भारत सरकार
Government of India
विद्युत मंत्रालय
Ministry of Power
उत्तर क्षेत्रीय विद्युत समिति
Northern Regional Power Committee

सेवा में : संरक्षण उप-समिति के सदस्य (सूची के अनुसार) ।
To: Members of Protection Sub-Committee (As per mail list)

विषय: संरक्षण उप-समिति की 54 वीं बैठक की कार्यवृत्त |
Subject: Minutes for 54th Protection Sub-Committee Meeting.

संरक्षण उप-समिति की **54 वीं बैठक, दिनांक 25.11.2024 को 10:00 बजे** से **जोधपुर, राजस्थान** में एनएचपीसी लिमिटेड द्वारा आयोजित की गयी थी | उक्त बैठक की कार्यवृत्त संलग्न है । यह उत्तर क्षेत्रीय विद्युत् समिति की वेबसाइट (http://164.100.60.165/) पर भी उपलब्ध है |

The **54th meeting** of Protection Sub-Committee was held on **25.11.2024** at **10:00 Hrs** at **Jodhpur, Rajasthan** hosted by NHPC Ltd. The minutes of the meeting is attached herewith. The same is also available on NRPC website (http://164.100.60.165/).

Signed by Dharmendra Kumar Meena
Date: 06-12-2024 17:00:22

(डी.के. मीना)
(D.K. Meena)
निदेशक (संरक्षण)

54th Protection Sub-Committee Meeting (25th November, 2024)-MoM

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Minutes of
54th Meeting of Protection Sub-Committee (PSC) of Northern Regional Power Committee

Date and time of meeting : ***25.11.2024 10.00 Hrs.***

Venue : ***Jodhpur, Rajasthan, hosted by NHPC Ltd.***

ED (O&M), NHPC welcomed all the participants and thanked NRPC for giving opportunity to host the meeting. He added that PSC of NRPC is an excellent forum for all the constituent members to interact and deliberate on the issues of Power System protection and control, be it generation, transmission or distribution, we arrive at consensus and solutions for the benefit of the Region and also the constituent members.

The protection of Power System, in general, bears huge importance in terms of system stability, asset's health management, and ensuring Power quality. This importance has also rightly been demonstrated by Hon'ble CERC in its regulation 2023 under sub-head 'Protection Protocol'. PSC Forum, has already taken various steps in this regard to implement these provisions in letter and spirit.

Further, he added that the Government of India is transforming the country from power deficit to power surplus, through several schemes. Hydro Power is an important component of Nation's electricity basket, as it allows greater degree of integration of solar and wind in the grid and the same shall provide impetus to the hydropower development. It has been estimated that the installed capacity of Renewable Energy is likely to reach 596 GW by 2031-32 and contribution of Renewable Energy will be around 43.96 % of the total energy of the country in the year 2031-32. Hydro with its inherent capabilities to quickly ramp up and ramp down is a critical source in this regard.

NHPC being a partner in growth of the power sector is fully committed to produce clean power and play its role in grid stability.

Presently, NHPC has 15 Hydro Power Stations in the Northern Region having total installed capacity of 4484 MW and Design energy of 18668 MU. Out of these Power Stations, 10 are Peaking Stations and 5 are Run of River Stations. NHPC also has one operating Wind Power Project at Jaisalmer, Rajasthan with installed capacity of 50MW and 65MW Kalpi Solar power at Jalaun Uttar Pradesh which has been partially commissioned for 26MW.

NHPC has ambitious plans for development of hydro power in the region. Work in 800MW Parbati-II HE Project is in advanced stage and commissioning of the units is scheduled in this financial year. The Work in Hydro Power Projects namely, 1000MW Pakal Dul, 850MW Ratle, 624MW Kiru and 540MW Kwar through our JVs in the UT of J&K is already under progress. In addition to this, work is going on in full swing for 300MW Solar PV Power Project in Rajasthan.

NHPC as RE Implementing Agency has total of 2000 MW Solar Projects as an Intermediary Procurer, out of which 320MW has already been commissioned.

NHPC has also initiated Pilot Green Hydrogen based Fuel cell of 25KWe in the UT of Ladakh, which shall be used for our Guest House at Nimmo Bazgo PS, Alchi, Leh.

Climate change has its own challenges for hydro sector. Floods in the month of July 2023 in Himachal Region has affected the generation of our stations namely Parbati-III, Chamera-II and Chamera-III. Further Glacial Lake Outburst induced flood of LHONAK LAKE has severely damaged the Dam Spillway Radial Gates, of 510 MW Teesta-V Power Station in Eastern Region. Nevertheless, NHPC is committed in the service of the nation and we shall restore the station in earliest possible time. At the end, he once again extended a very warm welcome to all the dignitaries.

MS, NRPC welcomed all delegates, experts of protection from different power utilities of Northern Region and extended heartfelt thanks to NHPC Ltd. He requested all utilities to ensure availability and healthiness of required protection system. He urged to collectively uphold grid parameters such as voltage, frequency, and equipment loading within IEGC and CEA standards for safe and reliable grid operation.

He also informed that recently, Uniform Protection Protocol for users of the Indian Grid for implementation on Pan India basis was approved in the 15th NPC meeting of CEA. The Uniform protection protocol aims to ensure Grid stability, reliability, security. He asked utilities to acknowledge the same for needful compliance. He

highlighted that Protection Philosophy of Transmission line, Power Transformer and Reactor for Northern Region have been finalized after detailed deliberation and all utilities may follow the same and coordinate the relay settings accordingly.

He requested all entities to do audit (internal and external) of protection system as per IEGC 2023. Compliance of audit observations is required to be planned and executed timely. Further, as per finalized procedure of approval of protection settings, FTC is being accorded by NRLDC/SLDC provisionally. In order to get the final approval, he conveyed utilities to send the agenda in PSC meetings. Lastly, he congratulated NHPC officials for making splendid arrangements.

List of participants is attached as **Annexure-P**.

A.1. Confirmation of minutes of 53rd meeting of Protection Sub-Committee

A.1.1 AEE (P), NRPC apprised that the 53rd PSC meeting was held on 22.10.2024. Minutes of the meeting were issued vide letter dt. 18.11.2024. No comment has been received till the date.

Decision taken by Forum:

Forum approved the minutes of 53rd PSC meeting as issued.

A.2. Status of action taken on decisions of 53rd Protection Sub-Committee meeting (agenda NRPC Secretariat)

A.2.1 Status of action taken on the decisions of 53rd PSC meeting were informed to the Forum.

A.2.2 Concerned utilities submitted the status of action taken.

A.2.3 Forum noted the action taken status reported submitted by concerned utilities and requested to expedite the actions.

Decision taken by Forum

*Concerned utilities submitted the status of action taken and the same has been complied as **Annexure- I**.*

A.3. Submission of protection performance indices along with reason and corrective action taken for indices less than unity to NRPC Secretariat on monthly basis (agenda by NRPC Secretariat)

A.3.1 AEE (P), NRPC apprised that as per clause 15 (6) of IEGC 2023;

- *Users shall submit the following protection performance indices of previous month to their respective RPC and RLDC on monthly basis for 220 kV and above (132 kV and above in NER) system, which shall be reviewed by the RPC:*

  a) The ***Dependability Index*** *defined as* $D = Nc/Nc+Nf$

  b) The ***Security Index*** *defined as* $S = Nc/Nc+Nu$

  c) The ***Reliability Index*** *defined as* $R = Nc/Nc+Ni$

  where,

  Nc is the number of correct operations at internal power system faults,

  Nf is the number of failures to operate at internal power system faults,

  Nu is the number of unwanted operations,

  Ni is the number of incorrect operations and is the sum of Nf and Nu

Further, as per clause 15 (7) of IEGC 2023;

- *Each user shall also submit the reasons for performance indices less than unity of individual element wise protection system to the respective RPC and action plan for corrective measures. The action plan will be followed up regularly in the respective RPC.*

A.3.2 In earlier PSC meetings, it was decided that each utility shall submit the Performance indices of previous month by 7th day of next month.

A.3.3 Further, the status of the indices reported for the month of October-2024 was presented and concerned who have not submitted were asked to submit the same at the earliest.

A.3.4 AEE (P), NRPC highlighted that NPCIL, PSTCL, HPPCL, HPGCL, HPSEBL, MEIL Anpara Energy Limited, Meja Urja Nigam Limited, JSW Energy Limited (KWHEP), UT of J&K, Ladakh and Chandigarh, POWERLINK transmission limited, Sekura Energy Limited have not sent the performance indices even after sensitization in each PSC and previous OCC meeting. These may look into this and send the indices timely.

A.3.5 Forum directed HPGCL to submit the protection performance indices from April, 2024 to October, 2024 as the same have not been submitted earlier for any of the month.

A.3.6 NTPC was requested to communicate Meja Urja Nigam Limited for submitting the protection performance indices. He agreed to discuss with them and ensure the same in future also.

A.3.7 SLDCs were directed to share the compiled data of all utilities (GENCOs, & TRANSCOs) under their jurisdiction. They may take regular follow ups with other utilities who are not members of NRPC and arrange the protection performance indices.

A.3.8 MS, NRPC emphasized that protection is utmost requirement for our system to operate smoothly and uninterruptedly.

A.3.9 Further, he highlighted that all the concerned utilities need to stream line the performance indices submission in pursuance to the IEGC 2023 for each month.

A.3.10 The current status of the indices reported for the month of October-2024 is attached as **Annexure-II**.

A.3.11 Further, the summary of events, reported prior to this meeting which caused indices less than unity was discussed. The concerned utilities were supposed to submit the reason for the same and corrective action taken to resolve the related issue. Accordingly, concerned utilities were asked about the reason and remedial action taken for unwanted, incorrect operation and failure of operation.

A.3.12 26 no. of operations reported of 400kV Meerut Muradnagar-II line in the October, 2024 which was highlighted by the Forum. UPSLDC representative conveyed that probable cause of frequent operation is the insulator flashing therefore regular cleaning of insulator is being done. UPPTCL representative mentioned that directions have been issued from higher authorities to reduce the interruption in power supply and regular monitoring is being done. However, trippings have been found at different locations. Therefore, Forum instructed UPPTCL and UPSLDC to take necessary actions in order to reduce the trippings.

A.3.13 RVPN representative suggested that tripping occurring due to bird excreta can be avoided by having first insulator of large size and bottom insulator of normal size in string of suspension tower. MS, NRPC requested RVPN to share these inputs to NRPC so that the same may be apprised and deliberated to all utilities for betterment of Grid. POWERGRID representative mentioned that a protecting cover may be provided on insulator.

A.3.14 CGM, NRLDC advised UPSLDC to resolve the issues by conducting monthly OCC meeting of state.

A.3.15 NRLDC representative highlighted that NHPC may ensure to prevent the tripping of units and evacuating lines due to SCADA issues. NHPC representative conveyed that issue has been observed in scheme. The matter is being taken up with OEM and will get resolved at the earliest.

A.3.16 RVPN representative informed that they are replacing all MIT and MVT relays with numerical relays as maloperations have been observed in both relays.

A.3.17 BBMB representative added that auto-recloser issue at Dehar end will be discussed with generation wing. AGEL representative conveyed that auto recloser may be kept on at generating end if there are two or more evacuating lines. MS, NRPC highlighted that these inputs may be considered while finalizing the philosophy for conventional generators.

A.3.18 Based on detailed discussion and submission of information by utilities, the reason and corrective action taken for Performance Indices less than Unity related to the events of October 2024 are attached as **Annexure- III.**

A.3.19 MS, NRPC emphasized that repetitive tripping due to same causes may be avoided and review of protection settings may be done timely.

A.3.20 Subsequently, MS, NRPC highlighted that utilities may submit the performance indices of previous month by 7th day of next month element wise along with the reason for indices less than unity and corrective action taken. He directed all concerned utilities to send their reasons within a week via email along with corrective action taken for indices less than unity. SLDCs may send the compiled data of all utilities (GENCOs, & TRANSCOs) under their jurisdiction.

Decision taken by Forum:

Concerned utilities were requested to submit the Protection performance indices of previous month by 7th day of next month element wise along with corrective action taken for indices less than unity.

A.4. Annual protection audit plan for FY 2024-25 and third-party protection audit plan (agenda by NRPC Secretariat)

Annual Internal Audit Plan:

A.4.1 AEE (P), NRPC apprised that as per clause 15 of IEGC 2023;

- *Annual audit plan for the next financial year shall be submitted by the users to*

their respective RPC by 31st October. The users shall adhere to the annual audit plan and report compliance of the same to their respective RPC.

A.4.2 In the 48th, 49th, 50th, 51st & 52nd PSC meetings, all utilities were requested to submit the annual protection audit plan.

A.4.3 Some utilities have submitted their annual audit plans and others were requested to submit annual audit plan for FY 2024-25.

A.4.4 NTPC and UPSLDC were requested to send the annual audit plans of its plants and JVs also. UPSLDC representative mentioned that NTPC finalizes the audit schedule after having discussion with HQ.

Third party protection audit:

A.4.5 As per clause 15 of IEGC 2023:

All users shall also conduct third party protection audit of each sub-station at 220 kV and above (132 kV and above in NER) once in five years or earlier as advised by the respective RPC.

A.4.6 Some utilities have submitted their third-party protection audit plans and other remaining were requested submit the same.

A.4.7 UPSLDC representative informed that third–party protection audit of SEUPPTCL has been conducted in October,2024 and report will be submitted shortly.

A.4.8 AGEL representative updated that third–party protection audit of Adani Power Rajasthan limited (Kawai) has been done. Adani was requested to send the audit report.

A.4.9 Members highlighted that they had contacted with vendors for third party audit. However, no response is being received most of the times. They submitted that several issues are coming in finalization of vendor for third–party protection audit.

A.4.10 MS, NRPC added that the draft list of external agencies for conducting Third Party Protection Audit was presented in the 15th NPC meeting of CEA (held on 14.11.2024). Although, the same was not approved in that meeting. Members may use the draft list of external agencies for reference (the below list of agencies has been extracted from agenda of 15th NPC meeting issued vide letter dated 28.10.2024)

i. CPRI, Bangalore

ii. CBIP

iii. Electrical Research and Development Association (ERDA)

iv. GE T&D India Limited

v. Power Research & Development Consultants Pvt. Ltd (PRDC limited)

vi. Power Projects, Tamilnadu

vii. Power Technology Center, Gurugram

viii. Tracetbel

A.4.11 In view of issues faced by utilities during finalization of vendor for conducting Third Party Protection Audit, it was decided that STU/Utilities may get their substations audited as third party audit by another STU/Utilities mutually in Northern region.

A.4.12 MS, NRPC directed that concerned SLDCs shall send the internal annual audit plan for FY 2024-25 and third protection audit plan of all utilities in its control area. The status of audit as per submitted schedule, audit report and compliance of observations shall also to be updated by SLDCs of all utilities (GENCOs, TRANSCOs) in its control area.

A.4.13 Utilities may send the 3rd party protection audit plan. Subsequently, the audit reports along with compliance status may be submitted to NRPC Secretariat regularly.

A.4.14 As on date the status of Internal Protection Audit plan for FY 2024-25 and third-party protection audit plan is attached as **Annexure-IV** & **Annexure-V**.

A.4.15 ADHPL was requested to update the current status of third-party protection audit. As per submitted plan, third party audit was scheduled to be done by September, 2024.

A.4.16 Subsequently, MS, NRPC requested all utilities to comply the IEGC regulations timely and take care of same in future also.

Decision taken by Forum:

Utilities were requested to submit the Annual Internal Protection Audit plan for FY 2024-25 and third-party protection audit plan at the earliest and comply the same timely. Audit report along with action plan for deficiency detected, if any may be submitted in time.

A.5. Annual protection audit plan for FY 2025-26 (agenda by NRPC Secretariat)

A.5.1 AEE (P), NRPC apprised that as per clause 15 of IEGC 2023;

- *Annual audit plan for the next financial year shall be submitted by the users to their respective RPC by 31st October. The users shall adhere to the annual audit plan and report compliance of the same to their respective RPC.*

A.5.2 In view of above, all utilities were requested to submit the annual protection audit plan for FY-2025-26 latest by 31st October 2024 in the 53rd PSC meeting.

A.5.3 Accordingly, some utilities have submitted their annual audit plans (enclosed as **Annexure- VI**) and others were requested to submit annual audit plan for FY 2025-26 at the earliest in order to comply IEGC regulations.

Decision taken by Forum:

Utilities were requested to submit the Annual Internal Protection Audit plan for FY 2025-26 at the earliest and comply the submitted schedule timely.

A.6. Observations and Compliance of recommendations of protection audit (agenda by NRPC Secretariat)

A.6.1 AEE (P), NRPC apprised that as per clause 15 of IEGC 2023*;*

- *All users shall conduct internal audit of their protection systems annually, and any shortcomings identified shall be rectified and informed to their respective RPC. The audit report along with action plan for rectification of deficiencies detected, if any, shall be shared with respective RPC for users connected at 220 kV and above (132 kV and above in NER).*

- *All users shall also conduct third party protection audit of each sub-station at 220 kV and above (132 kV and above in NER) once in five years or earlier as advised by the respective RPC.*

- *The protection audit reports, along with action plan for rectification of deficiencies detected, if any, shall be submitted to the respective RPC and RLDC or SLDC, as the case may be, within a month of submission of third-party audit report. The necessary compliance to such protection audit report shall be followed up regularly in the respective RPC.*

A.6.2 Utilities have submitted the internal audit report based on the audit done at their substations. The received internal audit reports from THDC, UJVNL, RVUNL, UPRVUNL & PPCL after the 53rd Protection sub-committee meeting are attached as **Annexure-VII** and received reports of 3rd Party audit from LPGCL are attached as **Annexure-VIII.**

A.6.3 However, compliances of audit recommendations have not been reported to NRPC Secretariat. UPPTCL has submitted the compliance reports of internal protection audit held in FY 23-24 of its substations, PPCL has submitted the compliance report for internal protection audit done of PPS-I in FY 23-24, LPGCL has shared compliance action status of third-party protection audit. All of these are attached as **Annexure-IX**.

A.6.4 The internal and external reports were presented and discussed. All members and concerned utilities were asked to share their findings and observations based on audit report.

A.6.5 THDC, UJVNL, RVUNL, UPSLDC and UPRVUNL were also requested to submit the compliance report of internal Protection audits.

Decision taken by Forum:

Utilities were requested to submit action taken report or compliance of observations/recommendations of audit. Forum directed all utilities to ensure that audit reports (internal and external) should be in proper sequence along with annexures, if any, while sharing with NRPC.

A.7. Uniform Protection Protocol (agenda by NRPC Secretariat)

A.7.1 AEE (P), NRPC apprised that in pursuance to the discussion of the 14th NPC meeting (held on 03.02.2024), a uniform protection protocol was finalized after the Protection subgroup meetings held on 21.05.2024 and 02.07.2024.

A.7.2 The finalized protection protocol is attached as **Annexure-X**. NPC division, CEA has prepared the Uniform Protection Protocol in accordance with Clauses 12(2) & 13 of the Indian Electricity Grid Code, 2023 (IEGC 2023) notified by the Central Electricity Regulatory Commission.

A.7.3 The Uniform Protection Protocol shall be applicable to all Regional's entities, State/Central/Private Generating Companies/ Generating Stations, SLDCs, RLDCs,

CTU, STUs, Transmission Licensees connected at 220 kV (132 kV for NER) & above and RPCs.

A.7.4 In view of above, it was requested that all stakeholders may note and ensure the compliance of the same.

Decision taken by Forum:

Forum directed all utilities to acknowledge the compliance of Uniform Protection Protocol.

A.8. Provisional protection clearance during FTC in October 2024 (agenda by NRPC Secretariat)

A.8.1 AEE (P), NRPC apprised that provisional protection clearance during FTC in October 2024 were allowed by NRLDC are attached as **Annexure-XI.**

A.8.2 As per the list, it was observed that most of the utilities have not put up the agenda for final approval of protection settings which is violation of procedure approved by NRPC forum.

A.8.3 MS, NRPC stressed upon final approval of provisionally cleared FTCs and requested utilities to submit the agenda timely.

A.8.4 NRLDC representative stated that approval of protection settings given by NRLDC during FTC stage is provisional. It is being done to facilitate the stakeholders and to avoid delay in first time charging of elements. However, as per IEGC and procedure for approval of protection settings, utilities have to take final approval at PSC forum. Therefore, all the constituents are requested to ensure to get approval of provisional approved protection settings at PSC forum.

A.8.5 MS, NRPC highlighted that as most of the utilities are not giving the agenda for final approval of the settings in line with the finalized procedure in spite of emphasizing the same regularly.

A.8.6 In view of above, Forum decided that henceforth NRLDC shall give provisional protection clearance during FTC on conditional basis subject to submission of agenda in next Protection Sub-Committee meetings (**not later than 2nd next PSC meeting**). If utility does not put up the agenda within time, further FTC clearance

would not be granted to the concerned.

A.8.7 Subsequently, Utilities were requested to get the final approval of FTC.

Decision taken by Forum:

After detailed deliberation Forum decided that henceforth NRLDC shall give provisional protection clearance during FTC on conditional basis subject to submission of agenda in upcoming two Protection Sub-Committee meetings. If utility does not put up the agenda within time, further FTC clearance would not be granted to the concerned.

A.9. Implementation of AUFLS scheme in accordance with the report of Task Force on Automatic under Frequency Load Shedding (AUFLS) (agenda by NRPC Sectt.)

A.9.1 AEE (O), NRPC apprised that National Power Committee (NPC), had constituted a Task Force on Implementation of Automatic Under Frequency Load Shedding (AUFLS) and df/dt scheme and the Task Force has finalized the methodology for identification quantum of relief at each stages of AUFLS, distribution among Regions by NPC, distribution of relief quantum among State/UT in Regions by respective RPCs for implementation in the Region.

A.9.2 As per the report (enclosed as **Annexure-XII**) of Task Force on Automatic under Frequency Load Shedding (AUFLS) and df/dt scheme, total 25% relief will be planned in 4 stages-49.4 Hz, 49.2 Hz, 49.0 Hz & 48.8 Hz. The 25% total relief distribution in four stages would be in such a way that 5% in Stage-1, 6% in Stage-2 and 7% each in Stage 3 & 4. NPC Division to communicate the Region wise relief quantum (based on Regional Peak Demand Met during the previous year) by **31st of May** to RPCs for implementation in the next Financial Year (FY).

A.9.3 NPC Division has communicated to RPC's that they have computed the quantum of load shedding in different stages of AUFLS based on the Peak Demand Met of the Region in the financial year (2023-24). The region wise Peak Demand Met considered by NPC Sectt. is as follows:

Region	**NR**	**SR**	**WR**	**ER**	**NER**
Peak Demand Met (MW)	80,548	68,094	72,556	29,299	3,603

A.9.4 The quantum of load shedding in different stages of AUFLS region-wise is as follows:

Sr. No.	*Stage*	*Frequency (Hz)*	*Demand Disconnection (%)*	Quantum of Load shed in MW					
AUFLS Set Points and Percentage Quantum of Relief				NR	SR	WR	ER	NER	All India Load shed
1	Stage 1	49.4 Hz	5.00%	3801.7	3213.9	3424.5	1382.8	173.5	11996.55
2	Stage 2	49.2 Hz	6.00%	4562.04	3856.7	4109.4	1659.4	208.3	14395.86
3	Stage 3	49.0 Hz	7.00%	5322.4	4499.5	4794.3	1935.9	243.03	16795.17
4	Stage 4	48.8 Hz	7.00%	5322.4	4499.5	4794.3	1935.9	243.03	16795.17
	Total (in MW)			**19008.5**	**16069.5**	**17122.4**	**6914.3**	**867.9**	**59982.7**

A.9.5 Further, he apprised that after the receipt of the allocated load shedding quantum of the Region from NPC, AUFLS relief quantum should be distributed among the State/UT in the region by the RPCs in consultation with the stakeholders.

A.9.6 The Task Force recommended that Distribution of relief among State/UT to be carried out based on regional relief and demand contribution in the average of Peak demand met ratio and demand met (consumption) ratio of State/UT in the previous FY.

A.9.7 He also conveyed that for Northern Region each State/UT relief quantum will be computed by NRPC in line with the methodology finalized by the task force and would be communicated in the next OCC meeting.

GUIDELINES FOR IDENTIFICATION OF AUFLS FEEDERS

A.9.8 AEE (O), NRPC added that as per recommendation of task force the following to be considered for identification of feeders:

i. AUFLS relays under Stage-1 & Stage-2 should be implemented preferably on downstream network at 11/22/33 kV level.

ii. AUFLS relays under Stage-3 & Satge-4 should be implemented on upstream network at EHV (66/110/132 kV) level so that load relief obtained is fast and reliable as it is a desperate measure for areas that have disintegrated.

iii. As far as possible the feeders/transformers are feeding radial loads shall be identified.

iv. Telemetry availability would be considered as important factor so that the feeders/transformer loading can be extended to SLDC/RLDC for mapping

v. Feeders catering to critical loads are to be avoided. VIP areas, Airport, Metro, Railways, Defence, Govt Hospitals, Government Offices, continuous process industries etc. needs to be prioritized

vi. No mixed feeders with RE/Distributed generations should be identified. If identified the feeder should be never in injecting mode. Steps to segregate the feeder (load/RE/Distributed generation) would be taken.

vii. If Grid feeder is identified the other side breakers should be in normally open condition. If they are to be closed frequently then UFR with same set points to be provided at other ends.

viii. The feeders identified for AUFLS would be as far as possible not common for df/dt, scheduled power cuts, load shedding, SPS, ADMS etc. In case of difficulty to identify dedicated feeders the same is to be approved in OCC/PCSC. Adequate care is to be taken if round robin scheme is adopted for ADMS, SPS etc.

ix. The Islanding loads/feeders which are to be retained would not be enabled for AUFLS. However, loads in the Island can be identified for AUFLS but same has to be factored while designing the Island.

A.9.9 CGM, NRLDC mentioned that SLDC shall ensure that telemetered data of feeders (MW power flow in real time) on which UFR and df/dt relays are installed is available at its control centre.

Decision taken by Forum:

Members were sensitized to acknowledge the same for needful compliance.

A.10. Tripping of every transmission line whenever Broken Conductor Alarm on 220kV feeder and loss of VT (in any of phase) at 220kV bus is observed simultaneously (agenda by RVPN)

A.10.1 AEE (P), NRPC apprised that RVPN vide letter dated 28.10.2024 submitted that "Protection Philosophy/ Protocol of Northern Region" has been incorporated with "Protection for broken conductor" as Alarm indication for transmission line and cable. A rider has been provided that tripping may be considered for radial lines to protect single phasing of transformers.

A.10.2 Further, RVPN has mentioned that at the substations which operate radially, it provides us liberty to enable the tripping of line with broken conductor alarm to prevent single phasing of transformers but in case of substation fed by two or more transmission lines, this setting is to be kept on alarm mode only.

A.10.3 For example, in case of a substation connected with two lines (i.e. it is in ring), if one line is out due to fault or by the direction of SLDC, the substation becomes radially connected and setting for the Broken Conductor remains on Alarm. This may lead to single phasing of transformer if conductor of remaining line breaks. The same may be applied to the cases with more lines.

A.10.4 Therefore, RVPN proposed to have tripping of every transmission line whenever Broken Conductor Alarm on 220kV feeder and loss of VT (in any of phase) at 220kV bus is observed simultaneously.

A.10.5 UPPTCL representative conveyed that if line PT/CVT voltage is used for voltage measurement then proposed logic may not work. RVPN replied that the proposed logic is for those 220kV feeders where voltage is being taken from Bus PT/CVT. RVPN mentioned that voltage for one relay in distance protection is taken from Line PT and for another relay from Bus PT to have better application.

A.10.6 NRLDC representative conveyed that generally most of the utilities are using line PT/CVT for voltage instead of Bus PT/CVT.

A.10.7 UPPTCL representative suggested that in case of S/S fed by only two lines, both

lines' distance protection should be programmed for detection of loss of voltage (using undervoltage function 27) for detection of shutdown/breakdown. This loss of voltage output should be cross wired to binary input of other line distance protection. Tripping on broken conductor on any line should take place only if the other line is showing loss of voltage.

A.10.8 MS, NRPC highlighted that in order to amend the philosophy, all members are required to be of same view. Therefore, it is required that the proposal of RVPN may be discussed within the utilities itself further and comments may be shared with NRPC Secretariat.

A.10.9 Subsequently, MS, NRPC stated to ask the comments of utilities on the proposal of RVPN via email and the same may be again discussed in the next PSC meeting based on received inputs.

Decision taken by Forum:

Forum requested all the members to share the comments on the proposal of RVPN and deferred the agenda to next PSC meeting for deliberation based on the compiled received inputs of members.

A.11. Review suggestions on the Protection Philosophy / Protocol of Northern Region (agenda by AGEL)

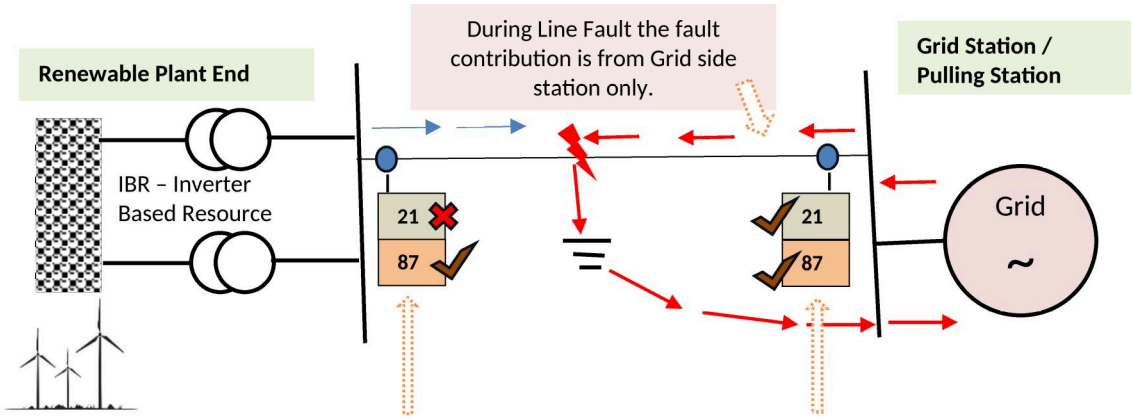
A.11.1 AEE (P), NRPC apprised the as per discussion of the meeting on Protection philosophy for Power Transformer and Reactor in Northern Region held on 27.09.2024 at NRPC, AGEL has suggested following aspect to incorporate.

Review of Distance Protection requirement Philosophy for Renewable plants having one evacuation line. (Point No. 1)

i. For Renewable plants with a single evacuation line, the requirement of Line Distance Protection at Renewable Plant needs to be reviewed due to following reasons.
    1. During the line fault the contribution from Renewable plant is negligible, the fault is fed from grid side source or connected station end only, as being a Radial feeder.

2. Due to (1) above, the operation of distance protection employed at Renewable plant cannot detect and interpret the fault impedance as compared to opposite end i.e. Grid source and there is no operation of distance protection at Renewable Plant end. However, operation of the distance protection may happen due to voltage dip and coincidental measurement of impedance within the Zone with normal current.
3. The Line Differential Protection employed at both ends detect the fault on current differential principle and assures the protection as required.
4. The following conceptual schematic indicates the operation of protection for fault on the single line connected with renewable plant with Grid station

Conceptual Schematic indicating the Non detection of Fault by Distance Protection at Renewable plant end having single evacuation Line



The Distance Protection at Grid end station is assured however the same at Renewable Station can not detect the fault as distance protection.

The Line Differential Protection at both end is assured to operate due to difference of current as per the setting.

Fault Current fed from Grid side end
Normal Current from Renewable plant end

A.11.2 Looking to the above phenomena, to avoid complexity of scheme and undesired operations at Renewable Plant end following is suggested by AGEL.

A.11.3 **Proposal of AGEL: -**

It was proposed for the Renewable plants with single evacuation line connected with Grid station that,

- The Line Distance Protection (Impedance based measurement) at Renewable plant end is not required as to be considered as Radial Feeder.
- For 220 kV and above lines, Redundant i.e. two Main Protections (main-1 and Main-2) Current based Line Differential Protection with Back up Earth fault protection is required.
- For such Lines, other schemes like inters trip signalling, Direct Trip & Auto re-closure scheme based on Differential Protection and other schemes as per Philosophy are required.
- The Distance Protection at Grid End station is to be considered as per philo-sophy without any change.
- The Back Up Earth fault Protection at Grid End Station should be coordinated with the Renewable Plant Power Transformer HV side or Main Substation Bus coupler, as the case may be.

A.11.4 The agenda was discussed in the 1st RE Sub-Committee meeting held on 24.10.2024 wherein all RE members were requested to send their comment on the proposal of AGEL. However, no comments have been received as of now.

A.11.5 CGM, NRLDC conveyed that NRLDC have no objection with these proposals of AGEL for RE evacuating line. However, a detailed discussion with RE generator will be useful.

Decision taken by Forum

Forum decided to discuss the agenda after receiving the inputs of RE members on the proposals of AGEL. Based on the inputs, these proposals will also be discussed during the finalization of protection philosophy for RE generators or in the PSC meeting.

A.12. Failure of carrier protection of Jhakri- Rampur ckt-2 of Rampur HPS & upgradation of tele protection communication scheme of PLCC to Digital tele protection communication (DTPC) scheme for Nathpa Jhakri HPS end & Rampur HPS end (agenda by SJVN)

A.12.1 SJVN representative apprised that SJVN has submitted that carrier protection of transmission line circuit Jhakri-Rampur ckt-2 has been failed many times since Oct 2021. It has been observed that during failed carrier protection both channels of line circuit have been become out of order at Rampur HPS end.

A.12.2 Whenever the carrier protection fails, gain is not received as well as sent from Rampur HPS end. This event has been communicated many times via mails to NRLDC, NRPC, Nalagarh substation & RTAMC (Copy of mails are attached as **Annexure-XIII**). Recently, engineers from PGCIL substation Nalagarh carried out the inspection of PLCC system at Jhakri end & Rampur end & informed that the problem is with the LMU at Jhakri end.

A.12.3 SJVN has submitted that tripping of transmission line is critical event during peaking period for hydro stations when approximately 3500MW of power is evacuated through this corridor including generating stations Baspa HPS- Karcham Wangtoo HPS - Nathpa Jhakri HPS-Rampur HPS. If carrier protection fails, line circuit will trip in zone 2 protection with 350ms of delay that may affect the life of associated equipment & endangers the stability & security of National grid.

A.12.4 Further, SJVN also submitted that the existing installed ABB make PLCC panels ETL41 are obsolete at Nathpa Jhakri HPS & Rampur HPS (PLCC panels are property of POWERGRID). Therefore, in order to avoid the delayed tripping in future SJVN requested to POWERGRID to upgrade the tele protection communication scheme to DTPC for Nathpa Jhakri HPS end & Rampur HPS end so that safety, security & stability of national grid can be ensured.

A.12.5 POWERGRID, NR-2 representative informed that issue has already been in consideration and corrective measure to ensure the healthiness of carrier protection will also be taken during the shutdown on 27.11.2024.

A.12.6 Further, regarding SJVN proposal for upgradation of the tele protection communication scheme to DTPC for Nathpa Jhakri HPS end & Rampur HPS end,

POWERGRID NR-2 representatvie added that the tender activity has been done and DTPC scheme will be commissioned Nathpa Jhakri HPS end & Rampur HPS end by 31st March, 2025.

A.12.7 MS, NRPC requested SJVN to provide required assistance to POWERGRID.

Decision taken by Forum

Forum directed POWERGRID to take necessary action for ensuring the healthiness of carrier protection of transmission line circuit Jhakri-Rampur ckt-2 and get it resolved at the earliest. Forum also requested POWERGRID to expedite the commission work for upgradation of the tele protection communication scheme to DTPC for Nathpa Jhakri HPS end & Rampur HPS end.

A.13. Review of protection setting of Thermal, Hydro, IBR based generations/HVDC and FACTS (agenda by NLDC)

A.13.1 NLDC representative proposed that the review and finalisation of protection settings of Thermal/Hydro/Gas/IBR based RE generations/HVDC/FACTS devices etc. may be done by PSC committee members.

A.13.2 NLDC representative added that proper coordination in protection settings of different equipment is also required. In view of this Protection philosophy is required to be finalized.

A.13.3 MS, NRPC stated that Protection philosophy for Transmission Line, Power Transformer and Reactor has already been finalized for Northern Region. In continuation with this, philosophy for other elements may be finalized.

A.13.4 He added that protection philosophy for Conventional generators may be finalized. For this, all generators were requested to share their inputs related to protection settings and after compilation of the same, a meeting may be called to discuss the same.

A.13.5 In the same way, he also stated for finalization of protection philosophy for RE generators and IBR based generations/HVDC and FACTS. Inputs may be sought from other RPCs, NRLDC, NLDC, HVDC owners, RE generators.

A.13.6 Further, it was decided that NLDC may take inputs from the RE generators, HVDC

owners, NRLDC and other RPCs & RLDCs. As NLDC is associated across region so it will be helpful to link the same with the other regions.

Decision taken by Forum

After deliberation followings were decided

i. Forum requested all generating members to share the inputs for protection settings for conventional generators.

ii. Forum directed NLDC to seek the inputs on protection philosophy of IBR based RE generations/HVDC and FACTS from RE generators, HVDC owners, NRLDC, other RPCs & RLDCs and compile the received inputs. Accordingly, a meeting a may be called by NRPC for discussion and philosophy may be finalized.

A.14. Implementation status of tripping of pump storage and BESS before triggering of UFR 1st stage (IEGC 2023 compliance) (agenda by NLDC)

A.14.1 NLDC representative apprised that as per IEGC 2023, the 1st stage of operation of UFR is desired at 49.4Hz. The same is endorsed by 14th NPC and Task force of uniform implementation of UFR and df/dt.

A.14.2 The target of RE generation has been set at 500GW by 2030. With the IBR based RE generation the high ROCOF is observed in grid and frequency is touching Nadir point with close proximity of 49.4Hz i.e. 1st stage of operation of UFR.

A.14.3 Therefore, as per IEGC 2023, the disconnections of storage-based generation is mandatorily done from grid before 1st stage of UFR operation.

A.14.4 Further, it was highlighted that the above-mentioned may be considered in AUFLS and df/dt operation.

A.14.5 MS, NRPC added that the disconnection of storage based generation was also discussed in the 15th NPC meeting and sensitized.

Decision taken by Forum

Forum noted the same and take care the same during AUFLS and df/dt operation.

A.15. Status of adoption of DR parameter standardization published by FOLD working group (agenda by NLDC)

A.15.1 NLDC representative apprised that as per the discussion in the 41st FOLD meeting to streamline the Disturbance Recorder (DR) Parameter Standardization finalisation of following points were agreed: - (Report enclosed as **Annexure-XIV**).

- Triggering criteria of DR (Criteria for start of recording)
- Sampling rate to be adapted for DR to enable verification of system models and to capture harmonics related to transient conditions
- Recording window to cover pre-trigger, trigger (fault) and post-fault duration
- Data format for raw data files of DR
- Power supply arrangement for DR and associated equipment like GPS Receive/Clock, the SCADA/EMS RTU, modems and any other equipment supplying signals to the DR.
- Protocol for monitoring healthiness of DR including loss of supply, time synchronization.

A.15.2 He requested that all SLDCs may adopt the DR parameter standardization published by FOLD working group and ensure the follow the guidelines.

Decision taken by Forum

Forum directed SLDCs to ensure the adoption of DR parameter standardization published by FOLD working group and follow the guidelines of FOLD working group.

A.16. Approval of protection settings in compliance of IEGC 2023 (agenda by UPSLDC)

A.16.1 AEE (P), NRPC apprised that UPSLDC vide email dated 12.11.2024 submitted the settings for the FTC elements commissioned in September 2024 and October 2024.

A.16.2 UPSDLC has also mentioned that these above implemented settings have been approved by NRLDC during FTC.

A.16.3 Further, as per protection setting procedure finalized in 75th NRPC meeting, utility has to get final approval of settings in PSC meeting, therefore, UPSLDC put up the implemented settings (available at NRPC website link

http://164.100.60.165/meetings/PCC/PCC54/UPSLDC.rar) for approval of Forum.

A.16.4 MS, NRPC stated that all members would have already checked the settings and requested that one state/SLDC may cross verify the settings of other states mutually and comment in the PSC meeting.

Decision taken by Forum:

Forum approved the protection settings put up by UPSLDC (available at http://164.100.60.165/meetings/PCC/PCC54/UPSLDC.rar).

A.17. Approval of protection settings in compliance of IEGC 2023 (agenda by PSTCL)

A.17.1 PSTCL representative apprised that vide letter dated 12.11.2024 it was intimated that 500 MVA 400/220 kV ICT #3 at 400 kV Substation PSTCL Nakodar was charged after clearance from NRLDC.

A.17.2 As per protection setting procedure finalized in 75th NRPC meeting, utility has to get final approval of settings in PSC meeting, therefore, PSTCL put up the agenda for Post-facto approval of settings (available at NRPC website link http://164.100.60.165/meetings/PCC/PCC54/Agenda_regarding_ICT_settings_PSTCL_Nakodar.pdf) from Forum.

Decision taken by Forum:

Forum approved the protection settings put up by PSTCL (available at http://164.100.60.165/meetings/PCC/PCC54/Agenda_regarding_ICT_settings_PSTCL_Nakodar.pdf)

A.18. Approval of protection settings in compliance of IEGC 2023 (agenda by HPSLDC/HPPTCL)

A.18.1 AEE (P), NRPC apprised that HPSLDC vide letter (enclosed as **Annexure-XV**) dated 13.11.2024 intimated that FTC was accorded by NRLDC for the 220kV Ckt-1 & 2 from 400/220kV GIS of PKATL at Arandwala (Kala Ama) to 220/132/33kV AIS of HPPTCL at Andheri (Kala-Amb) & 220/132/33kV ICT at Kala-Amb (HP) in the month of May, 2024.

A.18.2 Further, it has also been intimated that FTC was accorded by HPSLDC for 132kV transmission line on Multi Circuit Tower from 220/132/33kV Substation of HPPTCL at

Andheri (Kala-Amb) to T20/T21 of existing 132kV Jamta-Kala-Amb Transmission Line in the month of September, 2024.

A.18.3 HPPTCL representative conveyed that they have implemented the changes suggested by NRLDC in protection settings of 220/132/33kV Substation at Andheri (Kala-Amb).

A.18.4 As per protection setting procedure finalized in 75th NRPC meeting, utility has to get final approval of settings in PSC meeting, therefore, HPSLDC/HPPTCL put up the agenda for Post-facto approval of settings (available at NRPC website link *http://164.100.60.165/meetings/PCC/PCC54/HPSLDC.rar*) from Forum.

Decision taken by Forum:

Forum approved the protection settings put up by HPSLDC/HPPTCL (available at http://164.100.60.165/meetings/PCC/PCC54/HPSLDC.rar).

A.19. Status of remedial actions recommended during previous PSC meetings (agenda by NRLDC)

A.19.1 As per the discussion in pervious PSC meetings, necessary remedial actions were recommended based on the analysis and discussion of the grid events. It is expected that necessary actions would have taken place. In view of the same, constituents were requested to share the status of remedial actions taken. List of points discussed in 53rd PSC meeting is attached as **Annexure-XVI**. During the meeting constituents were requested to apprise the status of the same. Constituents informed following during the meeting:

a) Frequent multiple elements tripping at 220kV Kunihar, Baddi, Upperla Nangal complex and load loss event in HP control area

PSC (51, 52 & 53) recommendations: Forum requested HP to complete the protection audit as per mentioned timelines (protection audit of 220kV Kunihar has been awarded and it would be completed within next 15-20 days. In next phase, by 15th September, protection audit of substations in downstream and upstream of 220kV Kunihar S/s would be completed.) and resolve the protection

related issues. HP was also requested to share the reports of protection audit to NRPC & NRLDC after completion of audits.

