SCHEDULE A-D- TRANSFORMERS

Summary & Main System Parameters

Site and substation condition	400/132/33 kV AAWDCP (MAIN SS) substation
	New SS
Substation type	GIS
Site Altitude (m a.s.l.)	≤1000
Minimum ambient temperature (°C)	-10
Design temperature	
Outdoor	50 (°C)
Indoor	40 (°C)
Highest average daily temperature (°C)	38
Relative humidity (%)	4÷100
The climate –day	Dry & Hot
The climate – night	Cold
Pollution level	Heavy airborne contamination
Insulator creepage distance (mm/kV)	38
Wind velocity (m/s)	50
Ice loading, radial thickness (mm)	10
Isoceraunic level (days/annum)	15
Average annual rainfall (cm)	cca. 23
Seismic Conditions	Zone 2B
Solar radiation (W/m2)	1150
Short circuit rating	
400 kV switchgear	40 / 1 sec.
132 kV switchgear	40 / 3 sec.
33 kV switchgear	31.5 / 3 sec.
11 KV side	40 kA / 1 sec.
BUSBAR current rating (A)	
400 kV switchgear	3150
132 kV switchgear	3150
33 kV switchgear	2500
11 KV side	3150

- All outdoor equipment must be suitable for live washing.
- The insulator outdoor creepage distance should be based on 420 kV for 400 kV, 145kV for 132kV, 36kV for 33kV and 12kV for 11 kV.

DEFINITE SCOPE OF WORK OF TRANSFORMERs

AAWDCP 400/132/33KV SUBSTATION			
Auto-transformer, power transformer, earthing transformer and shunt reactor			
List No.	**Name of Goods**	**Brief Description**	**Quantity**
D1	132/33 KV 80 MVA TRANSFORMERS		
D1.1	**Main Transformer**	Three-phase, two-winding, oil immersed main transformer, for outdoor installation with rated output of 54/80 MVA for ONAN/ONAF type of cooling, rated transformation ratio of 132/33 kV with on-load tap changer on HV side (+3×1.67%/-9×1.67%), vector group YNd1, all in accordance with IEC 60076. **132kV line terminals shall be inside cable box (oil insulated), provided on HV side of transformer, suitable for transformer cable termination connection, in accordance with IEC 62271-209 and EN 50299.** **33kV line terminals shall be inside cable box (air insulated) provided on LV side of transformer, suitable for connection of 33kV cables for SWG and Earthing transformer**. **Neutral terminal shall be at air bushing suitable for overhead conductor connection.**	4 sets
D1.2	**Main Transformer Remote Tap-Changer Control Panel**	Remote Tap-Changer Control (RTCC) Panel for control of main transformer On-Load Tap-Changer (OLTC), completely wired, with voltage regulator, instruments, control switches, relays and other auxiliary devices, for indoor installation with IP41 degree of mechanical protection.	4 sets
D1.3	**Earthing & Auxiliary Power Supply Transformer**	Three-phase, two-winding, oil immersed earthing and auxiliary power supply transformer for outdoor installation, with HV winding designed for rated output of min. 200 kVA for ONAN type of cooling (The rated ETR according to actual SS load), rated transformation ratio of 33/0,4 kV with off-load tap changer on HV side (±2×2.5%), vector group ZNyn11, all in accordance with IEC 60076-6. **33kV line terminals shall be inside cable box (air insulated) provided on HV side of earthing transformer, suitable for 33kV cable connection.** **33kV neutral terminal shall be air bushing type, suitable for outdoor overhead conductor connection.**	4 sets

AAWDCP 400/132/33KV SUBSTATION			
Auto-transformer, power transformer, earthing transformer and shunt reactor			
List No.	**Name of Goods**	**Brief Description**	**Quantity**
D2	132/33 KV 63 MVA TRANSFORMERS		
D2.1	**Main Transformer**	Three-phase, two-winding, oil immersed main transformer, for outdoor installation with rated output of 43/63 MVA for ONAN/ONAF type of cooling, rated transformation ratio of 132/33 kV with on-load tap changer on HV side (+3×1.67%/-9×1.67%), vector group YNd1, all in accordance with IEC 60076. **132kV line terminals shall be inside cable box (oil insulated), provided on HV side of transformer, suitable for transformer cable termination connection, in accordance with IEC 62271-209 and EN 50299.** **33kV line terminals shall be inside cable box (air insulated) provided on LV side of transformer, suitable for connection of 33kV cables for SWG and Earthing transformer**. **Neutral terminal shall be at air bushing suitable for overhead conductor connection.**	3 sets
D2.2	**Main Transformer Remote Tap-Changer Control Panel**	Remote Tap-Changer Control (RTCC) Panel for control of main transformer On-Load Tap-Changer (OLTC), completely wired, with voltage regulator, instruments, control switches, relays and other auxiliary devices, for indoor installation with IP41 degree of mechanical protection.	3 sets
D2.3	**Earthing & Auxiliary Power Supply Transformer**	Three-phase, two-winding, oil immersed earthing and auxiliary power supply transformer for outdoor installation, with HV winding designed for rated output of min. 200 kVA for ONAN type of cooling (The rated ETR according to actual SS load), rated transformation ratio of 33/0,4 kV with off-load tap changer on HV side (±2×2.5%), vector group ZNyn11, all in accordance with IEC 60076-6. **33kV line terminals shall be inside cable box (air insulated) provided on HV side of earthing transformer, suitable for 33kV cable connection.** **33kV neutral terminal shall be air bushing type, suitable for outdoor overhead conductor connection.**	3 sets

<table>
<tr><th colspan="4">AAWDCP 400/132/33KV SUBSTATION</th></tr>
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<tr><td>D3</td><td colspan="3">Three Phase 33KV Shunt Reactor</td></tr>
<tr><td>D3.1</td><td>Three Phase Shunt Reactor</td><td>Three-phase, single-winding, oil immersed shunt reactor, for outdoor installation with rated output of 25 MVAr at rated voltage 33 kV for ONAN type of cooling, all in accordance with IEC 60076-6.
Reactor 33kV line terminals shall be inside cable box (air insulated), suitable for 33kV cable connection.
Reactor 33kV neutral terminal shall be air bushing type.</td><td>2 sets</td></tr>
<tr><td>D4</td><td colspan="3">400/132/33 KV 400 MVA AUTO-TRANSFORMERS</td></tr>
<tr><td>D4.1</td><td>Main Auto-transformer</td><td>Three-phase, oil immersed autotransformer, for outdoor installation with rated output as follow:
<table><tr><td></td><td>Rated power</td><td>type of cooling</td></tr><tr><td>HV terminal</td><td>240/320/400 MVA</td><td>ONAN/ONAF/OFAF</td></tr><tr><td>LV terminal</td><td>240/320/400 MVA</td><td>ONAN/ONAF/OFAF</td></tr><tr><td>TV terminal</td><td>60/80/100 MVA</td><td>ONAN/ONAF/OFAF</td></tr></table>FOR rated transformation ratio of 400/138.6/33 kV with on-load tap changer on the common winding (+9×1.59%/-9×1.59%), STEP SIZE 2.2 kV and number of steps 19 with vector group YNa0d1, all in accordance with IEC 60076.
The 400 kV transformer terminals shall be connected directly to the GIS bay through suitable SF_6/oil transformer bushings, in accordance with the latest applicable editions of IEC 62271-211, IEC 60137 and IEC 60076.
132kV line terminals shall be inside cable box (oil insulated), provided on LV side of transformer, suitable for transformer cable termination connection, in accordance with IEC 62271-209 and EN 50299.
33kV line terminals shall be inside cable box (air insulated) provided on TV side of transformer, suitable for connection of 33kV cables for 33 kV SWG and Earthing transformer.</td><td>2 sets</td></tr>
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AAWDCP 400/132/33KV SUBSTATION			
Auto-transformer, power transformer, earthing transformer and shunt reactor			
List No.	**Name of Goods**	**Brief Description**	**Quantity**
		Neutral terminal shall be at air bushing suitable for overhead conductor connection.	
D4.2	**Main Auto-Transformer Remote Tap-Changer Control Panel**	Remote Tap-Changer Control (RTCC) Panel for control of main transformer On-Load Tap-Changer (OLTC), completely wired, with voltage regulator, instruments, control switches, relays and other auxiliary devices, for indoor installation with IP41 degree of mechanical protection.	2 sets
D4.3	**Earthing & Auxiliary Power Supply Transformer**	Three-phase, two-winding, oil immersed earthing and auxiliary power supply transformer for outdoor installation, with HV winding designed for rated output of min. 500 kVA for ONAN type of cooling (The rated ETR according to actual SS load), rated transformation ratio of 33/0,4 kV with off-load tap changer on HV side (±2×2.5%), vector group ZNyn11, all in accordance with IEC 60076-6. **33kV line terminals shall be inside cable box (air insulated) provided on HV side of earthing transformer, suitable for 33kV cable connection.** **33kV neutral terminal shall be air bushing type, suitable for outdoor overhead conductor connection.**	2 sets