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5. Members of Auditing Team:

Sl.No.	Name	Designation	Organization	Signature
1.	Rajib Das	AE	NERPC	
2.	Devaprasad Paul	ch. Mgr	Powergrid	
3.	Ashim Kumar Nath	Engineer	NERLDC	

6. Representatives of the Sub-station/Generating Station assisting the auditing team:

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Observations/Recommendations:

Sl.No.	Parameters	Yes/NO	Remarks
1	Whether redundant supply for station auxiliaries is available?	Yes	
2	Whether SCADA system is present?	Yes.	
3	Whether SAS has been implemented? If no, whether panels are SAS compliant?	Yes	
4	Whether protection relays for transformers/ICTs/reactors are operational?	Yes	
5	Whether reliability by way of Bus-Bar scheme is present in 132kV station?	No	
6	Whether Double Main Arrangement is present in 220kV Station? If yes, whether operational or not?	NA	
7	Whether Bus Bar Protection is available for the 220kV and above station?	NA	
8	Whether protection relays for emanating lines are operational?	Yes	
9	Whether time synchronisation facility is available in the Sub-station?	Yes	
10	Whether existing RTUs are healthy and reporting?	Yes	
11	Whether existing communication via PLCC or OPGW? If PLCC then healthiness of PLCC panels	Yes	Available only in HLKND

12	In case of OPGW connectivity to the station, whether end equipments are available and functional?	NA	
13	Whether all analog/digital points are reporting in local SCADA?	Yes	
14	Healthiness of Protection coupler/Coupling device?	Yes	HLKD - Av.
15	Whether sufficient lighting is available in the switchyard?	g	To be improved
16	DC Supply- Whether two DC sources are available?	No	
17	Earthing System in the switchyard: Whether as per IS?	Partial	
18	List of diagnostic tools, testing equipments etc. and whether are present in sufficient quantity?	Partial	To be provided.
19	Whether firefighting provision is available in the station?	No	
20	Whether Protection Audit has ever been carried out before? If yes then compliance status of Audit Observations/Recommendations	Yes	
21	Whether all relay settings have been submitted in PDMS? If no, then compliance status	No	
22	Whether CTs, PTs/CVTs of sufficient accuracy is present in the station?	Yes.	

Any other specific observations/recommendations:

- 1) 3.5x 3MVA - SF₆ Loss observed. To be checked & charged.
- 2) 2nd Battery bank to be maintained (110V)
- 3) AMF Panel to be made healthy.
- 4) LTAC panel to be installed properly.
- 5) DC ~~EFF~~ source 1 - -60V, +61.
- 6) AC to be installed in Battery room.
- 7) Shed to be provided in DG set.
- 8) Store to be demarcated.
- 9) Spare & scrap material to be identified & stored properly.

- 10) Bay marking & ph marking to be done.
- 11) FFP to be adopted.
- 12) AC change over Switch to be installed.
- 13) Earthing to be connected for all equipment.
- 14) Cable trench to be repaired.
- 15) Separate Earthing for each LA to be maintained.
- 16) ~~EFF relay to be installed in 110V system~~
- 17) Adequate TLP to be provided.
- 18) Phase wise WT to be installed.
- 19) System Architecture to be corrected. Some relays are ~~not~~ not reporting.
- 20) WT & OT status not reporting.
- 21) CB status to be provided in DR.
- 22) LBB protection to be enabled for all feeders etc.
- 23) POMS format to be Submitted.