Status submitted by HPSEBL during 54th PSC meetings is as follows:

- Protection audit of 220kV Kunihar was conducted by POWERGRID on 19th October 2024. Protection audit of rest of the stations (Bhabha, Upperla Nangal, Baddi etc.) shall be conducted in near future and will be completed by December 2024.
- Protection audit and its compliance report has been submitted (attached as **Annexure-XVII**). Necessary actions shall be taken on priority.

NRLDC representative requested HPSEBL to expedite the protection audit of other stations and submit the report of protection audit after its completion. HPSEBL was also requested to take expedited actions to comply the protection system related shortcomings (highlighted in audit) at 220kV Kunihar S/s.

Forum requested HPSEBL to expedite the process of protection audit of other stations. It was also requested to share the reports of protection audit to NRPC & NRLDC after completion of audits. HPSEBL shall take expedited actions to comply the protection system related shortcomings (highlighted in audit) at 220kV Kunihar S/s.

b) Multiple elements tripping at 220kV Hissar(BBMB) 07th May 2024, 11:16 hrs

PSC (51 & 52) recommendations: Expedite the implementation of differential protection in short lines to avoid undesired operation of distance protection.

During 53rd PSC meeting, HVPNL representative stated that matter has been taken up with HVPNL and is pending at their end. HVPNL representative informed that design team has compiled all such requirements in Haryana control area and is now working on the further process.

During 54th PSC meeting, HVPNL was requested to apprise the present status.

HVPNL representative informed that existing earth wire is normal earth wire which is to be replaced with OPGW. Process of the same has been started. After this, process of implementation of differential protection will be started.

NRLDC representative requested HVPNL to expedite the process as it is long pending issue. Implementation of differential protection will help in avoiding undesired tripping of multiple transmission lines due to overreach of distance protection.

HVPNL agreed to expedite the process of implementation of differential protection in short lines.

Forum recommended HVPNL to expedite the implementation of differential protection in short lines.

c) Multiple elements tripping at 400/220kV Akal(RS) on 02nd Jan 2024, 07:28 hrs:

PSC 51 recommendations:

- Bus bar protection at 220kV bus at 400/220kV Akal shall be made operational by June 2024.
- Time synchronization of recording instruments (DR/EL) need to be ensured.

During 52nd PSC meeting, RVPNL representative informed that three faulty PU were replaced from the future bay and one PU is still unhealthy which is in warranty period. Process is getting delayed due to lack of response from the OEM. Process will be expedited and will try to resolve the bus bar protection issue on priority.

During 53rd PSC meeting, RVPNL representative stated that correspondence with the firm is still going on and as an alternative, possibility of replacing healthy PU from any other station is being explored. Issue of time sync will be able to resolve only if bus bar protection get operational.

During 54th PSC meeting, RVPNL was asked to apprise the forum about the present status.

RVPNL representative stated that issue not resolved yet, continuous follow-ups are being done.

NRLDC representative requested Rajasthan to expedite the process, it was suggested to purchase new PU if OEM is not supporting as Akal S/s is in RE complex and important S/s for evacuation of RE generation.

RVPNL agreed to resolve the issues by the end of 2024 (December 2024).

Forum recommended RVPNL to expedite the process and make bus bar protection at Akal S/s healthy & operational at the earliest.

d) Multiple elements tripping at 400kV Sainj (HP), 400kV Parbati2 & Parbti3 (NHPC) Stations on 07th May 2024, 16:17 hrs:

PSC 51 recommendations:

- NHPC shall follow up with the relay engineer and taken necessary remedial actions to ensure proper operation of A/R scheme at Parbati2 end.
- NHPC and HPPTCL shall review the healthiness of PLCC at Parbati3 and Sainj end and take necessary actions to ensure their proper operation.
- Expedite the implementation of differential protection in 400kV Parbati2-Sainj line.
- Standardisation of recording instruments (DR/EL) need to be ensured.

NHPC representative informed following during 52nd PSC meeting:

- Shutdown has been planned in 1st week of November 2024, testing of A/R scheme and implementation of differential protection will be done during that period.
- PLCC card at Parabti3 end will be replaced by the end of September 2024. For dual test of PLCC operation, PLCC at Sainj end also need to be healthy. Sainj HEP representative was not present in the meeting. HPPTCL was requested to intimate concerned person of HPPCL to taken necessary corrective actions and ensure healthiness of PLCC at Sainj end.

Further in 53rd PSC meeting, NHPC representative informed following:

- Due to unavailability of OEM, shutdown plan has been now rescheduled in last week of November or 1st week of December. Testing of A/R scheme and implementation of differential protection will be done during that period.
- PLCC card at Parabti3 end has been replaced and made functional. However, for dual test, PLCC at Sainj end also need to be functional.

During 54th PSC meeting, NHPC & Sainj HEP were requested to apprise the forum about the present status.

NHPC representative informed that status is same. Implementation of differential protection & testing of A/R in 400kV Parbati2-Sainj line will be completed by December end. Further, PLCC at Sainj HEP end also need to be healthy for testing of PLCC at Parbati3 end and proper operation of carrier communication in line.
Representative of Sainj HEP was not present in the meeting.

NRLDC representative requested HPPTCL to follow up with the HPPCL for necessary actions at their end. HPPTCL representative agreed for the same.

***Forum recommended NHPC to expedite the process at their end and HPPTCL was requested to follow up with HPPCL for necessary actions required at Sainj HEP*.**

e) Multiple elements tripping at 400kV Khedar(RGTPS) Station at 10th May 2024, 19:35 hrs

PSC 51 recommendations: Revised corrected protection settings of Main-2 Micom P442 distance protection relay and A/R scheme at Khedar(RGTPS) end need to implemented at the earliest.

During 52nd PSC meeting, HVPNL representative informed that Khedar(RGTPS) have conducted 3rd party protection audit. Status of corrective action taken yet to be confirmed.

During 53rd PSC meeting, Khedar RGTPS representative informed that issues with the settings of the Micom relays has been resolved however in REL 670 relay installed at Khedar end, only 1-ph A/R option is not available. 3-ph A/R has been disabled now and it has been kept as 1-ph/2-ph A/R.

On this, NRLDC representative stated that 2-ph A/R is not desirable as most of the 2-ph fault will be of permanent nature only and being a generating station, keeping 2-ph A/R is not healthy. RGTPS representative was suggested to consult

with the OEM and ensure only 1-ph A/R. In case option is not there then option of replacement of relay may be explored.

Khedar (RGTPS) representative agreed to take up the issue with OEM.

During 54th PSC meeting, HVPNL and RGTPS were requested to apprise the forum about the present status.

RGTPS representative informed that OEM has agreed to revise the logic of A/R function in relay and issue related to A/R operation will be resolved at the earliest.

Forum requested RGTPS & HVPNL to ensure the desired correction in logic of A/R function at Khedar TPS at the earliest.

f) Multiple elements tripping at 400kV Koteshwar(PG) on 17th May 2024, 17:21 hrs

PSC 51 recommendation: In view of short line length of 400KV Koteshwar(PG)-Tehri D/C, POWERGRID shall plan for the differential protection in the line on priority in near future to avoid overreach of distance protection.

During 53rd PSC meeting, POWERGRID (NR-1) representative informed that order for the material of differential protection has been placed. It is estimated that materials will get delivered in next 3-months. In addition, to avoid delayed fault clearance in case of high resistive fault, time delay of DEF protection and carrier aided DEF operation has been implemented.

During 54th PSC meeting, POWERGID(NR-1) was requested to apprise the forum about the present status.

POWERGRID(NR-1) representative informed that, material for differential protection is expected to be arrived by the end of December 2024 and the same will be implemented by the end of January 2024.

Forum requested POWERGRID(NR-1) to expedite the process of implementation of differential protection at Koteshwar HEP.

g) Multiple elements tripping at 220kV Sarna (PS) on 04th May 2024, 07:10 hrs

PSC 51 recommendations:

- Punjab shall expedite the commissioning of new bus scheme.

- POWERGRID shall revise the Z-4 time delay setting of Kishenpur lines at Sarna (PS) end as 160msec till bus bar get operational.

During 52nd PSC meeting, Punjab representative informed that tender of bus bar protection has been processed, bus bar protection at 220kV Sarna will be commissioned within 4-5 months tentatively.

During 53rd PSC meeting, PSTCL representative informed that tender of bus bar scheme is in process and POWERGID(NR-2) representative informed that Z-4 time delay setting of lines of their control area has been revised.

During 54th PSC meeting, PSTCL was requested to apprise the forum about the present status.

PSTCL representative stated that process is still at the tender stage. It will be commissioned in next 3 months.

Forum requested PSTCL to expedite the process of bus bar protection implementation at 220kV Sarna(PS).

h) Multiple elements tripping at 400/132kV Masoli(UP) on 29th May 2024, 15:57 hrs

PSC 51 recommendations: UP shall implement the bus bar protection at 132kV level at 400/132kV Masoli S/s.

During 52nd & 53rd PSC meeting, UP representative informed that this case has been communicated to design team. Design team is compiling all such requirements and further process will be initiated within 1-2 months.

During 54th PSC meeting, UPPTCL was requested to apprise the forum about the present status.

UPPTCL representative informed that process is still at the design team stage. Continuous follow ups are being done for expeditious implementation of bus bar protection at such stations.

Forum requested UPPTCL to expedite the process of bus bar protection implementation at 400/132kV Masoli(UP) and such other stations.

i) Multiple elements tripping at 220kV KTPS (RVUN) on 21st June 2024, 11:37 hrs

PSC 51 recommendations: Commissioning of bus coupler between 220kV Bus-3 & 5 need to be expedited.

During 52nd PSC meeting, RVUNL representative informed that informed that tender for the same has been floated.

During 53rd PSC meeting RVUNL representative informed that process is at same stage. It will take around 01 year to complete all the process and implementation of bus coupler.

During 54th PSC meeting, RVUNL representative was requested to apprise the present status.

RVUNL representative stated that whole process will take time. Tender process is completed, and review meeting is scheduled on 25th December 2024.

Forum requested KTPS to expedite the process.

j) Frequent tripping of 220 KV Anta(NT)-Sakatpura(RS) (RS) Ckt-1: Non operation of A/R in line

PSC 52 recommendations: RVPN was requested to expedite the process of relay replacement and rectification of issues related to A/R operation.

During 53rd PSC meeting, RVPNL representative informed that request of relay panel has been floated however DI of the same is yet to be issued.

During 54th PSC meeting, RVPNL representative was requested to apprise the present status.

RVPNL representative informed that existing panels are of simplex type which have to be replaced with duplex panels. Panels have been issued however civil work is required for installation of the same. Delay is due to civil work.

Forum requested RVPNL to expedite the process.

k) Frequent tripping of 220 KV Saharanpur (PG)-Shamli(UP) (UP) Ckt-1: Frequent fault and non-operation of A/R at Shahranpur(PG) end.

PSC 52 recommendations:

- POWERGRID shall review and ensure the A/R operation at their end.
- UPPTCL shall take necessary actions to minimise the faults.

Discussion during 53rd PSC meeting: POWERGRID(NR-1) representative informed that issue in A/R relay is suspected, inspection of the same will be done and rectified. Further, concern was raised on frequent faults in line. POWERGRID representative also suggested to use adaptive A/R scheme in such lines where there are instances of frequent faults.

NRLDC representative stated that PWOERGRID may propose the implementation of adaptive A/R scheme in next PSC meeting. Apart from this, healthiness of A/R in line need to be ensured and in case any transmission licensee faces the issue due to frequent faults in line, then issue should be highlighted in PSC forum before taking any such actions (disabling A/R).

UPPTCL representative stated that remedial actions are been taken to rectify the cause of faults such as replacement of old insulators etc. Further necessary actions will also be initiated to minimise the occurrence of faults in line.

During 54th PSC meeting, POWERGRID(NR-1) & UPPTCL were requested to apprise the forum about present status.

POWERGRID(NR-1) representative informed that, A/R function in the line has been reviewed and it is healthy and operational. He further raised concern over frequent faults in line.

UPPTCL representative stated that they will take necessary remedial actions to minimise the frequent faults in the line.

Forum requested UPPTCL to take necessary actions to minimise the occurrence of faults in line. POWERGRID shall ensure the proper operation of A/R in line.

l) Frequent tripping of 220 KV Khara(UP)-Saharanpur(PG) (UP) Ckt-1

PSC 52 recommendations:

- UP was requested to expedite the process of relay replacement at Khara end.
- POWERGRID shall review and ensure the A/R operation at their end.

Discussion during 53rd PSC meeting: UPPTCL representative informed that status is same and follow up is being done to ensure the relay replacement in Nov-Dec 2024.

NRLDC representative highlighted the issue of non-operation of A/R in this line also at Saharanpur end and requested POWERGRID(NR-1) to review the healthiness of A/R operation in all the lines at Saharanpur(PG). Issue in A/R operation at Khara end in case of Y-ph fault is observed. 2*ph A/R is occurring in this scenario. UPPTCL may review the same.

UPPTCL representative stated that remedial actions are been taken to rectify the cause of faults such as replacement of old insulators etc. Further necessary actions will also be initiated to minimise the occurrence of faults in line.

During 54th PSC meeting, POWERGRID(NR-1) & UPPTCL were requested to apprise the forum about present status.

POWERGRID(NR-1) representative informed that, A/R function in the line has been reviewed and it is healthy and operational. He further raised concern over frequent faults in line.

UPPTCL representative informed that all the line protection relays at Khara(UP) are of electromechanical type. Relays will be replaced with numerical relays by the end of December 2024.

Forum requested UPPTCL to expedite the replacement of relay at Khara(UP) end. POWERGRID shall ensure the proper operation of A/R in line.

m) Multiple elements tripping event at Patiala (PG)

PSC 52 recommendation: Implementation of new bus bar relay at Patial (PG).

During 54th PSC meeting, POWERGRID(NR-2) representative was requested to apprise the present status.

POWERGRID(NR-2) representative informed that materials have been arrived. Presently, team is working at Nallagarh(PG) S/s, thereafter work will start at Patiala(PG). Implementation of new bus bar protection at Patiala (PG) will be completed by the end of January 2025.

Forum requested POWERGRID(NR-2) to expedite the process.

n) Multiple elements tripping at 400/220kV Bhadla(RS)

PSC 52 recommendation: Commissioning of Bus bar protection at 220kV bus at 400/220kV Bhadla(RS) need to be expedited.

During 54th PSC meeting, RVPNL representative was requested to apprise the present status.

RVPNL representative informed that bus bar protection at 220kV bus at 400/220kV Bhadla(RS) has been commissioned.

o) Multiple elements tripping at 400/220kV Lucknow(UP)

PSC 52 recommendation: Replacement of bus bar relay with numerical bus bar relay need to be expedited.

During 54th PSC meeting, UPPTCL representative was requested to apprise the present status.

UPPTCL representative informed that bus bar protection has been commissioned and taken into service on 24.11.2024 at 220kV Lucknow (UP).

p) Frequent tripping of 220 KV Nara (UP)-Roorkee (UK) (UP) Ckt-1

PSC 53 recommendation: PTCUL was requested to analyse the tripping events and take necessary remedial action to avoid undesired tripping.

During 54th PSC meeting, PTCUL was requested to apprise the forum about analysis and remedial action w.r.t. frequent tripping of this line.

PTCUL representative stated that this line is being operated in radial mode due to which issue of single phasing of transformers observed many a times during fault. To avoid this, A/R has been kept off.

With the reference of similar case in Rajasthan control area, RVPNL representative suggested that some changes in protection settings can help in avoiding such issues.

NRLDC representative raised concern over disabling the A/R without intimation to the forum. PTCUL was requested to enable the A/R in line and any issues may first be intimate to forum for necessary recommendation / actions. Further, PTCUL was requested to thoroughly analyse the tripping incidents and identify the root cause which will help in taking necessary remedial actions. PTCUL was also requested to on the A/R PTCUL may also discuss with RVPNL in reference to Rajasthan case study.

Forum recommended following actions to PTCUL:

- *A/R shall be enabled in the line. Any issues may be put up in the PSC Forum.*
- *Root causes analysis of the frequent tripping of line need to be submitted.*
- *Necessary remedial actions need to be taken to avoid frequent tripping of the line.*

q) Frequent tripping of 400 KV Agra-Unnao (UP) Ckt-1

PSC 53 recommendation: UPPTCL shall share the DR of overvoltage tripping of 400kV Agra-Unnao ckt-1 and analyse the root cause of tripping.

During 54th PSC meeting, UPPTCL was requested to apprise the forum about present status.

UPPTCL representative informed that overvoltage relay at Unnao (UP) is of electromechanical type. Binary output ports in existing distance protection relay are exhausted. Solutions are being explored, issue will be resolved shortly.

Forum requested UPPTCL to take necessary remedial action to resolve the issue.

r) Multiple elements tripping at 220kV Khodri HEP & Chibro HEP on 5th, 11th & 19th September 2024

PSC 53 recommendation:

- Timely submission of disturbance recorder (DR) and event logger (EL) files need to be ensured. As per IEGC clause 37.2 (c), Disturbance Recorder (DR), station Event Logger (EL), Data Acquisition System (DAS) shall be submitted within 24 hrs of the event.
- HPPTCL shall take necessary actions to rectify the protection related issue in 220kV Khdori-Majri ckt-2.
- OV protection needs to be disabled in 220kV lines at the earliest.
- Over frequency and over current protection operation in units at Khodri HEP need to be reviewed.
- A/R should be made operational in Sarsawan line at the earliest.
- UJVNL shall share the CPRI audit report and details of remedial action taken within one week.
- Replacement of Units breakers need to be expedited.

During 54th PSC meeting, UJVUNL was requested to apprise the forum about status of remedial actions.

UJVUNL representative informed following during the meeting:

- Timely submission of DR/EL & tripping reports for the tripping incidents are being ensured.
- Overvoltage setting in all the lines at Khodri HEP has been disabled. However, 220kV Khodri-Mazri ckt-2 is in jurisdiction of HPSEBL.
- Over frequency & overcurrent protection in generating units have been proposed to review.
- Audit report of the CPRI conducted in October 2023 has already been submitted by mail.
- A/R operation in Sarsawan line and replacement of Unit breakers has been proposed. Follow ups are being done with OEM.
- Time delay setting of Z-4 in distance protection in all the lines at Khodri has been revised from 1sec to 160msec.

NRLDC representative requested UJVUNL to expedite the implementation of bus bar protection at Khodri HEP and submit the action plans w.r.t. all the desired remedial actions at Khodri HEP. Compliance status of CPRI audit report also need to be submitted.

Forum recommended following actions to UJVUNL:

- *expedite the implementation of bus bar protection at Khodri HEP*
- *submit the action plans w.r.t. all the desired remedial actions at Khodri HEP*
- *Compliance status of CPRI audit report also need to be submitted.*

s) Multiple elements tripping at 400/220kV Jaisalmer(RS) Akal(RS) on 20th September 2024

PSC 53 recommendation: RVPNL shall share the detailed analysis of the event within one week.

During 54th PSC meeting, RVPNL was requested to share the analysis and status of remedial action taken.

RVPNL representative stated that multiple elements tripping occurred during this event on operation of LBB relay. However, LBB relay is not communicating due to which DRs couldn't be extracted. Therefore, analysis of the events hasn't submitted yet. OEM has been requested to update the software of relay.

NRLDC representative requested RVPNL to resolve the issue with the LBB relay at the earliest so that proper analysis of the grid event could be done.

Forum requested RVPNL to resolve the issue with the LBB relay at Akal S/s at the earliest.

A.20. Multiple element tripping events in Northern region in the month of October'24 (agenda by NRLDC)

A.20.1 A total of 13 grid events occurred in the month of October'24 of which **04** are of GD-1 category, **06** are of GI-2 Category and **03** are of GI-1 Category. The tripping report of all the events have been issued from NRLDC. A list of all these events is attached at **Annexure-XVIII.**

A.20.2 Maximum delayed clearance of fault observed in event of multiple elements tripping at 220/132kV Pampore (PDD JK) on 16th October, 2024 (As per PMU at Amargarh(INDIGRID), Y-N phase to earth fault converted to Y-B-N double phase to earth fault with delayed fault clearing time of 1000ms is observed).

Delayed clearance of fault (more than 100ms for 400kV and 160ms for 220kV system) observed in total **04** events out of **13** grid events occurred in the month. In 05 (no.) of grid events, there was no fault in the grid.

A.20.3 NRLDC representative presented the reporting status of DR/EL & tripping reports w.r.t. grid events occurred in October 2024. It was highlighted that detailed report of majority of the tripping events have not received. Utilities were requested to start preparing the detailed report of the tripping events as per timeline mentioned in IEGC 2023 and share the report with NRLDC, NRPC and PSC forum. Remedial actions taken by constituents to avoid such multiple elements tripping may also be included in the detail report.

A.20.4 As per IEGC clause 37.2 (c), Disturbance Recorder (DR), station Event Logger (EL), Data Acquisition System (DAS) shall be submitted within 24 hrs of the event and as per IEGC clause 37.2 (e), the user shall submit a detailed report in the case of grid disturbance or grid incidence within one (1) week of the occurrence of event to RLDC and RPC.

Decision taken by Forum:

Forum requested members to take necessary preventive measures to avoid such grid incidents / disturbances in future and report actions taken by respective utilities in OCC & PSC forum. Moreover, utilities may impress upon all concerned for providing the Preliminary Report, DR/EL & detailed report of the events to RLDC in line with the regulations.

A.21. Analysis of the tripping events occurred during October-2024 and status of remedial action taken (agenda by NRLDC)

a) Frequent elements tripping during October 2024:

A.21.1 The following transmission elements were frequently tripping during the month of

October'24:

S. NO.	Element Name	No. of forced outages	Utility/SLDC
1	400 KV Muradnagar_2-Mathura (UP) Ckt-1	7	UP
2	220 KV RAPS_B(NP)-Sakatpura(RS) (RS) Ckt-1	5	NPCIL/Raj
3	220 KV Saharanpur(PG)-Shamli(UP) (UP) Ckt-1	5	PG/UP
4	220 KV Nanauta(UP)-Saharanpur(PG) (UP) Ckt-1	3	PG/UP
5	220 KV Sarsawan(UP)-Khodri(UK) (UP) Ckt-1	3	UP/Utt

A.21.2 List of tripping is attached as **Annexure-XIX.**

A.21.3 NRLDC representative highlighted that frequent tripping of such elements affects the reliability and security of the grid. In view of the same, utilities were requested to analyse the root cause of the tripping and share the remedial measures taken/being taken in this respect.

A.21.4 **Discussion during the meeting:**

- **400 KV Muradnagar_2-Mathura (UP) Ckt-1:** NRLDC representative raised concern over frequent incidents of faults, non-operation of A/R and delayed clearance of fault in 01 number of incidents. UPPTCL representative informed that A/R is healthy and operational in line, tripping occurred due to fault in reclaim time. Regarding delayed clearance of fault, it was informed that it was due to LBB operation.

Forum requested UPPTCL to take necessary remedial actions to minimise frequent faults in line.

- **220 KV RAPS_B(NP)-Sakatpura(RS) (RS) Ckt-1:** NRLDC representative raised concern over frequent faults in line and delayed clearance of fault during 2 (two) number of incidents. RVPNL representative stated that this line passes through forest area due to which this line is prone to frequent faults. However, remedial actions are being taken to avoid frequent tripping of line. Installation of bird guard throughout the line and replacement of damaged disc insulators are being done in lines evacuating from Sakatpura(RS). Work is almost completed in 220 KV RAPS_B(NP)-Sakatpura(RS) (RS) Ckt-1. Regarding delayed clearance of fault, RVPNL stated that review of carrier aided tripping shall be done, and any shortcoming will be rectified.

  Forum requested RVPNL to take necessary actions and ensure that frequent tripping of lines connected to RAPS (Nuclear Power Station) is avoided.

- **220 KV Nanauta(UP)-Saharanpur(PG) (UP) Ckt-1:** NRLDC representative raised concern over frequent tripping of line and non-operation of A/R. UPPTCL representative informed that there is issue in relay configuration in Main-2 relay at Nanauta end. In case of 1-ph fault also 3-ph trip and A/R block is occurring. Issue has been taken up with ABB however, they couldn't resolve the issue. As a precautionary measure, time delay of Z-1 in Main-2 relay has been kept as 70msec to avoid A/R block in Z-1 1-ph fault due to mis-operation of Main-2 relay. As soon relay configuration get corrected, protection setting of Main-2 relay will be normalised.

  Forum requested UPPTCL to ensure resolution of issue with the Main-2 relay at Nanauta(UP) at the earliest.

- **220 KV Sarsawan(UP)-Khodri(UK) (UP) Ckt-1:** NRLDC representative raised concern over frequent tripping of line and non-operation of A/R. UPPTCL representative informed that at Sarsawan(UP) end also similar issue like 220kV Nanauta(UP) is there. Issue will be rectified at the earliest. UJVUNL representative stated that A/R is not functional in line and same has been taken up with the OEM.

  Forum requested UPPTCL & UJVUNL to ensure resolution of issue with the Main-2 relay at Sarsawan(UP) and A/R issue at Khodri HEP at the earliest.

A.21.5 NRLDC representative emphasized that A/R (auto re-closer) issue was found in many of these tripping. He sensitized all the utilities to ensure healthiness/in service

of A/R in 220 kV and above transmission lines in compliance to CEA Grid Standards. He further informed that most of the tripping are transient in nature but due to non-operation of A/R, it resulted into tripping of the transmission element thus reducing the reliability of the grid. All the utilities shall endeavour to keep auto re-closer in service and healthy condition of 220 kV and above voltage level transmission line. The issue of time syncing of DR/EL at many of the stations was highlighted, constituents were requested to ensure the time syncing of DR/EL. In addition, necessary actions also need to be taken to ensure the Right of Way and other operation & maintenance issues to minimize the frequent faults in the line. All utilities agreed for the same.

PSC forum reiterated that frequent outages of such elements affect the reliability and security of the grid. Members were requested to investigate such frequent outages and share the suitable remedial measures taken/being taken in this respect.

b) Protection related issues in multiple elements tripping, detailed analysis of the events and status of remedial measures:

A.21.6 The list of major tripping events occurred during October 2024 is attached as **Annexure-XX.** Concerned constituents/utilities were requested to share the detailed analysis of the tripping elements along with status of remedial action taken/to be taken.

A.21.7 Utilities were requested to prepare detailed analysis report and present the event details during 54th PSC meeting. Events involving more than one utility may be jointly prepared and presented.

A.21.8 **Discussion during the meeting of Tripping Events is as below-**

A. **Multiple elements tripping at 220kV Dhauliganga HEP (NHPC) on 5th October 2024**

Discussion during the meeting:

i. Brief of the event shared by NRLDC representative based on detail available is as follows:

- During antecedent condition, only 70 MW Unit-4 at Dhauliganga(NH) was running and generating approx. 69MW (as reported, SCADA data not available). Unit-1, 2 & 3 were under shutdown.
- As reported, at 18:24hrs, 220 KV Jauljivi (PG)-Dhauliganga(NH) (PG) Ckt-1 & 2 tripped due to malfunction of GIS controller software.
- Along with the same, 70 MW Unit-4 at Dhauliganga(NH) also tripped due to loss of evacuation path. Hence 220kV Dhauliganga(NH) S/s be-came dead.
- As per PMU at 400kV Bareilly(PG), no fault signature was observed.
- As per SCADA, no change in NR hydro generation is observed.
- As reported by Dhauliganga, Generation loss of 69MW was reported at Dhauliganga(NH).
- Major observations:
  - Reason of malfunction in software.
  - Other such software related issues at other NHPC stations?
  - Remedial action taken to rectify the issues?

NRLDC representative raised concern over frequent events of tripping of generating units due to SCADA or software related mis operation. Tripping of units due to synchronisation failure also observed during recent past. NHPC was asked about the root cause of these events and status of remedial actions taken to avoid such events in future.

ii. NHPC representative and others informed the following:

- Some of the breaker statuses are taken through hard wired and some are through GIS controller. Accordingly, that is incorporated in system protection logic.
- During the event, breaker status was not coming due to hanging of GIS controller which further initiated tripping command as per logic.

- This issue has been taken up with the OEM (GE) for suitable resolution to avoid such event in future. Option of incorporating complete hardwired system instead of GIS controller will also be explored.
- Regarding issue of unit trippings due to SCADA system issue, it was informed that this issue was observed at Chmaera_I HEP during commissioning of new SCADA system. Now there no such issues are persisting.
- Regarding issue of tripping of units during synchronisation, it was informed that those tripping occurred during syncing of units due to frequency mismatch. During hourly boundary in morning hours frequency excursion are being observed leading to tripping of units due to synchronisation failure.

NRLDC representative stated that tripping of generating units without any actual electrical fault in system is point of concern. Hydro generating units are crucial in grid operation and necessary corrective actions need to be taken to avoid such incidents in future. Regarding, tripping of units on synchronisation failure, NHPC was suggested to take synchronisation attempt some time before hourly boundary to avoid such tripping incidents.

Forum Recommendations:

- *NHPC shall take necessary corrective actions to avoid tripping of generating units due to SCADA & GIS controller related issues in future.*
- *Healthiness of SCADA system, protection system and their proper operation need to be ensured.*

B. Multiple elements tripping at 400/220kV Obra_B(UP) on 9th October 2024

Discussion during the meeting:

i. Brief of the event shared by NRLDC representative based on details available is as follows:

- 400/220 KV Obra -B substation has 2*315 MVA (ICT-1&2) and one 240MVA ICT (ICT-3). During antecedent condition, 2*315 MVA & 240 MVA ICTs were carrying 104MW (ICT1), 101MW (ICT2) and 78MW (ICT3) respectively.
- 400/220kV 315 MVA ICT-1, 240 MVA ICT-3 at Obra_B, 220kV Obra_A-Allahabad Rewa Road ckt-2 & 220kV Obra_A-Sahupuri ckt were all connected to 220KV Bus-1 during the antecedent condition.
- As reported at 11:39 hrs, R-Y fault occurred on 220kV Obra-Sahupuri ckt. Fault location was 5km from Sahupuri end. Fault was in Z-1 from Obra end and Z-2 from Sahupuri end.
- On this fault, distance protection at both ends operated. CB opened from Sahupuri end however, CB at Obra end failed to open.
- As reported, LBB protection didn't operate (relay is of static type) and fault cleared with the tripping of 220kV Obra_A-Allahabad Rewa Road ckt-2 on Z-4 distance protection operation and 400/220kV 315 MVA ICT-1, 240 MVA ICT-3 on directional O/C E/F protection operation. 220kV bus coupler CB also opened on over current protection and 220kV Bus-2 got isolated.
- After tripping ICT-1 & 3 all the load shifted to ICT-2 and the loading of ICT-2 increased to 240 MW.
- As per PMU at Anpara(UP), R-Y fault with delayed clearance of ~960msec is observed.
- Both the transformers were restored back into service at 12:22 hrs (ICT-1) and 14:41 hrs (ICT-3) respectively.
- As per SCADA, no generation or load loss was observed in UP control area.
- As per SCADA, no change in demand is observed in the Northern Region.
- **Major observations:**
  - Exact reason of fault need to be shared.
  - Why did the LBB of Sahupuri bay at Obra_A not operate? Review of LBB protection need to be done. Also process of replacement of static relay with numerical relay need to be initiated.
  - DR/EL (.dat/.cfg) of all tripped elements along with detailed tripping report need to be shared from both the ends.

- Routine maintenance of breaker and its auxiliary equipment's need to be done to ensure their proper operation.
- Disturbance recorder at Obra_B is not time synced.
- Remedial action taken report to be shared.

ii. UPPTCL & Obra_B(UP) representative and others informed the following:

- 2 Main & 1 Transfer Bus Scheme is used in 400/220KV OBRA BTPS which was distributed in following manner during antecedent condition:
  - 220kV BUS-I: 220 KV Obra Allahabad-III, 100 MVA ICT-I, 100 MVA ICT-III, 315 MVA 400/220 KV ICT-I , 240 MVA 400/220 KV ICT-II, 30 MVA ST-I.
  - 220kV BUS-II: 100 MVA ICT-II, 100 MVA ICT-III, 30 MVA ST-II, 315 MVA 400/220 KV ICT-II.
  - 220KV BUS-I & II: Coupled through Bus Coupler.
- R-Y phase-phase fault occurred on 220 KV Obra_B-Sahupuri Ckt at about 5 Km (Z-1)from Obra_B end. Distance protection relay detected the fault and initiated tripping however, CB at Obra_B end failed to open. Line tripped from Sahupuri end in Z-2.
- As per protection philosophy, on breaker failure, LBB protection should operate. However, LBB protection is not implemented at 220kV Obra_B(UP) since commissioning.
- Therefore, fault cleared with the tripping of ICTs on directional overcurrent earth fault protection and adjacent lines on back up distance protection (Z-2). Bus coupler also tripped on overcurrent protection and one of the ICT (315 MVA ICT-2) got saved on isolation of faulty section.
- Proposal of implementation of LBB protection has been initiated.
- GPS scheme is also not available at Obra_B due to which there is issue of time sync. Proposal of implementation of GPS scheme has also been initiated. It will be implemented by the end of January 2025.

NRLDC representative raised concern over non availability of LBB protection since commissioning and requested Obra_B & UPPTCL to take necessary remedial action and expedite the process of implementation of LBB protection.

***Forum Recommendations**:*

- *UPPTCL & Obra_B(UP) shall ensure the implementation of LBB protection at the earliest.*
- *GPS scheme shall be implemented at Obra_B(UP) by the end of January 2025 and time sync of recording devices will be ensured.*
- *Necessary actions need to be taken to ensure the healthiness of equipment at Unnao S/s.*
- *Proper operation of protection system also needs to be ensured.*

C. Multiple elements tripping at 220/132kV Obra_A(UP) on 9th October 2024

Discussion during the meeting:

i. Brief of the event shared by NRLDC representative based on detail available is as follows:

- Obra-A has 3, 220/132 KV, 100MVA transformers which were carrying approx. 46MW, 51MW and 45MW during antecedent condition.
- As reported, during inclement weather conditions, 220/132kV 100 MVA ICT-1 & ICT-2 tripped on B-N earth fault protection at Obra-A(UP) which led to complete shifting of load on 220/132kV 100 MVA ICT-3 at Obra-A (UP).
- As a result of overloading of the 3rd transformer, ICT-3 also tripped on O/C protection at 17:04hrs.
- At the same time 17:04hrs, 03 Units at Obra Hydro and 03 Units at Rihand HEP (connected at Bus-2) also tripped leading to a total generation loss of approx. 215 MW.
- Considering the above incident, Rihand manually tripped Obra-A, Obra H1, Obra H2 and Gharwad lines from perspective of safety.
- As per SCADA, change in demand of approx. 100MW is observed in UP control area.
- Major observations:

- SCADA data of 220/132KV Obra-A substation is unavailable after the tripping. Availability of SCADA data needs to be ensured.
- DR/EL for each tripped element & tripping report need to be shared from both the ends.
- Sequence of tripping also need to be shared.
- Remedial actions taken and reports need to be shared

ii. UPPTCL & Obra_A representative and others informed the following:

- There is only single bus at 132kV Obra_A and two bus (132 KV Main Bus and 132 KV Reserve Bus) at 132kV Rihand S/s.
- At 17:04hrs, 132 KV Obra-Dalla ckt-1 tripped on B-N fault. At the same time 132 KV ICT-1 and ICT-2 at Obra_A also tripped along with 33MW Unit-1,2&3.
- Due to tripping of ICT -1 & ICT-2 at Obra_A, ICT-3 got overloaded and tripped further resulted into tripping of Unit no 1, 2 & 4 at Rihand HEP.
- As reported by Obra TnC team, 132kV ICT -1 & ICT-2 often trips on external line fault, it might be due to high set/normal relay setting, unavailability of directional E/F relay or ageing effect of Electromagnetic relays for 132 KV ICT-1 & 2.
- Commissioning of numerical relay for 132KV ICT-1 & 2 in under process. Procurement of relay has been done and commissioning will be done by the end of February 2025.

Forum Recommendations:

- *Commissioning and Implementation of numerical relays in 132kV ICT-1&2 at Obra_A(UP) need to be expedited. Timely commissioning of the same need to be ensured.*
- *Proper operation of protection system needs to be ensured.*
- *Timely submission of disturbance recorder (DR) and event logger (EL) files need to be ensured. As per IEGC clause 37.2 (c), Disturbance Recorder (DR), station Event Logger (EL), Data Acquisition System (DAS) shall be submitted within 24 hrs of the event.*

D. Multiple elements tripping at 400kV Muradnagar_2(UP) on 17th October 2024

Discussion during the meeting:

i. Brief of the event shared by NRLDC representative based on detail available is as follows:

- 400/220/132kV Muradnagar-New(UP) has one and half breaker scheme at 400kV level and double main and transfer bus scheme at 220kV level.
- As reported, at 00:43 hrs, 400kV Muradnagar_2-Mathura (UP) Ckt tripped on Y-N phase to earth fault with fault current of 4.065kA from Muradnagar_2 end and fault clearing time of 291 ms; zone-1 distance protection operated (as per DR at Muradnagar_2 end) and DT received at Mathura end (as reported).
- Due to delayed opening of CB at Muradnagar_2 end of 400kV Muradnagar_2-Mathura (UP) Ckt, LBB protection operated and both main and tie CBs at Muradnagar_2 end of 400 KV Dadri(NT)-Muradnagar_2(UP) (PG) Ckt and 400kV Muradnagar_2-Simbholi_PMSTL (UP) Ckt-1 & 2 opened and all the 400kV lines connected at Muradnagar_2 tripped. DT received at remote ends (as reported).
- As informed by SLDC-UP, the logic of LBB operation was wrong in 400kV Muradnagar_2-Simbholi_PMSTL (UP) Ckt-1 & 2: on LBB operation opening command was sent to both main and tie CBs. Reason of opening of tie CB of 400 KV Dadri(NT)-Muradnagar_2(UP) (PG) Ckt is under investigation and yet to be shared.
- As per PMU at Muradnagar1(UP), Y-N phase to earth fault with delayed fault clearing time of 280ms is observed.
- As per SCADA, no change in demand is observed in UP control area.
- **Major observations:**
  - Reason for delayed fault clearance need to be shared.
  - Submitted DR are not time synced.
  - Reason of opening of tie CB of 400 KV Dadri(NT)-Muradnagar_2(UP) (PG) Ckt on LBB operation need to be shared.
  - DR/EL (.dat/.cfg file) of all the tripped elements along with detailed tripping report need to be shared from both the ends.

- Remedial action taken report to be shared.

ii. UPPTCL representative and others informed the following:

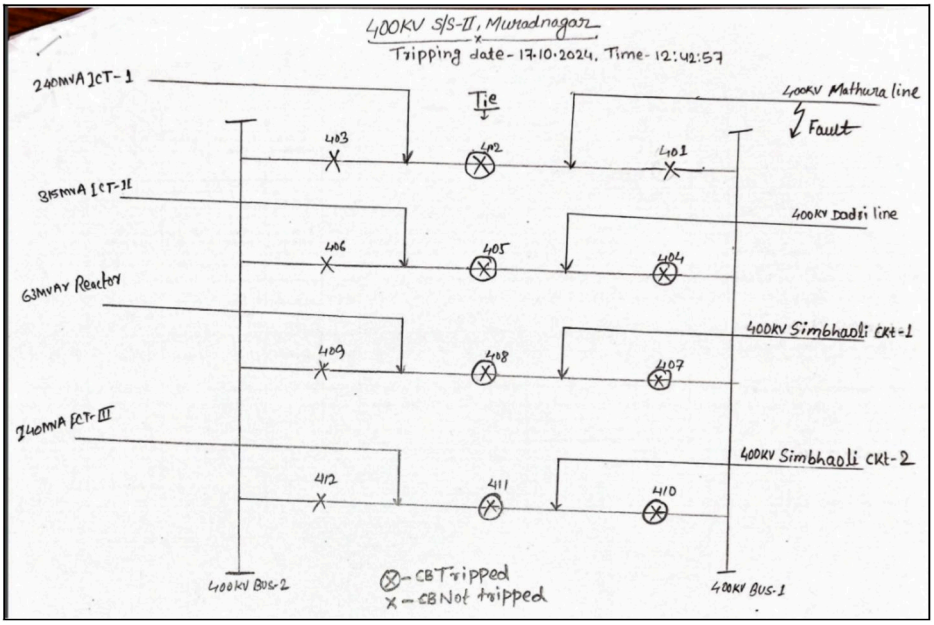


Fig: SLD of 400kV Muradnagar_2(UP)

- 400/220kV Muradnagar_2(UP) has one and half breaker scheme at 400kV side. SLD of the station is shown above.
- Y-N fault occurred on 400kV Muradnagar_2-Mathura line at 00:42:57 hrs in zone-1 from Muradnagar_2 end with fault current of 3.66KA.
- Relay issued trip command to Main CB 401 & Tie CB 402 of Mathura line but Main CB 401 failed to trip resulting in LBB operation.
- Due to LBB operation only Tie CB (402 bay) should have operated, but due to some configuration error other Tie CBs (405, 408 and 411) also tripped.
- Time Testing of CB-401 has been done after servicing of CB mechanism on 18.10.2024.
- On analyzing busbar protection, it was found that Protection logics are different in different PUs, the same shall be corrected after thorough review of busbar scheme. Bus bar protection relay is of ZIV make, follow up with the OEM is being done for early resolution of the issue.

- Testing of auto recloser function in 400 kV Muradnagar-2-Mathura Line has been done on dated 19.10.2024, all the results were found in order.

