are severe for oil impregnated bushings in particular. Explosive failure of these types will result in a scattering of porcelain pieces and opening of the transformer tank resulting in transformer fire and loss of the entire transformer. Hence, there are risks associated with staff injury, collateral damage and possible additional trips.

International surveys and TransGrid's own statistics shows that between 35% - 39% of transformer failures are due to bushing failure.

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

2. Need/opportunity

High Voltage bushings installed on a number of power transformers are approaching end of life in the regulatory period from 2019-2023.

Risk reduction measures such as replacement are needed to properly manage the overall risk profile of the organisation. The associated total risk cost is \$690,000 per annum during 2019 to 2023 period, the most significant element of which concerns the safety risk of explosive failure.

This Need Statement covers a program of bushings that is required to be completed by June 2023.

3. Related needs/opportunities

Nil.

4. Recommendation

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

Attachment 1 - Risk costs summary

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

Current Option Assessment - Risk Summary



Project Name: Various Bushing Replacement

Option Name: 1525 - Base Case

Option Assessment Name: 1525 - Base Case - Assessment 1

Rev Reset Period: Next (2018-23)

Major Component	No.	Minor Component	Sel. Hazardous Event	LoC x CoF (\$M)	Failure Mechanism	NoxLoC xCoF (\$M)	PoF (Yr 1)	Total Risk (\$M)	Risk (\$M) (Rel)	Risk (\$M) (Op)	Risk (\$M) (Fin)	Risk (\$M) (Pco)	Risk (\$M) (Env)	Risk (\$M) (Rep)
Rx Bushing Program	1	Bushings	Explosive Failure of Asset (Rx Bushing Program)	\$111.23	Failure	\$111.23	0.74%	\$0.08	\$0.03	\$0.03	\$0.05	\$0.01	\$0.00	\$0.00
Tx Bushing Program	1	Bushings	Explosive Failure of Asset (Tx Bushing Program)	\$69.29	Failure	\$69.29	0.88%	\$0.61	\$0.03	\$0.03	\$0.50	\$0.08	\$0.00	\$0.00
								\$0.69	\$0.06	\$0.06	\$0.55	\$0.08	\$0.00	\$0.00

Total VCR Risk: \$0.04 Total ENS Risk: \$0.00

Attachment 2 - List of Bushings included in this Need Statement

Equipment Reference	Equipment Description	PIC Number	Voltage
COSMPP1A2	NO1 TRANSFORMER 132/66KV TRANSF BAY	ETA1851	66
COSMPP1A2	NO1 TRANSFORMER 132/66KV TRANSF BAY	ETA1849	66
COSMPP1A2	NO1 TRANSFORMER 132/66KV TRANSF BAY	ETA1850	66
COSMPP1A2	NO1 TRANSFORMER 132/66KV TRANSF BAY	ETA1842	132
COSMPP1A2	NO1 TRANSFORMER 132/66KV TRANSF BAY	ETA1840	132
COSMPP1A2	NO1 TRANSFORMER 132/66KV TRANSF BAY	ETA1841	132
COSMPP1B2	NO2 TRANSFORMER 132/66KV TRANSF BAY	ETA1855	66
COSMPP1B2	NO2 TRANSFORMER 132/66KV TRANSF BAY	ETA1853	66
COSMPP1B2	NO2 TRANSFORMER 132/66KV TRANSF BAY	ETA1854	66
COSMPP1B2	NO2 TRANSFORMER 132/66KV TRANSF BAY	ETA1845	132
COSMPP1B2	NO2 TRANSFORMER 132/66KV TRANSF BAY	ETA1843	132
COSMPP1B2	NO2 TRANSFORMER 132/66KV TRANSF BAY	ETA1844	132
COSMTP1C4	NO3 TRANS. 330/132/11KV & 330 BUS CONN.	ETA2519	330
COSMTP1C4	NO3 TRANS. 330/132/11KV & 330 BUS CONN.	ETA2517	330
COSMTP1C4	NO3 TRANS. 330/132/11KV & 330 BUS CONN.	ETA2518	330
NNSMRK1A1	NO1 330KV TRANSFORMER BAY	TG000549	132
NNSMRK1A1	NO1 330KV TRANSFORMER BAY	TG000547	132
NNSMRK1A1	NO1 330KV TRANSFORMER BAY	TG000548	132
NNSMRK1A1	NO1 330KV TRANSFORMER BAY	ETA3437	330
NNSMRK1A1	NO1 330KV TRANSFORMER BAY	ETA3435	330
NNSMRK1A1	NO1 330KV TRANSFORMER BAY	ETA3436	330
SWSBKH3A2	NO1 TRANSFORMER 220KV TRANSFORMER BAY	TG002845	22
SWSBKH3A2	NO1 TRANSFORMER 220KV TRANSFORMER BAY	TG002846	22
SWSBKH3A2	NO1 TRANSFORMER 220KV TRANSFORMER BAY	TG002847	22
SWSBKH3A2	NO1 TRANSFORMER 220KV TRANSFORMER BAY	ETA1060	220
SWSBKH3A2	NO1 TRANSFORMER 220KV TRANSFORMER BAY	ETA1058	220