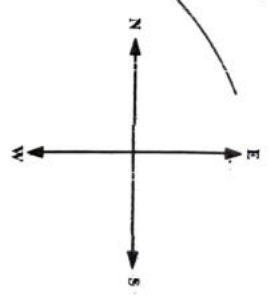
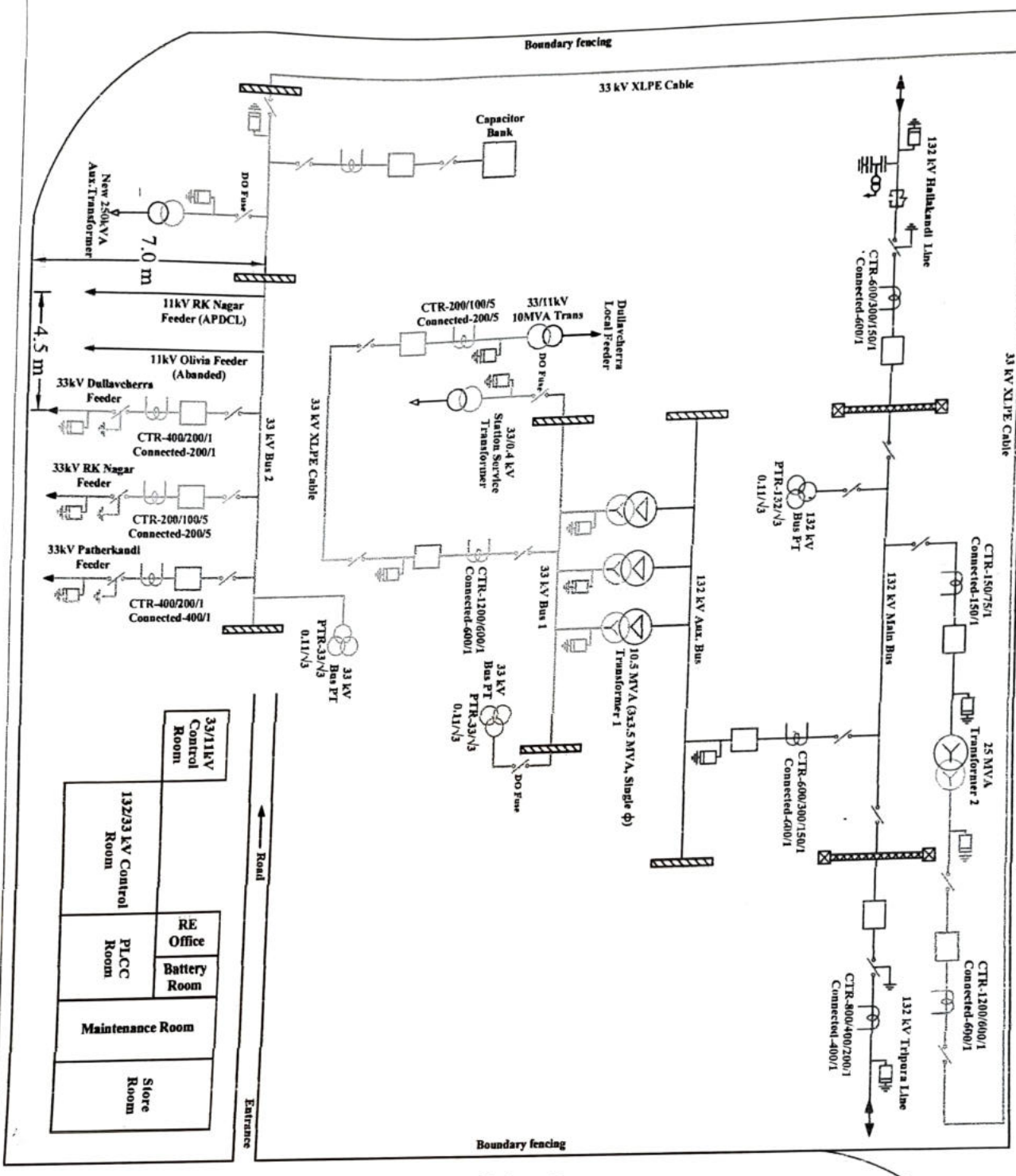
for Dullaucherra GSS

1. Dilbar (Dilbar Hussain Laskar)
20/11/21
2. Dutta (Arunabha Dutta)
20/11/21

for Audit team

1. Rajib (Rajib Das)
20/11/21
2. Dev (Devaprasad Paul)
20/11/21
3. Ashim Kumar Das (Ashim)
20/11/21

SINGLE LINE DIAGRAM OF 132KV GRID SUBSTATION, AEGCL, DULLAVCHERRA



EXISTING LEGENDS	
	Circuit Breaker
	Isolator
	Isolator with Earthswitch
	Lightning Arrestor
	Transformer
	Potential Transformer
	Current Transformer
	CVT
	Wave Trap
Colour Code	
	132 kV
	33 kV