Forum Recommendations:

- *UPPTCL shall ensure the necessary correction in ZIV make bus bar protection at 400kV Muradnagar_2(UP) by the end of December 2024.*
- *Proper operation of protection system needs to be ensured.*
- *Time synchronisation and standardisation of recording instrument need to be ensured.*
- *Timely submission of disturbance recorder (DR) and event logger (EL) files need to be ensured. As per IEGC clause 37.2 (c), Disturbance Recorder (DR), station Event Logger (EL), Data Acquisition System (DAS) shall be submitted within 24 hrs of the event.*

E. Multiple elements tripping at 400kV Aligarh(UP) on 23rd October 2024

Discussion during the meeting:

i. Brief of the event shared by NRLDC representative based on detail available is as follows:

- 400/220kV Aligarh(UP) has one and half breaker scheme at 400kV level and double main and transfer bus scheme at 220kV level.
- As reported, at 12:08 hrs, differential protection of line reactor of 400 KV Panki-Aligarh (UP) Ckt operated (exact reason of differential protection operation of line reactor of 400 KV Panki-Aligarh (UP) Ckt yet to be shared).
- During the same time, Bus bar protection operated at 400kV Bus-1 at Aligarh(UP) also operated (exact reason of bus bar operation of 400kV Bus-1 at Aligarh(UP) yet to be shared).
- Due to this, all the elements connected to 400kV Bus-1 at Aligarh(UP) tripped and Bus-1 became dead (exact reason of opening of tie CBs of 400 KV lines connected to Bus-1 at Aligarh(UP) yet to be shared).
- As per PMU at Aligarh(PG), no fault is observed in the system.
- As per SCADA, no change in demand is observed in UP control area.
- **Major observations:**

- Exact reason of differential protection operation of line reactor of 400 KV Panki-Aligarh (UP) Ckt need to be shared.
- Exact reason of bus bar operation of 400kV Bus-1 at Aligarh(UP) need to be shared.
- Reason of opening of tie CBs of 400 KV lines connected to Bus-1 at Aligarh(UP) need to be shared.
- DR/EL (.dat/.cfg file) of all the tripped elements along with detailed tripping report need to be shared from both the ends.
- Remedial action taken report to be shared.

ii. UPPTCL representative and others informed the following:

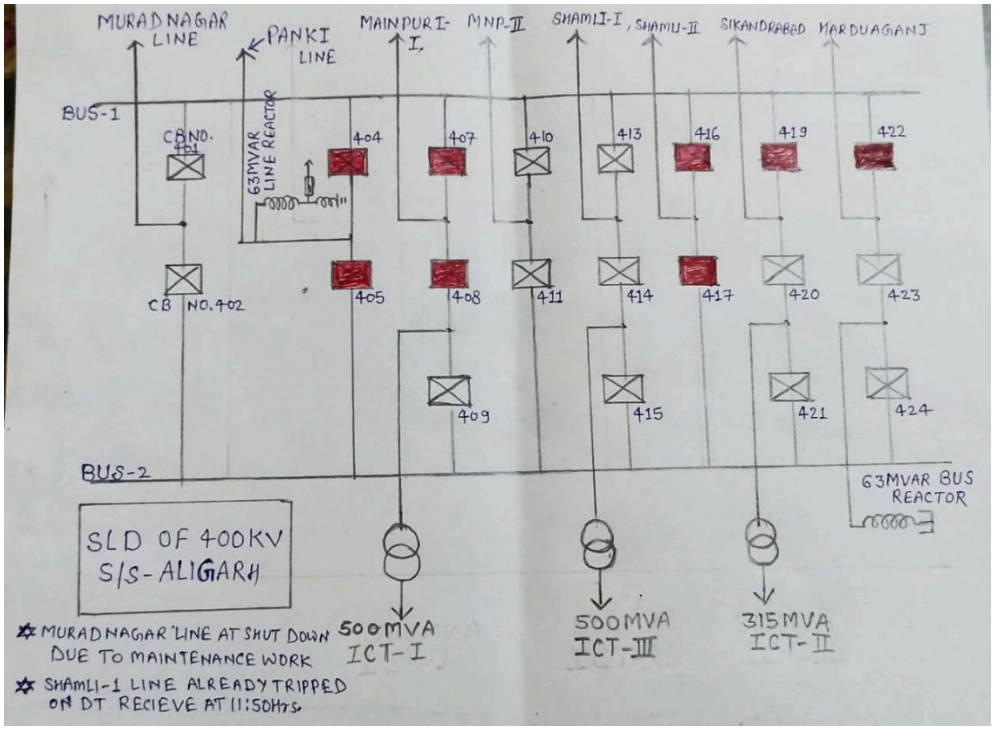


Fig: SLD of 400kV Aligarh(UP)

- At 12:08 hrs Busbar (Zone I) protection operated at 400kV Aligarh(UP) resulted into tripping of elements connected to 400kV Bus-1 i.e., 400kV Panki line with reactor, 400kV Shamli line II, 400kV Mainpuri line I & 400kV Sikandrabad line.
- It was also observed that Y phase LED indication appeared on differential relay of Panki line reactor at the time of incident. However, bay no. 413 (400kV Shamli-1 line) was already in tripped condition since 11:50 hrs on 23.10.2024.

- After analysing events recorded in Busbar (CU) relay of Zone-I, it was observed that the communication between PU1 of Shamli-I line (Bay 13 in Bus Bar protection) and CU was getting lost and establishing multiple times before the incident. Similarly, status of connection of same bay also toggled from Bus 1 to Bus 2 which shows some topology error.
- Due to these errors, Busbar Zone 1 protection operated erratically at 12:08:48:706 hrs.
- Recently 400kV Shamli I and Shamli II circuits were energised. Notable differences between the wiring and configuration logics were observed on thorough inspection of these bays.
- However, no abnormality was observed in the switchyard, which suggests that this event originated from Shamli bay -13(413). This seems to be a case of malfunction of busbar relay due to errors in configuration and logic.
- Panki line 63MVR reactor stability test was conducted, and results were found satisfactory.
- Issue related to bus bar protection has been taken up with OEM (ZIV) for checking and correction of busbar logic and associated wiring.
- Till the time the problem in busbar relay is rectified, busbar protection is kept in blocked state and zone 4 reach and time settings of all lines are revised accordingly (160 msec).

Forum Recommendations:

- *Issues related to bus bar protection at 400kV Aligarh(UP) need to be resolved at the earliest.*
- *Proper operation of protection system needs to be ensured.*
- *Timely submission of disturbance recorder (DR) and event logger (EL) files need to be ensured. As per IEGC clause 37.2 (c), Disturbance Recorder (DR), station Event Logger (EL), Data Acquisition System (DAS) shall be submitted within 24 hrs of the event.*

F. Multiple elements tripping at 400kV Obra_B(UP) on 25th October 2024

Discussion during the meeting:

i. Brief of the event shared by NRLDC representative based on detail available is as follows:

- 400/220kV Obra-B(UP) has double main and transfer bus scheme at both 400kV and 220kV level.
- During antecedent condition, 200 MW Obra TPS - UNIT 11 and 13 were generating approx. 48 MW and 102 MW respectively. 200 MW Obra TPS - UNIT 09 was under tripped condition since 09:57 hrs on 25th Oct'24. 400/220 kV 315 MVA ICT 1 at Obra_B(UP), 400 KV Obra_B-Rewa Road (UP) Ckt-1 and 200 MW Obra TPS - UNIT 09, 11 & 13 were connected to 400KV Bus 1 at Obra-B(UP) and rest of the elements were connected to 400KV Bus 2 at Obra-B(UP).
- As reported, at 12:52 hrs, while synchronizing 200 MW Obra TPS - UNIT 09, busbar differential protection operated at 400KV Bus 1 at Obra-B(UP) (exact reason of busbar protection operation yet to be shared).
- Due to busbar protection operation, all the elements connected to 400kV Bus-1 at Obra-B(UP) tripped and Bus-1 became dead.
- As per PMU at Anpara-TH(UP), B-N phase to earth fault is observed with fault clearing time of 120 ms.
- As per SCADA, no change in demand is observed in UP control area. However, generation loss of approx. 150 MW occurred at Obra-B(UP).
- As reported by Obra-B, after investigation it was found that interrupter unit of CB at 400kV side of 200 MW Obra TPS - UNIT 09 was damaged. This CGL make SF6 type CB which was commissioned on 30th Nov'23 and was continuously in service since 16th Feb'24, is under warranty period. CGL service engineer was called for detailed analysis regarding the same as primarily it seems that there is some manufacturing defect of CB.
- **Major observations:**
  - Exact reason of bus bar operation of 400kV Bus-1 at Obra-B(UP) need to be shared.
  - DR/EL (.dat/.cfg file) of all the tripped elements along with detailed tripping report need to be shared from both the ends.
  - Remedial action taken report to be shared.

ii. UPPTCL & Obra_B representative and others informed the following:

- 400/220KV OBRA_B TPS has double main transfer bus scheme and distribution of elements during antecedent condition was as follows:
  - **400 KV BUS-I:** 200MW Unit-9, 315MVA 400/220/33kV ICT-I, 400kV Obra- Rewa Road line, 200MW Unit-13, 200MW Unit-11.
  - **400 KV BUS-II:** 315MVA 400/220/33V ICT-II, 240MVA 400/220/33 kV ICT-III, 400kV Obra- Sultanpur line, 400kV Obra-Anpara Line, 200MW Unit-10, 200MW Unit-12, 400 kV OBRA'B'-OBRA'C' Line.
  - **400kV BUS-I & II**: Coupled through 400 KV Bus Coupler.
- On dated 25.10.2024 unit is running normally at 122MW through 400kv Bus-I and tripped at 09:56:58,931 hrs on turbine MOT level low protection. Further, unit was lighted up and attempted for synchronisation, at 12:52:00 hrs, when field circuit breaker of excitation system put in ON position, (till time main breaker is in OFF position), current of B PHASE was increasing.
- Due to this, above B phase current of whole system also increased. As per relay data of 400KV bus-coupler, current increased from 170 A to 1900 A.
- During this incident GT Backup O/C protection operated which caused operation of lockout relay of unit-9 at 12:52:01,010 hrs and initiated LBB protection of this bay.
- As per LBB relay, B phase current in this bay was still present continuously flowing which caused reattempt of tripping of this breaker after 120ms (at 12:52:01,129 hrs) by LBB protection, but it was already in OPEN position.
- Finally, LBB protection operated at 12:52:01,288 hrs and all elements of 400KV BUS-I tripped including 400KV bus coupler. Breaker interrupter unit of this breaker (towards 400KV BUS) damaged and all porcelain part scattered.
- 400KV SF6 Circuit Breaker of Unit-09 at Obra_B is CG Power make was commissioned on 30.11.2023 and successfully charged since 16.02.2024.
- Damaged B Pole of Unit-9 has been replaced with available new spare pole at site. After replacement of this pole different tests i.e., mechanical 50 operation, before and after CRM test, IR test, dew point, timing test

has been performed as per standard for assurance of not repeating such incident.

- CG Power (OEM) was also requested to submit the analysis of root cause analysis report.

NRLDC representative raised concern over frequent incidents of breaker failure in UP control area and requested for routine inspection & maintenance to avoid such events.

Forum Recommendations:

- *Healthiness of electrical & mechanical equipment's at stations need to be ensured.*
- *Proper operation of protection system needs to be ensured.*
- *Timely submission of disturbance recorder (DR) and event logger (EL) files need to be ensured. As per IEGC clause 37.2 (c), Disturbance Recorder (DR), station Event Logger (EL), Data Acquisition System (DAS) shall be submitted within 24 hrs of the event.*

G. Multiple elements tripping at 400/220kV Kashipur (Utt) on 10th October 2024

Discussion during the meeting:

i. Brief of the event shared by NRLDC representative based on detail available is as follows:

- 400/220/132kV Kashipur has 2*315 400/220kV and 2*160MVA 220/132kV ICTs.
- As reported, at 10:56:13.086, LV side CB of 315MVA ICT-2 tripped. Uttarakhand-SLDC in its tripping report mentioned the reason for the fault was operation of Restricted Earth Fault (REF) as well as some external fault, which is of contradictory nature. REF is an internal fault of the transformer. Further clarification may be given by Uttarakhand -SLDC on this matter.
- With the tripping of 315MVA ICT-1 at Kashipur, case-2 of SPS for transformers at 400KV Kashipur (PTCUL) substation operated. As a result of the SPS present in Kashipur sub-station, the following lines also tripped:

(a) 220kV Jafarpur-Kashipur (UK) Ckt (b) 220kV Pantnagar – Kashipur (UK) Ckt (c) 132kV Kahipur – Jaspur (UK) Ckt

- Even after tripping of the aforementioned lines, loading of 315MVA ICT-1 didn't reduce and increase to ~339MVA. As reported, load of 220kV Kamalwaganja was being fed from 220kV Pantnagar and 132kV Bajpur. After tripping of 220kV Kashipur-Pantnagar ckt, load of Kamalwaganja which was feeding through Kashipur-Pantnagar shifted to Bajpur source. Due to this, loading of 315MVA ICT-3 didn't reduce after SPS operation.
- Further, at 10:56:24.522,315MVA ICT-1 HV and LV Side tripped on Over Current Protection. However, from the DR of ICT-1, loading of ICT-1 before tripping was ~107%.
- Further, 220/132kV 160 MVA ICT-3 also tripped at Kashipur. As reported, no flag was observed for the said tripping.
- As per PMU at Roorkee(PG), no fault in system is observed.
- As per SCADA, a change in demand of approx. 247MW is observed in Uttarakhand control area.
- **Major observations:**
  - Exact reason of REF protection operation in 400/220kV 315 MVA ICT-2 need to be analysed and shared.
  - From the DR of ICT-1, loading of ICT before tripping was ~107%. As per NRPC protection philosophy, pick up setting of ICT O/C protection shouldn't be less than 110%. O/C protection setting of ICTs at Kashipur need to be shared and reviewed.
  - SCADA data of 400/220/132kV Kashipur (UK) S/s was not available during event time. The same needs to be ensured.
  - SPS system needs to be revised to take care of 132KV Bazpur- Kamalwaganja loading factor.
  - Exact reason of tripping of 220/132kV 160 MVA ICT-3 need to be shared.
  - DR, EL & tripping report need to be shared from both the ends.
  - Remedial action taken report to be shared.

ii. PTCUL representative and others informed the following:

- At first, LV side CB of 400/220kV ICT-2 tripped due to DC earth fault at 220kV side.
- With the tripping of ICT-2, SPS had operated. However, load of Kamalwaganja shifted to 400/220kV 315 MVA ICT-1 and loading of ICT-1 remained on higher side.
- Further, ICT-1 tripped on overcurrent protection operation due to overloading.
- Issue of DC earth fault at 220kV side at Kashipur(Utt) has been rectified.
- On query of NRLDC regarding overcurrent protection setting in ICT at Kashipur, it was informed that overcurrent setting has been kept at 100%.

NRLDC representative stated that as per protection philosophy approved by PSC forum, IDMT overcurrent pick up setting should be in the range of 110-150%. PTCUL was requested to review and revise the protection setting. Further, PTCUL was also requested to review the SPS scheme as even after operation of SPS, ICT-1 got tripped.

PTCUL agreed for revision of overcurrent protection setting in line with the protection philosophy.

Forum Recommendations:

- *PTCUL shall review the SPS scheme at 400/220kV Kashipur S/s.*
- *Overcurrent protection setting (IDMT) need to be revised in line with the approved protection philosophy.*
- *Proper operation of protection system needs to be ensured.*
- *Timely submission of disturbance recorder (DR) and event logger (EL) files need to be ensured. As per IEGC clause 37.2 (c), Disturbance Recorder (DR), station Event Logger (EL), Data Acquisition System (DAS) shall be submitted within 24 hrs of the event.*

H. Multiple elements tripping at 220kV Dausa(RS) on 21st October 2024

Discussion during the meeting:

i. Brief of the event shared by NRLDC representative based on detail available is as follows:

- 220/132kV Dausa(RS) has double main and transfer bus scheme at 220kV level.
- During antecedent condition, 220 kV Alwar(RS)-Dausa(RS) Ckt was not in service.
- As reported, at 15:32 hrs, R-phase CVT of Main-Bus-I flashover occurred due to reptile climbing on structure at Dausa end and bus fault created. Bus bar protection at Dusa(RS) was not operational during the event and due to delay in opening of bus coupler (bus coupler opening delay setting was 110ms), fault was also sensed by Main Bus-II.
- Due to this bus fault, all the 220kV lines connected to Bus-I & II at Dausa(RS) sensed the fault in zone-4 and fault cleared from Dausa(RS) end in zone-4 (zone-4 delay setting was 160ms). But in 220 KV Lalsote(RS)-Dausa(RS) (PG) Ckt and 220 KV Bassi(PG)-Dausa(RS) (PG) Ckt-2, CB didn't open from Dausa(RS) end and finally fault cleared in zone-2 from remote end.
- During the same time, 220/132kV 160MVA ICT-1 and 100MVA ICT-2 at Dausa(RS) also tripped on over-current protection operation (exact reason yet to be shared).
- As all the elements connected to both the 220kV buses tripped and there was no source of supply at 132kV level, complete blackout occurred at 220/132kV Dausa(RS) S/s.
- As per DR at Lalsote end of 220 KV Lalsote(RS)-Dausa(RS) (PG) Ckt, R-N phase to earth fault occurred with fault current of 1.729kA from Lalsote end and fault sensed in zone-2 at Lalsote end.
- As per PMU at Bassi(PG), R-N phase to earth fault converted to R-B-N double phase to earth fault with delayed fault clearing time of 560ms is observed.
- As per SCADA, change in demand of approx. 170 MW is observed in Rajasthan control area.
- **Major observations:**
  - Why was bus bar protection at Dausa(RS) not operational during the event?
  - Reason for delay in bus coupler CB opening need to be shared.

- Why line CB at Dausa(RS) end of 220 KV Lalsote(RS)-Dausa(RS) (PG) Ckt and 220 KV Bassi(PG)-Dausa(RS) (PG) Ckt-2 didn't trip in zone-4?
- Exact reason of tripping of 220/132kV 160MVA ICT-1 and 100MVA ICT-2 at Dausa(RS) need to be shared.
- SCADA data at 220/132kV Dausa(RS) freezed after the event. Availability and healthiness of the same need to be ensured.
- DR/EL (.dat/.cfg file) of all the tripped elements along with detailed tripping report need to be shared from Rajasthan end (Same DR submitted for all the circuits for Dausa end; clarification needed)
- Submitted DR was not time synced.
- Remedial action taken report to be shared.

ii. RVPNL representative and others informed the following:

- Fault occurred due to snake which climbed on R-ph bus CVT. Due to this, main CVT switch blown off.
- Main-1 relay in all the feeders are of numerical type and configured with bus CVT. Main-2 relays are of static type and configured with line CVT. One limitation is that Z-4 time delay setting in Main-2 relay (static type) can't be set below 1sec.
- Therefore, due to blowing off of main bus CVT, distance protection (main-1) in all the feeders got blocked. Main-2 relay sensed fault in Z-4 but to high time delay they couldn't operate.
- Bus bar protection was also not in operating state due to issue of isolator status.
- Fault cleared with the tripping of lines from remote end in Z-2. Bassi feeder tripped from remote end with 500msec time delay in Z-2. Its time delay setting has been revised to 350msec.
- Issue related to isolator status has been rectified and bus bar protection is now healthy.
- Process of replacement of static relays with numerical relays has been started.
- Issue related to time synchronization of recording instruments will also be rectified.

Forum Recommendations:

- *RVPNL will expedite the replacement of all the static relays at 220kV Dausa S/s with numerical relays.*
- *Time synchronization of all the recording instruments need to be ensured.*
- *Proper operation of protection system needs to be ensured.*
- *Timely submission of disturbance recorder (DR) and event logger (EL) files need to be ensured. As per IEGC clause 37.2 (c), Disturbance Recorder (DR), station Event Logger (EL), Data Acquisition System (DAS) shall be submitted within 24 hrs of the event.*

I. Multiple elements tripping at 400kV Alwar (RS) on 30th October 2024

Discussion during the meeting:

i. Brief of the event shared by NRLDC representative based on detail available is as follows:

- 400/220kV Alwar400(RS) has one and half-breaker scheme at 400kV level and double main and transfer bus scheme at 220kV level. 400 KV Alwar(ATIL)-Hindaun(RS) (ATIL) Ckt is the only 400kV line connected to Alwar400(RS). The active power coming from Hindaun(RS) goes to Alwar(RS), Alwar MIA(RS), Mandawar(RS) and Dausa(RS) through two 400/220kV ICTs at Alwar400(RS).
- During antecedent condition, 220kV Alwar400-Dausa(RS) Ckt was on no-load. 400 KV Alwar(ATIL)-Hindaun(RS) (ATIL) Ckt was carrying 356 MW.
- As reported, at 14:15 hrs, 400 KV Alwar(ATIL)-Hindaun(RS) (ATIL) Ckt tripped on R-Y-N double phase to earth fault with fault current of 5.759kA and 5.272kA in R and Y phase respectively from Hindaun(RS) end; fault sensed in zone-1 at Hindaun(RS) end (exact reason and location of fault yet to be shared).
- As 400 KV Alwar(ATIL)-Hindaun(RS) (ATIL) Ckt is the only source of power at Alwar400(RS), with the tripping of this line there was no source of power left to any of the 220kV feeders. Hence complete blackout occurred at 400/220kV Alwar400(RS).

- As per SCADA SOE, 220kV Alwar-Kukas(RS) Ckt also tripped during the same time (exact reason of the same yet to be shared).
- As per PMU at Bassi(PG), R-N phase to earth fault is observed with fault clearing time of 80 ms.
- As per SCADA, change in demand of approx. 500 MW is observed in Rajasthan control area.
- **Major observations:**
  - Exact reason and location of fault need to be shared.
  - As per SCADA SOE, 220kV Alwar-Kukas(RS) Ckt also tripped during the same time. Exact reason of the same need to be shared.
  - DR/EL (.dat/.cfg file) of all the tripped elements along with detailed tripping report need to be shared from both the ends.
  - Remedial action taken report to be shared.

ii. RVPNL representative and others informed the following:

- At 14;15 Hrs, 400 KV Alwar(ATIL)-Hindaun(RS) ckt tripped with ph-ph Z1 indication from Hindaun end. The distance recorded by the relay was 4.2 Km with fault current 5.78 kA. During patrolling of line, no visible fault was observed.
- 400/220kV Alwar S/s has feeding at 220kV side also from 220kV Bansur & 220kV Kukas S/s.
- 220kV Alwar-Kukas line tripped on Z-4 (forward) (EPAC distance relay) from Kukas end. The current recorded in all the three phases were ~1.25KA. This was basically an overloading condition however, due to wrong reach setting of Z-4, the relay operated in Z4 (Forward). This setting has been revised and corrected. The relay is of static type therefore no DR recorded at Kukas end.
- Further, 220kV Alwar-Bandur line also tripped on I> (Overloading), as this was the only source remaining as a source for 220KV Alwar S/S and its adjoining substations.
- Z-4(Forward) setting at 220 KV S/S Kukas and Z-3 Setting at 220kV Bansur S/s were found on much higher side. Both the settings have been corrected

NRLDC representative raised concern over radial feeding of 400kV Alwar S/s, due to which frequent incidents of load loss are observed. Further, low voltage issues at Alwar, Hinduan area was also highlighted. RVPNL was requested to discuss this issue with their planning division for strengthening of system in this area. For time being, a suitable SPS may be designed at 400/220kV Alwar S/s to avoid complete blackout of the station.

Forum Recommendations:

- *RVPNL shall design a suitable SPS for 400/220kV Alwar S/s a propose the same in next OCC/PSC meeting for discussion.*
- *Healthiness of protection system and their proper operation need to be ensured.*
- *Timely submission of disturbance recorder (DR) and event logger (EL) files need to be ensured. As per IEGC clause 37.2 (c), Disturbance Recorder (DR), station Event Logger (EL), Data Acquisition System (DAS) shall be submitted within 24 hrs of the event.*

A.21.9 Grid event analysis details of all the aforementioned grid incidents is attached as **Annexure-XXI.**

A.22. Details of tripping of Inter-Regional lines from Northern Region for October' 24 (agenda by NRLDC)

A.22.1 A total of 6 inter-regional lines tripping occurred in the month of October'24. The list is attached at **Annexure-XXII.** The status of receipt of preliminary reports, DR/EL within 24hrs of the event and fault clearing time as per PMU data has also been mentioned in the table. The non-receipt of DR/EL & preliminary report within 24hrs of the event from SLDCs / ISTS licensees / ISGSs is in violation of regulation 37.2(c) of IEGC and regulation 15(3) of CEA Grid Standards. As per regulations, all the utilities shall furnish the DR/EL, flag details & preliminary report to RLDC/RPC within 24hrs of the event. They shall also furnish the detailed investigation report within 7 days of the event if fault clearance time is higher than that mandated by CEA (Grid Standard) Regulations.

A.22.2 Members were requested to please note and advise the concerned for taking corrective action to avoid such tripping as well as timely submission of the

information.

A.22.3 NRLDC representative highlighted the frequent tripping of 220 KV Auraiya(NT)-Mehgaon(MP) (MPSEB) Ckt-1 and issue of non-operation of A/R in line. NTPC was requested to apprise the forum about the cause of frequent tripping and remedial action taken to avoid the trippings.

A.22.4 Members from NTPC were not present in the meeting. Member of NTPC Green was requested to communicate the meeting discussion with NTPC for necessary actions at their end.

Decision taken by Forum:

Forum recommended NTPC to take necessary actions to minimise the tripping and ensure proper operation of A/R in line.

A.23. Availability and Standardization of recording instruments (Disturbance recorder and Station Event Logger) (agenda by NRLDC)

A.23.1 As per IEGC clause 17

1) All users shall keep the recording instruments (disturbance recorder and event logger) in proper working condition.
2) The disturbance recorders shall have time synchronization and a standard format for recording analogue and digital signals.

A.23.2 IEGC clause 37.2 (c) also mandates the submission of Disturbance Recorder (DR), station Event Logger (EL), Data Acquisition System (DAS) within 24 hrs of the event.

A.23.3 NRLDC representative highlighted that during FTC process, cases of non-availability of station event logger and non-standardisation of recording instruments have been observed.

A.23.4 Data of recording instruments (DR/EL) are very helpful in grid event analysis and is being used in availability verification of transmission lines. Complete and conclusive analysis of any grid event is not possible without these recording instruments and thus their standardisation is very important.

A.23.5 Therefore, availability of disturbance recorder with standardisation, time sync and

correct nomenclature and station event logger need to be ensured by users at the station of their respective control area.

A.23.6 Deliberation on this subject is going on from 50th PSC meeting. Details were received from Rajasthan, UP, Uttarakhand & Haryana only. Details received is attached as **Annexure-XXIII.**

A.23.7 In view of above, all the constituents were requested share the updated details w.r.t. availability and standardisation of disturbance recorder and event logger at the station of their respective control area in format attached as **Annexure-XXIII.**

A.23.8 NRLDC representative further highlighted that as per details received there are large number of stations where recording instruments are not as per standard. Such as approx. 43 number of stations in Rajasthan, 54 number of stations in Uttar Pradesh and 7 number of stations in Uttarakhand are non-complaint w.r.t. requirement of recording instrument.

A.23.9 Constituents were requested to take expeditious actions to ensure standardisation of recording instruments at stations in their respective control area. Other constituents who haven't share the status yet were requested to share the compliance status at substation of their control area at the earliest.

Decision taken by Forum:

Forum requested all the members to share the status of their control area and ensure the standardisation of recording instruments at all the stations in their control area.

A.24. Corrective action for healthiness of 500kV Mundra-Mahindergarh SPS (agenda by NRLDC)

A.24.1 On 17th May 2024 on outage of both pole (carrying total ~1500MW), SPS of 500kV HVDC Mundra-Mahindergarh inter regional link didn't operate. This issue was discussed during 51st PSC meeting and ADANI was requested to share the details w.r.t. SPS operation during the meeting.

A.24.2 Further, NRLDC in coordination with NLDC conducted an online discussion meeting with concerned stakeholders (SLDCs, ADANI, POWERGRID) on 12th August 2024, for further remedial actions required to make this SPS healthy.

A.24.3 Following actions were decided during the meeting:

i. POWERGRID, ADANI and concerned states were requested to identify the issue in communication links and take expeditious actions to make the all the communication link healthy. POWERGRID & ADANI shall review the healthiness of SPS system at different load centres and communication path between them in coordination with the SLDCs.

ii. States were requested to go through the details of load feeders mentioned in SPS document and share the changes / modifications as per present scenario and share the inputs w.r.t. unavailability in identified load feeders and load shedding. SLDCs shall share the revised updated feeder details (radial) along with expected average/peak load relief through respective feeders.

iii. SLDCs in coordination with their transmission and protection team shall share the status and healthiness of existing SPS system along with details of availability of communication path for incorporation of proposed revised/additional feeders.

A.24.4 Load end details have been received from UP, Haryana, Punjab Rajasthan & Delhi. Details are attached as **Annexure-XXIV.**

A.24.5 Regarding communication network and hardware system, ADANI has submitted the status of their healthiness. As per details submitted, counter status was found OFF at Alwar, Ratangarh, Gobindgarh, Malerkotla, Bamnauli, Shamli and Dhanonda.

A.24.6 Constituents were also requested to share the nodal officer for coordination with the ADANI team for further remedial actions. Details received from UP, Punjab, Rajasthan & Haryana. BBMB & Delhi are requested to share the details of their control area at the earliest.

A.24.7 NRLDC representative stated that during 53rd PSC meeting, ADANI was requested to coordinate with the respective states to rectify the issues in the SPS system and share the status of remedial action taken / planned to be taken.

A.24.8 ADANI agreed for the same and stated that update would be given within 01 week. However, no detail received yet from ADANI.

A.24.9 ADANI was requested to apprise the forum about the present status of remedial actions.

A.24.10 ADANI representative stated that TnC wing is looking after this, member of the same were not present in the meeting. He stated that as per information received, OEM has done preliminary inspection at stations. He will communicate TnC wing to share the status of remedial action at the earliest.

Decision taken by Forum:

Forum emphasized the importance of 500kV Mundra-Mahindergarh SPS and its healthiness is important to ensure secure & reliable operation of grid. ADANI was to coordinate with the respective states to rectify the issues in the SPS system and share the status of remedial action taken / planned to be taken. Desired remedial actions need to be expedited.

A.25. Review and uniformity of df/dt (ROCOF) protection philosophy in Northern Region (agenda by NRLDC)

A.25.1 Multiple incidents of load shedding on df/dt (ROCOF) protection operation have been reported during recent past. Major operations were reported from Punjab control area. Delhi, Rajasthan & UP have also reported load shedding on df/dt operation during some of the incidents. Incidents during which df/dt operation have reported is attached as **Annexure XXV**.

A.25.2 In view of frequent incidents of tripping of distribution feeders on df/dt operation, analysis and review of df/dt operation is necessary. Communication has already been sent to SLDCs via mail to provide details of stage wise quantum of load relief on df/dt operation and protection setting adopted (average cycle, time delay etc.)

A.25.3 Partial details received from Delhi and Punjab.

A.25.4 SLDCs were requested to share the adopted philosophy of df/dt protection and confirm whether uniform philosophy has been adopted throughout the state or not. Kindly share the details at the earliest so that analysis and review of df/dt operation and its philosophy may be done.

A.25.5 Further review of df/dt protection setting also need to be done to ensure its uniformity and to avoid undesired operation and load loss.

A.25.6 NRLDC representative requested respective control area to ensure the DR triggering facility in df/dt relay for analysis and monitoring purpose. Necessary actions need to

be initiated if DR triggering and recording facility is not available for df/dt relays.

Decision taken by Forum:

Forum requested SLDCs who haven't shared the data yet to share the data w.r.t. df/dt at the earliest and take necessary actions to incorporate DR triggering facility in df/dt relays.

A.26. Frequency response performance for the reportable events of month of October 2024 (agenda by NRLDC)

A.26.1 In the month of October 2024, only 1 no. of reportable event on 21st October 2024 was notified by NLDC for which FRC/ FRP need to be calculated and the same along with high resolution data need to be submitted to RLDC. Description of the event is as given below table:

S. No.	Event Date	Time (In hrs.)	Event Description	Starting Frequency (in Hz)	Nadir Frequency (in Hz)	End Frequency (in Hz)	*Δf*	NR FRP during the event
1	21-Oct-24	16:49 hrs	As reported, at 16:49 hrs (solar hours) on 21st October, 2024, generation loss event of around 1114 MW occured at DB Power generating station, WR. Hence net generation loss of 1114 MW is considered for FRC/FRP Calculation.	49.998	49.885	49.965	-0.03	0.29

A.26.2 As per IEGC 2023 Clause 30.8, "The primary response of the generating units shall be verified by the Load Despatch Centres (LDCs) during grid events. The concerned generating station shall furnish the requisite data to the LDCs within two days of notification of reportable event by the NLDC."

A.26.3 As per IEGC 2023 Clause 30.10.(n), "Each control area shall assess its frequency response characteristics and share the assessment with the concerned RLDC along with high resolution data of at least 1 (one) second for regional entity generating

stations and energy storage systems and 10 (ten) seconds for the state control area." As per sub-clause (a(v)) of clause (9) of IEGC 2023 Annexure-2, "All the SLDCs shall work out FRC for all the intra-state entities (for events indicated by the Regional Load Despatch Centres) based on the HDR available at their respective SLDCs and submit the same to respective RLDC within six (6) working days after the event. (Format as per Table-B)."

A.26.4 As per sub-clause (a(vi)) of clause (9) of IEGC 2023 Annexure-2, "All regional entity generating stations shall also assess the FRC for their respective stations and submit the same to respective RLDC within six (6) working days. (Format as per Table-B). The high-resolution data (1 second or better resolution) of active power generation and frequency shall also be shared with RLDC."

A.26.5 Status of details received from constituents as on 05th November, 2024 is:

FRC computation and data submission status		
S. No	Control Area	Event Date
		21-10-2024
1	Punjab	Not Received
2	Haryana	Received
3	Rajasthan	Not Received
4	Delhi	Not Received
5	Uttar Pradesh	Not Received
6	Uttarakhand	Received
7	Chandigarh*	Not Received
8	Himachal Pradesh	Received
9	J&K(UT) and Ladakh(UT)	Not Received
10	Dadri -1 (TH)	Received
11	Dadri -2 (TH)	Received
12	Jhajjar (TH)	Received
13	Rihand-1 (TH)	Received
14	Rihand-2 (TH)	Received
15	Rihand-3 (TH)	Received
16	Shree Cement (TH)	Not Received
17	Singrauli (TH)	Received
18	Tanda-2 (TH)	Received
19	Unchahar-I (TH)	Received
20	Unchahar-II (TH)	Received
21	Unchahar-III (TH)	Received
22	Unchahar stg-4 (TH)	Received
23	Anta (G)	Not Received
24	Auraiya (G)	Received
25	Dadri (G)	Not Received

26	AD Hydro (H)	Received
27	Bairasiul (H)	Not Received
28	Bhakra (H)	Not Received
29	Budhil (H)	Not Received
30	Chamera-1 (H)	Received
31	Chamera-2 (H)	Not Received
32	Chamera-3 (H)	Not Received
33	Dehar (H)	Not Received
34	Dhauliganga (H)	Not Received
35	Dulhasti (H)	Not Received
36	Karcham (H)	Received
37	Kishanganga	Not Received
38	Koldam (H)	Received
39	Koteshwar (H)	Received
40	Malana-2 (H)	Not Received
41	Nathpa Jhakri (H)	Received
42	Parbati-2 (H)	Not Received
43	Parbati-3 (H)	Not Received
44	Pong (H)	Not Received
45	Rampur (H)	Not Received
46	Sainj (H)	Not Received
47	Salal (H)	Not Received
48	Sewa-II (H)	Not Received
49	Singoli Bhatwari (H)	Not Received
50	Sorang (H)	Not Received
51	Tanakpur (H)	Not Received
52	Tehri (H)	Received
53	Uri-1 (H)	Not Received
54	Uri-2 (H)	Not Received

A.26.6 Frequency Response Performance (FRP) of generating stations for each reportable event are calculated based on the submitted high resolution data from generating stations. However, the generating stations for which data is not received till 05th November, 2024, FRC/FRP as per NRLDC HDR data is used for computation of Average Monthly Frequency Response Performance, Beta 'β' for Generating Stations.

A.26.7 FRP values as considered (as per NRLDC HDR data/ generator high resolution data) for the events of October, 2024 is as follows:

Frequency response Performance		
S. No	Control Area	Event Date
		21-10-2024
1	Punjab	0.43

2	Haryana	0.37
3	Rajasthan	0.50
4	Delhi	-3.28
5	Uttar Pradesh	-0.34
6	Uttarakhand	0.43
7	Chandigarh*	NA
8	Himachal Pradesh	-6.00
9	J&K(UT) and Ladakh(UT)	-1.41
10	Dadri -1 (TH)	13.73
11	Dadri -2 (TH)	0.00
12	Jhajjar (TH)	5.33
13	Rihand-1 (TH)	5.52
14	Rihand-2 (TH)	2.37
15	Rihand-3 (TH)	3.31
16	Shree Cement (TH)	0.00
17	Singrauli (TH)	2.65
18	Tanda-2 (TH)	0.49
19	Unchahar-I (TH)	6.92
20	Unchahar-II (TH)	1.87
21	Unchahar-III (TH)	No Gen
22	Unchahar stg-4 (TH)	3.85
23	Anta (G)	No Gen
24	Auraiya (G)	No Gen
25	Dadri (G)	No Gen
26	AD Hydro (H)	No Gen
27	Bairasiul (H)	0.00
28	Bhakra (H)	0.03
29	Budhil (H)	No Gen
30	Chamera-1 (H)	No Gen
31	Chamera-2 (H)	-2.44
32	Chamera-3 (H)	No Gen
33	Dehar (H)	-0.50
34	Dhauliganga (H)	5.37
35	Dulhasti (H)	35.28
36	Karcham (H)	20.30
37	Kishenganga	0.00
38	Koldam (H)	5.27
39	Koteswar (H)	-3.17
40	Malana-2 (H)	NA
41	Nathpa Jhakri (H)	2.23
42	Parbati-2 (H)	0.00
43	Parbati-3 (H)	No Gen
44	Pong (H)	-0.28
45	Rampur (H)	11.92
46	Sainj (H)	No Gen
47	Salal (H)	-1.42
48	Sewa-II (H)	No Gen
49	Singoli Bhatwari (H)	-0.62

50	**Sorang (H)**	0.11
51	**Tanakpur (H)**	-2.70
52	**Tehri (H)**	3.91
53	**Uri-1 (H)**	-0.01
54	**Uri-2 (H)**	0.00

A.26.8 Memebers were requested to analyse the frequency response of their respective control area and share the FRC/FRP analysis of generating stations along with unit wise 01 sec data as per timeline for ensuring IEGC compliance.

A.26.9 ISGS were requested to confirm whether FGMO as per IEGC 2023 has been implemented at their respective stations or not. Updated sheet on the basis of details receicved is as follows:

Sl. No.	Entity	Capacity(MW)	Governor Mode (FGMO as per IEGC 2023) Yes or No	Droop setting (%)	Remarks (if any)
1	Dadri-1 (TH)	4*200			
2	Dadri -2 (TH)	2*490			
3	Jhajjar (TH)	3*500			
4	Rihand-1 (TH)	2*500	Yes	5.0	Under Implementation
5	Rihand-2 (TH)	2*500	Yes	5.0	Under Implementation
6	Rihand-3 (TH)	2*500	Yes	5.0	Under Implementation
7	Shree Cement (TH)	(2 * 150)			
8	Singrauli (TH)	2*500+5*200			
9	Tanda-2 (TH)	2*660			
10	Unchahar stg-4 (TH)	1*500			
11	Unchahar (TH)	2*210			
12	Anta (G)	(1 * 153.2 + 3 * 88.71)			
13	Auraiya (G)	(2 * 109.3 + 4 *			

		111.19)			
14	Dadri (G)	(2 * 154.51 + 4 * 130.19)			
15	AD Hydro (H)	(2 * 96)	YES	4.0	-
16	Bairasiul (H)	(3 * 60)	Yes	4.0	
17	Bhakra (H)	(5 * 126 + 5 * 157)			
18	Budhil (H)	(2 * 35)			
19	Chamera-1 (H)	(3 * 180)	Yes	5.0	
20	Chamera-2 (H)	(3 * 100)	Yes	5.0	
21	Chamera-3 (H)	(3 * 77)	Yes	4.0	
22	Dehar (H)	(6 * 165)			
23	Dhauliganga (H)	(4 * 70)	Yes	5.0	
24	Dulhasti (H)	(3 * 130)	Yes	5.0	
25	Karcham (H)	(4 * 261.25)	Yes	5.0	
26	Kishenganga	(3 * 110)	Yes	4.0	
27	Koldam (H)	(4 * 200)	Yes	4.0	
28	Koteswar (H)	(4 * 100)	Yes	4.0	
29	Malana-2 (H)	(2 * 50)			
30	Nathpa Jhakri (H)	(6 * 250)	Yes	5.5	
31	Parbati-2 (H)	(4 * 200)			
32	Parbati-3 (H)	(4 * 130)	Yes	4.0	
33	Pong (H)	(6 * 66)			
34	Rampur (H)	(6 * 68.67)			
35	Sainj (H)	(2 * 50)			
36	Salal (H)	(6 * 115)	Yes	3.0	
37	Sewa-II (H)	(3 * 40)	Yes	4.0	
38	Singoli Bhatwari (H)	(3 * 33)			
39	Sorang (H)	(2 * 50)			
40	Tanakpur (H)	(1 * 31.42 + 2 * 31.4)	Yes	4.0	
41	Tehri (H)	(4 * 250)	Yes	4.0	
42	Uri-1 (H)	(4 * 120)	Yes	6.0	
43	Uri-2 (H)	(4 * 60)	Yes	5.0	

A.26.10 NRLDC highlighted non compliance / unsatisfactory data submission status and requested all the memebers for timley computation of FRC/FRP and analysi of

governor response of their trespective control area.

A.26.11 Members were requested to ensure implementation of FGMO as per IEGC 2023 at generating stations in their respective control area and share the present status.

A.26.12 NRLDC representative highlighted that FRC/FRP computation sheet received from Haryana, Uttarakhand and HP only. Other SLDCs were requested to conduct the FRC/FRP computation as per procedure and timeline specified in IEGC 2023. Haryana, Rajasthan and Punjab agreed for the same.

A.26.13 NRLDC also requested SLDCs and other generating stations to implement data extracting facility if not available, in line with the data requirement mentioned in IEGC.

A.26.14 Among ISGS, data have been received from Auraiya GPS, AD Hydro HEP, Karcham HEP, Koldam HEP, Chamera-I HEP, Koteshwar HEP, Nathpa Jhakri HEP and Tehri HEP only. Other ISGS also requested to share the FRC data of their respective stations for each reportable event.

A.26.15 NHPC representative stated that delayed submission of their data is due to issue in data extracting facility. It was informed that they are following up with OEM to implement data extracting facility as per requirement in IEGC 2023 and same will be resolved on priority.

A.26.16 NRLDC representative stated that timelines for FRC/FRP data submission is very clear in IEGC and compliance of the same is very important as it is linked with ‘’beta’’ computation. In view of this, NHPC was requested to take expeditious actions to resolve the issues and ensure timely submission of FRC/FRP data. Other non-complaint control areas were also requested to ensure the same

Decision taken by Forum:

Forum requested members to share the FRC data and analysis fo FRC response of their respective control area as per FTC/FRP compuation procedure and also ensure complaince as per IEGC 2023.

A.27. Mock trial run and testing of black start facilities at generating stations in Northern Region (agenda by NRLDC)

A.27.1 As per Indian Electricity Grid Code (IEGC) clause 34.3

"*Detailed procedures for restoration post partial and total blackout of each user system within a region shall be prepared by the concerned user in coordination with the concerned SLDC, RLDC or NLDC, as the case may be. The concerned user shall review the procedure every year and update the same. The user shall carry out a mock trial run of the procedure for different sub-systems including black-start of generating units along with grid forming capability of inverter based generating station and VSC based HVDC black-start support at least once a year under intimation to the concerned SLDC and RLDC. Diesel generator sets and other standalone auxiliary supply source to be used for black start shall be tested on a weekly basis and the user shall send the test reports to the concerned SLDC, RLDC and NLDC on a quarterly basis*".

A.27.2 Hydro and gas-based plants are capable of self-black-start. Conducting periodic mock black start exercises are extremely important to ensure the healthiness of black start facilities and also to build awareness as well as confidence among the system operators.

A.27.3 In view of above, regional entity generating stations shall conduct the dead bus charging of their units on rotation basis as per availability of schedule under intimation to the NRLDC. Testing of Diesel generator sets and other standalone auxiliary supply source to be used for black start shall also be done on a weekly basis. SLDC shall also ensure the same in their respective control area. This will ensure the healthiness of blackstart facility at generating stations. Further, NRLDC shall coordinate with the ISGS and states to conduct the mock black start exercise of subsystems.

