DURBAN - BBC TERMINALS

Document Title:
SCOPE OF WORK

Project Title:
Provision of Services for Maintenance of Substations (Durban BBC)

REVISION 01: FOR QUOTATION

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1. Background

The High Voltage network within the Transnet Port Terminal`s Durban BBC Terminal is made up of 5x 11kV substations, 2x 6.6kV substations, 4x 6.6kV mini-substations and 3x 11kV mini-substations. The full Durban BBC High Voltage network is shown in Annexure B. Annual maintenance is required in the MV network and equipment.

2. Proposed solution

In the terminal, a service provider is required to carry out full maintenance on the substations and the miniature substations. The appointed service provider should:

i. Perform complete routine maintenance on the substations and mini substations as according to Clause 3 in the following areas:

ii. Provide a maintenance report, inclusive but not restricted to the following:
- Maintenance procedures carried out,
- Relay Testing report
- Transformer oil sample analysis
- All findings and conclusions and/or,
- Further recommendations

3. Engineering work to be provided

The following should be carried out. The maintenance should include (but not be limited to) the listed items below:

3.1. Substations and Miniature substations:

3.1.1. MV Switchgear

3.1.1.1. MV The appointed service provider is to conduct full maintenance and testing on all the medium voltage circuit breakers and link switches. Incomers and feeders. Ensure correct operation of the switchgear units, ancillary apparatus, electrical and mechanical tripping mechanism before it being returned to service.

3.1.2. Protection Relays

3.1.2.1. The service provider is to conduct relay testing ensuring all relays operate by conducting tests such as injection testing using the appropriate software and hardware (relay details to be requested during site meeting)

3.1.2.2. The supplier is required to submit a report of the relay testing conducted.

3.1.2.3. Available relay specifications are detailed in the Annexure A

3.1.3. Distribution Transformers (Oil and Dry Type)

3.1.3.1. Transformer oil if found low, should be topped up with new oil and an oil sample should be taken for testing and results returned for further recommendations. The silica gel needs to be replaced and all abnormalities such as minor oil leaks to be repaired and where not possible to be reported and recommended for further repairs.

Transformer protection devices such as Buchholz relays and temperature relays to be tested for operation. Check corona on the MV cable terminations.

3.1.3.2. Cleaning and torquing of transformer bushings, terminals, gasket joints and oil valves. Torquing of all loose bolts with impact wrench. Megger test the transformer windings and record all values. Perform induced over voltage, winding resistance, ratio, vector group verification, transformer losses, partial discharge tests, and Tan Delta testing for dryness of winding and bushing. Replace silica gel air drier and check the condition of drying agent and replace if necessary. Check and record transformer tap changer settings, etc.

3.1.3.3. As an addition to the above, for the dry type transformers, look for rust on the clamps and core steel, carbonization or tracking on the windings and insulation. Check for discoloration on surfaces, and loose connections. Clean the transformer preferably using a vacuum. Tighten any hardware components that appear to be loose, if possible.

3.1.4. Busbars and Busbar chamber

3.1.4.1. Isolate and open busbar chamber, check for any moisture, tighten all loose connections and pressure test above rated operational voltage. Clean all contacts, lubricate, and clean all switchgear shutters and ensure they operate up and down.

3.1.4.2. Internals and externals of the MV switchgear, LV switchgear and remote switching panels are to be thoroughly cleaned of dust and any residue.

3.1.5. Battery Charger Unit

3.1.5.1. Clean and maintain battery charger unit. Test charger for operation. Maintain and lubricate all battery terminals. Replace all dead batteries with new. (TPT to free-issue new Lead-Acid batteries)

3.1.5.2. For Nickel Cadmium battery cells, the supplier is required to conduct maintenance on the battery pack as follows:

3.1.5.3. Check all voltages on the battery charger

3.1.5.4. Test functionality of protective switches

3.1.5.5. Clean the battery charger panel and internals

3.1.5.6. Clean and wipe all battery cells and terminals.

3.1.5.7. Refill any cells with low battery dielectric

3.1.5.8. Lubricate the battery terminals

3.1.5.9. Test the operation of battery charger and record all findings

3.1.6. Earthing

3.1.6.1. Inspect for the continuity of all earthing connections and ensure that the system is grounded as required. Test that resistance to ground of the earth connection and record the values for all test points.

3.1.7. Low Voltage Panels

3.1.7.1. Conduct maintenance on the low voltage panel. Open and maintain all low voltage incomer and bus-coupler circuit breakers.

3.1.7.2. Open, check and clean internals of the busbar chambers.

3.1.8. Substation Lighting

3.1.8.1. All lights in the substation should be tested for operation. Any and all defective lights to be replaced by the supplier. (TPT to free issue light fittings)

3.1.9. All substation Rooms

3.1.9.1. Sweep and wipe all substation internal floors and walls

3.1.9.2. Replace all ventilation filters

3.1.9.3. Clean, lubricate and repair all substation doors

3.1.9.4. Clean and remove foreign objects in cable trenches (Dust affects smoke detectors installed in cable trenches)

3.1.10. 11kV Slip ring Panels and Junction Panels

3.1.10.1. Slip ring panels and 11kV junction panels are to be inspected, cleaned and maintained. Insulation testing is to be done upon completion of the cleaning at the correct test voltage. Any failed components or components showing potential failure are to be identified and communicated with TPT.

(such components are to be replaced by the supplier should TPT free-issue the replacement components)

3.2. Conducting the work

3.2.1. Work is to be done on site and any work that is required off-site will be to the service providers cost and should be communicated timeously with TPT.