132/33kV Dullavcheru Substation

Sl No	Recommendation during Protection Audit 2013	Status as on 06-08-18 (Attended/Not Attended).	If not attended, please mention target date of completion.
1	MT switching scheme may be implemented	Not attended	
2	Old SF6 type CBs may be replaced, if required.	Attended: 2 Nos of 132 kV SFG CB replaced and 2 Nos of 33kV SFG CB replaced under PSDF scheme & 1 Nos not installed due to defective of CB	
3	The old gapped type SA, if exists, need to be replaced by heavy duty station class, gapless type surge arrester of suitable rating. The healthiness of old Gapless Surge Arrester need to be ensured, and may be replaced, if required.	Attended: 2 Nos of 132 kV Line LA replaced and 2 Nos of 33 kV LA (against transformer) replaced ✓	
4	No. of CT cores are not adequate. CT accuracy class is not as per CEA's regulations, CT ratio is not suitable for bus bar protection. CTs of suitable ratios (if bus bar protection is to be provided) and accuracy class need to be provided. The healthiness of old CTs need to be ensured and may be replaced, if required.	Attended: 1 Nos of 132kV line CT & 1 Nos of 132 kV transformer CT replaced ✓	
5	PT/CVTs accuracy class is not as per CEA regulation. PT/CVTs of suitable accuracy class need to be provided. The healthiness of old PT/CVTs need to be ensured and may be replaced, if required.	Not attended	Will be commissioned very soon
6	Two sets of batteries (110V) with associated chargers for station DC supply and two sets of batteries (48V) with associated for reliable communication system shall be in place as per CEA's regulations.	Attended: 1 sets of 110 V battery & 1 set of 48V battery bank and chargers are available	
7	DG set of suitable capacity may be provided.	Not attended	Will be implemented in near future
8	The bus PT/CVT is being used for both protection and metering of transformer and lines. Dedicated line CVT may be used for distance protection	Attended: New 132 kV PT installed against 132 kV main bus	CVT not yet installed
9	Protection scheme as per CEA's regulations need to be provided for lines, ICT, EM/static relays to be replaced by Numerical relays complying to IEC 61850 protocol. DR, EL and TSE need to be provided. BC&PU and SAS may be provided. Telecommunication link may be established for communication and protection	Not attended	PLCC system are not available and new SAS panel will be commissioned very soon
10	Required FF provision has to be made as per CEA's regulations.	Not attended	
11	Earthing system needs improvement	Partially attended	Will be implemented in near future
12	The modern diagnostic tools including relay test kit need to be procured to assess healthiness of transmission line and various substation equipment/material including protective relays, Minimum diagnostic tools are to be provided as per CEA's regulations.	Not attended	New tool kit will be supplied very soon
13	Old Substation renovation required	Not attended	Yes renovation required

14A. PERIODICITY OF MAINTENANCE OF SUBSTATION EQUIPMENT / TRANSMISSION LINE COMPONENTS/ELEMENTS

Sl. No.	Equipment	Tests being conducted	Periodicity of Tests being conducted (Put "Y" under appropriate column)				
			3 months	6 months	1 year	> 1 year	No test is being done
1	Transformer / Reactor	Winding resistance measurement			Y		
		Voltage Ratio test for transformer			Y		
		Magnetising current test			Y		
		Magnetic balance test			Y		
		Insulation Resistance (IR) Measurement		Y			
		Polarisation Index (PI)			Y		
		Capacitance & Tandelata Measurement for				Y	
		(a) Winding				Y	
		(b) Bushing				Y	
		Break Down Voltage (BDV) Test for oil		Y			
		Dissolved Gas Analysis (DGA)			Y		
		Sweep Frequency Response Analysis (SFRA)			Y		
		Partial Discharge (PD) Measurement			Y		
		Degree of Polymerisation (DP) for cellulose insulation					
		Furan Analysis					
		Vibration Measurement for reactors					
		Check of various earthing connections		Y			
		Any other test (Please mention)					
2	Circuit Breaker (CB)	Static Contact Resistance Measurement			Y		
		Dynamic Contact Resistance Measurement (DCRM)					
		Operating timing of CB (Opening Time, Closing time, CO)			Y		
		Operating timing of Pre Insertion Resistor (Pre-insertion time)					
		Capacitance & Tandelata measurement for Grading capacitors				Y	
		Healthiness of Trip Coil (TC) & Closing Coil (CC)		Y			
		Healthiness of Operating Mechanism		Y			
		Dew point measurement of SF6 gas			Y		
		Check of various earthing connections		Y			
		Any other test (Please mention)					
3	Isolator / Disconnectors	Static Contact Resistance Measurement					Y
		Healthiness of Operating Mechanism		Y			
		Checking of Interlocks with CB, Earthing switches etc.					
		Check of various earthing connections		Y			
		Any other test (Please mention)					
4	Current Transformer (CT)	Capacitance & Tandelata Measurement			Y		
		Insulation Resistance (IR) Measurement			Y		
	Current Transformer (CT)	Measurement of secondary winding resistance			Y		
		Partial Discharge (PD) measurement					
		Check of various earthing connections		Y			
		Any other test (Please mention)					