A.27.4 Therefore, regional entity generating stations and SLDCs were requested to share the annual schedule plan for conducting dead bus charging / mock black start exercise of generating stations / sub-systems during 2024-25 in the format attached as Annexure-**XXVI**. Constituents were also requested to share the test report of diesel generators / auxiliary supply on a quarterly basis. In this regard, a communication has already been sent to constituents through NRLDC letter dated

24.04.2024.

A.27.5 Details received from AD Hydro HEP, Tehri HEP, Karcham Wangtoo HEP, Koteshwar HEP, SJVN, NHPC, Budhil, Auraiya GPS, Singoli Bhatwari HEP, Koldam HEP, Dadri GPS, Delhi, Punjab and Uttarakhand.
NRLDC representative informed the that mock black start exercises conducted during 2024-25 till date is as follows:

a) GTPS (IPGCL) on 10.04.2024
b) Ranjit Sagar Dam(RSD) HEP on 07.05.2024
c) Kishenganga HEP on 09.11.2024
d) Tehri HEP on 13.11.2024
e) Koteshwar HEP on 27.11.2024

Decision taken by Forum:

Members were requested to share the tentative schedule of mock black start exercise of generating stations in their respective control area. SLDCs were also requested to share the tentative schedule plan of mock black start exercise of generating stations in their respective control area and share the report of the same. Members were requested to conduct dead bus charging after self-starting the generating station if schedule with load is not available. Further, members were also requested to share the test report of weekly DG testing on monthly/quarterly basis.

A.28. Mock testing of System Protection Schemes (SPS) in Northern Region (agenda by NRLDC)

A.28.1 As per IEGC clause 16.2

‘’For the operational SPS, RLDC or NLDC, as the case may be, in consultation with the concerned RPC(s) shall perform regular load flow and dynamic studies and mock testing for reviewing SPS parameters & functions, at least once in a year. RLDC or NLDC shall share the report of such studies and mock testing including any short comings to respective RPC(s). The data for such studies shall be provided by CTU to the concerned RPC, RLDC and NLDC.’’

A.28.2 As per IEGC clause 16.3

''The users and SLDCs shall report about the operation of SPS immediately and detailed report shall be submitted within three days of operation to the concerned RPC and RLDC in the format specified by the respective RPCs.''

A.28.3 There are 53 numbers of System Protection Scheme (SPS) approved in Northern Region out of which 05 number of SPS are under implementation stage. These SPS are implemented at major generation complexes, important evacuating transmission lines and ICTs which are N-1 non-complaint. Details of SPS in Northern Region is available on NRLDC website at link https://nrldc.in/download/nr-sps-2024/?wpdmdl=13255&lang=en .

A.28.4 SPS is designed to detect abnormal system conditions and take predetermined, corrective action to preserve system integrity and provide acceptable system performance. Therefore, correct operation of SPS as per designed logic is important to serve its purpose. To ensure this, mock testing of SPS needs to be conducted at a regular period. Clause 16.2 of IEGC 2023 also mandates the mock testing of SPS for reviewing SPS parameters & functions, at least once a year.

A.28.5 In view of the above, concerned constituents / utility were requested to share the tentative schedule plan for conducting mock testing of SPS in their respective control area during 2024-25 in format attached as **Annexure-XXVII.** In this regard, a communication has already been sent to constituents through NRLDC letter dated 01.05.2024. Update in this regard received only from UP and Uttarakhand.

A.28.6 Members were requested to share the tentative schedule of mock testing of SPS implemented on their control area and share the report of the same.

A.28.7 NRLDC representative informed that UP has conducted ~70-80% of SPS schemes in their control area and requested Rajasthan, Punjab and other members to plan and conduct the SPS testing in their control area**.**

A.28.8 NRLDC representative asked UP to share the present status of SPS of 400kV Gr. Noida, Unnao & Sultanpur. In status report submitted by UP, it was mentioned that SPS at these stations are unhealthy., If yes, then necessary remedial actions may be taken to ensure the healthiness of SPS system.

A.28.9 UP representative informed that SPS at these stations are still unhealthy. UP agreed to follow up for necessary remedial actions in this regard.

A.28.10 Rajasthan representative informed that they have conducted mock testing of SPS in their control area and submitted the status report.

A.28.11 Updated status of Mock testing of SPS is attached as **Annexure-XXVIII.**

Decision taken by Forum:

Members were requested to conduct the mock testing of SPS in their respective control area, share the tentative schedule of mock testing of SPS and share the report of the same.

A.29. Periodic Testing of Generators, HVDC/FACTS Devices (agenda by NRLDC)

A.29.1 Regulation 40 (1) of CERC (IEGC) Regulations, 2023 stipulate that there shall be periodic tests, as required under clause (3) of this Regulation, carried out on power system elements for ascertaining the correctness of mathematical models used for simulation studies as well as ensuring desired performance during an event in the system.

A.29.2 The tests shall be performed once every five (5) years or whenever major retrofitting is done. If any adverse performance is observed during any grid event, then the tests shall be carried out even earlier, if advised by SLDC or RLDC or NLDC or RPC, as the case may be.

A.29.3 Further, Regulation 40(1)(b) stipulate that “All equipment owners shall submit a testing plan for the next year to the concerned RPC by 31st October to ensure proper coordination during testing as per the schedule. In case of any change in the schedule, the owners shall inform the concerned RPC in advance.”

A.29.4 Extract of IEGC 2023 clause 40,

“40. PERIODIC TESTING

(1) There shall be periodic tests, as required under clause (3) of this Regulation, carried out on power system elements for ascertaining the correctness of mathematical models used for simulation studies as well as ensuring desired performance during an event in the system.

(2) General provisions

(a) The owner of the power system element shall be responsible for carrying out tests as specified in these regulations and for submitting reports to NLDC, RLDCs, CEA and CTU for all elements and to STUs and SLDCs for intra-State elements.

(b) All equipment owners shall submit a testing plan for the next year to the concerned RPC by 31st October to ensure proper coordination during testing as per the schedule. In case of any change in the schedule, the owners shall inform the concerned RPC in advance.

(c) The tests shall be performed once every five (5) years or whenever major retrofitting is done. If any adverse performance is observed during any grid event, then the tests shall be carried out even earlier, if so advised by SLDC or RLDC or NLDC or RPC, as the case may be.

(d) The owners of the power system elements shall implement the recommendations, if any, suggested in the test reports in consultation with NLDC, RLDC, CEA, RPC and CTU.

(3) Testing requirements

The following tests shall be carried out on the respective power system elements:

Power System Elements	Tests	Applicability
Synchronous Generator	(1) Real and Reactive Power Capability assessment. (2) Assessment of Reactive Power Control Capability as per CEA Technical Standards for Connectivity (3) Model Validation and verification test for the complete Generator and Excitation System model including PSS. (4) Model Validation and verification of Turbine/Governor and Load Control or Active Power/ Frequency Control Functions. (5) Testing of Governor performance and Automatic Generation Control.	Individual Unit of rating 100MW and above for Coal/lignite, 50MW and above gas turbine and 25 MW and above for Hydro.
Non synchronous Generator (Solar/Wind)	(1) Real and Reactive Power Capability for Generator (2) Power Plant Controller Function Test (3) Frequency Response Test (4) Active Power Set Point change test. (5) Reactive Power (Voltage / Power Factor / Q) Set Point change test	Applicable as per CEA Technical Standards for Connectivity.
HVDC/FACTS Devices	(1) Reactive Power Controller (RPC) Capability for HVDC/FACTS (2) Filter bank adequacy assessment based on present grid condition, in consultation with NLDC. (3) Validation of response by FACTS devices as per settings.	To all ISTS HVDC as well as Intra-State HVDC/FACTS, as applicable

A.29.5 In accordance with above, Generators and HVDC/FACT owners were required to furnish the Testing schedule for 2024-25 by 31st October 2023.

A.29.6 The procedure for testing is available at the NLDC website at https://posoco.in/wpcontent/uploads/2023/09/Final-Procedure-of-Periodic-Testing-for-Power-SystemElements-submitted-to-CERC.pdf. This may be used for testing.

A.29.7 Along with testing, the mathematical models (preferably PSSE models) based on the results of testing need to be provided, so that All India case can be built with the respective generic models.

A.29.8 In 73rd NRPC meeting held on 21st May 2024, NRPC forum asked all the Generators

and HVDC/FACT owners may furnish the Testing schedule for 2024-25 at the earliest.

A.29.9 IOM dated 18th October 2024 issued from NLDC in this regard and sample testing format is attached as **Annexure-XXIX.**

A.29.10 Few of the members raised query regarding selection of 3rd party for audit. Forum suggested that it is responsibility of utility to select 3rd party on their own.

Decision taken by Forum:

Forum requested members to conduct the different testing mentioned in IEGC 2023 as applicable to your respective control area. Members were asked to furnish the Testing schedule for 2024-25 at the earliest.

A.30. Excessive SPS Tripping of 2x315 MVA, 400/220kV ICT's at STPS Suratgarh (agenda by Rajasthan SLDC)

A.30.1 AEE (P), NRPC apprised that the agenda was discussed in the 52nd PSC meeting wherein RVPN submitted that excessive interruptions (i.e. 39 Nos w.e.f. 18/5/24 to 22/7/24) has been observed due to operation of newly commissioned SPS at STPS Suratgarh since commissioning and a large load approx. 150 MW was affected due to same.

A.30.2 In that meeting, RVPN recommended the followings to update in the existing approved SPS scheme of STPS Suratgarh to avoid the power supply disturbance caused by gradual overloading instead of "N-l Contingency".

1) To update the settings of over current element used for SPS start on "ALL Phase" instead of "Any Phase". As in most of the trippings, there is very much unbalance between the phases and the same may cause undesired initiation of SPS.

2) To update the Current Setting (I>) from full load to 125 % of load on each ICT as per thermal capability of each ICT's.

3) To incorporate C.B. status in the tripping circuit of SPS on each 220 KV lines at both ends to avoid unnecessary trippings.

4) To Split the first stage of time delay of 1.0 sec (approx load relief of 150MW) at 220 KV GSS Bhadra by providing timer with 0.85 Sec (with load relief of 20 MW) and with 1.0 Sec (with load relief of rest 140 MW).

A.30.3 Forum accorded consent on point no. 3rd and 4th and directed RVPN to install underpower relay at the GSS and implement bifurcation of load relief at each stage.

A.30.4 Now, Point No. 01st & 02nd was again put up before the Forum by RVPN to update in the existing approved SPS scheme of STPS at Suratgarh as below:

a. To update the settings of over current element used for SPS start on "ALL Phase" instead of "Any Phase". As in most of the trippings, there is very much unbalance between the phases and the same may cause undesired initiation of SPS.

b. To update the Current Setting (I>) from full load to 125 % of load on each ICT as per thermal capability of each ICT's.

c. There is heavy Traction Load causing SPS operation due to sudden rise of 35 MVA approx for few seconds on two phases only which is within the thermal capability of 2X315 MVA ICT’s. The transformer is capable for continuous loading 505 Amp as per Transformer Name plate. The SPS setting may be done at 495 Amp on all three phases simultaneously or 505 Amp on any phase.

A.30.5 RVPN representative mentioned that momentary loading of railway causing dark in large area due to SPS operation. Therefore, RVPN proposed that SPS settings may be done at slightly more than 110% of rated current (~505A) on any phase. Further, he supported his proposal by adding that as per finalized transformer protection philosophy, over current is to be kept within 110-150% of full load.

A.30.6 RVUN representative commented that transformer rating in MVA depends on voltage also along with current. As RVPN mentioned that Transformer is designed for 505A this is applicable when transformer is at maximum tap. At normal tap transformer is designed for approx. 460A.

A.30.7 RVUN representative added that SPS operation is kept on 460A with 1, 1.2 and 1.5

Sec time setting for three different feeders. He highlighted that a transformer should not be operated continuously more than rated current for such time settings used in the SPS operation (i.e. 1, 1.2 & 1.5Sec). He also mentioned that the OEM also does not allow to operate the old transformers overloaded with definite time settings.

A.30.8 RVUN representative was not of view that settings of over current element used for SPS start on "ALL Phase" instead of "Any Phase".

A.30.9 AGEL representative conveyed that we are using the SPS operation starting from 105% with designated time settings. He also shared that overcurrent is being considered for all three phases. For traction case which pertains to Mundra SPS, operation has been considered on single phase.

A.30.10 UPPTCL representative suggested that in order to avoid operation of the old ICT of STPS on more than rated current continuously, over current protection settings for simultaneously three phase overloading may be kept at 100% with IDMT (this may be achieved by Boolean AND of individual phase IDMT trip outputs). Further, he added that to prevent the SPS operation due to sudden addition of traction load, the over current setting in SPS may be kept at 110% on single phase elements with already decided definite time settings.

A.30.11 RVUN representative reiterated that with the 110%, ICT is going to operate overloaded continuously for definite time which is not good for health of ICTs. RVPN representative commented that 110% loading will occur only when there will be traction load. So, it will be momentary and ICT will not be operating continuously on overloading.

A.30.12 Subsequently, Forum decided that above-mentioned suggestion of UPPTCL may be implemented and consequences may be shared in next meetings accordingly by RVUN and RVPN.

Decision taken by Forum:

Forum decided that over current protection settings for simultaneously three phase overloading may be kept at 100% with IDMT for ICT of STPS and the over current

setting in SPS may be kept at 110% on single phase elements with already decided definite time settings i.e. 1, 1.2 & 1.5Sec.

A.31. Revision in logic of Anpara SPS (agenda by UPSLDC)

A.31.1 UPSLDC representative apprised that vide its letter dated 14.11.2024 it was informed that a grid disturbance occurred on 23.09.2024 at 765 kV S/S Unnao and SPS operated at Anpara 'C' & 'D' TPS. During detailed analysis of the incident, Anpara 'C' informed that they have given 3 sec time delay in unit tripping logic of condition (iv) of SPS logic (enclosed as **Annexure-XXX**).

A.31.2 Further, as per discussion held in 53rd PSC meeting, Forum asked to review the logic.

A.31.3 In view of above, UPSLDC organized a meeting on 23.10.2024 to review the logic. Executive Engineer, ETD-ll, Varanasi informed that 400 kV Anpara-obra B line can sustain 1100 MW load for a short duration (Minutes of the meeting enclosed in the annexure-XXX).

A.31.4 In view of this, UPSLDC proposed to provide 3 sec time delay in the unit tripping of condition (iv) of approved logic and also mentioned that by providing 3 sec time delay, unit tripping may be avoided in case line loading exceeds 1000 MW momentarily.

A.31.5 NRLDC representative asked whether UPSLDC has checked the same by having studies. UPSLDC replied that necessary studies have been performed and verified the logic.

Decision taken by Forum:

Forum approved the above proposal of UPSLDC for revision in logic of Anpara SPS.

A.32. Modification in Auto-Recloser Scheme (agenda by POWERGRID)

A.32.1 POWERRGRID NR-1 has apprised that frequent faults occur in the downstream feeders of state utilities connected at Hissar (HVPNL Fatehabad Line-1 & 2), Mandola (DTL Wazirabad, Gopalpur & Narela), Baghpat (UPPTCL Shamli, Baghpat, Modipuram), Meerut (UPPTCL Shatabdinagar, Nara, Modipuram), and Saharanpur (UPPTCL Shamli). Several trippings have been reported for lines of these substations.

A.32.2 He further added that these faults tend to appear at the same locations and phases, suggesting that state utilities are not taking necessary actions to identify and resolve transmission line defects. The frequent faults on the downstream feeders are severely impacting the switchgear at these substations and pose a risk to the ICTs and GIS switchgears.

A.32.3 To prevent major outages, the following actions were proposed by POWERGRID:

i. Implement an **Adaptive Auto Reclose (AAR)** scheme for all 220kV downstream lines, excluding radial feeders. The circuit breaker (CB) at the POWERGRID end should only close after detecting a stable voltage from the state utility end for 200ms following the expiration of the auto-reclose (AR) dead time. If stable voltage is not detected for 200ms after the AR dead time, the CB at the POWERGRID end will lock out.

ii. If more than three faults occur on the same line within a month and no corrective action is taken by the state utility after notification from POWERGRID, the Auto Reclose (AR) at the POWERGRID end should remain OFF until the state utilities submit a detailed rectification report.

A.32.4 These actions are necessary to prevent major breakdowns of the ICTs and GIS switchgear and to avoid prolonged line outages, thereby enhancing grid security.

A.32.5 UPPTCL representative commented that these proposals have not been earlier found in any philosophy or guidelines. Further, if single line is owned by two utilities, then there will always be deadlock that who will take auto reclose attempt firstly.

A.32.6 He suggested that utilities may focus to ensure less trippings and corrective actions may be taken to reduce the fault in the lines.

A.32.7 POWERGRID representative highlighted that this adaptive auto-reclose philosophy will be applied for those lines which are completely owned by STUs.

A.32.8 RVPN representative was of view that there is no need to change the philosophy because line is getting successfully auto reclosed means there is no need of corrective action to be taken.

A.32.9 AGEL representative also was of view that philosophy should not be changed.

A.32.10 BBMB representative suggested that the adaptive auto reclose scheme may be implemented by POWERGRID with the specific utility or STU based on requirement by mutual understanding.

A.32.11 CGM, NRLDC conveyed POWERGRID to bring the history of faults for next discussion.

A.32.12 After detailed deliberation, Forum decided that there is no need to change the finalized protection philosophy. However, case to case basis, concerned utilities may mutually agree and arrive on consensus for implementation of adaptive auto reclose. Specific case may be discussed in PSC Forum for approval.

A.32.13 Generators desired to implement the adaptive auto reclose scheme at their end for lines evacuating from station. Forum decided to discuss the same during finalization of protection philosophy for the Generators.

Decision taken by Forum:

Forum decided that on case-to-case basis, concerned utilities may mutually agree and implement of adaptive auto reclose. Specific case may be discussed in PSC Forum for approval.

A.33. Constitution of Protection System Analysis Group (PSAG) (agenda by NRPC Secretariat)

A.33.1 MS, NRPC briefed that in the 14th NPC meeting (held on 03.02.2024), it was recommended that Protection System Analysis Group (PSAG) may be constituted at RPC level consisting of the members from RPC, NPC, NLDC, RLDC, PGCIL, a Protection Expert from the region along with the Entity under whose jurisdiction GD/GI occurred to analyse Grid Disturbances/Grid Incidents occurred at major/critical substations or at substations that affected critical/essential/strategic loads.

A.33.2 Since, PSC meeting of NRPC is being organized monthly wherein the major trippings (Grid Disturbances/Grid Incidents) are regularly discussed and based on the deliberation, the recommendations are given by the Forum to the concerned. Therefore, PSAG was not constituted for Northern Region.

A.33.3 However, the agenda was discussed in the 15th NPC meeting (held on 14.11.2024)

wherein Chairperson NPC directed to form the standing PSAG group to analyse the any critical or specific tripping/grid incident/grid disturbance etc. PSC shall continue to work on routine matter as being done presently.

A.33.4 In view of above, it was proposed that a PSAG may be constituted for Northern Region having members as per recommendation of 14th NPC including generator member.

A.33.5 MS, NRPC added that NTPC may also be included in the PSAG.

A.33.6 CGM, NRLDC enquired about the category of GD/GI to be discussed by the PSAG. Further, it was gathered that any critical or specific Grid Disturbance/Grid Incident recommended by NRPC Secretariat and NRLDC may be discussed in PSAG.

A.33.7 Subsequently, Forum decided that PSAG may be constituted having members from NRPC, NPC, NLDC, NRLDC, PGCIL, NTPC and a Protection Expert from the region along with the entity under whose jurisdiction GD/GI occurred and nominations may be asked accordingly.

A.33.8 Further, it was also decided that Protection Expert from the region may be nominated by STU/SLDC on rotational basis.

Decision taken by Forum:

Forum approved the constitution of Protection System Analysis Group (PSAG) having members from NRPC, NPC, NLDC, NRLDC, PGCIL, NTPC and a Protection Expert from the region along with the entity under whose jurisdiction GD/GI occurred to analyse any critical or specific Grid Disturbances/Grid Incidents recommended by NRPC Secretariat and NRLDC.

Meeting ended with a vote of thanks to the chair and special thanks to NHPC Ltd. for successfully hosting the meeting.

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Annexure-P

54th Protection Sub-Committee Meeting on 25.11.2024				
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Status of action taken on decision 53rd PSC meeting

S.N.	Agenda	Decision of 53rd PSC	Status of action taken
A.2	Submission of protection performance indices along with reason and corrective action taken for indices less than unity to NRPC Secretariat on monthly basis (agenda by NRPC Secretariat)	i) HPPCL, HPGCL, Meja Urja Nigam Limited, JSW Energy Limited (KWHEP), UT of J&K, Ladakh and Chandigarh, POWERLINK transmission limited, Sekura Energy Limited have not sent the protection performance indices for September, 2024. ii) BBMB representative conveyed to submit the protection performance indices shortly. iii) Forum also directed UPSLDC to ensure the protection settings of SEUPPTCL element as per philosophy of Northern Region. iv) PSTCL, MEIL Anpara Energy Limited & ADHPL have not shared the corrective action taken for event related to	i) All concerned were requested to submit protection performance indices at the earliest. ii) BBMB has submitted the same for transmission on date 20.11.2024. iii) UPSLDC informed that there was carrier issue at SEUPPTCL end. Detailed analysis is being done. iv) MEIL Anpara Energy Limited & ADHPL were requested to submit the corrective action at the earliest.

		performance indices less than unity. v) A letter may be sent to higher authorities of the concerned utilities and SLDCs to actively participate in the Protection Sub-Committee meeting	v) A letter dated 08.11.2024 has been sent to the concerned by NRPC Secretariat.
A.3	Annual protection audit plan for FY 2024-25 and third-party protection audit plan (agenda by NRPC Secretariat)	PSCPL representative conveyed that third–party protection audit plan will be submitted with in few days.	PSPCL has submitted the same for GATP and GHTP. For remaining, PSPCL was directed to submit.
A.5	Observations and Compliance of recommendations of protection audit (agenda by NRPC Secretariat)	i) CCGT, Bawana was requested to submit the compliance report of internal and third-party Protection audits of PPS-III. ii) UPSLDC and UPRVUNL were also requested to submit the compliance report of internal and third-party Protection audits.	(i) CCGT, Bawana submitted the same on 02.12.2024. (ii) UPSLDC informed that follow ups are being done with UPRVUNL in this matter.
A.15	Non operation of auto recloser at 220 kV S/S Saharanpur (PG) & 220	Forum directed POWERGRID to expedite the functioning and healthiness of Auto-	POWERGRID vide email dated 11.11.2024 submitted that the AR scheme

	kV s/S Baghpat (PG) (agenda by UPSLDC)	Recloser scheme at both Substations of 400 kV S/s Saharanpur (PG) and 400 kV S/s Baghpat (PG).	has been thoroughly checked at both the Saharanpur and Baghpat Substations. During testing on 04.11.2024, the AR was found to be functioning satisfactorily at both locations after modification of schemes.

Annexure-II

Status of perfomance indices report of October 2024		
S. No.	**Utility**	**Status of Protection Performance indices**
1	PGCIL	Recevied (NR-1, 2,3)
2	NTPC	Recevied (Unchahar, Dadri thermal, Koldam, Singrauli, Auriaya, Tanda
3	BBMB	Recevied (Transmission)
4	THDC	Recevied (Tehri, Koteshwar)
5	SJVN	Recevied (NJHPS, RHPS)
6	NHPC	Recevied
7	NPCIL	Recevied (RAP-5&6, RAP-3&4, RAP-A
8	Delhi SLDC	Not Recevied
9	Haryana SLDC	Not Recevied
10	Rajasthan SLDC	Not Recevied
11	Uttar Pradesh SLDC	Received (WUPPTCL, Alaknanda, Vishnuprayag)
12	Uttarakhand SLDC	Not Recevied
13	Punjab SLDC	Not Recevied
14	Himachal Pradesh SLDC	Not Recevied
15	DTL	Recevied
16	HVPNL	Recevied
17	RRVPNL	Recevied
18	UPPTCL	Recevied (All Zones)
19	PTCUL	Recevied
20	PSTCL	Not Recevied
21	HPPTCL	Recevied
22	IPGCL	Recevied (PPS-I, III)
23	HPGCL	Not Recevied
24	RRVUNL	Recevied
25	UPRVUNL	Recevied (DTPS Anpara, Parichha, Anpara-B, C, Harduaganj, Obra-B
26	UJVNL	Recevied (Dharshu, Tiloth, Khodri, Chibro, Vyasi)
27	HPPCL	Not Recevied
28	PSPCL	Recevied (RSD, GHTP, GATP, GGSSTP)
29	HPSEBL	Not Recevied
30	Prayagraj Power Generation Co. Ltd.	Recevied
31	Aravali Power Company Pvt. Ltd	Recevied
32	Apraava Energy Private Limited	Recevied
33	Talwandi Sabo Power Ltd.	Recevied
34	Nabha Power Limited	Recevied
35	MEIL Anpara Energy Ltd	Not Recevied
36	Rosa Power Supply Company Ltd	Recevied
37	Lalitpur Power Generation Company Ltd	Recevied
38	MEJA Urja Nigam Ltd.	Not Recevied
39	Adani Power Rajasthan Limited	Recevied
40	JSW Energy Ltd. (KWHEP)	Not Recevied
41	AESL	Recevied (ATIL, ATSCL, BKTL, FBTL, GTL, HPTSL, MTSCL, OCBTL)
42	Tata Power Renewable Energy Ltd.	Recevied (TPGEL, TPREL, Tata Power Sourya)
43	UT of J&K	Not Recevied
44	UT of Ladakh	Not Recevied
45	UT of Chandigarh	Not Recevied
46	INDIGRID	Recevied
47	POWERLINK	Not Recevied
48	ADHPL	Recevied
49	Sekura Energy Limited	Not Recevied

Reasons and Corrective actions taken by concerned utility for Performance Indices less than Unity- October 2024

UPPTCL

Case-1 Tripping of 400kV Meerut Muradnagar-II (Meerut Zone)

No. of unwanted operation -0

No. of correct operation-25

No. of failure to operate-1

Reason for failure to operate – Line CB failed at Mathura to clear the fault timely.

Corrective action taken- CB timing test has been done.

Case-2 Tripping of 400kV Muradnagar-II to Simbhawali Ckt-1,2 & Dadri line (Meerut Zone)

No. of unwanted operation -1 on each line

No. of correct operation-0

No. of failure to operate-0

Reason for unwanted operation – at the time of tripping of 400kV Meerut Muradnagar-II, tie CBs of these lines got tripped, resulted into tripping of these lines also. Reason of tie CB tripping is yet to ascertained

Corrective action taken- Under investigation.

Case-3 Tripping of 315MVA ICT-II at 400kV Substation Panki (Agra Zone)

No. of unwanted operation -1

No. of correct operation-0

No. of failure to operate-0

Reason for unwanted operation – Tripping due to DC Earth Fault.

Corrective action taken- Instructions have been issued to change the breaker cable at least.

Case-4 400kV Banda -Reewa Road-I (Jhansi Zone)

No. of unwanted operation -0

No. of correct operation-0

No. of failure to operate-2

Reason for failure to operate – DT received at Banda end but Circuit Breaker did not trip.

Corrective action taken- carrier inter tripping (DT Receive) issue will be rectified on 09.11.2024 with the help of ZIV service engineer.

Case-5 Tripping of 220kV Sitapur to BKT line (Lucknow Zone)

No. of unwanted operation -1 on Bus Bar due to LBB operation

No. of correct operation-0

No. of failure to operate-1 on line

Reason for failure of line to operate – Circuit Breaker delayed tripped due to partially jam of CB mechanism. LBB operated.

Corrective action taken- CB mechanism was made smooth using CRC and greasing.

Case-6 tripping of 400kV Bareilly Unnao circuit-II (Lucknow Zone)

No. of unwanted operation -0

No. of correct operation-2

No. of failure to operate-1

Reason for failure to operate – - Tripping due to Auto Recloser issue

Corrective action taken- Rectified.

NHPC

Case-1 Tripping of 220 KV Dhauliganga-Jauljivi Line-I & II

No. of unwanted operation – 1 on each line

No. of correct operation-1

No. of failure to operate-0

Reason for unwanted operation- GIS Controller Fault.

Corrective action taken- Matter is being taken up with SCADA OEM.

PPGCL

Case-1 Tripping of 75MVA, 400KV/33/11 KV SUT Transformer at 3x660 MW STPP, BARA

No. of unwanted operation – 1

No. of correct operation-0

No. of failure to operate-0

Reason for unwanted operation- tripped on differential protection with maloperation of P645 relay.

Corrective action taken- Physical inspection of SUT done and no abnormalities observed. All CTs included in 87OA, secondary circuit WR & IR done. All healthiness confirmed. Relay P645 was replaced with a new one and all tests were completed. all signals simulated.

SJVN

Case-1 Tripping of 68.67 MW generating unit no. 1 of Rampur HPS on 13.10.2024.

Number of unwanted operations = 1

Reason for unwanted operation – Transformer differential protection function operated due to damaged & burnt wiring connection found at test block.

Corrective action taken –Damaged & burnt test block was replaced.

RRVPN

Case-1 Tripping of 400/220 KV 315 MVA ILT-III at 400KV GSS RATANGARH on 10.10.2024 & 220/132KV, 100MVA T/F at 220KV GSS RATANGARH on 11.10.2024

No. of Unwanted operation – 2

Reason of unwanted operation – Oil level low in transformer

Corrective Action taken – Oil level maintained and general instructions has been issued to check oil level regularly.

Case-2 Tripping of 220 KV Side of 315 MVA ICT -III at 400 KV GSS AJMER on 15.10.2024

No. of Unwanted operation – 1

Reason of unwanted operation – During checking of SF6 lockout problem, tripping occurred due to DC fault.

Corrective Action taken – DC fault rectified.

Case-3 Tripping of 220 KV KANKROLI-BAMANTUKDA LINE at Kankroli on 06.10.2024

No. of Unwanted operation – 2

Reason of unwanted operation – Bus bar isolator status issue in Bus bar protection scheme.

Corrective Action taken – Bus bar isolator status issue resolved.

Case-4 Tripping of 220/132KV 100MVA ABB MAKE Transformer at (220 KV GSS) GIS Banar on 13.10.2024 and 17.10.2024

No. of Unwanted operation – 2

Reason of unwanted operation – REF relay wiring found loose.

Corrective Action taken – REF relay wiring issue resolved.

Case-5 Tripping of 220/132 KV 100 MVA TRF at 220 KV GSS DANTA RAMGARH on 15.10.2024

No. of Unwanted operation – 1

Reason of unwanted operation – OLTC surge relay operated during TAP change.

Corrective Action taken – TAP changer overhauled and problem rectified.

Case-6 Tripping of 220 KV/132 KV, 100 MVA T/F-I at 220 KV GSS Jalore on 27.10.2024

No. of Unwanted operation – 1

Reason of unwanted operation – Mal-operation of REF relay MIT161.

Corrective Action taken – REF relay has been replaced on 23.11.2024.

Case-7 Tripping of 220/132kv 160MVA EMCO TRF-1 at 220 KV GSS MANSAROVAR on dated 13.10.2024

No. of Unwanted operation – 1

Reason of unwanted operation – Mal-operation of REF relay.

Corrective Action taken – REF relay replaced.

Case-8 220/132 KV 100 MVA Trf-I BHEL Make at 220KV GSS Sujangarh on 03.10.2024

No. of Unwanted operation – 1

Reason of unwanted operation – Water logging in PRD relay.

Corrective Action taken – PRD relay cleaned and problem rectified.

DTL

Case-1 Tripping of 500MVA (400/220kV) ICT-II at 400kV Bamnauli S/s

No. of unwanted operation – 1

No. of correct operation-0

No. of failure to operate-0

Reason for unwanted operation- PRV operated due to DC leakage.
Corrective Action taken- Wiring fault has been rectified.

Case-2 Tripping of 315MVA (400/220kV) ICT-IV at 400kV Bawana S/s

No. of unwanted operation – 1

No. of correct operation-0

No. of failure to operate-0

Reason for unwanted operation- inadvertently tripped due to testing of control wiring by 400kV side substation maintenance officer.

Corrective Action taken- Staff has been instructed to be careful in future.

INDIGRID

Case-1 Tripping of 400kV LILO Point (T. No. 161) at Ropar – Ludhiana

No. of unwanted operation – 1

No. of correct operation-0

No. of failure to operate-0

Reason for unwanted operation- Tripping due to PLCC maloperation at PSTCL end.
Corrective Action taken- PSTCL representative informed that there was no operation on the line. Issue might be of Protection couplers owned by POWERGRID that requires to be replaced. POWERGRID informed that the matter has already been in consideration and the same will be replaced.

POWERGRID NR-2 due to Others

Case-1 Tripping of 220KV WAGOORA-PAMPORE-II

No. of unwanted operation – 1

Reason for unwanted operation due to other end- Line tripped on operation of distance protection in Z2 caused by 220KV Bus fault at JKPTCL Substation Pampore. Bus fault was neither cleared by 220KV Bus bar protection at Pampore (JKPTCL) nor by Line protection in reverse zone at JKPTCL Pampore.

Corrective Action taken- Not received from utility. (JKPTCL may apprise)

Case-2 Tripping of 400KV DEHAR (BBMB) - PANCHKULA (PGCIL) LILO PORTION

No. of unwanted operation – 1

Reason for unwanted operation at other end- Line successfully Auto Reclosed from Panchkula (PG) but tripped from Dehar(BBMB) due to maloperation of Auto reclose scheme at Dehar(BBMB). Bay and protection at Dehar (BBMB) are owned and maintained by BBMB.

Corrective Action taken- BBMB representative informed that Auto-recloser has been kept off at generating end (dehar) which may be reviewed based on protection philosophy.

Case-3 Tripping of 400KV BHIWANI (BBMB) - RAJPURA (PSTCL) LILO PORTION

No. of unwanted operation – 1

Reason for unwanted operation at other end- Line successfully Auto Reclosed from Rajpura PSTCL (POWERGRID Bay) but tripped from Bhiwani (BBMB) due to fault in BBMB portion of the line. A/R Scheme failed to operate at BBMB Bhiwani.

Corrective Action taken- BBMB informed that the issue will be corrected.

Annexure-IV

Status of Internal Protection Audit Plan for FY 2024 -25

S. No.	NRPC Member	Category	Status
1	PGCIL	Central Government owned Transmission Company	Received
2	NTPC	Central Generating Company	Received
3	BBMB		Received
4	THDC		Received
5	SJVN		Received
6	NHPC		Received
7	NPCIL		
8	Delhi SLDC	SLDC	
9	Haryana SLDC		
10	Rajasthan SLDC		
11	Uttar Pradesh SLDC		Vishnuprayag, WUPPTCL
12	Uttarakhand SLDC		
13	Punjab SLDC		
14	Himachal Pradesh SLDC		
15	DTL	State Transmission Utility	Received
16	HVPNL		Received
17	RRVPNL		Received
18	UPPTCL		Received for Jhansi, Lucknow, Meerut, Gorakhpur, Prayagraj, Agra zone)
19	PTCUL		Received
20	PSTCL		Received
21	HPPTCL		Received
22	IPGCL	State Generating Company	Received (PPCL-I,III)
23	HPGCL		
24	RRVUNL		Received
25	UPRVUNL		Received (obra -B, Anpara-B,D switch yard, Harduganj-C,D,E))
26	UJVNL		Received (Khodri, Chibro, Vyasi, Dharasu , Tiloth)
27	HPPCL		
28	PSPCL	State Generating Company & State owned Distribution Company	Received (Ranjet sagar dam, GHTP, GGSSTP, GATP)
29	HPSEBL	Distribution company having Transmission connectivity ownership	
30	Prayagraj Power Generation Co. Ltd.	IPP having more than 1000 MW installed capacity	Received
31	Aravali Power Company Pvt. Ltd		Received
32	Apraava Energy Private Limited		Received
33	Talwandi Sabo Power Ltd.		
34	Nabha Power Limited		Received
35	MEIL Anpara Energy Ltd		Received
36	Rosa Power Supply Company Ltd		Received
37	Lalitpur Power Generation Company Ltd		Received
38	MEJA Urja Nigam Ltd.		
39	Adani Power Rajasthan Limited		Received
40	JSW Energy Ltd. (KWHEP)		Received
41	AESL	Other transmission licensee	Received (ATIL -400kV Mohindergarh S/s, OBTL, FBTL, MTSCL, ATSCL, HPTSL, BKTL, GTL)
42	Tata Power Renewable Energy Ltd.		Recevied (TPGEL, BTPSL)
43	UT of J&K	UT of Northern Region	
44	UT of Ladakh		
45	UT of Chandigarh		
46	INDIGRID		Received
47	ADHPL		Received
48	Sekura Energy Limited		

Annexure-V

Status of 3rd Party Protection Audit Plan

S. No.	NRPC Member	Category	Status	Schedule submitted as per utililty	Present Status Comlpleted (yes/no)
1	PGCIL	Central Government owned Transmission Company	Received (7 S/s of NR-1, 1 S/s of NR-2, 4 S/s of Nr-3)	By Jan 2025	
2	NTPC	Central Generating Company	Received (Singrauli, Rihand, Unchahar, Dadri, Dadri Gas, Auraiya Gas, Faridabad Gas, Anta Gas Power Station)	By Oct 2028	
			Received (Tanda)	By 17.07.2025	
3	BBMB				
4	THDC		Received	March 2026-Tehri, F.Y. 2025-26- Koteshwar	
5	SJVN		Received	Nov-Dec 2025 for RHPS, Nov 24- March 25 for NJHPS	
6	NHPC		Received	FY-2025-26	
7	NPCIL				
8	Delhi SLDC				
9	Haryana SLDC				
10	Rajasthan SLDC				
11	Uttar Pradesh SLDC		SEUPPTCL	Conducted (Oct 2024)	Report is to be submitted
12	Uttarakhand SLDC				
13	Punjab SLDC				
14	Himachal Pradesh SLDC				
15	DTL	State Transmission Utility	Received		
16	HVPNL				
17	RRVPNL				
18	UPPTCL				
19	PTCUL		Received	By Jan 2025	
20	PSTCL				
21	HPPTCL				
22	IPGCL	State Generating Company	Received (PPS-III)	FY 25-26	
23	HPGCL				
24	RRVUNL				
25	UPRVUNL		Received (Obra-B)	2026-27	
26	UJVNL				
27	HPPCL				
28	PSPCL	State Generating Company & State owned Distribution Company	Reeceived (GHTP)	Dec. 2025	
			Received (GATP)	May 2025	
			GGSSTP		
			RSD/ Sahapur Kandi		
29	HPSEBL	Distribution company having Transmission connectivity ownership			
30	Prayagraj Power Generation Co. Ltd.	IPP having more than 1000 MW installed capacity	Received	Dec-24	
31	Aravali Power Company Pvt. Ltd				
32	Apraava Energy Private Limited		Received	By May, 2025	
33	Talwandi Sabo Power Ltd.				
34	Nabha Power Limited		Received	Dec-24	
35	MEIL Anpara Energy Ltd		Received	Dec-24	
36	Rosa Power Supply Company Ltd		Conducted	By 30.09.2024	Report is to be submitted
37	Lalitpur Power Generation Company Ltd		Conducted	26.03.2024	
38	MEJA Urja Nigam Ltd.				
39	Adani Power Rajasthan Limited		Conducted	September, 2024	Report is to be submitted
40	JSW Energy Ltd. (KWHEP)		Received	December 2024 to March 2025	
41	AESL	Other Transmission Licensee	Received (ATIL -400kV Mohindergarh S/s,)	400kV Mohindergarh SS- Q2 , FY 2025-26	
			Received (OBTL)	OBTL-Q1 , FY 2025-26	
			Received (FBTL)	FBTL-Q3 , FY 2025-26	
			Received (MTSCL)	MTSCL-Q4 , FY 2025-26	
			Received (ATSCL)	ATSCL-Q1 , FY 2026-27	
			Received (HPTSL)	HPTSL- Q2 , FY 2026-27	
			Received (BKTL)	BKTL-Q3 , FY 2026-27	
			Received (GTL)	GTL- Q3 & Q4, FY 2026-27	
42	Tata Power Renewable Energy Ltd.	IPP having less than 1000 MW installed capacity (alphabetical rotaional basis)			
43	UT of J&K	UT of Northern Region			
44	UT of Ladakh				
45	UT of Chandigarh				
46	INDIGRID		Received (NRSS 29)	FY 24-25	
47	ADHPL		Received	30.09.2024	May update current status
48	Sekura Energy Limited				

* Revised Schedule

Annexure-VI

Status of Internal Protection Audit Plan for FY 2025 -26

S. No.	NRPC Member	Category	Status
1	PGCIL	Central Government owned Transmission Company	
2	NTPC	Central Generating Company	Received
3	BBMB		
4	THDC		Received (Tehri)
5	SJVN		Received (NJHPS)
6	NHPC		
7	NPCIL		
8	Delhi SLDC	SLDC	
9	Haryana SLDC		
10	Rajasthan SLDC		
11	Uttar Pradesh SLDC		Received (Jaypee Vishnuprayag, WUPPTCL)
12	Uttarakhand SLDC		
13	Punjab SLDC		
14	Himachal Pradesh SLDC		
15	DTL	State Transmission Utility	Received
16	HVPNL		Received
17	RRVPNL		Received
18	UPPTCL		Received (All zones)
19	PTCUL		
20	PSTCL		
21	HPPTCL		Received
22	IPGCL	State Generating Company	Received (PPS-III, I)
23	HPGCL		
24	RRVUNL		
25	UPRVUNL		
26	UJVNL		Received (Dharashu, Tiloth)
27	HPPCL		
28	PSPCL	State Generating Company & State owned Distribution Company	Received (GHTP, GGSSTP, GATP, RSD)
29	HPSEBL	Distribution company having Transmission connectivity ownership	
30	Prayagraj Power Generation Co. Ltd.	IPP having more than 1000 MW installed capacity	Received
31	Aravali Power Company Pvt. Ltd		
32	Apraava Energy Private Limited		
33	Talwandi Sabo Power Ltd.		
34	Nabha Power Limited		
35	MEIL Anpara Energy Ltd		
36	Rosa Power Supply Company Ltd		Received
37	Lalitpur Power Generation Company Ltd		Received
38	MEJA Urja Nigam Ltd.		
39	Adani Power Rajasthan Limited		
40	JSW Energy Ltd. (KWHEP)		
41	AESL	Other transmission licensee	
42	Tata Power Renewable Energy Ltd.		
43	UT of J&K	UT of Northern Region	
44	UT of Ladakh		
45	UT of Chandigarh		
46	INDIGRID		
47	ADHPL		
48	Sekura Energy Limited		

PROTECTION AUDIT REPORT (SELF CERTIFICATION)

A. GENERAL INFORMATION:

1. Name of Utility: THDC India Limited
2. Name & Voltage Level of Substation: Koteshwar HEP & 400 kV
3. Date of Commissioning: Mar' 2012
4. Type of Bus Scheme: Double Main & Transfer Bus Scheme
5. Name of Representative of Audit Team: Sh. Ashutosh Gairola, DGM (O&M)
   Sh. Anup Kumar, Sr. Manager (O&M)

