



सत्यमेव जयते

220 केवी और उससे अधिक वोल्टेज वर्ग सबस्टेशन उपकरणों की विफलता पर
विशेषज्ञों की स्थायी समिति की रिपोर्ट
(जनवरी 2022 - जून 2023)
(भाग-II)

REPORT OF STANDING COMMITTEE OF EXPERTS ON FAILURE OF 220 kV &
ABOVE VOLTAGE CLASS SUBSTATION EQUIPMENT
(JANUARY 2022 - JUNE 2023)
(Part-II)



GOVERNMENT OF INDIA
MINISTRY OF POWER
CENTRAL ELECTRICITY AUTHORITY

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(In fulfilment of CEA's obligation under Section 73(1) of the Electricity Act, 2003)



Table of Contents

Title	Pages
Introduction	1
Brief details of the failure of substation equipment failed between 1 st January 2022 and 30 th June 2023 as reported to CEA	1
Observations	15
Recommendations	16
Annexure-I Detailed information of all failed equipment reported to CEA between 1 st January 2022 and 30 th June 2023	22
Annexure-II Format for report of failure of the CT/CVT/PT/CB/SA etc. substation equipment	281
Annexure-III Office order constituting the Standing Committee	284
Annexure-IV Minutes of the meeting of the Standing Committee of Experts to investigate the failure of 220 kV and above voltage class Substation equipment held on 21.11.2023 and 22.11.2023 in CEA	287

EXECUTIVE SUMMARY

As per mandate of Standing Committee to investigate the failure of 220 kV and above voltage class substation/ switchyard equipment and recommend measures to avert recurrence of such failures in future, CEA receives reports of failures of various substation/ switchyard equipment from power utilities, investigates the failures and brings out the report for benefit of Power Sector as whole.

As part of this report, the failure of substation equipment for the period of 1st January 2022 and 30th June 2023 was analyzed by the committee for which meeting was conducted on 21.11.2023 and 22.11.2023. The first part of the report covering Reactors and Transformers has been published. In this report other equipment viz Current Transformers, Voltage Transformers (PT/CVT), Surge Arrestors, Circuit breakers, Insulators, Coupling Capacitors and Wave trap are covered. Total Fifteen (15) Utilities reported the failure of equipment to the CEA. Total 122 failure incidences of Instrument Transformers, Surge Arresters, Circuit Breakers, Insulators, Wave trap and Coupling Capacitors of 220 kV and above voltage rating were reported between 1st January 2022 and 30th June 2023 to CEA.

Total 47 Nos. of Current Transformers failures cases were reported during the period out of which 38 were of 220 kV class, 9 were of 400 kV class and none were of 765 kV class. Reported failures of Potential Transformers/ CVT failures constitutes total 16 Nos. out of which 13 were of 220 kV class, 3 were of 400 kV class and none were of 765 kV class.

Total 34 No. of failure cases of Surge arrestors were reported out of which 29 were of 220 kV class, 5 were of 400 kV class and none were of 765 kV class. Failures of Circuit breakers which were reported to CEA were 19, out of which 9 were of 220 kV class, 10 were of 400 kV class and none were of 765 kV class. Other equipment for which failures were reported include 2 Nos. of 220 kV Insulator, 2 Nos. of Wave trap and 2 Nos. of Coupling Capacitors.

Out of total 122 failures of the equipment occurred, 19 Nos. of equipment failed within five years, 30 Nos. of equipment failed in 5-10 years of period. 48 Nos. of equipment failed during 10-20 years of their operation. 25 Nos. of equipment failed who had operation of more than 20 years.

The Standing committee analysed the cases of the 122 Nos. reported failures of the equipment. Since in most of the failure cases of CT/PT/CVT/SA/CB, either the equipment got blasted or got completely damaged, therefore making it impossible to carry out any test after failure. Without tests, internal condition of the failed equipment cannot be assessed and cause of failure cannot be determined. However, in most of the cases it is assumed that degradation of insulation due to ingress of moisture and transient system voltages might be the reason of failure of these equipment. It is suggested that to prevent the failure of the equipment, the practice of Condition Based Monitoring using online modern diagnostic tools shall be followed. The equipment which are aging should be monitored closely. The frequency/periodicity of measurement should be changed depending on the condition/healthiness of the equipment in operation. The trend of test results should be monitored apart from the absolute values of test results. The regular cleaning of dust deposited on the housings

of major equipment in Thermal Power Plant or area with heavy pollution are essential to avoid flashover across the insulators as frequent flashovers may lead to failure of the equipment.

Standing Committee has suggested that a single electrical asset monitoring system may be installed that can monitor all medium voltage and high voltage electrical assets like GIS, AIS, Breakers, Power Cables including Transformers for condition-based maintenance. All FAT, SAT and Periodic testing data for all electrical equipment should be stored in this system for performing health assessment. The system shall have advanced health index models that utilizes analytics and threshold limits as prescribed by latest IEEE, IEC, and CIGRE standards / recommendations. This system shall also be capable of integrating online monitoring of sensors installed at electrical assets, and inspection records/reports from the visual inspection of assets.

In case of Surge Arrestor, 3rd harmonic resistive component of leakage current is a very good method for assessing healthiness of SA and therefore it should be regularly monitored. In case of Circuit breaker, Dynamic Contact Resistance Measurement (DCRM) test should be conducted once in two years. Measurement of resistance of disconnector main contacts should be carried out and it should not exceed 300 micro ohms.

1. INTRODUCTION

A Standing Committee of experts in the field of design and operation of EHV Substations from CEA, various power utilities and research/academic institutes was constituted vide CEA letter dated 01.01.2013 under Section 73, Clause (I) of the Electricity Act, 2003, to investigate the failure of 220 kV and above voltage class substation/ switchyard equipment such as Power/ Generator Transformer, Circuit Breaker (CB), Instrument Transformer [i.e. Current Transformer (CT), Potential Transformer (PT) and Capacitor Voltage Transformer (CVT)], Surge Arrester (SA), Isolator etc and recommend measures to avert recurrence of such failures in future. As a part of this activity, CEA has been receiving reports of failures of various substation/ switchyard equipment from power utilities. Office order vide which Standing Committee was constituted is enclosed at **Annexure-III**.

The intent behind formation of this Standing Committee was to investigate the causes of failures, deliberate the failures of various substation/ switchyard equipment of Power utilities, suggest remedial measures to prevent recurrence of such events in future and prepare a report which would serve as a repository of case studies of failures and suggested remedial measures for future.

All the utilities are required to report any event of failure of substation equipment at the earliest in the specified format for reporting the incident (available on CEA website and attached as **Annexure- II**) along with all the additional information [like Disturbance Recorder (DR)/ Event Logger (EL) report], SLD, Test reports, O&M history, photographs etc.) to be submitted by the utilities while reporting the incident. The details of many events had been received in CEA with delay, due to which site visit by the members of the committee could not be materialized.

A total of 122 failures of Current Transformers, Voltage Transformers (PT/CVT), Surge Arrestors, Circuit breakers, Insulators, Coupling Capacitors and Wave trap for the period of 1st January 2022 and 30th June 2023 were reported to CEA. To discuss and investigate the failure of these equipment a meeting of the Standing Committee of experts was held in CEA on 21.11.2023 and 22.11.2023. Minutes of the meeting are enclosed at **Annexure-IV**.

2. Brief details of the failure of substation equipment failed between 1st January 2022 and 30th June 2023 as reported to CEA

2.1 The Committee investigates failures of 220 kV and above voltage class equipment only. A total of 122 failure incidences of Instrument Transformers, Surge Arresters, Circuit Breakers, XLPE cable, Wave trap and Coupling Capacitors of 220 kV and above voltage rating were reported between 1st January 2022 and 30th June 2023 to CEA. The voltage wise quantity of each equipment has been indicated in the Table-1 below:

TABLE-1

Equipment	Voltage Class			Quantity (Nos.)
	220 kV	400 kV	765 kV	
	Quantity (Nos.)			
Current Transformers	38	9	0	47
Potential Transformers/ CVT	13	3	0	16
Surge Arresters	29	5	0	34
Circuit Breakers	9	10	0	19
Insulator	2	0	0	2
Wavetrap	2	0	0	2
Coupling Capacitors	2	0	0	2
			Total	122

2.2 Quantity of failed equipment and years of service put in by this equipment before failures is given in Table-2. Complete details of all the above-mentioned failures is provided in **Annexure-I**.

TABLE-2

Years of Service	Nos. of equipment failed						
	CT	CVT/PT	Surge Arrester	Circuit Breaker	Insulator	Wave-trap	Coupling Capacitor
0-5	5	4	6	4	0	0	0
5-10	13	5	6	4	0	0	2
10-15	12	0	12	5	0	1	0
15-20	5	3	6	4	0	0	0
>20	12	4	4	2	2	1	0

Note: In some cases, years of service have been considered taking the difference between re-commissioning and failure date.

2.3 Failure of Potential Transformers (PT/CVT):

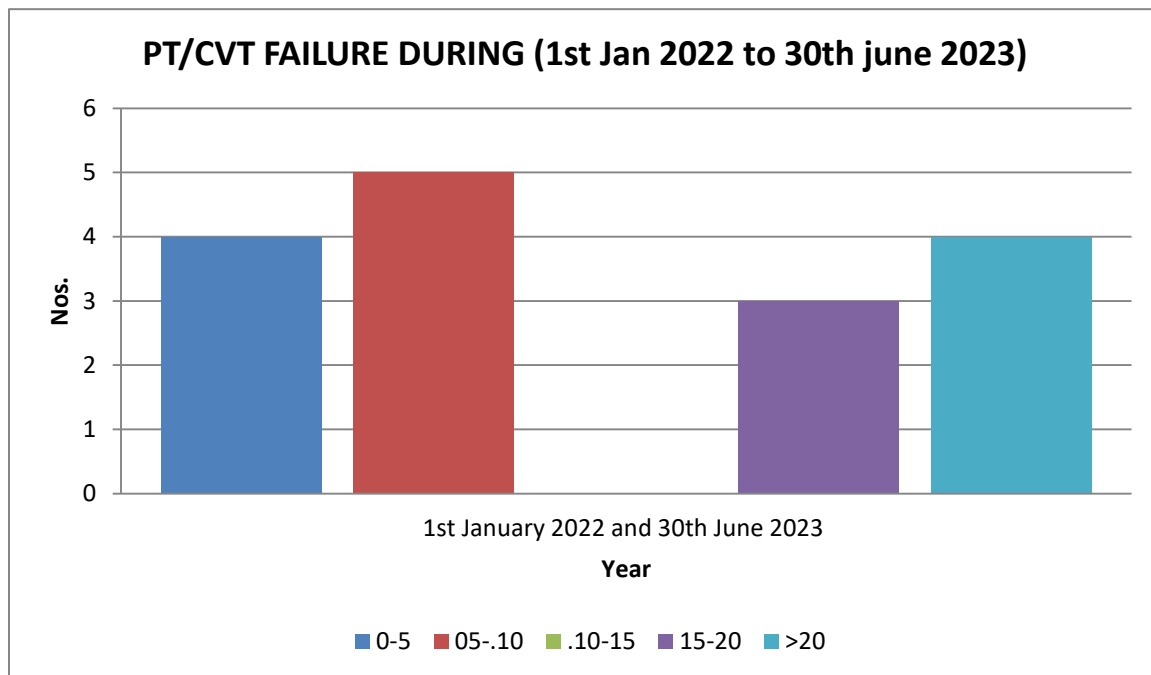
2.3.1 Total 16 Nos. of CVT/PT failures occurred between 1st January 2022 and 30th June 2023 were reported by six (06) utilities out of which 13 were of 220 kV class, 3 were of 400 kV class and none were of 765 kV class. Summary of failure of CVT/PT is as below (Table-3):

Table 3: Summary of failure of CVT/PT

S.No.	Utility	Substation/ Switchyard	Make	Rating	Year of commissioning	Date of failure
1.	NTPC	NTPC Kudgi STPP	CGL	400 kV/110 V, 4400 pF	11-12-2016	20-05-2022
2.	KSEB Ltd	220 kV Substation Kanhirode	CGL	220kV/ $\sqrt{3}$ /110V/ $\sqrt{3}$ (B Phase)	30-01-2023	01-04-2023
3.	KSEB Ltd	220 kV Substation Kanhirode	CGL	220kV/ $\sqrt{3}$ /110V/ $\sqrt{3}$ (Y Phase)	30-01-2023	01-04-2023
4.	PSTCL	220 kV Substation Udoke	NA	220 kV	18.06.2015	14-05-2022
5.	MSETCL	220/132/33 kV Substation Alephata	CGL	220 kV/110 / $\sqrt{3}$ V	2002	30-01-2022
6.	MSETCL	220/132/33 kV Substation Kurkumbh	Indian Transformer Co	220 kV/ 110 V/ $\sqrt{3}$	16-05-2019	29-03-2022
7.	MSETCL	220 kV Substation Kaulewada	CGL	220 kV	17-06-2003	18-07-2022
8.	MSETCL	220 kV Substation Kaulewada	CGL	220 kV	17-06-2003	21-08-2022
9.	RRVPL	220 kV Substation, Beawar	WSI	220/ $\sqrt{3}$ kV /110/ $\sqrt{3}$ V, 400 VA, 4400pF	29-06-1987	17-04-2022
10.	RRVPL	400 kV Substation Bikaner	Alstom	400 kV	28-07-2018	12-03-2023
11.	RRVPL	220 kV Substation, Heerapura	WSI	220 kV	1986	31-05-2023
12.	RRVPL	400 kV Substation, Merta City	Areva	420 kV	29-10-2012	07-08-2022
13.	RRVPL	220 kV Substation Reengus	WSI	220 kV 4400 PF, 100 VA, 0.5 CL	30-09-1984	15-04-2023
14.	RRVPL	220 kV Substation Reengus	WSI	220 kV, 4400 PF, 100 VA, 0.5 CL	06-09-1995	25-11-2022

15.	MPPTCL	220 kV Substation Gwalior II	SCT	220 kV / 110 V	25-01-2017	17-01-2023
16.	MPPTCL	400 kV Substation Pithampur	SCT	220/110 V PT	25-03-2013	20-12-2022

2.3.2 Out of total 16 failures of the CVT/PT occurred, 4 Nos. of CVT/PT failed within five years, 5 Nos. of CVT/PT failed in 5-10 years of period. 3 Nos. of CVT/PT failed during 10-20 years of their operation. 4 Nos. of CVT/PT failed who had operation of more than 20 years. The Potential Transformers failures occurred between 1st January 2022 and 30th June 2023 from the commissioning of the equipment is as per the below graph below:



2.4 Failure of Current Transformers

2.4.1 Total 47 Nos. of Current Transformers failures occurred between 1st January 2022 and 30th June 2023 were reported to CEA by nine (9) Utilities out of which 38 were of 220 kV class, 9 were of 400 kV class and none were of 765 kV class. Summary of failure of Current Transformers is as below (Table-4):

Table 4: Summary of failure of Current Transformers

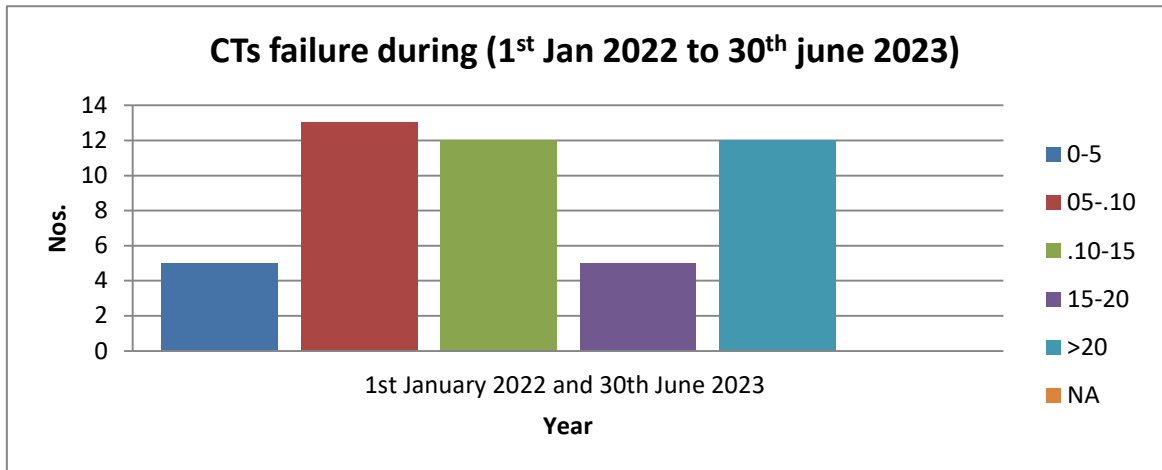
S. No.	Utility	Make	Rating	Year of commissioning	Date of failure
1.	GSECL	Hivolt Trans Electricals	220 kV/1200-600-300/1 A	1997	03-05-2023
2.	KSEB Ltd	Mehru	220 kV Substation, Taliparamba 1600/1 A (5 Core), 220 kV	2013	22-03-2023
3.	KSEB Ltd	Mehru	220 kV Sub Station Orkatteri 1600-800/1-1-1-1-1	07-06-2009	14-02-2023
4.	PSTCL	SCT	220 KV Sub-station Verpal 1200-600/1 A (5 core)	01-04-2009	18-06-2023
5.	PSTCL	BHEL	220KV S/S Wadala Granthian 220 kV/800-400/1 A (5 Core)	1990	24-02-2023
6.	PSTCL	SCT	220KV S/S Civil Line 220 kV/800-400/1 A (5 Core)	30-03-2002	08-05-2022
7.	PSTCL	BHEL	220 KV S/S Dasuya 220 kV/800 -400/ 1 A (5 Core)	1979	06-12-2022
8.	PSTCL	Mehru	220 KV S/S Botian Wala 220 kV/800-400/1 A (5 Core)	01-09-2012	23-10-2022
9.	PSTCL	Mehru	220 KV S/S GNDTP Bathinda 220 kV/800-400/1 A (5 Core)	01.04.2012	10-04-2023
10.	KPTCL	SCT	220/110/66/11 kV MRS, Shivamogga 220 kV/800-600-400-300/1A (5 Core)	09-01-2006	13-05-2022
11.	KPTCL	BHEL	220/66/11 kV S/S, Somanahalli Ratio: 1200-800-600-400-300/1-1-1A, 1600/1-1A,	1986	27-11-2022
12.	GETCO	Mehru	400 kV S/S Kasor 220 kV/(300-600-1200/1)	30-03-2016	23-05-2023
13.	GETCO	WS	400kV S/S Jetpur 400 kV/ 1000/1	20-02-1988	21-02-2023

14.	MSETCL	ICT Ltd	220 kV S/S Pegasus 220 kV/2400-1200/1A (5 Core),	30-11-2014	26-10-2022
15.	MSETCL	ICT Ltd	220 kV S/S Pegasus 220 kV/2400-1200/1A (5 Core),	30-11-2014	28-10-2022
16.	MSETCL	ABB	220/132/33 kV S/S Kurkumbh 220 kV/800-400-200/1 A (5 Core)	23-03-2000	09-02-2022
17.	MSETCL	Mehru	400 kV S/S Khaperkheda 420 kV/ 2000-1000-500/1A (5 Core)	27-10-2020	24-02-2022
18.	MPPGCL	Lustre Engineering Corporation	220 kV Switchyard, STPS, Sarni 220 kV/1200-800/1 A (5 Core)	07-12-2021	28-01-2022
19.	RRVPL	HBB	220 kV S/S Beawar 220 kV/150-300-600/5 A (4 Core)	06-10-1981	13-05-2023
20.	RRVPL	SCT Limited	220 kV S/S Behror 220 kV/1000/1A (5 Core)	12-12-2015	18-04-2023
21.	RRVPL	SCT Limited	220 kV S/S Bansur 220 kV/1000/1A (5 Core)	27-01-2017	16-04-2023
22.	RRVPL	ABB	220 kV S/S Khetri Nagar	17-05-2009	13-06-2022
23.	RRVPL	ABB	220 kV S/S Khetri Nagar 245 kV/200-400-800/5 A (4 Core)	23/11/1984	30-03-2022
24.	RRVPL	Mehru	220 kV S/S Khetri Nagar 245 kV/1000/5A, 5 Core	03-06-2016	04-04-2022
25.	RRVPL	Mehru	220 kV S/S Khetri Nagar 220 kV/1000/5 A, 5 Core	01-07-2015	29-04-2022
26.	RRVPL	SCT Limited	400 kV S/S Barmer 220 kV, 800/400/1 A	20-03-2009	10-04-2022
27.	RRVPL	SCT Limited	400 kV S/S Barmer 220 kV, 800/400/1 A	20-03-2009	15-04-2022
28.	RRVPL	SCT Limited	220 kV S/S Bikaner 800-400-200/1A-5C	17-12-2004	19-04-2022

29.	RRVPNL	SCT Limited	220 kV S/S Bikaner 800-400-200/1A-5C	20-04-2022	20-04-2022
30.	RRVPNL	WSI	220 kV S/S Suratgarh 245 kV	21-01-1996	16-03-2023
31.	RRVPNL	ALSTOM	400 kV S/S at Heerapura 2000-1000-500/1 A, 5 Core	05-02-2004	05-05-2023
32.	RRVPNL	WSI	400 kV S/S Heerapura 1000- 2000/1 A, 5 Core	05-12-1986	01-01-2022
33.	RRVPNL	MEHRU	220 kV S/S, Heerapura 220 kV 1000/5 A,5 Core	28-06-2018	30-09-2022
34.	RRVPNL	SCT Ltd.	220 kV S/S Sitapura 245 kV, 1000 A, 1000/1A	31-03-2015	20-03-2022
35.	RRVPNL	SCT	220 kV S/S Chaksu 220 kV, 400-800/1 A, 5 Core	24-10-2013	21-03-2022
36.	RRVPNL	SCT	220 kV S/S, Chaksu 220 kV, 400-800/1 A, 5 Core	24-10-2013	21-05-2022
37.	RRVPNL	SCT	220 kV S/S, Chaksu 220 kV, 400-800/1 A, 5 Core	24-10-2013	22-03-2022
38.	RRVPNL	SCT	220 kV S/S, Phulera 245 kV, 400-800/1 A, 5 core	29-10-2005	01-05-2022
39.	RRVPNL	SCT limited	220 kV S/S, Kuchaman City 245 kV/ 800-400-200/1 A, 5 Core	28-03-2001	26-05-2023
40.	RRVPNL	CGL	400 kV S/S, Merta City 400 kV 2000-1000-500/1 A, 5 Core	01-05-2008	26-05-2023
41.	RRVPNL	Universal Magnoflux	220 kV S/S Ratangarh 400-800/5 A, 5 Core	20-05-2016	13-04-2023
42.	RRVPNL	SCT	220 kV S/S Dhod 220 kV, 400-800/1 A	04-08-2011	05-04-2022
43.	RRVPNL	SCT Ltd.	220 kV S/S, Debari 245 kV, 800-400/1 A	16-09-2011	10-05-2023
44.	MPPTCL	SCT Limited	220 kV S/S Satna, 220 kV, 800/1A, 5 Core	11-11-2022	20-05-2023
45.	MPPTCL	SCT	220 kV S/S, Shujalpur 220 kV/800/1-1-1-1 A	08-07-2004	28-03-2023
46.	MPPTCL	SCT	220 kV S/S Betul 220 kV, 800/1 A	09-11-2010	27-03-2023
47.	MPPTCL	BHEL	400 kV S/S Badnawar 245 kV/1200 A/1 A, 5 Core	25-07-2019	25-02-2023

2.4.2 Out of total 47 failures of the Current Transformers occurred, 5 Nos. of Current

Transformers failed within five years, 13 Nos. of Current Transformers failed in 5-10 years of period. 17 Nos. of Current Transformers failed during 10-20 years of their operation. 12 Nos. of Current Transformers failed who had operation of more than 20 years. The Current Transformers failures occurred between 1st January 2022 and 30th June 2023 from the commissioning of the equipment is as per the below graph below:

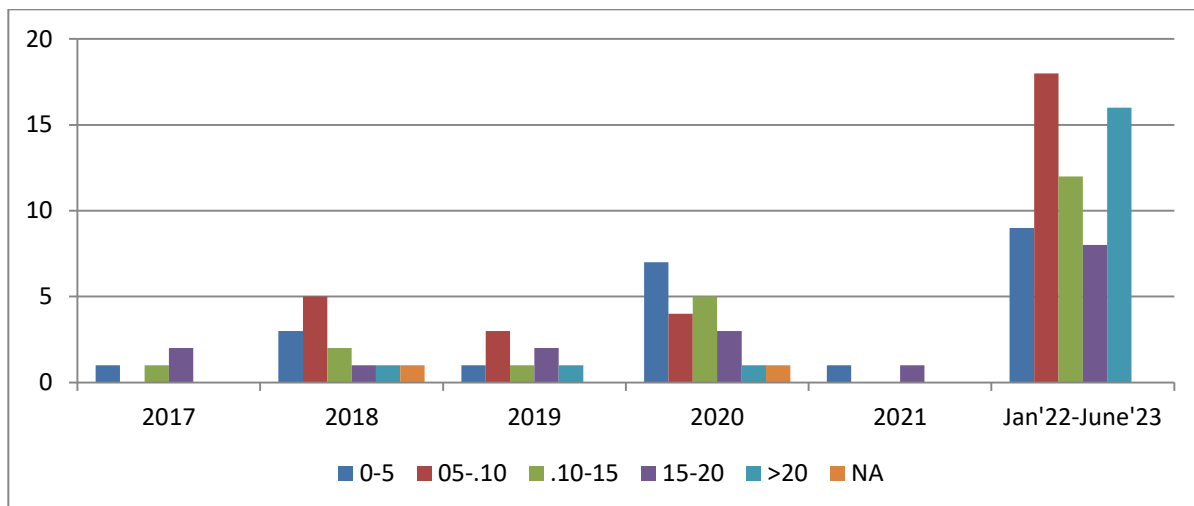


2.5 Analysis of Failure of Instrument Transformers (CT/PT/CVT)

2.5.1 In the case of Instruemenr Transformers (CT/PT/CVT), sixty-three (63) Nos. of failure occurred during the period from 1st January 2022 and 30th June 2023 have been reported to CEA by ten (10) Utilities. However, it may be noted that due to a handful of utilities reporting the failure, it is not possible to successfully capture the statistics of service life of key electrical equipment in the substations across various utilities in India.

2.5.2 In most of the cases of failure of CT/ CVT/ PT, the equipment had blasted or flashed over. In such cases, it becomes difficult to pin point the cause of failure. However, such failures may be attributed to deterioration of internal insulation and moisture ingress. Some of the failures of equipment could be due to ageing.

2.5.3 The number of different CT/PT/CVT failures as reported in last 6 years (2017 to June 2023) to CEA has been shown in the graph below:



2.6 Failure of Surge Arresters (SA)

2.6.1 Total 34 Nos. of Surge Arrestors failures occurred between 1st January 2022 and 30th June 2023 were reported to CEA by nine (9) Utilities out of which 29 were of 220 kV class, 5 were of 400 kV class and none were of 765 kV class. Summary of failure of Surge Arrestors is as below (Table-5):

Table 5 : Summary of failure of Surge Arrestors

S. No.	Utility	Station Name	Make	Rating	Year of commissioning	Date of failure
1.	GSECL	Sikka TPS	Oblum Electrical Industries Pvt Ltd	220 KV	31-08-2015	02-08-2022
2.	KSEB Ltd	220 kV Substation Malaparamba	Elektrolites India Pvt. Ltd	220 kV	2019	24-01-2023
3.	KSEB Ltd	220 kV Substation Edappon	LAMCO	220 kV	2009	07-07-2022
4.	KSEB Ltd	220 kV Substation Kanhirode, Kannur	Elektrolites India Pvt. Ltd	198 kV	30-01-2023	01-04-2023
5.	DVC	220 kV Substation Kalyaneswari	LAMCO	198 kV, 10 kA	01-11-2019	25-03-2023
6.	DVC	220kV Substation Giridih	Oblum Electrical Industries Pvt Ltd	198 kV, 40 kA	28-09-2015	02-07-2022
7.	NPCIL	Tarapur	Elpro International	216 kV, 10 kA	2003	03-11-2022

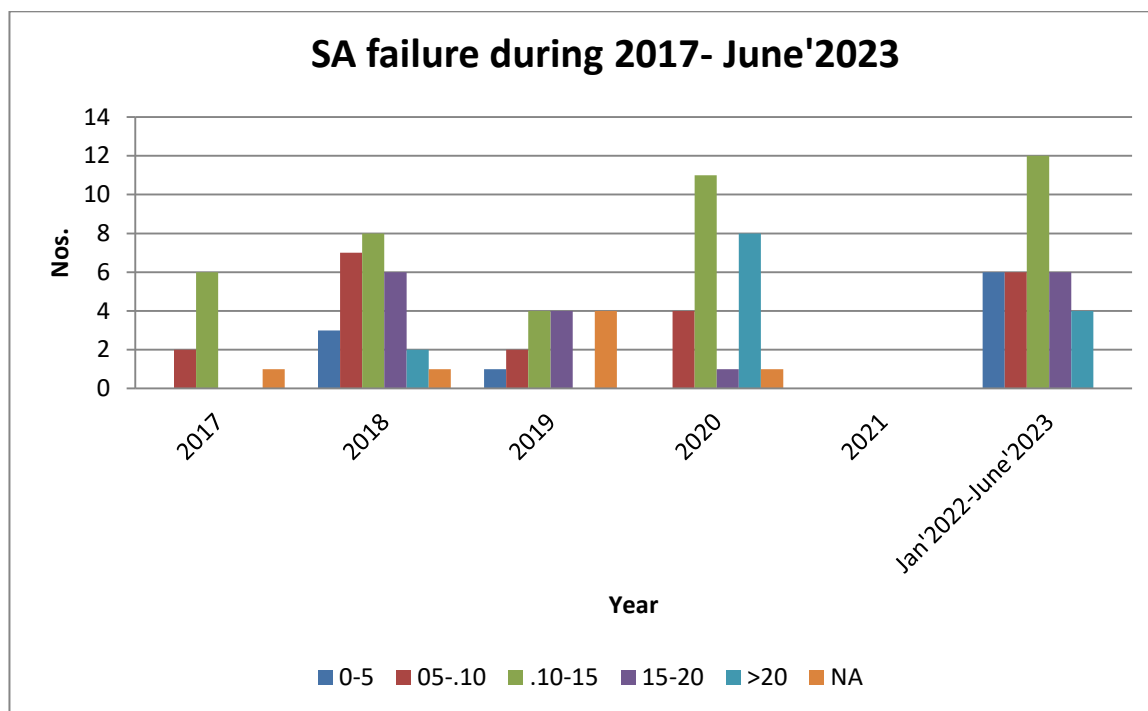
8.	NPCIL	Tarapur	Elpro International	220 kV, 10 kA	2003	23-04-2023
9.	NPCIL	Tarapur	Elpro International	390 kV, 10 kA	2004	15-05-2023
10	GETCO	400 kV Substation Amreli	Oblum Electrical Industries Pvt Ltd	400 kV	21-12-2000	18-08-2022
11	GETCO	400 kV Substation Amreli	LAMCO	400 kV	15-11-2013	19-07-2022
12	GETCO	220 kV Substation Keshod	LAMCO	220 kV	15-12-2009	01-01-2022
13	GETCO	220 kV Substation Shapur	LAMCO	220 kV	16-06-2012	20-06-2022
14	GETCO	220 kV Substation Salejada	Oblum Electrical Industries Pvt Ltd	220 kV	19-06-2010	01-09-2022
15	GETCO	220 kV Substation Salejada	Oblum Electrical Industries Pvt Ltd	220 kV	19-06-2010	29-08-2022
16	GETCO	220 kV Substation Morbi	CGL	220 kV	30-05-1997	07-10-2022
17	MSETCL	220 kV Substation Panvel	Oblum Electrical Industries Pvt Ltd	198 kV	08-03-2011	16-07-2022
18	MSETCL	220 kV Substation Dasturi	LAMCO	198 kV, 10 kA	07-02-2013	24-10-2022
19	MSETCL	400 kV Substation R.S Khadka	CGL	390 kV	16-08-2007	26-10-2022
20	MSETCL	220 kV Substation Wardha	Elektrolites India Pvt. Ltd	198 kV	11-03-2017	29-04-2022
21	MSETCL	400 kV Substation Koradi	CGL	198 kV	26-04-2003	15-07-2022
22	AEGCL	220 kV Substation Namrup	CGL	220 kV	2012	19-01-2022
23	AEGCL	220 kV Substation Agia	CGL	198 kV	31-07-2021	16-06-2023
24	RRVNL	220 kV Substation Chirawa	Oblum Electrical Industries Pvt Ltd	198 kV	06-12-2010	24-08-2022
25	RRVNL	220 kV Substation Dholpur	CGL	198 kV, 10 kA	24-05-2007	11-04-2023
26	RRVNL	220 kV Substation Heerapura	Oblum Electrical Industries Pvt Ltd	220 kV	05-04-1991	26-04-2022
27	RRVNL	220 kV Substation Jaipur	CGL	198 kV	29-01-2020	29-06-2022

28	RRVPNL	220 kV Substation Kukas	CGL	198 kV	20-12-2006	27-06-2022
29	RRVPNL	220 kV Substation Kotputli	Oblum Electrical Industries Pvt Ltd	220 kV	06-08-2011	19-07-2022
30	RRVPNL	220 kV Substation Kotputli	Oblum Electrical Industries Pvt Ltd	220 kV	06-08-2011	26-03-2023
31	RRVPNL	220 kV Substation Bali	LAMCO	198 KV	31-07-2011	01-06-2023
32	RRVPNL	220 kV Substation Merta	CGL	390 kV	29-10-2012	07-08-2022
33	MPPTCL	220 kV Substation Indore-II (Jetpura)	LAMCO	198 kV	12-10-2018	12-05-2023
34	MPPTCL	220 kV Substation Tikamgarh	Oblum Electrical Industries Pvt Ltd	220 kV	15-08-2006	20-06-2023

2.6.2 As per the reports received by CEA, thirty-four (34) Nos. of cases of SA failure that occurred during the period from 1st January 2022 and 30th June 2023 have been reported to CEA by nine (9) utilities. Out of these, twenty-nine (29) Nos. of SAs are of 220/230/245 kV class, seven (5) Nos. of SAs are of 400 kV class.

2.6.3 Out of total 34 failures of the Surge Arrestors occurred, 6 Nos. of Surge Arrestors failed within five years, 6 Nos. of Surge Arrestors failed in 5-10 years of period. 18 Nos. of Surge Arrestors failed during 10-20 years of their operation. 4 Nos. of Surge Arrestors failed who had operation of more than 20 years.

2.6.4 The number of different SA failures as reported in the last 6 years (2017 to June 2023) to CEA has been shown in the graph below.



2.7 Failure of Circuit Breaker:

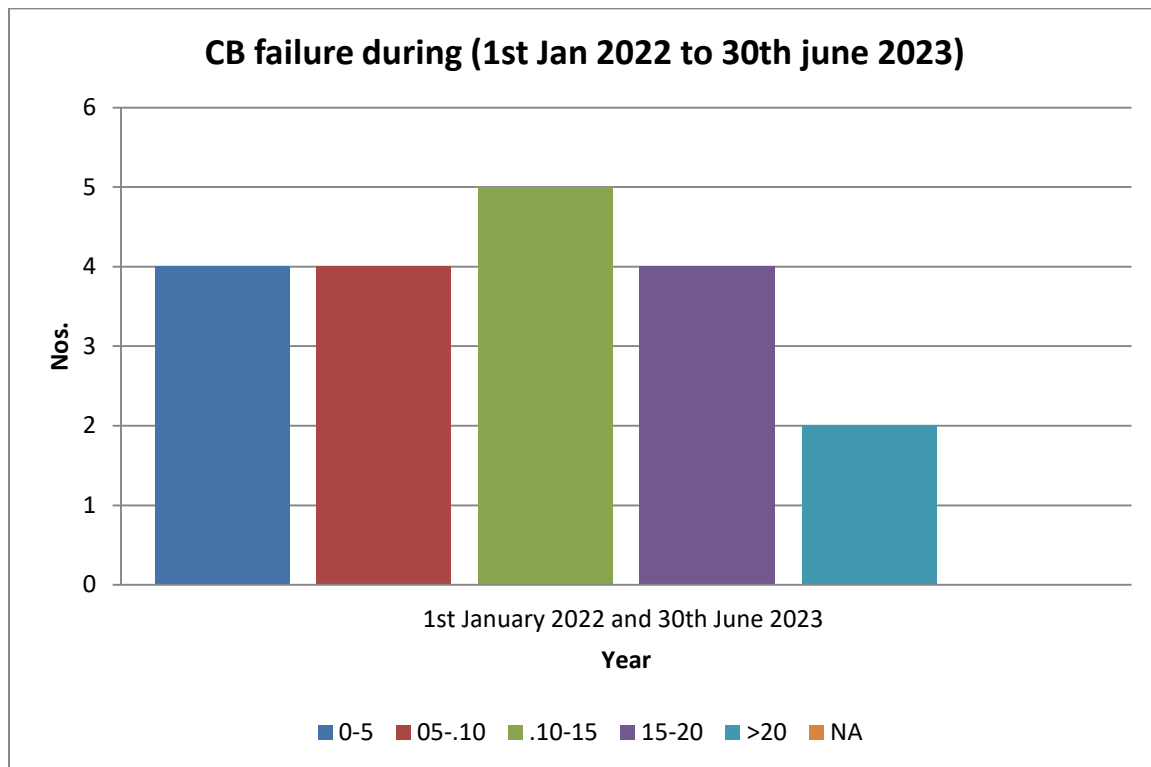
2.7.1 Total 19 Nos. of Circuit breakers failures occurred between 1st January 2022 and 30th June 2023 were reported to CEA by seven (7) Utilities out of which 9 were of 220 kV class, 10 were of 400 kV class and none were of 765 kV class. Summary of Circuit breakers failed is as below (Table-6):

Table 6: Summary of Circuit breakers failed

S. No.	Utility	Substation	Make	Rating	Year of commissioning	Date of failure
1.	NPCIL	400 KV Tarapur Substation	Merlin Gerin, France	1250 A ,440 kV / $\sqrt{3}$	2004	20-02-2022
2.	NPCIL	400 KV Tarapur Substation	Merlin Gerin, France	1250 A ,440 kV / $\sqrt{3}$	2004	12-11-2022
3.	SJVN	NJHPS Jhakri	GE T&D	420 kV/4000 A	30-03-2004	26-04-2023

4.	PSTCL	400 kV Substation Makhu	Siemens	420 kV/3150 A	17-01-2014	20-10-2022
5.	PSTCL	220 kV Substation Mohali 1	Alstom	220 kV	31-12-2008	11-05-2022
6.	PSTCL	220 kV Substation Bajakhana	ABB	220 kV	28-07-2004	16-09-2022
7.	HPPCL	Sainj Hydro Electric Project	ABB	400 kV/ 3150 A	2018	05-05-2022
8.	HPPCL	Sainj Hydro Electric Project	ABB	400 kV/ 3150 A	01-05-2022	24-11-2022
9.	MSETCL	400 kV Substation Alkud	Alstom	420 kV/4000 A	01-01-2017	22-04-2022
10.	MSETCL	400 kV Substation Kalwa	Areva	420 kV/3150 A	22-09-2007	18-08-2022
11.	AEGCL	220 kV Substation Salakati	Siemens	245 kV, 3150 A	01-04-2012	18-11-2022
12.	RRVNL	220 kV Substation Alwar	ABB	245 kV	16-01-1994	
13.	RRVNL	220 kV Substation Khetri Nagar	Areva	245 kV	12-01-2012	04-04-2022
14.	RRVNL	400 kV Substation Barmer	Areva	400 kV	09-01-2019	16-04-2023
15.	RRVNL	400 kV Substation Barmer	CGL	220 kV	16-03-2009	09-05-2023
16.	RRVNL	400 kV Substation Barmer	Siemens	245 kV / 3150 A	2016	03-01-2022
17.	RRVNL	400 kV Substation Heerapura	CGL	420 kV	29-03-2023	05-05-2023
18.	RRVNL	220 kV Substation Heerapura	HBB	220 kV	20-11-1992	14-06-2022
19.	RRVNL	220 kV Substation Sitapura	Alstom	245 kV, 2000 A	31-03-2015	20-03-2022

2.7.2 Out of total 34 failures of the Circuit breakers occurred, 4 Nos. of Circuit breakers failed within five years, 4 Nos. of Circuit breakers failed in 5-10 years of period. 9 Nos. of Circuit breakers failed during 10-20 years of their operation. 2 Nos. of Circuit breakers failed who had operation of more than 20 years. The Circuit breakers failures occurred between 1st January 2022 and 30th June 2023 from the commissioning of the equipment is as per the below graph below:



2.8 Failure of Insulator, Coupling Capacitors (CC) and Wave trap:

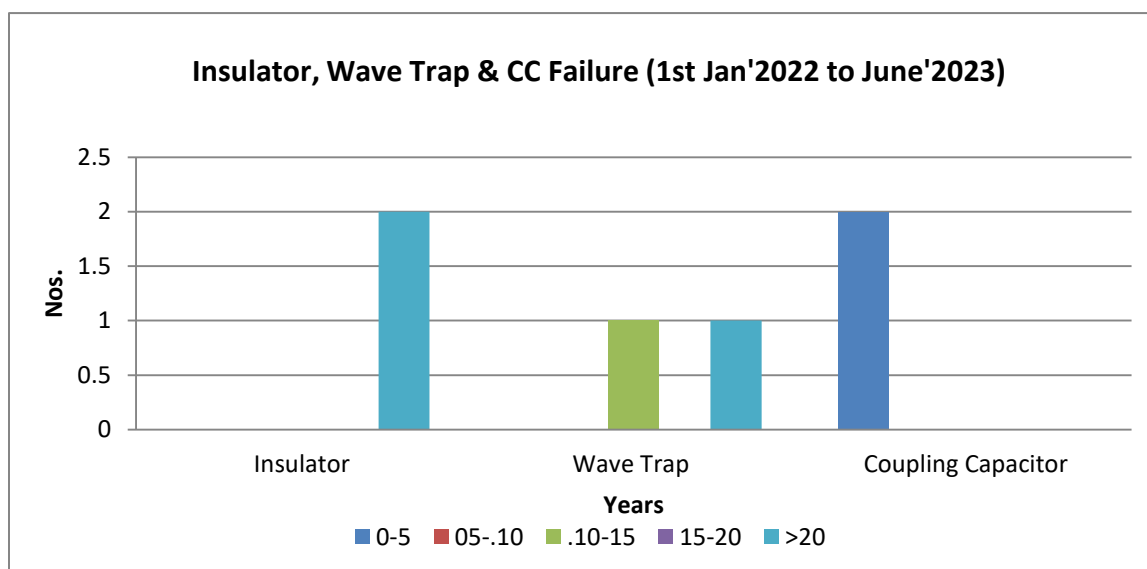
2.8.1 As reported to CEA total 2 No of Insulator, 2 Nos. of Wave Trap and 2 Nos. of Coupling Capacitor failed between 1st January 2022 and 30th June 2023. Summary of failuers of these equipment is as below (Table-7).

Table 7: Summary of failuers Insulator, Coupling Capacitors (CC) and Wave trap

S. No.	Utility	Substation	Make	Rating	Year of commissioning	Date of failure
Insulator Total 2 Nos.						
1.	NPCIL	Kakrapar Station Unit-1&2	Jayshree	220 kV, 1050 KVp (Dry impulse withstand voltage)	01-08-1991	05-06-2022
2.	NPCIL	Kakrapar Station Unit-1&2	Jayshree	220 kV, 535 KV (Dry) and 460 KV (Wet)	01-08-1991	05-06-2022

Wave Trap Total 2 Nos.						
1.	NPCIL	Kakrapar Unit-1&2	W.S.I.	220 kV/1250 A	01-01-1993	22-05-2022
2.	PSTCL	220 kV Lalton Kalan	PSP	220 KV	04-06-2008	16-08-2022
Coupling Capacitor: Total 2 Nos.						
1.	PSTCL	220 kV Substation Kotkaror	Mehru Electrical	220 kV	09-06-2013	17-06-2022
2.	PSTCL	220 kV Substation Rajpura	Mehru Electrical	8800 pF	21-11-2014	25.05.2023

2.8.2 The Insulator, Wave Trap and Coupling Capacitor failures occurred between 1st January 2022 and 30th June 2023 from the commissioning of the equipment is as per the below graph below:



3. OBSERVATIONS

- (i) It is observed that reported failures are primarily due to following reasons:
 - a) Normal Ageing
 - b) Failure of Insulation system for CB/CT/PT/CVT/SA.
 - c) Lack of prudent maintenance practices
 - d) Frequent System Faults and transient over voltages generated by the system.
- (ii) In most of the failure cases of CT/PT/CVT/SA, equipment blasted or got

completely damaged making it impossible to carry out any test after failure. Without tests, internal condition of the failed equipment cannot be assessed and cause of failure cannot be determined. However, in most of the cases it is assumed that degradation of insulation due to ingress of moisture and transient system voltages might be the reason of failure of these equipment.

- (iii) Condition Based Maintenance (CBM) Practices using modern diagnostic tools is not being followed by most of the utilities and in general, periodic Time Based Maintenance (TBM) is still being practiced.
- (iv) Adequate modern Diagnostic tools are not available with most of the State Utilities.
- (v) Most of the utilities are facing problem due to shortage of technical staff for operation & maintenance of sub-station equipment. Sometimes interpretation of test results becomes difficult in the absence of experts / experienced O&M staff.
- (vi) Sometimes due to unavailability of shut down, maintenance of equipment is deferred which affects the efficient functioning of the equipment and further deteriorate the health of equipment.
- (vii) In most of the cases of failures, utilities do not furnish factory test reports, pre-commissioning test reports, history of O&M and repairs, relay settings, environmental & system conditions at the time of failure etc. which makes it very difficult to analyze the cause of failure.
- (viii) Committee has observed that some times because of overmaintenance, gas in Circuit Breaker might get contaminated. Therefore, it is suggested that over maintenance, which also leads to failure of the equipment, should be avoided.

4. RECOMMENDATIONS:

4.1 Recommended measures suggested by the Committee for the Utilities to improve the performance of the substation equipment are listed below. Some of the recommendations are being repeated from the previous report with the objective to remind the actions required to be taken by utilities to improve performance of equipment and to use modern diagnostic tools for condition assessment so as to keep substation equipment healthy for long trouble- free and reliable operation.

4.2 General Recommendations:

- 4.2.1 The utilities should report to the Original Equipment Manufacturer (OEM) about the failure of equipment, even if the warranty has expired, which may help the manufacturers to take corrective action for improving the product design.
- 4.2.2 The practice of Condition Based Monitoring using online modern diagnostic tools should be followed instead of conventional Periodic / Time-Based Maintenance. A list of diagnostic tools is given in CEA Grid Standard regulation which can be used for one

substation or a pool of substations depending upon requirement.

- 4.2.3 A single electrical asset monitoring system shall be installed that can monitor all medium voltage and high voltage electrical assets like GIS, AIS, Breakers, Power Cables including Transformers for condition based maintenance. All FAT, SAT and Periodic testing data for all electrical equipment shall be stored in this system for performing health assessment. The system shall have advanced health index models that utilizes analytics and threshold limits as prescribed by latest IEEE, IEC, and CIGRE standards / recommendations. This system shall also be capable of integrating online monitoring of sensors installed at electrical assets, and inspection records/reports from the visual inspection of assets. It shall have the capabilities to monitor DGA, Partial discharge – Electrical & UHF, bushing, fan control, fiber optic monitoring and other monitoring parameters. This system shall be installed for transformers, including existing and new transformers; shall support cloud and on-premises installation and provide access to electrical asset health dashboards at Engineer's PC, Mobile, Laptops or Tablets.
- 4.2.4 The frequency/periodicity of measurement should be changed depending on the condition/healthiness of the equipment in operation. The trend of test results should be monitored rather than the absolute values of test results.
- 4.2.5 Utilities should follow best practices for maintenance of each equipment. All the equipment which have reached/ approaching end of service life need to be monitored closely and utility should plan and take action in advance for replacement of such equipment in a phased manner.
- 4.2.6 The utilities should make it a practice to carry out various tests on major electrical equipment at sites one or two months prior to expiry of warranty period of respective equipment so that any abnormality observed in test results can be discussed with OEM for taking up further necessary action within the warranty period.
- 4.2.7 The utilities must be careful while storing the equipment as spare or keeping transformer uncharged in the yard for long time before putting in to service. The OEM's recommendation for storage should be followed strictly. Spare equipment should be periodically tested as per OEM's recommendation.
- 4.2.8 Utilities should take appropriate action for repair/ replacement of concerned equipment as soon as some abnormality is observed through visual inspection or diagnostic tests.
- 4.2.9 Frequent failures of equipment of any particular make should be thoroughly investigated in consultation with OEM and necessary action including design

modification, if required, should be carried out by OEM.

- 4.2.10 Most of the utilities are facing problem due to shortage of supporting staff for operation & maintenance of sub-station equipment. The manpower should be strengthened for efficient operation & maintenance.
- 4.2.11 The regular cleaning of dust deposited on the housings of major equipment and bushings of transformer in Thermal Power Plant are essential to avoid flash over across the insulators, as such frequent flashover across the bushing / housing of equipment (due to operation in such dusty environment) may lead to failure of equipment. Wherever feasible, the porcelain housings of major equipment (CB/LA/CT/CVT) may be protected by providing Room Temperature Vulcanisation (RTV) coating. RTV coating over porcelain housing of equipment (CB/LA/CT/CVT) may also be considered by utilities for substation equipment installed in pollution prone areas.
- 4.2.12 Utilities should create and maintain complete data base of equipment including previous test reports (reports of factory tests/ pre-commissioning tests/ tests during O&M etc.), operation & maintenance history of equipment with make, model and year of commissioning etc. for proper evaluation, interpretation of test results and for taking Run-Refurbish-Replacement decision.
- 4.2.13 However, merely maintaining the history of O&M is not sufficient. Test results are not useful if correct method of testing is not followed. All tests and maintenance should be carried out as per best practices. The method of testing as well as the conditions while conducting the tests should be consistent / identical to previous testing condition as far as possible. For variation in temperature, required correction factors could be incorporated. Calibration of the testing instruments should also be ensured for reliability of the assessment.
- 4.2.14 If any damaged equipment is sent to the manufacturer's works for repair, detailed investigation report including probable causes of failure should be submitted to the Standing Committee for the benefit of the other utilities.

4.3 Recommendations for Instrument Transformers (CT/PT/CVT):

- 4.3.1 Periodic oil testing including DGA (wherever feasible) in the case of instrument transformers are recommended. Health of gaskets and bellows needs to be checked periodically for CTs. Thermo-vision scanning of CTs, CVTs and PTs should also be carried out regularly as a good maintenance practice.

- 4.3.2 While measuring tan delta of transformer bushing/CT/PT/CVT, apart from absolute value, rate of rise of tan delta should also be monitored and it should not be more than 0.1% per year. Frequency of measurement should be increased in case tan delta value is approaching 0.7%. Following tables can be referred while measuring tan δ and capacitance of CVTs:

Change in Tan δ	Monitoring Frequency
Upto +0.002	Three yearly
+0.002 to +0.003	Yearly
Above +0.003	Alarming

Change in Capacitance	Monitoring Frequency
upto $\pm 2\%$	Three yearly
$\pm 2\%$ to $\pm 3\%$	Yearly
Above $\pm 6\%$	Alarming

(Source: - CBIP Manual on EHV Substation Equipment Maintenance)

- 4.3.3 The change in secondary voltage of CVTs is a very good indicator of the condition/health of CVTs. Following table may be referred to for monitoring of secondary voltage:

Drift in secondary Voltage (to be measured by 0.2 / 0.5 class multimeter)	Condition	Monitoring Frequency
Upto ± 0.5 volts	Healthy	Six monthly
± 0.5 to ± 0.8 volts	To be monitored	03 monthly
+0.8 to +1.2 volts	Close monitoring	Monthly
+1.2 to +2.0 volts	Close monitoring	15 days

above +2.0 volts	Alarming	replacement
-0.8 to -4.0 volts	Close monitoring	15 days
less than -4.0 volts	Alarming	replacement

(Source: - CBIP Manual on EHV Substation Equipment Maintenance)

4.3.4 Following table can be referred while measuring $\tan \delta$ of CTs:

Value of $\tan \delta$	Monitoring Frequency
Upto 0.007 (annual rise@0.001)	Yearly
0.007 to 0.011	Half Yearly
Above 0.011	Replace the CT

(Source: - CBIP Manual on EHV Substation Equipment Maintenance)

4.3.5 Oil level in CTs should be checked before charging. For CTs with metallic bellows, the oil should be present up to the top of the bellows for proper functioning. The oil leakage needs to be checked periodically. Bellows level should be closely watched. The level of bellows of all CTs in one bay should be same at any point of time. Different bellows level may be an indicator of oil leakage, gassing or fault. Similarly, Capacitor units and EMU of CVTs in one bay should have same oil level indication at any point of time.

4.3.6 Varistors protect the CVT from over voltage due to Ferro-resonance (FR) oscillations. They may fail in service due to sustained FR or if the energy to be handled exceeds designed limit. If a varistor fails, it should be replaced by the varistor of the same voltage rating.

4.3.7 At the substations where fault level has increased beyond the design level, suitable corrective measures such as splitting of bus or employment of fault limiting devices should be adopted.

4.4 Recommendations for Surge Arrester:

4.4.1 Measurement of the 3rd harmonic resistive component of leakage current is a very

good method for assessing healthiness of SA. If 3rd harmonic component of resistive current is more than 150 μ A, then Insulation Resistance (IR) value test should also be conducted and if current exceeds 350 μ A, then SA should be removed from service and replaced. The measurement of leakage current before and after the monsoon should be carried out so as to ascertain the effect of moisture.

- 4.4.2 Before erection, the condition of the Arrester unit should be checked and it should be ensured that there is no damage during erection. If SA is kept on an uneven surface, it is likely to damage the pressure relief diaphragm. Any damage to this thin and sensitive material while handling and erecting will result into moisture entry into Surge Arrester, which will lead to its failure.
- 4.4.3 Thermal scanning is another simple on-line check often used on SAs to locate hot spot due to improper/defective terminations/excessive watt loss.
- 4.4.4 The specification of SA should include Dip test/Sealing Test which can be carried out at manufacturer's works to ensure proper sealing against ingress of moisture.

4.5 Recommendations for Circuit Breaker:

Dynamic Contact Resistance Measurement (DCRM) test kit is a very important tool to assess the healthiness of circuit breaker. This test may be carried out once in two years. Moreover, while formulating the specification for procurement of CB for new substation, provision for procurement of Operational Analyzer along with Dynamic Contact Resistance Measurement (DCRM) test kit should be included for one substation or a group of nearby substations depending upon the requirement.



Annexure-I

Detailed Information of All Failed Equipment other than Transformers and Reactors reported to CEA for the period 1st January 2022 and 30th June 2023

Detailed information in respect of following failures is given in subsequent pages of this annexure:

CURRENT TRANSFORMERS					
S.No.	Failure report	Utility	S/S Equipment	Serial no.	Date of Failure
1.	Failure of 220 kV KLTPS Switchyard, GSECL	GSECL	CT	0-143/1/42	03-05-2023
2.	Failure of 220 kV Taliparamba Substation	KSEB Ltd	CT	OC2183/1/5/7	22-03-2023
3.	Failure of 220 kV Substation Orkatteri	KSEB Ltd	CT	2183/1/11/08	14-02-2023
4.	Failure of 220 kV Substation Verpal	PSTCL	CT	2003/125	18-06-2023
5.	Failure of 220 kV Wadala Granthian Substation	PSTCL	CT	2218076	24-02-2023
6.	Failure of 220 kV Civil Line Substation	PSTCL	CT	99/280	08-05-2022
7.	Failure of 220 kV Substation Dasuya	PSTCL	CT	2204881	06-12-2022
8.	Failure of 220 kV Substation Botian Wala	PSTCL	CT	OC3326/14/13/ 11	23-10-2022
9.	Failure of 220 kV GNDTP Bathinda Substation	PSTCL	CT	OC 3760/2/113/12	10-04-2023
10.	Failure of 220 kV MRS, Shivamogga	KPTCL	CT	2004/588	13-05-2022
11.	Failure of 220/66/11 kV R/S, Somanahalli	KPTCL	CT	2210029	27-11-2022
12.	Failure of 400 kV Kasor Substation	GETCO	CT	OC-5122/4/53/14	23-05-2023

13.	Failure of 400 kV Jetpur Substation	GETCO	CT	860511	21-02-2023
14.	Failure of 220 kV Substation Pegasus	MSETCL	CT	3058-02	26-10-2022
15.	Failure of 220 kV Substation Pegasus	MSETCL	CT	3058-01	28-10-2022
16.	Failure of 220/132/33 kV Kurkumbh Substation	MSETCL	CT	20323	09-02-2022
17.	Failure of 400 kV Khaperkheda Substation	MSETCL	CT	OC 6346/1/2/16	24-02-2022
18.	Failure of 220 kV Switchyard, STPS, Sarni	MPPGCL	CT	LEC - CT - 2-0091	28-01-2022
19.	Failure of 220 kV GSS Beawar	RRVPNL	CT	IB070342	13-05-2023
20.	Failure of 220 kV Behror Substation	RRVPNL	CT	2014/ 604	18-04-2023
21.	Failure of 220 kV Bansur Substation	RRVPNL	CT	2014/590	16-04-2023
22.	Failure of 220 kV Bansur Substation	RRVPNL	CT	17500643	13-06-2022
23.	Failure of 220 kV Bansur Substation	RRVPNL	CT	IB069853	30-03-2022
24.	Failure of 220 kV Bansur Substation	RRVPNL	CT	OC6158/2/11/16	04-04-2022
25.	Failure of 220 kV Bansur Substation	RRVPNL	CT	OC5344/2/14/14	29-04-2022
26.	Failure of 400 kV GSS Barmer Substation	RRVPNL	CT	2008/963-R	10-04-2022
27.	Failure of 400 kV GSS Barmer Substation	RRVPNL	CT	2008/967-R	15-04-2022
28.	Failure of 220 kV GSS Bikaner	RVPN	CT	2003/249	19-04-2022
29.	Failure of 220 kV GSS Bikaner	RVPN	CT	2009/647	20-04-2022

30.	Failure of 220 kV GSS Suratgarh Substation	RRVPNL	CT	960433	16-03-2023
31.	Failure of 400 kV GSS Heerapura Substation	RVPNL	CT	20030237	05-05-2023
32.	Failure of 400 kV GSS Heerapura Substation	RVPNL	CT	861118	01-01-2022
33.	Failure of 220 kV GSS, Heerapura Substation	RVPNL	CT	6158/2/3/15	30-09-2022
34.	Failure of 220 kV GSS Sitapura Substation	RVPNL	CT	2011/0394	20-03-2022
35.	Failure of 220 kV GSS Chaksu	RVPNL	CT	2012/2325	21-03-2022
36.	Failure of 220 kV GSS Chaksu	RVPNL	CT	2012/2331	21-05-2022
37.	Failure of 220 kV GSS Chaksu	RVPNL	CT	2012/2329	22-03-2022
38.	Failure of 220 kV GSS Phulera	RRVPNL	CT	2003/257	01-05-2022
39.	Failure of 220 kV GSS Kuchaman City	RVPNL	CT	2003/237	26-05-2023
40.	Failure of 400 kV GSS, Merta City	RVPNL	CT	31034	26-05-2023
41.	Failure of 220 kV GSS Ratangarh	RVPNL	CT	15457	13-04-2023
42.	Failure of 220 kV GSS Dhod	RVPNL	CT	1146	05-04-2022
43.	Failure of 220 kV GSS, Debari	RVPNL	CT	2011-119	10-05-2023
44.	Failure of 220 kV Satna Substation	MPPTCL	CT	2010/1895	20-05-2023
45.	Failure of 220 kV Shujalpur Substation	MPPTCL	CT	94/328	28-03-2023

46.	Failure of 220 kV Betul Substation	MPPTCL	CT	2009/382	27-03-2023
47.	Failure of 400 kV Badnawar Substation	MPPTCL	CT	2464237	25-02-2023
POTENTIAL TRANSFORMERS / CAPACITOR VOLTAGE TRANSFORMERS					
1.	Failure of NTPC KUDGI STPP	NTPC	PT	S-51978	20-05-2022
2.	Failure of 220 kV Substation Kanhirode, Kannur	KSEB Ltd	PT	741931	01-04-2023
3.	Failure of 220 kV Substation Kanhirode, Kannur	KSEB Ltd	PT	741928	01-04-2023
4.	Failure of 220 kV Udoke Substation	PSTCL	PT	NA	14-05-2022
5.	Failure of 220/132/33kV Alephata S/s	MSETCL	PT	10249	30-01-2022
6.	Failure of 220/132/33 kV Kurkumbh Substation	MSETCL	PT	3019-03	29-03-2022
7.	Failure of 220 kV Kaulewada Substation	MSETCL	PT	13669	18-07-2022
8.	Failure of 220 kV Kaulewada Substation	MSETCL	PT	13668	21-08-2022
9.	Failure of 220 kV GSS Beawar	RVPNL	PT	8606305	17-04-2022
10.	Failure of 400 kV GSS, Bikaner	RVPNL	PT	37992009130	12-03-2023
11.	Failure of 220 kV GSS, Heerapura	RVPNL	PT	8512787	31-05-2023
12.	Failure of 400 kV GSS, Merta City	RVPNL	PT	21090701099	07-08-2022
13.	Failure of 220 kV GSS Reengus Substation	RVPNL	PT	8405419	15-04-2023
14.	Failure of 220 kV GSS Reengus Substation	RVPNL	PT	98070495	25-11-2022

15.	Failure of 220 kV Gwalior II substation	MPPTCL	PT	2014/2355	17-01-2023
16.	Failure of 400 kV Substation Pithampur	MPPTCL	PT	2011/319	20-12-2022
SURGE ARRESTER					
1.	Failure of 220 Kv Sikka TPS	GSECL	Surge Arrester	8	02-08-2022
2.	Failure of 220 kV Malaparamba Substation	KSEB Ltd	Surge Arrester	144 a, 144 b, 144 c	24-01-2023
3.	Failure of 220 kV S/S at Edappon	KSEB Ltd	Surge Arrester	167 A, 165 B & 140 C (3 Stack)	07-07-2022
4.	Failure of 220 kV Substation Kanhirode, Kannur	KSEB Ltd	Surge Arrester	24B	01-04-2023
5.	Failure of 220 kV Kalyaneswari Substation	DVC	Surge Arrester	891 (Y-ph.)	25-03-2023
6.	Failure of 220/132/33 kV Giridih Substation	DVC	Surge Arrester	08 (Y-ph.)	02-07-2022
7.	Failure of Tarapur	NPCIL	Surge Arrester	-	03-11-2022
8.	Failure Tarapur Taps-3 & 4	NPCIL	Surge Arrester	13	23-04-2023
9.	Failure of Tarapur Taps-3 & 4	NPCIL	Surge Arrester	15	15-05-2023
10.	Failure of 400 kV Substation Amreli	GETCO	Surge Arrester	4	18-08-2022
11.	Failure of 400 kV Substation, Amreli	GETCO	Surge Arrester	102 A	19-07-2022
12.	Failure of 220 kV Keshod	GETCO	Surge Arrester	490 A/B/C	01-01-2022

13.	Failure of 220 kV Shapur Substation	GETCO	Surge Arrester	496 A/B/C	20-06-2022
14.	Failure of 220 kV Salejada Substation	GETCO	Surge Arrester	29	01-09-2022
15.	Failure of 220 kV Salejada Substation	GETCO	Surge Arrester	30	29-08-2022
16.	Failure of 220 kV Morbi Substation	GETCO	Surge Arrester	9407097	07-10-2022
17.	Failure of 220 kV Substation Panvel	MSETCL	Surge Arrester	105	16-07-2022
18.	Failure of 220 kV Dasturi Substation	MSETCL	Surge Arrester	954	24-10-2022
19.	Failure of 400 kV R.S Khadka Substation	MSETCL	Surge Arrester	15460	26-10-2022
20.	Failure of 220 kV Wardha Substation	MSETCL	Surge Arrester	156A/163-B/164	29-04-2022
21.	Failure of 400 kV Koradi Substation	MSETCL	Surge Arrester	B-00118	15-07-2022
22.	Failure of 220 kV GSS Namrup Substation	AEGCL	Surge Arrester	ZLAX25C	19-01-2022
23.	Failure of 220 kV Agia Substation	AEGCL	Surge Arrester	63G33	16-06-2023
24.	Failure of 220 kV GSS Chirawa Substation	RVPNL	Surge Arrester	9	24-08-2022
25.	Failure of 220 kV GSS Dholpur Substation	RVPNL	Surge Arrester	49045	11-04-2023
26.	Failure of 220 kV GSS, Heerapura Substation	RVPNL	Surge Arrester	406000017	26-04-2022
27.	Failure of 220 kV GSS Jaipur Substation	RVPNL	Surge Arrester	122528	29-06-2022
28.	Failure of 220 kV Kukas Subststion	RVPNL	Surge Arrester	41340	27-06-2022
29.	Failure of 220 kV GSS Kotputli Subststion	RVPNL	Surge Arrester	38	19-07-2022

30.	Failure of 220 kV GSS Kotputli Substation	RVPNL	Surge Arrester	NA	26-03-2023
31.	Failure of 220 kV GSS Bali Substation	RVPNL	Surge Arrester	1817 C	01-06-2023
32.	Failure of 400 kV GSS, Merta City Substation	RRVPNL	Surge Arrester	88316	07-08-2022
33.	Failure of 220 kV Substation Indore-II (Jetpura)	MPPTCL	Surge Arrester	723 C	12-05-2023
34.	Failure of 220 kV Tikamgarh Substation	MPPTCL	Surge Arrester	NA	20-06-2023
Circuit Breaker					
1.	Failure of Tarapur Substation Taps-3 and 4	NPCIL	CB	-	20-02-2022
2.	Failure of Tarapur Substation Taps-3 and 4	NPCIL	CB	-	12-11-2022
3.	Failure of 1500 MW NJHPS Jhakri	SJVN	CB	267	26-04-2023
4.	Failure of 400 kV Makhu Substation	PSTCL	CB	2011/IND/04/8502	20-10-2022
5.	Failure of 220 kV Substation Mohali 1	PSTCL	CB	150203	11-05-2022
6.	Failure of 220 kV Bajakhana Substation	PSTCL	CB	20000051	16-09-2022
7.	Failure of 100 MW Sainj Hydro Electric Project	HPPCL	CB	-	05-05-2022
8.	Failure of 100 MW Sainj Hydro Electric Project	HPPCL	CB	-	24-11-2022
9.	Failure of 400 kV Alkud Substation	MSETCL	CB	253350	22-04-2022
10.	Failure of 400 kV Kalwa Substation	MSETCL	CB	160184	18-08-2022
11.	Failure Report of 220 kV Salakati GSS	AEGCL	CB	IND/01/9575	18-11-2022

12.	Failure of 220 kV Grid Substation Alwar	RRVPNL	CB	IB-106170	NA
13.	Failure of 220 kV GSS Khetri Nagar	RVPN	CB	151783	04-04-2022
14.	Failure of 400 kV Barmer GSS	RRVPNL	CB	Type GL316	16-04-2023
15.	Failure of 400 kV Barmer GSS	RRVPNL	CB	20614C	09-05-2023
16.	Failure of 400 kV Bikaner GSS	RVPNL	CB	2011/ind/12/9363	03-01-2022
17.	Failure of 400 kV GSS Heerapura	RVPNL	CB	54828C	05-05-2023
18.	Failure of 220 kV GSS Heerapura Substation	RVPNL	CB	IB1055443/1	14-06-2022
19.	Failure of 220 kV GSS Sitapura	RRVPNL	CB	220537	20-03-2022
Insulator					
1.	Failure of Kakrapar Atomic Power Station Unit-1&2	NPCIL	Insulator	-	05-06-2022
2.	Failure of Kakrapar Atomic Power Station Unit-1&2	NPCIL	Insulator		05-06-2022
Wave trap					
1.	Failure of Kakrapar Atomic Power Station Unit-1&2	NPCIL	Wave Trap	--	22-05-2022
2.	Failure of 220 kV Lalton Kalan Substation	PSTCL	Wave Trap	P1-L263	16-08-2022
Coupling Capacitor					
1.	Failure of 220 kV Kotkaror Substation	PSTCL	CC	4781/1/13713	17-06-2022
2.	Failure of 220 kV Rajpura Substation	PSTCL	CC	OC781/1/1/44/16	26-05-2023

CURRENT TRANSFORMERS
1. Failure Report of 220 kV Current Transformers at Nakhatrana line-1 of GSECL

i.	Name of Substation	:	220 kV KLTPS Switchyard, GSECL
ii.	Utility	:	GSECL
iii.	Faulty Equipment and the associated feeder	:	220 kV Nakhatrana line-1 CT (R-Phase)
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOV etc., as applicable)	:	220 kV/ 1200-600-300/ 1 amp/ 772.96 pf
v.	Short circuit withstand current and duration	:	40 kA for 3 Sec
vi.	Make (Original equipment manufacturer)	:	Hivolt Trans Electricals
vii.	Serial No.	:	R Phase - 0-143/1/42
viii.	Date and time of occurrence of fault	:	03/05/2023 at 16:48 hrs.
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	Line in Service
x.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)	:	Clear Sky
xi.	Year of manufacturing	:	1997
xii.	Date of Commissioning	:	1997
xiii.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	Beyond repair so new CT installed
xiv.	(a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities) (b) Whether any abnormality observed in these tests. If yes, attach the test reports.	: : :	(a) Ten Delta testing work done on date 07/02/2019 (b) No



	(c) What steps were taken to address the abnormality?		(c) No
xv.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	No
xvi.	Sequence of events/Description of fault (SOE with time stamp)	:	Nothing adverse noticed
xvii.	Details of protection operated	:	Distance protection operated, Zone-4
xviii.	Details of tests done after failure	:	No
xix.	Observation (Any relevant observation made by the field staff or during visual inspection)	:	visual inspection
xx.	Probable cause of failure	:	Aging

2. Failure Report of 220 kV Current Transformers at Taliparamba Substation of KSEB

i.	Name of Substation	:	220 kV Taliparamba Substation
ii.	Utility	:	KSEB Ltd
iii.	Faulty Equipment and the associated feeder	:	Current Transformer
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOV etc., as applicable)	:	1600/1 A (5 Core), 220 kV
v.	Make (Original equipment manufacturer)	:	Mehru
vi.	Serial No.	:	R phase - OC2183/1/4/07
vii.	Date and time of occurrence of fault	:	22/03/2023
viii.	Fault discovered during (Operation or periodic testing/ maintenance)	:	Periodic testing
ix.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)	:	Clear sky
x.	Year of manufacturing	:	2007
xi.	Date of Commissioning	:	2013
xii.	If OEM was contacted after failure, its recommendation/remark/ report/ MoM	:	Not contacted after failure
xiii.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	Beyond repair
xiv.	(a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities) (b) Whether any abnormality observed in these tests. If yes, attach the test reports.	:	a) Cleaned the insulator, checked oil level Periodicity: 3 months Tests: IR test, DAR, tan delta test once in an year b) Oil leakage observed

	(c) What steps were taken to address the abnormality?		c) Tightened the bolts near the point of leakage																		
<table border="1"> <thead> <tr> <th rowspan="2">Date</th><th colspan="2">IR Value (Mohms)</th><th rowspan="2">Tanδ</th></tr> <tr> <th>15sec</th><th>60sec</th></tr> </thead> <tbody> <tr> <td>03.01.2014</td><td>101000</td><td>131000</td><td>0.15</td></tr> <tr> <td>03.02.2022</td><td>6930</td><td>12700</td><td>0.70</td></tr> <tr> <td>22.03.2023</td><td>6790</td><td>11800</td><td>4.69</td></tr> </tbody> </table>				Date	IR Value (Mohms)		Tanδ	15sec	60sec	03.01.2014	101000	131000	0.15	03.02.2022	6930	12700	0.70	22.03.2023	6790	11800	4.69
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22.03.2023	6790	11800	4.69																		
xv.	Probable cause of failure	:	Quality problems of the gasket used by the manufacturer leading the leakage of the oil and ingress of the moisture.																		

3. Failure Report of 220 kV Current Transformers at Orkatteri Substation of KSEB

i.	Name of substation	:	220 kV Substation Orkatteri
ii.	Utility	:	KSEB
iii.	Faulty equipment and the associated feeder	:	Current Transformers
iv.	Rating (voltage/ current/ current ratio/ capacitance/ mcov etc., as applicable)	:	1600-800/1-1-1-1-1
v.	Short circuit withstand current and duration	:	40 kA for 1 second
vi.	Make (original equipment manufacturer)	:	Mehru electricals & mechanical engineering pvt. Ltd.
vii.	Serial no.	:	Y Phase - 2183/1/11/08
viii.	Date and time of occurrence of fault	:	14/02/2023 at 13:30 hrs.
ix.	Fault discovered during (operation or periodic testing/ maintenance)	:	
x.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)	:	Sunny Sky
xi.	Year of manufacturing	:	2008
xii.	Date of Commissioning	:	07/06/2009
xiii.	If OEM was contacted after failure	:	No
xiv.	Present condition of equipment (repaired/ to be repaired / beyond repair)	:	Burnt
xv.	(a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities)	:	02/02/2023

	(b) Whether any abnormality observed in these tests. If yes, attach the test reports. (c) What steps were taken to address the abnormality?																				
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xvi.	details of previous failure (any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	Na																		
xvii.	Sequence of events/description of fault (soe with time stamp)	:	Burnt Y-Phase CT of 220 kV bus couple, Bus bar protection acted. Check zone protection operated. 100 MVA Transformers 1and 2 tripped																		
xviii.	Details of protection operated	:	Bus bar protection acted.																		
xix.	Details of tests done after failure	:	Na																		
xx.	Observations (any relevant observation made by the field staff or during visual inspection)	:	Y-Phase CT of 220 kV Bus Coupler Burnt Completely																		
xxi.	Probable cause of failure	:	Aging																		

4. Failure Report of 220 kV Current Transformers at Verpal Substation of PSTCL

i.	Name of Substation		220 kV Substation Verpal
ii.	Utility	:	PSTCL
iii.	Faulty Equipment and the associated feeder	:	C.T, 220 kV Verpal-Balachak Ckt 2
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOV etc., as applicable)	:	220 kV (1200-600/1-1-1-1-1)
v.	Short circuit withstand current and duration	:	40 KA
vi.	Make (Original equipment manufacturer)	:	SCT
vii.	Serial No.	:	2003/125
viii.	Date and time of occurrence of fault	:	18/06/2023 at 00:06 hrs.
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	operation
x.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)	:	clear sky
xi.	Year of manufacturing	:	2001
xii.	Date of Commissioning	:	01/04/2009
xiii.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	Beyond repair
xiv.	(a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities) (b) Whether any abnormality observed in these tests. If yes, attach the test reports. (c) What steps were taken to address the abnormality?	:	PTW No. 074, Date: 06/12/22 to tightened nut and bolts of CT Clamps. Checking Tightness of Earthing Under PTW No. 091, Date: 20/12/22 Tan-Delta tests conducted by Protection team and value of Tan-Delta of CT was 0.67% which is under Permissible value.
xv.	Details of previous failure	:	-----

	(Any failure which has led to a major repair of the equipment in the past since its Commissioning)		
xvi.	Sequence of events/Description of fault (SOE with time stamp)	:	220 kV Balachakckt 1 and 100 MVA 220/132 kV Auto Transformer Incomers of T-3, T- 4, T-5 Tripped at 00:06 hrs.
xvii.	Details of protection operated	:	DPR Operated
xviii.	Observations (Any relevant observation made by the field staff or during visual inspection)	:	Control Cables of 220 kV Balachak Ckt 1 and 2 got burnt due to bursting of Line CT of 220 kV Balachak Ckt 2
xix.	Probable cause of failure	:	Due to insulation failure

5. Failure Report of 220 kV Current Transformers at Wadala Granthian Substation of PSTCL

i	Name of Substation	:	220 kV Wadala Granthian Substation
ii.	Utility	:	PSTCL
iii.	Faulty Equipment and the associated feeder	:	1 No. 220 kV CT of 220 kV Verpal Ckt
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOV etc., as applicable)	:	220 kV/800-400/1-1-1-1
v.	Short circuit withstand current and duration	:	40 kA for 1 sec
vi.	Make (Original equipment manufacturer)	:	BHEL
vii.	Serial No.	:	2218076
viii.	Date and time of occurrence of fault	:	24/02/2023 at 04:25 hrs.
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	Operation
x.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)	:	Clear
xi.	Year of manufacturing	:	1988
xii.	Date of Commissioning	:	1990
xiii.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	Unserviceable (Damaged)

xiv.	(a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities) (b) Whether any abnormality observed in these tests. If yes, attach the test reports. (c) What steps were taken to address the abnormality?	:	a) PTW No. 07, Date: 19/10/22 to tightened nut and bolts of CT Clamps. Checking Tightness of Earthing. b) No C) Under PTW No. 57, Date: 24/02/23 damaged CT replaced with new MEHRU CT , Tests conducted by Protection team and value of IR of CT was found under permissible value.
xv.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	---
xvi.	Sequence of events/Description of fault (SOE with time stamp)	:	220 kV Tibber, 220 kV Sarna ckt 4, 220 kV Kotli Surat Malhi, 220 kV Fatehgarh churian, 132 kV Shrihar gobindpur ckt 1and 2 , 220/132 kV 100 MVA PTF T-1 and T-4 at 4.25 AM
xvii.	Details of protection operated	:	Main 1 DPR RYB Phase Zone 1 Main 2 DPR Micom Any trip A
xviii.	Details of tests done after failure	:	Damaged
xix.	Observations (Any relevant observation made by the field staff or during visual inspection)	:	No
xx.	Probable cause of failur	:	Failure of Insulation

6. Failure Report of 220 kV Current Transformers at Civil Line Chogawan of PSTCL

i.	Name of Substation	:	220 kV Civil Line Substation
ii.	Utility	:	PSTCL
iii.	Faulty Equipment and the associated feeder	:	220 kV Y-Phase Line Current Transformer controlling 220 kV Civil Line-Chogawan Ckt
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOV etc., as applicable)	:	Voltage : 220 kV , Current Ratio = 800-400/1-1-1-1-1A
v.	Short circuit withstand current and duration	:	40 kA for 1 sec
	Make (Original equipment manufacturer)	:	SCT
vi.	Serial No.	:	99/280
vii.	Date and time of occurrence of fault	:	08/05/2022 at 19:37 hrs.
viii.	Fault discovered during (Operation or periodic testing/ maintenance)	:	Nil
ix.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)	:	Clear Sky
x.	Year of manufacturing	:	15/01/99
xi.	Date of Commissioning	:	30/03/2002
xii.	Storage condition of equipment if the gap between delivery at site and Commissioning is over 6 months	:	Not Known
xiii.	If OEM representative had inspected the equipment or visited the site after failure, their remarks, MoM etc. may be attached.	:	Not known
xiv.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	Replaced with new on dated 13/05/2022 and charged at 16:02 hrs.

xv.	(a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities) (b) Whether any abnormality observed in these tests. If yes, attach the test reports. (c) What steps were taken to address the abnormality?	:	Conducted Test Data related to Protection
xvi.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	NIL
xvii.	Sequence of events/Description of fault (SOE with time stamp)	:	Not Known
xviii.	Details of tests done after failure	:	Not Known
xix.	Observations (Any relevant observation made by the field staff or during visual inspection)	:	Cause could not be found

7. Failure Report of 220 kV Current Transformers at Dasuya Substation of PSTCL

i.	Name of Substation	:	220 kV Substation Dasuya
ii.	Utility	:	PSTCL
iii.	Faulty Equipment and the associated feeder	:	Y Phase CT of 220 kV Dasuya- Pong Ckt No. 3 at Pong end
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOV etc., as applicable)	:	220 kV CT Ratio 800 -400/1 A (5 Core)
v.	Short circuit withstand current and duration	:	40 kA for 1 sec
vi.	Make (Original equipment manufacturer)	:	BHEL
vii.	Date and time of occurrence of fault	:	06/12/2022 at 15:03 hrs.
viii.	Serial No.	:	2204881
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	Nil
x.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)	:	Clear Sky
xi.	Year of manufacturing	:	1978
xii.	Date of Commissioning	:	1979
xiii.	Storage condition of equipment if the gap between delivery at site and Commissioning is over 6 months	:	Nil
xiv.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	Damaged

xv.	(a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities) (b) Whether any abnormality observed in these tests. If yes, attach the test reports. (c) What steps were taken to address the abnormality?	:	Not any abnormality observed during testing when it was working condition
xvi.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	Nil
xvii.	Sequence of events/Description of fault (SOE with time stamp)	:	B- Phase Zone 2 at Dasuya end
xviii.	Details of protection operated	:	DPR Main 2 operated at Dasuya end
xix.	Details of tests done after failure	:	No test was done because CT was totally damaged
xx.	Observations (Any relevant observation made by the field staff or during visual inspection)	:	Nil
xxi.	Probable cause of failure	:	At pong end breaker of generating unit no. 6 blast due to which CT of dasuya pong ckt no. 3 damaged

8. Failure Report of 220 kV Current Transformers at 220 kV Substation Botian Wala, PSTCL

i.	Name of Substation	:	220 kV Substation Botian Wala
ii.	Utility	:	PSTCL
iii.	Faulty Equipment and the associated feeder	:	220 kV CT of Y Phase of 220 kV Mastewala Circuit No. I Line
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOV etc., a applicable)	:	220 kV CTR: 800-400/1-1-1-1-1 A
v.	Short circuit withstand current and duration	:	40 kA for 1 sec
vi.	Make (Original equipment manufacturer)	:	Mehru
vii.	Serial No.	:	OC 3326/14/13/ 11
viii.	Date and time of occurrence of fault	:	23/10/2022 at 17:40 hrs.
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	Operation
x.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)	:	Clear
xi.	Year of manufacturing	:	2011
xii.	Date of Commissioning	:	01/09/2012
xiv.	If OEM was contacted after failure, its recommendation/remark/ report/ MoM	:	No, CT got damaged/ burst at site and it caught fire.

xv.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	Beyond repair
xvi.	(a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities) (b) Whether any abnormality observed in these tests. If yes, attach the test reports. (c) What steps were taken to address the abnormality?	:	Maintenance done as per P&M Manual on dated 20/10/2022
xvii.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	-
xviii.	Sequence of events/Description of fault (SOE with time stamp)	:	220 kV got damaged / burst at site at time 17:40 hrs. dated - 23/10/2022 and it caught fire. 220 kV Mastewal circuit No.-I tripped at 17:40 hrs. from far end only. 220 kV Mastewal Circuit No. II tripped 17:40 hrs. 220 kV Ferozpur line tripped at 17:40 hrs. 220 kV Kotaror line tripped at 17:40 hrs. 220 kV Goindwal line circuit No. I tripped at 17:40 hrs. 220 kV Goindwal Circuit No. II tripped at 17:40 hrs.
xix.	Details of protection operated	:	DPR operated at far end only
xx.	Details of tests done after failure	:	Not done as 220 kV CT got damaged



xxi.	Observations (Any relevant observation made by the field staff or during visual inspection)	:	-
xxii.	Probable cause of failure	:	Cannot be identified.

9. Failure Report of 220 kV Current Transformers at GNDTP Bathinda Substation of PSTCL

i.	Name of Substation	:	220 kV GNDTP Bathinda Substation
ii.	Utility	:	Punjab State Transmission Corporation Limited
iii.	Faulty Equipment and the associated feeder	:	R-Phase CT of 220 kV Bus Coupler
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOV etc., as applicable)	:	800-400/1-1-1-1-1 A
v.	Short circuit withstand current and duration	:	40 kA for 3sec
vi.	Make (Original equipment manufacturer)	:	Mehru
vii.	Serial No.	:	OC 3760/2/113/12
viii.	Date and time of occurrence of fault	:	10/04/2023 at 05:40 hrs
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	High Tan Delta Value
x.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)	:	Clear
xi.	Year of manufacturing	:	2012
xii.	Date of Commissioning	:	01/04/2012
xiii.	Present condition of equipment (Repaired/ To be repaired beyond repair)	:	Beyond Repair
xiv.	(a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities)	:	a) - b) Periodic Testing and Preventive Maintenance c) Tan Delta value of R-ph CT is more than permissible limit

	(b) Whether any abnormality observed in these tests. If yes, attach the test reports. (c) What steps were taken to address the abnormality?		
xv.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	NA
xvi.	Sequence of events/Description of fault (SOE with time stamp)	:	CT Blasted and Both 220 kV Bus Bar tripped.
xvii.	Details of protection operated	:	220 kV Bus Bar Protection Operated
xviii.	Observations(Any relevant observation made by the field staff or during visual inspection)	:	During visual inspection everything was ok (Before Fault)
xix.	Probable cause of failure	:	Insulation failure

10. Failure Report of 220 kV Current Transformers at MRS, Shivamogga Substation of KPTCL

i	Name of the Sub-station	:	220/110/66/11 kV MRS, Shivamogga
ii	Utility/Owner of the Sub-station	:	KPTCL, MRS, Shivamogga.
iii	Faulty Equipment and the associated feeder	:	220 kV Current Transformer of Sharavathi No.3 Line
iv	Rating (voltage /current/current ratio/ capacitance/ MCOV etc., as applicable)	:	800-600-400-300/1-1-1-1A
v	Short Circuit withstand current and duration	:	40 kA for 1sec
vi	Make (Original equipment manufacturer)	:	SCT Ghaziabad
vii	Sl. No	:	2004/588
viii	Date & Time of occurrence of fault	:	13/05/2022 at 07:25 hrs.
ix	Fault discovered during (Operation or periodic testing/ maintenance)	:	Failed during in service
x	Weather Conditions at the time of failure (clear sky/ rainy/ thunderstorm etc.,)	:	Clear sky
xi	Year of Manufacturing	:	2004
xii	Date of Commissioning	:	09/01/2006
xiii	If OEM was contacted after failure, its recommendation/ remark/ report/ MoM	:	No
xiv	Present condition of equipment (repaired/ To be repaired/ beyond repair)	:	Beyond Repair as CT was completely damaged
xv	(a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities)	:	a) Previous maintenance date is 05.05.2022. b) No

	(b) Whether any abnormality observed in these tests. If yes, attach the test reports. (c) What steps were taken to address the abnormality?		c) -
xvi	Details of Previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	Nil
xvii	Sequence of events/ Description of Fault (SOE with time stamp)	:	B-Phase CT got flash over at MRS end.
xviii	Details of protection operated	:	Distance protection. Since CT was connected towards Bus, CT failure resulted in operation of Bus bar dead zone Protection also.
xix	Details of Tests done after failure	:	Not carried out as the equipment was flashed over
xx	Observations (any relevant observation made by the field staff or during visual inspection)	:	CT might have failed due to ageing.
xxi	Probable cause of failure	:	Due to Ageing

11. Failure Report of 220 kV Current Transformers at Somanahalli Substation of KPTCL

i.	Name of sub Station	:	220/66/11 kV R/S, Somanahalli
ii.	Utility	:	KPTCL
iii.	Faulty Equipment and the associated feeder	:	R phase 220 kV CT of 220 kV Somanahalli-BWSSB Harohalli line
iv.	Rating [Voltage/current/current ratio/capacitance/MCOV etc., as applicable]	:	Ratio: 1200-800-600-400-300/1-1-1A, 1600/1-1A, STC: 31.5 kA/1sec
v.	Short circuit withstand current and duration	:	31.5 kA/1sec
vi.	Make (Original equipment manufacturer)	:	BHEL
vii.	Serial No.	:	2210029
viii.	Date and time of occurrence of fault	:	27.11.2022, 22:06Hrs
ix.	Fault discovered during (Operation or periodic testing/maintenance)	:	Failed during in service
x.	Weather conditions at the time of failure (clear sky/rainy/thunderstorm etc.)	:	Clear sky
xi.	Year of manufacturing	:	1984
xii.	Date of commissioning	:	1986
xiii.	Storage condition of equipment if the gap between delivery at site and commissioning is over six months	:	NA
xiv.	If OEM was contacted after failure, recommendation/remark/report/MO M	:	NA
xv.	Present condition of equipment (repaired/to be repaired/beyond repair)	:	Beyond repair
xvi.	(a) Details of previous maintenance (activities carried out in previous maintenance including the test conductor, periodicity of the maintenance activities	:	Previous maintenance carried out on 21.07.2022 a) Quarterly maintenance works such as tightening of primary clamps, checking tightness of secondary terminals,

	(b) Whether any abnormality observed in these tests if yes, attach the test reports. (c) What steps were taken to address the abnormality?		verminproofing, checking oil level in the CT. IR test conducted on CT and Circuit Breaker. IR value of R phase CT: 3.23 G Ohm, 1.54 uA, 2.68 nF b) No abnormalities observed. c) Not applicable
xvii.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its commissioning)	:	Nil
xviii.	Sequence of events/Description of fault (SOE with time stamp)	:	220 kV Somanahalli-BWSSB Harohalli line tripped at 22:06 Hrs with Distance Protection Relay at 220/66/11 kV R/S, Somanahalli with heavy sound and 220kV R phase CT of the line had flashed over.
xix.	Details of protection operated		400/220 kV ICT-1 tripped on OCR at 400/220 kV station, PGCIL, Somanahalli at the time of flashover. (source for 220kV Somanahalli-BWSSB Harohalli line)
xx.	Details of test done after failure	:	Not carried out as the equipment had flashed over.
xxi.	Observations (Any relevant observation made by the field staff or during visual inspection)	:	Nil
xxii.	Probable cause of failure	:	Insulation failure
xxiii.	Attach reports of tests during pre-commissioning periodic maintenance and after failure; photographs of the failed equipment etc.	:	Pre commissioning report not available. Periodical maintenance report and photographs of failed equipments are herewith attached.

12. Failure Report of 400 kV Current Transformers at Kasor Substation of GETCO

i.	Name of Substation	:	400 kV Kasor Substation
ii.	Utility	:	GETCO
iii.	Faulty Equipment and the associated feeder	:	HV Current Transformer of 100 MVA, 220/66 kV TR-1
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOV etc., as applicable)	:	220 kV/(300-600-1200/1)
v.	Short circuit withstand current and duration	:	NA
vi.	Make (Original equipment manufacturer)	:	Mehru
vii.	Serial No.	:	OC-5122/4/53/14
viii.	Date and time of occurrence of fault	:	23/05/2023
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	Maintenance
x.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)	:	Clear sky
xi.	Year of manufacturing	:	2013
xii.	Date of Commissioning	:	30/03/2016
xiii.	If OEM was contacted after failure,its recommendation/ remark/ report/ Mom.	:	YES
xiv.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	Beyond Repair

xv.	(a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities) (b) Whether any abnormality observed in these tests. If yes, attach the test reports. (c) What steps were taken to address the abnormality?	:	23/05/2023 Oil leakage attending work
xvi.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	Nil
xvii.	Sequence of events/Description of fault (SOE with time stamp)	:	Mechanical Failure during lifting up from ground after Oil Leakage attending work.
xviii.	Details of protection operated	:	NA
xix.	Details of tests done after failure	:	NA
xx.	Observations (Any relevant observation made by the field staff or during visual inspection)	:	NA
xxi.	Probable cause of failure	:	Mechanical Failure

13. Failure Report of 400 kV Current Transformers at Jetpur Substation, GETCO

i.	Name of Substation	:	400 kV Jetpur Substation
ii.	Utility	:	GETCO
iii.	Faulty Equipment and the associated feeder	:	R Phase CT, 400 kV Jetpur Amreli line-1
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOV etc., as applicable)	:	400 kV Ratio 1000/1
v.	Short circuit withstand current and duration	:	40 kA for 1 Sec
vi.	Make (Original equipment manufacturer)	:	WS
vii.	Serial No.	:	860511
viii.	Date and time of occurrence of fault	:	21/02/2023 at 02:12 hrs.
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	NA
x.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)	:	Clear Sky
xi.	Year of manufacturing	:	1986
xii.	Date of Commissioning	:	20/02/1988
xiii.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	Fail
xiv.	a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities) b) Whether any abnormality observed in these tests. If yes, attach the test reports.	:	Dated 11/02/2023, Water Washing of Bay Equipments, including this CT, No any abnormalities observed.

	What steps were taken to address the abnormality?		
xv.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	NO
xvi.	Sequence of events/Description of fault (SOE with time stamp)	:	This CT only Porcelain Insulator Blast, all internal winding with paper insulation remain intact.
xvii.	Details of protection operated	:	Bus Bar PU:Zone-1, R-Phase, IA-2.734KA, IB-382A, IC-234A, IN-2.102KA Jetpur end: R-Ph. AR optd. 186A &186B optd Amreli End: R-Ph., Dist. 71.2KM IA-2.27KA, Zone-1,
xviii.	Details of tests done after failure	:	NA
xix.	Observations (Any relevant observation made by the field staff or during visual inspection)	:	No
xx.	Probable cause of failure	:	Ageing

14. Failure Report of 220 kV Current Transformers at Pegasus, MSETCL

i.	Name of Substation	:	220 kV Pegasus
ii.	Utility	:	MSETCL
iii.	Faulty Equipment and the associated feeder	:	220 kV Bus Sectionalizer – R- Phase CT
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOV etc., as applicable)	:	220 kV, 2400-1200/1A, 5 Core, VA Burden-20
v.	Short circuit withstand current and duration	:	40 kA for 1 Sec
vi.	Make (Original equipment manufacturer)	:	Indian Transformers Co.(ICT) Ltd
vii.	Serial No.	:	3058-02
viii.	Date and time of occurrence of fault	:	26/10/2022 at 22:21 hrs.
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	Operation
x.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)		clear sky
xi.	Year of manufacturing	:	2013
xii.	Date of Commissioning	:	30.11.2014
xiii.	If OEM was contacted after failure, its recommendation/remark/ report/ MoM	:	No
xiv.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	Beyond repair
xv.	a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities)	:	a) CT Tan Delta Value- 0.49 (Tested on dt 18.12.2021) b) CT Tan Delta Value- 0.51 (Tested on dt 03.03.2018) c) IR (P-E) - 105 GΩ [18.12.2021]

	b) Whether any abnormality observed in these tests. If yes, attach the test reports. What steps were taken to address the abnormality?		
xvi.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	No
xvii.	Sequence of events/Description of fault (SOE with time stamp)	:	CT burst during normal condition on same bay.
xviii.	Details of protection operated	:	Busbar Protection Operated
xix.	Details of tests done after failure	:	No test carried out as CT burst
xx.	Observations (Any relevant observation made by the field staff or during visual inspection)	:	CT burst.
xxi.	Probable cause of failure	:	Due to insulation failure

15. Failure Report of 220 KV Current Transformers at Pegasus of MSETCL

i.	Name of Substation	:	220 kV Pegasus
ii.	Utility	:	MSETCL
iii.	Faulty Equipment and the associated feeder	:	220 kV Bus Sectionalizer - B phase CT
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOV etc., as applicable)	:	220 kV, 2400-1200/1A, 5 Core, VA Burden-20
v.	Short circuit withstand current and duration	:	40 kA for 1 Sec
vi.	Make(Original equipment manufacturer)	:	Indian Transformers Co.(ITC) Ltd
vii.	Serial No.	:	3058-01
viii.	Date and time of occurrence of fault	:	28.10.2022 at 13:49 Hrs
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	Operation
x.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)	:	clear sky
xi.	Year of manufacturing	:	2013
xii.	Date of commissioning	:	30.11.2014
xiii.	If OEM was contacted after failure, its recommendation/remark/ report/ MoM	:	No
xiv.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	Beyond repair
xv.	(a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities) (b) Whether any abnormality observed in these tests. If yes, attach the test reports. (c) What steps were taken to address the abnormality?	:	a) CT Tan Delta Value- 0.46(Tested on dt 27.10.2022) b)CT Tan Delta Value- 0.66(Tested on dt 18.12.2021) c)CT Tan Delta Value- 0.62(Tested on dt 11.01.2020) d)CT Tan Delta Value- 0.70(Tested on dt 03.03.2018)
xvi.	Details of previous failure (Any failure which has led to a	:	No



	major repair of the equipment in the past since its commissioning)		
xvii.	Sequence of events/Description of fault (SOE with time stamp)	:	1) CT burst during normal condition on same bay.
xviii.	Details of protection operated	:	Busbar Protection Operated
xix.	Details of tests done after failure	:	No test carried out as CT burst
xx.	Observations (Any relevant observation made by the field staff or during visual inspection)	:	CT burst.
xxi.	Probable cause of failure	:	Due to insulation failure

16. Failure Report of 220 kV Current Transformers at Kurkumbh Substation of MSETCL

i.	Name of Substation	:	220/132/33 kV Kurkumbh Substation
ii.	Utility	:	MSETCL
iii.	Faulty Equipment and the associated feeder	:	220/132 kV, 200 MVA EMCO ICT HV B- Phase CT.
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOV etc., as applicable)	:	Rated Voltage - 220 kV, 800-400-200/1 A , 5 Core
v.	Short circuit withstand current and duration	:	40 kA for 1 sec
vi.	Make (Original equipment manufacturer)	:	ABB
vii.	Serial No.	:	20323
viii.	Date and time of occurrence of fault	:	09/02/2022 at 07:43 hrs.
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	Operation
x.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)	:	Clear sky
xi.	Date of Commissioning	:	23/03/2000
xii.	Storage condition of equipment if the gap between delivery at site and Commissioning is over 6 months	:	Open Switchyard
xiii.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	Beyond repair

xiv.	a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities) b) Whether any abnormality observed in these tests. If yes, attach the test reports. c) What steps were taken to address the abnormality?	:	On dated -14/12/2021 Nut bolt tightening, cleaning work of CT. On Dated – 25/01/2021 , CT tan delta testing carried out , B Phase CT C=1033 and B Phase CT tan delta value=0.244%, No abnormality found
xv.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	Nil
xvi.	Sequence of events/Description of fault (SOE with time stamp)	:	Suspension string of 220/132 kV, 200 MVA EMCO ICT (Sr. No. HT1455/11936) HV bay burst and B Phase HV CT stud broken on Dt-09.02.2022 at 07:43 hrs. 220/132 kV, 200 MVA EMCO ICT tripped on differential protection. During yard inspection it was observed that B-Phase 220 kV CT mechanically damaged.
xvii.	Details of protection operated	:	Differential protection and Main Bucholz protection of ICT.
xviii.	Details of tests done after failure	:	As CT is mechanically damaged, can not be tested.
xix.	Observations (Any relevant observation made by the field staff or during visual inspection)	:	CT stud broken due to burst of suspension string.
xx.	Probable cause of failure	:	Mechanical damage, suspension string burst and due to heavy jerk, CT stud broke.

17. Failure Report of 400 kV Current Transformers at Khaperkheda Substation of MSETCL

i.	Name of Substation	:	400 kV Khaperkheda Substation
ii.	Utility	:	MSETCL
iii.	Faulty Equipment and the associated feeder	:	R Phase CT of 400/220/33 kV 500 MVA ICT-1 Tie Bay 403
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOV etc., as applicable)	:	420 kV, 2000-1000-500/1A, 5 Core VA burden-20
v.	Short circuit withstand current and duration	:	50 kA for 1 Sec
vi.	Make (Original equipment manufacturer)	:	Mehru Electricals
vii.	Serial No.	:	OC 6346/1/2/16
viii.	Date and time of occurrence of fault	:	24/02/2022 at 03:29 Hrs.
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	Operation
x.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)	:	Clear Sky
xi.	Date of Commissioning	:	27.10.2020 Manufacturing Date-2016, Commissioning Date -2020 (The manufacturing date of CT is 2016. The said CT was received at 400/220 kV Khaperkheda SUBSTATION on Dt.28.05.2018 and since then it was n in inventory of 400/220 kV Khaperkheda SUBSTATION. The CT was commissioned on Dt.26.10.2020 at BAY 403_ICT_1 TIE R PH. CT)
xii.	Storage condition of equipment if the gap between delivery at site and Commissioning is over 6 months	:	Good

xiii.	Present condition of equipment (Repaired / To be repaired / Beyond repair)	:	Beyond Repair
xiv.	a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities) b) Whether any abnormality observed in these tests. If yes, attach the test reports. c) What steps were taken to address the abnormality?	:	Tan Delta and Capacitance taken on Dt. 26.10.2020. Results were found normal. Tan Delta value - 0.14%, Capacitance value - 532.20 pF
xv.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	No previous failure
xvi.	Sequence of events / Description of fault (SOE with time stamp)	:	1) Line Tripped. 2) ICT Tripped. 3) Relay Operations Observed
xvii.	Details of protection operated	:	ICT-1 Tie Bay tripped on instantaneous differential trip A
xviii.	Details of tests done after failure	:	Not applicable
xix.	Observations (Any relevant observation made by the field staff or during visual inspection)	:	CT failed and fell on cable trench
xx.	Probable cause of failure	:	Insulation failure

18. Failure Report of 220 kV Current Transformers at Sarni Switchyard of MPPGCL

i.	Name of Substation	:	220 kV Switchyard, STPS, Sarni
ii.	Utility	:	MPPGCL
iii.	Faulty Equipment and the associated feeder	:	CT (Current Transformer) Bus Coupler Bay
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOV etc., as applicable)	:	Voltage - 220 kV CTR -1200-800/1-1-1-1 VKP - 1400-1400-/- /-1400 Burden - /-/-30-40-/-
v.	Short circuit withstand current and duration	:	26.3 kA for 3 Sec
vi.	Make (Original equipment manufacturer)	:	M/s Lustre Engineering Corporation, Navi Mumbai
vii.	Serial No.	:	LEC - CT - 2-0091
viii.	Date and time of occurrence of fault	:	28/01/2022 at 03:29 hrs
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	during operation
x.	Weather conditions at the time of failure (clear sky/ rainy /thunderstorm etc.)	:	Clear Sky
xi.	Year of manufacturing	:	2020
xii.	Date of Commissioning	:	07/12/2021
xiii.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	beyond repair
xiv.	(a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities) (b) Whether any abnormality observed in these tests. If yes, attach the test	:	NA Since installed CTs are new and Supplied on Sep.-2021



	reports.What steps were taken to address the abnormality?		
xv.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	NA
xvi.	Observations (Any relevant observation made by the field staff or during visual inspection)	:	NA
xvii.	Probable cause of failure	:	Cause could not be found

19. Failure Report of 220 kV Current Transformers at Beawar Substation of RVPNL

i.	Name of Substation	:	01 No. CT got damaged at 220 kV GSS, RVPNL, Beawar
ii.	Utility	:	RVPNL
iii.	Faulty Equipment and the associated feeder	:	220/132 kV 100 MVA Tr-I (CGL)
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOV etc., as applicable)	:	245 kV/150-300-600/5 (4 Core)
v.	Make (Original equipment manufacturer)	:	HBB
vi.	Serial No.	:	IB070342
vii.	Date and time of occurrence of fault	:	13.05.2023
viii.	Fault discovered during (Operation or periodic testing/ maintenance)	:	while in operation
ix.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)	:	Clear Sky
x.	Year of manufacturing	:	1981
xi.	Date of Commissioning	:	06.10.1981
xii.	Storage condition of equipment if the gap between delivery at site and Commissioning is over 6 months	:	Delivery and Commissioning was within 6 months

xiii.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	Completely damaged, beyond repair												
xiv.	(a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities) (b) Whether any abnormality observed in these tests. If yes, attach the test reports. (c) What steps were taken to address the abnormality?	:	Voltage(kV) C(nf) TAN Delta(%) I(mA) <table> <tr> <td>2</td><td>555.3</td><td>2.769</td><td>0.349</td></tr> <tr> <td>5</td><td>555.2</td><td>2.793</td><td>0.87</td></tr> <tr> <td>10</td><td>555.5</td><td>2.850</td><td>1.745</td></tr> </table> (TAN DELTA Test Report on 28.01.2022)	2	555.3	2.769	0.349	5	555.2	2.793	0.87	10	555.5	2.850	1.745
2	555.3	2.769	0.349												
5	555.2	2.793	0.87												
10	555.5	2.850	1.745												
xv.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	NIL												
xvi.	Sequence of events/Description of fault (SOE with time stamp)	:	CT at 220/132 kV 100 MVA Tr-I (Y Phase) Burst, Differential, O/C, E/F @220/132 kV 100 MVA Tr-II, O/C @220/132 kV 100 MVA Tr-III O/C Relay, E/F. @220 kV Ajmer Distance protection operated @220 kV Bhilwara Distance protection operated @220 kV Gulabpura Distance protection operated												
xvii.	Details of protection operated	:	Distance protection Operated, Overcurrent, E/F												
xviii.	Details of tests done after failure	:	NA (Completely DAMAGED)												



xix.	Observations (Any relevant observation made by the field staff or during visual inspection)	:	Fire Brokeout in the yard.
xx.	Probable cause of failure	:	Aging (The Current Transformer has completed its useful life (42 years))

20. Failure Report of 220 kV Current Transformers at Behror Substation of RRVPNL

i.	Name of Substation	:	220 kV Behror Substation
ii.	Utility	:	RRVPNL
iii.	Faulty Equipment and the associated feeder	:	245 kV CT of R Phase 220 kV Behror-PGCIL (Neemrana) Ckt- IST
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOV etc., as applicable)	:	245 kV, 1000/1 A 5 Core
v.	Short circuit withstand current and duration	:	50 kA for 1sec
vi.	Make (Original equipment manufacturer)	:	SCT Limited Ghaziabad
vii.	Serial No.	:	2014/ 604
viii.	Date and time of occurrence of fault	:	18/04/2023 at 18:30 hrs.
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	Nil
x.	Weather conditions at the time of failure (clear sky/ rainy/ thunderstorm etc.)	:	Clear sky
xi.	Year of manufacturing	:	2014
xii.	Date of Commissioning	:	12/12/2015
xiii.	Storage condition of equipment if the gap between delivery at site and Commissioning is over 6 months	:	Received from firm in month of Septemeber 2015 and installed on structure in Septemeber 2015.
xiv.	If OEM was contacted after failure, its recommendation/remark/ report/ MoM	:	Nil
xv.	Present condition of equipment (Repaired/To be repaired / beyond repair)	:	Beyond repair

xvi.	(a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities) (b) Whether any abnormality observed in these tests. If yes, attach the test reports. (c) What steps were taken to address the abnormality?	:	(a) Tan delta taken on 20/02/2020, tan delta 1.068%, capacitance 395.1pf, IR 9.27 Gohm and IR value taken on 27/02/2023 is 3.12 Gohm maintenance carried out periodically such as quarterly, half yearly and yearly on dated 20/02/2020, 15/06/2020, 19/09/2020, 20/12/2020, 04/03/2021, 19/06/2021, 16/09/2021, 25/12/2021, 28/03/2022, 27/06/2022, 27/09/2022, 27/02/2023 (b) No abnormality observed in test reports (c) Nil
xvii.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	Nil
xviii.	Sequence of events/Description of fault (SOE with time stamp)	:	NA
xix.	Details of protection operated	:	M1- Phase A, B, Zone-1, distance 268.6 m, Fault current- 8.517 kA M2 - Phase R, Zone -1, distance- .7 km, Fault current- 10.83 kA
xx.	Details of tests done after failure	:	Nil as CT was Brusted
xxi.	Observations (Any relevant observation made by the field staff or during visual inspection)	:	Nil
xxii.	Probable cause of failure	:	Probabaly Insulation Failure

21. Failure Report of 220 kV Current Transformers at Bansur Substation of RRVPNL

i.	Name of Substation	:	220 kV Bansur Substation
ii.	Utility	:	RRVPNL
iii.	Faulty Equipment and the associated feeder	:	245 kV CT,1000/1A and 220 kV Bansur-Kotputli PGCIL Ckt-Ist
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOV etc., as applicable)	:	1000/1A, 5 Core
v.	Short circuit withstand current and duration	:	Fault Duration - 5.44 ms
vi.	Make (Original equipment manufacturer)	:	SCT Ltd.
vii.	Serial No.	:	2014/590
viii.	Date and time of occurrence of fault	:	16/04/2023 at 12:46 Hrs
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	Burst
x.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)	:	Clear Sky
xi.	Year of manufacturing	:	2014
xii.	Date of Commissioning	:	27/01/2017
xiii.	Storage condition of equipment if the gap between delivery at site and Commissioning is over 6 months	:	NIL
xiv.	If OEM was contacted after failure, its recommendation/ remark/ report/ MoM	:	No
xv.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	Damaged and beyond repair

xvi.	a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities) b) Whether any abnormality observed in these tests. If yes, attach the test reports. What steps were taken to address the abnormality?	:	NO
xvii.	Details of previous failure c) (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	NIL
xviii.	d) Sequence of events/Description of fault (SOE with time stamp)	:	M1 :- Zone 1, Dist.- 19.64 M, Phase - R, Ir - 10.43 kA M2 :- Zone 1, Dist. - 1.6 KM, Phase - R, Ir - 36.49 kA
xix.	e) Details of protection operated	:	Distance protection operated
xxi.	Observations f) (Any relevant observation made by the field staff or during visual inspection)	:	Nil
xxii.	g) Probable cause of failure	:	Probabaly Insulation Failure

22. Failure Report of 220 kV Current Transformers at Khetri Nagar Substation of RVPN

i.	Name of Substation	:	220 kV GSS Khetri Nagar Substation
ii.	Utility	:	RVPN
iii.	Faulty Equipment and the associated feeder	:	220 kV Khetri- Chirawa
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOVetc., as applicable)	:	245 kV
v.	Short circuit withstand current and duration	:	
vi.	Make (Original equipment manufacturer)	:	ABB
vii.	Serial No.	:	17500643
viii.	Date and time of occurrence of fault	:	13/06/2022
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	One Pole Y Phase Busted
x.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)	:	Rainy
xi.	Year of manufacturing	:	Dec-08
xii.	Date of Commissioning	:	17/05/2009
xiii.	Storage condition of equipment if the gap between delivery at site and Commissioning is over 6 months	:	Gap not Over 6 Months
xiv.	If OEM was contacted after failure, its recommendation/ remark/ report/ MoM	:	NO, because it was not in Guarantee Period
xv.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	Beyond repair

xvi.	(a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities) (b) Whether any abnormality observed in these tests. If yes, attach the test reports. What steps were taken to address the abnormality?	:	a) 08/09/2021 No abnormality found
xvii.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	Nil
xviii.	Details of protection operated	:	Relay Indication
xix.	Details of tests done after failure	:	One Pole Y Phase Brusted
xx.	Observations (Any relevant observation made by the field staff during visual inspection)	:	NIL
xxi.	Probable cause of failure	:	Insulation Failure

23. Failure Report of 220 kV Current Transformers at Khetri Nagar of RVPN

i.	Name of Substation	:	220 kV GSS Khetri Nagar Substation
ii.	Utility	:	RVPN
iii.	Faulty Equipment and the associated feeder	:	220 kV Khetri-Dadri II
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOV etc., as applicable)	:	245 kV/200-400-800/5A, 4C
v.	Short circuit withstand current and duration	:	
vi.	Make (Original equipment manufacturer)	:	ABB
vii.	Serial No.	:	IB069853
viii.	Date and time of occurrence of fault	:	30/03/2022
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	Line was healthy but suddenly its R Ph. CT got burst
x.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)	:	Clear Sky
xi.	Year of manufacturing	:	NA
xii.	Date of Commissioning	:	23/11/1984
xiii.	Storage condition of equipment if the gap between delivery at site and Commissioning is over 6 months	:	OLD CT, it was installed since the Commissioning of line therefore can't be ascertained the gap between delivery at the site and commissioning
xiv.	If OEM was contacted after failure, its recommendation/remark/ report/ MoM	:	NO, because it was not in Guarantee period
xv.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	Beyond Repair

xvi.	(a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities) (b) Whether any abnormality observed in these tests. If yes, attach the test reports. (c) What steps were taken to address the abnormality?	:	a) 20/05/2021 IR taken by RVPN result within, limit No abnormality found
xvii.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	NIL
xviii.	Sequence of events/Description of fault (SOE with time stamp)	:	---
xix.	Details of protection operated	:	Relay Indication at Khetri end-: Main-Ist, 21 Pick up AG, Ia: 3.26 kA, Dist 7.40 km, R Sec 0.25 ohm, Xsec 0.24 ohm, Relay 85 X2
xx.	Details of tests done after failure	:	CT got Burt sed
xxi.	Observations (Any relevant observation made by the field staff or during visual inspection)	:	NIL
xxii.	Probable cause of failure	:	Probabaly Insulation Failure
xxiii.	Attach reports of tests during pre-Commissioning, periodic maintenance and after failure; Ph.otograPh.s of the failed equipment etc.	:	IR Value- Y Phase -4.971Gohm

24. Failure Report of 220 kV Current Transformers at Khetri Nagar of RVPN

i.	Name of Substation	:	220 kV GSS Khetri Nagar Substation
ii.	Utility	:	RVPN
iii.	Faulty Equipment and the associated feeder	:	220 kV Khetri-Dadri-I
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOVetc., as applicable)	:	245 kV/1000/5 A, 5 Core
v.	Make (Original equipment manufacturer)	:	Mehru
vi.	Serial No.	:	OC6158/2/11/16
vii.	Date and time of occurrence of fault	:	04/04/2022
viii.	Fault discovered during (Operation or periodic testing/ maintenance)	:	Line was healthy but suddenly its BPhase CT got burst
ix.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)	:	Clear Sky
x.	Year of manufacturing	:	2016
xi.	Date of Commissioning	:	03/06/2016
xii.	Storage condition of equipment if the gap between delivery at site and Commissioning is over 6 months	:	gap not over 6 months
xiii.	If OEM was contacted after failure, its recommendation/ remark/ report/ MoM	:	No because it was not in Gurantee period
xiv.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	Beyond Repair

xv.	(a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities) (b) Whether any abnormality observed in these tests. If yes, attach the test reports. (c) What steps were taken to address the abnormality?	:	a)18/05/2021 IR taken by RVPN result with in limit b)No abnormality found
xvi.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	NIL
xvii.	Sequence of events/Description of fault(SOE with time stamp)	:	---
xviii.	Details of protection operated	:	Relay Indication at Khetri end-: Main-Ist, 21 Pick up CG, 21 Loop CG, 21 Trip 1 Phase C, Ic=10.21 kA Main-II-Ia=1.979 A, IB=0, Ic=516.3 A, F/R=626.4 Ohm, Z-Ist, D=1.503Km, AR Lock out Shot
xix.	Details of tests done after failure	:	CT got Burtsted
xx.	Observations (Any relevant observation made by the field staff orduring visual inspection)	:	NIL
xxi.	Probable cause of failure	:	Probabaly Insulation Failure
xxii.	Attach reports of tests during pre-Commissioning, periodic maintenance and after failure; Photographs of the failed equipment etc.	:	IR value- B Phase 24.14 G Ohm

25. Failure Report of 220 kV Current Transformers at Khetri Nagar, RVPN

i.	Name of Substation	:	220 kV GSS Khetri Nagar Substation
ii.	Utility	:	RVPN
iii.	Faulty Equipment and the associated feeder	:	220 kV Khetri-Chirawa
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOVetc., as applicable)	:	245 kV/1000/5 A, 5 Core
vi.	Make (Original equipment manufacturer)	:	Mehru
vii.	Serial No.	:	OC5344/2/14/14
viii.	Date and time of occurrence of fault	:	29/04/2022
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	Line was healthy but suddenly its Y- Phase CT got burst
x.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)	:	Clear Sky
xi.	Year of manufacturing	:	2014
xii.	Date of Commissioning	:	01/07/2015
xiii.	Storage condition of equipment if the gap between delivery at site and Commissioning is over 6 months	:	Gap not Over 6 Months
xiv.	If OEM was contacted after failure, its recommendation/ remark/ report/ MoM	:	No because it was not in G.P.
xv.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	Beyond Repair

xvi.	(a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities) (b) Whether any abnormality observed in these tests. If yes, attach the test reports. What steps were taken to address the abnormality?	:	a) 08/09/2021 IR taken by RVPN result with in limit No abnormality found
xvii.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	NIL
xix.	Details of protection operated	:	Relay Indication at Khetri end:- Main- Ist, 21 Pick up CG, 21Loop CG, 21 Trip 1 Phase B, Ib= KA Zone-I, Dist=- 2.2 Km Main-II- Ia=220.3A, IB=8.00KA, Ic=107.5A, Van=30.38 KV, Vbn= 109.1KV, Vcn= 184.7 KV F/R=14.30 Ohm, Z-Ist, Dist.= 6.4 Km.
xx.	Details of tests done after failure	:	CT got burtshed
xxi.	Observations (Any relevant observation made by the field staff orduring visual inspection)	:	NIL
xxii	Probable cause of failure	:	Probabaly Insulation Failure
xxiii	Attach reports of tests during pre-Commissioning,periodic maintenance and after failure; Ph.otograPh.s of the failed equipment etc.	:	IR Value Y- Phase- 23.19 G Ohm

26. Failure Report of 220 kV Current Transformers at RVPN Barmer Substation of RVPN

i.	Name of Substation	:	400 kV GSS Barmer Substation
ii.	Utility	:	RVPN
iii.	Faulty Equipment and the associated feeder	:	220 kV CT of both Ckt
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOV etc., as applicable)	:	220 kV, 800/400/1A
v.	Short circuit withstand current and duration	:	DIST PROT. OPTD
vi.	Make (Original equipment manufacturer)	:	SCT Limited
vii.	Serial No.	:	2008/963-R
viii.	Date and time of occurrence of fault	:	10/04/2022 at 20:29 hrs
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	Operation
x.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)	:	Clear Sky
xi.	Year of manufacturing	:	2008
xii.	Date of Commissioning	:	20/03/2009
xiii.	Storage condition of equipment if the gap between delivery at site and Commissioning is over 6 months	:	Reasored / installed within 02 days
xiv.	If OEM was contacted after failure, its recommendation/remark/ report/ MoM	:	---

xv.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	Beyond repair
xvi.	(a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities) (b) Whether any abnormality observed in these tests. If yes, attach the testreports. (c) What steps were taken to address the abnormality?	:	Bay maintenance was carried out in the month of Dec -2021
xvii.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	Nil
xviii.	Sequence of events/Description of fault (SOE with time stamp)	:	ZONE -I, B Phase Distance Protection Operated
xix.	Details of protection operated	:	ZONE -I, B Phase Distance Protection Operated
xx.	Details of tests done after failure	:	Yes
xxi.	Observations (Any relevant observation made by the field staff or during visual inspection)	:	internal fault
xxii.	Probable cause of failure	:	Probabaly Insulation Failure

27. Failure Report of 220 kV Current Transformers at RVPN Barmer Substation of RVPN

i.	Name of Substation	:	400 kV GSS Barmer Substation
ii.	Utility	:	RVPN
iii.	Faulty Equipment and the associated feeder	:	220 kV CT of both Ckt
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOV etc., as applicable)	:	220 kV, 800/400/1A
v.	Short circuit withstand current and duration	:	DIST PROT. OPTD
vi.	Make (Original equipment manufacturer)	:	SCT Limited
vii.	Serial No.	:	2008/967-R
viii.	Date and time of occurrence of fault	:	15/04/2023 at 20:48 hrs
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	Operation
x.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)	:	Clear Sky
xi.	Year of manufacturing	:	2008
xii.	Date of Commissioning	:	20/03/2009
xiii.	Storage condition of equipment if the gap between delivery at site and Commissioning is over 6 months	:	Reasored / installed within 02 days
xiv.	If OEM was contacted after failure, its recommendation/remark/ report/ MoM	:	0
xv.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	Beyond repair

xvi.	(d) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities) (e) Whether any abnormality observed in these tests. If yes, attach the test reports. (f) What steps were taken to address the abnormality?	:	Bay maintenance was carried out in the month of Dec -2021
xvii.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	Nil
xviii.	Sequence of events/Description of fault (SOE with time stamp)	:	ZONE -I, Y Phase Distance Protection Operated
xix.	Details of protection operated	:	ZONE -I, Y Phase Distance Protection Operated
xx.	Details of tests done after failure	:	Yes
xxi.	Observations (Any relevant observation made by the field staff or during visual inspection)	:	Internal Fault
xxii.	Probable cause of failure	:	Internal Fault

28. Failure Report of 220 kV Current Transformers at Bikaner Substation of RVPN

i.	Name of Substation:-	:	220 kV GSS Bikaner
ii.	Utility :	:	RVPN
iii.	Faulty Equipment and the associated feeder	:	CT
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOV etc., as applicable)	:	800-400-200/1 A-5 Core
v.	Short circuit withstand current and duration	:	40 kA for 1sec
vi.	Make (Original equipment manufacturer)	:	SCT
vii.	Serial No.	:	2003/249
viii.	Date and time of occurrence of fault	:	19/04/2022
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	Due to internal fault in the running condition
x.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)	:	Clear Sky
xi.	Year of manufacturing	:	2003 and 2009
xii.	Date of Commissioning	:	17/12/2004
xiii.	Storage condition of equipment if the gap between delivery at site and Commissioning is over 6 months	:	Nil
xiv.	If OEM was contacted after failure, its recommendation/remark/report/ MoM	:	Nil
xv.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	Beyond repair

xvi.	(a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities) (b) Whether any abnormality observed in these tests. If yes, attach the test reports. (c) What steps were taken to address the abnormality?	:	25/03/2022
xvii.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	NIL
xviii.	Sequence of events/Description of fault (SOE with time stamp)	:	220 kV CT installed at 220 kV GSS Interconnector-I with Sr. No.2003/249 failed and burned with fault indication as Distance Protection, 86 Relay. CT was replaced with same make old CT as available at 220 kV GSS Nokha.
xix.	Details of protection operated	:	Distance Protection.
xx.	Details of tests done after failure	:	Tests were carried out By MPT & SW
xxi.	Observations (Any relevant observation made by the field staff or during visual inspection)	:	Nil
xxii.	Probable cause of failure	:	Probabaly Insulation Failure

29. Failure Report of 220 kV Current Transformers at Bikaner Substation of RVPN

i.	Name of Substation:-	:	220 kV GSS Bikaner
ii.	Utility :	:	RVPN
iii.	Faulty Equipment and the associated feeder	:	CT
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOV etc., as applicable)	:	800-400-200/1 A-5 Core
v.	Short circuit withstand current and duration	:	40 kA for 1sec
vi.	Make (Original equipment manufacturer)	:	SCT
vii.	Serial No.	:	2009/647
viii.	Date and time of occurrence of fault	:	20/04/2022
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	Due to internal fault in the running condition
x.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)	:	Clear Sky
xi.	Year of manufacturing	:	2003 and 2009
xii.	Date of Commissioning	:	20/04/2022
xiii.	Storage condition of equipment if the gap between delivery at site and Commissioning is over 6 months	:	Nil
xiv.	If OEM was contacted after failure, its recommendation/remark/ report/ MoM	:	Nil
xv.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	Beyond repair
xvi.	(a) Details of previous maintenance (Activities carried out in previous maintenance including	:	220 kV CT installed at 220 kV GSS Interconnector-I with Sr. No.2003/249 failed and burned with fault indication as Distance Protection, 86 Relay. CT was replaced with same make old CT as available at 220 kV GSS Nokha and after testing by MPT&s installed

	the tests conducted, periodicity of the maintenance activities) (b) Whether any abnormality observed in these tests. If yes, attach the test reports. (c) What steps were taken to address the abnormality?		on dtd 19/04/2022 at 18:55 hrs. CT with serial no. 2009/647 again failed with blast with fault indication as B Phase, Z-I, DIST 1.8 km.
xvii.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	NIL
xviii.	Sequence of events/Description of fault (SOE with time stamp)	:	220 kV CT installed at 220 kV GSS Interconnector-I with Sr. No.2003/249 failed and burned with fault indication as Distance Protection, 86 Relay. CT was replaced with same make old CT as available at 220 kV GSS Nokha and after testing by MPT&s installed on dtd 19/04/2022 at 18:55 hrs. CT with serial no. 2009/647 again failed with blast with fault indication as B Phase, Z-I, DIST 1.8 km.
xix.	Details of protection operated	:	Distance Protection.
xx.	Details of tests done after failure	:	Tests Were Carried Out By MPT & SW
xxi.	Observations (Any relevant observation made by the field staff or during visual inspection)	:	Nil
xxii.	Probable cause of failure	:	Probabaly Insulation Failure

30. Failure Report of 220 kV Current Transformers at Suratgarh Substation of RRVPNL

i.	Name of Substation	:	220 kV GSS Suratgarh Substation
ii.	Utility	:	RRVPNL
iii.	Faulty Equipment and the associated feeder	:	220 kV Suratgarh-Bikaner Line
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOV etc., as applicable)	:	245 kV
vi.	Make (Original equipment manufacturer)	:	WSI
vii.	Serial No.	:	960433
viii.	Date and time of occurrence of fault	:	16/03/2023 at 23:52 hrs.
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	---
x.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)	:	Clear Sky
xi.	Year of manufacturing	:	1996
xii.	Date of Commissioning	:	21/01/1996
xv.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	---
xvi.	(a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities) (b) Whether any abnormality observed in these tests. If yes, attach the testreports. (c) What steps were taken to address the abnormality?	:	---

xvii.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	
xviii.	Sequence of events/Description of fault (SOE with time stamp)	:	CT got Burst
xix.	Details of protection operated	:	Distance Protection 0.2 km Zone 1 (MAIN-I)
xx.	Details of tests done after failure	:	---
xxi.	Observations (Any relevant observation made by the field staff or during visual inspection)	:	---
xxii.	Probable cause of failure	:	Probabaly Insulation Failure

31. Failure Report of 400 kV Current Transformers at Heerapura Substation of RVPNL

i.	Name of Substation	:	400 kV GSS Heerapura Substation
ii.	Utility	:	RVPNL
iii.	Faulty Equipment and the associated feeder	:	400 kV CT 400/220 kV, 315 MVA ILT-4
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOV etc., as applicable)	:	2000-1000-500/1 A, 5 Core
v.	Short circuit withstand current and duration	:	40 kA for 1 sec
vi.	Make (Original equipment manufacturer)	:	ALSTOM
vii.	Serial No.	:	20030237,
viii.	Date and time of occurrence of fault	:	05/05/2023
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	Operation
x.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)	:	clear sky
xi.	Year of manufacturing	:	2003
xii.	Date of Commissioning	:	05/02/2004
xiii.	If OEM was contacted after failure, its recommendation/remark/ report/ MoM	:	NIL
xiv.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	Beyond Repair.
xv.	Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities)	:	01/03/2023

	Whether any abnormality observed in these tests. If yes, attach the test reports. What steps were taken to address the abnormality?		
xvi.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	NA
xvii.	Sequence of events/Description of fault (SOE with time stamp)	:	R Phase CT Burst due to internal fault and damaged all 3 Poles of CB
xviii.	Details of protection operated	:	67A, 186, Trans.prot.87, 2/50Z (time LBB) Buch/wdy temp K1 170X,195AC,195BC,195CC,295A C,295BC,295CC,286X, Low A/R,S F6 30X/Y, B/B PROT ZONE A-87 (87AA,87AB,87AC) 386,80X.
xix.	Details of tests done after failure	:	---
xx.	Observations (Any relevant observation made by the field staff or during visual inspection)	:	R-Phase CT Burst due to internal fault and damaged Y and BPhase CT (S.No. 20030232, 20030238)
xxi.	Probable cause of failure	:	Probabaly Insulation Failure

32. Failure Report of 400 kV Current Transformers at Heerapura Substation of RVPN

i.	Name of Substation	:	400 kV GSS Heerapura Substation
ii.	Utility	:	RVPN
iii.	Faulty Equipment and the associated feeder	:	01 Nos. 220 kV CT of 220 kV Bus Sectionalizer No.1(D-A) B-Phase
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOV etc., as applicable)	:	1000- 2000/1 A, 5 Core
v.	Short circuit withstand current and duration	:	31.5 kA for 1 sec
vi.	Make (Original equipment manufacturer)	:	WSI
vii.	Serial No.	:	861118
viii.	Date and time of occurrence of fault	:	01/01/2022
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	Operation
x.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)	:	clear sky
xi.	Year of manufacturing	:	1986
xii.	Date of Commissioning	:	05/12/1986
xiii.	Storage condition of equipment if the gap between delivery at site and commi Substation oning is over 6 months	:	NA
xiv.	If OEM was contacted afterm failure,its recommendation/remark/ report/ MoM	:	NIL
xv.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	Beyond repair
xvi.	a) Details of previous maintenance (Activities carried out in previous maintenance including the tests	:	07/12/2021

	conducted, periodicity of the maintenance activities) b) Whether any abnormality observed in these tests. If yes, attach the test reports. c) What steps were taken to address the abnormality?		
xvii.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	NA
xviii.	Sequence of events/Description of fault (SOE with time stamp)	:	NA
xix.	Details of protection operated	:	Nil
xx.	Details of tests done after failure	:	
xxi.	Observations (Any relevant observation made by the field staff or during visual inspection)	:	Abnormal Sound
xxii.	Probable cause of failure	:	Probabaly Insulation Failure

33. Failure Report of 220 kV Current Transformers at Heerapura Substation of RVPN

i.	Name of Substation	:	220 kV GSS, Heerapura Substation
ii.	Utility	:	RVPN
iii.	Faulty Equipment and the associated feeder	:	220 kV HPR- NIWANA BAY
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOV etc., as applicable)	:	220 kV, Ratio: 1000/5 A, 5 Core
v.	Short circuit withstand current and duration	:	40 kA at 1sec
vi.	Make (Original equipment manufacturer)	:	Mehru Electricals
vii.	Serial No.	:	6158/2/3/15
viii.	Date and time of occurrence of fault	:	30/09/2022 at 05:08 Hrs
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	Burst During Normal Running Condition
x.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)	:	Clear Sky
xi.	Year of manufacturing	:	2015
xii.	Date of Commissioning	:	28/06/2018
xiii.	Storage condition of equipment if the gap between delivery at site and commissioning is over 6 months	:	---
xiv.	If OEM was contacted after failure, its recommendation/remark/ report/ MoM	:	---
xv.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	Beyond Repair
xvi.	(a) Details of previous maintenance (Activities carried out in previous maintenance including the tests)	:	Maintenance & Testing Done as per Schedule

	conducted, periodicity of the maintenance activities) (b) Whether any abnormality observed in these tests. If yes, attach the test reports. (c) What steps were taken to address the abnormality?		
xvii.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	---
xviii.	Sequence of events/Description of fault (SOE with time stamp)	:	---
xix.	Details of protection operated	:	Distance Relay operated: Main-I: A-Phase, Zone-I, Dist: 400.8 KM Main-II: A-Phase, Zone-I, Dist: 0 KM
xx.	Details of tests done after failure	:	---
xxi.	Observations (Any relevant observation made by the field staff or during visual inspection)	:	---
xxii.	Probable cause of failure	:	Probabaly Insulation Failure

34. Failure Report of 220 kV Current Transformers at Sitapura Substation of RVPNL

i.	Name of Substation	:	220 kV GSS Sitapura Substation
ii.	Utility	:	RVPNL
iii.	Faulty Equipment and the a Substation ociated feeder	:	CT, 220 kV Sitapura-Sanganer Line
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOV etc., as applicable)	:	245 kV, 1000 A, 1000/1 A, 536.1
v.	Short circuit withstand current and duration	:	40 kA for 1 sec
vi.	Make (Original equipment manufacturer)	:	SCT Ltd.
vii.	Serial No.	:	2011/0394
viii.	Date and time of occurrence of fault	:	20/03/2022
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	21M2, 21M1 ,86A&B, Bus Bar Protection operated
x.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)	:	clear sky
xi.	Year of manufacturing	:	2011
xii.	Date of Commissioning	:	31/03/2015
xiii.	Storage condition of equipment if the gap between delivery at site and Commissioning is over 6 months	:	ACOS(T&C), Heerapura
xiv.	If OEM was contacted after failure, its recommendation/remark/ report/ MoM	:	NA
xv.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	beyond repair
xvi.	(a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities)	:	11/01/2015



	(b) Whether any abnormality observed in these tests. If yes, attach the test reports. (c) What steps were taken to address the abnormality?		
xvii.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	NA
xviii.	Sequence of events/Description of fault (SOE with time stamp)	:	
xix.	Details of protection operated	:	21M2, 21M1 ,86 A&B, Bus bar Protection Poerated
xx.	Details of tests done after failure	:	NA
xxi.	Observations (Any relevant observation made by the field staff or during visual inspection)	:	BRUNT
xxii.	Probable cause of failure	:	Probabaly Insulation Failure

35. Failure Report of 220 kV Current Transformers at Chaksu Substation of RVPNL

i.	Name of Substation	:	220 kV GSS, RVPNL, Chaksu
ii.	Utility	:	RVPNL
iii.	Faulty Equipment and the associated feeder	:	220 kV CT –Y Phase, 220/132 kV 160 MVA IMP Transformer
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOV etc., as applicable)	:	220 kV, 400-800/1 A, 5 Core
v.	Short circuit withstand current and duration	:	40 kA for 1 sec
vi.	Make (Original equipment manufacturer)	:	SCT Limited Gaziabad(UP)
vii.	Serial No.	:	2012/2325
viii.	Date and time of occurrence of fault	:	21/03/2022 at 03:13 hrs.
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	
x.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)	:	Clear sky
xi.	Year of manufacturing	:	2012
xii.	Date of Commissioning	:	24/10/2013
xiii.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	Beyond repair

xiv.	(a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities) (b) Whether any abnormality observed in these tests. If yes, attach the test reports. (c) What steps were taken to address the abnormality?	:	1. Previous Maintenance dated 15/02/2022 2. Testing on dt 28/12/2020 At 5 kV Cap(PF)-306.2 Tan Delta-0.0117 at 10 kV Cap(PF)-306.2 Tan Delta-0.0117
xv.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	NIL
xvi.	Sequence of events/Description of fault (SOE with time stamp)	:	CT got burst
xvii.	Details of protection operated	:	Differential protection operated; Bus bar protection operated
xviii.	Details of tests done after failure	:	NIL
xix.	Observations (Any relevant observation made by the field staff or during visual inspection)	:	No
xxii.	Probable cause of failure	:	Probabaly Insulation Failure

36. Failure Report of 220 kV Current Transformers at Chaksu Substation of RVPNL

i.	Name of Substation	:	220 kV GSS, RVPNL, Chaksu
ii	Utility	:	RVPNL
iii.	Faulty Equipment and the associated feeder	:	220 kV CT -Y Phase, 220 kV Goner feeder
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOV etc., as applicable)	:	220 kV, 400-800/1 A, 5 Core
v.	Short circuit withstand current and duration	:	40KA for 1 sec
vi.	Make (Original equipment manufacturer)	:	SCT Limited Gaziabad(UP)
vii.	Serial No.	:	2012/2331
viii.	Date and time of occurrence of fault	:	21/05/2022 at 09:25 Hrs
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	High tan delta Value
x.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)	:	Clear sky
xi	Year of manufacturing	:	2012
xii	Date of Commissioning	:	24/10/2013
xiii.	Storage condition of equipment if the gap between delivery at site and Commissioning is over 6 months	:	NA
xiv.	If OEM was contacted after failure, its recommendation/remark/ report/ MoM	:	NA
xv	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	Beyond repair

xvi.	a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities) b) Whether any abnormality observed in these tests. If yes, attach the test reports. c) What steps were taken to address the abnormality?	:	1.Previous Maintenance dt 16/03/2022 2.Testing on dt 16.03.2021 at 5 kV Cap(PF)-298.7 Tan Delta-0.0305 at 10 kV Cap(PF)-298.7 Tan Delta-0.0315
xvii.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	NIL
xviii.	Sequence of events/Description of fault (SOE with time stamp)	:	CT got burst
xix	Details of protection operated	:	Differential protection operated, Bus bar protection operated
xx.	Details of tests done after failure	:	NIL
xxi.	Observations (Any relevant observation made by the field staff or during visual inspection)	:	No
xxii.	Probable cause of failure	:	Probabaly Insulation Failure

37. Failure Report of 220 kV Current Transformers at Chaksu Substation of RVPNL

i.	Name of Substation	:	220 kV S/S, RVPNL, Chaksu
ii.	Utility	:	RVPNL
iii.	Faulty Equipment and the associated feeder	:	220 kV CT -R Phase, 220 kV Gonerfeeder
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOV etc., as applicable)	:	220 kV, 400-800/1 A, 5 Core
v.	Short circuit withstand current and duration	:	40 kA for 1 sec
vi.	Make (Original equipment manufacturer)	:	SCT Limited Gaziabad(UP)
vii.	Serial No.	:	2012/2329
viii.	Date and time of occurrence of fault	:	22/03/2022 at 02:48 Hrs
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	High tan delta Value
x.	Weather conditions at the time of failure (clear sky/ rainy /thunderstorm etc.)	:	Clear sky
xi.	Year of manufacturing	:	2012
xii.	Date of Commissioning	:	24/10/2013
xiii.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	Beyond repair

xiv.	(a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities) (b) Whether any abnormality observed in these tests. If yes, attach the test reports. (c) What steps were taken to address the abnormality?	:	1.Previous Maintenance dt 16/03/2022 2.Testing on dt 16/03/2021 At 5 kV Cap(PF)-294.3 Tan Delta-0.0292 At 10 kV Cap(PF)-294.3 Tan Delta-0.0303
xv.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	NIL
xvi.	Sequence of events/Description of fault (SOE with time stamp)	:	CT got burst
xvii.	Details of protection operated	:	Differential protection operated, Bus bar protection operated
xviii.	Details of tests done after failure	:	NIL
xix.	Observations (Any relevant observation made by the field staff or during visual inspection)	:	No
xx.	Probable cause of failure	:	Probabaly Insulation Failure

38. Failure Report of 220 kV Current Transformers at Phulera Substation of RVPNL

i.	Name of Substation	:	220 kV GSS, RVPNL Phulera
ii.	Utility	:	RVPNL
iii.	Faulty Equipment and the associated feeder	:	220 kV CT (Y Phase) of 220 kV Kishangarh Bay
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOVetc., as applicable)	:	245 KV, 400-800/1 A, 5 core
v.	Short circuit withstand current and duration	:	40 kA (RMS) for 1 sec
vi.	Make (Original equipment manufacturer)	:	SCT
vii.	Serial No.	:	2003/257
viii.	Date and time of occurrence of fault	:	01/05/2022 at 09:25 hrs.
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	Emergency Break Down/Internal fault
x.	Weather conditions at the time of failure (clear sky/ rainy /thunderstorm etc.)	:	CLEAR
xi.	Year of manufacturing	:	2003
xii.	Date of Commissioning	:	29/10/2005
xiii.	Storage condition of equipment if the gap between delivery at site and Commissioning is over 6 months	:	Spare CT was available in GSS Store & was replaced
xiv.	If OEM was contacted after failure, its recommendation/remark/ report/ MoM	:	N
xv.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	New CTs ratio 1000/1, 5 core with Serial No. OC6158/1/144/16, OC 6158/1/188/16, OC 6158/1/189/16 was installed by replacing all the old and burnt Y Phase CTs

xvi.	(a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities) (b) Whether any abnormality observed in these tests. If yes, attach the test reports. (c) What steps were taken to address the abnormality?	:	NO
xvii.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	NO
xviii.	Sequence of events/Description of fault (SOE with timestamp)	:	NA
xix.	Details of protection operated	:	Distance Protected Operated and CT got burst during Transient Fault at 3.753 km occurred on 220 kV Kishangarh-Phulera Line
xx.	Details of tests done after failure	:	NO
xxi.	Observations (Any relevant observation made by the field staff or during visual inspection)	:	CT got burnt
xxii.	Probable cause of failure	:	Probabaly Insulation Failure

39. Failure Report of 220 kV Current Transformers at Kuchaman City Substation of RVPNL

i.	Name of Substation	:	220 kV GSS Kuchaman City
ii.	Utility	:	RVPNL
iii.	Faulty Equipment and the associated feeder	:	220 kV CT of 220 kV Makrana Feeder
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOV etc., as applicable)	:	245 kV/ 800-400-200/1-1-1-1-1
v.	Make (Original equipment manufacturer)	:	40 kA for 1 Sec
vi.	Serial No.	:	SCT limited
vii.	Date and time of occurrence of fault	:	2003/237
viii.	Fault discovered during (Operation or periodic testing/ maintenance)	:	26/05/2023 at 05:54 hrs.
ix.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)	:	Thunderstorm
x.	Year of manufacturing	:	1999
xi.	Date of Commissioning	:	28/03/2001
xii.	Storage condition of equipment if the gap between delivery at site and Commissioning is over 6 months	:	
xiii.	If OEM was contacted after failure, its recommendation/ remark/ report/ MoM	:	Nil
xiv.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	Nil
xv.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	Nil
xvi.	Sequence of events/Description of fault (SOE with time stamp)	:	Distance Protection 0 km



xvii.	Details of protection operated	:	Nil
xviii.	Details of tests done after failure	:	Replaced by another CT
xix.	Observations (Any relevant observation made by the field staff or during visual inspection)	:	Nil
xx.	Probable cause of failure	:	Probabaly Insulation Failure

40. Failure Report of 400 kV Current Transformers at Merta City Substation of RVPNL

i.	Name of Substation	:	400 kV GSS, Merta City
ii.	Utility	:	RVPNL
iii.	Faulty Equipment and the associated feeder	:	400 kV 2000-1000-500/1 A, 5 Core Current Transformer 6 TB CT (R Phase) of 652 T CB
iv.	Rating (Voltage/ current/current ratio/ capacitance/ MCOV etc., as applicable)	:	420 kV
v.	Short circuit withstand current and duration	:	-
vi.	Make (Original equipment manufacturer)	:	Crompton Greaves
vii.	Serial No.	:	31034
viii.	Date and time of occurrence of fault	:	26/05/2023 at 16:18 hrs
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	Operating mode
x.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)	:	clear sky
xi.	Year of manufacturing	:	2007
xii.	Date of Commissioning	:	01/05/2008
xiii.	If OEM was contacted after failure, its recommendation/remark/ report/ MoM	:	NO
xiv.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	Beyond Repair
xv.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	NO
xvi.	Sequence of events/Description of fault (SOE with time stamp)	:	R Phase CT of 6 CT burst (Tie CT) at 400 kV GSS Merta, one R-Phase pole of 652 tie



			Crcuit Breaker 652, Tie CB of reactor heerapura bay also damaged.
xvii.	Details of protection operated	:	Differential R Phase Relay Operated; high impedance relay Operated.
xviii.	Details of tests done after failure	:	NA
xix.	Observations (Any relevant observation made by the field staff or during visual inspection)	:	
xx.	Probable cause of failure	:	Probabaly Insulation Failure

41. Failure Report of 220 kV Current Transformers at Ratangarh Substation of RVPNL

i.	Name of Substation-	:	220 kV GSS Ratangarh
ii.	Utility-	:	RVPNL
iii.	Faulty Equipment and the associated feeder-	:	220 kV CT / 220 kV Laxmangarh bay
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOV etc., as applicable)-	:	400-800/5 A, 5 Core
v.	Short circuit withstand current and duration-	:	40 kA for 1 sec
vi.	Make (Original equipment manufacturer)-	:	Universal Magnoflux
vii.	Serial No.-	:	15457
viii.	Date and time of occurrence of fault-	:	13/04/2023 at 19:42 hrs
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	NA
x.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)-	:	Clear Sky
xi.	Year of manufacturing-	:	2010
xii.	Date of Commissioning-	:	Initially installed at 220/132 kV, 100 MVA Transformer-I on dated 20/05/2016 (Transformer dismantled in the year 2018). Then the CT again installed at 220 kV Laxmangarh bay on dated 18/09/2019.
xiii.	Storage condition of equipment if the gap between delivery at site and Commissioning is over 6 months	:	NA
xiv.	If OEM was contacted after failure, its recommendation/ remark/ report/ MoM	:	NA

xv.	Present condition of equipment (Repaired/ To be repaired / beyond repair)-	:	Beyond Repair
xvi.	(a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities)- Test (b) Whether any abnormality observed in these tests. If yes, attach the test reports. (c) What steps were taken to address the abnormality?	:	IR taken on dated 03/03/2023. R Phase CT, IR value- 1.21 G Ω
xvii.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	NA
xviii.	Sequence of events/Description of fault (SOE with time stamp)	:	
xix.	Details of protection operated	:	Fault Trip, Distance Protection operated and tripped Phase R, Y, B. Z4, Location - 0.2 km
xx.	Details of tests done after failure	:	Damaged
xxi.	Observations (Any relevant observation made by the field staff or during visual inspection)	:	NIL
xxii.	Probable cause of failure	:	Probabaly Insulation Failure

42. Failure Report of 220 kV Current Transformers at Dhod Substation of RVPNL

i.	Name of Substation:-	:	220 kV GSS Dhod
ii.	Utility	:	RVPNL
iii.	Faulty Equipment and the associated feeder:-	:	Current Transformer, 220 kV Dhod - Danta Bay
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOV etc., as applicable):-	:	245 KV, 400-800/1 A
v.	Short circuit withstand current and duration	:	40 KA for 1 sec.
vi.	Make (Original equipment manufacturer):-	:	SCT
vii.	Serial No.:-	:	1146
viii.	Date and time of occurrence of fault :-	:	05/04/2022 at 22:08 Hrs.
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	Operation
x.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.): CLEAR	:	Clear Sky
xi.	Year of manufacturing:-	:	2010
xii.	Date of Commissioning	:	04/08/2011
xiii.	Storage condition of equipment if the gap between delivery at site and Commissioning is over 6 months	:	NA
xiv.	If OEM was contacted after failure, its recommendation/ remark/ report/ MoM	:	NA
xv.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	Beyond Repair (Completely Damage)

xvi.	Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities) Whether any abnormality observed in these tests. If yes, attach the test reports. What steps were taken to address the abnormality?	:	1. Check Oil level 2. Cleaning the MK/Junction Box and Tightening the Terminal 3. Cleaning terminal box and tightening the terminals 4. Tightening of primary clamp, jumper etc. 5. Cleaning of bushing and checking it for cracks.
xvii.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	NA
xviii.	Sequence of events/Description of fault (SOE with time stamp)	:	220 kV Dhod –Danta Bay B Phase CT burst and damaged at 22:08 hrs on dated 05/04/2022
xix.	Details of protection operated	:	Bus Bar Protection Operated
xx.	Details of tests done after failure	:	CT Completely Damaged
xxi.	Observations (Any relevant observation made by the field staff or during visual inspection)	:	CT Burnt
xxii.	Probable cause of failure	:	Probabaly Insulation Failure

43. Failure Report of 220 kV Current Transformers at Debari Substation of RVPNL

i.	Name of Substation	:	220 kV GSS, Debari
ii.	Utility	:	RVPNL
iii.	Faulty Equipment and the associated feeder	:	220 kV CT of RAPP "A" Bay
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOV etc., as applicable)	:	245 kV, 800-400/1A
v.	Short circuit withstand current and duration	:	NA
vi.	Make (Original equipment manufacturer)	:	SCT Ltd.
vii.	Serial No.	:	2011-119
viii.	Date and time of occurrence of fault	:	10/05/2023 at 22.55 hrs.
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	No
x.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)	:	Clear Sky, Hot Summer
xi.	Year of manufacturing	:	2011
xii.	Date of Commissioning	:	16/09/2011
xiii.	Storage condition of equipment if the gap between delivery at site and Commissioning is over 6 months	:	No
xiv.	If OEM was contacted after failure, its recommendation/ remark/ report/ MoM	:	No
xv.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	Damaged
xvi.	(a) Details of previous maintenance	:	No abnormality was observed

	(Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities) (b) Whether any abnormality observed in these tests. If yes, attach the test reports. What steps were taken to address the abnormality?		
xvii.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	No
xviii.	Sequence of events/Description of fault (SOE with time stamp)	:	Distance Protection Operatd M-I, R-Phase IL1=0.43KA, IL2=0.30KA, IL3=0.64KAM-II, R-Phase, D=-3.7KM
xix.	Details of protection operated	:	Distance Protection Operatd M-I, R-Phase IL1=0.43KA, IL2=0.30KA, IL3=0.64KA
xx.	Details of tests done after failure	:	Completely damaged
xxi.	Observations (Any relevant observation made by the field staff or during visual inspection)	:	CT completely damaged and not repairable
xxii.	Probable cause of failure	:	Probabaly Insulation Failure
xviii.	Sequence of events/Description of fault (SOE with time stamp)	:	Distance Protection Operatd M-I, R-Phase IL1=0.43KA, IL2=0.30KA, IL3=0.64KAM-II, R-Phase, D=-3.7KM

44. Failure Report of 220 kV Current Transformers at Satna Substation, MPPTCL

i.	Name of Substation	:	220 kV Satna Substation
ii.	Utility	:	MPPTCL
iii.	Faulty Equipment and the associated feeder	:	CT of B Phase of 220 kV Satna Katni feeder
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOVetc., as applicable)	:	220 kV, 800/1-1-1-1-1
v.	Short circuit withstand current and duration	:	40 kA for 1 Sec,
vi.	Make (Original equipment manufacturer)	:	SCT Limited
vii.	Serial No.	:	2010/1895
viii.	Date and time of occurrence of fault	:	20/05/2023
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	NA
x.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)	:	Clear
xi.	Year of manufacturing	:	2010
xii.	Date of Commissioning	:	11/11/2022
xiii.	Storage condition of equipment if the gap between delivery at site and Commissioning is over 6 months	:	No
xiv.	If OEM was contacted after failure, its recommendation/ remark/ report/ MoM	:	NA
xv.	Present condition of equipment	:	Beyond repair

	(Repaired/ To be repaired / beyond repair)		
xvi.	(a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities) (b) Whether any abnormality observed in these tests. If yes, attach the test reports. (c) What steps were taken to address the abnormality?	:	No abnormality was seen
xvii.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	NA
xviii.	Details of protection operated	:	Bus bar operated
xix.	Details of tests done after failure	:	NA
xx.	Probable cause of failure	:	Probabaly Insulation Failure

45. Failure Report of 220 kV Current Transformers at Shujalpur Substation of MPPTCL

i.	Name of Substation	:	220 kV Shujalpur Substation
ii.	Utility	:	MPPTCL
iii.	Faulty Equipment and the associated feeder	:	220 kV CT (R Phase) of 160 MVA transformer No.-III
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOVetc., as applicable)	:	220 kV/800/1-1-1-1 A
v.	Make (Original equipment manufacturer)	:	SCT
vi.	Serial No.	:	94/328
vii.	Date and time of occurrence of fault	:	28/03/2023 at 21:47 hrs
viii.	Fault discovered during (Operation or periodic testing/ maintenance)	:	During Operation
ix.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)	:	Clear sky
x.	Year of manufacturing	:	2004
xi.	Date of Commissioning	:	08/07/2004
xii.	Storage condition of equipment if the gap between delivery at site and Commissioning is over 6 months	:	NA
xiii.	If OEM was contacted after failure, its recommendation/ remark/ report/ MoM	:	NO, beyond guarantee period
xiv.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	Beyond repair

xv.	(a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities) (b) Whether any abnormality observed in these tests. If yes, attach the test reports. (c) What steps were taken to address the abnormality?	:	(a) Megger value taken (b) No (c) NA
xvi.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	NA
xvii.	Sequence of events/Description of fault(SOE with time stamp)	:	On Dtd. 28/03/2023 at 21:47 hrs due to failure of "R" Phase 220 kV CT of 160 MVA transformer No- III tripped on differential and simultaneously following feeders were tripped tripping: (1) 160 Mva transformer No.- I and II on HV DTOC (2) 220 kV PGCIL No. I and II on DPR (Zone-4) (3) 132 kV Arniyakalan, 132 kV Narsingarh, Sarangpur- I, Pachore-II,7 and Shajapur on DPR
xviii	Details of protection operated	:	160 MVA transformer No- III tripped on differential
xix	Details of tests done after failure	:	Testing of transformer done and all 3 Phase 220 kV CT replaced
xx.	Observations (Any relevant observation made by the field staff orduring visual inspection)	:	No
xxi.	Probable cause of failure	:	Insulation failure

46. Failure Report of 220 kV Current Transformers at Betul Substation of MPPTCL

i.	Name of Substation	:	220 kV Betul Substation
ii.	Utility	:	MPPTCL
iii.	Faulty Equipment and the associated feeder	:	220 kV CT R- Phase of 220 kV Transfer bus coupler bay
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOVetc., as applicable)	:	220 kV CT 800/1 A
v.	Short circuit withstand current and duration	:	40 kA for 1 Sec
vi.	Make (Original equipment manufacturer)	:	SCT GHAZIABAD
vii.	Serial No.	:	2009/382
viii.	Date and time of occurrence of fault	:	27/03/2023 at 05:42 hrs
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	In Service (On No Load, 220 kV Aux Bus was kept charged)
x.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)	:	Clear Sky
xi.	Year of manufacturing	:	2009
xii.	Date of Commissioning	:	09/11/2010
xiii.	Storage condition of equipment if the gap between delivery at site and Commissioning is over 6 months	:	NA
xiv.	If OEM was contacted after failure Its recommendation/remark/ report/ MoM	:	Nil

xv.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	Beyond Repair
xvi.	(a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities) (b) Whether any abnormality observed in these tests. If yes, attach the test reports. What steps were taken to address the abnormality?	:	(a) IR value measure (b) No abnormality found
xvii.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	NA
xviii.	Details of protection operated	:	Distance protection of TBC operated (R Ph. Zone IFD-2.15 Km, Fault current 2404.77A) and Bus bar protection operated (Zone 1, Zone 3, Check Zone) 220 kV Chindwarn, 220 kV Gudgaon 1 st , 220 kV PGCIL. 1 st and 160 MVA 2 nd Make BBL at 220 kV Substation MPPTCL Betul
xix.	Details of tests done after failure	:	Not Required (CT Damaged Totally)
xx.	Observations (Any relevant observation made by the field staff during visual inspection)	:	No any abnormality observed before failure.
xxi.	Probable cause of failure	:	Aging

47. Failure Report of 400 KV Current Transformers at Badnawar Substation of MPPTCL

i.	Name of Substation	:	400 kV Badnawar Substation
ii.	Utility	:	MPPTCL
iii.	Faulty Equipment and the associated feeder	:	220 kV TBC B- Phase CT
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOVetc., as applicable)	:	245 kV/1200 A/1-1-1-1-1
v.	Short circuit withstand current and duration	:	40 kA for 1 Sec
vi.	Make (Original equipment manufacturer)	:	BHEL
vii.	Serial No.	:	2464237
viii.	Date and time of occurrence of fault	:	25/02/2023 at 15:21 hrs.
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	Failed in working condition
x.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)	:	Clear sky
xi.	Year of manufacturing	:	2016
xii.	Date of Commissioning	:	25/07/2019
xiii.	Storage condition of equipment if the gap between delivery at site and Commissioning is over 6 months	:	NA
xiv.	If OEM was contacted after failure, its recommendation/remark/ report/ MoM	:	NA

xv.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	Beyond Repair
xvi.	(a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities) (b) Whether any abnormality observed in these tests. If yes, attach the test reports. What steps were taken to address the abnormality?	:	No abnormality observed during previous maintenance
xvii.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	NA
xviii.	Sequence of events/Description of fault(SOE with time stamp)	:	The CT was ideally charged on No Load and got failed.
xix.	Details of protection operated	:	Distance protection operated
xx.	Details of tests done after failure	:	Equipment failed and replaced with new CT after tan delta, IR, Polarity, PI test.
xxi.	Observations (Any relevant observation made by the field staff orduring visual inspection)	:	No any abnormal observations.
xxii.	Probable cause of failure	:	Insulation Failure

POTENTIAL TRANSFORMERS / CAPACITOR VOLTAGE TRANSFORMERS
1. Failure of 400 kV CVT at KUDGI Substation of NTPC

i.	Name of Substation	:	NTPC KUDGI STPP
ii.	Utility	:	NTPC
iii.	Faulty Equipment and the associated feeder	:	CVT
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOV etc., as applicable)	:	400 kV/110 kV, 4400 pF
v.	Short circuit withstand current and duration	:	63 kA
vi.	Make (Original equipment manufacturer)	:	CGL
vii.	Serial No.	:	S-51978
viii.	Date and time of occurrence of fault	:	20/05/2022
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	Periodical checking
x.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)	:	Clear sky
xi.	Year of manufacturing	:	2014
xii.	Date of Commissioning	:	11/12/2016
xiii.	Storage condition of equipment if the gap between delivery at site and Commissioning is over 6 months	:	Not available
xiv.	If OEM was contacted after failure, its recommendation/remark/ report/ MoM	:	Yes, OEM advised to send EQP to their works for RCA.
xv.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	To be repair/ beyond repair
xvi.	(a) Details of previous maintenance (Activities carried out in previous	:	1.Tan delta & capacitance testing – yearly

	maintenance including the tests conducted, periodicity of the maintenance activities) (b) Whether any abnormality observed in these tests. If yes, attach the test reports. (c) What steps were taken to address the abnormality?		2. Secondary voltage measurement-fortnightly 3. abnormality found during secondary voltage measurement 4. OEM was informed & as per their advise equipment was taken out of service
xvii.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	NIL
xviii.	Sequence of events/Description of fault (SOE with time stamp)	:	This CVT was not used for protection, only metering core was used.
xix.	Details of protection operated	:	None
xx.	Details of tests done after failure	:	Ratio and tan delta test
xxi.	Observations (Any relevant observation made by the field staff or during visual inspection)	:	No abnormal sound after failure. No Physical indications
xxii.	Probable cause of failure	:	Cause could not be found

2. Failure Report of 220 kV Potential Transformers (B Phase) at Kanhirode Substation of KSEB

i.	Name of Substation	:	220 kV Substation Kanhirode, Kannur
ii.	Utility	:	KSEB Ltd
iii.	Faulty Equipment and the associated feeder	:	PT, 2KHTL#1 (220 kV Kanhirode Thalassery feeder 1)
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOV etc., as	:	220 kV/ $\sqrt{3}$ /110V/ $\sqrt{3}$
v.	Make (Original equipment	:	CG Power and Industrial Solutions Ltd
vi.	Serial No.	:	741931
vii.	Date and time of occurrence of fault	:	01/04/2023 at 16:46 hrs.
viii.	Fault discovered during (Operation or periodic	:	PT in B Phase Blasted
ix.	Weather conditions at the time of failure (clear sky/ rainy/ thunder storm etc.)	:	Clear Sky
x.	Year of manufacturing	:	2021
xi.	Date of Commissioning	:	30/1/2023
xii.	Present condition of equipment (Repaired/ To be repaired/	:	Beyond repair
xiii.	a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities) b) Whether any abnormality observed in these tests. If yes, attach the test reports.	:	Tightened terminals of PT at routine maintenance on 21/2/23. PET testing conducted before Commissioning on 22/8/2022. No abnormality found in testing

xiv.	Details of previous failure (Any failure which has led to a	:	No
xv.	Sequence of events/Description of fault (SOE with time stamp)	:	16:46 hrs. on Dt 01/04/23 PT on B Phase blasted and fire occurred around 30 minutes.
xvi.	Details of protection operated	:	Main 1 distance protection and main 2 distance protection relay operated

3. Failure Report of 220 kV Potential Transformers (Y Phase) at Substation Kanhirode KSEB

i.	Name of Substation	:	220 kV Substation Kanhirode, Kannur
ii.	Utility	:	KSEB Ltd
iii.	Faulty Equipment and the associated feeder	:	PT, 2KHTL#1(220 kV Kanhirode Thalassnery feeder 1)
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOV etc., as applicable)	:	220 kV / $\sqrt{3}$ /110 V/ $\sqrt{3}$
v.	Make (Original equipment manufacturer)	:	CG Power and Industrial Solutions Ltd
vi.	Serial No.	:	741928
vii.	Date and time of occurrence of fault	:	01/04/2023 at 16:46 hrs.
viii.	Fault discovered during (Operation or periodic testing/ maintenance)	:	Y Phase PT insulator cracked during blast of B Phase PT
ix.	Weather conditions at the time of failure (clears sky/ rainy /thunderstorm etc.)	:	Clear sky
x.	Year of manufacturing	:	2021
xi.	Date of Commissioning	:	30/01/2023
xii.	Present condition of equipment (Repaired/ To be repaired/ beyond repair)	:	To be repaired
xiii.	a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities) b) Whether any abnormality observed in these tests. If yes, attach the test reports. c) What steps were taken to address	:	Tightened terminals of PT at routine maintenance on 21/02/23. PET testing conducted before Commissioning on 22/8/2022.No abnormality found in testing
xiv.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	No

xv.	Details of protection operated	:	Main 1 distance protection and main 2 distance protection relay
xvi.	Details of tests done after failure	:	IR value checked. 60 G ohm obtained between primary to
xvii.	Observations (Any relevant observation made by the field)	:	Insulator portion of PT cracked during blast of B Phase PT
xviii.	Probable cause of failure	:	During blast of B Phase PT (Collateral Damage)

4. Failure Report of 220 kV Potential Transformers at Udoke Substation of PSTCL

i.	Name of Substation	:	220 kV Udoke Substation
ii.	Utility	:	PSTCL
iii.	Faulty Equipment and the associated feeder	:	220 kV CVT of 220 kV Varpal circuit
iv.	Rating (Voltage/ current/ current ratio/ capacitance/MCOV etc., as applicable)	:	220 kV
v.	Make (Original equipment manufacturer)	:	NA
vi.	Serial No.	:	NA
vii.	Date and time of occurrence of fault	:	14/05/2022 at 16.33 hrs.
viii.	Fault discovered during (Operation or periodic testing/ maintenance)	:	Operation
ix.	Weather conditions at the time of failure (clear sky/rainy / thunderstorm etc.)	:	Clear
x.	Year of manufacturing	:	NA
xi.	Date of Commissioning	:	18/06/2015
xii.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	Unserviceable (Damaged)
xiii.	(a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities) (b) Whether any abnormality observed in these tests. If yes, attach the test reports. (c) What steps were taken to address the abnormality?	:	a) PTW No.91, Date:22/03/22 to tightened nut & bolts of CC Clamps b) No c) Under PTW No.97, Date:13/02/23 damaged CC replaced with CVT , Test conducted by Protection team and IR of CVT is under permissible limit.
xiv.	Sequence of events/Description of fault (SOE with timestamp)	:	NIL
xv.	Details of protection operated	:	Breaker not tripped

xvi.	Details of tests done after failure	:	CVT completely damaged
xvii.	Observations (Any relevant observation made by the field staff for during visual inspection)	:	No
xviii.	Probable cause of failure	:	Insulation failure

5. Failure Report of 220 kV Potential Transformers at Alephata Substation of MSETCL

i.	Name of Substation	:	220/132/33kV Alephata S/s
ii.	Utility	:	MSETCL
iii.	Faulty Equipment and the associated feeder	:	220 kV Spare Y phase PT (PT was charged but its wiring connection were not done)
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOV etc., as applicable)	:	220 kV/110/ $\sqrt{3}$ V
v.	Make (Original equipment manufacturer)	:	Crompton Greaves
vi.	Serial No.	:	10249
vii.	Date and time of occurrence of fault	:	30.01.2022 at 18:08 Hrs.
viii.	Fault discovered during (Operation or periodic testing/ maintenance)	:	Y-Phase PT burst. PT was spare but in charged condition. The wiring connections were not done.
ix.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)	:	Clear weather condition
x.	Year of manufacturing	:	1999
xi.	Date of commissioning	:	18.03.2019
xii.	Storage condition of equipment if the gap between delivery at site and commissioning is over 6 months	:	PT was first commissioned in 2002 and dismantled on 19.04.2012 as new PT was commissioned at the place of said PT. Recommissioned i.e HV side jumper connection date 2019 (Only HV side connected)
xiii.	If OEM was contacted after failure, its recommendation/remark/ report/ MoM	:	No. As PT was not under Guarantee Period.

xiv.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	Beyond repair
xv.	(a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities) (b) Whether any abnormality observed in these tests. If yes, attach the test reports. (c) What steps were taken to address the abnormality?	:	a) PT tan delta carried out on dated 27.02.2019 and values were normal. Y Ph PT Value = Cap-437.7 and Tan delta value is 0.128% b) value was normal. c) not applicable.
xvi.	Details of previous failure(Any failure which has led to a major repair of the equipment in the past since its commissioning)	:	NA
xvii.	Sequence of events/Description of fault (SOE with time stamp)	:	R/I- Bus Bar Relay- 220/132 kV ICT I & II, TFR I, II & III. 220 kV BBLR line & 220 kV Kathapur Line - 96 Trip Bus Bar Relay LED- Op_Trp_BB, Op_Ph_Y, Individual Relay of ICT 1 & 2, TFR 1, 2 & 3. 220 kV BBLR line & 220 kV Kathapur Line – Master Trip 86 Trip.
xviii.	Details of protection operated	:	220 kV Bus Bar Operated
xix.	Details of tests done after failure	:	As PT was burst, no tests done after failure.
xx.	Observations (Any relevant observation made by the field staff or during visual inspection)	:	PT burst and oil spilled out. PT oil caught fire.
xxi.	Probable cause of failure	:	Ageing

6. Failure Report of 220 kV Potential Transformers at Kurkumbh Substation of MSETCL

i.	Name of Substation	:	220/132/33 kV Kurkumbh Substation
ii.	Utility	:	MSETCL
iii.	Faulty Equipment and the associated feeder	:	R- Phase 220 kV Bus PT 2
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOV etc., as applicable)	:	220 kV/ 110 V/ $\sqrt{3}$
v.	Short circuit withstand current and duration	:	N.A
vi.	Make (Original equipment manufacturer)	:	Indian Transformer Co.
vii.	Serial No.	:	3019-03
viii.	Date and time of occurrence of fault	:	29/03/2022 at 22:42 hrs.
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	Operation
x.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)	:	Clear sky
xi.	Year of manufacturing	:	2011
xii.	Date of Commissioning	:	16/05/2019 In 2011 the PT was received/taken from Project wing which was having high tan delta hence sent for repair /replace to manufacturer and received in 2019 and utilised.
xiii.	Storage condition of equipment if the gap between delivery at site and Commissioning is over 6 months	:	Open Switchyard
xiv.	If OEM was contacted after failure, its recommendation/remark/ report/ MoM	:	NA

xv.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	beyond repair
xvi.	(a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities) (b) Whether any abnormality observed in these tests. If yes, attach the test reports. (c) What steps were taken to address the abnormality?	:	Ondate-16/05/2019 Nut bolt tightning, cleaning work of PT No abnormality found
xvii.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	Nil
xviii.	Sequence of events/Description of fault (SOE with time stamp)	:	On dt-22/03/2022 at 22:42 hrs, 220 kV Bus bar protections operated at 220 kV Kurkumbh substation.
xix.	Details of protection operated	:	220 kV Bus Bar protection operated at 220 kV Kurkumbh substation.
xx.	Details of tests done after failure	:	After failure of PT it is not possible to carry out any test as total winding of PT burnt.
xxi.	Observations (Any relevant observation made by the field staff or during visual inspection)	:	PT was burst so unable to see any other Physical observation except physical PT Burst
xxii.	Probable cause of failure	:	Insulation failure.

7. Failure Report of 220 kV Potential Transformers (B phase) at Kaulewada Substation of MSETCL

i.	Name of Substation	:	220 kV Kaulewada Substation
ii.	Utility	:	MSETCL
iii.	Faulty Equipment and the associated feeder	:	220 kV 'B' Phase Bus PT
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOV etc., as applicable)	:	220 kV
v.	Short circuit withstand current and duration	:	NA
vi.	Make (Original equipment manufacturer)	:	CG Power and Industrial Solutions Ltd
vii.	Serial No.	:	13669
viii.	Date and time of occurrence of fault	:	18/07/2022 at 09.31 Hrs
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	Operation
x.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)	:	Rainy
xi.	Year of manufacturing	:	1999
xii.	Date of Commissioning	:	17/06/2003
xiii.	Storage condition of equipment if the gap between delivery at site and Commissioning is over 6 months	:	New PT was procured by Project and the substation was commissioned in the year 2003 and charged
xiv.	If OEM was contacted after failure, its recommendation / remark / report / MOM	:	PT blasted
xv.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	Beyond repair

xvi.	(a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities) (b) Whether any abnormality observed in these tests. If yes, attach the test reports. (c) What steps were taken to address the abnormality?	:	Periodic Test was done on Dt. 24/05/2019 (Tan-delta- 0.412% Cap- 128 pf) Dt. 21/10/2021 (Tan-delta- 0.463% Cap- 130 pf). Result found within permiceable limit.
xvii.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	No previous failure
xviii.	Sequence of events/Description of fault (SOE with time stamp)	:	On Dt. 18/07/2022 at 09:31 Hrs. the 220 kV B Phase Bus PT got burst and Busbar protection operated.
xix.	Details of protection operated	:	220 kV Busbar protection
xx.	Details of tests done after failure	:	Not possible as the PT got burst.
xxi.	Observations (Any relevant observation made by the field staff or during visual inspection)	:	220 kV PT got burst.
xxii.	Probable cause of failure	:	Not Identified

8. Failure Report of 220 kV Potential Transformers (Y Phase) at Kaulewada Substation of MSETCL

i.	Name of Substation	:	220 kV Kaulewada Substation
ii.	Utility	:	MSETCL
iii.	Faulty Equipment and the associated feeder	:	220 kV 'Y' Phase PT
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOV etc., as applicable)	:	220 kV
v.	Short circuit withstand current and duration	:	NA
vi.	Make (Original equipment manufacturer)	:	CG Power and Industrial Solutions Ltd
vii.	Serial No.	:	13668
viii.	Date and time of occurrence of fault	:	21/08/2022 at 08.41 hrs.
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	Operation
x.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)	:	Rainy
xi.	Year of manufacturing	:	1999
xii.	Date of Commissioning	:	17/06/2003
xiii.	Storage condition of equipment if the gap between delivery at site and Commissioning is over 6 months	:	NA
xiv.	If OEM was contacted after failure, its recommendation / remark / report / MOM	:	PT blasted
xv.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	Beyond repair

xvi.	(a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities) (b) Whether any abnormality observed in these tests. If yes, attach the test reports. (c) What steps were taken to address the abnormality?	:	Tan Delta value was 0.46% taken on DT.18/07/2022 Periodic Test was done on Dt. 24/05/2019 (Tan-delta- 0.39% Cap- 450 pf), Dt. 21/10/2021 (Tan-delta- 0.41% Cap- 460 pf), Dt. 18/07/2022 (Tan-delta- 0.46% Cap- 462 pf). Result found within permiSubstationible limit.
xvii.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	No previous failure
xviii.	Sequence of events/Description of fault (SOE with time stamp)	:	On Dt. 21/08/2022 at 08:41 hrs. the 220 kV Y Phase. Bus PT got blasted and Busbar protection operated.
xix.	Details of protection operated	:	220 kV Busbar protection
xx.	Details of tests done after failure	:	The 220 kV Y Phase. Bus PT got blasted
xxi.	Observations (Any relevant observation made by the field staff or during visual inspection)	:	220 kV PT blasted
xxii.	Probable cause of failure	:	Cause could not be found

9. Failure Report of 400 VA, 4400pF CVT at Beawar Substation of RVPN

i.	Name of Substation	:	220 kV GSS, RVPNL, Beawar																
ii.	Utility	:	RVPNL																
iii.	Faulty Equipment and the associated feeder	:	220 kV Main Bus-I (section-I)																
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOV etc., as applicable)	:	220/√3 kV /110/√3 V, 400 VA, 4400pF																
v.	Short circuit withstand current and duration	:	NA																
vi.	Make (Original equipment manufacturer)	:	W.S Insulators of India Pvt. Ltd., Bangalore																
vii.	Serial No.	:	8606305																
viii.	Date and time of occurrence of fault	:	17/04/2022																
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	while in operation																
x.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)	:	Clear sky																
xi.	Year of manufacturing	:	1984																
xii.	Date of Commissioning	:	29/06/1987																
xiii.	Storage condition of equipment if the gap between delivery at site and Commissioning is over 6 months	:	Records not Available																
xiv.	If OEM was contacted after failure, its recommendation/remark/ report/ MoM	:	NA																
xv.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	Completely damaged beyond repair																
xvi.	(a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities)	:	<table> <tr> <th>Voltage(kV)</th><th>C(nf)</th><th>TAN Delta</th><th>I(mA)</th></tr> <tr> <td>4.6259</td><td>0.00662</td><td>2.92</td><td>2</td></tr> <tr> <td>4.6472</td><td>0.00668</td><td>6.9</td><td>5</td></tr> <tr> <td>4.6780</td><td>0.00683</td><td>13.8</td><td>10</td></tr> </table>	Voltage(kV)	C(nf)	TAN Delta	I(mA)	4.6259	0.00662	2.92	2	4.6472	0.00668	6.9	5	4.6780	0.00683	13.8	10
Voltage(kV)	C(nf)	TAN Delta	I(mA)																
4.6259	0.00662	2.92	2																
4.6472	0.00668	6.9	5																
4.6780	0.00683	13.8	10																

	(b) Whether any abnormality observed in these tests. If yes, attach the testreports. (c) What steps were taken to address the abnormality?		
xvii.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	NIL
xviii.	Sequence of events/Description of fault (SOE with time stamp)	:	CVT at 220 kV Main Bus-I (B Phase) Burst. @220 kV Ajmer Distance protection operated @220 kV Gulabpura Distance protection operated @220 kV Bilara Distance Protection operated @220 kV KTPS Distance Protection operated @132 kV Masuda E/F operated @220 kV RAS Distance Protection operated
xix.	Details of protection operated	:	Distance Protection Operated & E/F
xx.	Details of tests done after failure	:	NA (Completely damaged)
xxi.	Observations (Any relevant observation made by the field staff or during visual inspection)	:	Fire Broke out in the yard
xxii.	Probable cause of failure	:	Aging

10. Failure Report of 400 kV Potential Transformers at Bikaner of RVPNL

i.	Name of Substation	:	400 kV GSS, Bikaner
ii.	Utility	:	RVPNL
iii.	Faulty Equipment and the associated feeder	:	CVT
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOV etc., as applicable)	:	420 kV
v.	Short circuit withstand current and duration	:	NA
vi.	Make (Original equipment manufacturer)	:	Alstom
vii.	Serial No.	:	37992009130
viii.	Date and time of occurrence of fault	:	12/03/2023
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	Due to internal fault in running condition
x.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)	:	Clear
xi.	Year of manufacturing	:	2016
xii.	Date of Commissioning	:	28/07/2018
xiii.	Storage condition of equipment if the gap between delivery at site and Commissioning is over 6 months	:	NIL
xiv.	If OEM was contacted after failure, its recommendation/ remark/ report/ MoM	:	NIL
xv.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	Beyond Repair

xvi.	(a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities) (b) Whether any abnormality observed in these tests. If yes, attach the test reports. (c) What steps were taken to address the abnormality?	:	06/06/2022
xvii.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	NIL
xviii.	Sequence of events/Description of fault (SOE with time stamp)	:	Heavy Oil Leakage due to internal fault in R-Phase CVT of 400 kV Bikaner-SCTPS II Line
xix.	Details of protection operated	:	NA
xx.	Details of tests done after failure	:	NIL
xxi.	Observations (Any relevant observation made by the field staff or during visual inspection)	:	NIL
xxii.	Probable cause of failure	:	Proably Insulation Failure

11. Failure Report of 220 kV Potential Transformers at Heerapura of RVPNL

i.	Name of Substation	:	220 kV GSS, Heerapura
ii.	Utility	:	RVPNL
iii.	Faulty Equipment and the associated feeder	:	220 kV HPR- CHOMU BAY
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOV etc., as applicable)	:	220 kV, 0.5CL
v.	Make (Original equipment manufacturer)	:	W.S Insulators of India Pvt. Ltd., Bangalore
vi.	Serial No.	:	8512787
vii.	Date and time of occurrence of fault	:	31/05/2023 at 05:00 hrs.
viii.	Fault discovered during (Operation or periodic testing/ maintenance)	:	Burst during normal running condition
ix.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)	:	Clear Sky
x.	Year of manufacturing	:	1985
xi.	Date of Commissioning	:	1986
xii.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	Beyond repair
xiii.	a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities) b) Whether any abnormality observed in these tests. If yes, attach the test reports. c) What steps were taken to address the abnormality?	:	Maintenance & Testing done as per Schedule
xiv.	Details of protection operated	:	Distance Relay operated: C-Phase, Zone-I, Dist: -2.5 KM
xv.	Probable cause of failure	:	Proably Insulation Failure

12. Failure Report of 400 kV Potential Transformers at Merta City of RVPNL

i.	Name of Substation	:	400 kV GSS, Merta City
ii.	Utility	:	RVPNL
iii.	Faulty Equipment and the associated feeder	:	CVT-400 kV- 50 VA (Y PHASE) of 400 kV Merta Kankani Bay
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOV etc., as applicable)	:	420 kV
v.	Make (Original equipment manufacturer)	:	AREVA
vi.	Serial No.	:	210907010 99
vii.	Date and time of occurrence of fault	:	07/08/2022 at 12:55 hrs.
viii.	Fault discovered during (Operation or periodic testing/ maintenance)	:	Operating Mode
ix.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)	:	Clear Sky
x.	Year of manufacturing	:	2009
xi.	Date of Commissioning	:	29/10/2012
xii.	If OEM was contacted after failure, its recommendation/remark/ report/ MoM	:	No
xiii.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	To be repaired
xiv.	(a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities)	:	Tan Delta Testing Of Y Phase CVT DT. 16.07.2021- (1) $V_{out}(V)$:- 2000, $I_{out}(mA)$:- 2.796, Hz:- 49.97, CAP.(pF):- 4454, TAN δ (%):- 0.246 , $\Phi(^{\circ})$:- 89.859, P(mW):-13.75 , Temp.($^{\circ}$ C):- 48.

	(b) Whether any abnormality observed in these tests. If yes, attach the test reports. (c) What steps were taken to address the abnormality?		(2). Vout(V):- 10000, Iout(mA):- 14, Hz:- 50, CAP.(pF):- 4457, TAN δ (%):- 0.229 , Φ (°):- 89.868, P(mW):-321 ,Temp.(° C):- 48.
xv.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	NO
xvi.	Sequence of events/Description of fault (SOE with time stamp)	:	Due To Internal Fault LA Burst and due to which the CVT broken
xvii.	Details of protection operated	:	400 kV GSS MERTA & DIST PROT. OPTDM-I Z-I Y PHASE DIST-81.05 METER IF=14.57 kA, M-II Y PHASE DIST=100 METER, 86
xv.	Probable cause of failure	:	Collateral Damage (Due to Internal Fault LA Burst and due to which the CVT broken)

13. Failure Report of 220 kV Potential Transformers at Reengus of RRVPNL

i.	Name of Substation	:	220 kV GSS Reengus Substation
ii.	Utility	:	RRVPNL
iii.	Faulty Equipment and the associated feeder:-	:	220 kV CVT 220 kV Renwal Bay
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOV etc., as applicable)	:	220 kV, 4400 PF, 100 VA, 0.5 CL
v.	Make (Original equipment manufacturer)	:	W.S. Industires Ltd.
vi.	Serial No.:-	:	8405419
vii.	Date and time of occurrence of fault:-	:	15/04/2023 at 07:35 hrs
viii.	Fault discovered during (Operation or periodic testing/ maintenance)	:	Operation
ix.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.):- CLEAR	:	CLEAR SKY
x.	Year of manufacturing: -	:	1984
xi.	Date of Commissioning	:	30/09/1984
xii.	Storage condition of equipment if the gap between delivery at site and ommiSubstationioningis over 6 months	:	NA
xiii.	If OEM was contacted after failure, its recommendation/remark/ report/ MoM	:	NA
xiv.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	Beyond Repair (Completely Damage)
xv.	(a) Details of previous maintenance	:	Maintenance done on dt 10.3.2023 1. Check Oil level

	(Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities) (b) Whether any abnormality observed in these tests. If yes, attach the test reports. (c) What steps were taken to address the abnormality?		2. Cleaning the MK/Junction Box and Tightening the Terminal 3. Cleaning terminal box and tightening the terminals 4. Tightening of primary clamp, jumper etc. 5. Cleaning of bushing and checking it for cracks.
xvi.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	NIL
xvii.	Sequence of events/Description of fault (SOE with time stamp)	:	220 kV Renwal Bay CVT burst on 15/04/2023 at 07:35:00 hrs.
xviii.	Details of protection operated	:	186 A, 186 B Auto Reclose, Trip B Phase
xix.	Details of tests done after failure	:	CVT Completely Damaged
xx.	Observations (Any relevant observation made by the field staff or during visual inspection)	:	CVT got burst
xxi.	Probable cause of failure	:	Aging

14. Failure Report of 220 kV Potential Transformers at Reengus, RVPNL

i.	Name of Substation	:	220 kV GSS Reengus Substation
ii.	Utility	:	RVPNL
iii.	Faulty Equipment and the associated feeder:-	:	245 kV, CVT 220 kV Sikar II Bay
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOV etc., as applicable):-	:	245 kV, 4400 PF, 100 VA, 0.5 CL
v.	Short circuit withstand current and duration	:	NA
vi.	Make (Original equipment manufacturer):-	:	W.S. INDUSTRIES LTD
vii.	Serial No.:-	:	98070495
viii.	Date and time of occurrence of fault:-	:	25/11/2022 at 16:35:00 Hrs
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	Operation
x.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.): CLEAR	:	Clear Sky
xi.	Year of manufacturing: -	:	1995
xii.	Date of Commissioning	:	06/09/1995
xiii.	Storage condition of equipment if the gap between delivery at site and Commissioning is over 6 months	:	NA
xiv.	If OEM was contacted after failure, its recommendation/remark/ report/ MoM	:	NA
xv.	Present condition of equipment (Repaired/To be repaired / beyond repair)	:	Beyond Repair (Completely Damage)

xvi.	(a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities) (b) Whether any abnormality observed in these tests. If yes, attach the test reports. (c) What steps were taken to address the abnormality?	:	Maintenance done on dt 20.09.2022 1. Check Oil level 2. Cleaning the MK/Junction Box and Tightening the Terminal 3. Cleaning terminal box and tightening the terminals 4. Tightening of primary clamp, jumper etc. 5. Cleaning of bushing and checking it for cracks.
xvii.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	NIL
xviii.	Sequence of events/Description of fault (SOE with time stamp)	:	220 kV SIKAR II BAY CVT got burst on 25/11/2022 at 16:35:00 hrs
xix.	Details of protection operated	:	DISTANCE PROTECTION Ia - 3.972 kA, Zone-I. 3.75 Km
xx.	Details of tests done after failure	:	CVT Completely Damaged
xxi.	Observations (Any relevant observation made by the field staff or during visual inspection)	:	CVT BURST
xxii.	Probable cause of failure	:	Aging

15. Failure Report of 220 kV Potential Transformers at Gwalior II of MPPTCL

i.	Name of substation	:	Gwalior II 220 kV
ii.	Utility	:	MPPTCL
iii.	Faulty equipment and the associated feeder	:	220 kV Y-Phase. PT (PT- LL)
iv.	Rating (voltage/ current/ current ratio/ capacitance/ mcov etc., as applicable)	:	220 kV / 110 V PT
v.	Short circuit withstand current and duration	:	NA
vi.	Make (original equipment manufacturer)	:	SCT
vii.	Serial no.	:	2014/2355
viii.	Date and time of occurrence of fault	:	17/01/2023 at 00:28 hrs.
ix.	Fault discovered during (operation or periodic testing/ maintenance)	:	Nil
x.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)	:	Foggy
xi.	Year of manufacturing	:	2014
xii.	Date of Commissioning	:	25/01/2017
xiii.	Storage condition of equipment if the gap between delivery at site and Commissioning is over 6 months	:	NA
xiv.	If OEM was contacted after failure, its recommendation/remark/ report/MoM	:	No, failed beyond guarantee period
xv.	Present condition of equipment (repaired/ to be repaired / beyond repair)	:	Beyond repair

xvi.	(a) Details of previous maintenance (activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities) (b) Whether any abnormality observed in these tests. If yes, attach the test reports. (c) What steps were taken to address the abnormality?	:	General cleaning, tightning, checking of oil leakage, measurement of IR values, PD etc.
xvii.	Details of previous failure (any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	Nil
xviii.	Sequence of events/description of fault (SOE with time stamp)	:	PT failed and caught fire. Bus bar protection operated and cleared the fault by isolating 220 kV source connected to the faulty bus. 160 MVA Transformer-LL Trip (220 kV Side) AT 00:28 hrs. 220 kV PGCIL-LI ckt at 00:28 hrs 220 kV Bus Tie Trip at 00:28 hrs 220 kV Bus Coupler Trip at 00:28 hrs
xix.	Details of protection operated	:	Bus bar differential of Bus-LI operated
xx.	Details of tests done after failure	:	PT completely burnt and damaged
xxi.	Observations (any relevant observation made by the field staff or during visual inspection)	:	No
xxii.	Probable cause of failure	:	Insulation failure

16. Failure Report of 220 kV Potential Transformers at Pithampur of MPPTCL

i.	Name of Substation	:	400 kV Substation Pithampur
ii.	Utility	:	MPPTCL
iii.	Faulty Equipment and the associated feeder	:	220 kV R Phase PT (220 kV Main Bus-II)
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOVetc., as applicable)	:	HSV = 245 KV, Insulation Level = 460/1050 KV, Over Voltage Factor = 1.25, 1.5-30 sec, Ratio = 220/110 V
v.	Make (Original equipment manufacturer)	:	SCT
vi.	Serial No.	:	2011/319
vii.	Date and time of occurrence of fault	:	20/12/2022
viii.	Fault discovered during (Operation or periodic testing/ maintenance)	:	NA
ix.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)	:	Clear Sky
x.	Year of manufacturing	:	2011
xi.	Date of Commissioning	:	25/03/2013
xii.	Storage condition of equipment if the gap between delivery at site and Commissioning is over 6 months	:	The 220 kV PT was commissioned the next day on date – 21/12/2022
xiii.	If OEM was contacted after failure, its recommendation/ remark/ report/ MoM	:	NA
xiv.	Present condition of equipment	:	Beyond Repair

	(Repaired/ To be repaired / beyond repair)		
xv.	(a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities) (b) Whether any abnormality observed in these tests. If yes, attach the test reports. (c) What steps were taken to address the abnormality?	:	Tan delta and IR Value measured. Test results was within permissible limit.
xvi.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	R Phase of SCT make of 220 kV Bus PT-2 burst on date – 08/08/2017
xvii.	Sequence of events/Description of fault (SOE with time stamp)	:	Due to burst R Phase 220 kV PT Make – SCT on date – 20/12/2022 Time : 20:43 Hrs, 220 kV Bus Bar operated (Please find the attachment DR and Event of 220 kV Bus Bar)
xviii.	Details of protection operated	:	220 kV Bus Bar operated
xix.	Details of tests done after failure	:	Tan delta tests, Ratio test of New 220 kV PT make - CG
xx.	Observations (Any relevant observation made by the field staff or during visual inspection)	:	NA
xxi.	Probable cause of failure	:	Insulation Failure

SURGE ARRESTORS
1. Failure Report of 220 kV Surge Arrester at Sikka Substation of GSECL

i.	Name of Substation	:	Sikka TPS
ii.	Utility	:	GSECL
iii.	Faulty Equipment and the associated feeder	:	GT-4, R Phase LA
iv.	Rating	:	220 kV
v.	Make (Original equipment manufacturer)	:	Oblum Electrical Industries Private Limited, Hyderabad
vi.	Serial No.	:	8
Vii.	Date and time of occurrence of fault	:	02/08/2022 at 13:53 hrs.
viii.	Fault discovered during (Operation or periodic testing/ maintenance)	:	GT-4 Synchronizing activity (Operation)
ix.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)		Rainy
x.	Year of manufacturing	:	2009
xi	Date of Commissioning	:	31/08/2015
xii.	Storage condition of equipment if the gap between delivery at site and Commissioning is over 6 months	:	NA
xiii.	If OEM was contacted after failure, its recommendation/remark/ report/ MoM	:	NA
xiv.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	R Phase LA was totally damaged and replaced with new one

xv.	(a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities) (b) Whether any abnormality observed in these tests. If yes, attach the test reports. What steps were taken to address the abnormality?	:	(a) LCM test was taken and value of leakage current found 266 micro ampere on 09/06/2022 (b) No (c) NA
xvi.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	No any such kind of previous failure
xvii.	Sequence of events/Description of fault(SOE with time stamp)	:	On 02/08/2022 unit # 4 was taken on bar. After synchronization with grid of unit # 4 at 13:53 R Phase LA of GT 4 suddenly busted
xviii.	Details of protection operated	:	First up: Generator Electric Protection Trip Relay: 1. Class-A Trip Relay 186A 2. Multiplier to 186A Relay 186X 3. Generator LFP Trip (37) 4. Class-A Trip Relay 286A 5. Multiplier to 286A Relay 286X GRP-4 Relay 1. Generator Differential Trip(870A) 2. GT EF 86C Trip (51) 3. GT EF 86A Trip (51) 4. 87 OLX Operated
xix.	Details of tests done after failure	:	NA



xx.	Observations (Any relevant observation made by the field staff orduring visual inspection)	:	NA
xxi.	Probable cause of failure	:	Aging

2. Failure Report of 220 kV Surge Arrester at Malaparamba Substation of KSEB

i.	Name of Substation	:	220 kV Malaparamba Substation
ii.	Utility	:	KSEB
iii.	Faulty Equipment and the associated feeder	:	R Phase Lightning Arrester of 200 MVA, 220/11
iv.	Rating(Voltage/ current/ current ratio/ capacitance/ MCOV etc., as applicable)	:	220 kV
v.	Short circuit withstand current and duration	:	40 kA, 3 minutes
vi.	Make (Original equipment manufacturer)	:	Elektrolite India Pvt. Ltd
vii.	Serial No.	:	144 a,144 b,144 c
viii.	Date and time of occurrence of fault	:	24/1/2023
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	During the routine PET test
x.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)	:	Clear sky
xi.	Year of manufacturing	:	2019
xii.	Date of Commissioning	:	
xiii.	Storage condition of equipment if the gap between delivery at site and Commissioning is over 6 months	:	NA
xiv.	If OEM was contacted after failure, its recommendation/ remark/report/ MoM	:	Yes. Equipment under Warranty period

xv.	Present condition of equipment (Repaired / To be repaired / beyond repair)	:	Beyond repair
xvi	(a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities) (b) Whether any abnormality observed in these tests. If yes, attach the test reports. (c) What steps were taken to address the abnormality?	:	a) Scheduled maintenance done b) Nil c) NA
xvii	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	Nil
xviii	Sequence of events/Description of fault (SOE with time stamp)	:	NA
xix	Details of protection operated	:	NA
xx	Details of tests done after failure	:	NA
xxi	Observations (Any relevant observation made by the field staff or during visual inspection)	:	NA
xxii	Probable cause of failure	:	Manufacturing defect

3. Failure Report of 220 kV Surge Arrester at Edappon Substation of KSEB

i.	Name of Substation	:	220 kV Edappon Substation
ii.	Utility	:	KSEB
iii.	Faulty Equipment and the associated feeder	:	Bus 2, 220 kV LA
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOVetc., as applicable)	:	220 kV
v.	Short circuit withstand current and duration	:	
vi.	Make (Original equipment manufacturer)	:	LAMCO
vii.	Serial No.	:	167 A, 165 B and 140 C (3 Stack)
viii.	Date and time of occurrence of fault	:	07/07/2022 at 12:00 hrs.
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	Equipment broken during Periodic Testing
x.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)		Clear Sky
xi.	Year of manufacturing	:	2003
xii.	Date of Commissioning	:	2009
xiii.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	Beyond repair (Broken)
xiv.	(a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities)	:	Maintenance done on 08/12/2021, Cleaning of Porcelain Insulators & tightening of terminal connections. PET test done on 13/05/2022. No abnormalities noticed.



	(b) Whether any abnormality observed in these tests. If yes, attach the test reports. (c) What steps were taken to address the abnormality?		
xv.	Probable cause of failure	:	Due to the breakdown of supporting Insulator

4. Failure Report of 220 kV Surge Arrester at Substation Kanhirode of KSEB

i.	Name of Substation	:	220 kV Substation Kanhirode, Kannur
ii.	Utility	:	KSEB
iii.	Faulty Equipment and the associated feeder	:	PT, 2KHTL#1(220 kV Kanhirode Thala Substation feeder 1)
iv.	Rating (Voltage/current/ current ratio/ capacitance/ MCOV etc., as applicable)	:	198 kV
v.	Make (Original equipment manufacturer)	:	Elektrolites India Pvt. Ltd
vi.	Serial No.	:	24B
vii.	Date and time of occurrence of fault	:	01/04/2023 at 16:46 hrs
viii.	Fault discovered during (Operation or periodic testing/ maintenance)	:	Blast of B Phase PT
ix.	Weather conditions at the time of failure (clear sky/ rainy/ thunderstorm etc.)	:	Clear sky
x.	Year of manufacturing	:	2021
xi.	Date of Commissioning	:	30/1/2023
xii.	Present condition of equipment (Repaired/To be repaired/ beyond repair)	:	Beyond repair
xiii.	(a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities) (b) Whether any abnormality observed in these tests. If yes, attach the test reports. (c) What steps were taken to address the abnormality?	:	Tightened terminal of LA at routine maintenance on 21/02/23. PET testing conducted before Commissioning on 22/08/2022. No abnormality found in testing



xiv.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	No
xv.	Details of protection operated	:	Main 1 distance protection and main 2 distance protection relay
xvi.	Probable cause of failure	:	Cause could not be found

5. Failure Report of 220 kV Surge Arrester at Kalyaneswari Substation of DVC

i.	Name of Substation	:	220 kV/132 kV/33 kV Kalyaneswari Substation
ii.	Utility	:	Damodar Valley Corporation
iii.	Faulty Equipment and the associated feeder	:	220 kV (Y-Phase) LA of 220 kV L#240 (DVC Kalyaneswari Substation- DVC Mejia TPS).
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOV etc., as applicable)	:	198 kV, 10 kA, 50 Hz
v.	Short circuit withstand current and duration	:	40 kA
vi.	Make (Original equipment manufacturer)	:	LAMCO Industries Pvt Ltd.
vii.	Serial No.	:	891 (Y-Phase)
viii.	Date and time of occurrence of fault	:	25/03/2023 at 15:30 hrs.
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	None
x.	Weather conditions at the time of failure (clear sky/rainy/thunderstorm etc.)	:	Clear Sky
xi.	Year of manufacturing	:	2019
xii.	Date of Commissioning	:	Nov-2019
xiii.	Storage condition of equipment if the gap between delivery at site and Commissioning is over 6 months	:	Gap between delivery at site and commissioning period is less than 6 months.
xiv.	If OEM was contacted after failure, its recommendation/ remark/ report/MoM	:	No
xv.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	Beyond Repair
xvi.	(a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted,	:	(a) Third Harmonic Resistive Leakage Current value (measured on 22/03/23) was 318 micro amperes. Stack wise IR of the said LA (measured on (06/03/2023)

	periodicity of the maintenance activities) (b) Whether any abnormality observed in these tests. If yes, attach the test reports. (c) What steps were taken to address the abnormality?		was 170 M ohm, 77 M ohm, 159 M ohm respectively. (b) Replacement program of the LA was fixed but within the meantime said LA busted.
xvii.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	NIL
xviii.	Sequence of events/Description of fault (SOE with time stamp)	:	No
xix.	Details of protection operated	:	Surge Monitor did not operate.
xx.	Details of tests done after failure	:	LA busted and is beyond repair
xxi.	Observations (Any relevant observation made by the field staff or during visual inspection)	:	The said LA was commissioned through PSDF project in 2019. The THRC value of the LA increased quickly with in the short duration of time.
xxii.	Probable cause of failure	:	Insulation Failure (Moisture ingress)

6. Failure Report of 220/132/33 kV Surge Arrester at Giridih Substation of DVC

i.	Name of Substation	:	220/132/33 kV Giridih Substation
ii.	Utility	:	Damodar Valley Corporation
iii.	Faulty Equipment and the associated feeder	:	LA-MCOV 198 kV, Line#252
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOV etc., as applicable)	:	LA-MCOV-198 kV, Normal Discharge Current-10 kA, Pressure Relief Current-40 kA, Rated Voltage-198 kV
v.	Short circuit withstand current and duration	:	40 kA
vi.	Make (Original equipment manufacturer)	:	Oblum Electrical Industries Pvt. Ltd
vii.	Serial No.	:	08 (Y-Phase.)
viii.	Date and time of occurrence of fault	:	02/07/2022 at 12.26 hrs.
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	None
x.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)	:	RAINY
xi.	Year of manufacturing	:	2010
xii.	Date of Commissioning	:	28/09/2015
xiii.	Storage condition of equipment if the gap between delivery at site and Commissioning is over 6months	:	Outside in switchyard
xiv.	If OEM was contacted after failure, Its recommendation/remark/ report/ MoM	:	No
xv.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	Beyond repair
xvi.	(a) Details of previous maintenance (Activities carried out in previous maintenance	:	(a) Nut bolt tightness and megger value taken. (b) No abnormality observed.

	including the tests conducted, periodicity of the maintenance activities) (b) Whether any abnormality observed in these tests. If yes, attach the test reports. (c) What steps were taken to address the abnormality?		
xvii.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	NIL
xviii.	Sequence of events/Description of fault (SOE with time stamp)	:	Line#251 tripped at Giridih end only and line#252 tripped at both (Giridih and KTPS) end at 12.26 hrs. R/I of line #251- Y Phase, Z-1,67/67N,86A,86B R/I of line#252- M1M2 DP OPTD, Y-Phase, Z-1 ,86A,86B, Dist-0.4 km
xix.	Details of protection operated	:	M1M2 Distance Protection operated, Y-Phase, Zone-1,86a,86b, Dist-0.4km
xx.	Details of tests done after failure	:	LA busted and beyond repair
xxi.	Observations (Any relevant observation made by the field staff or during visual inspection)	:	None
xxii.	Probable cause of failure	:	Insulation Failue (Moistre ingress)

7. Failure Report of 220 kV LA at Tarapur TAPS-3&4 of NPCIL

i.	Name of Substation	:	Tarapur
ii.	Utility	:	NPCIL
iii.	Faulty Equipment and the associated feeder	:	Tarapur-1&2 and Tarapur-3&4 tie line LA
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOV etc., as applicable)	:	216 kV, nominal discharge current 10 kA,
v.	Short circuit withstand current and duration	:	40 kA
vi.	Make (Original equipment manufacturer)	:	Elpro International
vii.	Serial No.	:	-
viii.	Date and time of occurrence of fault	:	03/11/2022
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	Periodic testing
x.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)	:	Clear sky
xi.	Year of manufacturing	:	2002
xii.	Date of Commissioning	:	2003
xiii.	Storage condition of equipment if the gap between delivery at site and Commissioning is over 6 months	:	NPCIL Store
xiv.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	Beyond repair
xv.	(a) Details of previous maintenance (Activities carried out in previous maintenance including the tests	:	During periodic testing of LA, low IR was observed, so LA was replaced.



	conducted, periodicity of the maintenance activities) (b) Whether any abnormality observed in these tests. If yes, attach the test reports. (c) What steps were taken to address the abnormality?		
xvi.	Sequence of events/Description of fault (SOE with time stamp)	:	Nil
xvii.	Details of protection operated :	:	Nil
xviii.	Details of tests done after failure	:	IR
xix.	Observations (Any relevant observation made by the field staff or during visual inspection)	:	IR 820 GΩ
xx.	Probable cause of failure	:	Aging

8. Failure Report of 220 kV LA at Tarapur TAPS-3&4 of NPCIL

i.	Name of Substation	:	Tarapur
ii.	Utility	:	NPCIL
iii.	Faulty Equipment and the associated feeder	:	4-52100-SUT-4, Y-Phase LA SUT-4
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOV etc., as applicable)	:	220 kV, Nominal Discharge Current 10 kA
v.	Short circuit withstand current and duration	:	40 kA
vi.	Make (Original equipment manufacturer)	:	Elpro International
vii.	Serial No.	:	13
viii.	Date and time of occurrence of fault	:	23/04/2023
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	Periodic testing
x.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)	:	Clear sky
xi.	Year of manufacturing	:	2002
xii.	Date of Commissioning	:	2003
xiii.	Storage condition of equipment if the gap between delivery at site and Commissioning is over 6 months	:	NPCIL Store
xiv.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	Beyond repair
xv.	(a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities)	:	During periodic testing of LA low IR was observing, so LA was replaced.

	(b) Whether any abnormality observed in these tests. If yes, attach the test reports. (c) What steps were taken to address the abnormality?		
xvi.	Sequence of events/Description of fault (SOE with time stamp)	:	Nil
xvii.	Details of protection operated:	:	Nil
xviii.	Details of tests done after failure	:	IR
xix.	Observations (Any relevant observation made by the field staff or during visual inspection)	:	IR 100 GΩ
xx.	Probable cause of failure	:	Aging

9. Failure Report of 390 kV LA at Tarapur BOISRA Ckt-1 of NPCIL

i.	Name of Substation	:	Taps-3&4
ii.	Utility	:	NPCIL
iii.	Faulty Equipment and the associated feeder	:	0-51400-line-4, R-Phase LA Tarapur- boisra ckt-1
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOV etc., as applicable)	:	390 kV, nominal discharge current 10 kA
v.	Short circuit withstand current and duration	:	65 kA
vi.	Make (Original equipment manufacturer)	:	Elpro International
vii.	Serial No.	:	15
viii.	Date and time of occurrence of fault	:	15/05/2023
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	Periodic testing
x.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)	:	Clear sky
xi.	Year of manufacturing	:	2002
xii.	Date of Commissioning	:	2004
xiii.	Storage condition of equipment if the gap between delivery at site and Commissioning is over 6 months	:	NPCIL store
xiv.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	Beyond repair
xv.	(a) Details of previous maintenance (Activities carried out in previous maintenance including the tests	:	During periodic testing of LA low IR was observed, so LA was replaced.



	conducted, periodicity of the maintenance activities) (b) Whether any abnormality observed in these tests. If yes, attach the test reports. (c) What steps were taken to address the abnormality?		
xvi.	Sequence of events/Description of fault (SOE with time stamp)	:	Nil
xvii.	Details of protection operated:	:	Nil
xviii.	Details of tests done after failure	:	IR
xix.	Observations (Any relevant observation made by the field staff or during visual inspection)	:	IR 28 GΩ
xx.	Probable cause of failure	:	Aging

10. Failure Report of 400 kV Surge Arrester at Amreli Substation of GETCO

i.	Name of Substation	:	400 kV GETCO Substation, Amreli
ii.	Utility	:	Gujarat Energy Transmission Corporation Limited
iii.	Faulty Equipment and the associated feeder	:	Surge Arrester of 400 kV Amreli Jetpur line no. 1
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOVetc., as applicable)	:	400 kV
v.	Short circuit withstand current and duration	:	20 kA
vi.	Make (Original equipment manufacturer)	:	Oblum Electrical Industries Pvt Ltd
vii.	Serial No.	:	4
viii.	Date and time of occurrence of fault	:	18.08.2022 21:04 hrs
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	Operation
x.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)	:	Rainy and thunderstorm
xi.	Year of manufacturing	:	1998
xii.	Date of Commissioning	:	21.12.2000
xiii.	Storage condition of equipment if the gap between delivery at site and Commissioning is over 6 months	:	Kept in good condition
xiv.	If OEM was contacted after failure, its recommendation/ remark/ report/ MoM	:	Not contacted
xv.	Present condition of equipment	:	Beyond repair

	(Repaired/ To be repaired / beyond repair)		
xvi.	(a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities) (b) Whether any abnormality observed in these tests. If yes, attach the test reports. (c) What steps were taken to address the abnormality?	:	Surge arrester LCM test was carried on dated. 19.04.2022 and results were found within limit.
xvii.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	No any previous failure occurred
xviii.	Sequence of events/Description of fault(SOE with time stamp)	:	On Dt 18.08.2022 @ 21:04 Hrs. R Phase LA of 400 kV Amreli Jetpur line no. 1 failed with blast and 3 rd no of stack from top found completely damaged.
xix.	Details of protection operated	:	400 kV Amreli-Jetpur line no. 1 tripped with R Phase to Earth fault with following relay data: - (1) Main-1, Z-1 operated; fault current IR : 7.85 KA (2) Main-2, Z-1 operated, fault current IR : 7.663 KA Distance of Fault: - 23.90mtr
xx.	Details of tests done after failure	:	Not any
xxi.	Observations (Any relevant observation made by the field staff orduring visual inspection)	:	3rd No. of stack from top side of LA blasted and smoke came out from middle portion of LA. Also, LA counter got failed
xxii.	Probable cause of failure	:	Due to rainy weather and Lightning strike on the line

11. Failure Report of 400 kV Surge Arrester at Amreli substation of GETCO

i.	Name of Substation	:	400 kV GETCO Substation, Amreli
ii.	Utility	:	Gujarat Energy Transmission Corporation Limited
iii.	Faulty Equipment and the associated feeder	:	Surge Arrester of 400 kV Amreli Jetpur line no. 2
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOVetc., as applicable)	:	400 kV
v.	Short circuit withstand current and duration	:	20 kA
vi.	Make (Original equipment manufacturer)	:	LAMCO
vii.	Serial No.	:	102 A
viii.	Date and time of occurrence of fault	:	12:20 Hrs on date 19.07.2022
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	Operation
x.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)	:	Rainy and thunderstorm
xi.	Year of manufacturing	:	2012
xii.	Date of Commissioning	:	15.11.2013
xiii.	Storage condition of equipment if the gap between delivery at site and Commissioning is over 6 months	:	Kept in good condition
xiv.	If OEM was contacted after failure, its	:	Not contacted

	recommendation/remark/ report/ MOM		
xv.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	Beyond repair
xvi.	(a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities) (b) Whether any abnormality observed in these tests. If yes, attach the test reports. (c) What steps were taken to address the abnormality?	:	LA- LCM test was carried on Dt. 19.04.2022 and results were found within limit.
xvii.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	No any previous failure occurred
xviii.	Sequence of events/Description of fault(SOE with time stamp)	:	On Dt 19.07.2022 @ 12:20 B Phase LA of 400 kV Amreli Jetpur line no. 2 blasted and 3 rd stack from top side of LA blasted
xix.	Details of protection operated	:	400 kV Amreli-Jetpur line no. 2 tripped with B Phase to Earth fault with following relay data: - Main-1, Z-1 operated; fault current I_b : 9.44 KA
xx.	Details of tests done after failure	:	Not Any
xxi.	Observations (Any relevant observation made by the field staff orduring visual inspection)	:	3rd No. of stack from top side of LA blasted.
xxii.	Probable cause of failure	:	Insulation failure

12. Failure Report of 220 kV Surge Arrester at Keshod of GETCO

i.	Name of Substation	:	220 kV Keshod
ii.	Utility	:	GETCO
iii.	Faulty Equipment and the associated feeder	:	220 kV Class R-Phase Lightning Arrester of 220/66 kV, 100 MVA Transformer No.3
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOVetc., as applicable)	:	220 kV
v.	Short circuit withstand current and duration	:	NA
vi.	Make (Original equipment manufacturer)	:	LAMCO
vii.	Serial No.	:	490 A/B/C
viii.	Date and time of occurrence of fault	:	01.01.2022 at 21:45 HRS
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	Operation
x.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)	:	Clear
xi.	Year of manufacturing	:	2009
xii.	Date of Commissioning	:	15.12.2009
xiii.	Storage condition of equipment if the gap between delivery at site and Commissioning is over 6 months	:	Stored at GETCO store in packing condition
xiv.	If OEM was contacted after failure, its recommendation/ remark/ report/ MoM	:	NIL

xv.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	Beyond repair
xvi.	(a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities) (b) Whether any abnormality observed in these tests. If yes, attach the test reports. (c) What steps were taken to address the abnormality?	:	LCM measured on dtd: 31.12.2021. Ir- 330 uA, It-1135 uA. Cloth cleaning and Jumper tightening works carried out on dtd: 15.05.2021. There were no abnormalities observed during maintenance and testing.
xvii.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	NIL
xviii.	Sequence of events/Description of fault(SOE with time stamp)	:	220/66 kV, 100 MVA TR No-3, HV side R Phase LA failed with heavy blast and relay indication at 220 kV Keshod Substation end Fault current HV side: R-Phase: 7.708 KA Relay at LV side: Inter Tripped
xix.	Details of protection operated	:	Fault current HV side: R-Phase: 7.708 KA Relay at LV side: Inter Tripped
xx.	Details of tests done after failure	:	No test has been carried out after failure
xxi.	Observations (Any relevant observation made by the field staff orduring visual inspection)	:	LA Porcelain insulator part carbonized from external. Black spot found on counter connection with earth and counter is also damaged.
xxii.	Probable cause of failure	:	Insulation Failure (Moisture ingress)

13. Failure Report of 220 kV Surge Arrester at Shapur Substation of GETCO

i.	Name of Substation	:	220 kV Shapur Substation
ii.	Utility	:	GETCO
iii.	Faulty Equipment and the associated feeder	:	220 kV Keshod line bay (Y- Phase)
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOV etc., as applicable)	:	220 kV
v.	Short circuit withstand current and duration	:	NA
vi.	Make (Original equipment manufacturer)	:	LAMCO
vii.	Serial No.	:	496 A/B/C
viii.	Date and time of occurrence of fault	:	20/06/2022 at 05:50 Hrs.
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	Operation
x.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)	:	Humid
xi.	Year of manufacturing	:	2010
xii.	Date of Commissioning	:	16/06/2012
xiii.	Storage condition of equipment if the gap between delivery at site and Commissioning is over 6 months	:	Stored at GETCO store in packing condition
xiv.	If OEM was contacted after failure, its recommendation/ remark/ report/ MoM	:	No

xv.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	Beyond repair
xvi.	(a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities) (b) Whether any abnormality observed in these tests. If yes, attach the test reports. (c) What steps were taken to address the abnormality?	:	LCM measured on dated: 22.04.2022 Ir-116uA, It-977uA. Cloth cleaning & Jumper tightening works carried out on Dtd: 26.03.2022
xvii.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	NA
xviii.	Sequence of events/Description of fault(SOE with time stamp)	:	At 05:50 hrs., 220 kV Shapur-Keshod line Tripped with heavy blast and during yard observation at 220 kV Shapur Substation end Y-Phase LA found failed and porcelain insulator part found Carbonize. Counter meter also damaged.
xix.	Details of protection operated	:	Y-Phase.: 6.23 kA
xx.	Details of tests done after failure	:	No
xxi.	Observations (Any relevant observation made by the field staff or during visual inspection)	:	Porcelain insulator parts of Top, Middle and Bottom are found carbonize. Spot found on counter connection and counter found damaged.
xxii.	Probable cause of failure	:	Insulation Failure (Moisture ingress)

14. Failure Report of 220 kV Surge Arrester (R Phase) at Salejada Substation of GETCO

i.	Name of Substation	:	220 kV Salejada Substation
ii.	Utility	:	GETCO
iii.	Faulty Equipment and the associated feeder	:	220 kV LA R- Phase 220 kV Salejada Bhat Line No.-2
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOV etc., as applicable)	:	220 kV
v.	Short circuit withstand current and duration	:	40 kA for 3 Sec
vi.	Make (Original equipment manufacturer)	:	OBLUM ELECTRICAL INDUSTRIES PVT LTD.
vii.	Serial No.	:	29
viii.	Date and time of occurrence of fault	:	01-09-2022 @ 11:53 hrs
ix.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)		RAINY
x.	Year of manufacturing	:	2009
xi.	Date of Commissioning	:	19-06-2010
xii.	Storage condition of equipment if the gap between delivery at site and Commissioning is over 6 months	:	Nil
xiii.	If OEM was contacted after failure, its recommendation/ remark/ report/ MoM	:	Nil
xiv.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	Beyond repair (Due to LA Blast)

xv.	(a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities) (b) Whether any abnormality observed in these tests. If yes, attach the test reports. What steps were taken to address the abnormality?	:	09.02.2022, IT=1151, IR=88, 09.03.2021, IT =1078, IR =61, 27.02.2020, IT =1280, IR =101,
xvi.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	Nil
xvii.	Sequence of events/Description of fault (SOE with time stamp)	:	Heavy spark and blast observed Carbonized at R PH. LA. The LA Top Portion got detached from LA
xviii.	Details of protection operated	:	Breaker off at Salejada end (line soak charge from 220 kV Bhat End) Bhat end: R-6586A, Y-10A, B-3A
xix.	Details of tests done after failure	:	Nil as LA got blasted
xx.	Observations (Any relevant observation made by the field staff or during visual inspection)	:	Nil
xxi.	Probable cause of failure	:	Insulation failure

15. Failure Report of 220 kV Surge Arrester (Y Phase) at Salejada Substation of GETCO

i.	Name of Substation	:	220 kV Salejada Substation
ii.	Utility	:	GETCO
iii.	Faulty Equipment and the associated feeder	:	220 kV LA Y- Phase 220 kV salejada bhat line no.-2
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOVetc., as applicable)	:	220 kV
v.	Short circuit withstand current and duration	:	40 kA for 3 sec
vi.	Make (Original equipment manufacturer)	:	Oblum Electrical Industries Pvt Ltd.
vii.	Serial No.	:	30
viii.	Date and time of occurrence of fault	:	29-08-2022 @ 14:58 hrs..
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	HIGH LCM
x.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)	:	Hot
xi.	Year of manufacturing	:	2009
xii.	Date of Commissioning	:	19-06-2010
xiii.	Storage condition of equipment if the gap between delivery at site and Commissioning is over 6 months	:	Nil
xiv.	If OEM was contacted after failure, its recommendation/remark/ report/ MoM	:	Nil

xv.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	Beyond repair (Due to LA blast)
xvi.	(a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities) (b) Whether any abnormality observed in these tests. If yes, attach the test reports. What steps were taken to address the abnormality?	:	a) LCM - 09.02.2022, IR=1514, IT=1583, 09.03.2021, IR=1519, IT=869, b) HIGH LCM c) NEW LA DEMANDED
xvii.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	Nil
xviii.	Sequence of events/Description of fault(SOE with time stamp)	:	Heavy spark and blast observed. Carbonized at Y -Ph. LA. The LA Top Portion got detached from LA
xix.	Details of protection operated	:	Bkr off at Salejada end. Bhat end: R-9.384 A, Y- 6.701 KA, B-9.444 A.
xx.	Details of tests done after failure	:	Nil as LA got blasted
xxi.	Observations (Any relevant observation made by the field staff orduring visual inspection)	:	Nil
xxii.	Probable cause of failure	:	Insulation failure

16. Failure Report of 220 kV Surge Arrester at Morbi Substation of GETCO

i.	Name of Substation	:	220 kV Morbi Substation
ii.	Utility	:	GETCO
iii.	Faulty Equipment and the associated feeder	:	220 kV Class Y- Phase LA at 220 kV Morbi Substation for 220 kV Morbi-Lalpar line
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOVetc., as applicable)	:	220 kV
v.	Short circuit withstand current and duration	:	40 KA
vi.	Make (Original equipment manufacturer)	:	CGL
vii.	Serial No.	:	9407097
viii.	Date and time of occurrence of fault	:	07.10.2022, 13:57 hrs.
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	NA
x.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)	:	Rainy
xi.	Year of manufacturing	:	1994
xii.	Date of Commissioning	:	30.05.1997
xiii.	Storage condition of equipment if the gap between delivery at site and Commissioning is over 6 months	:	NA
xiv.	If OEM was contacted after failure, its recommendation/remark/ report/ MoM	:	NA
xv.	Present condition of equipment	:	Beyond repair



	(Repaired/ To be repaired / beyond repair)		
xvi.	Probable cause of failure	:	Aging

xvi.	(a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities) (b) Whether any abnormality observed in these tests. If yes, attach the test reports. (c) What steps were taken to address the abnormality?	:	(a) Last cloth cleaning of LA was carried out on dated :18.05.2022 1.LCM Testing carried out on (i) dtd:12.10.2021 IR Corre.:102 Micro amp. IT(Toal):-637 Mico amp. (ii).Dt:10.10.2020 IR Corre.:67 Micro amp. IT(Toal):-614 Mico amp. (iii). 15.11.2019 IR Corre.:117 Micro amp. IT(Toal):-176 Mico amp. 2.IR Testing carried out on (i) dtd:12.01.2022 I IR:5150 MΩ (IR:7931 MΩ @ 20°C) (ii)dtd:06.10.2020 IR:5800 MΩ (IR:9860 MΩ @ 20°C) (iii) dtd:17.07.2020 IR:3000 MΩ (IR:6000 MΩ @ 20°C) (b) NO, there is no any abnormality observed in these tests. (c) NA
xvii.	Details of previous failure (Any failure whJich has led to a major repair of theequipment in the past since its Commissioning)	:	NA
xviii.	Sequence events/Description of fault (SOE with time stamp)	:	At 13:57hrs 220 kV Morbi-Lalpar line tripped and during yard observation R-Phase LA found sparked.
xix.	Details of protection operated	:	Morbi end:-Main 1 &2 dist. Protection operated, A/R lock out, Carrier send, Main-1:-Y-Ph. operated, Zone-1,Dist.:-35.77m Y-Ph.:-13.40 kA Main-2:-Gen. Trip, Y-Ph., Zone-1.A/R Block, Y- Ph.:-11.55KA Lalpar end:-



			Main-1:- Gen. Trip, Y-Ph., A/R Block, SOTF Y -Ph.: -3.37KA ,Main-2:-A/R open, Carrier fail,Zone-2,Dist:-5.89km Y-Ph.: -3.36KA
xx.	Details of tests done after failure	:	NA
xxi.	Observations (Any relevant observation made by the field staff orduring visual inspection)	:	LA found flashed from top and bottom
xxii.	Probable cause of failure	:	Ageing

17. Failure Report of 220 kV Surge Arrester at Panvel Substation of MSETCL

i.	Name of Substation	:	220 kV Substation Panvel
ii.	Utility	:	MSETCL
iii.	Faulty Equipment and the associated feeder	:	220 kV Lighting Arrester R-Phase of 220 kV Panvel - Kharghar line
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOV etc., as applicable)	:	198 kV
v.	Short circuit withstand current and duration	:	NA
vi.	Make (Original equipment manufacturer)	:	Oblum Electrical Industries
vii.	Serial No.	:	105
viii.	Date and time of occurrence of fault	:	16/07/2022
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	Operation
x.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)	:	RAINY
xi.	Year of manufacturing	:	2000
xii.	Date of Commissioning	:	08.03.2011
xiii.	Storage condition of equipment if the gap between delivery at site and Commissioning is over 6 months	:	Details not available
xiv.	If OEM was contacted after failure, its recommendation/remark/ report/ MoM	:	NA
xv.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	Broken in to particles
xvi.	(a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities)	:	On Dt- 10.05.2022 LA LCM taken; results found satisfactory



	(b) Whether any abnormality observed in these tests. If yes, attach the test reports. (c) What steps were taken to address the abnormality?		
xvii.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	NA
xviii.	Sequence of events/Description of fault (SOE with time stamp)	:	NA
xix.	Details of protection operated	:	Line distance protection operated
xx.	Details of tests done after failure	:	NA
xxi.	Observations (Any relevant observation made by the field staff or during visual inspection)	:	NA
xxii.	Probable cause of failure	:	Ageing.

18. Failure Report of 220 kV Surge Arrester Dasturi Substation of MSETCL

i.	Name of Substation	:	220 kV Dasturi Substation
ii.	Utility	:	MSETCL
iii.	Faulty Equipment and the associated feeder	:	198 kV Lightning Arrester of R- Phase of 220 kV Dasturi - Kandalgaon line
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOV etc., as applicable)	:	MCOV:168 kV rms, Rated voltage: 198 kV rms, Nominal Discharge current: 10 kA, Pressure relief current(rms): 40 kA, Long Duration discharge Class:3
v.	Make (Original equipment manufacturer)	:	LAMCO
vi.	Serial No.	:	954
vii.	Date and time of occurrence of fault	:	24.10.2022 14:45 Hrs.
viii.	Fault discovered during (Operation or periodic testing/ maintenance)	:	Operation
ix.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)	:	Clear sky
x.	Year of manufacturing	:	2008
xi.	Date of Commissioning	:	07.02.2013
xii.	Storage condition of equipment if the gap between delivery at site and Commissioning is over 6 months	:	Wooden packing kept in dry place
xiii.	If OEM was contacted after failure, its recommendation/remark/ report/ MoM	:	No
xiv.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	LA got burst and beyond repair
xv.	(a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities)	:	1) LCM conducted twice in a year. Last LCM test done on dt. 05.05.2022 with values IR core =127 μ A, It=1559 μ A, Ir=117 μ A. Insulator part cleaned & other maintenance done during pre-monsoon maintenance work on

	(b) Whether any abnormality observed in these tests. If yes, attach the test reports. (c) What steps were taken to address the abnormality?		dt.18.05.2022 b) No abnormality found during testing c) NA
xvi.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	Nil
xvii.	Sequence of events/Description of fault (SOE with time stamp)	:	R-Ph. LA. of 220 kV Dasturi- Kandalgaon line failed on date 24.10.2022. 14:45 hrs. Indications at Dasturi:- W.I.=Distance protection operated, A/R operated. Auto Reclose lockout R.I.= A/R operated, A/R Lockout, 21Rx, 21Yx, 21BX Operated 21 L Operated, Trip R, S, T, Zone 1, carrier send, CB Close ON A/R. Indications at Kandalgaon:- W.I.= W.I.=Distance protection operated, Trip relay Back up protection operated. Carrier Send. R.I. = Distance protection relay LED: R-Ph. earth relay trip, zone II, carrier send. Dist. Pick up L1 E, Dist-67.1 km, UP time-478 ms, Trip Time-508 ms. IL1= 2.70 KA, IL2= 0.48 KA, IL3= 0.10KA. IR notification no.= 20095613
xviii.	Details of protection operated	:	Distance protection operated at both ends
xix.	Details of tests done after failure	:	Test could not be done as LA was completely damaged.
xx.	Observations (Any relevant observation made by the field staff or during visual inspection)	:	LA burst
xxi.	Probable cause of failure	:	Probably Insulation Failure

19. Failure Report of 400 kV Surge Arrester at R.S Khadka Substation of MSETCL

i.	Name of Substation	:	400 kV R.S Khadka Substation
ii.	Utility	:	MSETCL
iii.	Faulty Equipment and the associated feeder	:	R-Phase LA, of 400/220 kV, 315 MVA ICT-3
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOV etc., as applicable)	:	390 kV
v.	Short circuit withstand current and duration	:	NA
vi.	Make (Original equipment manufacturer)	:	CGL
vii.	Serial No.	:	15460
viii.	Date and time of occurrence of fault	:	26.10.2022 13:57 Hrs.
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	Operation
x.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)	:	clear
xi.	Year of manufacturing	:	2007
xii.	Date of Commissioning	:	16.08.2007
xiii.	Storage condition of equipment if the gap between delivery at site and Commissioning is over 6 months	:	NA
xiv.	If OEM was contacted after failure, its recommendation/remark/ report/ MoM	:	NA
xv.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	beyond repair
xvi.	(a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities)	:	13.10.2022

	(b) Whether any abnormality observed in these tests. If yes, attach the test reports. (c) What steps were taken to address the abnormality?		
xvii.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	NA
xviii.	Sequence of events/Description of fault (SOE with time stamp)	:	315 MVA, 400/220 kV ICT tripped on dated 26.10.2022 on Differential protection and HV backup protection relay. Both HV Circuit Breaker and LV circuit breaker tripped simultaneously.
xix.	Details of protection operated	:	Differential Protection operated, HV Backup Protection operated.
xx.	Details of tests done after failure	:	NA
xxi.	Observations: (Any relevant observation made by the field staff or during visual inspection)	:	Flashover observed on LA Clamp
xxii.	Probable cause of failure	:	Ageing

20. Failure Report of 220 kV Surge Arrester at Wardha Substation of MSETCL

i.	Name of Substation	:	220 kV Wardha Substation
ii.	Utility	:	MSETCL
iii.	Faulty Equipment and the associated feeder	:	Y- Phase LA, 220 kV
iv.	Rating (Voltage/ current/ current ratio/ capacitance/MCOV etc., as applicable)	:	Votlage- 198 kV rms
v.	Short circuit withstand current and duration	:	-
vi.	Make (Original equipment manufacturer)	:	Elektrolites India Pvt. Ltd
vii.	Serial No.	:	156A/163-B/164
viii.	Date and time of occurrence of fault	:	29.04.2022 at 15.08 Hrs.
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	Y- Phase LA of 220 kV Ckt-I burst (during operation)
x.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)	:	Clear sky
xi.	Date of Commissioning	:	11.03.2017
xii.	If OEM was contacted after failure, its recommendation/remark/ report/ MoM	:	No
xiii.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	Beyond repair
xiv.	(a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities) (b) Whether any abnormality observed in these tests. If yes, attach the test reports.	:	LCM taken, on dt. 29.10.2021 LCM value taken IR corrected value is 76 micro Amp and IT value is 750 micro Amp



	(c) What steps were taken to address the abnormality?		
xv.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	NA
xvi.	Sequence of events/Description of fault (SOE with time stamp)	:	Y- Phase LA got burst
xvii.	Details of protection operated	:	Feeder Protection operated (Back up relay operated)
xviii.	Details of tests done after failure	:	LA got burst completely
xix.	Observations (Any relevant observation made by the field staff or during visual inspection)	:	Y- Phase LA burst and caught fire.
xx.	Probable cause of failure	:	Insulation Failure

21. Failure Report of 400 kV Surge Arrester at Koradi Substation of MSETCL

i.	Name of Substation	:	400 kV Koradi Substation
ii.	Utility	:	MSETCL
iii.	Faulty Equipment and the associated feeder	:	200 kV B- Phase Surge Arrester (Damaged) of Station T/F-3 Feeder
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOV etc., as applicable)	:	198 kV
v.	Short circuit withstand current and duration	:	40 KA
vi.	Make (Original equipment manufacturer)	:	Crompton Greaves Ltd. (CGL)
vii.	Serial No.	:	B-00118
viii.	Date and time of occurrence of fault	:	15/07/2022 at 17:24 Hrs.
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	On Dt. 15/07/2022 at 17:24 hrs., B-Phase LA of Station T/F-3 got damaged due to bursting of B-Phase bushing of Station T/F-3 at Generation end.
x.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)	:	Clear Sky
xi.	Year of manufacturing	:	1998
xii.	Date of Commissioning	:	26.04.2003
xiii.	Storage condition of equipment if the gap between delivery at site and Commissioning is over 6 months	:	NA
xiv.	If OEM was contacted after failure, its recommendation / remark / report / MOM	:	NA
xv.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	Beyond Repair

xvi.	(a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities) (b) Whether any abnormality observed in these tests. If yes, attach the test reports. (c) What steps were taken to address the abnormality?	:	a) LCM of LA was done on Dt. 06.04.2022. The results are as below- IR (Corrected) = 139μA, Resistive Current (IR) = 132μA, Total Current (IT) = 918μA b) No c) NA
xvii.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	NA
xviii.	Details of protection operated	:	Differential Protection Operated, Master Trip Relay Operated at Generation End.
xix.	Details of tests done after failure	:	LA is beyond repair
xx.	Observations (Any relevant observation made by the field staff or during visual inspection)	:	During inspection on Dt. 15.07.2022 @ 17:24 Hrs., the operation staff observed that, the B- Ph. LA of Station T/F-3 got damaged due to bursting of B Ph. bushing of Station T/F-3 at Generation end. The foundation of the said LA also found damaged.
xxi.	Probable cause of failure	:	Collateral Damage
xxii.	Attach reports of tests during pre-Commissioning, periodic maintenance and after failure Photographs of the failed equipment etc.	:	LCM of LA was done on Dt. 06.04.2022. The results are as below- IR (Corrected) = 139 μ A, Resistive Current (IR) = 132 μ A, Total Current (IT) = 918 μ A
xxiii.	Remark		On Dt. 15.07.2022 @ 17:24 hrs. B- Ph. LA of Station T/F-3 got damaged due to bursting of B- Ph.. bushing of Station T/F-3 at Generation end. The foundation of said LA also got damaged. At Generation end, replacement of bushing, & all the diagnostic testing activities of Station T/F-3 was carried out. Meantime, restrengthening of LA foundation by



			civil department & replacement of LA carried out from Dt. 11.11.2022 to 24.11.2022.
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22. Failure Report of 220 kV Surge Arrester at Namrup Substation of AEGCL

i.	Name of Substation	:	220 kV GSS, AEGCL, NTPS, Namrup Substation
ii.	Utility	:	AEGCL
iii.	Faulty Equipment and the associated feeder	:	Surge arrester (R-Phase) for 220/132 kV, 50 MVA, Auto Transformer
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOV etc., as applicable)	:	Rated voltage of unit: 120 kV, MCOV KV: 102, LD CLASS: 3
v.	Make (Original equipment manufacturer)	:	Crompton Greaves Ltd
vi.	Serial No.	:	ZLAX25C
vii.	Date and time of occurrence of fault	:	19-01-2022
viii.	Fault discovered during (Operation or periodic testing/ maintenance)	:	Periodic testing
ix.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)	:	Clear sky
x.	Year of manufacturing	:	2007
xi.	Date of Commissioning	:	2012
xii.	Storage condition of equipment if the gap between delivery at site and Commissioning is over 6 months	:	N/A
xiii.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	Changed
xiv.	(a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities)	:	Periodic testing and maintenance done.



	(b) Whether any abnormality observed in these tests. If yes, attach the test reports. (c) What steps were taken to address the		
xv.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	Nil
xvi.	Details of protection operated	:	Nil
xvii.	Details of tests done after failure	:	IR value found below permissible limit.
xviii.	Observations (Any relevant observation made by the field staff or during visual inspection)	:	Nil
xix.	Probable cause of failure	:	Ageing

23. Failure Report of 220 kV Surge Arrester at Agia Substation of AEGCL

i.	Name of Substation	:	220 kV Agia Substation
ii.	Utility	:	AEGCL
iii.	Faulty Equipment and the associated feeder	:	LA of 100 MVA Auto-Transformer-II HV Side, R- Phase
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOVetc., as applicable)	:	198 kV/ 40 kA
v.	Short circuit withstand current and duration	:	-
vi.	Make (Original equipment manufacturer)	:	Crompton Greaves Ltd
vii.	Serial No.	:	63G33
viii.	Date and time of occurrence of fault	:	16/06/2023 at 13:40 hrs
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	Operation
x.	Weather conditions at the time of failure(clear sky/ rainy / thunderstorm etc.)	:	Clear sky
xi.	Year of manufacturing	:	-
xii.	Date of Commissioning	:	31/07/2021
xiii.	Storage condition of equipment if the gap between delivery at site and Commissioning is over 6 months	:	NA
xiv.	If OEM was contacted after failure, its recommendation/remark/ report/ MoM	:	NA

xv.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	Replaced
xvi.	(a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities) (b) Whether any abnormality observed in these tests. If yes, attach the test reports. (c) What steps were taken to address the abnormality?	:	-
xvii.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	NA
xviii.	Sequence of events/Description of fault(SOE with time stamp)	:	-
xix.	Details of protection operated	:	General trip, Differential trip, REF, O/C, E/F
xx.	Details of tests done after failure	:	IR test
xxi.	Observations (Any relevant observation made by the field staff during visual inspection)	:	-
xxii.	Probable cause of failure	:	Insulation Failure

24. Failure Report of 220 kV Surge Arrester at Chirawa Substation of RVPNL

i.	Name of Substation	:	220 kV GSS Chirawa Substation
ii.	Utility	:	RVPNL
lii.	Faulty equipment and the associated feeder	:	220 kV Hisar Line
iv.	Rating (voltage/ current/ current ratio/ capacitance/ mcoV etc., as applicable)	:	220 /198 kV 40 kA
v.	Short circuit withstand current and duration	:	40 kA
vi.	Make (original equipment manufacturer)	:	Oblum Electrical Industries Pvt. Ltd., Hyderabad, A.P. (India)
vii.	Serial no.	:	9
viii.	Date and time of occurrence of fault	:	24.08.2022
ix.	Fault discovered during (operation or periodic testing/ maintenance)	:	Line was healthy but suddenly this LA got burst on fault on the line.
x.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)	:	Rainy/thunder strome
xi.	Year of manufacturing	:	2009
xii.	Date of Commissioning	:	06.12.2010
xiii.	Storage condition of equipment if the gap between delivery at site and Commissioning is over 6 months	:	Since upgradation of 132 kV GSS, to 220 kV GSS therefore can't be accertained the gap between delivery at Site and Commissioning
xiv.	If oem was contacted after failure, its Recommendation/remark/ report/ mom	:	No because it was not in Gurantee Period
xv.	Present condition of equipment (repaired/ to be repaired / beyond repair)	:	Beyond repair
xvi.	(a) Details of previous maintenance (activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities)	:	(a) 27.05.2022 and IR taken on 25.02.2022 and value of ir was 149 G ohm (b) No abnormality found not applicable as no abnormality found.

	(b) Whether any abnormality observed in these tests. If yes, attach the test reports. (c) What steps were taken to address the abnormality?		
xvii.	Details of previous failure (any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	Nil
xviii.	Sequence of events/description of fault (soe with time stamp)	:	
xix.	Details of protection operated	:	Distance trip Ia 1.680 kA Ib 119.1 A Ic 40.49 A Van 2.701 kV Vbn 126.3 kV Vcn124.1 kV zone 1
xx.	Details of tests done after failure	:	Y- Phase LA got burst
xxi.	Observations (any relevant observation made by the field staff or during visual inspection)	:	Nil
xxii.	Probable cause of failure	:	May be due to failure of Insulation
xxiii.	Attach reports of tests during pre-Commissioning, periodic maintenance and after failure; Photographs of The failed equipment etc.	:	IR taken on 25.02.2022 and value of IR was 1.13 G ohm taken by JBS

25. Failure Report of 220 kV Surge Arrester at Dholpur Substation of RVPNL

i.	Name of Substation	:	220 kV GSS Dholpur Substation
ii.	Utility	:	RVPNL
iii.	Faulty Equipment and the associated feeder	:	01 No. 220 kV Y-Phase SURGE ARRESTER
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOV etc., as applicable)	:	220/198 kV, 10 kA
v.	Short circuit withstand current and duration	:	Discharge Current-10 kA, Pressure Relief Current -40 kA
vi.	Make(Original equipment manufacturer)	:	Crompton Greaves Ltd
vii.	Serial No.	:	49045
viii.	Date and time of occurrence of fault	:	11.04.2023 at 14:26 Hrs.
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	Running/ working condition
x.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)	:	Clean
xi.	Year of manufacturing	:	2006
xii.	Date of Commissioning	:	24.05.2007
xiii.	Storage condition of equipment if the gap between delivery at site and Commissioning is over 6 months	:	Not available
xiv.	If OEM was contacted after failure, its recommendation/ remark/ report/ MOM	:	LA Should be replaced
xv.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	Beyond Repair

xvi.	(a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities) (b) Whether any abnormality observed in these tests. If yes, attach the test reports. (c) What steps were taken to address the abnormality?	:	(a) Recording of Surge Counter reading, Checking of it's Leakage current Indicator, Checking of Healthiness of Surge Counter, Measurement of Earth Resistance, Cleaning of Insulator Stack & checking for cracks etc., Tightening of clamp. (b) No any abnormality observed.
xvii.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	No
xviii.	Sequence of events/ Description of fault (SOE with time stamp)	:	Distance Prot., Y Phase, Zone-2, Distt. - 3.0 KM
xix.	Details of protection operated	:	Distance Prot., Y Phase, Zone-2, Distt. - 3.0 KM
xx.	Details of tests done after failure	:	NA
xxi.	Observations (Any relevant observation made by the field staff or during visual inspection)	:	LA is damaged due to internal Fault
xxii.	Probable cause of failure	:	Probably Insulation Failure

26. Failure Report of 220 kV Surge Arrester at Heerapura Substation of RVPNL

i.	Name of Substation	:	220 kV GSS, Heerapura Substation
ii.	Utility	:	RVPNL
iii.	Faulty Equipment and the associated feeder		220 kV HPR- NIWANA BAY
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOV etc., as applicable)	:	220 kV, MCOV: 56KV
v.	Short circuit withstand current and duration	:	-
vi.	Make (Original equipment manufacturer)	:	Oblum Electrical Industries Pvt Ltd
vii.	Serial No.	:	406000017
viii.	Date and time of occurrence of fault	:	26.04.2022 at 13:47 Hrs
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	Burst During Normal running Condition
x.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)	:	Clear Sky
xi.	Year of manufacturing	:	1990
xii.	Date of Commissioning	:	5/4/1991
xiii.	Storage condition of equipment if the gap between delivery at site and Commissioning is over 6 months	:	
xiv.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	Beyond Repair
xv.	(a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities) (b) Whether any abnormality observed in	:	Maintenance and Testing was done as per Schedule



	these tests. If yes, attach the test reports. (c) What steps were taken to address the abnormality?		
xvi.	Details of protection operated	:	Distance Relay operated: Main-I: C-Phase, Zone-I, Dist:-1.1 km Main-II: C-Phase, Zone-I, Dist: 0 km
xvii.	Probable cause of failure	:	Probably Insulation Failure

27. Failure Report of 220 kV Surge Arrester at NPH. Jaipur Substation of RVPN

i.	Name of Substation	:	220 kV GSS, NPH., Jaipur Substation
ii.	Utility	:	RVPN
iii.	Faulty Equipment and the associated feeder	:	198 kV LA at 220 kV O/G Spare Bay (Y- Phase) (not charged)
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOV etc., as applicable)	:	198 kV
v.	Short circuit withstand current and duration	:	NA
vi.	Make (Original equipment manufacturer)	:	Crompton Greaves Ltd
vii.	Serial No.	:	122528
viii.	Date and time of occurrence of fault	:	29.06.2022
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	NO
x.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)	:	WINDSTORM
xi.	Year of manufacturing	:	2011
xii.	Date of Commissioning	:	29.01.2020
xiii.	Storage condition of equipment if the gap between delivery at site and Commissioning is over 6 months	:	NA
xiv.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	BEYOND REPAIR
xv.	(a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities)	:	NIL

	(b) Whether any abnormality observed in these tests. If yes, attach the test reports. (c) What steps were taken to address the abnormality?		
xvi.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	NIL
xvii.	Sequence of events/Description of fault (SOE with time stamp)	:	Due to heavy wind storm this LA fell to the ground and got damaged
xviii.	Details of protection operated	:	NIL
xix.	Details of tests done after failure	:	NIL
xx.	Observations (Any relevant observation made by the field staff or during visual inspection)	:	NIL
xxi.	Probable cause of failure	:	Due to heavy wind storm this LA fell to the ground and got damaged

28. Failure Report of 220 kV Surge Arrester at Kukas Substation of RVPNL

i.	Name of Substation	:	220 kV RVPNL Kukas Subststion
ii.	Utility	:	RVPNL
iii.	Faulty Equipment and the associated feeder	:	220 kV LA of 220 kV Kukas-Bassi Bay at PGCIL Bassi
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOV etc., as applicable)	:	220/198 kV
v.	Short circuit withstand current and duration	:	40 kA
vi.	Make (Original equipment manufacturer)	:	Crompton Greaves Ltd
vii.	Serial No.	:	41340
viii.	Date and time of occurrence of fault	:	27.06.2022, 13.00 Hrs
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	Testing
x.	Weather conditions at the time of failure (clear sky/ rainy /thunderstorm etc.)	:	Cloudy
xi.	Year of manufacturing	:	2005
xii.	Date of Commissioning	:	20.12.2006
xiii.	Storage condition of equipment if the gap between delivery at site and Commissioning is over 6 months	:	NA
xiv.	If OEM was contacted after failure, its recommendation/remark/ report/ MoM	:	Not in Guarantee Period
xv.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	Defective

xvi.	Details of previous maintenance (a) (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities) (b) Whether any abnormality observed in these tests. If yes, attach the test reports. What steps were taken to address the abnormality?	:	As per Maintenance Schedule
xvii.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	NIL
xviii.	Sequence of events/Description of fault (SOE with timestamp)	:	NA
xix.	Details of protection operated	:	NA
xx.	Details of tests done after failure	:	IR Value found 0
xxi.	Observations (Any relevant observation made by the field staff or during visual inspection)	:	LA Vibrating
xxii.	Probable cause of failure	:	Insulation Failure

29. Failure Report of 220 kV Surge Arrester at Kotputli Substation of RVPNL

i.	Name of Substation	:	220 kV GSS RVPNL Kotputli Subststion
ii.	Utility	:	RVPNL
iii.	Faulty Equipment and the associated feeder	:	220 kV LA AT 220 kV Kotputli-Neemrana Line
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOV etc., as applicable)	:	220 kV
v.	Short circuit withstand current and duration	:	10 kA
vi.	Make (Original equipment manufacturer)	:	Oblum Electrical Industries Pvt Ltd
vii.	Serial No.	:	38
viii.	Date and time of occurrence of fault	:	19.07.2022 AT 16:23 Hrs
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	Operation
x.	Weather conditions at the time of failure (clear sky/ rainy /thunderstorm etc.)	:	Rainy thunderstorm
xi.	Year of manufacturing	:	2009
xii.	Date of Commissioning	:	06-08-2011
xiii.	Storage condition of equipment if the gap between delivery at site and Commissioning is over 6 months	:	NA
xiv.	If OEM was contacted after failure, its recommendation/remark/ report/ MoM	:	Not in guarantee period
xv.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	Beyond repair

xvi.	(a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities) (b) Whether any abnormality observed in these tests. If yes, attach the test reports. (c) What steps were taken to address the abnormality?	:	As per maintenance schedule
xvii.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	NIL
xviii.	Sequence of events/Description of fault (SOE with time stamp)	:	NA
xix	Details of protection operated	:	Distance protection Operated
xx.	Details of tests done after failure	:	These were burst out
xxi.	Observations (Any relevant observation made by the field staff or during visual inspection)	:	Burnt out
xxii.	Probable cause of failure	:	Probably Insulation Failure

30. Failure Report of 220 kV Surge Arrester at Kotputli Substation of RVPNL

i.	Name of Substation	:	220 kV GSS RVPNL Kotputli Substation
ii.	Utility	:	RVPNL
iii.	Faulty Equipment and the associated feeder	:	220 kV LA 220 kV Kotputli-Neemrana Line
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOV etc., as applicable)	:	220 kV
v.	Short circuit withstand current and duration	:	10 kA
vi.	Make (Original equipment manufacturer)	:	Oblum Electrical Industries Pvt Ltd
vii.	Serial No.	:	NA
viii.	Date and time of occurrence of fault	:	26.03.2023 at 18:32 Hrs
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	Operation
x.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)	:	Rainy thunderstorm
xi.	Year of manufacturing	:	2009
xii.	Date of Commissioning	:	06-08-2011
xiii.	Storage condition of equipment if the gap between delivery at site and Commissioning is over 6 months	:	NA
xiv.	If OEM was contacted after failure, its recommendation/remark/ report/ MoM	:	Not in guarantee period
xv.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	Beyond repair

xvi.	(d) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities) (e) Whether any abnormality observed in these tests. If yes, attach the test reports. (f) What steps were taken to address the abnormality?	:	As per maintenance schedule
xvii.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	NIL
xviii.	Sequence of events/Description of fault (SOE with time stamp)	:	NA
xix.	Details of protection operated	:	Distance protection operated
xx.	Details of tests done after failure	:	These were burst out
xxi.	Observations (Any relevant observation made by the field staff or during visual inspection)	:	Burnt out
xxii.	Probable cause of failure	:	Probably Insulation Failure

31. Failure Report of 220 kV Surge Arrester at Bali Substation of STU (RVPNL)

i.	Name of Substation	:	220 kV GSS Bali
ii.	Utility	:	STU (RVPNL)
iii.	Faulty Equipment and the associated feeder	:	B- Phase, 220 kV LA of 220/132 kV, 100 MVA YF-II
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOV etc., as applicable)	:	Rated Voltage: - 198 kV, MCOV: - 168 kV
v.	Short circuit withstand current and duration	:	Data Not Available
vi.	Make (Original equipment manufacturer)	:	LAMCO Industries, Hyderabad
vii.	Serial No.	:	Sr. No 1817 C
viii.	Date and time of occurrence of fault	:	01.06.2023 at 01:15 Hrs.
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	Operation
x.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)	:	Rainy
xi.	Year of manufacturing	:	Yr. 2009
xii.	Date of Commissioning	:	31.07.2011
xiii.	Storage condition of equipment if the gap between delivery at site and Commissioning is over 6 months	:	NA
xiv.	If OEM was contacted after failure, its recommendation/remark/ report/ MoM	:	NA

xv.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	Not Repairable so replaced with new one
xvi.	(a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities) (b) Whether any abnormality observed in these tests. If yes, attach the test reports. (c) What steps were taken to address the abnormality?	:	Periodic maintenance done in March-2023
xvii.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	NA
xviii.	Sequence of events/Description of fault (SOE with time stamp)	:	LA Burst into multiple pieces
xix.	Details of protection operated	:	Diff. Prot of TF Operated
xx.	Details of tests done after failure	:	No
xxi.	Observations (Any relevant observation made by the field staff or during visual inspection)	:	LA Burst into Multiple Pieces
xxii.	Probable cause of failure	:	Probably Insulation Failure

32. Failure Report of 400 kV Surge Arrester at Merta City Substation of RVPNL

i.	Name of Substation	:	400 kV GSS, Merta City Substation
ii.	Utility	:	RVPNL
iii.	Faulty Equipment and the associated feeder	:	LA-400 kV-40 kA-CGL-88316 (Y-Phase) of 400 kV Merta Kankani Bay
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOV etc., as applicable)	:	390 kV
v.	Short circuit withstand current and duration	:	-
vi.	Make (Original equipment manufacturer)	:	Crompton Greaves Ltd
vii.	Serial No.	:	88316
viii.	Date and time of occurrence of fault	:	07/08/2022 at 12:55 hrs.
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	Operating mode
x.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)	:	Clear sky
xi.	Year of manufacturing	:	2009
xii.	Date of Commissioning	:	29/10/2012
xiii.	Storage condition of equipment if the gap between delivery at site and Commissioning is over 6 months	:	-
xiv.	If OEM was contacted after failure, its recommendation/remark/ report/ MoM	:	No
xv.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	Beyond repair

xvi.	(a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities) (b) Whether any abnormality observed in these tests. If yes, attach the test reports. (c) What steps were taken to address the abnormality?	:	Leakage current measurement of Y-Phase LA dated 15/07/2021:- IR (th) – 59 μ A, IR Corr- 65 μ A, I (total) –1251 μ A.
xvii.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	No
xviii.	Sequence of events/Description of fault (SOE with time stamp)	:	Due to internal fault LA burst
xix.	Details of protection operated	:	400 kV GSS Merta and Distance protection operated M-I Z-I Y- Phase Dist-81.05 meter if=14.57 kA, m-ii Y-Phase Dist=100 Meter, 86
xx.	Details of tests done after failure	:	NA
xxi.	Observations (Any relevant observation made by the field staff or during visual inspection)	:	Not
xxii.	Probable cause of failure	:	Probably Insulation Failure

33. Failure Report of 220 kV Surge Arrester at Indore-II (Jetpura), MPPTCL

i.	Name of Substation	:	220 kV Substation Indore-II (Jetpura)
ii.	Utility	:	MPPTCL
iii.	Faulty Equipment and the associated feeder	:	LA of 220 kV PGCIL-1 Feeder
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOVetc., as applicable)	:	198 kV
v.	Short circuit withstand current and duration	:	23900 Amps. and duration 55 ms
vi.	Make (Original equipment manufacturer)	:	LAMCO
vii.	Serial No.	:	723 C
viii.	Date and time of occurrence of fault	:	12/05/2023 at time 17:16 Hrs.
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	13/05/2023 at time 20:37
x.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)	:	Clear Sky
xi.	Year of manufacturing	:	2011
xii.	Date of Commissioning	:	12/10/2018
xiii.	Storage condition of equipment if the gap between delivery at site and Commissioning is over 6 months	:	NA
xiv.	If OEM was contacted after failure, its recommendation/ remark/ report/ MoM	:	NIL

xv.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	LA Burst
xvi.	(a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities) (b) Whether any abnormality observed in these tests. If yes, attach the test reports. (c) What steps were taken to address the abnormality?	:	General Maintenance done on dt. 07/01/2023 and no abnormality found.
xvii.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	Not repaired
xviii.	Sequence of events/Description of fault(SOE with time stamp)	:	LA Burst PGCIL-1 Feeder tripped on Y Phase, Z-1, F/L 2.5 km indications
xix.	Details of protection operated	:	DPR
xx.	Details of tests done after failure	:	NA
xxi.	Observations (Any relevant observation made by the field staff or during visual inspection)	:	LA Burst
xxiii.	Attach reports of tests during pre-Commissioning, periodic maintenance and after failure; Photographs of the failed equipment etc.	:	Megger value was more than 2000 Mega Ohm

34. Failure Report of 220 kV Surge Arrester at Tikamgarh Substation of MPPTCL

i.	Name of Substation	:	220 kV Tikamgarh Substation
ii.	Utility	:	MPPTCL
iii.	Faulty Equipment and the associated feeder	:	Y- Phase LA of 220/132 kV 160 MVA EMCO Make X-mer
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOV etc., as applicable)	:	220 kV LA
v.	Short circuit withstand current and duration	:	NIL
vi.	Make (Original equipment manufacturer)	:	Oblum Electrical Industries Pvt Ltd
vii.	Serial No.	:	NA
viii.	Date and time of occurrence of fault	:	20/06/2023
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	Evening time of C shift
x.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)	:	Thunderstorm
xi.	Year of manufacturing	:	2006
xii.	Date of Commissioning	:	15/08/2006
xiii.	Storage condition of equipment if the gap between delivery at site and Commissioning is over 6 months	:	No
xiv.	If OEM was contacted after failure, its recommendation/remark/ report/ MoM	:	Not contacted unit become BGP

xv.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	Burst condition
xvi.	(a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities) (b) Whether any abnormality observed in these tests. If yes, attach the test reports. (c) What steps were taken to address the abnormality?	:	Not any abnormality found
xvii.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	NA
xviii.	Sequence of events/Description of fault(SOE with time stamp)	:	On dated 20.06.2023 time from 19:18 Hrs. as loudly sound hear near 160 MVA X-mer and the X-mer tripped from HV and LV side both with differential protection during inspection it was found Y-Phase LA burst after that informed to all concerned and availability of another fresh unit of 220 kV LA replace work started and completed then testing of 160 MVA EMCO Make X-mer done after that all result found ok then X-mer charged at 00:10 Hrs on dated 21.06.2023 at 00:15 Hrs and system is still ok during this breakdown no any interruption occurred the load managed by other 160 MVA X-mer
xix.	Details of protection operated	:	Differential relay operated
xx.	Details of tests done after failure	:	IR value test
xxi.	Observations (Any relevant observation made by the field staff orduring visual inspection)	:	At the time of field staff observation equipment found ok



xxi.	Probable cause of failure	:	Probably Insulation Failure
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CIRCUIT BREAKER
1. Failure Report of 400 kV Circuit Breaker at TAPS-3 and 4 Tarapur Substation of NPCIL

i.	Name of Substation	:	Tarapur Substation Taps-3 and 4
ii.	Utility	:	NPCIL
iii.	Faulty Equipment and the associated feeder	:	400 kV line-4 Tarapur-Boisar Circuit-1 B-Phase
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOV etc., as applicable)	:	440 kV / $\sqrt{3}$
v.	Short circuit withstand current and duration	:	-
vi.	Make (Original equipment manufacturer)	:	Merlin Gerin, France
vii.	Serial No.	:	-
viii.	Date and time of occurrence of fault	:	20/02/2022
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	During Periodic Surveillance SF6 Gas Leakage Observed.
x.	Weather conditions at the time of failure (Clear sky/ rainy / thunderstorm etc.)	:	Clear sky
xi.	Year of manufacturing	:	2002
xii.	Date of Commissioning	:	2004
xiii.	Storage condition of equipment if the gap between delivery at site and Commissioning is over 6 months	:	NPCIL Store under controlled atmosphere
xiv.	If OEM was contacted after failure, its recommendation/remark/ report/ MoM	:	-
xv.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	Repaired
xvi.	a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities)	:	Yearly preventive maintenance SF6 Gas leak due to seal failure, no electrical fault.

	b) Whether any abnormality observed in these tests. If yes, attach the test reports. c) What steps were taken to address the abnormality?		
xvii.	Sequence of events/Description of fault (SOE with time stamp)	:	No electrical fault occurred.
xviii.	Details of protection operated :	:	Nil
xix.	Details of tests done after failure	:	Leak test
xx.	Observations (Any relevant observation made by the field staff or during visual inspection)	:	SF6 Gas leak due to seal failure
xxi.	Probable cause of failure	:	Seal failure (o'ring)
xxii.	Attach reports of tests during pre-Commissioning, periodic maintenance and after failure; Photographs of the failed equipment etc.	:	IR 4gΩ Mvdt – 243 μΩ

2. Failure Report of 400 kV Circuit Breaker at TARAPUR TAPS-3&4 of NPCIL

i.	Name of Substation	:	Tarapur Substation Taps-3 and 4
ii.	Utility	:	NPCIL
iii.	Faulty Equipment and the associated feeder	:	400 kV line-3 Tarapur-Boisar Circuit-1
iv.	Rating(Voltage/ current/ current ratio/ capacitance/ MCOV etc., as applicable)	:	1250 A SF6 to Air Bushing, 440 kV / $\sqrt{3}$
v.	Make (Original equipment manufacturer)	:	Merlin gerin, france
vi.	Serial No.	:	-
vii.	Date and time of occurrence of fault	:	12/11/2022
viii.	Fault discovered during (Operation or periodic testing/ maintenance)	:	During periodic testing SF6 gas leakage observed.
ix.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)	:	Clear sky
x.	Year of manufacturing	:	2002
xi.	Date of Commissioning	:	2004
xii.	Storage condition of equipment if the gap between delivery at site and Commissioning is over 6 months	:	NPCIL Store
xiii.	Present condition of equipment (Repaired/ To be repaired / beyond.	:	Repaired
xiv.	a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities) b) Whether any abnormality observed in these tests. If yes, attach the test reports. c) What steps were taken to address the abnormality?	:	Yearly preventive maintenance (SF6 gas leak due to seal failure, no electrical fault)
xv.	Sequence of events/Description of fault (SOE with time stamp)	:	No electrical fault occurred.

xvi.	Details of protection operated :	:	Nil
xvii.	Details of tests done after failure	:	Leak test
xviii.	Observations (Any relevant observation made by the field staff or during visual inspection)	:	SF6 gas leak due to seal failure
xix.	Probable cause of failure	:	Seal failure (o'ring)
xx.	Attach reports of tests during pre-Commissioning, periodic maintenance and after failure; Photographs of the failed equipment etc.	:	Ir 3.5 GΩ Mvdt – 168 μΩ

3. Failure Report of 420 kV Circuit Breaker at Nathpa Jhakri Hydro Power Station of SJVN

i.	Name of Substation	:	1500 MW NJHPS Jhakri
ii.	Utility	:	SJVN
iii.	Faulty Equipment and the associated feeder	:	Generator Circuit Breaker Pole, R-Phase, Unit#01
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOV etc., as applicable)	:	420 kV/4000 A
v.	Short circuit withstand current and duration	:	50 kA for 1 Second
vi.	Make (Original equipment manufacturer)	:	GE T&D, France (Formerly ALSTOM T&D France)
vii.	Serial No.	:	267
viii.	Date and time of occurrence of fault	:	26/04/2023 at 05:08:41 hrs.
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	Operation
x.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)	:	Clear Sky
xi.	Year of manufacturing	:	1998
xii.	Date of Commissioning	:	30/03/2004
xiii.	Storage condition of equipment if the gap between delivery at site and Commissioning is over 6 months	:	Indoor and Dry
xiv.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	Beyond Repair
xv.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	NIL
xvi.	Details of protection operated	:	Overall Differential 87GT, Busbar-1 Protection Operated
xvii.	Details of tests done after failure	:	SO ₂ content checked with SF-6 Multi Analyzer Kit.



xviii.	Observations (Any relevant observation made by the field staff or during visual inspection)	:	Pungent foul Smell of SF-6 gas was observed while testing with vacuum break tool of faulty CB Pole.
xix.	Probable cause of failure	:	Cause of failure could not be ascertained. Gas might have got contaminated due to over maintenance

4. Failure Report of 420 kV/3150 A Circuit Breaker at Makhu Substation of PSTCL

i.	Name of Substation	:	400 kV Makhu Substation
ii.	Utility	:	PSTCL
iii.	Faulty Equipment and the associated feeder	:	400 kV Circuit Breaker Limb blasted of 400 kV Makhu Amritsar Ckt 01(Main breaker)
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOVetc., as applicable)	:	420 kV/3150 A
v.	Short circuit withstand current and duration	:	125 kA for 03 sec
vi.	Make (Original equipment manufacturer)	:	SIEMENS
vii.	Serial No.	:	2011/IND/04/8502
viii.	Date and time of occurrence of fault	:	20/10/22 at 23:09 hrs.
ix.	Fault discovered during (Operation or periodic testing /maintenance)	:	OPERATION
x.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)	:	CLEAR
xi.	Year of manufacturing	:	2011
xii.	Date of Commissioning	:	17/01/2014
xiii.	If OEM was contacted after failure, its recommendation/ remark/ report/ MoM	:	YES
xiv.	Present condition of equipment (Repaired/To be repaired/beyond repair)	:	Beyond repair
xv.	(a) Details of previous maintenance (Activities carried out in previous maintenance including	:	a) Scheduled Maintenance hasbeen done after getting approval from NRLDC. b) No abnormality found.

	the tests conducted, periodicity of the maintenance activities) (b) Whether any abnormality observed in these tests. If yes, attach the test reports. (c) What steps were taken to address the abnormality?		
xvi.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	NA
xvii.	Sequence of events/Description of fault (SOE with time stamp)	:	During discharging of 400 kV Makhu Amritsar Ckt 01, 400 kV Limb blasted
xviii.	Details of protection operated	:	86.1 and 86.2 opt
xix.	Details of tests done after failure	:	NA
xx.	Observations (Any relevant observation made by the field staff or during visual inspection)	:	400 kV R- Phase Interrupter got damaged along with grading capacitor.
xxi.	Probable cause of failure	:	Excess Substation Switching Operation may be probable cause

5. Failure Report of 220 kV Circuit Breaker at Mohali 1 Substation of PSTCL

i.	Name of Substation	:	220 kV Substation Mohali 1
ii.	Utility	:	PSTCL
iii.	Fault Equipment and the associated feeder	:	220 kV Banur blue Phase limb
iv.	Rating (Voltage/current/current ratio/Capacitance/MCOV etc., as applicable)	:	245 kV
v.	Short circuit withstand current and duration	:	40 kA for 3 sec
vi.	Make (Original equipment manufacturer)	:	Alstom
vii.	Serial No.	:	150203
viii.	Date and time of occurrences of fault	:	11/5/2022 at 14:19 hrs
ix.	Fault discovered during (Operation or periodic testing/maintenance)	:	NA
x.	Weather conditions at the time of failure (clear sky/rainy/thunderstorm etc.)	:	Clear
xi.	Year of manufacturing	:	2005
xii.	Date of Commissioning	:	31/12/2008
xiii.	Storage condition of equipment if the gap between delivery at site and Commissioning is over 6 months	:	NA
xiv.	If OEM was contacted after failure, its recommendation /remarks/report. Mom	:	NA
xv.	Present condition of equipment (Repaired/To be repaired/beyond repair)	:	beyond repair
xvi.	a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities)	:	(a) Testing carried out on 05.04.22 • Tests: Remote/Local operation of breaker. • Breaker time measurement. • Breaker contact resistance measurement • Tan-Delta measurement of CT

	b) Whether any abnormality observed in these tests. If yes, attach the test reports. (c) What steps were taken to address the abnormality?		• SF6 gas Pressure • SF6 Gas Pressure fasica indication • Pole discrepancies relay operating time. • Breaker status indication. • Trip ckt healthy indication and trip ckt supervision relays at C & R Panel. • Distance protection relays tripping on all Phases. • Over current relay settings. • Earth fault relays settings. (b) No
xvii.	Detail of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	No
xviii.	Sequence of events /Description of fault (SOE with time stamp)	:	B- Phase limb damaged due to birdage
xix.	Detail of Protection Operated	:	DPR Main 1, Z2 Z3, Y B- Phase, Main 2, Z1, Z2, Z3, Started CN, E/F
xx.	Detail of tests done after failure	:	B-Phase limb damaged due to birdage
xxi.	Observations (Any relevant observation made by the field staff or during visual inspection)	:	B-Phase limb damaged due to birdage
xxii.	Probable cause of failure	:	B-Phase limb damaged

6. Failure Report of 220 kV Circuit Breaker at Bajakhana Substation of PSTCL

i.	Name of Substation	:	220 kV Bajakhana Substation
ii.	Utility	:	PSTCL
iii.	Fault Equipment and the associated feeder	:	Pneumatic Type Circuit Breaker of 220 kV GHTP Lehra Mohabbat line bay
iv.	Rating (Voltage /current/current ratio/Capacitance/MCOV etc., as applicable)	:	220 kV
v.	Short circuit withstand current and duration	:	40 kA for 3 sec
vi.	Make (Original equipment manufacturer)	:	ABB
vii.	Serial No.	:	20000051
viii.	Date and time of occurrences of fault	:	16/09/2022 at 22:22 hrs.
xi.	Fault discovered during (Operation or periodic testing/maintenance)	:	Protection testing after replacement of control cable
x.	Weather conditions at the time of failure (clear sky/rainy/thunderstorm etc.)	:	Clear sky
xi.	Year of manufacturing	:	2000
xii.	Date of Commissioning	:	28/07/2004
xiii.	Storage condition of equipment if the gap between delivery at site and Commissioning is over 6 months	:	NA
xiv.	If OEM was contacted after failure, its recommendation /remarks/report. Mom	:	NA
xv.	Present condition of equipment (Repaired/To be repaired/beyond repair)	:	beyond repair
xvii.	Detail of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	NA



xviii.	Sequence of events /Description of fault (SOE with time stamp)		Suddenly damaged
xix.	Detail of Protection Operated	:	Gas Pressure trip block
xx.	Detail of tests done after failure	:	leakage was checked after refilling gas using soap foam.
xxi.	Observations (Any relevant observation made by the field staff or during visual inspection)	:	Gas was leaking from limb (observed using soap foam)
xxii.	Probable cause of failure	:	Several continuous operations during protection testing

7. Failure Report of 400 kV Circuit Breaker at 100 MW Sainj Hydro Electric Project of HPPCL

i.	Name of Substation	:	100 MW Sainj Hydro Electric Project
ii.	Utility	:	HPPCL
iii.	Faulty Equipment and the associated feeder	:	Circuit Breaker (Unit)
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOV etc., as applicable)	:	400 kV/ 3150 A
v.	Short circuit withstand current and duration	:	40 kA for 1 sec
vi.	Make (Original equipment manufacturer)	:	ABB
vii.	Serial No.	:	
viii.	Date and time of occurrence of fault	:	05/05/2022 at 00:04 hrs.
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	Shutting down the machine
xi.	Year of manufacturing	:	2015
xii.	Date of Commissioning	:	2018
xiii.	Storage condition of equipment if the gap between delivery at site and Commissioning is over 6 months	:	In sealed box in GIS hall
xv.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	Beyond repair
xix.	Details of protection operated	:	Differential Protection
xx.	Details of tests done after failure	:	Gas quality checks
xxi.	Observations (Any relevant observation made by the field staff or during visual inspection)	:	Powdering material was observed from inspection window

xxii.	Probable cause of failure	:	Cause could not be found
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8. Failure Report of 400 kV Circuit Breaker at Sainj Hydro Electric Project of HPPCL

i.	Name of Substation	:	Sainj Hydro Electric Project
ii.	Utility	:	HPPCL
iii.	Faulty Equipment and the associated feeder	:	Unit Circuit Breaker pole
iv.	Rating (Voltage/ current/ current ratio capacitance/ MCOV etc., as applicable)	:	400 kV/3150 A
v.	Short circuit withstand current and duration	:	40 kA for 1 sec
vi.	Make (Original equipment manufacturer)	:	ABB
vii.	Serial No.	:	-
viii.	Date and time of occurrence of fault	:	24/11/2022 at 19:31 hrs.
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	Shutting down the machine
xii.	Date of Commissioning	:	May 2022
xiii.	Storage condition of equipment if the gap between delivery at site and Commissioning is over 6 months	:	In sealed box is in GIS hall
xv.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	Beyond repair
xvi.	(a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities)	:	Routine checked are done. No abnormality was found.

	(b) Whether any abnormality observed in these tests. If yes, attach the test reports. (c) What steps were taken to address the abnormality?		
xvii.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	In 2018 and in May 2022
xviii.	Sequence of events/Description of fault (SOE with time stamp)	:	-
xix.	Details of protection operated	:	Differential Protections
xx.	Details of tests done after failure	:	Gas quality checks
xxi.	Observations (Any relevant observation made by the field staff or during visual inspection)	:	Powdering material was observed from inspection window
xxii.	Probable cause of failure	:	Cause could not be found

9. Failure Report of 400 kV Circuit Breaker at Alkud Substation of MSETCL

i.	Name of Substation	:	400 kV Alkud Substation
ii.	Utility	:	MSETCL
iii.	Faulty Equipment and the associated feeder	:	400 kV Circuit Breaker of 402 TIE bay
iv.	Rating (Voltage/ current/current ratio/ capacitance/MCOV etc., as applicable)	:	420 kV/4000 A
v.	Short circuit withstand current and duration	:	50 kA for 3 Sec.
vi.	Make (Original equipment manufacturer)	:	Alstom
vii.	Serial No.	:	253350
viii.	Date and time of occurrence of fault	:	22/04/2022 at 05:10 hrs.
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	Operation
x.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)	:	Clear sky
xi.	Year of manufacturing	:	2016
xii.	Date of Commissioning	:	01/01/2017
xiii.	Storage condition of equipment if the gap between delivery at site and Commissioning is over 6 months	:	Not applicable
xiv.	If OEM was contacted after failure, its recommendation /remark/ report/ MoM	:	-
xv.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	Beyond repair
xvi.	(a) (Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities) (b) Whether any abnormality observed in these tests. If yes, attach the test reports.	:	22/02/2022 relay testing and CB Quarterly Maintenance work done.

	(c) What steps were taken to address the abnormality?		
xvii.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	Not applicable
xviii.	Sequence of events/Description of fault (SOE with time stamp)	:	While opening the 400 kV 402-52 tie breaker to take the bus reactor out of service, the Y-phase pole of this circuit breaker burst. At the same time, the ICT tripped at 05:10 hrs. The TEED 2 and TEED 1 of 401, 402, and 403 bays tripped due to the differential Y-phase protection operating. The Y-phase current was 8.68 kA, while the IN derived was 8.657 kA
xix.	Details of protection operated	:	LBB, 187 TEED1 & 187 TEED2 operated of 402 FULL DIA (401-402-403)
xx.	Details of tests done after failure	:	YES DCRM taken on dtd 29.04.2022 of R and B- Phase pole. (Y- Phase pole Burst)
xxi.	Observations (Any relevant observation made by the field staff or during visual inspection)	:	No
xxii.	Probable cause of failure	:	Failure due to Insulation Weakening/Failure.

10. Failure Report of 400 kV Circuit Breaker at Kalwa Substation of MSETCL

i.	Name of Substation	:	400 kV Kalwa Substation
ii.	Utility	:	MSETCL
iii.	Faulty Equipment and the associated feeder	:	B-Phase Circuit Breaker pole of 600 MVA ICT-2, only intrupter burst.
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOV etc., as applicable)	:	420 kV/3150 A
v.	Short circuit withstand current and duration	:	40 kA for 3 second
vi.	Make (Original equipment manufacturer)	:	Areva T&D India Ltd
vii.	Serial No.	:	160184
viii.	Date and time of occurrence of fault	:	18/08/2022 at 11.54 hrs.
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	Operation
x.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)	:	Sky clear, No rain
xi.	Year of manufacturing	:	2007
xii.	Date of Commissioning	:	22/09/2007
xiii.	Storage condition of equipment if the gap between delivery at site and Commissioning is over 6 months	:	NA
xiv.	If OEM was contacted after failure, its recommendation /remark/ report/ MoM	:	Recommendation for replacement
xv.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	beyond repair
xvi.	(a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities)	:	16/01/2022, DCRM test done

	(b) Whether any abnormality observed in these tests. If yes, attach the test reports (c) What steps were taken to address the abnormality?		
xvii.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	NIL
xviii.	Sequence of events/Description of fault (SOE with time stamp)	:	The heavy sound heard from 400 kV switchyard along with window and relay indication on 600 MVA, 400/220 kV ICT-2 CRP. The yard inspection carried out and found that 400 kV CB interrupter towards CT side bursted and IPS tube between line isolator and CB pole hanging in air without any earth contact.
xix.	Details of protection operated	:	over current/Earth fault protection operated
xx.	Details of tests done after failure	:	Not repairable
xxi.	Observations (Any relevant observation made by the field staff or during visual inspection)	:	Areva make CB B Phase pole, interrupter damaged, Pole column with Drive box was mounted. Pole is ON position
xxii.	Probable cause of failure	:	Failure due to mechanical strength of interrupter.

11. Failure Report of 220 kV Circuit Breaker at Salakati of AEGCL

i.	Name of Substation	:	220 kV Salakati GSS
ii.	Utility	:	AEGCL
iii.	Faulty Equipment and the associated feeder	:	B Phase pole of Circuit Breaker 220 kV BTPS-AGIA-II feeder
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOV etc., as applicable)	:	Rated voltage: 245kV Rated normal current: 3150A Rated Pressure of SF6: 6 bar
v.	Short circuit withstand current and duration	:	50 kA for 3 sec
vi.	Make (Original equipment manufacturer)	:	Siemens
vii.	Serial No.	:	IND/01/9575
viii.	Date and time of occurrence of fault	:	18/11/2022 at 16:17:31 hrs.
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	Fault occurred during running condition
x.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)	:	Clear Sky
xi.	Year of manufacturing	:	2012
xii.	Date of Commissioning	:	April, 2012
xiii.	Storage condition of equipment if the gap between delivery at site and Commissioning is over 6 months	:	Commissioning was done within 6 months of delivery
xiv.	If OEM was contacted after failure, its recommendation/remark/report/ MoM	:	No
xv.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	The mentioned pole was Beyond repair and replaced.

xvi.	(a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities) (b) Whether any abnormality observed in these tests. If yes, attach the test reports. (c) What steps were taken to address the abnormality?	:	Contact Resistance Measurement and Timing Test conducted on 08/06/2022 and found OK.
xvii.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	NA
xviii.	Sequence of events/Description of fault (SOE with time stamp)	:	1) At 16:07:00:723 hrs: - 220 kV TRAF 0-1 tripped showing 86A/B operated, HV Earth fault protection operated. 2) At 16:17:31:066 hrs: - 220 kV PGCIL-I was already under shutdown taken by PGCIL. Alarm shown as 86 A/B operated. 3) At 16:17:31:144 hrs- 220 kV Bus coupler tripped showing 86 A/B operated, current L3, Non directional E/F low set stage-I operate. 4) At 16:17:31:220 hrs: - 220 kV NTPC-II tripped showing 86A/B operated, EF protection trip, current L3. (Tripped at both NTPC and BTPS end) 5) At 16:17:31:297 hrs.- 220 kV PGCIL-11 only tripped at PGCIL end. Alarms shown in BTPS end as current reversal operated, current L3. 6) At 16:17:31:575 hrs :- 220 kV Agia-11 alarm shown as SF6 gas Pressure trip lockout. Later on Ph.ysical inspection, it is observed that B Phase pole of Circuit breaker bursted and the broken insulator pieces damaged nearby bay equipments (isolator and PI of 220 kV Agia-1 bay and 220 kV Rangia-1 bay) (tripped at Agia end) 7) At 16:17:31:592 hrs :- 132 kV bus coupler tripped showing Non directional E/F stage-I operated. 8) At 16:17:33:609 hrs : - 220 kV Rangia-I tripped showing zone 4 operated (reverse zone), fault loop R Phase. (Tripped at both

			Btps and Agia end) 9) At 16:17:33:610 Hrs: - 220 kV Agia-1 tripped showing zone 4 operated (reverse zone), fault loop R Phase. (Tripped at both BTPS and Agia end) 10) At 16:17 Hrs: - 220 kV Rangia-II only tripped at Rangia end.
xix.	Details of protection operated	:	As mentioned in Sequence of Events.
xx.	Details of tests done after failure	:	Contact Resistance Measurement and Timing Test conducted and found OK.
xxi.	Observations (Any relevant observation made by the field staff or during visual inspection)	:	B Phase pole of Circuit breaker burst and the broken insulator pieces damaged nearby bay equipments (isolator and PI of 220 kV Agia-1 bay and 220 kV Rangia-1 bay)
xxii.	Probable cause of failure	:	Cause could not be founded as Circuit breaker got burst

12. Failure Report of 220 kV Circuit Breaker at Alwar Grid Substation of RRVPNL

i.	Name of Substation	:	220 kV Grid Substation Alwar
ii.	Utility	:	RRVPNL
iii.	Faulty Equipment and the associated feeder	:	Circuit Breaker, 220 kV Alwar Bansur Bay
iv.	Rating (Voltage/ current/ current ratio/ capacitance/MCOV etc., as applicable)	:	245 kV
v.	Short circuit withstand current and duration	:	40 kA
vi.	Make (Original equipment manufacturer)	:	ABB
vii.	Serial No.	:	IB-106170
viii.	Date and time of occurrence of fault	:	Continuous Air Pressure Leakage from its pole, and equipment complete its useful life
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	Operation
x.	Weather conditions at the time of failure (clear sky/ rainy/ thunderstorm etc.)	:	Clear Sky
xi.	Year of manufacturing	:	1993
xii.	Date of Commissioning	:	16/01/1994
xiii.	Storage condition of equipment if the gap between delivery at site and Commissioning is over 6 months	:	NA
xiv.	If OEM was contacted after failure, its recommendation/remark/ report/ MoM	:	NA
xv.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	beyond repair

xvi.	(a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities) (b) Whether any abnormality observed in these tests. If yes, attach the test reports. (c) What steps were taken to address the abnormality?	:	Heavy Air Pressure leakage, Dpares not available
xvii.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	NA
xviii.	Sequence of events/Description of fault (SOE with time stamp)	:	
xix.	Details of protection operated	:	Lockout
xx.	Details of tests done after failure	:	NA
xxi.	Observations (Any relevant observation made by the field staff or during visual inspection)	:	Continuous Air Pressure Leakage and spare parts not available
xxii.	Probable cause of failure	:	Continuous Air Pressure Leakage

13. Failure Report of 220 kV Circuit Breaker Khetri Nagar of RVPNL

i.	Name of Substation	:	220 kV GSS Khetri Nagar
ii.	Utility	:	RVPNL
iii.	Faulty Equipment and the associated feeder	:	220 kV Khetri-Dadri Ckt-I
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOV etc., as applicable)	:	245 kV
v.	Short circuit withstand current and duration	:	---
vi.	Make (Original equipment manufacturer)	:	Areva
vii.	Serial No.	:	151783
viii.	Date and time of occurrence of fault	:	04/04/2022
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	One pole damaged due to bursting of its B- Phase CT
x.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)	:	Clear Sky
xi.	Year of manufacturing	:	Feb-10
xii.	Date of Commissioning	:	12/01/2012
xiii.	Storage condition of equipment if the gap between delivery at site and Commissioning is over 6 months	:	Gap not over 6 months
xiv.	If OEM was contacted after failure, its recommendation/remark/ report/ MoM	:	NO because it was not in Gurantee period
xv.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	Beyond repair
xvi.	(a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities) (b) Whether any abnormality observed in these tests. If yes, attach the test reports.	:	a) 18/05/2021 b) No abnormality found

	(c) What steps were taken to address the abnormality		
xvii.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	NIL
xviii.	Sequence of events/Description of fault (SOE with time stamp)	:	---
xix.	Details of protection operated	:	Relay Indication at KTN end:- Main-Ist,21 Pick-up CG,21Loop CG ,21 Trip 1 Ph. C, Ic=10.21KAMain-II-Ia=1.979A, IB=0, Ic=516.3A, F/R=62 6.4Ohm, Z-Ist, D=1.503Km, AR Lock out Shot
xx.	Details of tests done after failure	:	One pole damaged due to bursting of its B-Phase CT
xxi.	Observations (Any relevant observation made by the field staff or during visual inspection)	:	One pole damaged due to bursting of its B Phase CT
xxii.	Probable cause of failure	:	One pole damage due to bursting of its B Phase CT

14. Failure Report of 400 kV Circuit Breaker at Barmer grid Substation of RVPNL

i.	Name of Substation	:	400 kV Barmer GSS
ii.	Utility	:	RVPNL
iii.	Faulty Equipment and the associated feeder	:	400 kV,125 MVAR REACTOR
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOV etc., as applicable)	:	400 kV CB
v.	Short circuit withstand current and duration	:	400 kV CB Blast during the operation
vi.	Make (Original equipment manufacturer)	:	GE/AREVA
vii.	Serial No.	:	Type -GL316,
viii.	Date and time of occurrence of fault	:	16/04/2023
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	operation
x.	Weather conditions at the time of failure (clear sky/ rainy / understorm etc.)	:	clear sky
xi.	Year of manufacturing	:	2019
xii.	Date of Commissioning	:	09/01/2021
xiii.	Storage condition of equipment if the gap between delivery at site and Commissioning is over 6 months	:	---
xv.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	to be repaired
xvi.	(a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted,	:	400 kV CB maintenance was carried out in the month of april -

	periodicity of the maintenance activities) (b) Whether any abnormality observed in these tests. If yes, attach the test reports. (c) What steps were taken to address the abnormality?		
xvii.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	Nil
xix.	Details of protection operated	:	ON 400 kV CB side :- 86G R A & B, Backup impedance , and LBB INT.
xx.	Details of tests done after failure	:	Only Dismantal Work Carried Out For Inspection of CB
xxi.	Observations (Any relevant observation made by the field staff or during visual inspection)	:	In 400 kV CB :- During The Tripping Operation CB POLE delay / stuck and got damage
xxii.	Probable cause of failure	:	Cause could not be found

15. Failure Report of 400 kV Circuit Breaker at Barmer Grid Substation of RVPNL

xiv.	Name of Substation	:	400 kV GSS Barmer
xv.	Utility	:	RVPNL
xvi.	Faulty Equipment and the associated feeder	:	220 kV CB
xvii.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOV etc., as applicable)	:	220 kV CB
xviii.	Short circuit withstand current and duration	:	220 kV CB insulating pole got damage / stuck during operation.
xix.	Make (Original equipment manufacturer)	:	CGL
xx.	Serial No.	:	20614C
xxi.	Date and time of occurrence of fault	:	09/05/2023 at 13:00 hrs
xxii.	Fault discovered during (Operation or periodic testing/ maintenance)	:	operation
xxiii.	Weather conditions at the time of failure (clear sky/ rainy / understorm etc.)	:	clear sky
xxiv.	Year of manufacturing	:	220 kV CB-2009
xxv.	Date of Commissioning	:	16/03/2009
xxvi.	Storage condition of equipment if the gap between delivery at site and Commissioning is over 6 months	:	
xv.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	to be repaired
xvi.	(d) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted,	:	220 kV CB was damage /stuck during the Testing operation

	periodicity of the maintenance activities) (e) Whether any abnormality observed in these tests. If yes, attach the test reports. (f) What steps were taken to address the abnormality?		
xvii.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	Nil
xix.	Details of protection operated	:	---
xx.	Details of tests done after failure	:	Only Dismantal Work Carried Out For Inspection of CB
xxi.	Observations (Any relevant observation made by the field staff or during visual inspection)	:	220 kV CB during the operation the Insulating pole road & coupling pin open and pole got in stuck position.
xxii.	Probable cause of failure	:	Cause could not be found

16. Failure Report of 220 kV Circuit Breaker at Bikaner of RVPNL

i.	Name of Substation:-	:	400 kV Bikaner GSS
ii.	Utility :	:	RVPNL
iii.	Faulty Equipment and the associated feeder	:	CB
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOV etc., as applicable)	:	245 kV / 3150 Amp, 400/220 kV 315 MVA ICT-II (220 kV Side)
v.	Short circuit withstand current and duration	:	40 kA
vi.	Make (Original equipment manufacturer)	:	Siemens
vii.	Serial No.	:	2011/ind/12/9363
viii.	Date and time of occurrence of fault	:	03/01/2022
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	NIL
x.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)	:	Clear
xi.	Year of manufacturing	:	2011
xii.	Date of Commissioning	:	2016
xiii.	Storage condition of equipment if the gap between delivery at site and Commissioning is over 6 months	:	NIL
xiv.	If OEM was contacted after failure, its recommendation/remark/ report/ MoM	:	NIL
xv.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	Beyond Repair

xvi.	(a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities) (b) Whether any abnormality observed in these tests. If yes, attach the test reports. (c) What steps were taken to address the abnormality?	:	28/12/2022
xvii.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	NIL
xviii.	Sequence of events/Description of fault (SOE with time stamp)	:	Y-Phase Pole Bust with o/c protection indication
xix.	Details of protection operated	:	O/C Protection Trip
xx.	Details of tests done after failure	:	NIL
xxi.	Observations (Any relevant observation made by the field staff or during visual inspection)	:	NIL
xxii.	Probable cause of failure	:	Probably Insulation failure

17. Failure Report of 220 kV Circuit Breaker at Heerapura Substation of RVPNL

i.	Name of Substation	:	400 kV GSS Heerapura
ii.	Utility	:	RVPNL
iii.	Faulty Equipment and the associated feeder	:	420 kV CB of 400/220 kV, 315 MVA ILT-4
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOV etc., as applicable)	:	420 kV
v.	Short circuit withstand current and duration	:	40 kA for 3 sec
vi.	Make (Original equipment manufacturer)	:	CGL
vii.	Serial No.	:	54828C
viii.	Date and time of occurrence of fault	:	05/05/2023
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	Operation
x.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)	:	clear sky
xi.	Year of manufacturing	:	2018
xii.	Date of Commissioning	:	29/03/2023
xiii.	Storage condition of equipment if the gap between delivery at site and Commissioning is over 6 months	:	NA
xv.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	To be repaired
xvi.	(a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities)	:	14/03/2023

	(b) Whether any abnormality observed in these tests. If yes, attach the test reports. (c) What steps were taken to address the abnormality?		
xvii.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	NA
xviii.	Sequence of events/Description of fault (SOE with time stamp)	:	R-Phase CT Burst due to internal fault and damaged all 3 Poles of CB
xix.	Details of protection operated	:	67 A,186, Trans.prot.87, 2/50Z(time LBB) Buch/wdy temp K1 70X,195 AC, 195 BC, 195CC, 295 AC, 295BC, 295CC, 286X, Low A/R,SF6 30X/Y, B/B PROT ZONE A-87 (87AA,87AB,87AC) 386,80X.
xx.	Details of tests done after failure	:	
xxi.	Observations (Any relevant observation made by the field staff or during visual inspection)	:	NIL
xxii.	Probable cause of failure	:	Probably Insulation failure

18. Failure Report of 220 kV Circuit Breaker at Heerapura GSS Substation of RVPNL

i.	Name of Substation	:	220 kV GSS Heerapura Substation
ii.	Utility	:	RVPNL
iii.	Faulty Equipment and the associated feeder	:	220 kV HPR- CHOMUBAY
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOV etc., as applicable)	:	220 kV
v.	Short circuit withstand current and duration	:	40 kA for 3 sec
vi.	Make(Original equipment manufacturer)	:	HBB
vii.	Serial No.	:	IB1055443/1
viii.	Date and time of occurrence of fault	:	14/06/2022 at 10:30 Hrs
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	Pole Stuck During Normal Running Condition
x.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)	:	Clear Sky
xi.	Year of manufacturing	:	1990
xii.	Date of Commissioning	:	20/11/1992
xiii.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	Beyond Repair, Deposited in ACOS
xiv.	(a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities) (b) Whether any abnormality observed in these tests. If yes, attach the test reports. (c) What steps were taken to address the abnormality?	:	Maintenance and Testing Done as per Schedule
xv.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	---



xvi.	Sequence of events/Description of fault (SOE with time stamp)	:	---
xvii.	Details of protection operated	:	---
xviii.	Details of tests done after failure	:	---
xix.	Observations (Any relevant observation made by the field staff or during visual inspection)	:	---
xx.	Probable cause of failure	:	Probably Insulation failure

19. Failure Report of 220 kV Circuit Breaker at GSS Sitapura Substation of RVPNL

i.	Name of Substation	:	220 kV GSS Sitapura
ii.	Utility	:	RVPNL
iii.	Faulty Equipment and the associated feeder	:	CB, 220 kV Sitapura- Sanganer Line
iv.	Rating(Voltage/ current/ current ratio/ capacitance/ MCOV etc., as applicable)	:	245 kV, 2000 A
v.	Short circuit withstand current and duration	:	40 kA
vi.	Make (Original equipment manufacturer)	:	Alstom
vii.	Serial No.	:	220537
viii.	Date and time of occurrence of fault	:	20/03/2022
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	21M2, 21M1 ,86A&B, BUS BAR PROTECTION POERATED
x.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)	:	clear sky
xi.	Year of manufacturing	:	2011
xii.	Date of Commissioning	:	31/03/2015
xiii.	Storage condition of equipment if the gap between delivery at site and Commissioning is over 6 months	:	ACOS(T&C), Heerapura
xv.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	beyond repair
xvi.	(a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities)	:	11/01/2015

	(b) Whether any abnormality observed in these tests. If yes, attach the test reports. (c) What steps were taken to address the abnormality?		
xvii.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	NA
xix.	Details of protection operated	:	21M2, 21M1 ,86A&B ,BUS BAR Protection Operated
xx.	Details of tests done after failure	:	NA
xxi.	Observations (Any relevant observation made by the field staff or during visual inspection)	:	BRUNT
xxii.	Probable cause of failure	:	Cause could not be found

Insulator

1. Failure Report of 220 kV Insulator at Kakrapar Atomic Power Station Unit-1&2 of NPCIL

i.	Name of Substation	:	Kakrapar Atomic Power Station Unit-1&2
ii.	Utility	:	Generating station
iii.	Faulty Equipment and the associated feeder	:	1)220 kV KAPS-VAV-2 Line Main Isolator R- Phase Arm's Insulator
iv.	Rating (Voltage/current/current/ratio/capacitance/ MCOV etc., as applicable)	:	1050 KVp (Dry impulse withstand voltage)
v.	Short circuit withstand current and duration	:	NA
vi.	Make (Original equipment manufacturer)	:	M/s Jayshree Insulators.
vii.	Serial No.	:	--
viii.	Date and time of occurrence of fault	:	05/06/2022 at 04:35:12 hrs
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	Operation
x.	Weather condition at the time of failure (clear sky/ rainy/ thunderstorm etc.)	:	Drizzling
xi.	Year of Manufacturing	:	April-1989
xii.	Date of Commissioning	:	August-1991
xiii.	Storage condition of equipment if the gap between delivery at site and Commissioning is over 6 months	:	Commissioned immediately after supply of material
xiv.	If OEM was contacted after failure, its recommendation/ remark/ report/ MoM	:	NA
xv.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	Replaced
xvi.	(a) Details of previous maintenance	:	April-May-2021 No Abnormality observed

	(Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities) (b) Whether any abnormality observed in these tests. If yes, attach the test reports. (c) What steps were taken to address the abnormality?		
xvii.	Details of any previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	No
xviii.	Sequence of events/ Description of fault (SOE with time stamp)	:	05/06/2022, 04:35:12 hrs. 220 kV Main Bus-I differential protection operated. 220 kV Main Bus-I bay-5, B- Phase bus support insulator developed fault.
xix.	Details of protection operated	:	220 kV Main Bus-II differential protection
xx.	Details of tests done after failure	:	1) IR and HV testing carried out on failed insulator. 2) Test carried out on spare insulators before replacement: IR, HV test.
xxi.	Observations (Any relevant observation made by the field staff or during visual inspection)		Flash over mark was observed on 220 kV KAPS-VAV-2 line main isolator (DS-29) R-Phase arms insulator
xxii.	Probable cause of failure	:	Tracking fault of switchyard insulators due to Environmental Condition of High humidity.

2. Failure Report of 220 kV Insulator at Kakrapar Atomic Power Station Unit-1 & 2 of NPCIL

i.	Name of Substation	:	Kakrapar Atomic Power Station Unit-1&2
ii.	Utility	:	Generating station
iii.	Faulty Equipment and the associated feeder	:	220 kV Main Bus bar-I (1-6-B) B- Phase support insulator
iv.	Rating (Voltage/current/current/ratio/capacitance/MCOV etc., as applicable)	:	535 KV (Dry) and 460 KV (Wet) (Min. power frequency withstand voltage 154 KV (Visual discharge voltage)
v.	Short circuit withstand current and duration	:	NA
vi.	Make (Original equipment manufacturer)	:	M/s Jayshree Insulators.
vii.	Serial No.	:	--
viii.	Date and time of occurrence of fault	:	05/06/2022 at 04:41:05 hrs.
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	Operation
x.	Weather condition at the time of failure (clear sky/ rainy/ thunderstorm etc.)	:	Drizzling
xi.	Year of Manufacturing	:	April-1989
xii.	Date of Commissioning	:	August-1991
xiii.	Storage condition of equipment if the gap between delivery at site and Commissioning is over 6 months	:	Commissioned immediately after supply of material
xiv.	If OEM was contacted after failure, its recommendation/ remark/ report/ MoM	:	NA
xv.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	Replaced
xvi.	(d) Details of previous maintenance	:	April-May-2021 No Abnormality observed

	(Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities) (e) Whether any abnormality observed in these tests. If yes, attach the test reports. (f) What steps were taken to address the abnormality?		
xvii.	Details of any previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	No
xviii.	Sequence of events/ Description of fault (SOE with time stamp)	:	05/06/2022, 04:41:05 hrs. 220 kV Main Bus-II differential protection operated. KAPP-VAV-2 line R-Phase support insulator of 220 kV Main Bus-II side main isolator developed fault.
xix.	Details of protection operated	:	220 kV Main Bus-I differential protection
xx.	Details of tests done after failure	:	1) IR and HV testing carried out on failed insulator. 2) Test carried out on spare insulators before replacement: IR, HV test.
xxi.	Observations (Any relevant observation made by the field staff or during visual inspection)		Flash over mark was also observed on 220 kV Bus-I, between Bay-5 & 6 B-Phase bus support insulator (number 1-6-B)
xxii.	Probable cause of failure	:	Tracking fault of switchyard insulators due to Environmental Condition of High humidity.

WAVE TRAP
1. Failure Report of 220 kV WAVE TRAP at Kakrapar Atomic Power Station Unit-1&2 of NPCIL

i.	Name of Substation	:	Kakrapar Atomic Power Station Unit-1&2
ii.	Utility	:	NPCIL
iii.	Faulty Equipment and the associated feeder	:	KAPP UKAI-MOTA line R -Phase Wave trap
iv.	Rating (Voltage/current/current ratio/capacitance/ MCOV etc.,as applicable)	:	220 kV/1250 A
v.	Short circuit withstand current and duration	:	31.5 kA (max. thermal short circuit rating for 1 sec.)
vi.	Make (Original equipment manufacturer)	:	W. S. Industries(India) Ltd.
vii.	Serial No.	:	--
viii.	Date and time of occurrence of fault	:	22/05/2022 at 11:04 hrs.
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	Operation
x.	Weather condition at the time of failure (clear sky/ rainy/ thunderstorm etc.)	:	Clear sky, Windy atmosphere
xi.	Year of Manufacturing	:	January-1992
xii.	Date of Commissioning	:	January-1993
xiii.	Storage condition of equipment if the gap between delivery at site and Commissioning is over 6 months	:	Commissioned immediately after supply of material
xiv.	If OEM was contacted after failure, its recommendation/ remark/ report/ MoM	:	NA
xv.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	Replaced
xvi.	(a) (Details of previous maintenance Activities)	:	March-2018

	carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities) (b) Whether any abnormality observed in these tests. If yes, attach the test reports. (c) What steps were taken to address the abnormality?		No Abnormality observed
xvii.	Details of any previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	No
xviii.	Sequence of events/ Description of fault (SOE with time stamp)	:	22/05/2022 at 11:04 hrs. 220 kV KAPP – UKAI-MOTA line R-Phase Wave trap is damaged and got dislodged from its location.
xix.	Details of protection operated	:	No protection operated at KAPS end as line CB remains open at KAPS end. It is required for only Station Blackout condition. However, UKAI-MOTA line tripped as per intent.
xx.	Details of tests done after failure	:	Faulty wave trap was replaced with healthy spare wave trap after visual inspection.
xxi.	Observations (Any relevant observation made by the field staff or during visual inspection)	:	Wave trap found damaged and got dislodged from its location. Wave trap holding plate found rusted.
xxii.	Probable cause of failure	:	Due to high windy atmosphere wave trap was swinging badly due to which rusted hanging clamp dislodged from its clamp

2. Failure Report of 220 kV Wave Trap at Lalton Kalan of PSTCL

i.	Name of Substation	:	220 kV Lalton Kalan Substation
ii.	Utility	:	PSTCL
iii.	Faulty Equipment and the associated feeder	:	220 kV Wavetrap, 220 kV PGCIL – Lalton 1
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOV etc., as applicable)	:	220 kV
v.	Short circuit withstand current and duration	:	NA
vi.	Make (Original equipment manufacturer)	:	PSP
vii.	Serial No.	:	P1-L263
viii.	Date and time of occurrence of fault	:	16/08/2022 at 00:45 hrs.
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	Operation
x.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)	:	Clear sky
xi.	Year of manufacturing	:	Not known
xii.	Date of Commissioning	:	04/06/2008
xiii.	Storage condition of equipment if the gap between delivery at site and Commissioning is over 6 months	:	NA
xiv.	If OEM was contacted after failure, its recommendation/remark/ report/ MoM	:	No
xv.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	Replaced with new one
xvi.	(a) Details of previous maintenance (Activities carried out in previous maintenance including the tests)	:	13/12/2021

	conducted, periodicity of the maintenance activities) (b) Whether any abnormality observed in these tests. If yes, attach the test reports. What steps were taken to address the abnormality?		No
xvii.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	NIL
xviii.	Sequence of events/Description of fault (SOE with time stamp)	:	If got broken due to mechanical failure
xix.	Details of protection operated	:	Main 1&2 operated ABC Phase
xx.	Details of tests done after failure	:	No
xxi.	Observations (Any relevant observation made by the field staff or during visual inspection)	:	NA
xxii.	Probable cause of failure	:	Mechanical Breakdown/Failure

Coupling Capacitor

1. Failure Report of 220 kV Coupling Capacitor at Kotkaror of PSTCL

i.	Name of Substation	:	220 kV Kotkaror Substation
ii.	Utility	:	PSTCL
iii.	Faulty Equipment and the associated feeder	:	Coupling Capacitor Y & B Phase of 220 kV Botianwala Kotkaror Line
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOV etc., as applicable)	:	220 kV
v.	Short circuit withstand current and duration	:	Equivalent Capacitance = 8800 pF
vi.	Make (Original equipment manufacturer)	:	Mehru Electrical & Mechanical Engineers Ltd
vii.	Serial No.	:	Y- Phase: NA & B- Phase: OCC 4781/1/13713
viii.	Date and time of occurrence of fault	:	17/06/2022 at 18:12 hrs
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	Operation
x.	Weather conditions at the time of failure (clear sky/rainy / thunderstorm etc.)	:	Clear Sky
xi.	Year of manufacturing	:	2013
xii.	Date of Commissioning	:	09/06/2013
xiii.	Storage condition of equipment if the gap between delivery at site and Commissioning is over 6 months	:	Not Applicable
xiv.	If OEM was contacted after failure, its recommendation/ remark/ report/ MoM	:	OEM was not contacted because equipment was out of warranty
xv.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	Y-Phase was Replaced with NewCoupling capacitor. (Only 1 No. Coupling Capacitor Installed at present.)

xvi.	(a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities) (b) Whether any abnormality observed in these tests. If yes, attach the test reports. (c) What steps were taken to address the Abnormality?	:	No record available at this office and Maintenance done by CO&C S/D PSTCL Moga.
xvii.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	No Previous Failure Occurred
xviii.	Sequence of events/Description of fault (SOE with time stamp)	:	1. 220 kV Kotkaror Botianwala Ckt tripped at 18:12 2. 220 kV Kotkaror Dharamkot Ckt No.1 tripped at 18:12 3. 220 kV Kotkaror Dharamkot Ckt No.2 tripped at 18:12 4. 220 kV Kotkaror Moga Ckt No.2 tripped at 18:12 5. 220 kV Kotkaror Sadiq Ckt tripped at 18:12 220 kV Kotkaror Moga Ckt No.1 tripped at 18:12 from far End only.
xix.	Details of protection operated	:	Bus Bar Protection Scheme operated.
xx.	Details of tests done after failure	:	IR Values of bay was recorded.
xxi.	Observations (Any relevant observation made by the field staff or during visual inspection)	:	CC's got damaged due to burst
xxii.	Probable cause of failure	:	Cause could not be founded

2. Failure of 220 kV Coupling Capacitor at Rajpura of PSTCL

i.	Name of Substation	:	220 kV Rajpura Substation
ii.	Utility	:	PSTCL
iii.	Faulty Equipment and the associated feeder	:	Coupling Capacitor
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOV etc., as applicable)	:	8800 pF
v.	Short circuit withstand current and duration	:	---
vi.	Make (Original equipment manufacturer)	:	Mehru
vii.	Serial No.	:	OC781/1/1/44/16
viii.	Date and time of occurrence of fault	:	26/05/2023 Fault duration: 13:52
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	Due to Capacitor coupling damaged
x.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)	:	Clear
xi.	Year of manufacturing	:	JAN 2000
xii.	Date of Commissioning	:	21/11/2014
xiii.	Storage condition of equipment if the gap between delivery at site and Commissioning is over 6 months	:	---
xiv.	If OEM was contacted after failure, its recommendation/remark/ report/ MoM	:	---
xv.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	beyond repair
xvi.	(a) Details of previous maintenance	:	(a) periodical Testing done on 02-11-2022 vide PTW no. 48



	(Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities) (b) Whether any abnormality observed in these tests. If yes, attach the test reports. What steps were taken to address the abnormality?		No abnormality found
xvi.	Probable cause of failure	:	Due to Capacitor coupling damaged

**Annexure- II**

**Format for report of failure of the CT/CVT/PT/CB/SA etc. substation
equipment**

**Proforma for failure report of other substation equipment**

[Circuit Breaker, Instrument Transformers (CT/PT/CVT), Wave Trap, Isolator, Surge Arrester, Coupling Capacitor, Cable]

i.	Name of Substation	:	
ii.	Utility	:	
iii.	Faulty Equipment and the associated feeder	:	
iv.	Rating (Voltage/ current/ current ratio/ capacitance/ MCOV etc.,as applicable)	:	
v.	Short circuit withstand current and duration	:	
vi.	Make (Original equipment manufacturer)	:	
vii.	Serial No.	:	
viii.	Date and time of occurrence of fault	:	
ix.	Fault discovered during (Operation or periodic testing/ maintenance)	:	
x.	Weather conditions at the time of failure (clear sky/ rainy / thunderstorm etc.)		
xi.	Year of manufacturing	:	
xii.	Date of Commissioning	:	
xiii.	Storage condition of equipment if the gap between delivery at site and Commissioning is over 6 months	:	
xiv.	If OEM was contacted after failure, its recommendation/ remark/ report/ MoM	:	
xv.	Present condition of equipment (Repaired/ To be repaired / beyond repair)	:	
xvi.	(a) Details of previous maintenance (Activities carried out in previous maintenance including the tests conducted, periodicity of the maintenance activities)	:	



	(b) Whether any abnormality observed in these tests. If yes, attach the test reports. What steps were taken to address the abnormality?		
xvii.	Details of previous failure (Any failure which has led to a major repair of the equipment in the past since its Commissioning)	:	
xviii.	Sequence of events/Description of fault (SOE with time stamp)	:	
xix.	Details of protection operated	:	
xx.	Details of tests done after failure		
xxi.	Observations (Any relevant observation made by the field staff or during visual inspection)		
xxii.	Probable cause of failure		
xxiii.	Attach reports of tests during pre-Commissioning, periodic maintenance and after failure; Photographs of the failed equipment etc.		



Annexure- III
Office Order Constituting the Standing Committee



Government of India
Central Electricity Authority
Office of Secretary
Sewa Bhawan, R.K. Puram
New Delhi- 110 066
Fax No. 011-26108476
Tel.No. 011-26105619



(ISO :9001-2008)

No. CEA/SETD/220-O/2012/1-80

01.01.2013

Subject:- Constitution of a Standing Committee of Experts to investigate the failure of equipment at 220 kV & above sub-stations.

In order to investigate the failure of equipment at 220 kV & above sub-stations, it has been decided to constitute a Standing Committee comprising experts in the field of design and operation of EHV substation from Central Electricity Authority(CEA), various power utilities and research/academic institutes under section 73, clause(1) of the Electricity Act, 2003.

2. The Committee shall consist of the following members:

- | | | |
|-------|---|-------------------|
| (i) | Chief Engineer (SETD), CEA | -Chairperson |
| (ii) | A representative from CPRI, Bangalore | -Member |
| (iii) | A representative from IIT, Hauz Khas, New Delhi | -Member |
| (iv) | A representatives from concerned State Utility/Generating Companies/Transmission Companies where Substation Equipment failure has taken place | -Member |
| (v) | Member Secretary of concerned RPC | -Member |
| (vi) | Director (SETD), CEA | -Member Secretary |

3. The terms of reference of the Committee shall be as follows:

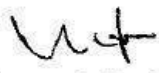
- To investigate the causes of failure of substation equipment in service
- To recommend remedial measures to avert recurrences of such failures in future.

4. Every incident of substation equipment failure needs to be immediately reported to Chairperson of the Standing Committee by a designated officer of the concerned organization.

5. The Power Utility where failure of substation equipment has taken place will provide all assistance required by the Committee in carrying out the investigations.

6. The TA/DA and other expenses shall be borne by the respective organizations of the members of the Committee.

The Chairperson of the Committee will prepare compendium of the analysis of the failures and recommendations every six months and submit the same to the Authority and MoP.


(M.S. Puri)
Secretary, CEA

To:

1. Director General, Central Power Research Institute, Professor Sir C.V. Raman Road, P.O. Box- 8066, Bangalore- 560080.
2. Director, Indian Institute of Technology, Hauz Khas, New Delhi- 110016.
3. Chairman/CMDs of State Utility/ Generating Companies and Transmission Companies.

With a request to nominate their representative as member of the Committee along with an alternative member.

4. Member Secretaries, Regional Power Committees:

- a) NRPC, New Delhi
- b) WRPC, Mumbai
- c) SRPC, Bangalore
- d) ERPC, Kolkata
- e) NERPC, Shillong

5. Chief Engineer (SETD), CEA

6. Director (SETD), CEA.



Annexure- IV

**Minutes of Meeting of the Standing Committee of Experts to Investigate the
Failure of 220 kV and Above Voltage Class Substation Equipment Held on
21.11.2023 and 22.11.2023 in CEA**

Minutes of the Meeting of Standing Committee of experts to investigate the failure of substation equipment at 220 kV and above voltage Class for the period of January 2022 to June 2023 held on 21.11.2023 and 22.11.2023.

A meeting of Standing Committee of experts to investigate the failure of substation equipment at 220 kV and above voltage Class for the period of January 2022 to June 2023 was held on 21.11.2023 and 22.11.2023 through Physical mode, under the chairmanship of Chief Engineer, PSE&TD, CEA, and Chairman of the committee. However, link of the online meeting through video conferencing mode was provided to the participants who could not join Physically.

List of participants is attached as Annexure.

- 1 Chief Engineer, PSETD, welcomed all the participants and highlighted a brief background about the formation and mandates of the committee. He stated that a Standing Committee of experts in the field of design and operation of EHV Substations from CEA, various power utilities and research / academic institutes was constituted under Section 73, Clause (I) of the Electricity Act, 2003, to investigate the failure of 220 kV and above voltage Class substation / switchyard equipment such as Power/Generator Transformer and reactors vide which all the utilities are required to report any event of failure of transformers and reactors within 48 hours in the specified format for reporting the incident (available on CEA website) along with all the additional information (like Disturbance Recorder (DR)/ Event Logger (EL) report], SLD, Test reports, O&M history, Photographs etc.).
- 2 Further, he informed that for the period of January 2022 to June 2023, a total of 169 incidents of failure of substation equipment were reported to CEA by 21 utilities (NTPC, GSECL, AEGCL, KSEB, RRVUNL, DTL, DVC, NLCIL, MPPTCL, NTPL, KPTCL, Powergrid, UPPTCL, NPCIL, SJVN, PSTCL, HPPCL, GETCO, MSETCL, Puducherry Electricity Department, HTPS). Failure of thirty transformers, five Reactors, fifty four Current Transformers, twenty nine CVTs, twenty two Surge arresters, eighteen Circuit Breakers, two Wave traps and four Coupling Capacitors were reported.
- 3 He requested all the members to ensure timely maintenance and monitoring of substation equipment to reduce their failures. He also stressed upon intimation of incidents of failure to CEA within 48 hours by the utilities in order to arrange for site visit by CEA and other members of committee for investigation. He further stated that the objective of this committee was not finding faults in operation but rather to bring out the best practices being carried out by various utilities and extend them further to all the utilities. The findings of this

committee would help in strengthening the Indian grid and avoid unwanted failure of substation equipment.

- 4 Director, PSETD, stated that sometimes the information provided by the utility is not sufficient to arrive at any conclusion. He informed that detailed Proforma for reporting of failure is available on CEA website and the same should be used by all utilities to report the incidents of failure of equipment so as to facilitate an investigation by CEA team and other members of committee. All utilities were advised to share the information in the provided format (word file shall also be included) along with all the relevant Photographs, reports of all pre-Commissioning tests and those carried out post fault. Director, PSETD, requested the utilities to present their failure incidents one by one to the expert members of the committee for investigation and opinions.
- 5 The presentation for their respective failure incidents were given by representatives of the utilities. The failure incidents and their subsequent findings were deliberated upon by the members of the committee, based on which suggestions were made to address the prevalent issues by members of the committee. Based on the deliberation in the meeting, the recommendations will be recorded in the final report of the Standing Committee.
- 6 KSEB representative presented 7 Nos. failure of CT, PT and Surge Arrester. In the reported CT, severe oil leak and the tan delta value were found high due to moisture ingress which causes failure. Chief Engineer, PSE&TD observed that the tests was done after oil leakage and moisture ingress. He advised to do the tests regularly so that deviation could be detected at early stage. Committee further advised that Capacitance variance should also be checked and the value of it should be within 5%. It was further recommended that the value of tan delta should be less than 0.07.
- 7 KPTCL representatives presented their six Power Transformers failure and two Current Transformers failure cases. The committee recommended that after severe fault, Dissolved Gas Analysis (DGA) and Sweep Frequency response Analysis (SFRA) tests should be carried out. KPTCL representatives also presented the fact that sometimes during end terminal fault in star connected transformers differential relay does not operate. The committee advised to carry out the variable frequency tan delta test starting from 1 Hz as this test provides earlier indication of a problem in the dielectric. Committee further recommended that Gasket should be changed after every 10 years so that proper seal is maintained to prevent the ingress of moisture.
- 8 SJVN representatives presented their one Generator Circuit Breaker (GCB) failure case. SJVNL stated that they are doing the SF6 gas analysis test for circuit breakers every fortnightly by SF6 Gas Kit. It was

observed that gas might have got contaminated due to over maintenance. Therefore, Committee recommended that over maintenance also leads to failure of the equipment. Utilities should carry out the maintenance as per standard practices. Committee further recommended that Dynamic contact resistance measurement (DCRM) is useful tool to prevent the failure of Circuit breaker. Therefore, DCRM should be regularly monitored.

- 9 AEGCL representatives presented their two 220 kV Circuit Breaker failure, one 100 MVA, 220 kV Autotransformer OLTC bevel gear teeth failure, one 220 kV Lightning Arrester failure, one surge arrestor failure and one isolator failure cases. For the failure of Surge arrestor, it was observed that the counter reading is not being monitored although they are monitoring the third harmonics frequently. It was informed that failed transformer faced frequent line faults that may deteriorates transformers life. Therefore, it becomes pertinent to monitors the number as well severity of faults also. Further, Bad Quality of CRGO may also lead to the failure of transformer in due course of time. CPRI representative stated that in case of Transformer, CRGO testing can only be carried out in Lab.
- 10 PSTCL representatives presented the 22 Nos. failure cases. Out of the 8 numbers of Power Transformers damage cases of PSTCL presented, 7 no Transformers were 220/66KV, 100 MVA rated and 1 no. 400/220 kV, 315 MVA rated. Out of the 7 no 100MVA Transformers, 4 No, Transformers were old, having their Year of manufacturing (YOM) as 1986, 1994, 1996 and 1997 respectively. The remaining 3 no. damaged 100 MVA Transformers were of M/s BBL make. The 400/220 kV, 315 MVA ICT, make M/s SIEMENS, YOM-2010 belonging to the same lot and procured without carrying out the short-circuit type test. The transformers got damaged due to tertiary winding insulation failure according to investigation report submitted by supplier firm M/S SIEMENS. All the 8 no. Power Transformers got damaged due to winding insulation failure either during feeding of severe external through faults or during normal load running condition. The insulation failure during these events occurred either due to old age of transformers or design issues. During discussion committee remarked that it appears that protection setting are not proper. In response to this, PSPCL representative stated that they have carried out the protection audit recently and no such observation was provided by the Audit. The Committee recommended to recheck the protection coordination.
- 11 DTL representative presented their Failure of 315 MVA, 400/220/33 kV ICT-3 at 400 kV Substation Tikrikalan and Failure of 100 MVA, 220/66 kV Power Transformer at 220 kV substation Park Street.

- 12 GETCO representative presented their total four numbers of 220 kV and above transformer failure, fourteen numbers of current transformers failures, and twenty four numbers of lightening arresters failure, one CVT failure and two PT failure cases. He also added that due to coastal area their atmosphere has different salinity and moisture content which leads to change in various parameters of the devices. Committee recommends that Condition of equipment should be monitored before monsoon. Equipment should be tested for condition monitoring at the periodicity of annual for High Voltage equipment annually and on twice a year basis for EHV.
- 13 DVC representative presented their one 50 MVAR , 420 kV, 3- Phase Bus Reactor failure and 198 kV Lightening Arrestor failure. Committee recommended carrying out the variable frequency tan delta test on the equipment. Further tan delta value should be adjusted w.r.t. temperature so that values can be compared with base value.
- 14 MPPTCL representative presented their two transformer failure, four CT failure, two potential transformer/CVT failure and two Surge Arrester failure cases. It was observed that bushing failure was very frequent. PGCIL representative suggested for RIP Bushing which has very less Bushing failure rate and fault in that does not causes blasting. MPPTCL representative also asked for revision in Lightening Arresters standards. Chief Engineer (PSE&TD) and chairman of the committee suggested to follow the Standard Specification and technical parameters for transformer/Reactors (66 kV and above voltage Class) whereby use of RIP/RIS bushing for 145 kV and above Class except 765 kV Class transformers has been made mandatory.
- 15 NTPC representative presented their one 400 kV Ramagundam substation Autotransformer failure and one CVT failure of NTPC Kudgi STPP. The autotransformer was failed mainly due to aging and abnormality was observed during secondary voltage measurement of CVT. The committee recommended that in case the equipment is twenty years old then Furan test should be carried out to monitor the degree of degradation of the Transformer paper insulation.
- 16 RRVPNL representative presented their one Power Transformer failure, three Autotransformer failure, ten circuit breakers failure, twenty five current transformer failure, six CVT failure, thirteen Surge Arresters failure cases.
- 17 MSETCL representatives have attended the meeting through video conferencing mode. Total 22 number of failure cases was reported by MSETCL. Committee recommended to monitor the quality of SF6 gas in circuit breaker regularly because of impure SF6 gas may lead arching

between the contacts sustain during operation which deteriorates the life of CB.

- 18 MSETCL presented a case study whereby they have used Neutral Grounding Resistor (NGR) in the neutral connection of LV side resulting in reduction of ground fault currents to 40%. Earlier there were frequent faults as they have direct feeder to Distribution and the fault on discom feeders was directly fed by the Power Transformer. For a typical substation, the LV side short circuit current is in the range of 12 to 18 kA. For each fault, the transformers has to sustain axial and radial forces which causes displacement of LV windings over period of time. Out of 10 failed cases of power transformers in MSETCL, 9 Nos. cases of failures reported displacement of LV windings. Though SFRA test can determine the intactneSubstation of winding, however test cannot be conducted frequently owing to requirement of an outage. Therefore, by using NGR of one ohm, the ground fault current has been reduced by 40% and therefore reducing the impact of the fault on the Transformer.
- 19 NPCIL representatives have not attended the meeting although they had sent their failure report.
- 20 Director, PSETD advised all the utilities to ensure proper O&M and storage conditions at site of the equipment and taking all precautions as per the advice of OEM. He thanked all the participants for their presence and healthy deliberations in the meeting.
- 21 Chief Engineer, PSE&TD and Chairman of the Committee, thanked all the participants for a healthy deliberation in the meeting and sharing their best practices with other utilities. He advised all the utilities to carry out maintenance activities as per schedule.
- 22 He further informed that all the suggestions received during the meeting shall be incorporated appropriately in the final report of the Committee and the main purpose of the meeting is knowledge and experience sharing so that every utility get benefitted and there will be leSubstation cases of failure.

The meeting ended with thanks to the Chair.

Annexure**List of Participants:****Central Electricity Authority (CEA):**

- (i) Sh Ramesh Kumar, CE, PSE&TD & Chairperson of the Committee
- (ii) Sh Bhanwar Singh Meena, Director, PSE&TD & Member Secretary of the Committee
- (iii) Sh Pankaj Kumar Verma, Dy. Director, PSE&TD
- (iv) Sh Bhavesh Mahawar, AD, PSE&TD
- (v) Sh Amrendra Pratap Singh, AD, PSE&TD

AEGCL:

- (i) Sh Rituparna Khargharia, DGM
- (ii) Sh Bijoy Barman, AGM

MPPTCL:

- (i) Sh R.C. Sharma, SE (T&C)
- (ii) Sh Chandra Kant Shrivastava, EE

NTPL:

- (i) Sh N. Rengarajan, DGM

GETCO:

- (i) Sh N.J. Rathod, CE (TR)

KSEB:

- (i) Sh Biju M.T., EE RD Kannur

RRVUNL:

- (i) Sh V.K. Singh, SE

RVPN:

- (i) Sh A.K. BiSubstationa, SE
- (ii) Sh Neelesh Dharwad, SE
- (iii) Sh D.K. Jain, SE

PGCIL:

- (i) Sh Pradeep Kumar, CGM
- (ii) Sh Rajiv Ranjan, DGM

DVC:

- (i) Sh Sujeet Kumar, Dy. G.M.



DTL:

- (i) Sh R.S. Meena, GM
- (ii) Sh Ram Kumar, DGM

NRPC:

- (i) Sh Rituraj Pandey, Executive Engineer

NJHPS (SJVN Ltd.):

- (i) Sh M. Kumar, ED
- (ii) Sh Sanjeet S. Parmar, Dy. Manager

KPTCL:

- (i) Sh H.S. Shachi Kumar, SEE
- (ii) Sh B.V. Girish, CEE

PSTCL:

- (iii) Sh GS Sandhu, ASE
- (iv) Sh Sumit Moudgil, ASE

NTPC:

- (i) Sh Akhileshwar Maurya, Senior Manager

CPRI:

- (i) Sh L.N. Giri, EO
- (ii) Dr. J. Sreedevi, CPRI
- (iii) Sh T. Gurudev, CPRI
- (iv) Sh Chandra Shekhar, CPRI

Other Participants (Online):

- (i) Sh Animesh Meena
- (ii) Sh K.P. Meena
- (iii) Sh Rakesh Sharma
- (iv) ERPC
- (v) NERPC
- (vi) SRPC
- (vii) WRPC
- (viii) NRPC
- (ix) Sh Kura Ravi Kumar
- (x) MSETCL Corporate Office
- (xi) Sh Ganesh Deshmukh
- (xii) Sh Daulat Bhabad



CENTRAL ELECTRICITY AUTHORITY

- (xiii)** Sh Dilip Kumar Puhan
- (xiv)** Sh Maranani Sreekanth
- (xv)** Sh Ganesh Deshmukh
- (xvi)** Sh Vinayak Goad
- (xvii)** SE PAC AKOLA
- (xviii)** Dy. EE PAC KARAD
- (xix)** Executive Engineer, PAC Dn, Panvel
- (xx)** SE PAC Nagpur
- (xxi)** SE PAC Nashik
- (xxii)** Adee Testing
- (xxiii)** Protection unit Wardha
- (xxiv)** 400 kV Khadka
- (xxv)** Testing Bhandara
- (xxvi)** 400 kV testing, khaperkheds