14A.PERIODICITY OF MAINTENANCE OF SUBSTATION EQUIPMENT / TRANSMISSION LINE COMPONENTS/ELEMENTS

5	Potential Transformer (PT)	Capacitance & Tandelta Measurement			Y		
		Insulation Resistance (IR) Measurement			Y		
		Partial Discharge (PD) measurement					
		Check of various earthing connections		Y			
		Any other test (Please mention)					
6	Capacitive Voltage Transformer (CVT)	Capacitance & Tandelta Measurement			Y		
		Insulation Resistance (IR) Measurement			Y		
		Secondary Voltage Measurement					
		Partial Discharge (PD) measurement					
		Check of various earthing connections		Y			
		Any other test (Please mention)					
7	Surge Arrester (SA)	3rd Harmonic Leakage Current Measurement					Y
		Capacitance Measurement				Y	
		Insulation Resistance (IR) Measurement			Y		
		Check of various earthing connections		Y			
		Any other test (Please mention)					
8	Relays	Functional tests of each Protection relay			Y		
		Operating timings			Y		
		Testing of DR/EL with TSE					
9	PLCC system	Checking of PLCC system				Y	
10	Battery	Measurement of specific gravity of electrolyte (for flooded battery)					
		Topping of battery using Demineralized / Distilled water (for flooded battery)					
		Open Circuit Voltage of Cells Tests	Y				
		Capacity test				Y	
		Checking of earth fault due to leakage (for flooded battery)					
11	Earthing	Resistance of Earth mat		Y			
12	Hot Spot	Infrared scanning					
		(a) Inside switch yard / substation (for clamps , connectors etc.)	Y				
		(b) Transmission lines (Clamps, connectors, Jumpers etc.)		Y			
13	Insulator	Punnncture Insulator Detection					
		Cleaning of Porcelain / Glass insulators					
		(a) Normal washing			Y		
		(b) Hotline washing					
14	Tower	Tower footing resistance measurement		Y			

14A. PERIODICITY OF MAINTENANCE OF SUBSTATION EQUIPMENT / TRANSMISSION LINE COMPONENTS/ELEMENTS

5	Potential Transformer (PT)	Capacitance & Tandelta Measurement			Y		
		Insulation Resistance (IR) Measurement			Y		
		Partial Discharge (PD) measurement		Y			
		Check of various earthing connections					
		Any other test (Please mention)					
6	Capacitive Voltage Transformer (CVT)	Capacitance & Tandelta Measurement			Y		
		Insulation Resistance (IR) Measurement			Y		
		Secondary Voltage Measurement					
		Partial Discharge (PD) measurement					
		Check of various earthing connections		Y			
		Any other test (Please mention)					
7	Surge Arrester (SA)	3rd Harmonic Leakage Current Measurement					Y
		Capacitance Measurement				Y	
		Insulation Resistance (IR) Measurement			Y		
		Check of various earthing connections		Y			
		Any other test (Please mention)					
8	Relays	Functional tests of each Protection relay			Y		
		Operating timings			Y		
		Testing of DR/EL with TSE					
9	PLCC system	Checking of PLCC system				Y	
10	Battery	Measurement of specific gravity of electrolyte (for flooded battery)					
		Topping of battery using Demineralized / Distilled water (for flooded battery)					
		Open Circuit Voltage of Cells Tests	Y				
		Capacity test				Y	
		Checking of earth fault due to leakage (for flooded battery)					
11	Earthing	Resistance of Earth mat		Y			
12	Hot Spot	Infrared scanning					
		(a) Inside switch yard / substation (for clamps, connectors etc.)	Y				
		(b) Transmission lines (Clamps, connectors, Jumpers etc.)		Y			
13	Insulator	Punnture Insulator Detection					
		Cleaning of Porcelain / Glass insulators					
		(a) Normal washing			Y		
		(b) Hotline washing					
14	Tower	Tower footing resistance measurement		Y			