B. CHECK LIST FOR PROTECTION AUDIT:

1. DC Supply:

a. Switchyard

Sl. No.	Checks	220 V DC -1	220 V DC-2	48 V DC -1	48 V DC-2
a.	Measured Voltage				
i.	Positive to Earth	121 V	122 V	2 V	1 V
ii.	Negative to Earth	-118 V	-117 V	-51 V	-52 V
b.	No. of Cells Per Bank	110	110	24	24
c.	Availability & Healthiness of Charger	02 nos. of Charger & Functional	02 nos. of Charger & Functional	01 nos. of Charger & Functional	01 nos. of Charger & Functional

b. **Power House**

Sl. No.	Checks	220 V DC -1	220 V DC-2	24 V DC -1	24 V DC-2
a.	Measured Voltage				
ii.	Positive to Earth	120 V	122 V	13.6 V	13.7 V
ii.	Negative to Earth	-115 V	-113 V	-14.4 V	-14.3 V
b.	No. of Cells Per Bank	106	106	13	13
c.	Availability & Healthiness of Charger	02 nos. of Charger & Functional	02 nos. of Charger & Functional	02 nos. of Charger & Functional	02 nos. of Charger & Functional

2. **Protection Relays:**

a. **Bus Bar Protection:**

Sl. No.	Checks	Status
i.	Make & Model of Bus Bar Protection Relay	AREVA, MiCOM P741 (Functional)
ii.	Whether Stability Tests done or not	Yes
iii.	Date of Testing	
iv.	Time Synchronization	Yes
v.	DR/ EL	Yes
vi.	Remarks (if any)	

b. **Line Protection:**

i. **Line-1:**

Sl. No.	Checks	Status
i.	Pole Discrepancy relay	Yes (Functional)
ii.	PLCC Panel	Yes (Functional)
iii.	Make & Model of Relay	**Main -1**- AREVA (MiCOM P442), **Main-2**- AREVA (MiCOM P437), **LBB** - AREVA (MiCOM P141)

		(All above are functional)
iv.	Functional (Yes/No)	Yes
	Zone & Time Settings (Z-1/2/3/4)	Yes (As per settings provided by THDCIL Design deptt./ NRPC guidelines)
	SOTF	Yes
	Aided Scheme	Yes
	Fault Locator	Yes
	Power Swing	Yes
	Single Phase Auto Reclosing	Yes
	Binary Inputs	
	Breaker Contacts	Yes
	Carrier Receive	Yes
	DT receive	Yes
v.	Date of Testing	
vi.	Time Synchronization	Relays are currently being time synchronized manually.
vii.	DR/ EL	Yes
viii.	Remarks (if any)	Main-1/2 Protection is being upgraded to differential Protection from distance protection in co-ordination with POWERGRID as per NRPC recommendations. The time synchronization issue will be resolved with new relays.

ii. <u>Line-2:</u>

Sl. No.	Checks	Status
i.	Pole Discrepancy relay	Yes (Functional)
ii.	PLCC Panel	Yes (Functional)
iii.	Make & Model of Relay	**Main -1**- AREVA (MiCOM P442), **Main-2**- AREVA (MiCOM P437), **LBB** - AREVA (MiCOM P141) (All above are functional)
iv.	Functional (Yes/No)	Yes
	Zone & Time Settings (Z-1/2/3/4)	Yes (As per settings provided by

		THDCIL Design deptt./ NRPC guidelines)
	SOTF	Yes
	Aided Scheme	Yes
	Fault Locator	Yes
	Power Swing	Yes
	Single Phase Auto Reclosing	Yes
	Binary Inputs	
	Breaker Contacts	Yes
	Carrier Receive	Yes
	DT receive	Yes
v.	Date of Testing	
vi.	Time Synchronization	Relays are currently being time synchronized manually.
vii.	DR/ EL	Yes
viii.	Remarks (if any)	Main-1/2 Protection is being upgraded to differential Protection from distance protection in co-ordination with POWERGRID as per NRPC recommendations. The time synchronization issue will be resolved with new relays.

c. **Generator Transformer Protection:**

Sl. No.	Checks	Status
i.	Buchholz/ PRV trip	Yes
ii.	OTI/ WTI trip	Yes
iii.	Differential Protection	
	Make and Model	SIEMENS SIPROTEC 7UT612 (Functional)
	2nd Harmonic Block	Yes
	Event Logger/ DR	Yes
iv.	Restricted Earth Fault Protection	
	Make and Model	SIEMENS SIPROTEC 7SJ8032 (Functional)
	Event Logger/ DR	Yes
v.	Back up Over Current Protection	

	Make and Model	SIEMENS SIPROTEC 7SD610 (Functional)
	Event Logger/ DR	Yes
vi.	Local Breaker Back up	
	Make and Model	AREVA (MICOM P123) (Functional)
	Current/ Time Setting	I< 0.05 In & Time delay=0.02 sec
	Event Logger/ DR	Yes
viii.	Time Synchronization of above relays	Yes
ix.	Date of Testing of above relays	Unit # 1- 17.04.24 to 28.05.24 Unit # 2- 02.06.24 to 20.06.24 Unit # 3- 09.06.24 to 29.06.24 Unit # 4- 03.11.24 to 23.11.24
x.	Remarks (if any)	

d. **Generator Protection:**

Sl. No.	Checks	Status
i.	Generator Protection	
	Make and Model	SIEMENS SIPROTEC 7UM622 (Functional)
	Event Logger/ DR	Yes
ii.	Excitation Transformer	
	Make and Model	SIEMENS SIPROTEC 7SJ610 (Functional)
	Event Logger/ DR	Yes
iii.	UAT Protection	
	Make and Model	SIEMENS SIPROTEC 7SJ610 (Functional)
	Event Logger/ DR	Yes
iv.	SST Protection	
	Make and Model	SIEMENS SIPROTEC 7UT610 (Functional)
	Event Logger/ DR	Yes
vi.	Time Synchronization of above relays	Yes
vii.	Date of Testing of above relays	Unit # 1- 17.04.24 to 28.05.24 Unit # 2- 02.06.24 to 20.06.24 Unit # 3- 09.06.24 to 29.06.24 Unit # 4- 03.11.24 to 23.11.24
viii.	Remarks (if any)	

e. **Reactor Protection:**

Sl. No.	Checks	Status
i.	Reactor Protection	
	Make and Model	ALSTOM, P643 (Differential) ALSTOM, P141 (REF) ALSTOM, P442 (Back up Impedance) (All above are functional)
	Event Logger/ DR	Yes
ii.	Time Synchronization of above relays	Yes
iii.	Date of Testing of above relays	Periodic Testing of relays is being done by M/s POWERGRID since same being owner of the same
iv.	Remarks (if any)	

3. **CIRCUIT BREAKER TESTING:**

Sl. No.	Bay	Make of C.B.	Status of Breaker	No. of Trip Coil/ Healthiness	Date of Testing for Timing	Remarks (if any)
1.	400 kV Bay-1 (Unit # 1)	G.E.	Functional	02/ Healthy	05.05.24	
2.	400 kV Bay-2 (TBC)	G.E.	Functional	02/ Healthy	22.06.24	
3.	400 kV Bay-3 (Unit # 2)	G.E.	Functional	02/ Healthy	24.06.24	
4.	400 kV Bay-4 (Line # 1)	BHEL	Functional	02/ Healthy	19.06.24	
5.	400 kV Bay-5 (Unit # 3)	G.E.	Functional	02/ Healthy	24.06.24	
6.	400 kV Bay-6 (Line # 2)	BHEL	Functional	02/ Healthy	20.06.24	
7.	400 kV Bay-7 (Unit # 4)	G.E.	Functional	02/ Healthy	22.06.24	
8.	400 kV Bay-8 (BC)	BHEL	Functional	02/ Healthy	21.06.24	

4. **DG SET :**

Sl. No.	Detail/ rating	Status
1.	DG-1/ 1010 kVA	Functional

2.	DG-2/ 1010 kVA	Functional

5. TESTING OF PROTECTION RELAYS:

Sl. No.	Equipment	Testing Status
1.	400 kV Lines/ Bus Bar/ Bus Coupler/ TBC Protection etc	02 Year (Last done on 19.06.24)
2.	Generator/ GT/ SST/ ET/ UAT Protection etc	01 Year (During Annual Maintenance of Unit)

6. OBSERVATIONS/ RECOMMENDATIONS (IF ANY):

Up gradation of Line Protection from Distance to Differential Protection may be expedited for resolving issue of time synchronization of line protection relays.

Submitted to : **AGM (O&M),**
Koteshwar HEP

19/10/24

DGM (O&M)

19/10/24

SR. MANAGER (O&M)

Copy to: CGM (Koteshwar HEP)

यूजेवीएन लिमिटेड
(उत्तराखण्ड सरकार का उपक्रम)
UJVN Limited
(An Uttarakhand Govt. Enterprise)
कार्यालय अधिशासी अभियन्ता (उत्पादन), तिलोथ विद्युत गृह, उत्तरकाशी-249193 (उत्तराखण्ड), दूरभाष - (01374) 222250, फैक्स - (01374) 222436
Office of the Executive Engineer (Generation), Tiloth Power House, Uttarkashi-249193 (Uttarakhand), Phone - (01374) 222250, Fax - (01374) 222436
CIN No.40101UR2001SGC025866
ISO 9001 : 2008 Certified

Letter No: 605 /UJVNL/EE (G)/T-5 Dated: 21-10-2024

National regional power committee
Ministry of Power
Email: seo-nrpc@nic.in, nrltcso2@grid-india.in, eetestdph@gmail.com

Sub:- Submission of annual internal Protection Audit Plan for F.Y. 2024-25-reg.

Respected Sir,

I informed you regarding above mentioned Subject, we are going to submission of Annual Internal Protection Audit Plan for F.Y. 2024-25 of Tiloth Power House (3x30 MW), 220 kV Switchyard.

Thank you

(Praveen Chaurasiya)
Executive Engineer (Generation)
Tiloth Power House, Uttarkashi.

Copy to:- Dy General Manager, HGC, Tiloth Power House, Uttarkashi.

PROTECTION AUDIT OF TILOTH POWER HOUSE UTTARKASHI

1. Name of Utility & Zone : **UJVN Ltd.**

2. Name of Sub-station : **MANERI BHALI STAGE -I**

Address : **TILOTH POWER HOUSE UTTARKSHI**

3. Date of commissioning of Substation : **1984 , RMU COMPLETED ON 2022 (RMU OF 3RD UNIT COMPLETED)**

4. SLD of the substation : **COLLECTED**

5. Type of Bus Switching Scheme : **TWO BUS (ONE CHARGED BUS AND ONE STAND-BY BUS)**

6. Three ph Fault Level (MVA) : **3996.78**

7. SLG Fault level (MVA) :

8. Audit Team

UJVNL :

1 Er Praveen Chauvasiya EE (Gen)

2 Er Anant B Gaisla AE(Gen)

3 Er Deepak Kumar AE (Test)

4

Executive Engineer (Gen.)
Tiloth Power House
Uttarkashi

CPRI :

1

2

B) Capacitive Voltage Transformer (CVT)

Location of CVT — 220kV Feeder No. 82 (Line -02)
a. CVT ratio : — (220000/√3)/(110/√3)
b. Date of last Testing — 29.11.2020
c. Date of comissioning: — 19.12.2020
d. Serial no. — 2CV4840 2CV4841 2CV4842
e. Serviceble/Non-serviceble

		Phase	Core i	Core ii	Core iii
i	Ratio Adopted	R	2000.00	2000.00	2000.00
	Ratio Measured		2000.80	2000.80	2000.80
	Error Calculated		-0.04%	-0.04%	-0.04%
ii	Ratio Adopted	Y	2000.00	2000.00	2000.00
	Ratio Measured		2000.80	2000.80	2000.80
	Error Calculated		-0.04%	-0.04%	-0.04%
iii	Ratio Adopted	B	2000.00	2000.00	2000.00
	Ratio Measured		2000.80	2000.80	2000.80
	Error Calculated		-0.04%	-0.04%	-0.04%

Location of CVT — 220kV Feeder No. 84 (Line -02)
a. CVT ratio : — (220000/√3)/(110/√3)
b. Date of last Testing — 15.01.2020
c. Date of comissioning: — 22.02.2020
d. Serial no. — 2CV4836 2CV4844 2CV4845
e. Serviceble/Non-serviceble

		Phase	Core i	Core ii	Core iii
i	Ratio Adopted	R	2000.00	2000.00	2000.00
	Ratio Measured		2000.80	2000.80	2000.80
	Error Calculated		-0.04%	-0.04%	-0.04%
ii	Ratio Adopted	Y	2000.00	2000.00	2000.00
	Ratio Measured		2000.80	2000.80	2000.80
	Error Calculated		-0.04%	-0.04%	-0.04%
iii	Ratio Adopted	B	2000.00	2000.00	2000.00
	Ratio Measured		2000.80	2000.80	2000.80
	Error Calculated		-0.04%	-0.04%	-0.04%

Location of CVT — Unit- 01
a. CVT ratio : — (220000/√3)/(110/√3)
b. Date of last Testing — 20.02.2020
c. Date of comissioning: — 14.04.2020
d. Serial no. — 2CV4838 2CV4834 2CV4847
e. Serviceble/Non-serviceble

		Phase	Core i	Core ii	Core iii
i	Ratio Adopted	R	2000.00	2000.00	2000.00
	Ratio Measured		1998.40	1998.40	2003.20
	Error Calculated		+0.08%	+0.08%	-0.16%
ii	Ratio Adopted	Y	2000.00	2000.00	2000.00
	Ratio Measured		1998.40	1999.20	2004.00
	Error Calculated		+0.08%	+0.04%	-0.20%
iii	Ratio Adopted	B	2000.00	2000.00	2000.00
	Ratio Measured		1997.60	1997.60	2002.40
	Error Calculated		+0.12%	+0.12%	-0.12%

AE(Em)

Location of CVT — Unit-02
a. CVT ratio : — (220000/√3)/(110/√3)
b. Date of last Testing — 25.04.2022
c. Date of comissioning: — 05.09.2022
d. Serial no. — 2CV4843 2CV4839 2CV4837
e. Serviceble/Non-serviceble

		Phase	Core i	Core ii	Core iii
i	Ratio Adopted	R	2000.00	2000.00	2000.00
	Ratio Measured		2018.00	2006.00	2014.00
	Error Calculated		-0.89%	-0.30%	-0.70%
ii	Ratio Adopted	Y	2000.00	2000.00	2000.00
	Ratio Measured		2000.00	2006.00	2014.00
	Error Calculated		00.00%	-0.30%	-0.70%
iii	Ratio Adopted	B	2000.00	2000.00	2000.00
	Ratio Measured		2000.00	1994.00	2002.00
	Error Calculated		00.00%	+0.30%	-0.09%

AE(Test)

Executive Engineer (Gen.)
Tiloth Power House
Uttarkashi

B) Capacitive Voltage Transformer (CVT)

Location of CVT — Unit-03
a. CVT ratio : — (220000/√3)/(110/√3)
b. Date of last Testing — 19.03.2021
c. Date of comissioning: — 03.07.2021
d. Serial no. — 2CV4848 2CV4850 2CV4851
e. Serviceble/Non-serviceble

		Phase	Core i	Core ii	Core iii
i	Ratio Adopted	R	2000.00	2000.00	2000.00
	Ratio Measured		2000.80	2000.80	2000.80
	Error Calculated		-0.04%	-0.04%	-0.04%
ii	Ratio Adopted	Y	2000.00	2000.00	2000.00
	Ratio Measured		2000.80	2000.80	2000.80
	Error Calculated		-0.04%	-0.04%	-0.04%
iii	Ratio Adopted	B	2000.00	2000.00	2000.00
	Ratio Measured		2000.80	2000.80	2000.80
	Error Calculated		-0.04%	-0.04%	-0.04%

Location of CVT — 220kV BUS-A CVT
a. CVT ratio : — (220000/√3)/(110/√3)
b. Date of last Testing — 24.03.2023
c. Date of comissioning: — 28.03.2023
d. Serial no. — 2CV4846 S- 46867 S- 46866
e. Serviceble/Non-serviceble

		Phase	Core i	Core ii	Core iii
i	Ratio Adopted	R	2000.00	2000.00	2000.00
	Ratio Measured		2001.40	1997.20	2002.00
	Error Calculated		-0.07%	+0.14%	-0.1%
ii	Ratio Adopted	Y	2000.00	2000.00	
	Ratio Measured		2004.60	2001.00	
	Error Calculated		-0.23%	-0.05%	
iii	Ratio Adopted	B	2000.00	2000.00	
	Ratio Measured		1993.82	1995.21	
	Error Calculated		+0.31%	+0.24%	

Location of CVT — 220kV BUS-B CVT
a. CT ratio : — (220000/√3)/(110/√3)
b. Date of last Testing — 15.02.2020
c. Date of comissioning: — 16.02.2020
d. Serial no. — OCVT 8182/1/2/19 OCVT 8182/1/1/19 OCVT 8182/1/3/19
e. Serviceble/Non-serviceble

		Phase	Core i	Core ii	Core iii
i	Ratio Adopted	R	2000.00	2000.00	2000.00
	Ratio Measured		2018.00	2006.00	2014.00
	Error Calculated		-0.89%	-0.30%	-0.70%
ii	Ratio Adopted	Y	2000.00	2000.00	2000.00
	Ratio Measured		1998.40	1999.20	2004.00
	Error Calculated		+0.08%	+0.04%	-0.20%
iii	Ratio Adopted	B	2000.00	2000.00	2000.00
	Ratio Measured		2000.80	2000.80	2000.80
	Error Calculated		-0.04%	-0.04%	-0.04%

AE(Elect)

Location of CVT
a. CT ratio :
b. Date of last Testing
c. Date of comissioning:
d. Serial no.
e. Serviceble/Non-serviceble

		Phase	Core i	Core ii	Core iii
i	Ratio Adopted	R			
	Ratio Measured				
	Error Calculated				
ii	Ratio Adopted	Y			
	Ratio Measured				
	Error Calculated				
iii	Ratio Adopted	B			
	Ratio Measured				
	Error Calculated				

AE(Test)

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Tiloth Power House
Uttarkashi

Availability of Auxillary Systems

i)	Auxiliary Supply	Source of Supply	Reliability of Supply	Average of Tripping Month		
	Supply-I	SAT-01	Reliable	------		
	Supply-II	SAT-02	Reliable	------		

ii)	**DG Set**			
a	Make & serial no.	Kirlosker, JC/WC/500/SIL 5420 K	Cummins, CJK-19021176	
b	Rating	500kVA	500kVA	
c	Whether Dg Set on Auto or Manual	Manual	Auto	
d	Fuel Level	950 Ltr	950 Ltr	
e	Date of Last Testing	10.10.2024	04.10.2024	
f	Date of Comissioning	2011	26.12.2022	
g	Serviceble/Non-serviceble	Serviceble	Serviceble	

Any other Observation/Comments

AE(Gen)

AE(Test)

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Tiloth Power House
Uttarkashi

3) Line Parameter

		Line 1	Line 2	Line 3	Line 4	Line 5	Line 6	Line 7	Line 8	Line 9	Line 10	Line 11	Line 12
i)	**Name of Line**	LRP-1,220 kV Dharasu, 82 Feeder	LRP-2,220 kV Dharasu, 84 Feeder										
ii)	**Line Length**	25 Km	24.57 Km										
iii)	**Line Parameters (in Ω/Per KM/Per Phase Primary Value)**												
iv)	**Voltage level**	220 Kv	220 Kv										
	R1	1.943	1.943										
	X1	10.086	10.086										
	Ro	6.804	6.804										
	Xo	32.275	32.275										
	RoM	0	0										
	XoM	0	0										

AE(Em)

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Uttarkashi

Mechanical protection tripping and Annunciation healthiness.

Generating Transformer 38.5MVA:

Sl. No.	MECHANICAL PROTECTION	SETTINGS		Tr. R2		
		Alarm	Trip	Alarm	Trip	Healthiness
1.	OTI	60	65	60	65	Ok
2.	WTI	65	70	65	70	Ok
3.	BUCKHOLZ	Alarm	Trip	Ok	Ok	Ok
4.	PRV		Trip		Ok	Ok
5.	LOW OIL LEVEL	Alarm		Ok		Ok
6.	SOURCE A SUPPLY	Alarm		Ok		Ok
7.	SOURCE B SUPPLY	Alarm		Ok		Ok
8.	COOLER CONTROL SUPPLY	Alarm		Ok		Ok

Distribution Transformer 25MVA-01

Sl. No.	MECHANICAL PROTECTION	SETTINGS		Tr. R2		
		Alarm	Trip	Alarm	Trip	Healthiness
1.	OTI	60	65	60	65	Ok
2.	WTI	68	74	68	74	Ok
3.	BUCKHOLZ	Alarm	Trip	Ok	Ok	Ok
4.	PRV		Trip		Ok	Ok
5.	LOW OIL LEVEL	Alarm		Ok		Ok
6.	SOURCE A SUPPLY	Alarm		Ok		Ok
7.	SOURCE B SUPPLY	Alarm		Ok		Ok
8.	COOLER CONTROL SUPPLY	Alarm		Ok		Ok

AE(EM)

AE (Test)

E.E(G), TPM

Mechanical protection tripping and Annunciation healthiness.

Distribution Transformer 25MVA-02

Sl. No.	MECHANICAL PROTECTION	SETTINGS		Tr. R2		
		Alarm	Trip	Alarm	Trip	Healthiness
1.	OTI	70	75	70	75	Ok
2.	WTI	66	80	66	80	Ok
3.	BUCKHOLZ	Alarm	Trip	Ok	Ok	Ok
4.	PRV		Trip		Ok	Ok
5.	LOW OIL LEVEL	Alarm		Ok		Ok
6.	SOURCE A SUPPLY	Alarm		Ok		Ok
7.	SOURCE B SUPPLY	Alarm		Ok		Ok
8.	COOLER CONTROL SUPPLY	Alarm		Ok		Ok

AE(Elect)

AE (Test)

EE(G), TPH

Tiloth Power House

Observations on the Internal Protection audit conducted in the Month of October 2024

- The generator and GT (Generator Transformer) are adequately protected.
- The GPS clock is operational and functioning correctly.
- All relays have been time-synchronized with the GPS clock.
- The earthling of power equipment with the ground mat is adequate, with resistance measured at less than 1 ohm.
- The periodic test reports of circuit breakers and relays have been reviewed, and their performance in terms of breaker opening and closing times is satisfactory.
- U#3 Vibration sensor is not working.
- Setting of Temperature scanner must be updated.
- Networking of all the Units is Common. Recommended to individual networking.
- DC status healthy.
- All the LT breakers are periodically tested by OEM (Original Equipment Manufacturer)
- SCADA pc must be updated to latest version of windows.

EE(G), TPH

2) Availability of Protection System

Bus bar relay (220kV)						
		Main	Backup			
i)	Make and Model of Bus Bar relay	REB 650	REB 670			
ii)	Whether stability checks done or not					
iii)	Date of last Testing	5/1/2023	5/1/2023			
iv)	Date of comissioning	5/1/2023	5/1/2023			
v)	Serial no.	I1820092	I1820091			
vi)	Serviceble/Non-serviceble	Serviceble	Serviceble			

Substation Protection and Monitoring Equipments														
Sl. No.	System	LBB (Make & Model)	LBB (Serial no.)	Functional (Yes/No)	Date of last testing	Date of comissioning	Serviceble/ Non-serviceble	Event logger (Make & Model)	Functional (Yes/No)	Synchronising Facility Available or Not	Synchro Check Relay (Make & Model)	Date of last testing	Date of comissioning	Serviceble/ Non-serviceble
i)	765													
ii)	400													
iii)	220													
iv)	132													

AE(Elm)

AE (Test)

Executive Engineer (Gen.)
Tiloth Power House
Uttarkashi

Transmission Line Protection

Sl. No.	1	2	3	4	5	6	7	8	9	10
Name of Line	LRP-1,220 kV Dharasu, 82 Feeder	LRP-2,220 kV Dharasu, 84 Feeder								
Main-I Protection (Make & Model)	LRP-1 Make- ABB Modle- REL650 (Main Relay)	LRP-2 Make- ABB Modle- REL650 (Main Relay)								
Main-I Protection (Serial No.)	Serial No.- 11820042	Serial No.- 11820043								
Functional (Yes/No)	Yes	Yes								
Date of last Testing	12/16/2020	2/22/2020								
Date of comissioning	12/19/2020	2/22/2020								
Serviceble/ Non-serviceble	Serviceble	Serviceble								
Main - II Protection (Make & Model)	LRP-1 Make- ABB Modle- REL650 (Backup Relay)	LRP-2 Make- ABB Modle- REL650 (Backup Relay)								
Main-II Protection (Serial No.)	Serial No.- 11820041	Serial No.- 11820040								
Functional (Yes/No)	Yes	Yes								
Date of last Testing	12/17/2020	2/22/2020								
Date of comissioning	12/19/2020	2/22/2020								
Serviceble/ Non-serviceble	Serviceble	Serviceble								
LBB Protection (Make & Model)	Make- ABB Modle- REL650	Make- ABB Modle- REL650								
LBB Protection (Serial no.)	Serial No.- 11820042	Serial No.- 11820043								
Functional (Yes/No)	Yes	Yes								
Date of last Testing	12/16/2020	2/22/2020								
Date of comissioning	12/19/2020	2/22/2020								
Serviceble/ Non-serviceble	Serviceble	Serviceble								
PLCC/Protection coupler (Make & Model)	PLCC Panel Station- 220kV Tiloth Power House S/S Ckt - I Direction- 220kV Maneri Bhali II HEP S/S Ckt -I Make- ABB Modle- ETL600 -050-1	PLCC Panel Station- 220kV Tiloth Power House S/S Ckt - II Direction- 220kV Maneri Bhali II HEP S/S Ckt -II Make- ABB Modle- ETL600 -050-1	PLCC Panel Station- 33kV Tiloth Power House S/S Direction- 33kV Maneri Dam S/S Make- ABB Modle- ETL600 -050-1							
PLCC/Protection coupler (Serial no.)	Serial No.- E651190325	Serial No.- E651190327	Serial No.- E651190329							
Functional (Yes/No)	Yes	Yes	Yes							
Date of last Testing	5/6/2023	5/6/2023	5/6/2023							
Date of comissioning	5/6/2023	5/6/2023	5/6/2023							
Serviceble/ Non-serviceble	Serviceble	Serviceble	Serviceble							
DR (Make & Model)										
Functional (Yes/No)	Yes	Yes	Yes							
Time Synch.Unit (Make & Model)	Make- Masibus Modle- MC-1(GPS)									
Time Synch.Unit (serial no.)	Serial No.- 19092245									
Functional (Yes/No)	Yes									
Date of last Testing	10/6/2022									
Date of comissioning	10/6/2022									
Serviceble/ Non-serviceble	Serviceble	Serviceble								

AE(EM)

AE(Test)

Executive Engineer (Gen.)
Tiloth Power House
Uttarkashi

Transformer Protection

SL. NO.	1		3	4	5	6	7	8
ICT/GT/ST Name	**GT (38.5 MVA) U#1**	**GT (38.5 MVA) U#2**	**GT (38.5 MVA) U#3**	**ST (25 MVA) No.1**	**ST (25 MVA) No.2**	**ST (3.15 MVA) No.1**	**ST (3.15 MVA) No.2**	
Differential Proection (Make & Model)	Make- ANDRITZ Modle- HIPASE -P (87OA-DIFF4SYS3PH)	Make- ANDRITZ Modle- HIPASE -P (87OA-DIFF4SYS3PH)	Make- ANDRITZ Modle- HIPASE -P (87OA-DIFF4SYS3PH)	Make- ANDRITZ Modle- HIPASE -P (87T-DIFF4SYS3PH)	Make- ANDRITZ Modle- HIPASE -P (87T-DIFF4SYS3PH)	Make- ABB Modle- REF615	Make- ABB Modle- REF615	
Differential Proection (Serial no.)	Serial No.- Main Relay - GGP002-01711B040 Backup Relay- GGP002-01711B038	Serial No.- Main Relay - GGP002-01711B034 Backup Relay- GGP002-01711B039	Serial No.- Main Relay - GGP002-01711B03 Backup Relay- GGP002-01711B	Serial No.- Main Relay - GGP002-01711B043 Backup Relay- GGP002-01711B047	Serial No.- Main Relay - GGP002-02807B001 Backup Relay- GGP002-01711B041	Serial No.- 1VYV91276219	Serial No.- 1VYV91276216	
Functional (Yes/No)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Date of Testing	4/14/2020	9/5/2022	7/3/2021	9/14/2022	12/7/2022	9/26/2022	9/26/2022	
Date of comissioning	4/14/2020	9/5/2022	7/3/2022	9/14/2022	12/7/2022	9/26/2022	9/26/2022	
Serviceble/ Non-serviceble	Serviceble	Serviceble	Serviceble	Serviceble	Serviceble	Serviceble	Serviceble	
REF Protection (Make & Model)	Make- ABB Modle- REF615	Make- ABB Modle- REF615	Make- ABB Modle- REF615	Make- ANDRITZ Modle- HIPASE -P	Make- ANDRITZ Modle- HIPASE -P	Make- ABB Modle- REF615	Make- ABB Modle- REF615	
REF Protection (Serial no.)	Serial No.- Main Relay - 1VYV91276212 Backup Relay- 1VYV91276220	Serial No.- Main Relay - 1VYV91276081 Backup Relay- 1VYV91276211	Serial No.- Main Relay - 1VYV91276213 Backup Relay- 1VYV91276080	Serial No.- Main Relay - GGP002-01711B043 Backup Relay- GGP002-01711B047	Serial No.- Main Relay - GGP002-02807B001 Backup Relay- GGP002-01711B041	Serial No.- 1VYV91276219	Serial No.- 1VYV91276216	
Functional (Yes/No)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Date of Testing	4/14/2020	9/5/2022	7/3/2021	9/14/2022	12/7/2022	9/26/2022	9/26/2022	
Date of comissioning	4/14/2020	9/5/2022	7/3/2022	9/14/2022	12/7/2022	9/26/2022	9/26/2022	
Serviceble/ Non-serviceble	Serviceble	Serviceble	Serviceble	Serviceble	Serviceble	Serviceble	Serviceble	
Back-Up Overcurrent Protection (Make & Model)	Make- ABB Modle- REF615	Make- ABB Modle- REF615	Make- ABB Modle- REF615	Make- ANDRITZ Modle- HIPASE -P	Make- ANDRITZ Modle- HIPASE -P	Make- ABB Modle- REF615	Make- ABB Modle- REF615	
Back-Up Overcurrent Protection (Serial no.)	Serial No.- Main Relay - 1VYV91276212 Backup Relay- 1VYV91276220	Serial No.- Main Relay - 1VYV91276081 Backup Relay- 1VYV91276211	Serial No.- Main Relay - 1VYV91276213 Backup Relay- 1VYV91276080	Serial No.- Main Relay - GGP002-01711B043 Backup Relay- GGP002-01711B047	Serial No.- Main Relay - GGP002-02807B001 Backup Relay- GGP002-01711B041	Serial No.- 1VYV91276219	Serial No.- 1VYV91276216	
Functional (Yes/No)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Date of Testing	4/14/2020	9/5/2022	7/3/2021	9/14/2022	12/7/2022	9/26/2022	9/26/2022	
Date of comissioning	4/14/2020	9/5/2022	7/3/2022	9/14/2022	12/7/2022	9/26/2022	9/26/2022	
Serviceble/ Non-serviceble	Serviceble	Serviceble	Serviceble	Serviceble	Serviceble	Serviceble	Serviceble	
Over Flux Protection (Make & Model)	Make- ABB Modle- REF615	Make- ABB Modle- REF615	Make- ABB Modle- REF615	Make- ANDRITZ Modle- HIPASE -P	Make- ANDRITZ Modle- HIPASE -P	Make- ABB Modle- REF615	Make- ABB Modle- REF615	
Over Flux Protection (Serial no.)	Serial No.- Main Relay - 1VYV91276212 Backup Relay- 1VYV91276220	Serial No.- Main Relay - 1VYV91276081 Backup Relay- 1VYV91276211	Serial No.- Main Relay - 1VYV91276213 Backup Relay- 1VYV91276080	Serial No.- Main Relay - GGP002-01711B043 Backup Relay- GGP002-01711B047	Serial No.- Main Relay - GGP002-02807B001 Backup Relay- GGP002-01711B041	Serial No.- 1VYV91276219	Serial No.- 1VYV91276216	
Functional (Yes/No)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	

Executive Engineer (Gen.)
Tiloth Power House
Uttarkashi

AE (Test)

Date of Testing	4/14/2020	9/5/2022	7/3/2021	9/14/2022	12/7/2022	9/26/2022	9/26/2022	
Date of comissioning	4/14/2020	9/5/2022	7/3/2022	9/14/2022	12/7/2022	9/26/2022	9/26/2022	
Serviceble/ Non-serviceble	Serviceble	Serviceble	Serviceble	Serviceble	Serviceble	Serviceble	Serviceble	
OTI/WTI Indication working or Not	working	working	working	working	working	working	working	
Bucholtz /PRD	working	working	working	working	working	working	working	
Other Protection	-	-	-	-	-	-	-	
LA Rating HV Side	66kV*3	66kV*3	66kV*3	66kV*3	66kV*3	36 KV	36 KV	
LA Rating LV side	12kV	12kV	12kV	36 KV	36 KV	9kV	9kV	

SL. NO.		**1**	**2**	**3**	**4**	**5**	**6**	**7**
ICT/GT/ST		GT-01	GT-02	GT-03	ST-01	ST-02	ST-03	ST-04
Vector Group		Ynd-11	Ynd-11	Ynd-11	Ynyn-0	Ynyn-0	DNyn-11	DNyn-11
Percentage		9.73%	9.73%	9.73%	12.65%	12.22%	7.095%	7.095%
Rated Voltage (kV)	**HV**	230	230	230	220	220	33	33
	IV							
	LV	11	11	11	33	33	11	11
MVA Capacity (Maximum Rating)	**HV**	38.5	38.5	38.5	25	25	3.15	3.15
	IV							
	LV	38.5	38.5	38.5	25	25	3.15	3.15
CT Ratio	**HV**	400/200/1	400/200/1	400/200/1	400/200/1-1-1-1-1-1-1	400/200/1-1-1-1-1-1-1	200/100/1-1	200/100/1-1
	IV							
	LV	----	----	----	500/1-1-1	500/1-1-1		
	NCT	400/200/1	400/200/1	400/200/1	75/1, 500/1	75/1, 500/1	400/200/1-1-1-1	400/200/1-1-1-1
No: of Tap Positions		6	6	6	17	17	5	5
Voltage at (in % of rated Voltage)	**Minimum tap**	212.75	212.75	212.75	209	209	11.50	11.50
	Maximum tap	241.50	241.50	241.50	253	253	12.65	12.65
Nominal Tap Position		3	3	3	5	9b	1	1
REF Protection	**Lead Resistance**	----	----	----	----	----	----	----
	RCT (Ohms)	< 2 ohm	< 2 ohm	< 2 ohm	< 2 ohm	< 2 ohm	< 2 ohm	< 2 ohm
Stabilizing Resistance for REF (Ohms)		----	----	----	----	----	----	----

AE(Elect)

AE(Test)

Executive Engineer (Gen.)
Tiloth Power House
Uttarkashi

DC supply

a	Measured Voltage (to be Measured at furthest panel)	220/110 V DC-I	220/110 V DC-II	48V DC-I	48V DC-II
i)	Positive to Earth	141V	141V	48V	
ii)	Negative to Earth	91V	91V	4	
b	No.of cells per Bank	108	108		
c	Availability of Battery Charger	Float cum Boost	Float cum Boost		
d	Date of Comissioning of battery	10.09.2019	10.09.2019	10.09.2019	
e	Date of Comissioning of battery charger	10.09.2019	10.09.2019	10.09.2019	
f	Date of last testing of battery charger	02.10.2024	02.10.2024	02.10.2024	
g	Date of last testing of battery	02.10.2024	02.10.2024	02.10.2024	

Circuit Breaker

		Make and Model	Serial No.	Status of Breaker Available or Not	No.of Trip/Close Coil & Healthiness	PIR(Available or Not)	Date of Last Timing Taken	Date of Comissioning	Opening Time (ms)				Serviceble/ Non-serviceble	Remarks (if any)
A)	**765 kV System**													
1	765 kv Bay 1													
2	765 kv Bay 2													
3	765 kv Bay 3													
4	765 kv Bay 4													
5	765 kv Bay 5													
6	765 kv Bay 6													
B)	**400 kV System**													
1	400 kv Bay 1													
2	400 kv Bay 2													
3	400 kv Bay 3													
4	400 kv Bay 4													
5	400 kv Bay 5													
6	400 kv Bay 6													
A)	**220 kV System**													
1	220 kv Bay 1 Unit-01	ABB make and LTB245E1	17500563	Available	02 trip/ 01 close coil	Not Available	06.11.2023	2009	T1	16.8	16.2	16.2	Serviceable	Many times, breaker Pole Discripency occured, due to which machine damaged one time and generation loss occured. This kind of fault is dangerous for machines. During AMC visit and routine maintenance dashpot, Tripping spring, Driving machanism, Tripping arm and tripping latch were found malfunctioned and changed time to time. These breakers are less reliable for plant. Fault details attached for ready reference.
									T2	17.4	16.6	16.6	Serviceable	
2	220 kv Bay 2 Unit-02	ABB make and LTB245E1	17500562	Available	02 trip/ 01 close coil	Not Available	07.11.2023	2009	T1	16.2	16.2	16.2	Serviceable	
									T2	16.4	16.4	15.6	Serviceable	
3	220 kv Bay 3 Unit-03	ABB make and LTB245E1	17500561	Available	02 trip/ 01 close coil	Not Available	08.11.2023	2009	T1	16.4	16.4	16.2	Serviceable	
									T2	16.4	16	16.2	Serviceable	
4	220 kv Bay 4 Line-01	ABB make and LTB245E1	17500566	Available	02 trip/ 01 close coil	Not Available	01.05.2023	2009	T1	16.9	16.2	16.7	Serviceable	
									T2	17	16.5	16.9	Serviceable	
5	220 kv Bay 5 Line-02	ABB make and LTB245E5	17500565	Available	02 trip/ 01 close coil	Not Available	30.04.2024	2009	T1	16.8	16.4	16.3	Serviceable	
									T2	16.7	16.5	16.1	Serviceable	
6	220 kv Bay 6 -B/C	ABB make and LTB245E1	17500564	Available	02 trip/ 01 close coil	Not Available	22.06.2022	2009	T1	16	16.5	16.5	Serviceable	
									T2	16	16	16	Serviceable	
7	220 kv Bay 7- 25MVA-01	ABB make and LTB245E1	17500567	Available	02 trip/ 01 close coil	Not Available	23.06.2022	2009	T1	16	16.5	16	Serviceable	
									T2	16.5	16.5	16	Serviceable	
8	220 kv Bay 8- 25MVA-02	Alstom make and GL314	150033	Available	02 trip/ 01 close coil	Not Available	25.03.2023	2006	T1	16.2	16.4	16.6	Serviceable	
									T2	16.6	16.6	16.6	Serviceable	
B)	**132 kV System**													
1	132 kv Bay 1													
2	132 kv Bay 2													
3	132 kv Bay 3													
4	132 kv Bay 4													
5	132 kv Bay 5													
6	132 kv Bay 6													

AE(Em)

Note : Rows to be added /deleted as required for no. of bays

AE(Test)

Executive Engineer (Gen.)
Tiloth Power House
Uttarkashi

DETAILS OF PROTECTION AUDIT

A. General Information

1. Name of Sub-station — TILOTH POWER HOUSE UTTARKASHI

3.Type of Bus Switching Scheme — TWO BUS (ONE CHARGED BUS AND ONE STAND-BY BUS)

1) Instrument Transformer — (To be filled for each one of them)

A) Current Transformer(CT)

1.Location of CT : **220kV Feeder No. 82 (Line-01)**

a. CT ratio : 800/400/1-1-1-1-1-1 A

b. Date of last Testing 01.12.2020

c. Date of comissioning: 19.12.2020

d. Serial no. OC 8523/02/02/19 OC 8523/02/03/19 OC 8523/02/05/19

e. Serviceble/Non-serviceble

			Core I	Core II	Core III	Core IV	Core V	Core VI
i)	Ratio Adopted	R	400/1	400/1	400/1	400/1	400/1	400/1
			800/1	800/1	800/1	800/1	800/1	800/1
	Ratio Measured		398.8	400.4	398.8	400.8	400.8	398.8
			800.8	801.6	802.4	804	804	800.8
	Error		+0.30%	-0.10%	+0.30%	-0.20%	-0.20%	+0.40%
	Calculated		-0.10%	-0.20%	-0.30%	-0.50%	-0.50%	-0.10%
ii)	Ratio Adopted	Y	400/1	400/1	400/1	400/1	400/1	400/1
			800/1	800/1	800/1	800/1	800/1	800/1
	Ratio Measured		399.6	399.2	398.8	398.8	399.2	399.2
			798.4	798.4	797.6	799.2	798.4	796.8
	Error		+0.10%	+0.20%	+0.30%	+0.30%	+0.20%	+0.20%
	Calculated		+0.20%	+0.20%	+0.30%	+0.10%	+0.20%	+0.40%
iii)	Ratio Adopted	B	400/1	400/1	400/1	400/1	400/1	400/1
			800/1	800/1	800/1	800/1	800/1	800/1
	Ratio Measured		401.6	402.8	401.6	402.8	403.2	401.6
			802.4	802.4	796.8	796	796.8	796.8
	Error		-0.40%	-0.70%	-0.40%	-0.70%	-0.80%	-0.40%
	Calculated		-0.30%	-0.30%	+0.40%	+0.50%	+0.40%	+0.40%
iv)	Knee Point Voltage	Vk in Volt	924V @ 800/1	924V @ 800/1	----	----	511V @ 400/1	511V @ 400/1

3.Location of CT : **GTF No. - 01 HV (220kV) Bushing**

a. CT ratio : 400/200/1-1-1-1-1-1-1 A

b. Date of last Testing 12.03.2020 & 17.03.2020

c. Date of comissioning: 14.04.2020

d. Serial no. 19-25927 19-25928 19-25929

e. Serviceble/Non-serviceble

				Core I	Core II	Core III	Core IV	Core V	Core VI	Core VII
i)	Ratio Adopted	R		200/1	200/1	200/1	200/1	200/1	200/1	200/1
				400/1	400/1	400/1	400/1	400/1	400/1	400/1
	Ratio Measured			199.58	199.17	199.17	199.58	199.17	199.17	199.58
				398.34	401.67	398.34	401.67	401.67	401.67	398.34
	Error			+0.21%	+0.41%	+0.41%	+0.21%	+0.41%	+0.41%	+0.21%
	Calculated			+0.41%	-0.41%	+0.41%	-0.41%	-0.41%	-0.41%	+0.41%
ii)	Ratio Adopted	Y		200/1	200/1	200/1	200/1	200/1	200/1	200/1
				400/1	400/1	400/1	400/1	400/1	400/1	400/1
	Ratio Measured			199.58	199.17	199.17	199.58	199.58	199.17	199.58
				398.34	401.67	398.34	398.34	398.34	401.67	398.34
	Error			+0.21%	+0.41%	+0.41%	+0.21%	+0.21%	+0.41%	+0.21%
	Calculated			+0.41%	-0.41%	+0.41%	+0.41%	+0.41%	-0.41%	+0.41%
iii)	Ratio Adopted	B		200/1	200/1	200/1	200/1	200/1	200/1	200/1
				400/1	400/1	400/1	400/1	400/1	400/1	400/1
	Ratio Measured			199.58	199.17	199.58	199.17	199.17	199.17	199.17
				398.34	398.34	401.67	401.67	398.34	401.67	401.67
	Error			+0.21%	+0.41%	+0.21%	+0.41%	+0.41%	+0.41%	+0.41%
	Calculated			+0.41%	+0.41%	-0.41%	-0.41%	+0.41%	-0.41%	-0.41%
iv)	Ratio Adopted	N		200/1	200/1	200/1	200/1	-----	-----	-----
				400/1	400/1	400/1	400/1	-----	-----	-----
	Ratio Measured			198.97	198.97	198.7	198.7	-----	-----	-----
				397.95	397.95	397.95	397.95	-----	-----	-----
	Error			+0.51%	+0.51%	+0.51%	+0.51%	-----	-----	-----
	Calculated			+0.51%	+0.51%	+0.51%	+0.51%	-----	-----	-----
v)	Knee Point Voltage	Vk in Volt	Phase	≥393V @ 200/1A & ≥786V @ 400/1A	≥393V @ 200/1A & ≥786V @ 400/1A	≥393V @ 200/1A & ≥786V @ 400/1A	≥393V @ 200/1A & ≥786V @ 400/1A	-----	-----	-----
			Neutral	≥393V @ 200/1A & ≥786V @ 400/1A	≥393V @ 200/1A & ≥786V @ 400/1A	-----	-----			

AE(Elect)

AE(Test)

Executive Engineer (Genl.)
Tiloth Power House
Uttarkashi

A) Current Transformer(CT)

1.Location of CT : **GTF No. - 03 HV (220kV) Bushing**

a. CT ratio : 400/200/1-1-1-1-1-1-1 A

b. Date of last Testing 14.06.2021

c. Date of comissioning: 03.07.2021

d. Serial no. 27203249 27203235 27203229

e. Serviceble/Non-serviceble

				Core I	Core II	Core III	Core IV	Core V	Core VI	Core VI
i)	Ratio Adopted	R		200/1	200/1	200/1	200/1	200/1	200/1	200/1
	Ratio Adopted			400/1	400/1	400/1	400/1	400/1	400/1	400/1
	Ratio Measured			204.41	203.85	204.98	203.85	204.41	204.41	203.85
	Ratio Measured			402.17	400	397	404.37	404.37	402.17	402.17
	Error			-2.20%	-1.92%	-2.49%	-1.92%	-2.20%	-2.20%	-1.92%
	Calculated			-0.54%	0.00%	+0.75%	-1.09%	-1.09%	-0.54%	-0.54%
ii)	Ratio Adopted	Y		200/1	200/1	200/1	200/1	200/1	200/1	200/1
	Ratio Adopted			400/1	400/1	400/1	400/1	400/1	400/1	400/1
	Ratio Measured			205.46	205.19	205.46	204.92	204.66	203.6	204.66
	Ratio Measured			400	402.03	402.03	401.01	401.01	400	402.03
	Error			-1.36%	-1.29%	-1.36%	-1.23%	-1.16%	-0.90%	-1.16%
	Calculated			0.00%	-0.50%	-0.50%	-0.25%	-0.25%	0.00%	-0.50%
iii)	Ratio Adopted	B		200/1	200/1	200/1	200/1	200/1	200/1	200/1
	Ratio Adopted			400/1	400/1	400/1	400/1	400/1	400/1	400/1
	Ratio Measured			200	203.73	202.85	202.56	198.32	198.32	198.87
	Ratio Measured			400	401.12	400	403.4	400	401.12	401.12
	Error			0.00%	-1.86%	-1.42%	-1.28%	+0.84%	+0.84%	+0.56%
	Calculated			0.00%	-0.56%	0.00%	-0.85%	0.00%	-0.56%	-0.56%
iv)	Ratio Adopted	N		200/1	200/1	200/1	200/1	-----	-----	-----
	Ratio Adopted			400/1	400/1	400/1	400/1	-----	-----	-----
	Ratio Adopted			200	202.38	200	200	-----	-----	-----
	Ratio Adopted			397.37	397.37	397.37	397.37	-----	-----	-----
	Error			0.00%	-1.19%	0.00%	0.00%	-----	-----	-----
	Calculated			+0.65%	+0.65%	+0.65%	+0.65%	-----	-----	-----
v)	Knee Point Voltage	Vk in Volt	Phase	≥393V @ 200/1A & ≥786V @ 400/1A	≥393V @ 200/1A & ≥786V @ 400/1A	≥393V @ 200/1A & ≥786V @ 400/1A	≥393V @ 200/1A & ≥786V @ 400/1A	-----	-----	-----
			Neutral	≥393V @ 200/1A & ≥786V @ 400/1A	≥393V @ 200/1A & ≥786V @ 400/1A	-----	-----			

5.Location of CT : **Unit-02 Switchyard CT (220kV)**

a. CT ratio : 200/100/1-1

b. Date of last Testing 28.04.2022

c. Date of comissioning: 05.09.2022

d. Serial no. 2110310 2110308 2110307

e. Serviceble/Non-serviceble

			Core I	Core II
i)	Ratio Adopted	R	100/1	100/1
	Ratio Adopted		200/1	200/1
	Ratio Measured		100.9	100.3
	Ratio Measured		200.3	200.9
	Error		-0.89%	-0.30%
	Calculated		-0.15%	-0.45%
ii)	Ratio Adopted	Y	100/1	100/1
	Ratio Adopted		200/1	200/1
	Ratio Measured		100.3	100.3
	Ratio Measured		200.3	200.3
	Error		-0.30%	-0.30%
	Calculated		-0.15%	-0.15%
iii)	Ratio Adopted	B	100/1	100/1
	Ratio Adopted		200/1	200/1
	Ratio Measured		100.8	100.7
	Ratio Measured		200.8	200.6
	Error		-0.79%	-0.69%
	Calculated		-0.39%	-0.30%
iv)	Knee Point Voltage	Vk in Volt	----	>200/100V

AE (Test)

AE(Elect)

Executive Engineer (Gen.)
Tiloth Power House
Uttarkashi

A) Current Transformer(CT)

7.Location of CT : **220kV/33kV 25MVA T/F-01 HV CT**

a. CT ratio : 400/200/1-1-1-1-1-1-1

b. Date of last Testing 08.08.2022

c. Date of comissioning: 22.09.2022

d. Serial no. OC 8523/6/1/19 OC 8523/3/6/19 OC 8523/3/4/19

e. Serviceble/Non-serviceble

			Core I	Core II	Core III	Core IV	Core V	Core VI	Core VII
i)	Ratio Adopted	R	200/1	200/1	200/1	200/1	200/1	200/1	200/1
	Ratio Measured		400/1	400/1	400/1	400/1	400/1	400/1	400/1
	Error		201.41	202.02	201.01	201.82	201.41	202.02	202.02
	Calculated		401.61	401.61	401.2	400.8	402.01	402.41	402.41
			-0.70%	-0.99%	-0.50%	-0.90%	-0.70%	-0.99%	-0.99%
			-0.40%	-0.40%	-0.29%	-0.19	-0.49%	-0.59	-0.59%
ii)	Ratio Adopted	Y	200/1	200/1	200/1	200/1	200/1	200/1	200/1
	Ratio Measured		400/1	400/1	400/1	400/1	400/1	400/1	400/1
	Error		201.41	201.61	201.01	200.2	201.21	201.41	201.41
	Calculated		400.8	400	398.8	398.41	399.6	399.2	400.4
			-0.70%	-0.0079	-0.50%	-0.09%	-0.60%	-0.70%	-0.70%
			-0.19	00.00%	+0.30%	+0.39%	+0.10%	+0.20%	-0.09%
iii)	Ratio Adopted	B	200/1	200/1	200/1	200/1	200/1	200/1	200/1
	Ratio Measured		400/1	400/1	400/1	400/1	400/1	400/1	400/1
	Error		201.01	201.21	201.82	200.4	201.01	201.21	201.61
	Calculated		404.04	403.23	403.63	403.23	404.04	402.41	404.04
			-0.50%	-0.60%	-0.90%	-0.19%	-0.50%	-0.60%	-0.79%
			-0.99%	-0.80%	-0.89%	-0.80%	-0.99%	-0.59%	-0.99%
iv)	Knee Point Voltage	Vk in Volt	1074V @ 400/1A	----	----	----	1074V @ 400/1	511V @ 400/1A	511V @ 400/1A

9.Location of CT : 220kV Bus Coupler CT

a. CT ratio : 400/1-1-1

b. Date of last Testing 24.03.2023

c. Date of comissioning: 28.03.2023

d. Serial no. OC 8523/4/1/19 OC 8523/1/3/19 OC 8523/1/2/19

e. Serviceble/Non-serviceble

			Core I	Core II	Core III
i)	Ratio Adopted	R	400/1	400/1	400/1
	Ratio Measured		400.08	399.67	400.1
	Error Calculated		-0.02%	+0.08%	-0.02%
ii)	Ratio Adopted	Y	400/1	400/1	400/1
	Ratio Measured		400.1	400.14	400.23
	Error Calculated		-0.02%	-0.03%	-0.05%
iii)	Ratio Adopted	B	400/1	400/1	400/1
	Ratio Measured		400.2	399.67	400.14
	Error Calculated		-0.05%	+0.08%	-0.03%
iv)	Knee Point Voltage	Vk in Volt	452V	452V	----

Deepak Nanay AE (Test)

AE (Em)

Executive Engineer (Gen.)
Tiloth Power House
Uttarkashi

Note : Rows to be added /deleted as required for no. of bays

2. Date Of First Commissioning — 1984 , RMU COMPLETED ON 2022 (RMU OF 3RD UNIT COMPLETED)

4. Whether SLD Collected or Not : COLLECTED

2. Location of CT : **220kV Feeder No. 84 (Line-02)**

a. CT ratio : 800/400/1-1-1-1-1-1 A

b. Date of last Testing 20.02.2020

c. Date of comissioning: 22.02.2020

d. Serial no. OC 8523/2/4/19 OC 8523/2/6/19 OC 8523/2/1/19

e. Serviceble/Non-serviceble

			Core I	Core II	Core III	Core IV	Core V	Core VI
i)	Ratio Adopted	R	400/1	400/1	400/1	400/1	400/1	400/1
			800/1	800/1	800/1	800/1	800/1	800/1
	Ratio Measured		399.6	399.6	399.6	399.6	399.6	399.6
			799.2	799.2	799.2	798.4	799.2	798.4
	Error		+0.10%	+0.10%	+0.10%	+0.10%	+0.10%	+0.10%
	Calculated		+0.10%	+0.10%	+0.10%	+0.20%	+0.10%	+0.20%
ii)	Ratio Adopted	Y	400/1	400/1	400/1	400/1	400/1	400/1
			800/1	800/1	800/1	800/1	800/1	800/1
	Ratio Measured		399.6	399.6	399.6	399.6	399.2	399.2
			798.4	799.2	799.2	799.2	798.4	798.4
	Error		+0.10%	+0.10%	+0.10%	+0.10%	+0.20%	+0.20%
	Calculated		+0.20%	+0.10%	+0.10%	+0.10%	+0.20%	+0.20%
iii)	Ratio Adopted	B	400/1	400/1	400/1	400/1	400/1	400/1
			800/1	800/1	800/1	800/1	800/1	800/1
	Ratio Measured		399.6	399.2	399.6	399.6	399.6	399.2
			799.2	799.2	799.2	799.2	798.4	798.4
	Error		+0.10%	+0.20%	+0.10%	+0.10%	+0.10%	+0.20%
	Calculated		+0.10%	+0.10%	+0.10%	+0.10%	+0.20%	+0.20%
iv)	Knee Point Voltage	Vk in Volt	924V @ 800/1	924V @ 800/1	----	----	511V @ 400/1	511V @ 400/1

4. Location of CT : **GTF No. - 02 HV (220kV) Bushing**

a. CT ratio : 400/200/1-1-1-1-1-1-1 A

b. Date of last Testing 21.04.2022

c. Date of comissioning: 05.09.2022

d. Serial no. 27213238 27213246 27213244

e. Serviceble/Non-serviceble

				Core I	Core II	Core III	Core IV	Core V	Core VI	Core VII
i)	Ratio Adopted	R		200/1	200/1	200/1	200/1	200/1	200/1	200/1
				400/1	400/1	400/1	400/1	400/1	400/1	400/1
	Ratio Measured			204.5	203.8	204.91	203.86	204.4	204.45	203.65
				402.15	400.09	397.01	404.27	404.47	402.57	402.67
	Error			-2.20%	-1.92%	-2.49%	-1.92%	-2.20%	-2.20%	-1.92%
	Calculated			-0.54%	0.00%	+0.75%	-1.09%	-1.09%	-0.54%	-0.54%
ii)	Ratio Adopted	Y		200/1	200/1	200/1	200/1	200/1	200/1	200/1
				400/1	400/1	400/1	400/1	400/1	400/1	400/1
	Ratio Measured			205.45	205.15	205.43	204.93	204.65	203.68	204.61
				400.09	402.03	402.01	401	401.06	400.09	402.01
	Error			-1.36%	-1.029%	-1.36%	-1.23%	-1.16%	-0.90%	-1.16%
	Calculated			0.00%	-0.50%	-0.50%	-0.25%	-0.25%	0.00%	-0.50%
iii)	Ratio Adopted	B		200/1	200/1	200/1	200/1	200/1	200/1	200/1
				400/1	400/1	400/1	400/1	400/1	400/1	400/1
	Ratio Measured			200.01	203.74	202.86	202.58	198.34	198.32	198.84
				400.08	401.09	400.91	403.3	400.08	401.01	401.16
	Error			0.00%	-1.86%	-1.42%	-1.28%	+0.84%	+0.84%	+0.56%
	Calculated			0.00%	-0.56%	0.00%	-0.85%	0.00%	-0.56%	-0.56%
iv)	Ratio Adopted	N		200/1	200/1	200/1	200/1	----	----	----
				400/1	400/1	400/1	400/1	----	----	----
	Ratio Measured			198.97	198.97	198.97	198.97	----	----	----
				397.95	397.95	397.95	397.95	----	----	----
	Error			+0.51%	+0.51%	+0.51%	+0.51%	----	----	----
	Calculated			+0.51%	+0.51%	+0.51%	+0.51%	----	----	----
v)	Knee Point Voltage	Vk in Volt	Phase	≥393V @ 200/1A & ≥786V @ 400/1A	≥393V @ 200/1A & ≥786V @ 400/1A	≥393V @ 200/1A & ≥786V @ 400/1A	≥393V @ 200/1A & ≥786V @ 400/1A	-----	-----	-----
			Neutral	≥393V @ 200/1A & ≥786V @ 400/1A	≥393V @ 200/1A & ≥786V @ 400/1A	-----	-----			

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2.Location of CT : **Unit-01 Switchyard CT (220kV)**

a. CT ratio : 200/100/1-1

b. Date of last Testing 20.02.2020

c. Date of comissioning: 14.04.2020

d. Serial no. 2110304 2110303 2110309

e. Serviceble/Non-serviceble

			Core I	Core II
i)	Ratio	R	100/1	100/1
	Adopted		200/1	200/1
	Ratio		99.9	99.9
	Measured		200.2	199.6
	Error		+0.10%	+0.10%
	Calculated		-0.10%	+0.20%
ii)	Ratio	Y	100/1	100/1
	Adopted		200/1	200/1
	Ratio		99.9	100.1
	Measured		199.8	199.2
	Error		+0.10%	-0.10%
	Calculated		+0.10%	+0.40%
iii)	Ratio	B	100/1	100/1
	Adopted		200/1	200/1
	Ratio		99.9	100.1
	Measured		199.8	200.2
	Error		+0.10%	-0.10%
	Calculated		+0.10%	-0.10%
iv)	Knee Point Voltage	Vk in Volt	----	>200/100V

6.Location of CT : **Unit-03 Switchyard CT (220kV)**

a. CT ratio : 200/100/1-1

b. Date of last Testing 25.03.2021

c. Date of comissioning: 03.07.2021

d. Serial no. 2110306 2110305 2110302

e. Serviceble/Non-serviceble

			Core I	Core II
i)	Ratio	R	100/1	100/1
	Adopted		200/1	200/1
	Ratio		100.18	100.16
	Measured		200.2	200.32
	Error		+0.18%	+0.16%
	Calculated		+0.20%	+0.32%
ii)	Ratio	Y	100/1	100/1
	Adopted		200/1	200/1
	Ratio		100.15	100.14
	Measured		200.3	200.24
	Error		+0.15%	+0.14%
	Calculated		+0.30%	+0.24%
iii)	Ratio	B	100/1	100/1
	Adopted		200/1	200/1
	Ratio		100.23	100.17
	Measured		200.46	200.34
	Error		+0.23%	+0.17%
	Calculated		+0.46%	+0.34%
iv)	Knee Point Voltage	Vk in Volt	----	>200/100V

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8.Location of CT : **220kV/33kV 25MVA T/F-02 HV CT**

a. CT ratio : 400/200/1-1-1-1-1-1-1

b. Date of last Testing 30.11.2022

c. Date of comissioning: 09.12.2022

d. Serial no. OC 8523/3/2/19 OC 8523/3/5/19 OC 8523/3/3/19

e. Serviceble/Non-serviceble

			Core I	Core II	Core III	Core IV	Core V	Core VI	Core VII
i)	Ratio Adopted	R	200/1	200/1	200/1	200/1	200/1	200/1	200/1
	Ratio Measured		400/1	400/1	400/1	400/1	400/1	400/1	400/1
	Error		200.002	199.735	199.538	198.728	200.036	200.087	200.079
	Calculated		399.945	400.123	399.368	398.604	400.127	400.031	400.127
			-0.0009%	+0.1324%	+0.2308%	+0.636%	-0.0179%	-0.0436%	-0.0395%
			+0.0138%	-0.0308%	+0.1581%	+0.349%	-0.0318%	-0.0077%	-0.0318%
ii)	Ratio Adopted	Y	200/1	200/1	200/1	200/1	200/1	200/1	200/1
	Ratio Measured		400/1	400/1	400/1	400/1	400/1	400/1	400/1
	Error		200	199.77	199.3	198.68	200.04	199.78	200.09
	Calculated		400.05	399.85	400	398.81	399.84	399.76	400.23
			00.00%	+0.12%	+0.35%	+0.66%	-0.0200%	+0.11%	-0.05%
			-0.012%	+0.04%	00.00%	+0.30%	+0.04%	+0.06%	-0.06%
iii)	Ratio Adopted	B	200/1	200/1	200/1	200/1	200/1	200/1	200/1
	Ratio Measured		400/1	400/1	400/1	400/1	400/1	400/1	400/1
	Error		200.04	200.1	199.12	198.77	200.07	200.08	200.1
	Calculated		400.02	399.74	399.45	398.84	400.04	400.03	400.01
			-0.02%	-0.13%	+0.45%	+0.62%	-0.04%	-0.04%	-0.06%
			-0.01%	+0.07%	+0.14%	+0.29%	-0.01%	-0.01%	-0.001%
iv)	Knee Point Voltage	Vk in Volt	1074V @ 400/1A	----	----	----	1074V @ 400/1	511V @ 400/1A	511V @ 400/1A

10.Location of CT :

a. CT ratio :

b. Date of last Testing

c. Date of comissioning:

d. Serial no.

e. Serviceble/Non-serviceble

				Core I	Core II	Core III	Core IV	Core V		Core VI
i)	Ratio Adopted	R								
	Ratio Measured									
	Error Calculated									
ii)	Ratio Adopted	Y								
	Ratio Measured									
	Error Calculated									
iii)	Ratio Adopted	B								
	Ratio Measured									
	Error Calculated									
iv)	Knee Point Voltage	Vk in Volt								

Note : Rows to be added /deleted as required for no. of bays

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Appendix-9.4

CHECK LIST TO ENABLE AUDIT OF PRACTICES FOLLOWED IN PROTECTION APPLICATION & CRITERIA USED FOR SETTING CALCULATIONS IN 220KV, 400KV & 765KV SUBSTATIONS

CHECK-LIST: Check list for different protected objects & elements in fault clearance system are as under:

(put √ mark in the appropriate box)

A. Transmission Lines (OHL and Cables)

1.	Independent Main-I and Main-II protection (of different make OR different type) is provided with carrier aided scheme	☐ YES	☑ NO
2.	Are the Main-I & Main-II relays connected to two separate DC sources (Group-A and Group-B)	☑ YES	☐ NO
3.	Is the Distance protection (Non-switched type, suitable for 1-ph & 3-ph tripping) as Main1 and Main2 provided to ensure selectivity & reliability for all faults in the shortest possible time	☑ YES	☐ NO
4.	Is both main-I & Main-II distance relay are numerical design having Quadrilateral or Polygon operating characteristic	☑ YES	☐ NO
5.	In the Main-I / Main-II Distance protection, Zone-I is set cover 80% of the protected line section	☑ YES	☐ NO
6.	In the Main-I / Main-II distance protection, Zone-2 is set cover 120% of the protected line section in case of Single circuit line and 150% in case of Double circuit line	☑ YES	☐ NO
7.	In the Main-I / Main-II distance protection, Zone-3 is set cover 120% of the total of protected line section plus longest line at remote end as a minimum.	☑ YES	☐ NO
8.	Resistive reach for Ground fault element set to give maximum coverage considering fault resistance, arc resistance & tower footing resistance. (In case, It is not possible to set the ground fault and phase fault reaches separately, load point encroachment condition imposed on Phase fault resistive reach shall be applied)	☑ YES	☐ NO
9.	Resistive reach for Phase fault element set to give maximum coverage subject to check of possibility against load point encroachment considering minimum expected voltage and maximum load.	☑ YES	☐ NO
10.	In case of short lines, is manufacturers recommendation considered in respect of resistive setting vis a vis reactance setting to avoid overreach.	☑ YES	☐ NO
11	Is Zone-2 time delay of Main-I / Main-II distance relay set to 0.350 seconds ? In case any other value has been set for Zone-II timer, kindly specify the value and justification thereof.:- 400 Sec.	☐ YES	☑ NO
12	Is Zone-3 timer is set to provide discrimination with the operating time of relays at adjacent sections with which Zone-3 reach of relay is set to overlap. Please specify the Zone-3 time set.:- 800 m Sec.	☑ YES	☐ NO
13.	Is Zone-4 reach set in reverse direction to cover expected levels of apparent bus bar fault resistance, when allowing for multiple in feeds from other circuits?	☑ YES	☐ NO
14.	Is reverse looking Zone-4 time delay set as Zone-2 time delay?	☐ YES	☑ NO

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15.	Is Switch on to fault (SOTF) function provided in distance relay to take care of line energisation on fault? Whether SOTF initiation has been implemented using hardwire logic In case of Breaker and half switching scheme, whether initiation of line SOTF from CB closing has been interlocked with the other CB	☑ YES ☐ NO ☐ YES ☐ NO ☐ YES ☐ NO
16.	Whether VT fuse fail detection function has been correctly set to block the distance function operation on VT fuse failure	☑ YES ☐ NO
17.	Is the sensitive IDMT directional E/F relay (either separate relay or built-in function of Main relay) for protection against high resistive earth faults?	☑ YES ☐ NO
18.	Is additional element (Back-up distance) for remote back-up protection function provided in case of unit protection is used as Main relay for lines?	☑ YES ☐ NO
19.	In case of Cables, is unit protection provided as Main-I & Main-II protection with distance as back-up.	☐ YES ☑ NO
20.	Are the line parameters used for setting the relay verified by field testing	☑ YES ☐ NO
21.	Is Two stages Over-Voltage protection provided for 765 & 400kV Lines? Do you apply grading in over-voltage setting for lines at one station. Please specify the setting values adopted for: Stage-I : (typical value - 106 to 112 % , delay : 4-7 Sec) Stage-II: (typical value - 140 to 150%, delay: 0 to 100msec.)	☐ YES ☑ NO ☐ YES ☑ NO ....
22.	Is 1-ph Auto –reclosing provided on 765, 400 & 220kV lines? Please specify the set value: Dead time: (typical 1 Sec) :– 1·2 Sec Reclaim time: (typical 25 Sec)	☑ YES ☐ NO ....
23.	Is the Distance communication. Scheme Permissive Over Reach (POR) applied for short lines and Permissive Under Reach (PUR) applied for long lines? If any other communication scheme has been applied, please provide the detail with justification thereof.	☐ YES ☐ NO .....
24.	Is the Current reversal guard logic for POR scheme provided on Double circuit lines?	☐ YES ☐ NO
25.	In case the protected line is getting terminated at a station having very low fault level i.e. HVDC terminal, whether week end-infeed feature has been enabled in respective distance relay or not	☐ YES ☑ NO
26.	In case of protected line is originating from nuclear power station, are the special requirement (stability of nuclear plant auxiliaries) as required by them has been met	☐ YES ☑ NO
27.	What line current , Voltage and Load angle have been considered for Load encroachment blinder setting and what is the resultant MVA that the line can carry without load encroachment. (In the absence of Load encroachment blinder function, this limit shall be applied to Zone-3 phase fault resistive reach.)	I= V= Angle: S=
28.	a) What are the Zones blocked on Power swing block function: b) Setting for Unblock timer: (typical 02 second) c) Out of Step trip enabled	Z1 / Z2 / Z3 / Z4 Time: ☐ YES ☐ NO
29.	Whether the location of Out of step relay has been identified on the basis of power system simulation studies	☑ YES ☐ NO

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30.	a) Is Disturbance recorder and Fault locator provided on all line feeder ? b) Whether standalone or built in Main relay c) Whether DR is having automatic fault record download facility to a central PC d) Whether DR is time synchronised with the GPS based time synchronising equipment e) Whether DR analog channels contain line phase & neutral current and line phase & neutral voltage. f) Whether DR digital channel as a minimum contain the CB status, Main-I & II trip status, LBB trip status, Over-voltage trip status, Stub protn trip status, Permissive and direct carrier receive status, Line reactor trip status.	☑ YES ☐ NO Standalone / built-in ☐ YES ☑ NO ☑ YES ☐ NO ☑ YES ☐ NO ☑ YES ☐ NO
31.	Does the Setting document for the numerical relays (IED) contain all the settings for all functions that are used and indicates clearly the functions not used (to be Blocked / Disabled). Are all default settings validated or revised settings given in the setting document?	☑ YES ☐ NO

B. Power Transformers

1.	Do you use Group A and Group B protections connected to separate DC sources for power transformers	☑ YES ☐ NO
2.	Do you follow CBIP guideline (274 & 296) for protection setting of transformer	☑ YES ☐ NO
3.	Do you use duplicated PRD and Bucholtz initiating contact for power transformers at 765kV and 400kV levels	☐ YES ☑ NO
4.	Do you classify transformer protections as below in groups: Group A Group B • Biased differential relay Restricted earth fault (REF) relay •PRD , WTI Buchholz Protection, OTI • Back up Protection(HV) Back up Protection(MV) • Over fluxing protection(HV) Over fluxing protection(MV)	☑ YES ☐ NO Group A or B
5.	In case of Breaker & half switching scheme, whether CT associated with Main & Tie Breakers are connected to separate bias winding of the low impedance Biased differential protection in order to avoid false operation due to dissimilar CT response.	☐ YES ☐ NO
6.	Is Restricted earth fault (REF) protection used a high impedance type	☑ YES ☐ NO
7.	Are Main protection relays provided for transformers are of numerical design.	☑ YES ☐ NO
8.	a) Are directional over current & earth fault relays provided as back-up protection of Transformer are of numerical design. b) Do the back-up earth fault relays have harmonic restrain feature	☑ YES ☐ NO ☑ YES ☐ NO
9.	Is Fire protection system (HVW type) provided for power transformer and functioning	☑ YES ☐ NO
10.	a) Is the Disturbance recorder provided for Transformer feeder b) Whether standalone or built in Main relay c) Whether DR is having automatic fault record download facility to a central PC d) Whether DR is time synchronised with the GPS time synchronising equipment	☑ YES ☐ NO Standalone/built-in ☐ YES ☑ NO ☑ YES ☐ NO

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11.	Does the Setting document for the numerical relays (IED) contain all the settings for all functions that are used and indicates clearly the functions not used (to be Blocked / Disabled). Are all default settings validated or revised settings given in the setting document?	☑ YES ☐ NO

C. Shunt Reactors

1.	Do you use Group A and Group B protections connected to separate DC sources for reactors	☐ YES ☐ NO
2.	Do you follow CBIP guideline (274 and 296) for protection setting of reactors	☐ YES ☐ NO
3.	Do you use duplicated PRD and Bucholtz initiating contact for Reactors at 765kV and 400kV levels	☐ YES ☐ NO
4.	Do you classify Reactor protections as below in groups: Group A — Group B • Biased differential relay — R.E.F Protection • PRD , WTI — Buchholz Protection, OTI • Back up impedance protection — Direction O/C & E/F relay	☐ YES ☐ NO Group A or B
5	In case of Breaker & half switching scheme, whether CT associated with Main & Tie Breakers are connected to separate bias winding of the low impedance Biased differential protection in order to avoid false operation due to dissimilar CT response.	☐ YES ☐ NO
6	Is Restricted earth fault (REF) protection used a high impedance type	☐ YES ☐ NO
7	Are Main & back-up protection relays provided for Reactor are of numerical design.	☐ YES ☐ NO
8	Is Fire protection system (HVW type) provided for Reactor and functioning	☐ YES ☐ NO
9	a) Is the Disturbance recorder and Fault locator provided on all the Shunt Reactors used in 765 kV, 400 kV substations? b) Whether standalone or built in Main relay c) Whether DR is having automatic fault record download facility to a central PC	☐ YES ☐ NO Standalone/built-in ☐ YES ☐ NO
10.	Does the Setting document for the numerical relays (IED) contain all the settings for all functions that are used and indicates clearly the functions not used (to be Blocked / Disabled). Are all default settings validated or revised settings given in the setting document?	☐ YES ☐ NO

D. Bus bars

1.	Bus Bar protection for 765, 400 & 220kV buses is provided	☑ YES ☐ NO
2.	Duplicated Bus bar protection is provided for 765kV and 400kV buses	☐ YES ☑ NO
3.	CBIP guideline for Protection (274 and 296) settings is followed	☑ YES ☐ NO
4	In an existing substation if CTs are of different ratios, is biased type bus protection provided.	☐ YES ☑ NO
5	In stations where single bus bar protection is provided, is backup provided by reverse looking elements of distance relays or by second zone elements of remote end distance relays?	☐ YES ☑ NO

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6	In case of GIS where burn through time of SF6 is shorter than remote back up protection is the bus bar protection duplicated irrespective of voltage level?	☐ YES ☑ NO
7	Since it is difficult to get shutdowns to allow periodic testing of bus protection, numerical bus protections with self-supervision feature is an answer. Is this followed?	☑ YES ☐ NO
8	Does the Setting document for the numerical relays (IED) contain all the settings for all functions that are used and indicates clearly the functions not used (to be Blocked / Disabled). Are all default settings validated or revised settings given in the setting document?	☑ YES ☐ NO

E. Disturbance Recorder (DR) and Event Logger (EL)

1	a) Is the Disturbance recorder and Fault locator provided on all line feeders of 765, 400 & 220kV substations? b) Whether standalone or built in Main relay c) Whether DR is having automatic fault record download facility to a central PC d) Whether Central PC for DR , EL are powered by Inverter (fed from station DC)	☑ YES ☐ NO Standalone / built-in ☐ YES ☑ NO ☑ YES ☐ NO
2.	Whether DR is having the following main signals for lines: Analogue signals: • From CT: IA, IB, IC, IN • From VT: VAN, VBN, VCN • From Aux. VT: V0 Digital Signals • Main 1 Carrier receive • Main 1 Trip • Line O/V Stage I / Stage II • Reactor Fault Trip • Stub Protection Operated. • Main II Trip • Main II Carrier Receive • Direct Trip CH I / II • CB I Status (PH-R, Y & B) • CB II Status (PH R, Y & B) • Bus bar trip • Main / Tie CB LBB Operated • Main / Tie Auto-reclose operated. DR for Transformer / Reactor feeder should contain analog channel like input currents & voltage. Binary signal include all protection trip input, Main & Tie CB status, LBB trip	☑ YES ☐ NO
3.	Whether substation (765, 400 , 220kV) is having Event logger facility (standalone or built-in-SAS)	☑ YES ☐ NO
4.	Whether GPS based time synchronizing equipment is provided at the substation for time synchronizing of Main relays / DR/ Event logger / SAS/ PMU / Line Current Differential Relays	☑ YES ☐ NO

F. Circuit Breakers

1.	Is breaker fail protection (LBB / BFR) provided for all the Circuit Breakers at 220kV , 400kV & 765kV rating	☑ YES ☐ NO
3.	For Circuit Breaker connected to line feeder / transformer feeder, whether operation of LBB / BFR sends direct trip signal to trip remote end breaker ?	☑ YES ☐ NO

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4.	For lines employing single phase auto reclosing, Is start signal from protection trip to LBB / BFR relay is given on single phase basis?	☑ YES ☐ NO
5.	Is separate relay provided for each breaker and the relay has to be connected from the secondary circuit of the CTs associated with that particular breaker?	☑ YES ☐ NO
6.	Is LBB relay provided with separate DC circuit independent from Group-A and Group-B Protections?	☐ YES ☑ NO
7.	Is the LBB initiation provided with initiating contact independent of CB trip relay contact?	☐ YES ☑ NO
8.	Is Separation maintained between protective relay and CB trip coil DC circuit so that short circuit or blown fuse in the CB circuit will not prevent the protective relay from energizing the LBB scheme?	☐ YES ☑ NO
9.	Is LBB relay initiated by Bus bar protection in addition to other fault sensing relays, since failure of CB to clear a bus fault would result in the loss of entire station if BFP relay is not initiated?	☐ YES ☑ NO
10.	Is tripping logic of the bus bar protection scheme used for LBB protection also?	☑ YES ☐ NO
11.	Are the special considerations provided to ensure proper scheme operation by using Circuit Breaker contact logic in addition to current detectors in cases breaker-fail relaying for low energy faults like buckholz operation?	☑ YES ☐ NO
12.	Are the Current level detectors set as sensitive as the main protection? (Generally setting of 0.2 A is commonly practiced for lines and transformers)	☑ YES ☐ NO
13.	Is timer set considering breaker interrupting time, current detector reset time and a margin? (Generally a timer setting of 200ms has been found to be adequate)	☑ YES ☐ NO
14.	Is the back-up fault clearance time is shorter than the operating time of the remote protections (distance relay Zone-2) ?	☐ YES ☑ NO
15.	Is the breaker failure protection provided with two steps (First stage – retrip own CB, Second stage- Trip all associated CBs) . This mitigates unwanted operation of breaker failure protection during maintenance and fault tracing.	☑ YES ☐ NO
16.	Is the breaker failure protection hardware provided is separate from line /transformer feeder protection?	☑ YES ☐ NO

G. Communication systems

1.	a) Do you use PLCC for tele-protection of distance relays at 765, 400 & 220kV feeders	☑ YES ☐ NO
	b) Specify type of coupling	(Ph-Ph / Ph-G/ Inter-ckt)
	c) Whether redundant PLCC channels provided for 400 & 765kV lines	☐ YES ☑ NO
	d) Specify number of PLCC channels per circuit :	(One / two)
	e) Whether dependability & security of each tele-protection channel measured & record kept ?	☑ YES ☐ NO

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2.	a) In case you use OPGW for tele-protection, are they on geographically diversified route for Main-I and Main-II relay? b) Whether dedicated fibre is being used for Main-I / Main-II relay or multiplexed channel are being used.	☐ YES ☑ NO Dedicated / multiplexed

H. Station DC supply systems

1.	Do you have two separate independent DC system (220V or 110V) (Source-A and Source-B)	☑ YES ☐ NO
2.	Do you have two independent DC system (48V) for PLCC (source-A and source-B)	☐ YES ☑ NO
3.	There is no mixing of supplies from DC source-A and DC source-B	☑ YES ☐ NO
4.	Whether the protection relays and trip circuits are segregated into two independent system fed through fuses from two different DC source	☑ YES ☐ NO
5.	Whether Bay wise distribution of DC supply done in the following way: a) Protection b) CB functions c) Isolator / earth switch functions d) Annunciation / Indications e) Monitoring functions	☑ YES ☐ NO
6	Whether following has been ensured in the cabling: a) Separate cables are used for AC & DC circuits b) Separate cables are used for DC-I & DC-II circuits c) Separate cables are used for different cores of CT and CVT outputs to enhance reliability & security	☑ YES ☐ NO
7	Is guidelines prescribed in CBIP manual 274 & 296 followed in general	☑ YES ☐ NO

I. PERFORMANCE INDICES

1.	Is there a system of periodically measuring Dependability & Security of Protection system (as given in CBIP manual 296) and recorded	☑ YES ☐ NO
2.	Is there a system of periodically measuring Dependability of switchgear associated with Protection system and recorded	☑ YES ☐ NO
3.	Is there a process of Root cause analysis of unwanted tripping events	☑ YES ☐ NO
4.	Are improvement action like revision of relay setting, better maintenance practices, modernising & retrofitting of switching & protection system taken based on above data.	☑ YES ☐ NO
5.	Is attention also given to DC supply system, tele-protection signalling, healthiness of tripping cables, terminations etc. in order to improve the performance of fault clearance system	☑ YES ☐ NO

J. ADDITIONAL CHECKS FOR SERIES COMPENSATED LINES

1.	What is the operating principle of Main protection employed	☐ Distance ☐ Line Current diff.

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2.	Are both main-I & Main-II distance relay are numerical design	☐ YES ☐ NO
3.	Are both main-I & Main-II distance relay suitable for Series compensated lines	☐ YES ☐ NO
4.	Are POR tele-protection scheme employed for distance relays	☐ YES ☐ NO
5.	Position of Line VT provided on series compensated line	☐ Between Capacitor and line ☐ Between Capacitor and Bus
6.	What is the under reaching (Zone 1) setting used in teleprotection schemes (Local & Remote end)	% of line length Rationale:
7.	What is the overreaching (Zone 2) setting in used teleprotection schemes	% of line length Rationale:
8.	What kinds of measurement techniques are used to cope with voltage inversion?	☐ Phase locked voltage memory ☐ Intentional time delay Other, specify:
9.	Whether system studies carried out to check the possibility of current inversion due to series compensation	☐ YES ☐ NO
10.	Whether any system studies conducted to find the impact of series compensation on the performance of protections installed on adjacent lines? If yes, how many lines were found to be affected. Pl. specify _____	☐ YES ☐ NO
11	If YES, are the affected protections on adjacent lines changed / setting revised after the introduction of series compensation?	☐ YES ☐ NO
12.	Is dynamic simulation done to fine tune settings of distance relay installed on series compensated double circuit lines?	☐ YES ☐ NO
13.	Whether performance of directional earth fault relay verifies by simulation studies	☐ YES ☐ NO
14.	When is flashover of spark gaps expected?	☐ For protected line Faults up to ohms ☐ For external faults an adjacent lines
15.	Whether measures taken for under/overreach problems at sub-harmonic oscillations?	☐ YES ☐ NO
16.	Whether MOV influence considered while setting the distance relay reach	☐ YES ☐ NO
17.	Have you experienced any security problems (Relay mal-operation) with high frequency transients caused by ☐ Flashover of spark gaps ☐ Line energisation Other, specify:	☐ YES ☐ NO
18.	If YES, how the above problem has been addressed?	

AE (Test)

AE(En)

Executive Engineer (Gen.)
Tiloth Power House
Uttarkashi

Internal Protection Audit Report For FY-2024-25

Protection audit of Generators, Transformers and 400&220 kV Substation at RVUNL-CTPP (4*250MW) Chhabra

ACKNOWLEDGEMENT

SE(electrical) wishes to thank Electrical Protection team CTPP, Chhabra for their valuable contribution in conducting the work of internal annual protection audit for " Review Of Protection Scheme, Relay Settings Of Various Element & Associated System Of Generators, Transformers, and 400&220kV Substation at CTPP, Chhabra-RRVUNL (4*250MW).

I specially thank to the following officers for their excellent co-Operation for completion of Internal Protection Audit.