Equipment Reference	Equipment Description	PIC Number	Voltage
SWSBKH3A2	NO1 TRANSFORMER 220KV TRANSFORMER BAY	ETA1059	220
SWSBKH3B2	NO2 TRANSFORMER 220KV TRANSFORMER BAY	TG002848	22
SWSBKH3B2	NO2 TRANSFORMER 220KV TRANSFORMER BAY	TG002849	22
SWSBKH3B2	NO2 TRANSFORMER 220KV TRANSFORMER BAY	TG002850	22
SWSBKH3B2	NO2 TRANSFORMER 220KV TRANSFORMER BAY	ETA1063	220
SWSBKH3B2	NO2 TRANSFORMER 220KV TRANSFORMER BAY	ETA1061	220
SWSBKH3B2	NO2 TRANSFORMER 220KV TRANSFORMER BAY	ETA1062	220
SWSBRG3D3	X5/3 BALRANALD 220KV REACTOR BAY	ETA1075	220
SWSBRG3D3	X5/3 BALRANALD 220KV REACTOR BAY	ETA1073	220
SWSBRG3D3	X5/3 BALRANALD 220KV REACTOR BAY	ETA1074	220
SWSDN22A2	NO1 TRANSFORMER 132KV TRANSFORMER BAY	ETA1105	132
SWSDN22A2	NO1 TRANSFORMER 132KV TRANSFORMER BAY	ETA1103	132
SWSDN22A2	NO1 TRANSFORMER 132KV TRANSFORMER BAY	ETA1104	132
SWSDN22A2	NO1 TRANSFORMER 132KV TRANSFORMER BAY	ETA1108	66
SWSDN22A2	NO1 TRANSFORMER 132KV TRANSFORMER BAY	ETA1106	66
SWSDN22A2	NO1 TRANSFORMER 132KV TRANSFORMER BAY	ETA1107	66
SWSDN22B2	NO2 TRANSFORMER 132KV TRANSFORMER BAY	ETA1111	132
SWSDN22B2	NO2 TRANSFORMER 132KV TRANSFORMER BAY	ETA1109	132
SWSDN22B2	NO2 TRANSFORMER 132KV TRANSFORMER BAY	ETA1110	132
SWSDN22B2	NO2 TRANSFORMER 132KV TRANSFORMER BAY	ETA1114	66
SWSDN22B2	NO2 TRANSFORMER 132KV TRANSFORMER BAY	ETA1112	66
SWSDN22B2	NO2 TRANSFORMER 132KV TRANSFORMER BAY	ETA1113	66
SWSDNT1A2	NO1 TRANSFORMER 330KV TRANSF BAY	ETA1078	330
SWSDNT1A2	NO1 TRANSFORMER 330KV TRANSF BAY	ETA1076	330
SWSDNT1A2	NO1 TRANSFORMER 330KV TRANSF BAY	ETA1077	330
SWSDNT1B2	NO2 TRANSFORMER 330KV TRANSF BAY	ETA1084	330
SWSDNT1B2	NO2 TRANSFORMER 330KV TRANSF BAY	ETA1082	330
SWSDNT1B2	NO2 TRANSFORMER 330KV TRANSF BAY	ETA1083	330

Equipment Reference	Equipment Description	PIC Number	Voltage
SWSDNT1B2	NO2 TRANSFORMER 330KV TRANSF BAY	ETA1087	132
SWSDNT1B2	NO2 TRANSFORMER 330KV TRANSF BAY	ETA1085	132
SWSDNT1B2	NO2 TRANSFORMER 330KV TRANSF BAY	ETA1086	132
SWSDNT1C2	NO3 TRANSFORMER 330KV TRANSF BAY	ETA1090	330
SWSDNT1C2	NO3 TRANSFORMER 330KV TRANSF BAY	ETA1088	330
SWSDNT1C2	NO3 TRANSFORMER 330KV TRANSF BAY	ETA1089	330
SWSDNT1C2	NO3 TRANSFORMER 330KV TRANSF BAY	ETA1093	220
SWSDNT1C2	NO3 TRANSFORMER 330KV TRANSF BAY	ETA1091	220
SWSDNT1C2	NO3 TRANSFORMER 330KV TRANSF BAY	ETA1092	220
SWSDNT1D2	NO4 TRANSFORMER 330KV TRANSF BAY	ETA1096	330
SWSDNT1D2	NO4 TRANSFORMER 330KV TRANSF BAY	ETA1094	330
SWSDNT1D2	NO4 TRANSFORMER 330KV TRANSF BAY	ETA1095	330
SWSDNT1D2	NO4 TRANSFORMER 330KV TRANSF BAY	ETA1099	220
SWSDNT1D2	NO4 TRANSFORMER 330KV TRANSF BAY	ETA1097	220
SWSDNT1D2	NO4 TRANSFORMER 330KV TRANSF BAY	ETA1098	220
SWSDNT3F	X5/1 220KV BALRANALD No.1 REACTOR BAY	ETA1102	220
SWSDNT3F	X5/1 220KV BALRANALD No.1 REACTOR BAY	ETA1100	220
SWSDNT3F	X5/1 220KV BALRANALD No.1 REACTOR BAY	ETA1101	220
SYSCA11A2	NO1 TRANSFORMER 330/132/11KV TRANSF BAY	TG002857	330
SYSCA11A2	NO1 TRANSFORMER 330/132/11KV TRANSF BAY	TG002863	330
SYSCA11A2	NO1 TRANSFORMER 330/132/11KV TRANSF BAY	TG002862	330
SYSCA11A2	NO1 TRANSFORMER 330/132/11KV TRANSF BAY	TG002864	132
SYSCA11A2	NO1 TRANSFORMER 330/132/11KV TRANSF BAY	TG002865	132
SYSCA11A2	NO1 TRANSFORMER 330/132/11KV TRANSF BAY	TG002866	132