Sl. No.	DIAGNOSTIC TOOLS	Avail-ability	If Yes (i.e. if Available)	
		(Y/N)	Make	Model
1	Winding resistance meter			
2	Transformer Voltage Ratio test meter	N		
3	Insulation Resistance (IR) tester	N		
	(a) 5 kV			
	(b) 10 kV	Y	WACO	
4	Capacitance & Tandelta Measurement Instrument	N		MANUAL
	(a) Automatic		-	-
	(b) Manual	N	-	-
		N		
5	Break Down Voltage (BDV) Test kit for oil	Y	Udeyraj Electricals Pvt. Ltd. Mumbai -	US-7
6	Dissolved Gas Analyser	N		
7	Sweep Frequency Response Analysis(SFRA) test kit	N		
8	Partial Discharge (PD) Measuring Instrument	N		
9	CB operational Analyser		-	-
10	DCRM test kit		-	-
11	SF6 Gas leakage detector	N		
12	Dew point measuring instrument	N		
		N		
13	SF6 Gas Hanndling Plant (for Evacuation, filling, filtering of gas)	Y	ABB	A823/2K
14	Static Contact Resistance Measuring instrument	N		
15	Leakage Current Meter (LCM)	N		
16	Earth Tester	N		
17	Automatic Realy test kit	N		
18	Thermovision camera for detection of hot spots	Y	Fluke Corporation Everett, WA USA	TiX580
19	Thermal Scanner (for Transformer / Reactor)	N		
20	Transmission line Response Analyser	N		
21	Punncture Insulator Detector (PID)	N	-	-
22	On line Partial Discharge (PD) monitoring of GIS	N	-	-
	If Yes	N	-	-
	(a) Using Ultra High Frequency (UHF) technique	N	-	-
	(b) Using Acoustic technique	N	-	-
22	Any On line diagnostic tools	N		
	If Yes, List the instruments	N		
	(a)			
	(b)			
	(c)			

14C. VARIOUS PROVISION IN SUBSTATION / SWITCHYARD

No.	VARIOUS PROVISION	Availability
		(Y/N)
1	Soak Pit for transformer / reactors of 10MVA and above rating or with oil capacity more than 2000ltrs	N
2	Oil Collecting pit for transformer / reactors	N
3	CO2 and sand buckets	Y
4	Foam type fire extinguisher	N
5	Portable type fire extinguisher	Y
6	Hydrant Type	N
7	High Velocity Water Spray (HVWS) System	N
8	Nitrogen Injection Based Fire Protection System (NIFPS)	N
9	Both HVWS system & NIFPS	N
10	Fire Fighting wall between Transformers (if distance between transformers < 15m)	N
11	Direct Lightning Protection	
	(a) Using Over Head Ground Wire(OHGW)	Y
	(b) Using Spikes	N
	(c) Using Lightning Masts(LMs)	N
	(d) Combination of OHGW + LM	N
	(e)Combination of OHGW + Spikes	N
12	Condition of Earthing System	
	(a) Gravels Spread ove Pre-Stressed Concrete (PCC)	Y
	(b) Only Gravels	
	(c) Gravels are visible	Y
	(d) Gravels coverd with grass / soil	N
13	Operation of On Load Tap Changer (OLTC)	
	(a) As and when required	Y
	(b) Never operated	N
14	Operation of Off Load Tap Changer	
	(a) As and when required	
	(b) Never operated	
15	DG Set	Y
	If Yes, Rating (Nos., Voltage level, KVA capacity)	Y(1, 415V, 100KVA)