1. Sh. Jitender Gupta, Assistant Engineer, CTPP-Chhabra
2. Sh. Peeyush Kumar Tripathi, Assistant Engineer, CTPP-Chhabra

24/10/2024

C.P. Meena
S.E. (Gen.Mtc.)
CTPP, Chhabra, RVUNL

INDEX

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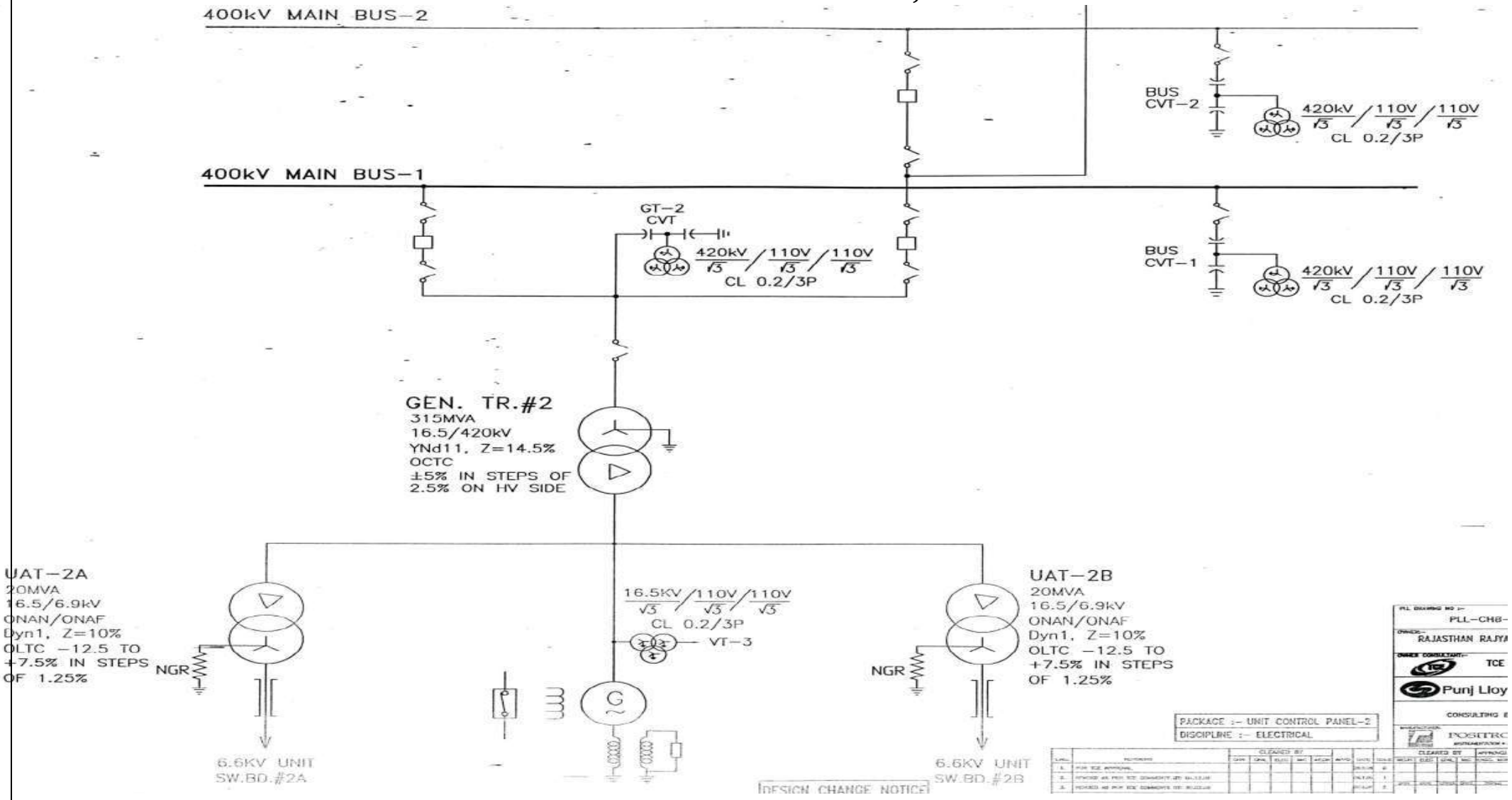
8.0	OBSERVATION

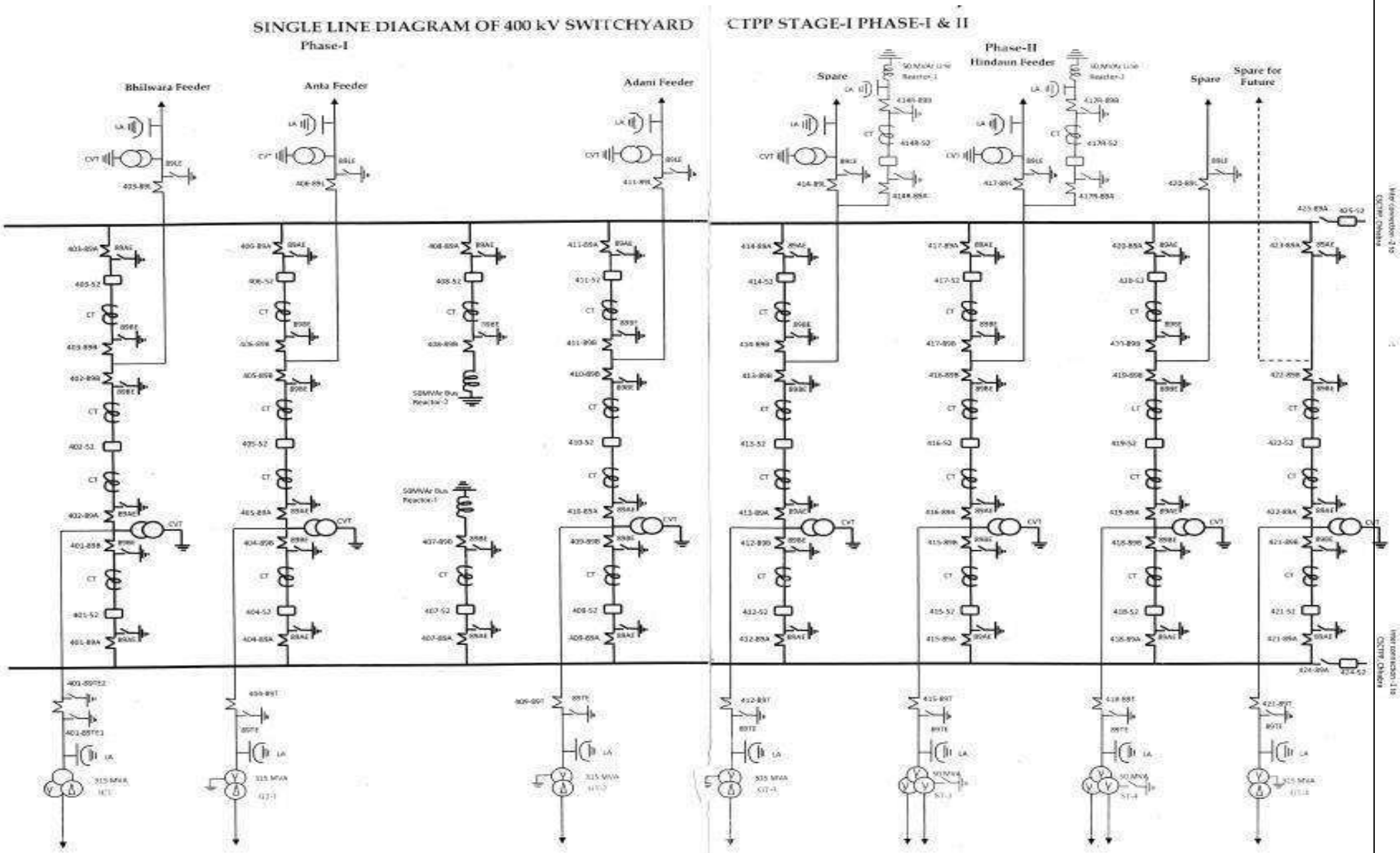
LIST OF ABBREVIATION

RRVUNL	Rajasthan Rajya Vidyut Utpadan Nigam Limited
CTPP	Chhabra Thermal Power Plant
GT	Generator Transformer
UAT	Unit Auxiliary Transformer
ST	Station Transformer
ICT	Interconnecting Transformer
CT	Current Transformer
CVT	Capacitive Voltage Transformer

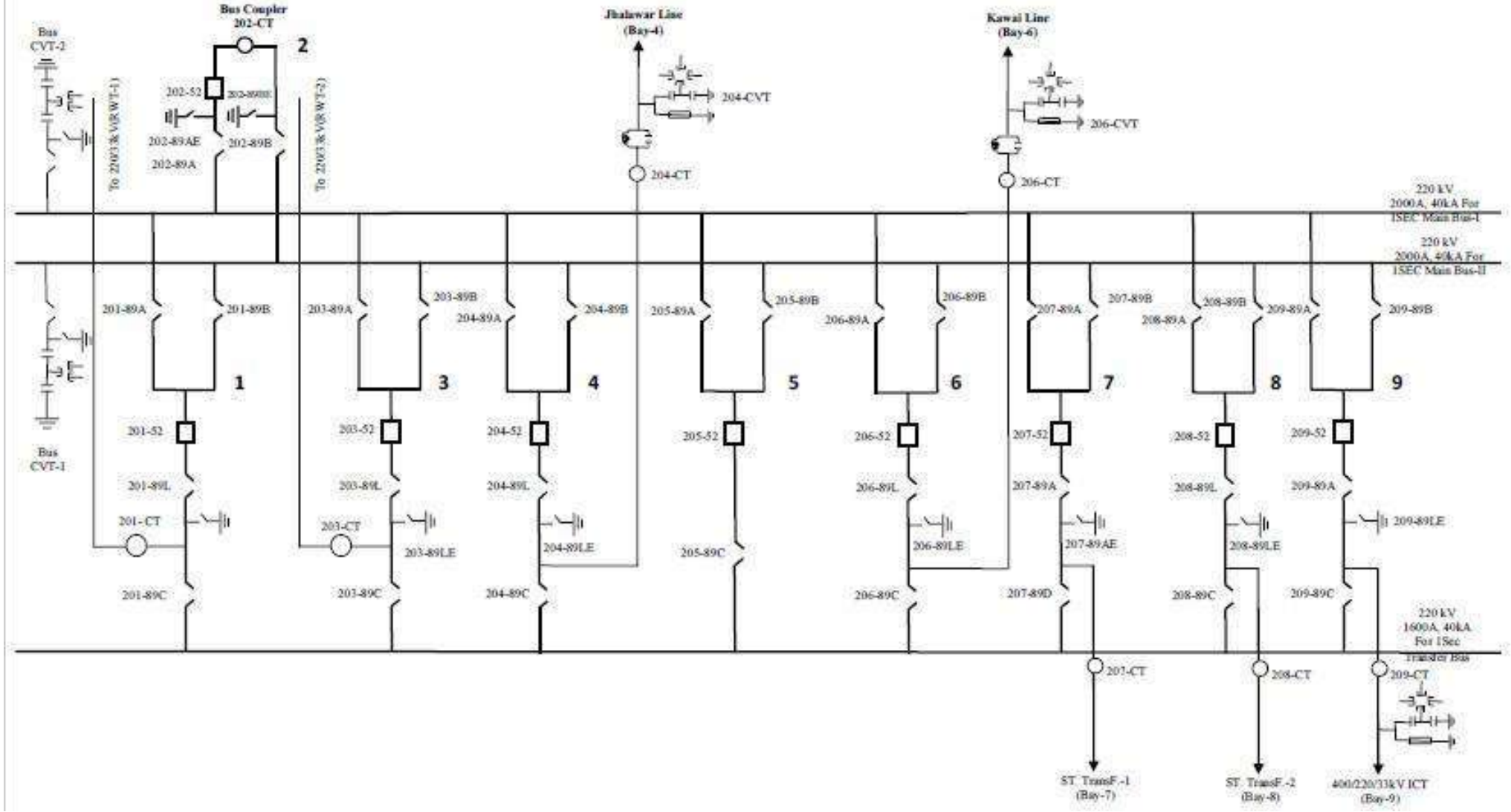
1.1

SINGLE LINE DIAGRAM OF GENERATOR, GT&UAT




SINGLE LINE DIAGRAM OF 400 kV SWITCHYARD
Phase-I
CTPP STAGE-I PHASE-I & II
Phase-II
Bhilwara Feeder
Anta Feeder
Adani Feeder
Spare
Hindaun Feeder
Spare
Spare for Future
50MVAr Line Reactor-1
50MVAr Line Reactor-2
50MVAr Bus Reactor-1
50MVAr Bus Reactor-2
315 MVA
50 MVA

SINGLE LINE DIAGRAM OF 220 kV BUSBAR PANEL SWITCHYARD CTPP STAGE-I PHASE-I & II



1.2: Protection system overall review

RVUNL-CTPP, Chhabra		
DATE OF AUDIT BY PROTECTION TEAM CTPP CHHABRA : 01/10/2024 to 21/10/2024		
Sl. No	**Title**	**Details**
1	**Name Of Grid Substation**	RVUNL-CTPP, Chhabra
2	**Highest Voltage Level**	400 kV
3	**Year Of Installation**	2010
4	**No of Generating Units**	Four(4*250MW)
5	**No Of Feeders**	Four 400 kV, Two 220 kV Feeder
6	**No of Transformers, Make and Capacity**	1*330 MVA GT-1 3*315 MVA GT-2/3/4 8*20 MVA UAT 315 MVA ICT 4*50 MVA Station transformers
7	**Busbar Arrangement**	Double main transfer bus for 220kV One and half breaker for 400kV
8	**Present Busbar Switching Status**	Commissioned
9	**Busbar Protection**	Commissioned
10	**Relay System Status**	In Service
11	**DC Supply System**	[1] 220 V DC-I System (1&2) [2] 220 V DC-II System (1&2) [3] 220 V DC-I System (3&4) [4] 220 V DC-II System (3&4) [5] 48 V DC-I System [6] 48 V DC-II System [7] 220 V DC-I System (Unit 1to 4) [8] 220 V DC-II System (Unit 1to 4)

12	**DC System Earth Fault Status**	DC System in Unit 1&2 is healthy. DC System in Unit 3&4 is healthy. DC Earth fault is present in switch yard 1&2. DC System in switch yard 3&4 is healthy.
13	**GPS Receiver Make & Model**	SANDS
14	**GPS Clock Receiver & Synchronization Of Relay Status**	Relays are Not synchronized
15	**Common Event Logger Status**	In-built feature in numerical relay is used
16	**Line Disturbance Recorder**	In-built feature in numerical relay is used
17	**Fault Locator in Line**	Provided
18	**Breaker Failure Relay Status**	Provided
19	**Relay test reports**	Available

1.3: Relays used for transmission line, transformer, reactor and bus-bar protection substation:

1.3.1: Relays used for Transmission Line Protection:

Sl. No.	Name of the Feeder	Main-I	Main-II
1	CTPP-BHILWARA	SEIMENS&7SA522	SEIMENS&7SA612
2	CTPP-ANTA	SEIMENS&7SA522	SEIMENS&7SA612
3	CTPP-ADANI	SEIMENS&7SA522	SEIMENS&7SA612
4	CTPP-HINDHAUN	ABB&REL670	ABB&REL670
5	CTPP-KAWAI	SEIMENS&7SA522	SEIMENS&7SA612
6	CTPP-AKLERA	SEIMENS&7SA522	SEIMENS&7SA612

1.3.2: Relays used for Transformer Protection:

Sl. No.	Transformer	Primary Protection		Back Up protection		
		Differential Protection	Restricted Earth Fault	Over fluxing protection	HV back up over current and Earth	LV back up Over Current and Earth
1.	**GT-1**	SIEMENS&7UT63	SIEMENS&7SJ61	SIEMENS&7UM62	SIEMENS&7SJ61	NA
2.	**GT-2**	SIEMENS&7UT63	SIEMENS&7SJ61	SIEMENS&7UM62	SIEMENS&7SJ61	NA
3.	**GT-3**	ABB&RET670	ABB&RET670	ABB&REG670	ABB&RET670	NA
4.	**GT-4**	ABB&RET670	ABB&RET670	ABB&REG670	ABB&RET670	NA
5.	**UAT 1A & 1B**	SIEMENS&7UT612	NA	NA	SIEMENS&7SJ611	NA
6.	**UAT 2A & 2B**	SIEMENS&7UT612	NA	NA	SIEMENS&7SJ611	NA
7.	**UAT 3A & 3B**	ABB&RET650	NA	NA	ABB&RET650, REF615	NA
8.	**UAT 4A & 4B**	ABB&RET650	NA	NA	ABB&RET650, REF615	NA
9.	**ICT**	SIEMENS&7UT613	SIEMENS&7SJ611	SIEMENS&7SJ613	SIEMENS&7SJ621	SIEMENS&7SJ621
10.	**ST-1**	SIEMENS&7UT613	SIEMENS&7SJ611	SIEMENS&7SJ613	SIEMENS&7SJ621	SIEMENS&7SJ621
11.	**ST-2**	SIEMENS&7UT613	SIEMENS&7SJ611	SIEMENS&7SJ613	SIEMENS&7SJ621	SIEMENS&7SJ621
12.	**ST-3**	ABB&RET670	ABB&RET670	ABB&RET670	ABB&RET670	ABB&REF615
13.	**ST-4**	ABB&RET670	ABB&RET670	ABB&RET670	ABB&RET670	ABB&REF615

1.3.3: Relays used for Reactor Protection:

Sl. No.	Reactor	Primary Protection	Backup protection
		Differential Protection	Over Current
1	BAY – 407 Bus reactor	SEIMENS&7SJ611	SEIMENS&7SA522
2	BAY – 408 Bus reactor	SEIMENS&7SJ611	SEIMENS&7SA522
3	BAY – 414R Line reactor	ABB&RET670	ABB&REL670
4	BAY – 417R Line reactor	ABB&RET670	ABB&REL670

1.3.4: Relays used for Bus bar Protection:

Sl. No.	Voltage level	Make	Model
1	220kV	SIEMENS	7SS5220
2	400kV	SIEMENS	7SS5220
		SIEMENS	7SS5220

1.3.5: Relays used for Generator Protection:

Sl. No.	Generator Name	Make			Model		
		Main -1	Main-2	Inter turn-1&2	Main -1	Main-2	Inter turn-1&2
1	**Generator-1**	SEIMENS	SEIMENS	SEIMENS	7UM6225	7UM62	7SJ6211
2	**Generator-2**	SEIMENS	SEIMENS	SEIMENS	7UM6225	7UM62	7SJ6211
3	**Generator-3**	ABB	SEIMENS	ABB	REG-670	7UM62	REF615
4	**Generator-4**	ABB	SEIMENS	ABB	REG-670	7UM62	REF615

2.1. Input Data for Transmission Lines Substation:

2.1.1. Input Data for Transmission Lines Substation – Bhilwara 400kv line:

Sl. No.	Description	Units	Value
	Station Name	**RVUNL-CTPP, Chhabra**	
1	**Line Reference**	CTPP-BHILWARA	
1.1	Line voltage level	kV	400
1.2	Name of remote substation		Bhilwara
2	**Main 1 Protection**		
2.1	Protection Type		Numerical
2.2	Model & Make		SIEMENS&7SA522
3	**Main 2 Protection**		
3.1	Protection Type		Numerical
3.2	Model & Make		SIEMENS&7SA612
4	**Back-up Protection**		
4.1	Protection Type		Numerical
4.2	Model & Make		SIEMENS&7SA612/7SA522
5	**CT data for Main 1**		
5.1	Ratio	A/A	2000/1
5.2	Class		PS
5.3	Vk / VA burden	Vk/VA	1000/5
5.4	Rct	Ohms	5
5.5	Imag @ Vk/2	mA	30
6	**CT data for Main 2**		
6.1	Ratio		2000/1
6.2	Class		PS
6.3	Vk / VA burden		1000/5
6.4	Rct		5
6.5	Imag @ Vk/2		30

7	**PT Ratio**	kV/V	400kV/110V
8	**PROTECTED LINE DATA**		
8.1	Line Length	Km	303
8.2	Positive seq. RESISTANCE	Ohms/Km	0.0297
8.3	Positive seq. REACTANCE	Ohms/Km	0.332
8.4	Zero seq. RESISTANCE	Ohms/Km	0.162
8.5	Zero seq. REACTANCE	Ohms/Km	1.24
9	**ADJACENT SHORTEST LINE DATA (from remote bus)**		
9.1	Name of the substation to which the shortest adjacent line is connected		**CHITTOR**
9.2	Line Length of shortest adjacent line	Km	49.5
9.3	Positive seq. RESISTANCE of shortest adjacent line	Ohms/Km	0.0297
9.4	Positive seq. REACTANCE of shortest adjacent line	Ohms/Km	0.332
9.5	Zero seq. RESISTANCE of	Ohms/Km	0.162

	shortest adjacent line		
9.6	Zero seq. REACTANCE of shortest adjacent line	Ohms/Km	1.24
10	**ADJACENT LONGEST LINE DATA (from remote bus)**		
10.1	Name of the substation to which the longest adjacent line is connected		**AJMER**
10.2	Line Length of longest adjacent line	Km	160
10.3	Positive seq. RESISTANCE of longest adjacent line	Ohms/Km	0.0297
10.4	Positive seq. REACTANCE of longest adjacent line	Ohms/Km	0.332
10.5	Zero seq. RESISTANCE of longest adjacent line	Ohms/Km	0.162
10.6	Zero seq. REACTANCE of longest adjacent line	Ohms/Km	1.24
11	**Is there a transformer connected to the remote bus**	Yes/No	YES
11.1	Number of Transformers		2
11.2	Voltage ratio of the Transformer	kV	-
11.3	MVA of the transformers 1	MVA	1*315,1*500 MVA
11.4	% Impedance of the transformers1	%	13.04,11.95

2.1.2 :Input Data for Transmission Lines Substation – Anta 400kV line:

Sl. No.	Description	Units	Value
	Station Name	**RVUNL-CTPP, Chhabra**	
1	**Line Reference**	CTPP-ANTA	
1.1	Line voltage level	kV	400
1.2	Name of remote substation		Anta
2	**Main 1 Protection**		
2.1	Protection Type		Numerical
2.2	Model & Make		SIEMENS&7SA522
3	**Main 2 Protection**		
3.1	Protection Type		Numerical
3.2	Model & Make		SIEMENS&7SA612
4	**Back-up Protection**		
4.1	Protection Type		Numerical
4.2	Model & Make		SIEMENS&7SA612/7SA522
5	**CT data for Main 1**		
5.1	Ratio	A/A	2000/1
5.2	Class		PS
5.3	Vk / VA burden	Vk/VA	1000/5
5.4	Rct	Ohms	5
5.5	Imag @ Vk/2	mA	30
6	**CT data for Main 2**		
6.1	Ratio		2000/1
6.2	Class		PS
6.3	Vk / VA burden		1000/5
6.4	Rct		5
6.5	Imag @ Vk/2		30
7	**PT Ratio**	kV/V	400kV/110V

8	**PROTECTED LINE DATA**		
8.1	Line Length	Km	91.1
8.2	Positive seq. RESISTANCE	Ohms/Km	0.0297
8.3	Positive seq. REACTANCE	Ohms/Km	0.332
8.4	Zero seq. RESISTANCE	Ohms/Km	0.162
8.5	Zero seq. REACTANCE	Ohms/Km	1.24
9	**ADJACENT SHORTEST LINE DATA (from remote bus)**		
9.1	Name of the substation to which the shortest adjacent line is connected		**Adani 400kV**
9.2	Line Length of shortest adjacent line	Km	50.29
9.3	Positive seq. RESISTANCE of shortest adjacent line	Ohms/Km	0.0297
9.4	Positive seq. REACTANCE of shortest adjacent line	Ohms/Km	0.332
9.5	Zero seq. RESISTANCE of shortest adjacent line	Ohms/Km	0.162
9.6	Zero seq. REACTANCE of	Ohms/Km	1.24

	shortest adjacent line		
10	**ADJACENT LONGEST LINE DATA (from remote bus)**		
10.1	Name of the substation to which the longest adjacent line is connected		**Nanta 400kV**
10.2	Line Length of longest adjacent line	Km	91
10.3	Positive seq. RESISTANCE of longest adjacent line	Ohms/Km	0.0297
10.4	Positive seq. REACTANCE of longest adjacent line	Ohms/Km	0.332
10.5	Zero seq. RESISTANCE of longest adjacent line	Ohms/Km	0.162
10.6	Zero seq. REACTANCE of longest adjacent line	Ohms/Km	1.24
11	**Is there a transformer connected to the remote bus**	Yes/No	YES
11.1	Number of Transformers		3
11.2	Voltage ratio of the Transformer	kV	-
11.3	MVA of the transformers 1	MVA	3*1500 MVA
11.4	% Impedance of the transformers1	%	14

2.1.3. Input Data for Transmission Lines Substation – Adani 400kV line:

Sl. No.	Description	Units	Value
	Station Name	**RVUNL-CTPP, Chhabra**	
1	**Line Reference**	CTPP-Adani	
1.1	Line voltage level	kV	400
1.2	Name of remote substation		Adani
2	**Main 1 Protection**		
2.1	Protection Type		Numerical
2.2	Model & Make		SIEMENS&7SA522
3	**Main 2 Protection**		
3.1	Protection Type		Numerical
3.2	Model & Make		SIEMENS&7SA612
4	**Back-up Protection**		
4.1	Protection Type		Numerical
4.2	Model & Make		SIEMENS&7SA612/7SA522
5	**CT data for Main 1**		
5.1	Ratio	A/A	2000/1
5.2	Class		PS
5.3	Vk / VA burden	Vk/VA	1000/5
5.4	Rct	Ohms	5
5.5	Imag @ Vk/2	mA	30
6	**CT data for Main 2**		
6.1	Ratio		2000/1
6.2	Class		PS
6.3	Vk / VA burden		1000/5
6.4	Rct		5
6.5	Imag @ Vk/2		30

7	**PT Ratio**	kV/V	400kV/110V
8	**PROTECTED LINE DATA**		
8.1	Line Length	Km	42
8.2	Positive seq. RESISTANCE	Ohms/Km	0.0297
8.3	Positive seq. REACTANCE	Ohms/Km	0.332
8.4	Zero seq. RESISTANCE	Ohms/Km	0.162
8.5	Zero seq. REACTANCE	Ohms/Km	1.24
9	**ADJACENT SHORTEST LINE DATA (from remote bus)**		
9.1	Name of the substation to which the shortest adjacent line is connected		**Anta 400kV**
9.2	Line Length of shortest adjacent line	Km	50
9.3	Positive seq. RESISTANCE of shortest adjacent line	Ohms/Km	0.0147
9.4	Positive seq. REACTANCE of shortest adjacent line	Ohms/Km	0.2528
9.5	Zero seq. RESISTANCE of shortest adjacent line	Ohms/Km	0.248
9.6	Zero seq. REACTANCE of	Ohms/Km	1

	shortest adjacent line		
10	**ADJACENT LONGEST LINE DATA (from remote bus)**		
10.1	Name of the substation to which the longest adjacent line is connected		**Anta 400kV**
10.2	Line Length of longest adjacent line	Km	50
10.3	Positive seq. RESISTANCE of longest adjacent line	Ohms/Km	0.0147
10.4	Positive seq. REACTANCE of longest adjacent line	Ohms/Km	0.2528
10.5	Zero seq. RESISTANCE of longest adjacent line	Ohms/Km	0.248
10.6	Zero seq. REACTANCE of longest adjacent line	Ohms/Km	1
11	**Is there a transformer connected to the remote bus**	Yes/No	-
11.1	Number of Transformers		-
11.2	Voltage ratio of the Transformer	kV	-
11.3	MVA of the transformers 1	MVA	-
11.4	% Impedance of the transformers1	%	-

2.1.4. Input Data for Transmission Lines Substation – Hindhaun 400KV line:

Sl. No.	Description	Units	Value
	Station Name	**RVUNL-CTPP, Chhabra**	
1	**Line Reference**	**CTPP- Hindhaun**	
1.1	Line voltage level	kV	400
1.2	Name of remote substation		Hindhaun
2	**Main 1 Protection**		
2.1	Protection Type		Numerical
2.2	Model & Make		ABB&REL670
3	**Main 2 Protection**		
3.1	Protection Type		Numerical
3.2	Model & Make		ABB& REL670
4	**Back-up Protection**		
4.1	Protection Type		Numerical
4.2	Model & Make		ABB&REL670
5	**CT data for Main 1**		
5.1	Ratio	A/A	2000/1
5.2	Class		PS
5.3	Vk / VA burden	Vk/VA	1000/5
5.4	Rct	Ohms	5
5.5	Imag @ Vk/2	mA	30
6	**CT data for Main 2**		
6.1	Ratio		2000/1
6.2	Class		PS
6.3	Vk / VA burden		1000/5
6.4	Rct		5
6.5	Imag @ Vk/2		30
7	**PT Ratio**	kV/V	400kV/110V

8	**PROTECTED LINE DATA**		
8.1	Line Length	Km	305
8.2	Positive seq. RESISTANCE	Ohms/Km	0.0266
8.3	Positive seq. REACTANCE	Ohms/Km	0.33
8.4	Zero seq. RESISTANCE	Ohms/Km	0.261
8.5	Zero seq. REACTANCE	Ohms/Km	1.031
9	**ADJACENT SHORTEST LINE DATA (from remote bus)**		
9.1	Name of the substation to which the shortest adjacent line is connected		**Alwar 400kV**
9.2	Line Length of shortest adjacent line	Km	96
9.3	Positive seq. RESISTANCE of shortest adjacent line	Ohms/Km	0.0266
9.4	Positive seq. REACTANCE of shortest adjacent line	Ohms/Km	0.33
9.5	Zero seq. RESISTANCE of shortest adjacent line	Ohms/Km	0.261
9.6	Zero seq. REACTANCE of	Ohms/Km	1.031

	shortest adjacent line		
10	**ADJACENT LONGEST LINE DATA (from remote bus)**		
10.1	Name of the substation to which the longest adjacent line is connected		**Heerapura 400kV**
10.2	Line Length of longest adjacent line	Km	192.6
10.3	Positive seq. RESISTANCE of longest adjacent line	Ohms/Km	0.0266
10.4	Positive seq. REACTANCE of longest adjacent line	Ohms/Km	0.33
10.5	Zero seq. RESISTANCE of longest adjacent line	Ohms/Km	0.261
10.6	Zero seq. REACTANCE of longest adjacent line	Ohms/Km	1.031
11	**Is there a transformer connected to the remote bus**	Yes/No	YES
11.1	Number of Transformers		2
11.2	Voltage ratio of the Transformer	kV	-
11.3	MVA of the transformers	MVA	2*315 MVA
11.4	% Impedance of the transformers1	%	18.86,13.4

2.1.5. Input Data for Transmission Lines Substation – Aklera 220KV LINE:

Sl. No.	Description	Units	Value
	Station Name	**RVUNL-CTPP, Chhabra**	
1	**Line Reference**	**CTPP- Aklera**	
1.1	Line voltage level	kV	400
1.2	Name of remote substation		Aklera
2	**Main 1 Protection**		
2.1	Protection Type		Numerical
2.2	Model & Make		SIEMENS&7SA522
3	**Main 2 Protection**		
3.1	Protection Type		Numerical
3.2	Model & Make		SIEMENS&7SA612
4	**Back-up Protection**		
4.1	Protection Type		Numerical
4.2	Model & Make		SIEMENS&7SA612/7SA522
5	**CT data for Main 1**		
5.1	Ratio	A/A	1000/1
5.2	Class		PS
5.3	Vk / VA burden	Vk/VA	1000/5
5.4	Rct	Ohms	5
5.5	Imag @ Vk/2	mA	30
6	**CT data for Main 2**		
6.1	Ratio		1000/1
6.2	Class		PS
6.3	Vk / VA burden		1000/5
6.4	Rct		5
6.5	Imag @ Vk/2		30

7	**PT Ratio**	kV/V	220kV/110V
8	**PROTECTED LINE DATA**		
8.1	Line Length	Km	116.7
8.2	Positive seq. RESISTANCE	Ohms/Km	0.0749
8.3	Positive seq. REACTANCE	Ohms/Km	0.3993
8.4	Zero seq. RESISTANCE	Ohms/Km	0.27
8.5	Zero seq. REACTANCE	Ohms/Km	1.24
9	**ADJACENT SHORTEST LINE DATA (from remote bus)**		
9.1	Name of the substation to which the shortest adjacent line is connected		**Jhalawar 220kV**
9.2	Line Length of shortest adjacent line	Km	82.7
9.3	Positive seq. RESISTANCE of shortest adjacent line	Ohms/Km	0.1363
9.4	Positive seq. REACTANCE of shortest adjacent line	Ohms/Km	0.4048
9.5	Zero seq. RESISTANCE of shortest adjacent line	Ohms/Km	0.0341
9.6	Zero seq. REACTANCE of shortest adjacent line	Ohms/Km	1.3253
10	**ADJACENT LONGEST LINE DATA (from remote bus)**		
10.1	Name of the substation to which the longest adjacent line is connected		**Jhalawar 220kV**
10.2	Line Length of longest adjacent line	Km	82.7
10.3	Positive seq. RESISTANCE of longest adjacent line	Ohms/Km	0.1363
10.4	Positive seq. REACTANCE of longest adjacent line	Ohms/Km	0.4048
10.5	Zero seq. RESISTANCE of longest adjacent line	Ohms/Km	0.0341
10.6	Zero seq. REACTANCE of longest adjacent line	Ohms/Km	1.3253

11	**Is there a transformer connected to the remote bus**	Yes/No	YES
11.1	Number of Transformers		1
11.2	Voltage ratio of the Transformer	kV	-
11.3	MVA of the transformers	MVA	160 MVA
11.4	% Impedance of the transformers1	%	9.13

2.1.6. Input Data for Transmission Lines Substation – Kawai 220KV LINE:

Sl. No.	Description	Units	Value
	Station Name	**RVUNL-CTPP, Chhabra**	
1	**Line Reference**	CTPP- Aklera	
1.1	Line voltage level	kV	400
1.2	Name of remote substation		Aklera
2	**Main 1 Protection**		
2.1	Protection Type		Numerical
2.2	Model & Make		SIEMENS&7SA522
3	**Main 2 Protection**		
3.1	Protection Type		Numerical
3.2	Model & Make		SIEMENS&7SA612
4	**Back-up Protection**		
4.1	Protection Type		Numerical
4.2	Model & Make		SIEMENS&7SA612/7SA522
5	**CT data for Main 1**		
5.1	Ratio	A/A	1000/1
5.2	Class		PS
5.3	Vk / VA burden	Vk/VA	1000/5
5.4	Rct	Ohms	5
5.5	Imag @ Vk/2	mA	30
6	**CT data for Main 2**		
6.1	Ratio		1000/1
6.2	Class		PS
6.3	Vk / VA burden		1000/5
6.4	Rct		5
6.5	Imag @ Vk/2		30
7	**PT Ratio**	kV/V	220kV/110V

8	**PROTECTED LINE DATA**		
8.1	Line Length	Km	42
8.2	Positive seq. RESISTANCE	Ohms/Km	0.0794
8.3	Positive seq. REACTANCE	Ohms/Km	0.3993
8.4	Zero seq. RESISTANCE	Ohms/Km	0.27
8.5	Zero seq. REACTANCE	Ohms/Km	1.24
9	**ADJACENT SHORTEST LINE DATA (from remote bus)**		
9.1	Name of the substation to which the shortest adjacent line is connected		**Atru 220kV**
9.2	Line Length of shortest adjacent line	Km	11.53
9.3	Positive seq. RESISTANCE of shortest adjacent line	Ohms/Km	0.1363
9.4	Positive seq. REACTANCE of shortest adjacent line	Ohms/Km	0.4048
9.5	Zero seq. RESISTANCE of shortest adjacent line	Ohms/Km	0.0341
9.6	Zero seq. REACTANCE of	Ohms/Km	1.3253

	shortest adjacent line		
10	**ADJACENT LONGEST LINE DATA (from remote bus)**		
10.1	Name of the substation to which the longest adjacent line is connected		**Baran 220kV**
10.2	Line Length of longest adjacent line	Km	50.75
10.3	Positive seq. RESISTANCE of longest adjacent line	Ohms/Km	0.1363
10.4	Positive seq. REACTANCE of longest adjacent line	Ohms/Km	0.4048
10.5	Zero seq. RESISTANCE of longest adjacent line	Ohms/Km	0.0341
10.6	Zero seq. REACTANCE of longest adjacent line	Ohms/Km	1.3253
11	**Is there a transformer connected to the remote bus**	Yes/No	YES
11.1	Number of Transformers		2
11.2	Voltage ratio of the Transformer	kV	-
11.3	MVA of the transformers	MVA	100 MVA
11.4	% Impedance of the transformers1	%	12.48,12.68

3.1. Transmission line protective relay Settings Review:

Line Name	**BHILWARA 400KV LINE**			
Main I/II	**Main-I**		**Main-II**	
Relay	**SEIMENS&7SA522**		**SEIMENS&7SA612**	
Description/Parameter	**Existing setting**	**Reviewed setting**	**Existing setting**	**Reviewed setting**
Line angle	85	84.93	85	84.93
Zero seq. compensation factor (**Rg/Rl**) for Z1	1.48	1.48	1.48	1.48
Zero seq. compensation factor (**Xg/Xl**) for Z1	0.91	0.91	0.91	0.91
Zero seq. compensation factor (**Rg/Rl**) for >Z1	1.48	1.48	1.48	1.48
Zero seq. compensation factor (**Xg/Xl**) for >Z1	0.91	0.91	0.91	0.91
ZONE 1				
Operating mode Z1	Forward	Forward	Forward	Forward
R(Z1) resistance for ph-ph faults	8.620	8.91	8.620	8.91
X(Z1), Reactance	44.262	44.26	44.262	44.26
RG(Z1),Resistance for ph-gnd faults	22.402	25.21	22.402	25.21
T1-1Phase,delay for single phase faults	0	0	0	0
T1 multi-ph, delay for multi phase faults	0	0	0	0
ZONE 1B				
Operating mode Z1B	Forward	Forward	Forward	Forward
zone 1B	**12.52**	**10.89**	**12.52**	**10.89**

X(Z1B), Reactance	66.39	66.39	66.39	66.39
RG(Z1B),Resistance for ph-gnd faults	23.00	26.20	23.00	26.20
T1B-1Phase,delay for single phase faults	0	0	0	0
T1B multi-ph, delay for multi phase faults	0	0	0	0
ZONE 2				
Operating mode Z2	Forward	Forward	Forward	Forward
R(Z2) resistance for ph-ph faults	11.430	10.89	11.430	10.89
X(Z2), Reactance	59.841	66.39	59.841	66.39
RG(Z2),Resistance for ph-gnd faults	24.452	27.19	24.452	27.19
T2-1Phase,delay for single phase faults	0.3	0.5	0.3	0.5
T2 multi-ph, delay for multi phase faults	0.3	0.5	0.3	0.5
ZONE 3				
Operating mode Z3	Forward	Forward	Forward	Forward
R(Z3) resistance for ph-ph faults	16.86	12.96	16.86	12.96
X(Z3), Reactance	90.08	89.57	90.08	89.57
RG(Z3),Resistance for ph-gnd faults	32.80	29.26	32.80	29.26
T3-1PHASE,delay for single phase faults	1	1	1	1
T3 multi-ph, delay for multi phase faults	1	1	1	1
ZONE 4				
Operating mode Z4	Reverse	Reverse	Reverse	Reverse
R(Z4) resistance for ph-ph faults	1.71	5.94	1.71	5.94
X(Z4), Reactance	8.85	11.07	8.85	11.07
RG(Z4),Resistance for ph-gnd faults	4.02	22.24	4.02	22.24

T4-1Phase,delay for single phase faults	1	1	1	1
T4 multi-ph, delay for multi phase faults	1	1	1	1
Power Swing Settings				
Power swing operating mode	All zones blocked	All zones blocked	All zones blocked	All zones blocked
Power swing trip	NO	NO	NO	NO
Trip delay after power swing blocking	0.10	0.10	0.10	0.10
SOTF				
Instantaneous SOTF O/C	On	On	On	On
SOTF O/C pickup	2.5	2.5	2.5	2.5
Ground Over Current				
Pickup	0.2	0.2	0.2	0.2
Time delay	1.25	1.25	1.25	1.25
Over Voltage Protection				
Ph-g over voltage protection	On	On	On	On
Pickup Overvoltage	70	70	70	70
Time delay	5	5	5	5
Pickup Overvoltage	95.3	95.3	95.3	95.3
Time delay	0.1	0.1	0.1	0.1

Line Name	ANTA 400KV LINE			
Main I/II	**Main-I**		**Main-II**	
Relay	**SEIMENS&7SA522**		**SEIMENS&7SA612**	
Description/Parameter	**Existing setting**	**Reviewed setting**	**Existing setting**	**Reviewed setting**
Line angle	85	84.93	85	84.93
Zero seq. compensation factor (Rg/Rl) for Z1	1.48	1.48	1.48	1.48
Zero seq. compensation factor (Xg/Xl) for Z1	0.91	0.91	0.91	0.91
Zero seq. compensation factor (Rg/Rl) for >Z1	1.48	1.48	1.48	1.48
Zero seq. compensation factor (Xg/Xl) for >Z1	0.91	0.91	0.91	0.91
ZONE 1				
Operating mode Z1	Forward	Forward	Forward	Forward
R(Z1) resistance for ph-ph faults	3.012	6.14	3.012	6.14
X(Z1), Reactance	13.301	13.31	13.301	13.31
RG(Z1),Resistance for ph-gnd faults	17.468	22.44	17.468	22.44
T1-1Phase,delay for single phase faults	0	0	0	0
T1 multi-ph, delay for multi phase faults	0	0	0	0
ZONE 1B				
Operating mode Z1B	Forward	Forward	Forward	Forward
zone 1B	4.204	6.74	4.204	6.74
X(Z1B), Reactance	19.951	19.96	19.951	19.96
RG(Z1B),Resistance for ph-gnd faults	18.340	22.74	18.340	22.74

T1B-1Phase,delay for single phase faults	0	0	0	0
T1B multi-ph, delay for multi phase faults	0	0	0	0
ZONE 2				
Operating mode Z2	Forward	Forward	Forward	Forward
R(Z2) resistance for ph-ph faults	4.204	6.74	4.204	6.74
X(Z2), Reactance	19.951	19.96	19.951	19.96
RG(Z2),Resistance for ph-gnd faults	18.340	22.74	18.340	22.74
T2-1Phase,delay for single phase faults	0.4	0.35	0.4	0.35
T2 multi-ph, delay for multi phase faults	0.4	0.35	0.4	0.35
ZONE 3				
Operating mode Z3	Forward	Forward	Forward	Forward
R(Z3) resistance for ph-ph faults	6.904	7.92	6.904	7.92
X(Z3), Reactance	34.990	33.25	34.990	33.25
RG(Z3),Resistance for ph-gnd faults	22.006	24.22	22.006	24.22
T3-1PHASE,delay for single phase faults	1	1	1	1
T3 multi-ph, delay for multi phase faults	1	1	1	1
ZONE 4				
Operating mode Z4	Reverse	Reverse	Reverse	Reverse
R(Z4) resistance for ph-ph faults	0.602	5.25	0.602	5.25
X(Z4), Reactance	2.660	3.33	2.660	3.33
RG(Z4),Resistance for ph-gnd faults	3.494	21.55	3.494	21.55
T4-1Phase,delay for single phase faults	1	1	1	1
T4 multi-ph, delay for multi phase	1	1	1	1

faults				
Power Swing Settings				
Power swing operating mode	All zones blocked	All zones blocked	All zones blocked	All zones blocked
Power swing trip	NO	NO	NO	NO
Trip delay after power swing blocking	0.10	0.10	0.10	0.10
SOTF				
Instantaneous SOTF O/C	On	On	On	On
SOTF O/C pickup	2.5	2.5	2.5	2.5
Ground Over Current				
Pickup	0.2	0.2	0.2	0.2
Time delay	1.25	1.25	1.25	1.25
Over Voltage Protection				
Ph-g over voltage protection	On	On	On	On
Pickup Overvoltage	70	70	70	70
Time delay	5	5	5	5
Pickup Overvoltage	95.3	95.3	95.3	95.3
Time delay	0.1	0.1	0.1	0.1

Line Name	ADANI 400KV LINE			
Main I/II	**Main-I**		**Main-II**	
Relay	**SEIMENS&7SA522**		**SEIMENS&7SA612**	
Description/Parameter	**Existing setting**	**Reviewed setting**	**Existing setting**	**Reviewed setting**
Line angle	85	84.93	85	84.93
Zero seq. compensation factor (**Rg/Rl**) for Z1	1.48	1.48	1.48	1.48
Zero seq. compensation factor (**Xg/Xl**) for Z1	0.91	0.91	0.91	0.91
Zero seq. compensation factor (**Rg/Rl**) for >Z1	1.48	1.48	1.48	1.48
Zero seq. compensation factor (**Xg/Xl**) for >Z1	0.91	0.91	0.91	0.91
ZONE 1				
Operating mode Z1	Forward	Forward	Forward	Forward
R(Z1) resistance for ph-ph faults	**3.850**	**5.50**	**3.850**	**5.50**
X(Z1), Reactance	6.135	6.14	6.135	6.14
RG(Z1),Resistance for ph-gnd faults	21.967	21.80	21.967	21.80
T1-1Phase,delay for single phase faults	0	0	0	0
T1 multi-ph, delay for multi phase faults	0	0	0	0
ZONE 1B				
Operating mode Z1B	Forward	Forward	Forward	Forward
zone 1B	3.988	5.77	3.988	5.77
X(Z1B), Reactance	7.669	9.20	7.669	9.20
RG(Z1B),Resistance for ph-gnd faults	22.133	21.93	22.133	21.93

T1B-1Phase,delay for single phase faults	0	0	0	0
T1B multi-ph, delay for multi phase faults	0	0	0	0
ZONE 2				
Operating mode Z2	Forward	Forward	Forward	Forward
R(Z2) resistance for ph-ph faults	4.219	5.77	4.219	5.77
X(Z2), Reactance	11.327	9.20	11.327	9.20
RG(Z2),Resistance for ph-gnd faults	22.410	21.93	22.410	21.93
T2-1Phase,delay for single phase faults	0.35	0.35	0.35	0.35
T2 multi-ph, delay for multi phase faults	0.35	0.35	0.35	0.35
ZONE 3				
Operating mode Z3	Forward	Forward	Forward	Forward
R(Z3) resistance for ph-ph faults	4.587	6.18	4.587	6.18
X(Z3), Reactance	16.517	16.16	16.517	16.16
RG(Z3),Resistance for ph-gnd faults	22.852	22.48	22.852	22.48
T3-1PHASE,delay for single phase faults	1	1	1	1
T3 multi-ph, delay for multi phase faults	1	1	1	1
ZONE 4				
Operating mode Z4	Reverse	Reverse	Reverse	Reverse
R(Z4) resistance for ph-ph faults	8.69	5.09	8.69	5.09
X(Z4), Reactance	0.766	1.53	0.766	1.53
RG(Z4),Resistance for ph-gnd faults	38.890	21.39	38.890	21.39
T4-1Phase,delay for single phase faults	1	1	1	1