3.2.2. Work should be planned in a manner to avoid any disruptions to operations and in event of disruptions communication should be made timeously with TPT representatives.

3.2.3. Once commenced work should be conducted in weekdays, weekends and public holidays. No breaks should be take for any of the above in order to minimise outage time.

NB: All engineering work done within Transnet substations should be under the supervision of an A-Brown approved Transnet employee where relevant work and safety permits have been issued.

4. Safety

The following safety procedures together with the terminal standard operating conditions are to be adhered to at all times. No exceptions will be tolerated.

i. Before gaining work permits, suppliers will be required to submit a safety file to be reviewed and upon approval, induction will be attended.
ii. All Technical personnel to be kitted with the appropriate personal protective equipment and to be kept clean all the time.
iii. Vehicles used for breakdowns to be fitted with rotating flashing light and proper company signage.
iv. All Technical personnel that are required to operate equipment must be certified to do so.
v. Mess and ablution facilities provided and must be kept cleaned at all times.
vi. All discipline irregularities will not be condoned. Offenders will be requested to leave the terminal immediately pending a full investigation.
vii. Notification of arrival will be mandatory.
viii. All work done within Transnet substations should be done under the supervision of an A-Brown qualified Transnet employee where relevant work and safety permits are issued by "CONTROL".

5. Operating hours

TPT terminals operate 24 hours a day. The infrastructure maintenance team mainly works day shift (06h45 – 15h15) and all work should be done during this period. Any work requiring irregular hours should be communicated with the supervisor.

Annexure A

Reefer Minisub and Terminal Minisub:

Transformer Details:

S - 1000kVA	Phases - 3
Impedance voltage – 5.45%	Frequency - 50Hz
Cooling - O.N.A.N.	Gross Mass ≈ 2920kg
Oil Capacity - 740 kg	Year of Man. - 2012
LVS Voltage – 400 V	LVS Amps – 1375 A
HVS Voltage – 11000 V	HVS Amps – 52.43 A

HV Switchgear:

ABB	11kV; Safe Ring Type C; SF6 Gas insulated RMU

Main LV Breaker:

ABB	SACE Tmax Moulded Case Circuit breaker

5 Jenkyn Substation

HV Panels and Switchgear:

Schneider Electric	NEX 11kV; 1x Incomer, 2x Feeders

Apriport Main Substation and Silo Substation

HV Panels and Switchgear:

Schneider Electric	8x Feeders, 1x Incomer; NEX 11kV, 1250A; Fault Level: 25kA
	Switchgear: M&G Evolis 630A and 1250A
Actom	Protection Relays: Arqtec F213B and F213D

Transformer 1 and 2 Details:

S - 2000kVA	Phases - 3
Impedance 6.96–7.02%	Frequency - 50Hz
Cooling - O.N.A.N.	Gross Mass ≈ 4860kg
Oil Capacity 912–1028 liters	Year of Man. - 2018
LVS Voltage – 400 V	LVS Amps – 2887 A
HVS Voltage – 11000 V	HVS Amps – 104.97 A

2x Ship Unloader Substations

Transformer Details:

S - 800kVA	Phases - 3
Dry Type Transformer	Frequency - 50Hz
Cooling - AN	Gross Mass ≈ 2080kg
LVS Voltage – 400 V	LVS Amps – 1154.7 A

HVS Voltage – 11000 V	HVS Amps – 41.99 A

HV Panels and Switchgear:

Schneider Electric	11kV; SM6 24kV AMT, 1x Link Switch, 1x Fused Switch

Ship-loader Minisub

Transformer Details:

S - 400kVA	Phases - 3
Impedance voltage – 4.5%	Frequency - 50Hz
Cooling - O.N.A.N.	Gross Mass ≈ 3400kg
Oil Capacity - 363 kg	Year of Man. - 2002
LVS Voltage – 400 V	LVS Amps – 577.35 A
HVS Voltage – 11000 V	HVS Amps – 20.99 A

HV Switchgear:

Schneider Electric	11kV; Merlin Gerin, RM6 Ring Main Unit

Sun Silo Substation

HV Panels and Switchgear:

Schneider Electric	1x Transformer feeder; NEX 11kV, 1250A; Fault Level: 25kA
	Switchgear: M&G Evolis 630A
Actom	Protection Relay: Arqtec F213B

Transformer Details:

kVA	1000 kVA
VOLTS	11000/400 V
Amperes	53/1443 A
Phases	3
Vector Symbols	Dyn 11
Type of Cooling	ONAN
Frequency	50Hz
Impedance Volts	4.51%
Core and Windings	1730 kg
Total Mass	3450 kg
Oil Quantity	930 liters
Year of Manuf.	1984

MPT Substation:

HV switchgear

Alstom	Type number: SBV4/800/25/SI 12KV, 800A, 50Hz

Transformer details:

KVA:1250	Phase: 3
H.V volts: 11000	Amperes: 65,60
H.V volts: 6600	Amperes: 109.35
L.V volts: 400	Amperes: 1804
Frequency: 50Hz	Impendence: 6,36%
Cooling: ONAN	Oil: 1106 litre

Rail Substation:

HV switchgear

GEC ALSTHOM	Type number: SBV 4/800/20-SI 12KV,800A, 50Hz

Transformer details:

KVA: 800	Phase: 3
H.V: 11000 / 6600	L.V: 400
Impendence: 4,89%	Frequency: 50Hz
Cooling: ONAN	Oil: 1184 litre
Core windings: 1549kg	

Annexure B

Durban BBC HV Network: