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विद्युत मंत्रालय/ Ministry of Power
केन्द्रीय विद्युत प्राधिकरण/ Central Electricity Authority
विद्युत प्रणाली अभियांत्रिकी एवं प्रौद्योगिकी विकास प्रभाग
Power System Engineering & Technology Development Division

दिनांक: 01.04.2026

विषय: Minutes of the meeting of the Standing Committee of the Experts to discuss the failure of 220 kV and above voltage level Transformers during period of July, 2025 to December, 2025 -reg.

महोदया/महोदय,

You are kindly aware 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 reconstituted by Central Electricity Authority vide letter No. CEA-PS-14-97/3/2018-PSETD Division-Part(5) dated 03.02.2025 to investigate the failure of Transformer and Reactor at 220 kV and above sub-station/ switchyard and recommend measures to avert recurrence of such failures in future.

2. In this connection, a meeting of the Standing Committee of the Experts was held on 20.02.2026 through video conferencing mode to discuss the cause of failures of the transformer reported by various utilities to CEA which had failed during the period from July 2025 to December 2025.
3. Based on the data provided by utilities and deliberation held during the meeting, The minutes of the meeting have been prepared and are enclosed herewith for kind information and necessary action please.

This issues with the approval of Competent Authorities.

Encl.: As above

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Power System Engineering & Technology Development Division Central Electricity Authority

Minutes of the meeting of the Standing Committee of the Experts to discuss the failure of 220 kV and above voltage level Transformers during period of July, 2025 to December, 2025 -reg.

1 Background

Under Section 73, Clause (I) of the Electricity Act, 2003, CEA vide Office Order No: CEA/SETD/220-O/2012/1-80 dated 01.01.2013 constituted a Standing Committee of Experts in the field of design and operation of EHV Substations from CEA, various power utilities and research/academic institutes to investigate the failure of 220 kV and above voltage class substation/ switchyard equipment. The Committee was reconstituted vide CEA office order no: CEA-PS-14-97/3/2018-PSETD Division-Part(5) dated 03.02.2025 (**Annexure-V**) to investigate the failure of 220 kV and above voltage class Transformers & Reactors and recommend measures to avert recurrence of such failures in future. As part of this activity, CEA has been receiving reports of failures from power utilities.

All the utilities are required to report any event of failure of Transformer and Reactor at the earliest in the specified format for reporting the incident (available on CEA website and attached as **Annexure-IV**) 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 objective of the Standing Committee is to investigate the causes of failures, deliberate the failures of Transformers and Reactors, 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.

In this connection, a meeting of the Standing Committee of Experts to investigate the failure of 220 kV and above voltage Class Transformer for the period of July 2025 to December 2025 was held on 20.02.2026 through video conferencing mode. List of participants is given at **Annexure-I**.

2 Introduction

Sh. N.R.L.K. Prasad, Chief Engineer (PSE&TD), CEA and Chairperson of the Standing Committee, extended warm welcome to all the Members & Participants, and gave a brief background about the formation and mandates of the committee. He mentioned that the Standing Committee comprising experts in the field of design and operation of EHV Substations from CEA, various power utilities and research/academic institutes was reconstituted by Central Electricity Authority vide letter dated 03.02.2025 to investigate the failure of Transformer and Reactor at 220 kV and above sub-station/switchyard and recommend measures to avert recurrence of such failures in future. To enable Standing

Committee carry out its work, it is important that the Utilities report the instances of failures in their network/ system well within time as per regulatory provisions, and ensure proper analysis of their respective events by the Committee by undertaking site visits, if required, in time.

It was informed that as per Regulation 48 (8) of CEA (Measures relating to Safety and Electric Supply) Regulations, failures of any 220 kV and above voltage level Transformer & Reactor shall be reported by the owner utility within 48 hours of occurrence of the failure, to the Authority, and the reasons for failure and measures to be taken to avoid recurrence of failure shall be sent to the Authority within one month of the occurrence as per stipulated formats, along with all the additional information (like Disturbance Recorder (DR)/ Event Logger (EL) report], SLD, Test Reports, O&M history, Photographs etc.). He requested all utilities to adhere to these timelines strictly.

He expressed concern regarding the limited responsiveness of certain utilities and emphasized that effective deliberations are contingent upon receipt of complete, factual, and verified information from the asset owners. It was reiterated that the Committee/ CEA functions primarily as a coordinating and facilitating body, and that the responsibility for accurate reporting and technical substantiation rests with the utilities concerned. All stakeholders were advised to discharge their responsibilities in a proactive manner in the larger interest of ensuring reliability and improved health of assets in the power sector.

Based on the information received, a total of 11 failure cases were recorded for the period under review. However, it was clarified that this number represents only the cases reported to CEA and may not reflect the actual number of failures that occurred. Despite repeated reminders and written communications, complete information had not been received from all utilities. It was directed that all failure events must be reported promptly and transparently, and that no incident should be concealed or under-reported. The Committee noted that its deliberations and conclusions serve as a technical repository and reference for future preventive and corrective actions. Timely submission of detailed reports is therefore essential to facilitate proper analysis and, where required, immediate site visits.

Chairperson further directed that each utility shall designate a single Nodal Officer responsible for consolidation, verification, and authentication of all failure reports prior to submission to CEA. It was emphasized that failure events occurring at field offices must first be reported to the respective headquarters, wherein the information shall be duly consolidated and vetted before being forwarded. The Committee observed that several detailed reports contained incomplete or peripheral information, with mandatory fields left unfilled. The designated Nodal Officer shall ensure that all prescribed details, including cause of failure and other relevant technical particulars, are properly filled, verified, and corroborated. Incomplete or inadequately substantiated reports impede meaningful technical analysis and may make the Committee's review unproductive.

Chairperson also reiterated the necessity of strict adherence to the standardized transformer ratings notified under the "Standard Specifications and technical Parameters for Transformers and Reactors (66 kV & above voltage class)". To address supply chain constraints and extended procurement timelines, standardization has been undertaken to reduce delivery delays and avoid repetitive testing requirements. Since original equipment

manufacturers have already completed design validation, type testing, and short-circuit testing for the standardized ratings, procurement from the approved list would obviate the need for type testing and facilitate expeditious supply. Utilities specifying non-standard ratings undermine the objective of standardization and contribute to avoidable delays. Accordingly, utilities were requested to adhere to the standardized specification documents for thermal generating transformers and interconnecting transformers used in transmission systems.

Thereafter presentations by Utilities for their respective failure incidents were held. The failure incidents and their subsequent findings were deliberated upon by the members of the committee.

3 Deliberations held during Standing Committee Meeting

3.1. General:

A total of 11 failure incidence of Transformer of 220 kV and above voltage rating between 1st July 2025 and 31st December 2025 were reported by 8 Utilities (DTL, GETCO, HVPNL, NHPC, OPTCL, RVPNL, THDCIL & TANTRANSCO). Complete details of all the reported Transformer failures are given at **Annexure-II**. The details of the deliberations of the standing committee are presented in the ensuing paras.

3.2. Failure report of 100 MVA, 200/66/11 kV Three Winding Transformer at Okhla S/s, DTL

Representative of DTL presented the case of failure of 100 MVA 220/66/11 kV, three phase Transformer at Okhla Substation. He informed that the NGEF make Transformer, manufactured in 1996 and commissioned in 1998, had already completed nearly 28 years of service and had undergone multiple major repairs during its lifetime, including relocation, winding and core replacement, and repeated replacement of the R-phase 66 kV bushing (in 2017 and again in May 2025). The transformer tripped on 09.08.2025 on R-phase differential protection after an initial R-phase fault (Fault current approximately 7.1 kA) on the 66 kV side, which escalated into an R-Y-G fault and subsequently developed into an internal fault within about 711 ms, leading to HV breaker tripping. Post-fault investigations revealed highly elevated acetylene levels (43.6 ppm) in DGA, abnormal Tan Delta test result, deviations in magnetic balance test result. Further, SFRA has indicated deviation from its original SFRA and it has been interpreted of shorted turns or core movement. Internal inspection identified burnt insulation paper, melted copper granules near the tertiary winding take-off lead, and damage around the R-phase limb, indicating severe internal damage.

In this regard it was informed that a Committee of Experts comprising members from CEA, NRPC, CPRI and PGCIL carried out the site visit on 25.08.2025 in order to investigate the cause of failure of the Power Transformer. Based on the Disturbance recorder, physical inspection of the Power transformer and the data provided by the Substation officials, following were observed by the Committee:

At the time of incidence, weather was rainy. The transformer was operating on load of 15 MW before the incidence of failure.

- (a) Prior to the failure of Power Transformer, 66 kV Incomer-2 tripped on Over Current, Earth Fault and master trip relay on external fault at 17:11.50.604 hrs.
- (b) After this, 100 MVA, 220/66/11 kV Power Transformer, NGEF make, installed at 220 kV Okhla S/s tripped on 09.08.2025 at 17:11.50.944 hrs on relay indication R phase differential and master trip.
- (c) The Disturbance Recorder data indicates that initially the fault current was 7.1 kA on R phase of 66 kV side of transformer. After 195 ms, fault converted into R-Y-G fault and fault current was 7.1 kA and 6.6 kA in R-phase and Y-phase respectively. The transformer was commissioned in the year 1996 and first time commissioned in the year 1998 at 220 kV Gazipur S/s. The transformer was failed on 25.07.2007 and after repairing, it was recommissioned at 220 kV Okhla S/s on May, 2013.
- (d) From the data it was inferred that the cause of the failure is mechanical failure due to the dynamic forces induced by the through fault current. From the internal inspection it was found that the intensity of the damage of core and coil assembly the ICT is very high.
- (e) DGA results taken before the failure showed a gradual increase in thermal gases, confirming that thermal stress was developing inside the transformer over time which indicate progressive insulation ageing. The transformer, being old and previously repaired, was already in a weakened condition. From the post-failure test results, it is observed that the R-phase of the transformer developed an internal fault. 66 kV side of Okhla Substation is connected radially to 220/66 kV Power Transformers-II. Due to this arrangement, the fault occurred on 66 kV Incomer-II was completely fed by the Transformer-II. The Transformer is 29 years old and has been repaired in year 2013. High fault current has led to development of forces in the winding which ultimately led to development of internal fault in Transformer. Magnetic balance and SFRA tests also show indications of possible core/winding movement in the R-phase. Differential relay operation also confirms an internal transformer fault.

CE (PSE&TD Division), CEA concluded that ageing, repeated through-faults, overvoltage stresses, and repeated bushing failures had progressively weakened the winding structure, resulting in insulation breakdown and internal fault. CE enquired about the present load management status, to which it was clarified that load is being managed through other substations and that replacement/augmentation is targeted by March-end.

3.3. Failure report of report of 160 MVA, 220/66 kV Power Transformer at Morbi S/s, GETCO

Representative of GETCO presented their case of failure of 160 MVA, 220/66 kV Power Transformer at Morbi Substation. It was informed by representative of GETCO that the above mentioned Transformer was manufactured in the year 2018 and commissioned on 24.20.2019. The Transformer got failed on 06.11.2025, at 18:35 hrs. The Transformer failure was most likely triggered by a sudden LV side R-phase bushing failure—either internal insulation breakdown or external flashover—despite tan delta and capacitance values of all the bushings as per last test conducted on 16.04.2025 were within permissible limits. This caused a high-energy internal fault with fault current around 19.8 kA, rapidly cleared by differential protection within three and half cycles. However, fire was observed near the LV R-phase bushing immediately thereafter. Mechanical protections such as PRV and Buchholz operated with a time delay of around two minutes, corresponding to pressure rise and gas accumulation due to ongoing burning. The Nitrogen Injection Fire Protection System (NIFPS)

failed to activate because its DC supply cables were damaged by hot oil and fire in a nearby trench. The fire completely destroyed the transformer and caused collateral damage to associated lightning arresters, conductors, and control cables. As the transformer was fully burnt in the incident, all external and internal non-metallic components were completely damaged. All HV, LV bushings and neutral bushings were also found burnt and shattered. Due to the high damage due to fire, no meaningful site testing or internal inspection could be carried out. Hence, a perfectly precise root-cause analysis could not be established based on physical evidence.

CE (PSE&TD Division), CEA emphasized that fire-resistant cables should have been provided for the NIFPS for the above subject Transformer. He further emphasized that as per CEA's "Standard Specifications and technical Parameters for Transformers and Reactors (66 kV & above voltage class)" RIP/RIS bushing should be used for the Voltage level of 66 kV above and upto 400 kV. Additionally, he advised that standardized transformer ratings should be adopted to ensure uniformity and operational reliability across the System. Regarding fire protection, he highlighted that as per CEA (Measures relating to Safety and Electric Supply) Regulations, 2023 every transformer of 10 MVA or reactor of 10 MVAR and above rating shall be provided with automatic fire fighting system as per relevant standards. Therefore, Utilities have to ensure that any Fire Protection System has to be installed as per relevant Standard.

3.4. Failure report of 100 MVA, 220/33 kV Auto Transformer at Nawada S/s, HVPNL

Representative of HVPNL presented the case of failure of 100 MVA 220/33 kV Auto Transformer at Nawada Substation. The Transformer was manufactured by M/s Bharat Bijlee Ltd (BBL) in 2010 and commissioned on 12.11.2012. On 07.07.2025, the Transformer tripped with operation of differential relay and Buchholz relay along with 33 kV side outgoing feeder. The 33 kV outgoing feeder tripped with operation of Overcurrent/earth fault. NIFPES operated and oil drained out in the oil tank of NIFPES and Nitrogen injected in the Transformer Tank. Testing of Buchholz relay gas flammable was carried out and no flammable gas was found in the Buchholz relay. Further, Oil sample was collected from bottom oil sample and sent to testing laboratory where acetylene gas was reported in quantity of 6 as per DGA report.

Physical inspection of the Transformer was carried out with OEM i.e. BBL on 08.07.2025 after draining complete oil from transformer main tank. During the inspection Carbon traces were found on top of winding R phase drum and top side of drum winding. Burnt paper was also found near yoke of R phase and bottom OLTC selector switch.

In the magnetizing current test, the magnetizing current in R phase of LV winding was found to be 23 A and was not in comparable range of Y phase and B Phase magnetizing current which was 72 A and 69 A respectively.

It was informed by M/s HVPNL that the Transformer has been sent to OEM factory for further analysis. HVPNL informed that another similar rating Transformer of same OEM has failed in Sector 107 Gururam Substation. CE (PSE&TD) requested to HVPNL to share the detailed report from the OEM in this regard.

3.5. Failure report of 100 MVA, 220/33 kV Power Transformer at Sector 107 Gurugram GIS S/s, HVPNL

Representative of HVPNL presented the case of failure of 100 MVA, 220/33 kV Power Transformer at Sector 107 Gurugram GIS Substation. The Transformer was manufactured by Bharat Bijlee Limited (BBL) in 2020 and commissioned on 19.08.2021. The Transformer failed on 30.07.2025. At the time of failure, the Transformer was operating under light load conditions, carrying 4.56 MVA against its rated capacity of 100 MVA. Transformer was feeding ten 33 kV feeders and was at Tap Position No. 05. It had experienced 196 through faults prior to the incident. On 30.07.2025 at 08:11 AM, the transformer tripped along with the 33 kV feeder. Transformer protection operated through differential relay (R & B phase), Buchholz alarm, and master relay, while the feeder protection operated on overcurrent and earth fault with high-set currents. The recorded fault current showed heavy current of 10.7 kA in Y-phase. Protection system operation was found satisfactory. Post-fault testing revealed no flammable gas in the Buchholz relay. However, the Transformer Turn Ratio test showed abnormality in R-phase, insulation resistance values were lower than previous records, and magnetic balance and magnetizing current tests were found abnormal. Winding resistance results were comparable with earlier values. Dissolved Gas Analysis indicated presence of methane, ethane, ethylene, hydrogen, carbon monoxide, and carbon dioxide, while acetylene was nil, indicating absence of major arcing but presence of internal thermal/electrical stress. Internal inspection showed no major physical damage, no burnt insulation smell, and no broken components; however, carbon deposits were observed on the R-phase winding. It was informed that the maximum load on the Subject Transformer recorded during 2025 was 23.98 MVA. Therefore, Transformer has not been loaded even for its 25 % of rating during 2025. As of now, the transformer has been sent to BBL, Navi Mumbai for detailed root cause analysis. The report from the OEM is awaited.

CE (PSE&TD Division), CEA observed that although the transformer was operating under light load at the time of failure, internal damage still occurred, which requires detailed justification from the manufacturer. It was emphasized that the root cause analysis (RCA) report from BBL must clearly establish whether the failure was due to design inadequacy, short-circuit withstand limitation, material defect, or cumulative effect of repeated through faults. CE then raised concerns about whether the issue was specific to a particular phase (notably Y-phase), related to 33 kV network faults, or influenced by disturbances from adjacent 220 kV lines, all of which fall under HVPNL's network jurisdiction. He also emphasized the need to examine the fault history of both the 33 kV downstream network and the adjacent 220 kV lines to determine whether repeated external faults or system conditions contributed to insulation deterioration and eventual internal transformer failure. He further requested to HVPNL to share the detailed report from the OEM in this regard.

3.6. Failure report of 43.33 MVA, 11/220/33 kV Generator Transformer at Salal S/s, NHPC

Representative of NHPC presented the case of failure of 43.33 MVA, 11/220/33 kV Generator Transformer (GT) at Salal Substation. GT was manufactured by Bharat Heavy Electricals Limited and commissioned in 1993. The GT experienced a major fault on 06.10.2025 at 09:59:06 hrs, immediately after synchronization at 10 MW load under normal grid conditions. During auto-synchronization testing, only the Y-phase circuit breaker (CB) got closed and opened after 30 milliseconds. Prior to its closing, the 86X relay operated and excitation was switched OFF while the unit was spinning. No command input was detected.

Subsequently, the unit appears to have been back-fed from the GT HV side, as evidenced by the GT protection DR which shows Y-phase current rising to approximately 3,300 A.

Physical inspection revealed damage to generator stator winding bars (bottom bars of slots 32, 33, 34 and top bars of 32, 33) with carbon deposition and impedance value reduction in poles 8 and 18 to 0.5 Ohm. Carbon particles were found deposited on the right-side adjacent portion of the faulty section of the winding. Insulation Resistance of LV winding and Ground was found to be 2.9 MΩ. DGA of Transformer Oil showed acetylene rising sharply from 0.5 ppm to 101 ppm, confirming severe internal arcing. Buchholz Stage-II operation further shows that an internal fault got developed. However, no core hotspot or mechanical displacement was observed.

The root cause analysis was concluded with the reason of failure as CB malfunction leading to out-of-phase closing of the Y-phase which led to LV voltage surge and internal arcing. The GT have been in long-term operation at Salal Power Station and may have contributed to insulation degradation due to aging effects.

The incident resulted in 115 MW generation loss and 59 days outage. Corrective measures regarding review and modification of protection settings were taken by NHPC. Based on the inspection of the OEM it was recommended to replace the existing ABB make CBs.

It was observed that the transformer worked for 33 years, therefore the transformer has completed its successful life. Chief Engineer (PSE&TD) enquired about Circuit breaker flash over protection and LBB protection, for which NHPC submitted that it has been already provided.

3.7. Failure report of 100 MVA, 220/66 kV Auto Transformer at Tarkera S/s, OPTCL

Representative of OPTCL presented the case of failure of 100 MVA, 220/132 kV Auto Transformer at GSS Tarkera. It was informed that the transformer was manufactured by Bharat Heavy Electricals Limited (BHEL) in 1978 and commissioned in 1981. The subject Transformer had undergone overhauling in March 2023 and was under regular condition monitoring. Insulation Resistance (IR), Polarisation Index (PI), Tan Delta, DGA, and BDV tests, with no major abnormalities reported prior to failure. The fault occurred on 02.09.2025 at 15:30 hrs under normal loading conditions, during which both Buchholz and Differential relays operated. Fault current reached upto approximately 21 kA in Y-phase. Post-failure inspection revealed rupture of the 220 kV Y-phase porcelain bushing and detachment of the Y-phase bushing lead, while DGA after failure did not indicate significant internal decomposition gases.

Representative of OPTCL stated that main reason of the failure of Transformer is failure of Y phase bushing lead. He said that detailed inspection is to be done inside the transformer after transformer oil removal from tank.

CE (PSE&TD Division), CEA emphasized that a structured and scientific maintenance philosophy must be established highlighting three critical aspects: first, identification of the complete set of diagnostic tests required to assess transformer health—such as IR, PI, Tan Delta, DGA, BDV, winding resistance, SFRA, bushing capacitance and tan delta, and thermal monitoring; second, defining clear periodicity and frequency for each test (quarterly, half-yearly, annual, or condition-based) depending on voltage class, age, and criticality; and third, establishing well-defined acceptance limits and alarm thresholds so that results are

not merely recorded but meaningfully interpreted to trigger timely corrective action. It was stressed that simply conducting tests is not sufficient—utilities must develop a guideline-driven philosophy where trend analysis, limit values, and escalation criteria are clearly laid down to ensure transformer healthiness and prevent failures

3.8. Failure report of 160 MVA, 220/132/11 kV Auto Transformer at Babai S/s, RVPNL

Representative of RVPNL presented the case of failure of BHEL make, 160 MVA, 220/132/11 kV Auto Transformer at Babai Substation. The subject Transformer was manufactured in 2017 and commissioned on 29.03.2019. He explained that the incident was associated with a high fault current exceeding 10 kA arising from a 132 kV bus-side fault caused by snapping of the Y-phase jumper between the circuit breaker and isolator of the Babai–Neem Ka Thana line bay. The resulting phase-to-ground fault near the LV side of the transformer led to rapid operation of protection schemes, including Restricted Earth Fault (REF), High Impedance Differential (HID), Buchholz relay, and PRD, along with heavy oil expulsion. Physical inspection revealed severe internal damage such as displacement of 2V and 2W bushings, burnt insulation, disturbed wooden support blocks, displaced winding turns in the middle phase, and heavily carbonized oil. He further said that in the DGA it was observed that huge amount of Acetylene gas beyond the permissible limit formed and formation of carbonic gases was also found to be increasing side in comparison to previous DGA report on dated 03.07.2025.

Representative of RVPNL stated that high current flow through the middle phase winding of Transformer led to development of electrical and mechanical forces and led to shifting of wooden support blocks, insulation failure of top and bottom side of winding and shifting of 2V and 2W bushing from their original position. As per transformer specification short circuit level was considered for the HV & LV system for 220 kV – 50 kA 1 sec (sym, rms, 3 phase fault) and for 132 kV – 40 kA for 1 sec. On the above finding, it seems that there was manufacturing defect in the transformer due to which it could not sustain the fault current up to the specify time 1 sec resulting in to failure of Transformer. However, detailed failure analysis may be carried out after dismantling the transformer completely at works.

Representative of RVPNL informed that Transformer supplied under same Purchase Order Number dated 27.06.2014 also got failed at 220 kV GSS, Amberi within Guaranteed Period (GP) and transformer at 220 kV GSS , Bikaner failed after GP.

CE (PSE&TD Division), CEA enquired whether the failed transformer had undergone DSC (Dynamic Short-Circuit) testing, noting that such testing could have provided significant assurance against the fault. He stated that as per CEA (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations, 2022, Dynamic short circuit withstand (DSC) test shall be conducted on one unit of each type and rating of transformers, to validate the design and quality. Therefore, all the Utilities are advised to ensure that DSC test should have been carried out on the Transformer of the same design. Representative of RVPNL informed that the Transformer was designed for short circuit for one second.

CE (PSE&TD) stated that if the transformer was truly designed and manufactured to sustain the specified fault level for one second, then surviving a fault of much shorter duration would not have caused such severe mechanical displacement and internal damage. He emphasized the need for corroborating documentary evidence such as short-circuit withstand test certificates, design calculations, routine/type test reports, and compliance

documentation submitted during procurement and factory testing. It was stressed that merely mentioning compliance in specification is not sufficient and utilities must verify supporting proof during design approval stages. CE advised that since the transformers are expected to serve 30–35 years, utility should negotiate extended warranty periods (ideally up to 10 years) to safeguard against latent manufacturing or design deficiencies.

3.9. Failure report of 260 MVA, 21/(420/3) kV, 1 Phase Generator Transformer at Khurja S/s, THDCIL

Representative of THDCIL presented Unit-2 GT R-phase failure at 2×660 MW Khurja Super Thermal Power Plant. He informed that the 260 MVA, 21/ (420/V3) kV, 1 Phase Generator Transformer manufactured by Bharat Heavy Electricals Limited in June 2024 and the Transformer was commissioned in September 2025. The Transformer was kept with nitrogen filled for three months at the site and thereafter kept ideal uncharged with oil filled condition.

On 26.09.2025, Unit-2 was operating at 533 MW. The unit tripped at 19:49 hrs. After clearance from BHEL, on 27.09.2025, the turbine was rolled and speed stabilized at 3000 rpm. At 00:43 Hours, excitation FCB was made ON. At 00:44 Hours, excitation Channel-2 (manual mode) was made ON; however, generator voltage did not develop, and the issue was informed to BHEL. At 00:47 Hours, standby excitation Channel-1 (auto mode) which was in healthy state with all permissive available was taken into service, as per procedure. To build up excitation voltage, two Automatic Voltage Regulator (AVR) channels are available in system (1 Working + 1 Standby). Immediately after channel changeover, generator terminal voltage suddenly rose to 28.5 kV, and explosion sound came from GT-2R, and the transformer caught fire.

During detailed analysis it was found that the Transformer experienced severe over-fluxing leading to core saturation. As per disturbance recorder data, the LV voltage initially reached the rated 21 kV with a magnetizing current of about 50 A; however, within milliseconds the voltage rose to 23.1 kV (110%) and then rapidly escalated to 27.19 kV (130%) with magnetizing current surging to approximately 3200 A. The voltage further increased to 28.8 kV (138%), at which point magnetizing current shot up to nearly 7700 A, clearly indicating transformer core saturation and extreme magnetic stress.

No prior abnormal trends were recorded in DGA or maintenance records. Further, no history of thermal overloading or insulation distress was observed earlier. Protection operated post-fault (PRV & Buchholz) confirms internal flashover. No evidence of design, manufacturing, commissioning, or O&M deficiency was found.

The root cause of the failure of transformer was found to be System generated resonance which induced transient overvoltage. The transient overvoltage resulted into dielectric breakdown within HV winding and led to oil decomposition. Rapid generation of gas led to rise in pressure which led to PRV and Bucholz operation. However, the pressure was huge and sudden, which lead to rupture of the tank and ultimately led to fire. He further informed that after the failure, remedial measures such as change in setting of DAVR and GRP have been modified in consultation with OEM.

CE (PSE&TD Division), CEA emphasized that transformers must be designed and validated as per applicable standards and regulatory requirements, including over-flux withstand

capability (typically up to 130% for short duration unless otherwise agreed in technical specifications), and also must ensure proper design validation, regulatory compliance, and coordinated implementation of corrective measures to prevent recurrence of over-voltage induced GT failures.

3.10. Failure report of 100 MVA, 230/110 kV Auto Transformer at Meelavittan S/s, TANTRANSCO

Representative of TANTRANSCO Meelavittan presented the failure of 100 MVA, 230/110 kV Auto Transformer. The Transformer was APEX make and manufactured in 1997. The Transformer had failed earlier. The Transformer was repaired and recommissioned on 28.03.2024 at Meelavittan Substation. The Transformer Oil was filtered on 10.12.2025 and after testing, the transformer was charged on 12.12.2025 at 17:34 hrs. Immediately after 10 minutes of charging, the Transformer tripped at 17:44 hrs on RYB differential protection with Buchholz alarm. No associated transmission line tripping occurred, indicating an internal transformer fault. DGA was conducted after tripping (13.12.2025) and result of DGA showed significant rise in Hydrogen and Acetylene, indicating a suspected high-energy discharge/arcing inside the transformer. Further, Electrical tests carried out revealed poor IR values, B-phase ratio mismatch, abnormal core balance, high magnetizing current in B-phase, and SFRA trace deviation. The Transformer was physically inspected. In the inspection, the Transformer top yoke core was found wobbled. Burnt odor was noticed inside the Main Tank. Many Iron granules were found on the bottom of the main tank at many spots.

The presence of Iron granules at many spots indicates winding to core lamination short in the Transformer. Based on the Internal examination, TANTRANSCO found the probable cause of failure to B phase winding to core short.

CE (PSE&TD Division), CEA sought to know why the transformer failed immediately after filtration of oil and sought details regarding the earlier failure and rectification history. Representative of TANTRANSCO was not aware of the year of the earlier failure. It was observed that the fault was purely internal, as no external system disturbance was recorded.

3.11. Failure report of 200 MVA, 400/110 kV ICT-2 at Alamathy S/s, TANTRANSCO

Representative of TANTRANSCO Alamathy presented the failure of 200 MVA, 400/110 kV ICT-2 at 400 kV Alamathy Substation. The ICT-2 was manufactured by BHEL and commissioned on 22.08.2006. The Transformer was operating in parallel with other 200 MVA units. The Transformer failed on 18.09.2025 at 16:14 hrs following a heavy sound in R-phase, after which multiple protections operated including Buchholz, differential (87T), PRV, OLTC trips, and lockout relays. Noticeable tank bulging and oil spurting from welded joints, was observed. The representative further mentioned that the main tank was cracked at several welding portions. The highest loading of the Transformer was observed of 166 MVA on 23.08.2024.

The failed ICT-2 R-phase was subsequently replaced with a healthy spare shifted from Sriperumbudur and re-commissioned on 06.11.2025, restoring system stability.

CE (PSE&TD Division), CEA emphasized that with a strong O&M and protection setup, such progressive deterioration should ideally have been detected earlier through structured

monitoring, trend analysis, and timely preventive action. CE further requested sharing of detailed O&M practices, including types of tests conducted and their periodicity, to assess whether condition-based maintenance philosophy is effectively implemented.

3.12. Failure report of 315 MVA, 400/230 kV ICT-4 at Manali GIS S/s, TANTRANSCO

Representative of TANTRANSCO Manali presented the failure of 315 MVA, 400/230 kV ICT-4 at 400 kV Manali GIS Substation, Chennai. The Transformer was manufactured by M/s CGL and commissioned on 25.07.2017. The Transformer failed on 14.12.2025 at 05:02 Hrs while operating in parallel with ICT-2. Multiple protections operated, including transformer differential (87T), restricted earth fault (64 REF), impedance protection (21T), Buchholz, PRV, OLTC surge relay, and master trip relays, and site observations revealed heavy sound, fire in HV/IV B-phase bushings, main tank bulging, and oil spurting from several locations, confirming a severe internal fault. Fault current reached up to 20 kA in B phase in IV winding. The transformer had a historical peak load of 270 MVA (May 2022) and sustained peak of 95 MVA in 2025, with earth resistance within limits, indicating that loading alone may not have been the sole cause. Following the incident, a spare ICT was moved from Thervoykandigai Substation and commissioned at Manali on 30.01.2026, restoring system reliability.

CE (PSE&TD Division), CEA reiterated the importance of periodic testing, trend comparison of DGA and other condition monitoring parameters, strict adherence to maintenance philosophy, and timely preventive action. TANTRANSCO was asked to immediately escalate the matter with CG Power and Industrial Solutions, emphasizing that a transformer failing within 5–8 years of service is unacceptable and requires urgent manufacturer level intervention and accountability. CE advised that senior management should take up the issue formally and ensure that future procurements mandatorily include advanced diagnostic requirements such as DSC testing to strengthen quality assurance.

3.13. Conclusion

The Chief Engineer (PSE&TD), CEA concluded the deliberations with the following remarks:

- a. Each Utility is required to intimate each incidence of failure of equipment to Chairperson of the Standing Committee within 48 hours of the occurrence of the failure. Further, each Utility shall submit the detailed report of equipment failure within one month of the occurrence of failure as per the format available on CEA website along with all the relevant information such as test reports, photographs, OEM recommendations, etc. This will help not only in analysing the failure events, but also enable the Committee members to undertake site visit in time, if required.
- b. All Utilities should furnish the action taken report on the recommendation suggested by the Standing Committee and O&M practices being followed for various substation equipment.
- c. Transformer shall be subjected to Dynamic effect of short circuit withstand test (DSC) as per CEA (Technical Standards for Construction of Electrical Plants and Electric Lines), 2022 Regulations, to verify its capability to withstand the dynamic effects of short circuit.

- d. As per CEA (Measures relating to Safety and Electric Supply) Regulations, 2023, every transformer of 10 MVA or reactor of 10 MVar and above rating shall be provided with automatic fire fighting system as per relevant standards.

4 Statistics & Analysis of the failure of Substation equipment

4.1 Statistics of Reporting of Equipment Failure to CEA

SN	Category	Number of Equipment Failure	Number of Utilities	Remarks
1	Failures of Equipment reported within 48 hrs on their own by the Utilities	1	1	GETCO
2	Failures of Equipment intimated by Utilities after 48 hours on their own	2	2	DTL, THDCIL
3	Failures of Equipment for which Detailed Report was submitted by Utilities within one month by their own	2	2	DTL, GETCO
4	Failures of Equipment for which Detailed Report was submitted by Utilities after One Month on their own	1	1	THDCIL
5	Failures of Equipment for which Detailed Report was submitted by Utilities only after CEA letter	8	5	HVPNL, NHPC, OPTCL, RVPNL, TANTRANSCO

4.2 General Statistics of Reported Equipment Failures

The Committee investigates failures of 220 kV and above voltage class Transformers and Reactors. A total of 11 failure incidences of Transformers of 220 kV and above voltage rating occurred between 1st July 2025 and 31st December 2025 were reported to CEA. No failure of Reactor during the above mentioned period was reported to CEA. The voltage wise quantity of each equipment has been indicated in the Table-1 below:

Table-1: Voltage wise segregation of Equipment

Equipment	Voltage Class			Quantity (Nos.)
	220 kV	400 kV	765 kV	
	Quantity (Nos.)			
Transformers	8	3	-	11
Reactors	-	-	-	-
			Total	11

Quantity of failed Transformers and years of service put in by these Transformers before failures is given in Table-2.

Table-2: Year of Service of failed Transformer

Years of Service	No. of Transformers Failed
0-5	2
5-10	3
10-15	1
15-20	1
>20	4
	11

Complete details of all the above-mentioned Transformers failures are provided in **Annexure-II**. The probable cause of failure is based on information, data, and reports furnished by the utility. The type of equipment wise analysis of failures is presented in ensuing paras.

4.3 Failure of Transformers

1. Transformer, the costliest equipment in a switchyard/substation, is expected to serve the entire life of a substation which is considered to be 35 years. However, it has been observed that many transformers installed in Indian utilities have failed within first few years of service which is a matter of concern.

2. Summary of Inter Connecting Transformers/Generator Transformers (GTs) reported to CEA that have failed between 1st July 2025 and 31st December 2025 is detailed below (Table 3):

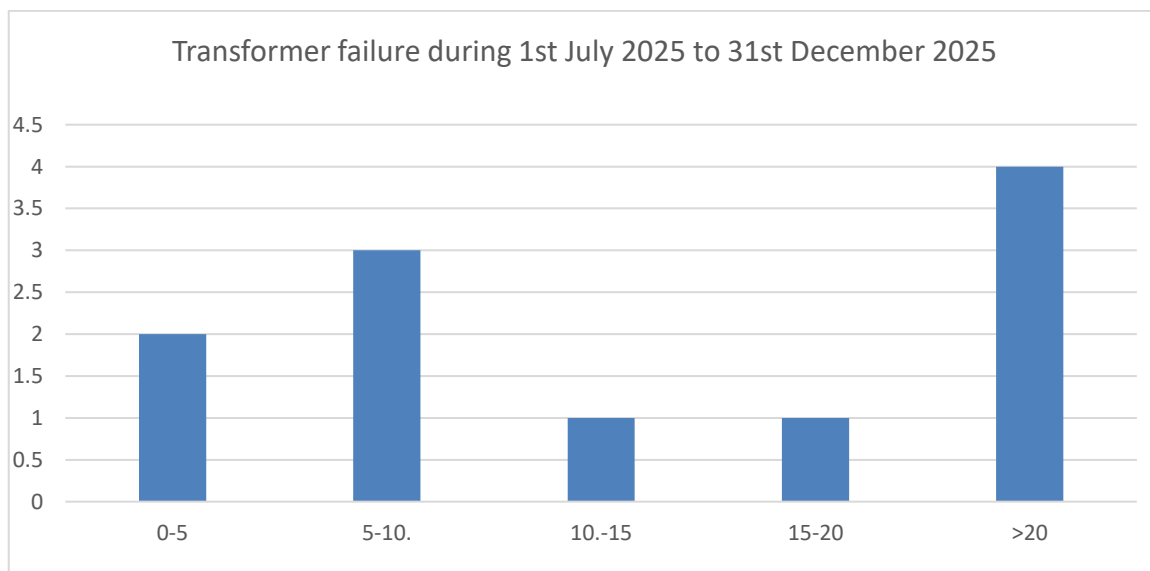
Table 3: Summary of failure of Transformers

S.N.	Utility	Substation Name	Make	Rating	Year of Commissioning	Date of Failure	Probable cause of failure
(i)	DTL	220 kV Okhla S/s	NGEF	100 MVA, 220/66/11 kV	1998	09.08.2025	Internal fault (inter turn)
(ii)	GETCO	220 kV Morbi S/s	ATLANTA	160 MVA 220/66 kV	24.10.2019	06.11.2025	Bushing Failure
(iii)	HVPNL	400 kV Nawada S/s	BBL	100 MVA, 220/33 kV	12.11.2012	07.07.2025	Transformer tripped due to the internal 33 kV feeder tripping
(iv)	HVPNL	220 kV Sector 107 Gurugram GIS S/s	BBL	100 MVA, 220/33 kV	19.08.2021	30.07.2025	---
(v)	NHPC	Salal Power S/s	BHEL	43.33 MVA, 11/220/33 kV	1993	06.10.2025	Insulation Failure
(vi)	OPTCL	220/132 kV GSS Tarkera S/s	BHEL	100 MVA 220/132 kV	1981	02.09.2025	Bushing Failure
(vii)	RVPNL	400 kV GSS, RVPN, Babai	BHEL	160 MVA, 220/132/11 kV	29.03.2019	12.12.2025	Manufacturing Defect
(viii)	THDCIL	Khurja Super Thermal Power Plant 2X660 MW, U.P.	BHEL	260 MVA 21/ (420/3) kV	Sep, 2025	27.09.2025	Insulation Failure due to System generated resonance
(ix)	TANTR ANSCO	230 kV Meelavittan S/s	APEX	100 MVA, 230/110 kV	28.03.2024	12.12.2025	Internal Fault
(x)	TANTR ANSCO	400/230-110 kV Alamathy	BHEL	200 MVA, 400/230-110 kV	20.08.2006	18.09.2025	Internal Fault

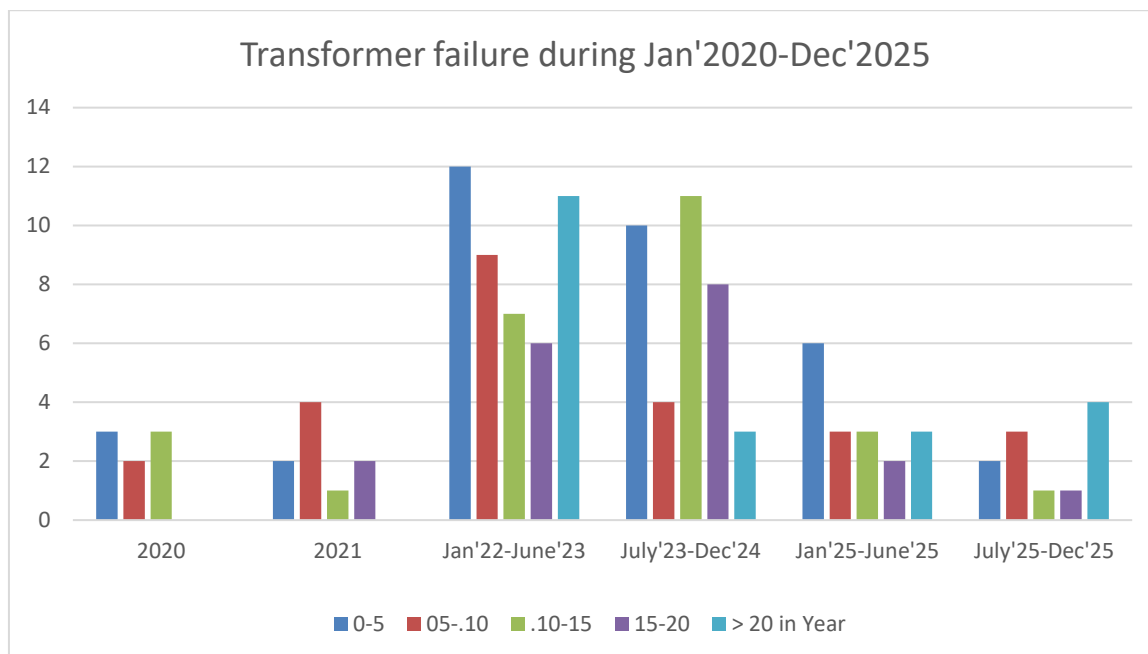
		S/s					
(xi)	TANTR ANSCO	400 kV Manali GIS S/s	CG Power	315 MVA, 400/230 kV	25.07.2017	14.12.2025	Internal Fault

Note: The probable cause of failure is based on information, data, and reports furnished by the utility.

3. As can be seen from Table 3 above, eleven (11) transformer failure cases from July 2025 to December 2025 have been reported by eight (8) Utilities to CEA. It is highlighted that a large number of transformer failure cases remain unreported as many of power utilities [State Transmission Utilities, Private Utilities/Licensees, Central Transmission Utilities, Public Sector Power Utilities] in the Country have not reported the failures.
4. Out of total 11 failures of the Transformers occurred, 8 were of 220 kV class, 3 of 400 kV class and none of 765 class. Two Nos. of Transformers failed within five years, three Nos. of Transformers failed in 5-10 years of period. Two Nos. of Transformers failed during 10-20 years of their operation. Four Nos. of Transformers failed who had operation of more than 20 years. The transformers failures that occurred between 1st July 2025 and 31st December 2025 from the commissioning of the equipment is as per the below graph below:



1. Failures of transformers during Jan'2020-Dec'2025: The number of different transformer failures as reported in the last 6.5 years to CEA has been shown in the graph below:



5 Observations & Recommendations

- 1) Recommended measures suggested by the Committee for the Utilities to improve the performance of the substation equipment are listed below. These have been given with the objective that the utilities take necessary action to improve performance of equipment and use modern diagnostic tools for condition assessment so as to keep substation equipment healthy for long trouble-free and reliable operation.
- 2) It is observed that reported failures are primarily due to the following reasons:
 - a) Normal Ageing
 - b) Failure of Insulation system & Bushing for Transformers
 - c) Lack of prudent maintenance practices
 - d) Frequent System Faults and transient over voltages generated by the system.
- 3) As the utilities have been intimating failure events to CEA with extended delay times, the required site visits could not be undertaken by the Committee for most of the failures.
- 4) In most cases of the failures, utilities do not furnish factory test reports, pre-commissioning test reports, history of O&M & repairs, relay settings, environmental & system conditions at the time of failure etc. which makes it very difficult to analyze the cause of failure.
- 5) In case of failure of transformers, report of detailed internal inspection carried out by the Original Equipment Manufacturer (OEM) at site or at its works are not provided.
- 6) All the utilities should furnish preliminary information of failure of substation equipment of 220 kV and above voltage class within 48 hours of the occurrence of

the failure and detailed report within a Month in the prescribed format available at **Annexure-IV** and also on CEA website. The report should accompany tests carried out after failure, test reports and details of previous maintenance, pre-commissioning test reports, and photographs of the failed equipment.

- 7) Condition Based Maintenance (CBM) Practices using modern diagnostic tools is yet to be adopted in large scale by many utilities, and in general, periodic Time Based Maintenance (TBM) is still being practiced. Adequate modern Diagnostic tools are also not available with most of the State Utilities.
- 8) 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.
- 9) A centralized 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 support cloud and on-premise installation and provide access to electrical asset health dashboards at engineer's PC, Mobile, Laptops or tablets.
- 10) Condition monitoring as mentioned in CEA "Standard Specifications and Technical parameters for Transformers and Reactors (66 kV & above voltage class)" shall be adopted.
- 11) 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.
- 12) Utilities are required to specify the standardized rating of the Transformer as per "Standard Specifications and Technical parameters for Transformers and Reactors (66 kV & above voltage class)".
- 13) Regular O&M of Substation equipment shall be carried out. In this regard, Model O&M Guidelines given at **Annexure-III** should be followed by Utilities.
- 14) 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.

- 15) Utilities should follow the 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.
- 16) 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 warranty period.
- 17) The utilities must be careful during installation of transformers at site and long hanging connecting leads which might touch with other parts of the transformer, should be avoided.
- 18) 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.
- 19) The Utilities are required to comply CEA (Measures relating to Safety and Electric Supply) Regulations, 2023. As per regulation 46(2)(ix) of these regulations, every transformer of 10 MVA or reactor of 10 MVAR and above rating shall be provided with automatic fire fighting system as per relevant standards.
- 20) Utilities should take appropriate actions for repair/ replacement of concerned equipment as soon as some abnormality is observed through visual inspection or diagnostic tests.
- 21) 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.
- 22) 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.
- 23) The Utilities are required to provide the RIP/RIS bushing for the Voltage of above 66 kV and up to 400 kV as per the "Standard Specifications and Technical parameters for Transformers and Reactors (66 kV & above Voltage class)".
- 24) 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) and bushings of transformer may be protected by providing Room Temperature Vulcanisation (RTV) coating. RTV coating over porcelain housing of

equipment (CB/LA/CT/CVT) / bushings of transformer & reactors may also be considered by utilities for substation equipment installed in pollution prone areas.

- 25) Utilities should create and maintain complete database of equipment/transformers including previous test reports (reports of factory tests/pre-commissioning tests/tests during O&M etc.), operation & maintenance history of equipment with make, model & year of commissioning etc. for proper evaluation, interpretation of test results and for taking Run-Refurbish-Replacement decision.
- 26) 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 example, test voltage, tap position at which test is conducted, etc., should be maintained while measuring IR or Turns Ratio, or conducting SFRA and other similar tests. Details of test kits, should be maintained so that the test results can be compared with subsequent test results. For variation in temperature, required correction factors could be incorporated. Calibration of the testing instruments should be ensured for reliability of the assessment.
- 27) Utilities should explore the possibility of installation of CCTV cameras in the substation, covering transformer area so that transformers could be monitored from the control room and any mishap with the transformer could be recorded for further analysis. It would also help to determine the point of initiation and actual cause in case of fire in transformer.
- 28) 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 benefit of the other utilities.
- 29) Proper handling, loading, transportation, unloading, and storage at site before assembling play important role in satisfactory operation of equipment.
- 30) The erection of major equipment including transformers/reactors should always be carried out by experienced technical team under the close supervision of manufacturer.
- 31) Inordinate delay in commissioning of equipment after reaching at site should be avoided.
- 32) When there is a wide gap between the year of manufacturing and year of commissioning of the transformers/ reactors, proper care must be taken to ensure satisfactory operation of transformer/ reactor. Storage and periodic testing of transformer/ reactor should be done as per manufacturer's recommendations.
- 33) Transformer/ reactors should not be kept for more than three (3) months with dry air/inert gas (Nitrogen) filling and all throughout the period, required pressure needs to be maintained in order to avoid the exposure of active part to atmosphere. After

three (3) months, transformer/ reactor should be filled with oil under vacuum and it should be provided with oil conservator including oil level indicator and breather. The oil parameters need to be monitored regularly.

- 34) As far as possible the transformer/ reactor should be transported filled with dry air. Use of nitrogen for this purpose should be avoided.
- 35) The height of the fire wall between two transformers/reactors should be at least 600 mm above the highest point of the transformer and fire wall should be rated for four-hour fire rating so that fire in one transformer/reactor does not affect adjacent transformers/ reactor.
- 36) Whenever there is movement of transformer either from manufacturing works or from one station to other, Sweep frequency response analysis (SFRA) should be carried out before movement and after shifting to new location and in case of any discrepancy, OEM may be contacted. SFRA signature would provide valuable information about deformation in winding /core during transportation.
- 37) On Load Tap Changer (OLTC) is one of the contributors to the failure of transformer. Possibility of eliminating OLTC from 400 kV & 765 kV class transformer should be considered (based on system studies) in consultation with Regional Power Committee (RPC) and Regional Load Despatch Centre (RLDC)/Grid-India and CEA. The reduction in in number of taps/steps can also be considered in case of OLTC of 220 kV and below voltage class transformers. The removal of OLTC will simplify the design and manufacturing of transformers.
- 38) Tertiary winding should be avoided, wherever feasible, as it increases the probability of failure of the transformer. Tertiary terminals of transformer prone to short circuiting by external element such as bird or animal may be suitably insulated.
- 39) Transformer should be subjected to short circuit withstand test as per CEA (Technical Standards for Construction of Electrical Plants and Electric Lines), 2022 Regulations, to verify its capability to withstand dynamic effect of short circuit. The design review of the transformers should be carried out properly before commencement of manufacturing. Stage inspection should also be carried out to check manufacturing process as well as quality of material used in subsequent transformers.
- 40) An internal inspection of the failed transformer on-site is warranted at times to locate fault inside the transformer and to assess the extent of damage. As far as possible, internal inspection should be carried out in association with OEM / in presence of representative of OEM. All safety precautions must be observed at all times. Internal inspection must be performed by experienced staff with proper training. The internal inspection should not cause any further damage to the transformer and precaution should be taken to prevent ingress of moisture and any foreign material into the transformer and hence internal inspection should be meticulously planned.

- 41) As far as possible, LV test and SFRA should be conducted after through fault to check the integrity of the transformer.
- 42) The capacitance and tan delta measurement of transformer bushing at variable frequency and Dissolved gas analysis (DGA) of bushing oil should be carried out for health assessment of bushings as this has been proved to be very effective in assessing the condition of in-service bushings.
- 43) Residual Life Assessment (RLA) should be conducted for old and aged transformers (approaching end of service life) for proper planning to replace them in stages.
- 44) At 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.

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Annexure-II
Detailed Information of All Failed Equipment Reported to
CEA between July 2025 and December 2025

**Annexure-II: Detailed Information of Failed Equipment Reported to CEA
between July 2025 and December 2025**

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

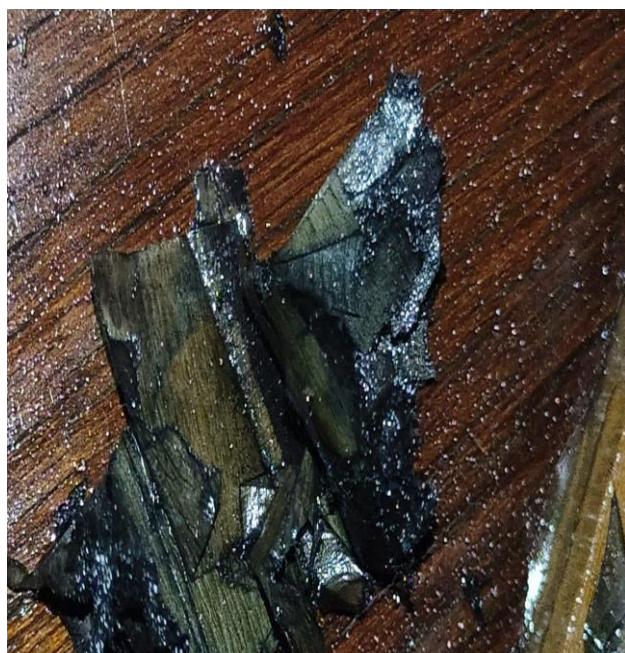
S. N.	Failure report	Utility	Serial No.	Date of Failure
1.	Failure report of 100 MVA, 220/66/11 kV three phase Power Transformer at Okhla S/s	DTL	6800000174	09.08.2025
2.	Failure report of 160 MVA, 220/66 kV Power Transformer at Morbi S/s	GETCO	1263/20	06.11.2025
3.	Failure report of 100 MVA, 220/33 kV Auto Transformer at Nawada S/s	HVPNL	5147/1	07.07.2025
4.	Failure report of 100 MVA, 220/33 kV Power Transformer at Sector 107 Gurugram GIS S/s	HVPNL	5721/02	30.07.2025
5.	Failure report of 43.33 MVA, 11/220/33 kV Generator Transformer at Salal S/s	NHPC	2007316	06.10.2025
6.	Failure report of 100 MVA, 220/66 kV Auto Transformer at Tarkera S/s	OPTCL	6004096	02.09.2025
7.	Failure report of 160 MVA, 220/132/11 kV Auto Transformer at Babai S/s	RVPNL	204084	12.12.2025
8.	Failure of 260 MVA, 21/420/V3 kV at Khurja Super Thermal S/s	THDCIL	6008082	27.09.2025
9.	Failure report of 100 MVA, 220/110 kV Auto Transformer at Meelavittan S/s	TANTRANSCO	T-968/05	12.12.2025
10.	Failure report of 200 MVA, 400/110 kV Transformer at Alamathy S/s	TANTRANSCO	6006121	18.09.2025
11.	Failure report of 315 MVA, 400/230 kV ICT at Manali S/s	TANTRAN SCO	T10680 / 2	14.12.2025

1. Failure report of 100 MVA, 220/66/11 kV Three winding transformer at Okhla S/s of DTL

i.	Name of Substations	:	220 kV Sub- station Okhla																																																															
ii.	Utility	:	DTL																																																															
iii.	Faulty Equipment (ICT/ Auto-transformer/ GT/ Reactor etc.)	:	Three Phase Power Transformer																																																															
iv.	Rating (MVA/ MVAr, Voltage ratio, 1-phase/3-phase)	:	100 MVA 220/66/11 kV, 3-phase																																																															
v.	Make (Original equipment manufacturer)	:	NGEF																																																															
vi.	Serial No.	:	6800000174																																																															
vii.	Date and time of occurrence of fault	:	09/08/2025, 17:10 hrs																																																															
viii.	Fault discovered during (Operation or periodic testing/maintenance)	:	Transformer tripped on differential relay																																																															
ix.	Year of Manufacturing	:	1996																																																															
x.	Date of Commissioning	:	May-2013 at Okhla (Repaired). Initially this Tx. was commissioned at 220 kV Gazipur substation in the year 1998 and failed on 25.07.2007																																																															
xi.	Sequence of events/Description of fault (SOE with time stamp, Protection operated during fault)	:	Prior to this event 66 kV Incomer-2 tripped on O/C, E/F, 86 on external fault, after this Transformer tripped on R phase differential & 86 relay																																																															
xii.	Details of Tests done after failure (What tests were conducted after the discovery of failure? If no tests were conducted, reasons for the same may be stated.)	:	Low voltage tests were conducted like, Magnetic balance, Magnetizing current, Winding resistance and Insulation resistance, Tan-delta SFRA and DGA test of oil <table><tr><th>Sample Date</th><th>H2</th><th>CO₂</th><th>CO</th><th>C₂H₄</th><th>C₂H₆</th><th>CH₄</th><th>C₂H₂</th><th>TDCG</th></tr><tr><td>18.06.2025</td><td>26</td><td>398</td><td>12</td><td>287</td><td>70</td><td>134</td><td>1.5</td><td>531</td></tr><tr><td>20.06.2025</td><td>30</td><td>434</td><td>12</td><td>296</td><td>78</td><td>139</td><td>1.5</td><td>556</td></tr><tr><td>25.06.2025</td><td>27</td><td>507</td><td>14</td><td>326</td><td>89</td><td>154</td><td>2.5</td><td>612</td></tr><tr><td>02.07.2025</td><td>28</td><td>528</td><td>17</td><td>335</td><td>89</td><td>162</td><td>2.0</td><td>632</td></tr><tr><td>15.07.2025</td><td>31</td><td>641</td><td>24</td><td>356</td><td>100</td><td>175</td><td>1.5</td><td>688</td></tr><tr><td>10.08.2025#</td><td>181</td><td>790</td><td>71</td><td>381</td><td>100</td><td>198</td><td>43.6</td><td>976</td></tr></table> # Post Failure	Sample Date	H2	CO ₂	CO	C ₂ H ₄	C ₂ H ₆	CH ₄	C ₂ H ₂	TDCG	18.06.2025	26	398	12	287	70	134	1.5	531	20.06.2025	30	434	12	296	78	139	1.5	556	25.06.2025	27	507	14	326	89	154	2.5	612	02.07.2025	28	528	17	335	89	162	2.0	632	15.07.2025	31	641	24	356	100	175	1.5	688	10.08.2025#	181	790	71	381	100	198	43.6	976
Sample Date	H2	CO ₂	CO	C ₂ H ₄	C ₂ H ₆	CH ₄	C ₂ H ₂	TDCG																																																										
18.06.2025	26	398	12	287	70	134	1.5	531																																																										
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10.08.2025#	181	790	71	381	100	198	43.6	976																																																										
xiii.	Observations (Visual observations e.g. bulging of tank, fire, any leakage of oil, damage to various components of transformer and nearby equipment/ materials etc.)	:	During Internal inspection found burnt marks, burnt insulation papers and melted copper granule in around the Tertiary winding take off lead and between (Top of Cylinder) the R-Phase cylinders of the transformer. Some of the burnt papers and melted copper granule have been																																																															

			taken out.
xiv.	Probable cause of failure	:	Internal fault (inter turn)
xv.	IF OEM representative had inspected the equipment or visited the site after failure, their remarks, MoM etc. may be attached.	:	No, Inspection was not done by the OEM, NGEF (The OEM has closed)
xvi.	Present condition of equipment (Whether repairable or beyond repair)	:	Transformer may be repairable at the work of any repairing agencies of transformer after replacement of R-ph winding.
xvii.	(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?	:	All PMS activities done as per DTL practice, no abnormality observed during testing.
xviii.	Details of any previous failure on the same unit	:	The Transformer was first commissioned in the year 1998 at 220 kV Sub-station Gazipur and same was failed on 25.07.2007 after repair of Tx at workshop of M/s Aditya Vidyut Appliances Limited. This Tx was re commissioned at 220 kV Okhla on May 2013 after that Txx was performing satisfactory till 09.08.2025
xix.	Is tertiary winding provided (Yes/No)	:	Yes
xx.	Tertiary loaded (Yes/No) If yes, specify load on tertiary	:	No
xxi.	Whether tertiary terminals are bare/insulated	:	Bare
xxii.	Details of protection for Tertiary	:	Tertiary unloaded
xxiii.	Whether relay time is synchronized with UTC	:	----
xxiv.	Bushing details (OIP/RIP/RIS, Porcelain/Polymer housing)	:	OIP, Porcelain
xxv.	On Load Tap Changer or Off Circuit Tap Changer	:	On Load Tap Changer
xxvi.	Tap positing of OLTC at the time of failure	:	5
xxvii.	Past record of Operation of OLTC	:	22-05-25 from tap 3 to 5
xxviii.	Tap Range	:	1 to 17
xxix.	Details of Protection provided for ICT/GT/Reactor	:	Transformer differential, HVREF. LVREF. Buchholz, PRV. OSR, SPR. WTI, OTI

xxx.	Details of Protection operated	:	Transformer R-Phase differential R phase, master trip 86
xxxi.	Whether equipment is properly earthed	:	Earthed properly
xxxii.	Earth Resistance of Substation and date of its measurement	:	0.41 Ohms, measured on dt 21.04.2025
xxxiii.	Surge Arrestor: (a) Is SA provided for protection (b) Whether healthiness of SA is monitored (c) Whether reading of SA counter changed during failure	:	(a) SA Provided (b) Yes Monitored
xxxiv.	Lightning Impulse and Switching Impulse Withstand Voltage of the bushings of all voltage level	:	HV-BIL 505 kV/1050 kVP LV-160 kV/350 kVP
xxxv.	Lightning Impulse and Switching Impulse Withstand Voltage of the winding of all voltage level	:	HV-1050 kVp. LV-325 kVp, TV-170 kVP
xxxvi.	Type of Fire protection provided (Emulsifier system/N2 Injection based fire protection system/foam based protection etc.)	:	---
xxxvii.	Weather conditions at the time of failure (clear sky/rainy/thunderstorm etc.)	:	Rainy
xxxviii.	Storage condition of equipment at site before commissioning: (a) Period of storage (b) Idle charged or uncharged (c) Dry air filled/Nitrogen filled/oil filled	:	Nil



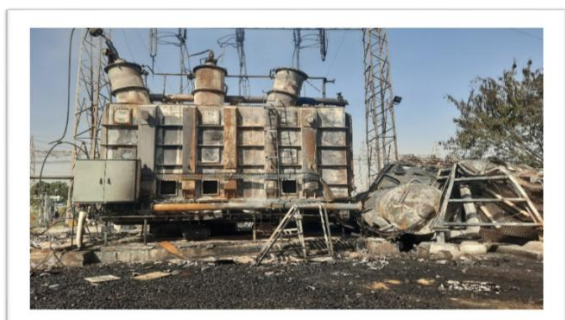
Burnt marks observed on Transformer

2. Failure report of report of 160 MVA, 220/66 kV Power Transformer at Morbi S/s, GETCO

i.	Name of Substation	:	220 kV Morbi S/s
ii.	Utility	:	GETCO
iii.	Faulty Equipment (ICT/ Auto-transformer/ GT/ Reactor etc.)	:	TRANSFORMER
iv.	Rating (MVA/ MVA _r , Voltage ratio, 1-phase/3-phase)	:	160 MVA 220/66KV 3 PHASE
v.	Make (Original equipment manufacturer)	:	ATLANTA
vi.	Serial No.	:	1263/20
vii.	Date and time of occurrence of fault	:	06.11.2025, 18:35HRS
viii.	Fault discovered during (Operation or periodic testing/ maintenance)	:	Transformer in service.
ix.	Year of Manufacturing	:	2018
x.	Date of Commissioning	:	24.10.2019
xi.	Sequence of events/Description of fault (SOE with time stamp, Protection operated during fault)	:	At 220 kV Morabi S/S at 18.35 Hrs, heavy sound observed in 220 KV Class switch yard. After observation, it was found that 220/66 kV, 160 MVA Transformer-3 tripped from HV and LV, and heavy fire was found on TR-3 (Make ATLANTA/ DOC: 24.10.2019). Other TR-1, TR-2 and TR-4 were hand tripped and 66 kV Bus was made zero power for safety purpose.
xii.	Details of Tests done after failure (What tests were conducted after the discovery of failure. If no tests were conducted, reasons for the same may be stated.)	:	It is not possible to test the transformer after it failed due to complete fire in the transformer.
xiii.	Observations (Visual observations e.g. bulging of tank, fire, any leakage of oil, damage to various components of transformer and nearby equipment/material etc.)	:	Transformer is completely failed and burnt in fire. Due to 220/66 kV 160 MVA TR 3 fire, near by cable trench cable was also damaged i.e. all control cable of 66 kV Morbi B2, 66 kV Morbi B3, 66 kV Ghuntu-2, 220/66 KV 160 MVA TR 3 LV bay and TR MK box damaged. 220/66 kV 160 MVA TR 3 -66 kV TR-3 bay 66 kV Flower bus, TR to 220 kV CT gantry flyover bus, all HV and LV Bushing jumper conductor broken due to fire. 220/66 kV 160 MVA TR 3-HV and LV LA got damaged.
xiv.	Probable cause of failure	:	It seems that R Phase 66 kV Bushing Blast causes complete transformer fire.

xv.	If OEM representative had inspected the equipment or visited the site after failure, their remarks, MoM etc. may be attached	:	OEM team visited and inspected site after failure and investigation of failed equipment under process
xvi.	Present condition of equipment (Whether repairable or beyond repair)	:	Totally damaged so beyond repair
xvii.	(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 Tan Delta Testing was carried out on Dtd.16.04.2025 and results found normal (b) Yes, rising trend observed in key gases of transformer oil since date of commissioning within GP Period. Last DGA testing of oil carried out on dtd: 28.08.2025 at ERDA. Report is attached herewith. (c) Yes. 02 times internal inspection was carried by OEM for the transformer at site, the abnormal rise of key gas content has continued. It indicates that the defects inside the transformer still persist.
xviii.	Details of any previous failure on the same unit	:	No
xix.	Is tertiary winding provided (Yes/No)	:	No
xx.	Tertiary loaded (Yes/No) If yes, specify load on tertiary	:	NA
xxi.	Whether tertiary terminals are bare/ insulated	:	NA
xxii.	Details of protection for Tertiary	:	NA
xxiii.	Whether relay time is synchronized with UTC	:	No
xxiv.	Bushing details (OIP/RIP/RIS, Porcelain/polymer housing)	:	OIP, Porcelain
xxv.	On Load Tap Changer or Off Circuit Tap Changer	:	On Load Tap Changer
xxvi.	Tap position of OLTC at the time of failure	:	11
xxvii.	Past record of Operation of OLTC	:	----
xxviii.	Tap Range	:	1 to 17
xxix.	Details of Protection provided for ICT / GT / Reactor	:	NA
xxx.	Details of Protection operated	:	1) HV Side: Diff. R, Y, B, Diff. High set, Main tank PRV trip, SPRR trip, OLTC OSR R,Y,B trip, Main Buchholz trip, oil temp. high trip, winding temp. high trip, HV 86 2) LV Side: Inter trip
xxxi.	Whether equipment is properly earthed	:	Yes

xxxii.	Earth Resistance of Substation and date of its measurement	:	0.84 OHM / 08.01.2025
xxxiii.	Surge arrestor: (a) Is SA provided for protection (b) Whether healthiness of SA is monitored (c) Whether reading of SA counter changed during failure	:	(a) Yes (b) Yes, it is being monitored (c) No
xxxiv.	Lightning Impulse and Switching Impulse Withstand Voltage of the bushings of all voltage level	:	NA
xxxv.	Lightning Impulse and Switching Impulse Withstand Voltage of the winding of all voltage level	:	HV – 1050/460 HV (N) 170/75 LV – 350/160 LV (N) 170/75
xxxvi.	Type of Fire protection provided (Emulsifier system/N2 Injection based fire protection system/ foam based protection etc.)	:	Nitrogen (N2) Injection based fire protection system (NIFPS)
xxxvii.	Weather conditions at the time of failure (clear sky/ rainy/ thunderstorm etc.)	:	Clear
xxxviii.	Storage condition of equipment at site before commissioning: (a) Period of storage (b) Idle charged or uncharged (c) Dry air filled/Nitrogen filled/oil filled	:	Nitrogen filled
xxxix.	Whether short circuit test was carried out on this transformer or same design transformer or short circuit with stand Capability was verified on the basis of calculation?	:	NA
xl.	Number of through faults the equipment was subjected to before failure	:	00



Failed Transformer at Morbi S/s

3. Failure report of 100 MVA, 220/33 kV Auto Transformer at Nawada S/s, HVPNL

i.	Name of substation	:	400 kV S/S in HVPNL Nawada
ii.	Utility	:	HVPNL
iii.	Faulty Equipment (ICT/ Auto Transformer/ GT/ Reactor)	:	Auto Transformer
iv.	Rating (MVA/ MVar, Voltage ratio, 1-phase / 3-phase)	:	100 MVA, 220/33 kV Transformer T-3
v.	Make (Original equipment manufacturer)	:	BBL
vi.	Serial No.	:	5147/1
vii.	Date & time of occurrence/discovery of fault	:	7/7/2025
viii.	Fault discovered during (Operation or periodic testing/ maintenance)	:	NA
ix.	Year of Manufacturing	:	2010
x.	Date of Commissioning	:	12.11.2012
xi.	Sequence of events/ Description of fault (SOE with time stamp, protection operated during fault)	:	Differential relay RYB Phase, Buchholz Relay, and master trip
xii.	Details of test done after failure (What test were conducted after discovery of failure. If no tests were conducted, reason for the same may be stated)	:	Gas flammability test, transformer turn ratio test, Insulation resistance test, Magnetic balance test, Magnetizing current test, Winding resistance test.
xiii.	Observation (Visual observation e.g. bulging of tank, fire, any leakage of oil, damage to various components of transformer and nearby equipment/ material etc.)	:	Carbon traces found on top of winding R phase drum, winding and burn paper found near yoke of R phase and bottom OLTC selector switch
xiv.	Probable cause of failure	:	Transformer tripped due to internal 33 kV feeder tripping Attached
xv.	If OEM representative had inspected the equipment or visited the site after failure, their remarks, MoM etc. may be attached.	:	Attached
xvi.	Present condition of equipment (Whether repairable or beyond repair)	:	Not repaired at site
xvii.	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?	:	insulation Resistance HV-E 2.97 Gohm 4.37 G ohm LVE 11.01 Gal/169 G ahm HV-LV 1610 ohm 296 0 ohm dated 16 02 2025 BA, OTA, WTA HV, WTA LV. MOGA BT, WYY IV, WTT LV, OTT, PRVT Main PRV OLTC

xviii.	Details of any previous failure on the same unit	:	No
xix.	Is tertiary winding provided (Yes/ No)	:	No
xx.	Tertiary loaded (Yes/ No) if yes, specify load on tertiary	:	NA
xxi.	Whether tertiary terminals are bare / insulated	:	NA
xxii.	Details of protection for tertiary	:	NA
xxiii.	Whether relay time is synchronized with UTC	:	No
xxiv.	Bushing details (OIP/ RIP/ RIS, Porcelain/ Polymer housing):-	:	Porcelain
xxv.	On load tap changer or off circuit Tap changer	:	On load tap changer
xxvi.	Tap position of OLTC at the time of failure	:	9b
xxvii.	Past record of Operation of OLTC	:	16.02.2025
xxviii.	Tap Range	:	1 to 17
xxix.	Details of Protection provided for ICT/ GT/ Reactor	:	Differential relay, REF Relay, Buchholz Relay, Over current Relay, BA, OTA, WTA HV, WTA LV, MOGA BT, Wit HV. WTT LV, OTT, PRVT Main PRV OLTC and master trip.
xxx.	Details of protection operated	:	Differential relay RYB Phase, Buchholz Relay, and master trip.
xxxi.	Whether equipment is properly earthed	:	Yes
xxxii.	Earth Resistance of Substation and date of its measurement	:	0.8 ohm
xxxiii.	Surge arrestor: (a) Is SA provided for protection (b) Whether healthiness of SA is monitored (c) Whether reading of SA counter changed during failure	:	Yes
xxxiv.	Lighting Impulse and Switching Impulse Withstand Voltage of the bushing of all voltage level	:	NA
xxxv.	Lighting Impulse and Switching Impulse Withstand Voltage of the winding of all voltage level	:	HV-395 kVrms/950 kVp, LV-70 kVrms/170 kVp

xxxvi.	Type of Fire protection provided (Emulsifier system/ N2 injection based fire protection system/ foam based protection etc.)-	:	N2 Inject based
xxxvii.	Weather condition at the time of failure (clear sky/ rainy/ thunderstorm etc.)	:	Clear
xxxviii.	Storage condition of equipment at site before commissioning: (a) Period of storage (b) Idle charged or uncharged (c) Dry air filled /Nitrogen filled / oil filled	:	Installed by M/s Alstom Ltd.
xxxix.	Whether short circuit test was carried out on this transformer or same design transformer or short circuit withstand capability was verified on the basis of calculation?	:	NA
xl.	Number of through faults the equipment was subjected to before failure	:	3378

4. Failure report of 100 MVA, 220/33 kV Power Transformer at Sector 107 Gurugram GIS S/s, HVPNL

i.	Name of substation	:	220 kV GIS Substation HVPNL, Sector 107 Gurugram
ii.	Utility/owner of substation	:	HVPNL
iii.	Faulty Equipment (ICT, Auto-transformer/GT/ Reactor etc.	:	Power Transformer
iv.	Rating	:	100 MVA, 220/33 kV, 3-Phase
v.	Make	:	Bharat Bijlee Limited (BBL)
vi.	Serial No-	:	5721/02
vii.	Date and time of occurrence of fault	:	30.07.2025 at 08.11hrs
viii.	Fault discovered during (Operation or Periodic testing/ maintenance)	:	Operation
ix.	Year of Manufacturing	:	2020
x.	Date of Commissioning	:	19.08.2021
xi.	Sequence of Events leading to failure/ Description of fault	:	DR copy attached
xii.	Details of Tests done after failure (What tests were conducted after the discovery of failure. If no tests were conducted, reasons for the same may be stated.)	:	Protection team (HVPNL) testing report attached
xiii.	Observation (Visual observations during site visit e.g. bulging of tank, fire, any leakage of oil, damage to various components of transformer and nearby equipment / material etc.)	:	Differential relay (R&B), Buchholz alarm, PRV and master relay with NIFES System operated
xiv.	Probable cause of failure	:	---
xv.	If OEM representative had inspected the equipment or visited the site after failure, their remark, MOM to be attached.	:	Visited the site and report attached
xvi.	Present condition of equipment (whether repairable or beyond repair)	:	Beyond repair at site
xvii.	(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 Cleaning of marshalling bc of T/F and OLTC 2. Tightening of termination b 3. Checking of contactors. space heaters and illumination 4. checking of oil pumps and cooling fans auto starting 5. Maintenance of OLTC driving mechanism boiling and greasing 6. Checking of all remote) indication (WTI and tap position indicator) 7. Electrical checking/testing c PRV, Buchholz relay, OSR 8. Checking/testing of Buchholz relay by oil

			draining 9. External cleaning of radiator and all bushings 10. Checking/calibration of OT and WTI 11. IR measurement of windings and polarization index 12. Earthing resistance of HV NCT, LV NCT and transformer body 13. oil test of main tank and OLTC for BDV, specific resistance, acidity, water factor and Dissolved Gas Analysis b) No c) NA
xviii.	Details of any previous failure on the same unit	:	NA
xix.	Is tertiary winding provided (Yes/No)	:	No
xx.	Tertiary loaded (Yes/No). If yes, specify load on tertiary.	:	No
xxi.	Whether tertiary terminals are bare/ Insulated	:	NA
xxii.	Details of Protection for tertiary.	:	NA
xxiii.	Whether relay time is synchronized with UTC	:	Yes
xxiv.	The type of bushing and housing: OIP/RIP, Porcelain / polymer housing	:	
xxv.	On load tap changer or Off circuit tap changer	:	On load Tap Changer
xxvi.	Tap position OLTC at the time of failure	:	05
xxvii.	Past record of Operation of OLTC	:	29.08.2024
xxviii.	Tap Range	:	1 to 17
xxix.	Details of Protection provided for ICT/GT/Reactor	:	Differential, REF, Overcurrent earth fault, Buchholz, PRV. OSR, WTT, OTT, Differential, DC supervision, overflux master.
xxx.	Details of Protection operated	:	Differential relay (R&B). Buchholz alarm, PRV and master relay with NIFES System operated
xxxi.	Whether equipment is properly earthed	:	Yes
xxxii.	Earth Resistance of Substation and date of its measurement	:	0.15 on date 29.08.2024
xxxiii.	Surge Arrestor a) Is SA provided for protection b) Whether healthiness of SA is monitored c) Whether reading of SA Counter	:	a) Yes b) Yes c) No

	changed during failure		
xxxiv.	Lighting Impulse and switching Impulse withstand voltage of bushings of all the voltage level.	:	505 kV/1050 kVp
xxxv.	Lighting Impulse and switching Impulse withstand voltage of windings of all the voltage level.	:	HV: 395 kV(RMS)/ 950 kVp HVN: 38 kV(RMS)/ 95 kVp LV: 70 kV (RMS)/ 170 kVp LVN. 70 kV(RMS)/170 kVp
xxxvi.	Type of Fire protection provided (Emulsifier system Injection based fire Protection system/ for based protection etc.)	:	N2 Injection based fire protection system
xxxvii.	Weather conditions at the time of failure (clear sky/ rainy/ thunderstorm etc.)	:	Clear sky
xxxviii.	Storage condition of equipment at site before commissioning a) Period of storage b) Idle charged or uncharged c) Dry air filled/ Nitrogen filled/ Oil filled	:	a) Six months b) NA c) Nitrogen filled
xxxix.	Whether short circuits test carried out on this transformer or same design transformer or short circuit withstand capability was verified on the basis of calculation	:	Short circuit withstand capability was verified on the basis of calculations
xl.	Number of through fault equipment is subjected to before failure	:	196 Nos. Tripping on 33 kV feeders

5. Failure report of 43.33 MVA, 11/220/33 kV Generator Transformer at Salal S/s, NHPC

i.	Name of Substation	:	Salal Power Station																																											
ii.	Utility	:	NHPC																																											
iii.	Faulty Equipment (ICT/ Auto-transformer/ GT/ Reactor etc.)	:	Generator Transformer																																											
iv.	Rating (MVA/ MVA _r , Voltage ratio, 1-phase/ 3-phase)	:	43.33 MVA, 11/220/v3 kV, Single Phase.																																											
v.	Make (Original equipment manufacturer)	:	M/s BHEL.																																											
vi.	Serial No.	:	2007316.																																											
vii.	Date and time of occurrence of fault	:	06.10.2025																																											
viii.	Fault discovered during (Operation or periodic testing/ maintenance)	:	Operation.																																											
ix.	Year of Manufacturing	:	1992																																											
x.	Date of Commissioning	:	1993																																											
xi.	Sequence of events/Description of fault (SOE with time stamp, Protection operated during fault)	:	• Unit start command issued • Generator excited up to 11 kV • Auto-synchronizer ON (testing) • Synchronization at 09:59:06.439 hrs • Subsequent abnormal event																																											
xii.	Details of Tests done after failure (What tests were conducted after the discovery of failure. If no tests were conducted, reasons for the same may be stated.)	:	Winding Resistance (After fault) <table><tr><td>Winding</td><td>PI</td><td colspan="4">Temp</td></tr><tr><td>HV</td><td>474.8 mΩ</td><td colspan="4" rowspan="2">30 °C</td></tr><tr><td>LV</td><td>2.629 mΩ</td></tr></table> Insulation Resistance (After fault) Test Voltage: 5 kV <table><tr><td>Test configuration</td><td>IR (15 sec)</td><td>IR (60 sec)</td><td>IR (600 sec)</td><td>PI</td><td>Temp</td></tr><tr><td>HV-LV</td><td>1.04 GΩ</td><td>1.48 GΩ</td><td>2.36 GΩ</td><td>1.59</td><td>30 °C</td></tr><tr><td>HV-G</td><td>1.48 GΩ</td><td>2.04 GΩ</td><td>2.54 GΩ</td><td>1.24</td><td></td></tr><tr><td>LV-G</td><td>4.4 MΩ</td><td>2.9 MΩ</td><td>--</td><td>--</td><td></td></tr></table>						Winding	PI	Temp				HV	474.8 mΩ	30 °C				LV	2.629 mΩ	Test configuration	IR (15 sec)	IR (60 sec)	IR (600 sec)	PI	Temp	HV-LV	1.04 GΩ	1.48 GΩ	2.36 GΩ	1.59	30 °C	HV-G	1.48 GΩ	2.04 GΩ	2.54 GΩ	1.24		LV-G	4.4 MΩ	2.9 MΩ	--	--	
Winding	PI	Temp																																												
HV	474.8 mΩ	30 °C																																												
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Test configuration	IR (15 sec)	IR (60 sec)	IR (600 sec)	PI	Temp																																									
HV-LV	1.04 GΩ	1.48 GΩ	2.36 GΩ	1.59	30 °C																																									
HV-G	1.48 GΩ	2.04 GΩ	2.54 GΩ	1.24																																										
LV-G	4.4 MΩ	2.9 MΩ	--	--																																										

xiii.	Observations (Visual observations e.g. bulging of tank, fire, any leakage of oil, damage to various components of transformer and nearby equipment / material etc.)	:	Overall Differential Protection, Buchholz Relay and REF Operated. No damage to nearby equipments.
xiv.	Probable cause of failure	:	Insulation Failure due to generator earth fault current.
xv.	Present condition of equipment (Whether repairable or beyond repair)	:	Repairable
xvi.	Details of any previous failure on the same unit	:	Nil
xvii.	Is tertiary winding provided (Yes/ No)	:	No
xviii.	Whether tertiary terminals are bare/ insulated	:	NA
xix.	Details of protection for Tertiary	:	NA
xx.	Whether relay time is synchronized with UTC	:	Yes
xxi.	Bushing details (OIP/ RIP/ RIS, Porcelain/ polymer housing)	:	Porcelain
xxii.	On Load Tap Changer or Off Circuit Tap Changer	:	OCTC
xxiii.	Tap position of OLTC at the time of failure	:	4
xxiv.	Past record of Operation of OLTC	:	No operation
xxv.	Tap Range	:	+7.50% to -2.50%
xxvi.	Details of Protection provided for ICT/ GT/ Reactor	:	Differential Protection, Buchholz Relay, PRV and REF.
xxvii.	Details of Protection operated	:	Overall Differential Protection, Buchholz Relay and REF Operated.
xxviii.	Whether equipment is properly earthed	:	Yes
xxix.	Earth Resistance of Substation and date of its measurement	:	< 0.50 ohm
xxx.	Surge arrestor: (a) Is SA provided for protection (b) Whether healthiness of SA is monitored (c) Whether reading of SA counter changed during failure	:	Yes

xxxi.	Lightning Impulse and Switching Impulse Withstand Voltage of the bushings of all voltage level	:	As per standard
xxxii.	Lightning Impulse and Switching Impulse Withstand Voltage of the winding of all voltage level	:	As per standard
xxxiii.	Type of Fire protection provided (Emulsifier system/ N2 Injection based fire protection system/ foam based protection etc.)	:	Emulsifier sysytem
xxxiv.	Weather conditions at the time of failure (clear sky/rainy/thunderstorm etc.)	:	Clear Sky
xxxv.	Storage condition of equipment at site before commissioning: (a) Period of storage (b) Idle charged or uncharged (c) Dry air filled/Nitrogen filled/ Oil filled	:	NA
xxxvi.	Whether short circuit test was carried out on this transformer or same design transformer or short circuit withstand capability was verified on the basis of calculation?	:	Data not available
xxxvii.	Number of through faults the equipment was subjected to before failure	:	NA

6. Failure report of 100 MVA, 220/66 kV Auto Transformer at Tarkera S/s, OPTCL

i.	Name of Substation	:	220/132 KV GSS, TARKERA
ii.	Utility	:	OPTCL
iii.	Faulty Equipment (ICT/ Auto-transformer/ GT/ Reactor etc.)	:	Auto Transformer-I
iv.	Rating (MVA/ MVA _r , Voltage ratio, 1-phase/ 3- phase)	:	100 MVA 220/132 kV AUTO TRANSFORMER
v.	Make (Original equipment manufacturer)	:	BHEL
vi.	Serial No.	:	6004096
vii.	Date and time of occurrence of fault	:	Dt:- 02/09/2025, Time :- 15:30 Hrs
viii.	Fault discovered during (Operation or periodic testing/ maintenance)	:	Operation
ix.	Year of Manufacturing	:	1978
x.	Date of Commissioning	:	1981
xi.	Sequence of events/Description of fault (SOE with time stamp, protection operated during fault)	:	1. Buchholz Relay operated 2. Differential Relay Operated
xii.	Details of Tests done after failure (What tests were conducted after the discovery of failure? If no tests were conducted, reasons for the same may be stated.)	:	DGA test of oil done but no abnormality found.
xiii.	Observations (Visual observations e.g. bulging of tank, fire, any leakage of oil, damage to various components of transformer and nearby equipment / material etc.)	:	Porcelain ruptured of Y-ph bushing only.
xiv.	Probable cause of failure	:	During replacement of damaged bushing, found lead was damaged.
xv.	If OEM representative had inspected the equipment or visited the site after failure, their remarks, MoM etc.	:	No
xvi.	Present condition of equipment (Whether repairable or beyond repair)	:	Repairable

xvii.	(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) IR, PI and Tan delta of Bushing, DGA and BDV test of Oil done annually. Quarterly and half yearly preventive maintenance carried out. (b) No abnormality observed
xviii.	Details of any previous failure on the same unit	:	No, Overhauling and gasket replaced done due to severe oil leakage on dated 03.03.2023
xix.	Is tertiary winding provided (Yes/No)	:	Yes
xx.	Tertiary loaded (Yes/No) If yes, specify load on tertiary	:	No
xxi.	Whether tertiary terminals are bare/ insulated	:	Insulated
xxii.	Details of protection for Tertiary	:	NA
xxiii.	Whether relay time is synchronized with UTC	:	Yes
xxiv.	Bushing details (OIP/RIP/RIS, Porcelain /polymer housing)	:	Porcelain
xxv.	On Load Tap Changer or Off Circuit Tap Changer	:	On load tap changer
xxvi.	Tap position of OLTC at the time of failure	:	9b
xxvii.	Past record of Operation of OLTC	:	OLTC operated checked during condition monitoring on dtd 17.02.2025
xxviii.	Tap Range	:	1 to 17
xxix.	Details of Protection provided for ICT/ GT/ Reactor	:	NA
xxx.	Details of Protection operated	:	NA
xxxi.	Whether equipment is properly earthed	:	Yes
xxxii.	Earth Resistance of Substation and date of its measurement	:	Individual Earth Pit:- 5 ohm Mesh :- 0.01 ohm

xxxiii.	Surge arrestor: (a) Is SA provided for protection (b) Whether healthiness of SA is monitored (c) Whether reading of SA counter changed during failure	:	(a) Yes, provided (b) Yes (c) No
xxxiv.	Lightning Impulse and Switching Impulse Withstand Voltage of the bushings of all voltage level	:	--
xxxv.	Lightning Impulse and Switching Impulse Withstand Voltage of the winding of all voltage level	:	--
xxxvi.	Type of Fire protection provided (Emulsifier system/ N2 Injection based fire protection system/ foam based protection etc.)	:	None
xxxvii.	Weather conditions at the time of failure (clear sky/rainy/thunderstorm etc.)	:	Cloudy
xxxviii.	Storage condition of equipment at site before commissioning: (a) Period of storage (b) Idle charged or uncharged (c) Dry air filled/Nitrogen filled/ Oil filled	:	Data Unavailable due to 1978 manufacturing transformer.
xxxix.	Whether short circuit test was carried out on this transformer or same design transformer or short circuit withstand Capability was verified on the basis of calculation?	:	Yes
xl.	Number of through faults the equipment was subjected to before failure	:	After condition monitoring on dated 17.02.2025 no fault occurred.



Damaged Bushing

7. Failure report of 160 MVA, 220/132/11 kV Auto Transformer at Babai S/s, RVPNL

i.	Name of Substation	:	400 kV GSS, RVPN, Babai
ii.	Utility	:	RVPNL
iii.	Faulty Equipment (ICT/ Auto-transformer/ GT/ Reactor etc.)	:	Auto Transformer
iv.	Rating (MVA/ MVA _r , Voltage ratio, 1-phase/ 3- phase)	:	160 MVA, 220/132/11 kV
v.	Make (Original equipment manufacturer)	:	BHEL
vi.	Serial No.	:	204084
vii.	Date and time of occurrence of fault	:	12.12.2025/ 14:16 Hrs
viii.	Fault discovered during (Operation periodic testing/ maintenance)	:	Operation
ix.	Year of Manufacturing	:	2017
x.	Date of Commissioning	:	29.03.2019
xi.	Sequence of events/ Description of fault (SOE with time stamp, Protection operated during fault)	:	Electrical Protection Element: REF & CCR Mechanical Protection Element: Bucholz 1 & 2, PRD-1 & PRD-2, OSR with huge amount of Oil splashed out through PRD
xii.	Details of Tests done after failure (What tests were conducted after the discovery of failure? If no tests were conducted, reasons for the same may be stated.)	:	Magnetization Current Test Short Circuit Test Magnetizing Balance Test IT Measurement CFT Test Transformer Turns Ratio Test Winding Resistance Test Tan Delta and Capacitance Measurement DGA Oil
xiii.	Observations (Visual observations e.g. bulging of tank, fire, any leakage of oil, damage to various components of transformer and nearby equipment/ material etc.)	:	Mechanical Protection Element: Bucholz 1 & 2, PRD-1 & PRD-2, OSR with huge amount of Oil splashed out through PRD.
xiv.	Probable cause of failure	:	As per attached MoM, detailed analysis is to be carried out at works to identify the probable cause.
xv.	If OEM representative had inspected the equipment or visited the site after failure, their remarks, MoM etc. may be	:	OEM i.e BHEL representative visited the site on dated 17.12.2025 and carried out internal inspection of the transformer.

	attached.		
A meeting was held between M/s BHEL Jhansi and RRVPN, Babai on December 17, 2025, with representatives present from both parties. The meeting concerned a 220/132 KV, 160 MVA transformer supplied by BHEL in 2017 and commissioned in March 2019, which tripped on December 12, 2025, due to electrical (REF & CCR) and mechanical protection elements (Buchholz 1&2, PRD-1 & PRD-2, OSR) with significant oil splash. Protection testing carried out on December 13, 2025, yielded results that were not in order, prompting an internal inspection. A joint physical inspection found IV bushings shifted from their original position, burnt paper insulation and press board on the middle phase winding, disturbed wooden supporting blocks, heavy carbonization of transformer oil, and displaced winding turns. Because detailed analysis and dismantling were impossible on-site, BHEL recommended sending the transformer to their facility in Jhansi, concluding that the unit is not repairable at the current location.			
xvi.	Present condition of equipment (Whether repairable or beyond repair)		Repairable
xvii.	(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) Maintenance activities as per norms were carried out. Last protection testing was carried out on dated 03.07.2025. (b) No abnormality was observed. (c) NA
xviii.	Details of any previous failure on the same unit	:	Nil
xix.	Is tertiary winding provided (Yes/No)	:	Yes
xx.	Tertiary loaded (Yes/ No) If yes, specify load on tertiary	:	No
xxi.	Whether tertiary terminals are bare/ insulated		Bare
xxii.	Details of protection for Tertiary	:	NDR
xxiii.	Whether relay time is synchronized with UTC	:	Yes
xxiv.	Bushing details (OIP/ RIP/ RIS, Porcelain/ polymer housing)	:	HV & IV – OIP LV (Tertiary)- Porcelain
xxv.	On Load Tap Changer or Off Circuit Tap Changer	:	ON LOAD TAP CHANGER
xxvi.	Tap position of OLTC at the time of failure	:	12
xxvii.	Past record of Operation of OLTC	:	Operated regularly as per requirement

xxviii.	Tap Range	:	1 to 21
xxix.	Details of Protect provided for ICT/ GT/ Reactor	:	Elect. Protection: Differential, Main-I, Differential Main-II, Back up protection, CCR, LBB, REF Mech Protection: Buchholz 1&2, PRD 1 &2, OSR, OTI, WTI
xxx.	Details of Protection operated	:	Elect. Protection: CCR & REF Mech Protection: Buchholz 1 & 2, PRD-1 & PRD-2, OSR with huge amount of Oil splashed out through PRD
xxxi.	Whether equipment is properly earthed	:	Yes
xxxii.	Earth Resistance of Substation and date of its measurement	:	0.64 Ohm on dated 02.12.2024
xxxiii.	Surge arrestor: (a) Is SA provided for protection (b) Whether healthiness of SA is monitored (c) Whether reading of SA counter changed during failure	:	(a) Yes (b) Healthy (c) No
xxxiv.	Lightning Impulse and Switching Impulse Withstand Voltage of the bushings of all voltage level	:	
xxxv.	Lightning Impulse and Switching Impulse Withstand Voltage of the winding of all voltage level	:	HV-950 kVp IV-550 kVp LV 170 kVp
xxxvi.	Type of Fire protection provided (Emulsifier system/ N2 Injection based fire protection system/ foam based protection etc.)	:	NIFPES
xxxvii.	Weather conditions at the time of failure (clear sky/rainy/thunderstorm etc.)	:	Clear sky
xxxviii.	Storage condition of equipment at site before commissioning: (a) Period of storage (b) Idle charged or uncharged (c) Dry air filled/Nitrogen filled/ Oil filled	:	a) 17 months b) Uncharged c) Nitrogen filled
xxxix.	Whether short circuit test was carried out on this transformer or same design transformer or short circuit withstand capability was verified on the basis of calculation?	:	Yes
xl.	Number of through faults the equipment was subjected to before failure	:	06

8. Failure report of 260 MVA, 21/(420/3) kV, 1 Phase Generator Transformer at Khurja S/s, THDCIL

i.	Name of Substation	:	Khurja Super Thermal Power Plant 2X660 MW, U.P.
ii.	Utility	:	THDCIL
iii.	Faulty Equipment (ICT/ Autotransformer/ GT/ Reactor etc.)	:	Generator Transformer Unit-2 R Phase
iv.	Rating (MVA/MVAr, Voltage ratio, 1-phase/3-phase)	:	260 MVA, 21/ (420/√3) kV, 1 Phase
v.	Make (Original equipment manufacturer)	:	BHEL Bhopal
vi.	Serial No.	:	6008082
vii.	Date and time of occurrence of fault	:	27.09.2025/ 00:47 HRS
viii.	Fault discovered during (Operation or periodic testing/ maintenance)	:	During Synchronization OF Unit #2
ix.	Year of Manufacturing	:	2024 (June)
x.	Date of Commissioning	:	2025 (Sep)
xi.	Sequence of events/Description of fault (SOE with time stamp, Protection operated during fault)	:	Refer Point xli (c)
xii.	Details of Tests done after failure (What tests were conducted after the discovery of failure? If no tests were conducted, reasons for the same may be stated.)	:	No testing was conducted due to damages outside of transformer tank (RHS, when viewed from front side), OLTC damaged, all oil drained.
xiii.	Observations (Visual observations e.g. bulging of tank, fire, any leakage of oil, damage to various components of transformers and nearby equipment / material etc.)	:	Bulging of tank, Leakage of complete oil, Broken bushing components lying on tank bottom, OLTC had burnt/contacts melted, Copper conductor exposed and splayed, Carbonized fragments of various parts scattered at tank bottom.
xiv.	Probable cause of failure	:	Earlier breakdown of insulation.
xv.	If OEM representatives had inspected the equipment or visited the site after failure, their remarks, MoM etc. may be attached.	:	OEM has visited the site and declared beyond repairable
xvi.	Present condition of equipment (Whether repairable or beyond repair)	:	Beyond Repairable
xvii.	(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	:	This is the new commissioning transformer on Sep 2025

	reports. (c) What steps were taken to address the abnormality?		
xviii.	Details of any previous failure on the same unit	:	Not Applicable
xix.	Is tertiary winding provided (Yes/ No)	:	No
xx.	Tertiary loaded (Yes/ No) If yes, specify load on tertiary	:	NA
xxi.	Whether tertiary terminals are bare/ insulated	:	NA
xxii.	Details of protection for Tertiary	:	NA
xxiii.	Whether relay time is synchronized with UTC	:	Yes
xxiv.	Bushing details (OIP/ RIP/ RIS, Porcelain/ polymer housing)	:	420 kV 1600 Amp, RIP Type
xxv.	On Load Tap Changer or Off Circuit Tap Changer	:	Off circuit tap changer
xxvi.	Tap position of OLTC at the time of failure	:	Position 3
xxvii.	Past record of Operation of OLTC	:	NA
xxviii.	Tap Range	:	1 to 17
xxix.	Details of Protection provided for ICT/ GT/ Reactor	:	Refer Point Xli(g)
xxx.	Details of Protection operated	:	Refer Point Xli(b)
xxxi.	Whether equipment is properly earthed	:	Yes
xxxii.	Earth Resistance of Substation and date of its measurement	:	Yes, July 25
xxxiii.	Surge arrester: (a) Is SA provided for protection (b) Whether healthiness of SA is monitored (c) Whether reading of SA counter changed during failure	:	(a) Yes (b) Yes (c) No
xxxiv.	Lightning Impulse and Switching Impulse Withstand Voltage of the bushings of all voltage level	:	1550 kVp Lighting impulse 1175 kVp Switching impulse
xxxv.	Lightning Impulse and Switching Impulse Withstand Voltage of the winding of all voltage level	:	1425 kVp Lighting impulse 1175 kVp Switching impulse
xxxvi.	Type of Fire protection provided (Emulsifier system/ N2 Injection based fire protection system/foam-based protection etc.)	:	Emulsifier System
xxxvii.	Weather conditions at the time of failure (clear sky/rainy/thunderstorm etc.)	:	Clear sky

xxxviii.	Storage condition of equipment at site before commissioning: (a) Period of storage (b) Idle charged or uncharged (c) Dry air filled/Nitrogen filled/ Oil filled	:	Information not available
xxxix.	Whether short circuit test was carried out on this transformer or same design transformer, or short circuit withstand capability was verified on the basis of calculation?	:	Yes
xl.	Number of through faults the equipment was subjected to before failure	:	zero



The Arching spot and burnt Transformer

9. Failure report of 100 MVA, 230/110 kV Auto Transformer at Meelavittan S/s, TANTRANSCO

i.	Name of Substation	:	230 kV Meelavittan SS							
ii.	Utility	:	TANTRANSCO							
iii.	Faulty Equipment	:	Auto Transformer							
iv.	Rating (MVA/MVAr, Voltage ratio, 1-phase/ 3-phase)	:	100 MVA, 230/110 kV							
v.	Make (Original equipment manufacturer)	:	APEX							
vi.	Serial No.	:	T-968/05							
vii.	Date and time of occurrence of fault	:	12.12.2025							
viii.	Fault discovered during (Operation or periodic testing/ maintenance)	:	Bucholz Alarm , Master Trip R, Y, B differential, Annunciation Window: - Differential, Transformer internal fault.							
ix.	Year of Manufacturing	:	1997							
x.	Date of Commissioning	:	28.03.2024 (At Meelavittan 230 kV SS)							
xi.	Sequence of events/Description of fault (SOE with time stamp, Protection operated during fault)	:	--							
xii.	Details of Tests done after failure (What tests were conducted after the discovery of failure. If no tests were conducted, reasons for the same may be stated.)	:	DGA test done by R&D Lab & All Electrical Test done by P&C Wing							
			Date of Test	Hydrogen	Methan	Ethane	Ethylene	Acetylene	Carbon Dioxide	Carbon Monoxide
			13.12.2025 (bottom)	109	25	1	26	42	353	66
			13.12.2025 (Top)	314	29	1	21	41	256	130
			12.12.2025 (Bottom) Before failure	1	1	0	1	0	191	13
xiii.	Observations	:	NIL							
xiv.	Probable cause of failure	:	Internal Fault							
xv.	If OEM representative had inspected the equipment or visited the site after failure, their remarks, MoM etc. may be attached.	:	The presence of Iron granules at many spots indicates winding to core lamination short in the 230/110 KV, Apex Make, Sl.No. T-968/05, YOM:1997 Auto Transformer/ Meelavittan SS. Based on the internal examination observation, P&C & DGA test results, it is suspected that B Phase winding to core short. The defect could not be attended at site.							
xvi.	Present condition of equipment (Whether repairable or beyond repair)	:	Repairable							

xvii.	(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?	:	The Director, Operation Chennai has instructed to isolate Auto Transformer II (APEX Make) due to DGA test result not satisfactory (C2H4 - 779; C2H2 - 29) and instructed to carry out open examination of Auto Transformer II. Accordingly, open inspection carried out on 20.11.2025 in 100 MVA, 230/110 KV Auto Transformer II (Apex Make, SI No. T-968/05, YOM-1997) by EE(i/c)/TRB/Arasur, EE(i/c)/SSE/Tin, AEE/TRB/Ambathur and AEE/P&C/Tuticorin
xviii.	Details of any previous failure on the same unit	:	Kayathar 230/110 kV SS
xix.	Is tertiary winding provided (Yes/No)	:	Yes
xx.	Tertiary loaded (Yes/No) If yes, specify load on tertiary	:	No
xxi.	Whether tertiary terminals are bare/ insulated	:	---
xxii.	Details of protection for Tertiary	:	---
xxiii.	Whether relay time is synchronized with UTC	:	---
xxiv.	Bushing details (OIP/RIP/RIS, Porcelain/polymer housing)	:	OIP
xxv.	On Load Tap Changer or Off Circuit Tap Changer	:	On Load Tap Changer
xxvi.	Tap position of OLTC at the time of failure	:	12
xxvii.	Past record of Operation of OLTC	:	No operation
xxviii.	Tap Range	:	
xxix.	Details of Protection provided for ICT / GT / Reactor	:	---
xxx.	Details of Protection operated	:	---
xxxi.	Whether equipment is properly earthed	:	Earthed
xxxii.	Earth Resistance of Substation and date of its measurement	:	30.09.2023
xxxiii.	Surge arrestor : a) Is SA provided for protection b) Whether healthiness of SA is	:	---

	monitored c) Whether reading of SA counter changed during failure		
xxxiv.	Lightning Impulse and Switching Impulse Withstand Voltage of the bushings of all voltage level	:	---
xxxv.	Lightning Impulse and Switching Impulse With stand Voltage of the winding of all voltage level	:	---
xxxvi.	Type of Fire protection provided (Emulsifier system/N2Injectionbasedfire protection system/ foam based protection etc.)	:	---
xxxvii.	Weather conditions at the time of failure (clear sky/rainy/thunderstorm etc.)	:	Clear Sky
xxxviii.	Storage condition of equipment at site before commissioning: (a) Period of storage (b) Idle charged or uncharged (c) Dry air filled/Nitrogen filled/Oil filled	:	---
xxxix.	Whether short circuit test was carried out on this transformer or same design Transformer or short circuit with stand Capability was verified on the basis of calculation?	:	---
xl.	Number of through faults the equipment was subjected to before failure	:	Nil

10. Failure report of 200 MVA, 400/110 kV ICT-2 at Alamathy S/s, TANTRANSCO

i.	Name of Substation	:	Alamathy 400/230-110 KV SUBSTATION, Chennai. 600052
ii.	Utility	:	TANTRANSCO
iii.	Faulty Equipment	:	BHEL Make, 66.67 MVA 400/110 kV - R Phase Unit of ICT-2 completely main tank welding cracks.
iv.	Rating (MVA/MVAr, Voltage ratio, 1-phase/ 3- phase)	:	3 x 66.67 MVA = 200 MVA (3 individual units)
v.	Make (Original equipment manufacturer)	:	M/s. BHEL
vi.	Serial No.	:	6006121 (R phase)
vii.	Date and time of occurrence of fault	:	18.09.2025 at 16:14 Hrs
viii.	Fault discovered during (Operation or periodic testing/ maintenance)	:	During in normal service
ix.	Year of Manufacturing	:	2004
x.	Date of Commissioning	:	20.08.2006
xi.	Sequence of events/Description of fault (SOE with time stamp, Protection operated during fault)	:	---
xii.	Details of Tests done after failure (What tests were conducted after the discovery of failure. If no tests were conducted, reasons for the same may be stated.)	:	R phase unit main tank welding cracks and it is beyond repairable
xiii.	Observations (Visual observations e.g. bulging of tank, fire, any leakage of oil, damage to various components of transformer and nearby equipment / material etc.)	:	Main tank welding cracks and heavy oil spill from R phase unit of ICT-II
xiv.	Probable cause of failure	:	Internal Fault
xv.	If OEM representative had inspected the equipment or visited the site after failure, their remarks, MoM etc. may be attached.	:	No
xvi.	Present condition of equipment (Whether repairable or beyond repair)	:	R Phase Beyond repairable; Y & B Phase normal condition

xvii.	(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 date : 16.09.2025; Annual Relay Test on : 16.09.2025; DGA :19.06.2025; Tan Delta Test : 16.09.2025 (b) So far no abnormality observed during the annual relay testing and maintenance works. (c) No abnormality observed
xviii.	Details of any previous failure on the same unit	:	No
xix.	Is tertiary winding provided (Yes/No)	:	Yes
xx.	Tertiary loaded (Yes/No) If yes, specify load on tertiary	:	No
xxi.	Whether tertiary terminals are bare/ insulated	:	Not Insulated
xxii.	Details of protection for Tertiary	:	Used only for delta connection and not loaded
xxiii.	Whether relay time is synchronized with UTC	:	Yes
xxiv.	Bushing details (OIP/RIP/RIS, Porcelain/ polymer housing)	:	OIP, Porcelain
xxv.	On Load Tap Changer or Off Circuit Tap Changer	:	On Load Tap Changer
xxvi.	Tap position of OLTC at the time of failure	:	10
xxvii.	Past record of Operation of OLTC	:	NIL
xxviii.	Tap Range	:	1 to 17
xxix.	Details of Protection provided for ICT/GT/Reactor	:	1. Differential Protection 2. Buchholz relay, 3. PRV for main and OLTC tanks 4. NIFES 5. back up OC EL relay, 6. Oil & winding temp trip relays, 7. OLTC surge relay
xxx.	Details of Protection operated	:	Protection Operated details : 1. Differential trip, 2. Buchholz trip, 3. WTI Trip,

			4. OTI Trip, 5. PRV Trip and 6. NIFES operated
xxxi.	Whether equipment is properly earthed	:	Yes
xxxii.	Earth Resistance of Substation and date of its measurement	:	Individual: 2.9; Combined: 0.3; Date of measurement: 16.09.2025
xxxiii.	Surge arrestor: (a) Is SA provided for protection (b) Whether healthiness of SA is monitored (c) Whether reading of SA counter changed during failure	:	(a) Yes (b) Yes, hi-pot test conducted. (c) No
xxxiv.	Lightning Impulse and Switching Impulse Withstand Voltage of the bushings of all voltage level	:	Lightning Impulse Withstand Voltage KVp HV: 1425, IV: 1050, LV: 325 [Neutral : 170 KVp] Switching Impulse Withstand Voltage KVp. HV: 1050 (IV & LV & Neutral : NA),
xxxv.	Lightning Impulse and Switching Impulse Withstand Voltage of the winding of all voltage level	:	Lightning Impulse Withstand Voltage KVp HV: 1300, IV: 950, LV: 250
xxxvi.	Type of Fire protection provided (Emulsifier system/ N2 Injection based fire protection system/ foam based protection etc.)	:	Nitrogen Injection Fire Extinguishing System
xxxvii.	Weather conditions at the time of failure (clear sky/rainy/thunderstorm etc.)	:	Clear Sky
xxxviii.	Storage condition of equipment at site before commissioning: (a) Period of storage (b) Idle charged or uncharged (c) Dry air filled/Nitrogen filled/ Oil filled	:	Transformer was in service before failure
xxxix.	Whether short circuit test was carried out on this transformer or same design transformer or short circuit withstand capability was verified on the basis of calculation?	:	No
xl.	Number of through faults the equipment was subjected to before failure	:	NIL

11. Failure report of 315 MVA, 400/230 kV ICT-4 at Manali GIS S/s, TANTRANSCO

i.	Name of Substation	:	400 KV Manali GIS SS
ii.	Utility	:	TANTRANSCO
iii.	Faulty Equipment (ICT/Auto-transformer/GT/Reactor etc.)	:	400/230 KV, 315 MVA ICT - 4
iv.	Rating (MVA/ MVA _r , Voltage ratio, 1-phase/3- phase)	:	315 MVA
v.	Make (Original equipment manufacturer)	:	CG Power
vi.	Serial No.	:	T10680 / 2
vii.	Date and time of occurrence of fault	:	14.12.2025 @ 05:02 Hrs
viii.	Fault discovered during (Operation or periodic testing/ maintenance)	:	Operation
ix.	Year of Manufacturing	:	2016
x.	Date of Commissioning	:	25.07.2017
xi.	Sequence of events/Description of fault (SOE with time stamp, Protection operated during fault)	:	CG Power make 400/230KV, 315 MVA ICT – 4 was in service under parallel operation with CG Power make 400/230KV, 315 MVA ICT – 2 at 400kv Manali GIS substation. On 14.12.2025 @ 05:02 Hrs heavy sound and fire observed in IV & HV B Phase transformer bushings. Immediately HV / IV CB had got tripped on actuation of protection and ICT – 4 got isolated through the following protection commands.
xii.	Details of Tests done after failure (What tests were conducted after the discovery of failure. If no tests were conducted, reasons for the same may be stated.)	:	Unit brunt out
xiii.	Observations (Visual observations e.g. bulging of tank, fire, any leakage of oil, damage to various components of transformer and nearby equipment / material etc.)	:	Tank Bulged
xiv.	Probable cause of failure	:	Internal Fault

xv.	If OEM representative had inspected the equipment or visited the site after failure, their remarks, MoM etc. may be attached.	:	No
xvi.	Present condition of equipment (Whether repairable or beyond repair)	:	Beyond Repair
xvii.	(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?	:	Half Yearly No abnormalities noticed. Details of maintenance works done are attached
xviii.	Details of any previous failure on the same unit	:	No
xix.	Is tertiary winding provided (Yes/No)	:	Yes
xx.	Tertiary loaded (Yes/No) If yes, specify load on tertiary	:	Not loaded
xxi.	Whether tertiary terminals are bare/insulated	:	Terminals insulated
xxii.	Details of protection for Tertiary	:	Restricted Earth Fault
xxiii.	Bushing details (OIP/ RIP/ RIS, Porcelain/ polymer housing)	:	Oil Impregnated Paper (OIP) / Porcelain housing
xxiv.	On Load Tap Changer or Off Circuit Tap Changer	:	On load Tap Changer
xxv.	Tap position of OLTC at the time of failure	:	07
xxvi.	Past record of Operation of OLTC	:	Operation Normal
xxvii.	Tap Range	:	Tap : 17, Range : +/- 12%
xxviii.	Details of Protection provided for ICT/ GT/ Reactor	:	Over Current (OC), Earth Fault (EF), Impedance, Differential, Restricted Earth Fault (REF), Over Flux, Buchloz , PRV (Main tank / OLTC), OSR, OT, WT, NIFPS
xxix.	Details of Protection operated	:	Main – 1 : F 87T & 64 REF Operated Main – 2 : F 21T & 64 REF Operated Mechanical Protection : OLTC – OSR (230 B), Main tank PRV (230 A), OLTC PRV (130 B), Master trip

			86 AH, 86 BH
xxx.	Whether equipment is properly earthed	:	Yes
xxxi.	Earth Resistance of Substation and date of its measurement	:	0.38 Ohm , 04.10.2023
xxxii.	Surge arrestor: (a) Is SA provided for protection (b) Whether healthiness of SA is monitored (c) Whether reading of SA counter changed during failure	:	Provided Monitored No Change
xxxiii.	Type of Fire protection provided (Emulsifier system/ N2 Injection based fire protection system/ foam based protection etc.)	:	NIFPS
xxxiv.	Weather conditions at the time of failure (clear sky/rainy/thunderstorm etc.)	:	Clear Sky(foggy)
xxxv.	Storage condition of equipment at site before commissioning: (a) Period of storage (b) Idle charged or uncharged (c) Dry air filled/Nitrogen filled/ Oil filled	:	(a) 03 months (b) No idle charged (c) N2 filled
xxxvi.	Whether short circuit test was carried out on this transformer or same design transformer or short circuit withstand capability was verified on the basis of calculation?	:	Yes
xxxvii.	Number of through faults the equipment was subjected to before failure	:	NIL



Annexure – III

General Guidelines for Substation/ Switchyard Operation & Maintenance Activities by Transmission Utilities

Substation/ Switchyard Operation & Maintenance Activities

(Issued vide CEA letter no: CEA-PS-14-12/18/2022-PSETD Division dated 22.06.2023)

I. Transformer/Reactor/Neutral Grounding Reactor (NGR):

Sl. No.	Test Name/Maintenance Check	Frequency
1.	Capacitance/Tan Delta for a) Bushing & b) winding	Yearly (for Bushing) 10 Yearly/SOS (for Winding)
2.	Magnetizing current Test (Excitation Current Test)	SOS
3.	Magnetic Balance Test (Three Phase) on transformer	SOS
4.	Winding resistance (Resistance converted to 75 °C)	SOS
5.	Voltage Ratio (All Taps) on transformer	SOS
6.	IR Value of Winding	SOS
7.	Polarization Index (Ratio of IR values at 10 min to 1 min)	SOS
8.	Core Insulation Test (Between core to clamp; clamp to tank; & core to tank)	SOS
9.	Neutral Earth pit Resistance Value	Yearly
10.	Turret/ Neutral CT Ratio Errors	SOS
11.	Vibration Level for reactors	SOS
12.	Sweep Frequency Response Analysis Tests (20 Hz to 5 MHz)	SOS
13.	Insulation Condition Dry (at commissioning) Normal in operation Wet Extremely Wet	SOS
14.	Short Circuit Impedance of transformer	SOS
15.	Dissolved Gas Analysis (DGA) of tank oil & Onload Tap Changer (OLTC) oil	Half Yearly
16.	Oil parameters of tank oil	Yearly
17.	Thermo-vision Scanning	Half Yearly
18.	Other maintenance checks:	
	(a) Checking of bushing oil level	Monthly
	(b) Checking of oil level in conservator	Monthly
	(c) Checking of oil level in OLTC conservator	Monthly

	(d) Checking of oil leaks	Monthly
	(e) Checking condition of silica gel in breather	Monthly
	(f) Checking of oil level in oil seal of breather	Monthly
	(g) Manual actuation of cooler fans and oil pumps	Monthly
	(h) External cleaning of all bushings	Yearly
	(i) External cleaning of radiators	Yearly
	(j) Checking of marshalling box/control cubicles: cleaning, tightening of terminations, checking of contactors, space heater, lamps etc	Yearly
	(k) Maintenance of OLTC driving mechanism	Yearly
	(l) Checking/testing of buchholz relay by oil draining	Yearly
	(m) Electrical checking/testing of Pressure Relief Device (PRD), buchholz relay, rapid pressure rise relay, OLTC surge relay, checking of alarm/trip	Yearly
	(n) Checking of gaskets	Yearly
	(o) Checking of Oil Temperature Indicator (OTI)/Winding Temperature Indicator (WTI) and tap position indicator and top up of oil in pockets, if required	Yearly

II. Current Transformer:

Sl. No.	Test Name/Maintenance Check	Frequency
1.	Measurement of Tan Delta & Capacitance	Yearly
2.	Measurement of Insulation Resistance (IR) value	SOS
3.	Measurement of Current Transformer (CT) secondary resistance	2 Yearly
4.	Magnetization characteristics	SOS
5.	CT ratio test	SOS
6.	DGA and testing of other parameter of oil	SOS
7.	Thermo-vision scanning of CT and top dome	Quarterly
8.	Checking of bellow expansion	Monthly
9.	Visual inspection of CT for oil leakage and crack	Monthly

10.	Checking of healthiness of marshalling box gaskets	Yearly
11.	Checking of space heater and illumination	Yearly
12.	Checking the tightness of all connections including earthing	Yearly
13.	Cleaning of marshalling box and junction box	Monthly

III.SF6 circuit breakers:

Sl. No.	Test Name/Maintenance Check	Frequency
1.	Checking of SF6 gas pressure (wherever pressure gauges are provided)	Daily
2.	Checking of oil leaks form grading capacitor	Monthly
3.	Status of healthiness of CSD relay	Monthly
4.	Tan delta and capacitance of grading capacitor	2 Yearly
5.	SF6 gas leakage test	SOS
6.	Dew point measurement of SF6 gas	2 Yearly
7.	Operating timing of Circuit Breaker (CB)/Pre-insertion Resistance (PIR)]	Yearly
8.	Static contact resistance	Yearly
9.	Checking of pole discrepancy relay	Yearly
10.	Checking of all operation lockouts	Yearly
11.	Checking of all interlocks	Yearly
12.	Cleaning of breaker interrupter, support insulators, PIRs and grading capacitors	Yearly
13.	Checking of healthiness of operation counter	Yearly
14.	Checking of tightness of all cable's termination in Marshalling Box (MB)	Yearly
15.	Checking of door sealing gaskets and replacement, ift necessary	Yearly
16.	Repainting of metallic surfaces (if required)	2 Yearly

17.	Checking of space heater	Yearly
18.	Dynamic Contact Resistance Measurement (DCRM) test	2 Yearly

IV. Capacitor Voltage Transformer:

1.	Visual checking of earthing HF (high-frequency) point [(in case it is not being used for Power Line Career Communication (PLCC) system]	Yearly
2.	Checking for any breakage of cracks	Yearly
3.	Checking of oil leaks	Monthly
4.	Cleaning of Capacitive Voltage Transformer (CVT) capacitor stacks and tightness of terminal connections	Yearly
5.	Capacitance and tan-delta measurement	SOS
6.	Measurement of voltage ratio error	SOS
7.	Measurement of voltage at metering points in control room	Monthly
8.	Testing of EMU tank oil for Break Down voltage (BDV)	SOS
9.	Thermo vision scanning of capacitor stacks	Quarterly
10.	Checking of space heater and illumination	Yearly
11.	Checking and tightness of all connections including earth connections	Yearly
12.	Cleaning of marshalling box and junction box	Yearly
13.	Checking of healthiness of gaskets	Yearly

V. Isolators:

1.	Maintenance of linkages and transmission gears	Yearly
2.	Cleaning of auxiliary switch contacts with rustolene spray	Yearly
3.	Lubrication of operating mechanism, hinges, locks, joints on leavers, bearings	Yearly

4.	Checking of all bolts for tightness	Yearly
5.	Cleaning and lubrication of main contacts	Yearly
6.	Alignment	Yearly
7.	Main contact resistance measurement	Yearly
8.	Tightness of bolts, nuts and pins etc	Yearly
9.	Cleaning of support insulators and checking of insulator cracks, if any	Yearly
10.	Thermo vision scanning of insulator hinges and contacts	Quarterly

VI. Earth Switch:

1.	Checking & alignment of earthing blades	Yearly
2.	Cleaning of contacts	Yearly
3.	Contact resistance	Yearly
4.	Operation of earthing switch	Yearly
5.	Checking of aluminum/copper flexible conductor	Yearly
6.	Checking of earth connections of structure and Manual Operating Mechanism (MOM) box	Yearly
7.	Visual check of auxiliary contacts	Yearly
8.	Cleaning and terminal tightness in MOM box	Yearly
9.	Checking of space heater and illumination	Yearly
10.	Checking of healthiness of marshalling box gaskets Surge Arresters	Yearly

VII. Surge arrester:

1.	Checking of leakage current	Monthly
2.	Reading of surge counter	Daily
3.	Testing of counters	Yearly

4.	Cleaning of Lightning Arrester (LA) insulator	Yearly
5.	Measurement of capacitance and tan-delta	SOS
6.	Measurement of IR value	SOS
7.	Stack meggering	SOS
8.	3rd harmonic resistive current measurement	4 Monthly

VIII. Wave Traps:

1.	Tightness and cleanliness	Yearly
2.	General inspection	Yearly

IX. Protection System:

1.	Testing of Disturbance Recorder and Event Logger	Monthly
2.	Calibration of panel meters (indicating / recording instruments along with the transducers)	Yearly
3.	Calibration of tariff/non-tariff energy meters	SOS
4.	Secondary injection test of individual protection schemes	5 Yearly
5.	Checking of voltage (in services) for relays	Half Yearly
6.	Checking of Direct Current (DC) logic circuits for trip and ammonization including timers and simulation	Yearly

X. Line Protection Distance Protection:

1.	Reach check for all four (4) zones	Yearly
2.	Time measurement	Yearly

XI. PLCC System:

1.	Power supply measurements	Yearly
2.	Checking of alarms	Yearly

XII. Miscellaneous:

1.	Measurement of station earth resistance	Yearly
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2.	Cleaning of insulator for cracks	Yearly
3.	De-weeding of switchyard	Monthly
4.	Repainting, rust removal of all structures, equipment's etc	SOS
5.	Checking of switchyard lighting	Daily

XIII. Thermal Imaging & Corona Scanning:

1.	Thermo vision scanning of all conductor joints, terminal connector/clamps	Quarterly
2.	Removal of hot spots	SOS
3.	Corona Scanning of Bay equipment	Yearly

XIV. Other Operational activities:

1.	Visual checking of the bay	Daily
2.	Isolation & restoration of bays as per LDC instruction	As required
3.	Mega Watt (MW)/Mega Volt Ampere Reactive (MVAR) meter reading (line flows)	Hourly
4.	Energy Meter readings	Daily
5.	PLCC counter readings	Daily
6.	Battery charger voltage and current	Daily
7.	Measurement of cell voltage	Monthly
8.	Healthiness of FF system	Daily
9.	Healthiness of SAS system/DR PC/Event Logger	Daily
10.	Providing trip related information/ documents to LDC/New TSP	As required
11.	Healthiness of AC plant system/KIOSK AC	Daily
12.	Defect Records	As required
13.	Healthiness of Emergency DC Lighting system	Monthly

SOS: as and when needed.



Annexure – IV

Format for report of failure of the Transformer/Reactors

Proforma for reporting of failure of Transformer/ Reactor

i.	Name of Substation	:	
ii.	Utility	:	
iii.	Faulty Equipment (ICT/ Auto-transformer/ GT/ Reactor etc.)	:	
iv.	Rating (MVA/MVAR, Voltage ratio, 1-Phase/ 3- Phase)	:	
v.	Make (Original equipment manufacturer)	:	
vi.	Serial No.	:	
vii.	Date and time of occurrence of fault	:	
viii.	Fault discovered during (Operation or periodic testing/ maintenance)	:	
ix.	Year of Manufacturing	:	
x.	Date of Commissioning	:	
xi.	Sequence of events/ Description of fault (SOE with time stamp, Protection operated during fault)	:	
xii.	Details of Tests done after failure (What tests were conducted after the discovery of failure. If no tests were conducted, reasons for the same may be stated.)	:	
xiii.	Observations (Visual observations e.g. bulging of tank, fire, any leakage of oil, damage to various components of transformer and nearby equipment / material etc.)	:	
xiv.	Probable cause of failure	:	
xv.	If OEM representative had inspected the equipment or visited the site after failure, their remarks, MoM etc. may be attached.	:	
xvi.	Present condition of equipment (Whether repairable or beyond repair)	:	

xvii.	(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?	:	
xviii.	Details of any previous failure on the same unit	:	
xix.	Is tertiary winding provided (Yes/ No)	:	
xx.	Tertiary loaded (Yes/ No) If yes, specify load on tertiary	:	
xxi.	Whether tertiary insulated terminals are bare/ insulated	:	
xxii.	Details of protection for Tertiary	:	
xxiii.	Whether relay time is synchronized with UTC	:	
xxiv.	Bushing details (OIP/ RIP/ RIS, Porcelain/ polymer housing)	:	
xxv.	On Load Tap Changer or Off Circuit Tap Changer	:	
xxvi.	Tap position of OLTC at the time of failure	:	
xxvii.	Past record of Operation of OLTC	:	
xxviii.	Tap Range	:	
xxix.	Details of Protection provided for ICT/ GT/ Reactor	:	
xxx.	Details of Protection operated	:	
xxxi.	Whether equipment is properly earthed	:	
xxxii.	Earth Resistance of Substation and date of its measurement	:	
xxxiii.	Surge arrestor: (d) Is SA provided for protection (e) Whether healthiness of SA is monitored (f) Whether reading of SA counter changed during failure	:	
xxxiv.	Lightning Impulse and Switching Impulse Withstand Voltage of the bushings of all voltage level	:	

xxxv.	Lightning Impulse and Switching Impulse Withstand Voltage of the winding of all voltage level	:	
xxxvi.	Type of Fire protection provided (Emulsifier system Injection based fire Protection system/ for based protection etc.)	:	
xxxvii.	Weather conditions at the time of failure (clear sky/ rainy/ thunderstorm etc.)	:	
xxxviii.	Storage condition of equipment at site before Commissioning: (a) Period of storage (b) Idle charged or uncharged (c) Dry air filled/Nitrogen filled/ Oil filled	:	
xxxix.	Whether short circuit test was carried out on this transformer or same design transformer or short circuit with stand, capability was verified on the basis of calculation?	:	
xl.	Number of through faults the equipment was subjected to before failure	:	
xli.	Attach the following: (a) Single Line Diagram of the substation (b) Photographs of the failed equipment (c) Disturbance Recorder/Even Logger Data (d) Reports of tests conducted after failure (e) Factory test results (f) Pre-Commissioning test results (g) Protection schematic diagram	:	



Annexure- V
Office Order for constitution and reconstitution of 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.

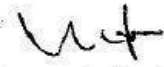
4. Every incident of substation equipment failure needs to be immediately reported to Chairperson of the Standing Committee by a designated officer of the concerned organization.

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.

0/c

(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.



भारत सरकार/ Government of India
विद्युत मंत्रालय/ Ministry of Power
केन्द्रीय विद्युत प्राधिकरण/ Central Electricity Authority
सचिव का कार्यालय/ Office of Secretary

No. - CEA-PS-14-37/3/2013- PSETD Division - Part(5)

03-02-2025

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

In suppression of the Letter No CEA/SETD/220-O/2012/1-80 dated 01.01.2013, following Standing committee comprising experts in the field of design and operation of EHV substation/switchyard from Central Electricity Authority (CEA), various power utilities and research/academic institutes is constituted to investigate the failure of Transformers and Reactors at 220 kV and above sub-stations/switchyard under section 73, clause (1) of the Electricity Act, 2003.

1.	Chief Engineer (PSETD), CEA	Chairperson
2.	Representative of CPRI	Member
3.	Representative of an Academic Institution	Member
4.	Representative from concerned State Utility/Generating Companies/Transmission Companies where Transformers/Reactors failure has taken place	Member
5.	Member Secretary of concerned RPC or its representative	Member
6.	Director(PSETD), CEA	Member Convener

- The terms of reference of the Committee shall be as follows:
 - To investigate the causes of failure of Transformer/Reactor in service
 - To recommend remedial measures to avert recurrences of such failures in future
- Each organisation shall report every incident of failure of 220 kV and above Transformer/Reactor within 48 hours of the occurrence of the failure to Chairperson of the Standing Committee. For this purpose, each organization shall nominate the designated officer.
- The Power Utility where failure of substation/switchyard equipment has taken place will provide all assistance required by the Committee in carrying out the investigations.
- The TA/DA and other expenses shall be borne by the respective organizations of the members of the Committee.
- The committee may invite other experts as needed.
- The committee shall publish the report every six months.

(Rakesh Kumar)
Secretary, CEA

To:

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

- 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 (PSETD), CEA
- 6) Director (PSETD), CEA