T4 multi-ph, delay for multi phase faults	1	1	1	1
Power Swing Settings				
Power swing operating mode	All zones blocked	All zones blocked	All zones blocked	All zones blocked
Power swing trip	NO	NO	NO	NO
Trip delay after power swing blocking	0.10	0.10	0.10	0.10
SOTF				
Instantaneous SOTF O/C	On	On	On	On
SOTF O/C pickup	2.5	2.5	2.5	2.5
Ground Over Current				
Pickup	0.2	0.2	0.2	0.2
Time delay	1.25	1.25	1.25	1.25
Over Voltage Protection				
Ph-g over voltage protection	On	On	On	On
Pickup Overvoltage	70	70	70	70
Time delay	5	5	5	5
Pickup Overvoltage	95.3	95.3	95.3	95.3
Time delay	0.1	0.1	0.1	0.1

Line Name	Hindhaun 400KV LINE	
Main I/II	**Main-I**	
Relay	**ABB&REL670 QUADRILATERAL**	
Description/Parameter	**Existing setting**	**Reviewed setting**
ZONE 1		
Operation	On	On
IBase	2000.00	2000.00
UBase	400.00	400.00
OperationDir	Forward	Forward
X1	81.01	80.52
R1	6.49	6.49
X0	251.56	251.56
R0	63.73	63.68
RFPP	30	30.00
RFPE	50	50.00
TPP	0	0.00
TPE	0	0.00
ZONE 2		
X1	121.51	120.78
R1	9.73	9.74
X0	377.34	377.35
R0	95.52	95.53
RFPP	60	60.00

RFPE	75	75.00
TPP	0.3	0.50
TPE	0.3	0.50
ZONE 3		
X1	185.26	197.05
R1	14.84	15.88
X0	575.29	615.63
R0	145.63	155.85
RFPP	75	75.00
RFPE	125	125.00
TPP	0.8	0.80
TPE	0.8	0.80
ZONE 4		
X1	20.25	20.13
R1	1.81	1.62
X0	62.89	62.89
R0	15.92	15.92
RFPP	75	60.00
RFPE	125	75.00
TPP	1	0.50
TPE	1	0.50
Residual over current		
IN1>	20	20
T1Min	1.1	1.1

K1	0.48	0.48
Automatic Switch Onto Fault Logic		
Ib	2000	2000
UB	400	400
IPh<	20	20
UPh<	70	70
tDuration	0.02	0.02
tSOTF	0.2	0.2
tDLD	0.2	0.2
AutoInit	OFF	OFF
Over Voltage protection		
Operation Step 1	ON	ON
U1>	110	110
T1	5	5
U2>	150	150
T2	0.1	0.1

Line Name	Hindhaun 400KV LINE	
Main I/II	**Main-II**	
Relay	**ABB&REL670 MHO**	
Description/Parameter	**Existing setting**	**Reviewed setting**
ZONE 1		
Operation	On	On
I Base	2000.00	2000.00
UBase	400.00	400.00
OperationDir	Forward	Forward
Load ench mode	ON	ON
OpModePE	ON	ON
ZPE	81.325	80.78
ZAngPE	85	85
KN	0.92	0.74
KNAng	-3	-13.89
ZRevPE	81.325	80.78
Tpe	0.00	0.00
OpModePP	ON	ON
ZPP	81.325	80.78
ZAngPP	85	85
ZRevPP	81.325	80.78
Tpp	0.00	0.00

ZONE 2		
ZPE	121.988	121.17
ZAngPE	85	85
KN	0.92	0.74
KNAng	-3	-13.89
ZRevPE	121.98	121.17
Tpe	0.50	0.50
OpModePP	ON	ON
ZPP	121.98	121.17
ZAngPP	85	85
ZRevPP	121.98	121.17
Tpp	0.50	0.50
ZONE 3		
ZPE	185.981	197.69
ZAngPE	85	85
KN	0.92	0.74
KNAng	-3	-13.89
ZRevPE	185.981	197.69
Tpe	1.00	1.00
OpModePP	ON	ON
ZPP	185.981	197.69
ZAngPP	85	85
ZRevPP	185.981	197.69
Tpp	1	1.00

ZONE 4		
ZPE	7	20.20
ZAngPE	85	85
KN	0.92	0.74
KNAng	-3	-13.89
ZRevPE	7	20.20
Tpe	1	1.00
OpModePP	ON	ON
ZPP	7	20.20
ZAngPP	85	85
ZRevPP	7	20.20
Tpp	1	1.00
Residual over current		
IN1>	20	20
T1Min	1.1	1.1
K1	0.48	0.48
Automatic Switch Onto Fault Logic (OFF)		
Ib	-	2000
UB	-	400
IPh<	-	20
UPh<	-	70
tDuration	-	0.02
tSOTF	-	0.2

tDLD	-	0.2
AutoInit	-	ON
Over Voltage protection		
Operation Step 1	ON	ON
U1>	110	110
T1	5	5
U2>	150	150
T2	0.1	0.1

Line Name	AKLERA 220KV LINE			
Main I/II	**Main-I**		**Main-II**	
Relay	**SEIMENS&7SA522**		**SEIMENS&7SA612**	
Description/Parameter	**Existing setting**	**Reviewed setting**	**Existing setting**	**Reviewed setting**
Line angle	80	79.42	80	79.42
Zero seq. compensation factor (**Rg/Rl**) for Z1	0.64	0.65	0.64	0.65
Zero seq. compensation factor (**Xg/Xl**) for Z1	0.78	0.78	0.78	0.78
Zero seq. compensation factor (**Rg/Rl**) for >Z1	0.64	0.65	0.64	0.65
Zero seq. compensation factor (**Xg/Xl**) for >Z1	0.78	0.78	0.78	0.78
ZONE 1				
Operating mode Z1	Forward	Forward	Forward	Forward
R(Z1) resistance for ph-ph faults	3.708	7.10	3.708	7.10
X(Z1), Reactance	18.682	18.64	18.682	18.64
RG(Z1),Resistance for ph-gnd faults	12.610	28.29	12.610	28.29
T1-1Phase,delay for single phase faults	0	0	0	0
T1 multi-ph, delay for multi phase faults	0	0	0	0
ZONE 2				
Operating mode Z2	Forward	Forward	Forward	Forward
R(Z2) resistance for ph-ph faults	5.562	9.16	5.562	9.16
X(Z2), Reactance	28.022	27.98	28.022	27.98
RG(Z2),Resistance for ph-gnd faults	18.915	27.30	18.915	27.30

T2-1Phase,delay for single phase faults	0.3	0.35	0.3	0.35
T2 multi-ph, delay for multi phase faults	0.3	0.35	0.3	0.35
ZONE 3				
Operating mode Z3	Forward	Forward	Forward	Forward
R(Z3) resistance for ph-ph faults	8.829	13.78	8.829	13.78
X(Z3), Reactance	44.480	40.54	44.480	40.54
RG(Z3),Resistance for ph-gnd faults	30.024	34.97	30.024	34.97
T3-1PHASE,delay for single phase faults	0.8	0.8	0.8	0.8
T3 multi-ph, delay for multi phase faults	0.8	0.8	0.8	0.8
ZONE 4				
Operating mode Z4	Reverse	Reverse	Reverse	Reverse

R(Z4) resistance for ph-ph faults	0.74	4.53	0.74	4.53
X(Z4), Reactance	3.736	4.66	3.736	4.66
RG(Z4),Resistance for ph-gnd faults	2.522	23.59	2.522	23.59
T4-1Phase,delay for single phase faults	1	1	1	1
T4 multi-ph, delay for multi phase faults	1	1	1	1
Power Swing Settings				
Power swing operating mode	All zones blocked	All zones blocked	All zones blocked	All zones blocked
Power swing trip	NO	NO	NO	NO
Trip delay after power swing blocking	0.1	0.1	0.1	0.1
SOTF				
Instantaneous SOTF O/C	On	On	On	On
SOTF O/C pickup	4	4	4	4
Ground Over Current				
Pickup	0.2	0.2	0.2	0.2
Time delay	0.75	0.75	0.75	0.75
Over Voltage Protection				
Ph-g over voltage protection	On	On	On	On
Pickup Overvoltage	73.5	73.5	73.5	73.5
Time delay	2	2	2	2
Pickup Overvoltage	76	76	76	76
Time delay	1	1	1	1

Line Name	KAWAI 220KV LINE			
Main I/II	**Main-I**		**Main-II**	
Relay	**SEIMENS&7SA522**		**SEIMENS&7SA612**	
Description/Parameter	**Existing setting**	**Reviewed setting**	**Existing setting**	**Reviewed setting**
Line angle	80	78.79	80	78.79
Zero seq. compensation factor (**Rg/Rl**) for Z1	0.65	0.80	0.65	0.80
Zero seq. compensation factor (**Xg/Xl**) for Z1	0.78	0.70	0.78	0.70
Zero seq. compensation factor (**Rg/Rl**) for >Z1	0.65	0.80	0.65	0.80
Zero seq. compensation factor (**Xg/Xl**) for >Z1	0.78	0.70	0.78	0.70
ZONE 1				
Operating mode Z1	Forward	Forward	Forward	Forward
R(Z1) resistance for ph-ph faults	7.55	4.93	7.55	4.93
X(Z1), Reactance	6.66	6.71	6.66	6.71
RG(Z1),Resistance for ph-gnd faults	16.25	24.00	16.25	24.00
T1-1Phase,delay for single phase faults	0	0	0	0
T1 multi-ph, delay for multi phase faults	0	0	0	0
ZONE 2				
Operating mode Z2	Forward	Forward	Forward	Forward
R(Z2) resistance for ph-ph faults	8.749	5.60	8.749	5.60
X(Z2), Reactance	13.317	10.06	13.317	10.06
RG(Z2),Resistance for ph-gnd faults	17.5	24.33	17.5	24.33
T2-1Phase,delay for single phase faults	0.3	0.5	0.3	0.5

T2 multi-ph, delay for multi phase faults	0.3	0.5	0.3	0.5
ZONE 3				
Operating mode Z3	Forward	Forward	Forward	Forward
R(Z3) resistance for ph-ph faults	9.68	7.04	9.68	7.04
X(Z3), Reactance	18.30	18.48	18.30	18.48
RG(Z3),Resistance for ph-gnd faults	18.43	26.10	18.43	26.10
T3-1PHASE,delay for single phase faults	0.8	1	0.8	1
T3 multi-ph, delay for multi phase faults	0.8	1	0.8	1
ZONE 4				
Operating mode Z4	Reverse	Reverse	Reverse	Reverse

R(Z4) resistance for ph-ph faults	6.641	3.93	6.641	3.93
X(Z4), Reactance	2.08	1.68	2.08	1.68
RG(Z4),Resistance for ph-gnd faults	15.391	23.00	15.391	23.00
T4-1Phase,delay for single phase faults	1	1	1	1
T4 multi-ph, delay for multi phase faults	1	1	1	1
Power Swing Settings				
Power swing operating mode	All zones blocked	All zones blocked	All zones blocked	All zones blocked
Power swing trip	NO	NO	NO	NO
Trip delay after power swing blocking	0.08	0.8	0.08	0.8
SOTF				
Instantaneous SOTF O/C	On	On	On	On
SOTF O/C pickup	4	4	4	4

Ground Over Current				
Pickup	0.2	0.2	0.2	0.2
Time delay	0.5	0.5	0.5	0.5
Over Voltage Protection				
Ph-g over voltage protection	On	On	On	On
Pickup Overvoltage	73.5	73.5	73.5	73.5
Time delay	2	2	2	2
Pickup Overvoltage	76	76	76	76
Time delay	1	1	1	1

4.1. Transformer Protection Data:

4.1.1. Input Data for Transformer Protection:

Sl. No.	Description	Units	Transformer						
Substation Name									
Transformer Name			**ICT**	**GT-1&2**	**GT-3&4**	**UAT-1A/1B&2A/2B**	**UAT-3A/3B&4A/4B**	**ST 1&2**	**ST 3&4**
1	**Ratings**								
1.1	MVA	MVA	315	340/315	315	20	20	50	50
1.2	**Voltage Ratio**	kV/kV	400/220/33	16.5/420	16.5/420	16.5/6.9	16.5/6.9	220/6.9/6.9	400/(6.9/6.9)
2	Impedance	%	12.50	14.6&12.5	14.0	9.24	9.24	17	17
3	Vector Group		YNa0d11	YNd11	YNd11	Dyn1	Dyn1	YNyn0yn0	YNyn0yn0
4	NGR Data (if Present)	Ohms	NO	NO	NO	9.5	9.5	9.5	9.5
`5	OLTC Present	Yes/No	Yes	NO	NO	Yes	Yes	Yes	Yes
5.1	OLTC Data								
5.2	Min Tap voltage	kV	350	----	---	14.44	14.44	192.5	350
5.3	Max Tap voltage	kV	434	----	----	17.73	17.73	236.5	430
5.4	No. of Steps		17	----	----	17	17	17	17

6	**Differential Protection provided**	**Yes/No**	**Yes**	**No**	**No**	**Yes**	**Yes**	**Yes**	**Yes**
6.1	Differential CT Ratio								
6.2	HV CT Ratio	A	1000/1	----	----	1000/1	1000/1	300/1	1000/1
6.3	LV CT Ratio	A	1000/1	-----	-----	2000/1	2000/1	2500/1	2500/1
7	Differential Relay								
7.1	Make		SIEMENS	-----	-----	SIEMENS	ABB	SIEMENS	ABB
7.2	Model		7UT613	----	-----	7UT613	RET650	7UT613	RET670
8	**REF Provided**	**Yes/No**	**Yes**	**Yes**	**Yes**	**NO**	**NO**	**Yes**	**Yes**
8.1	REF Protection CTs Ratio (Main & ICT)	A/A	1000/1	500/1	1000/1			150/1	150/1
8.2	Acc Class		PS	PS	PS			PS	PS
8.3	RCT (Ω)	Ohms	5.0	3.0	4.0			3.0	2.4
8.4	Vk(V)	V	<1000	<400	>1000			>200	-----
8.5	Im@Vk/2	mA	<20mA	<30mA	<30mA			<100mA	-----
8.6	Longest sec. one way lead R Ω	Ohms	-----		-----			---	-----
8.7	REF Relay								
8.8	Make		SIEMENS	SIEMENS	ABB	No	No	SIEMENS	ABB
8.9	Model		7UT613	7SJ6111	RET670	7UT613	7UT613	7UT613	RET670

8.10	Rstab Range (Ω)	Ohms	NA	300.0	825.0	----	----	892.0	370

Transformer Name			ICT	GT-1&2	GT-3&4	UAT-1A/1B & 2A/2B	UAT-3A/3B& 4A/4B	ST 1&2	ST 3&4
9	Over fluxing Protection provided	Yes/No	Yes	No	No	No	No	Yes	Yes
9.1	**Over fluxing Protection Relay**								
9.2	Make		SIEMENS	---	----	----	-----	SIEMENS	ABB
9.3	Model		7UT613	---	---	-----	----	7UT613	RET670
10	**HV Back-up Protection Provided**	**Yes/No**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
10.1	**HV Back-up Protection Relay**								
10.2	Make		SIEMENS	SIEMENS	ABB	SIEMENS	ABB	SIEMENS	ABB
10.3	Model		7SJ621	7SJ611	ABB RET670	7SJ611	RET650	7SJ611	RET670
10.4	HV Back-up Protection CTs Ratio	A/A	1000/1	1000/1	1000/1	1000/1	1000/1	300/1	1000/1

10.5	Acc Class		PS	PS	PS	5P20	5P20	PS	PS
11	**LV Back-up Protection Provided**	**Yes/No**	**Yes**	**No**	**No**	**No**	**No**	**No**	**No**
11.1	LV Back-up Protection Relay								
11.2	Make		SIEMENS	---	---	---	---	---	---
11.3	Model		7SJ621	---	---	---	---	---	---
11.4	LV Back-up Protection CTs Ratio	A/A	1000/1	---	---	---	---	---	---
11.5	Acc Class		PS	---	---	---	---	---	---

4.1.2 Transformers Protection Relay Setting Review:

Sl. No.	PROTECTION			ICT	
				Existing	Reviewed
1	Differential	Relay Make & Model		SIEMENS 7UT613	
		Biased	Pickup value of diff.current	0.20	0.20
			T I-DIFF> Time delay	0.00	0.00
			Pickup value of High set trip	12.00	12.00
			T I-DIFF>>Time delay	0.00	0.00
			Slope 1	0.25	0.25
			Base point of slope 1	0.00	0.00
			Slope 2	0.5	0.5
			Base point of slope 2	2.50	2.50
2	Over Fluxing	Relay Make & Model		SIEMENS 7UT613	
		U/f > Pickup		1.15	1.15
		T U/f >> Time delay		Infinity	Infinity
		U/f > Pickup		1.40	1.40
		T U/f > >Time delay		5 sec	5 sec

3	HV Over Current	Relay Make & Model	SIEMENS 7SJ621	
		Pickup Current	0.6	0.6
		TSM(s)	0.3	0.3
4	LV Overcurrent	Relay Make & Model	SIEMENS 7SJ621	
		Pickup Current	1.10	1.10
		TSM(s)	0.3	0.3
5	HV Earth fault	Relay Make & Model	SIEMENS 7SJ621	
		PSM(A)	0.1	0.1
		TSM(s)	0.35	0.35
6	LV Earth fault	Relay Make & Model	SIEMENS 7SJ621	
		PSM(A)	0.18	0.18
		TSM(s)	0.35	0.35

Sl. No.	PROTECTION			GT 1&2	
				Existing	Reviewed
1	**Over All Differential**	Relay Make & Model		SIEMENS 7UT635	
		Biased	Pickup value of diff. current	0.15	0.15
			T I-DIFF> Time delay	0.00	0.00
			Pickup value of High set trip	12.00	12.00
			T I-DIFF>>Time delay	0.00	0.00
			Slope 1	0.25	0.25
			Base point of slope 1	0.00	0.00
			Slope 2	0.5	0.5
			Base point of slope 2	2.50	2.50
2	**Over Fluxing**	Relay Make & Model		SIEMENS 7UM62	
		U/f > Pickup		1.10	1.10
		T U/f >> Time delay		1 sec	1 sec
		U/f > Pickup		1.40	1.40
		T U/f > >Time delay		0.10 sec	0.10 sec
3	**Overcurrent**	Relay Make & Model		SIEMENS 7SJ61	
		Pickup Current		0.5	0.5

		TMS(s)	0.5	0.5
		Curve	NI	NI
		High set Pickup current	4A	4A
		Time delay	0 sec	0 sec
4	**Stand by Earth fault**	Relay Make & Model	SIEMENS 7SJ61	
		PSM(A)	0.25A	0.25A
		TMS(s)	0.7	0.7
		Curve	NI	NI
5	**REF**	Relay Make & Model	SIEMENS 7SJ61	
		PSM(A)	0.1A	0.1A
		Time delay	0.7	0.7

Sl. No.	PROTECTION			GT 3&4	
				Existing	Reviewed
1	**Over All Differential**	Relay Make & Model		ABB RET670	
		Biased	Pickup value of diff. current	0.20	0.20
			T I-DIFF> Time delay	0.00	0.00
			Pickup value of unrestrained trip	6.00	6.00
			T I-DIFF>>Time delay	0.00	0.00
			End section 1	0.55	0.55
			End section 2	5	5
			Slope section 2	40%	40%
			Slope section 3	50%	50%
		Harmonic Blocking	2^{nd} Harmonic	15%	15%
			5^{th} Harmonic	25%	25%
2	**Over Fluxing**	Relay Make & Model		ABB RET670 & SIEMENS 7UM62	
		U/f > Pickup		1.10	1.10
		T U/f >> Time delay		1 sec	1 sec
		U/f > Pickup		1.40	1.40
		T U/f > >Time delay		0.10 sec	0.10 sec

3	**Over Current**	Relay Make & Model	ABB RET670	
		Pickup Current	120%Ib	120%Ib
		TMS(s)	0.25	0.25
		Curve	NI	NI
		High set Pickup current	1176A	1176A
		Time delay	0 sec	0 sec

4	**Stand by Earth fault**	Relay Make & Model	ABB RET670	
		PSM(A)	25%Ib	25%Ib
		TMS(s)	0.7	0.7
		Curve	NI	NI
5	**REF**	Relay Make & Model	ABB RET670	
		Alarm value	8V	8V
		Time delay	5.0 sec	5.0 sec
		Trip value	66V	66V
		Time delay	0 sec	0 sec

Sl. No.	PROTECTION			UAT 1&2	
				Existing	Reviewed
1	**Differential**	Relay Make & Model		SIEMENS 7UT612	
		Biased	Pickup value of diff. current	0.20	0.20
			T I-DIFF> Time delay	0.00	0.00
			Pickup value of High set trip	10.00	10.00
			T I-DIFF>>Time delay	0.00	0.00
			Slope 1	0.25	0.25
			Base point of slope 1	0.0	0.0
			Slope 2	0.5	0.5
			Base point of slope 2	2.5	2.5
		Harmonic Blocking	2^{nd} Harmonic	15%	15%
			5^{th} Harmonic	25%	25%
3	**Over Current**	Relay Make & Model		SIEMENS 7SJ61	
		Pickup Current		0.57A	0.57A
		TMS(s)		0.6	0.6
		Curve		NI	NI
		High set Pickup Current		11A	11A
		Time delay		0 sec	0 sec

4	Stand by Earth fault	Relay Make & Model	SIEMENS 7SJ61	
		PSM(A)	0.2A	0.2A
		TMS(s)	0.6	0.6
		Curve	NI	NI

Sl. No.	PROTECTION			UAT 3&4	
				Existing	Reviewed
1	**Differential**	Relay Make & Model		ABB RET650	
		Biased	Pickup value of diff. current	0.12Ib	0.12Ib
			T I-DIFF> Time delay	0.00	0.00
			Pickup value of unrestrained trip	8.00 Ib	8.00 Ib
			T I-DIFF>>Time delay	0.00	0.00
			End section 1	0.4	0.4
			End section 2	5	5
			Slope section 2	40%	40%
			Slope section 3	55%	55%
		Harmonic Blocking	2^{nd} Harmonic	15%	15%
			5^{th} Harmonic	25%	25%
2	**Overcurrent**	Relay Make & Model		ABB RET650	
		Pickup Current		1.30Ib	1.30Ib
		TMS(s)		0.25	0.25
		Curve		NI	NI
		High set Pickup current		18.28Ib	18.28Ib

		Time delay	0 sec	0 sec
		Relay Make & Model	ABB REF615	
		Pickup Current	0.84In	0.84In
		TMS(s)	0.25	0.25
		Curve	NI	NI
3	**Stand by Earth fault**	Relay Make & Model	ABB RET650	
		PSM(A)	5%Ib	5%Ib
		TMS(s)	2.7	2.7
		Curve	EI	EI
4	**Residual Over Current**	Relay Make & Model	ABB RET650	
		PSM(A)	5%Ib	5%Ib
		TMS(s)	2.7	2.7
		Curve	Ext.Inv	Ext.Inv
		Relay Make & Model	ABB REF615	
		PSM(A)	0.14In	0.14In
		TMS(s)	0.25	0.25
		Curve	NI	NI

Sl. No.	PROTECTION			ST 1&2	
				Existing	Reviewed
1	**Differential**	Relay Make & Model		SIEMENS 7UT613	
		Biased	Pickup value of diff.current	0.20	0.20
			T I-DIFF> Time delay	0.00	0.00
			Pickup value of High set trip	8.00	8.00
			T I-DIFF>>Time delay	0.00	0.00
			Slope 1	0.25	0.25
			Base point of slope 1	0.00	0.00
			Slope 2	0.5	0.5
			Base point of slope 2	2.50	2.50
2	**Over Fluxing**	Relay Make & Model		SIEMENS 7UT613	
		U/f > Pickup		1.10	1.10
		T U/f >> Time delay		5 sec	5 sec
		U/f > Pickup		1.40	1.40
		T U/f > >Time delay		1 sec	1 sec
3	**SEF Protection**	Relay Make & Model		SIEMENS 7SJ611	
		I>>> Pickup		35	35
		T I>>> Time delay		0	0

		I>> Pickup	3.72	3.72
		T I>> Time delay	0	0
4	**HV Earth fault**	Relay Make & Model	SIEMENS 7SJ621	
		PSM(A)	0.25	0.25
		TSM(s)	0.45	0.45
5	**LV1 Earth fault**	Relay Make & Model	SIEMENS 7SJ621	
		PSM(A)	0.2	0.2
		TSM(s)	0.55	0.55
6	**LV2 Earth fault**	Relay Make & Model	SIEMENS 7SJ621	
		PSM(A)	0.2	0.2
		TSM(s)	0.55	0.55

Sl. No.	PROTECTION			ST 3&4			
				Existing		Reviewed	
1	**Differential**	Relay Make & Model		ABB&RET670			
				main1	main2	main1	main2
		Biased	IDiffAlarm	0.2	0.2	0.2	0.2
			tAlarmDelay	10	10	10	10
			IdMin	0.3	0.5	0.3	0.5
			IdUnre	8	12	8	12
2	**Over Fluxing**	Relay Make & Model		ABB&RET670 main1/2			
		V/Hz>>		170		170	
		V/Hz>		110		110	
		AlaramLevel		100		100	
		tAlarm		5		5	
3	**Residual over current**	Relay Make & Model		ABB&RET670 main1/2			
		IN1>		10		10	
		T1		1.5		1.5	
		IN1 Mult		1.0		1.0	
		K1 (TSM)		0.3		0.3	
		T1 min		0		0	

4	**HV Overcurrent**	Relay Make & Model	ABB&RET670 main1/2	
		I1>	1.2	1.2
		T1	0	0
5	**LV Overcurrent**	Relay Make & Model	ABB&RET670 main1/2	
		I1>	1.2	1.2
		T1	0	0
7	**LV Earth fault**	Relay Make & Model	ABB REF615	
		Start value	0.15	0.15
		Time multiplier	0.55	0.55

5.1. Reactor protection Data:

5.1.1. Reactor Protection Relay Setting Review:

Sl. No.	PROTECTION		BAY – 407 Bus Reactor BAY – 408 Bus Reactor	
			Existing	**Reviewed**
1	**Earth fault Overcurrent**	**Relay Make & Model**	SIEMENS&7SJ611	
		I > Pickup	0.46	0.46
		T I > Time delay	0.50	0.50
		IE > Pickup	0.11	0.11
		T IE > Time delay	0.50	0.50
2	**High impedance diff protection R phase**	**Relay Make & Model**	SIEMENS&7SJ611	
		1Phase o/c I >Pickup Current	0.03	0.03
		T 1Phase o/c I >Pickup time delay	0.1	0.1
3	**High impedance diff protection Y phase**	**Relay Make & Model**	SIEMENS&7SJ611	
		1Phase o/c I >Pickup Current	0.03	0.03
		T 1Phase o/c I >Pickup time delay	0.1	0.1
4	**High impedance diff protection B phase**	**Relay Make & Model**	SIEMENS&7SJ611	
		1Phase o/c I >Pickup Current	0.03	0.03
		T 1Phase o/c I >Pickup time delay	0.1	0.1

5	**Impedance protection**	**Relay Make & Model**	SIEMENS&7SA522	
		R(Z1) resistance for ph-ph faults	33.80	33.80
		X(Z1), Reactance	386.6	386.6
		RG(Z1),Resistance for ph-gnd faults	50.73	50.73
		T1-1Phase,delay for single phase faults	0.15	0.15
		T1 multi-ph, delay for multi phase faults	0.15	0.15

Sl. No.	PROTECTION			BAY – 414R Line Reactor BAY – 417R Line Reactor	
				Existing	**Reviewed**
1	**High Impedance Differential**	Relay Make & Model		ABB&RET670 MAIN 1	
		High impedance Differential	U>Alarm	2	Stable
			tAlarm	5	
			U>Trip	5	
			Series resistor	250	
2	**Phase Over Current**	Relay Make & Model		ABB&RET670 MAIN 1	
		Pickup Current		1.3	1.3
		TSM(s)		1	1
3	**Impedance protection**	Relay Make & Model		ABB&RET670 MAIN 2	
		X1		2115	2115
		R1		0.6	0.6
		X0		1904	1904
		R0		0.54	0.54
		RFPP		75	75
		RFPE		125	125
		TPP		1	1
		TPE		1	1

6.1. Bus-bar protection data

6.1.1. Bus bar Protection (400kV) Relay Setting Review

Sl. No.	PROTECTION		400kV		220kV	
			Existing	Reviewed	Existing	Reviewed
1	Bus bar protection	Relay Make & Model	SIEMENS 7SS522		SIEMENS 7SS522	
		Stabilising factor-BZ	0.6	0.6	0.6	0.6
		Diff current threshold-BZ	0.8	0.8	1.10	1.10
		Stabilising factor-CZ	0.5	0.5	0.6	0.6
		Diff current threshold-CZ	0.8	0.8	1.10	1.10
2	Breaker failure protection	Relay Make & Model	SIEMENS 7SS522		SIEMENS 7SS522	
		Stabilizing factor-BF protection	0.5	0.5	0.5	0.5

7.1 Generator Protection Data:

7.1.1 Input Data for Generator Protection:

S.No.	Particular	Units	Generator-1&2	Generator-3&4
1	**Generator Type**		THRI 108/44	THRI 108/44
2	**No. of Phases**		3	3
3	**Rated Apparent Power**	MVA	294.1 MVA	294.1 MVA
4	**Rated Active Power**	MW	250	250
5	**Rated Generating Voltage**	kV	16.5 kV	16.5 kV
6	**Rated current**	A	10290.83	10290.83
7	**Rated Power factor**		0.85 Lag	0.85 Lag
8	**Rated power frequency**	Hz	50.0	50.0
9	**Rated Speed**	RPM	3000.0	3000.0
10	**Field Resistance at 25 Deg.**	Ohm	0.098628	0.098628
11	**Field Resistance at 75 Deg**	Ohm	0.1176	0.1176
12	**Synchronous Reactance Xd**	% Z Base	158	158
13	**Transient Reactance Xd'**	% Z Base	22.8	22.8
14	**Sub transient Reactance Xd''**	% Z Base	15.5	15.5
15	**NGR Resistance**	Ohm	0.369	0.369
16	**Differential CT Ratio(Phase &Neutral side)**	A/A	12500/5	12500/5
17	**PT Ratio**	V/V	16500/110	16500/110
18	**NGT RATIO**	V/V	16500/240	16500/240
19	**NGT CT RATIO**	A/A	400/5	400/5

7.1.2 Generator Protection Relay Setting Review Unit -1to 4:

S.No.	Protection	Setting	Generator-1&2		Generator-3&4			
			Main-1&2		Main-1		Main-2	
			Existing	Reviewed	Existing	Reviewed	Existing	Reviewed
1	Generator Differential Protection	87-1 Pickup Value	0.15 I/InO	0.15 I/InO	0.10 Ib	0.10 Ib	0.15 I/InO	0.15 I/InO
		87-1 T I-DIFF>	0.00 sec	0.00 sec	0.00 sec	0.00 sec	0.00 sec	0.00 sec
		87-2 Pickup Value of High Set Trip	4.0 I/InO	4.0 I/InO	4.0 Ib	4.0 Ib	4.0 I/InO	4.0 I/InO
		87-2 T I-DIFF>>	0.00 sec	0.00 sec	0.00 sec	0.00 sec	0.00 sec	0.00 sec
		Slope 1	15%	15%	25%	25%	15%	15%
		Base point of slope 1	0.0 I/InO	0.0 I/InO	0.60 Ib	0.60 Ib	0.0 I/InO	0.0 I/InO
		Slope 2	50%	50%	40%	40%	50%	50%
		Base point of slope 2	2.5 I/InO	2.5 I/InO	3.0 Ib	3.0 Ib	2.5 I/InO	2.5 I/InO
2	Loss of Excitation	40 Susceptance Intersect Characteristic1	0.55	0.55	NA	NA	0.55	0.55
		40 Inclination Angle of Characteristic 1	80 °	80 °	NA	NA	80 °	80 °
		40 Characteristic 1 Time Delay	5.00 sec	5.00 sec	NA	NA	5.00 sec	5.00 sec
		40 Susceptance Intersect Characteristic-2	0.50	0.50	NA	NA	0.50	0.50
		40 Inclination Angle of Characteristic 2	90 °	90 °	NA	NA	90 °	90 °

		40 Characteristic 2 Time Delay	5.50 sec	5.50 sec	NA	NA	5.50 sec	5.50 sec
		40 Susceptance Intersect Characteristic3	1.10	1.10	NA	NA	1.10	1.10
		40 Inclination Angle of Characteristic 3	90 °	90 °	NA	NA	90 °	90 °
		40 Characteristic 3 Time Delay	0.30 sec	0.30 sec	NA	NA	0.30 sec	0.30 sec
		XoffsetZ1	NA	NA	-11.40 % Z base	-11.40 % Z base	NA	NA
		Z1diameter	NA	NA	162.40 % Z base	162.40 % Z base	NA	NA
		tZ1	NA	NA	0.20 Sec	0.20 Sec	NA	NA
		XoffsetZ2	NA	NA	-13.07 % Z base	-13.07% Z base	NA	NA
		Z2diameter	NA	NA	186.87 % Z base	186.8% Z base	NA	NA
		tZ2	NA	NA	2.00 Sec	2.00 Sec	NA	NA
		Impedance Zone Z1	1.50 Ohm	1.50 Ohm	NA	NA	1.50 Ohm	1.50 Ohm
		Impedance Zone Z1 Time Delay	1.20 sec	1.20 sec	NA	NA	1.20 sec	1.20 sec
		Impedance Zone Z1B	0.99 Ohm	0.99 Ohm	NA	NA	0.99 Ohm	0.99 Ohm
		Impedance Zone Z1B Time Delay	∞ sec	∞ sec	NA	NA	∞ sec	∞ sec

3	**Back up Impedance Protection**	Impedance Zone Z2	2.23 Ohm	2.23 Ohm	NA	NA	2.23 Ohm	2.23 Ohm
		Impedance Zone Z2 Time Delay	2.00 sec	2.00 sec	NA	NA	2.00 sec	2.00 sec
		Z1PE	NA	NA	0.085 Ohm/p	0.085 Ohm/p	NA	NA
		Z1RevPE	NA	NA	0.085 Ohm/p	0.085 Ohm/p	NA	NA
		t1PE	NA	NA	1.20sec	1.20sec	NA	NA
		Z2PE	NA	NA	0.121 Ohm/p	0.121 Ohm/p	NA	NA
		Z2RevPE	NA	NA	0.121 Ohm/p	0.121 Ohm/p	NA	NA
		t2PE	NA	NA	2.0 sec	2.0 sec	NA	NA
4	**Pole Slip Protection**	78 Pickup Curr. for Measur. Release I1>	120.00%	120.00%	NA	NA	120.00%	120.00%
		78 Pickup Curr. for Measur. Release I2<	20.00%	20.00%	NA	NA	20.00%	20.00%
		78 Resistance Za of the Polygon (width)	1.53 Ohm	1.53 Ohm	NA	NA	1.53 Ohm	1.53 Ohm
		78 Reactance Zb of the Polygon (reverse)	3.52 Ohm	3.52 Ohm	NA	NA	3.52 Ohm	3.52 Ohm
		78 Reactance Zc of Polygon(forw. char.1)	1.08 Ohm	1.08 Ohm	NA	NA	1.08 Ohm	1.08 Ohm
		78 Reactance Dif. Char.1-Char.2 (forw.)	0.50 Ohm	0.50 Ohm	NA	NA	0.50 Ohm	0.50 Ohm
		78 Angle of Inclination of the Polygon	90.0 °	90.0 °	NA	NA	90.0 °	90.0 °
		78 Numb. of Power Swing: Characteristic1	1	1	NA	NA	1	1
		78 Numb. of Power Swing:	3	3	NA	NA	3	3

		Characteristic2						
		78 Holding Time of Fault Detection	4.00 sec	4.00 sec	NA	NA	4.00 sec	4.00 sec
		78 Min. Signal Time for Annun. Char. 1/2	0.05 sec	0.05 sec	NA	NA	0.05 sec	0.05 sec
		Impedance ZA	NA	NA	15.43% Z base	15.43% Z base	NA	NA
		Impedance ZB	NA	NA	22.80% Zbase	22.80% Zbase	NA	NA
		Impedance ZC	NA	NA	11.76% Zbase	11.76% Zbase	NA	NA
		Angle Phi	NA	NA	85	85	NA	NA
		Start Angle	NA	NA	110.0	110.0	NA	NA
		Trip Angle	NA	NA	90	90	NA	NA
		N1Limit	NA	NA	1	1	NA	NA
		N2Limit	NA	NA	3	3	NA	NA
		Reset Time	NA	NA	5.0	5.0	NA	NA
5	**Reverse Power Protection**	32R P> Reverse Pickup	-0.50%	-0.50%	-0.60%	-0.50%	-0.50%	-0.50%
		32R Time Delay Long (without Stop Valve)	5.00 sec	5.00 sec	5.00 sec	5.00 sec	5.00 sec	5.00 sec
		32R Time Delay Short (with Stop Valve)	2.00 sec	2.00 sec	2.00 sec	2.00 sec	2.00 sec	2.00 sec

6	**Low forward Power Protection**	32F P-forw.< Supervision Pickup	0.50%	0.50%	0.60%	0.50%	0.50%	0.50%
		32F T-P-forw.< Time Delay without Turbine trip	10.00 sec	10.00 sec	10.00 sec	10.00 sec	10.00 sec	10.00 sec
		32F T-P-forw.< Time Delay with Turbine trip	5.00 sec	5.00 sec	5.00 sec	5.00 sec	5.00 sec	5.00 sec
7	**Negative sequence current Protection**	46 Continuously Permissible Current I2	7.50% Ib	7.50% Ib	NA	NA	7.50% Ib	7.50% Ib
		46 Warning Stage Time Delay	5.00 sec	5.00 sec	NA	NA	5.00 sec	5.00 sec
		46 Permissible Negative Sequence Time K	6.7 sec	6.7 sec	NA	NA	6.7 sec	6.7 sec
		46 Time for Cooling Down	1562 sec	1562 sec	NA	NA	1562 sec	1562 sec
		46-2 Pickup	25.00% Ib	25.00% Ib	NA	NA	25.00% Ib	25.00% Ib
		46-2 Time Delay	1.00 sec	1.00 sec	NA	NA	1.00 sec	1.00 sec
		46-1Pickup	NA	NA	8.0% Ib	8.0% Ib	NA	NA
		46-1 TMS	NA	NA	2.5 Sec	2.5 Sec	NA	NA
		46-1 Curve	NA	NA	IEC Very Inv	IEC Very Inv	NA	NA
		46-2 Pickup	NA	NA	58.0 % Ib	58.0 % Ib	NA	NA
		46-2 Time Delay	NA	NA	2.0 Sec	2.0 Sec	NA	NA
		46-2 Curve	NA	NA	IEC Def.Time	IEC Def.Time	NA	NA
8	**Thermal over load**	49 K-Factor	0.86	0.86	NA	NA	0.86	0.86
		49 Time Constant	580 sec	580 sec	NA	NA	580 sec	580 sec
		49 Thermal Alarm Stage	90 %	90 %	NA	NA	90 %	90 %

	Protection	49 Current Overload Alarm	4.25 A	4.25 A	NA	NA	4.25 A	4.25 A
9	**100% Stator Earth fault Protection (20 Hz Injection method)**	Pickup Value of Alarm Stage Rsgf<	70.0 Ohm	70.0 Ohm	NA	NA	**70.0 Ohm (Unit-3)**	**70.0 Ohm (Unit-3)**
							210Ohm (Unit-4)	**210Ohm (Unit-4)**
		Pickup Value of Tripping Stage Rsgf<<	20.0 Ohm	20.0 Ohm	NA	NA	**20.0 Ohm (Unit-3)**	**20.0 Ohm (Unit-3)**
							60.0 Ohm (Unit-4)	**60.0 Ohm (Unit-4)**
		Time Delay of Alarm Stage Rsgf<	5.00 sec	5.00 sec	NA	NA	5.00 sec	5.00 sec
		Time Delay of Tripping Stage Rsgf<<	1.00 sec	1.00 sec	NA	NA	1.00 sec	1.00 sec
		Pickup Value of I SGF>> Stage	0.15 A	0.15 A	NA	NA	0.15 A	0.15 A
	100% Stator Earth fault Protection (3rdHarmonic method)	Beta	NA	NA	2	2	NA	NA
		UN3rdH<	NA	NA	2% of UB/1.732	2% of UB/1.732	NA	NA
		UT3BlkLevel	NA	NA	1% of UB/1.732	1% of UB/1.732	NA	NA
		t3rdH	NA	NA	1.0 sec	1.0 sec	NA	NA
10	**95% Stator Earth fault Protection (59N/67GN)**	59N V0> Pickup	9.0 V	9.0 V	6.0% of UB/1.732	6.0% of UB/1.732	5.0 V	5.0 V
		59N/67GN Time Delay	0.70 sec	0.70 sec	0.70 sec	0.70 sec	0.70 sec	0.70 sec
11	**Over Voltage**	59-1 Pickup	121.0 V	121.0 V	121.0 V	121.0 V	121.0 V	121.0 V
		59-1 Time Delay	2.00 sec	2.00 sec	2.00 sec	2.00 sec	2.00 sec	2.00 sec

	Protection	59-2 Pickup	128.7 V	128.7 V	128.7 V	128.7 V	128.7 V	128.7 V
		59-2 Time Delay	0.00 sec	0.00 sec	0.00 sec	0.00 sec	0.00 sec	0.00 sec
12	**Under Frequency Protections**	81-1 Alarm Pickup	48.20 Hz	48.20 Hz	48.20 Hz	48.20 Hz	48.20 Hz	48.20 Hz
		81-1 Time Delay	5.00 sec	5.00 sec	4.00 sec	4.00 sec	5.00 sec	5.00 sec
		81-2 Trip Pickup	47.50 Hz	47.50 Hz	47.50 Hz	47.50 Hz	47.50 Hz	47.50 Hz
		81-2 Time Delay	1.00 sec	1.00 sec	1.00 sec	1.00 sec	1.00 sec	1.00 sec
13	**Over Frequency Protections**	81-3 Alarm Pickup	51.50 Hz	51.50 Hz	51.50 Hz	51.50 Hz	51.50 Hz	51.50 Hz
		81-3 Time delay	1.00 sec	1.00 sec	1.00 sec	1.00 sec	1.00 sec	1.00 sec
		81-4 Trip Pickup	52.00 Hz	52.00 Hz	52.00 Hz	52.00 Hz	52.00 Hz	52.00 Hz
		81-4 Time delay	1.00 sec	1.00 sec	1.00 sec	1.00 sec	1.00 sec	1.00 sec
14	**Over Excitation Protection**	24-1 V/f Pickup	1.10	1.10	1.05	1.10	1.10	1.10
		24-1 V/f Time Delay	1.00 sec	1.00 sec	5.00 sec	1.00 sec	1.00 sec	1.00 sec
		24-2 V/f Pickup	1.40	1.40	1.40	1.40	1.40	1.40
		24-2 V/f Time Delay	0.10 sec	0.10 sec	0.0 sec	0.10 sec	0.10 sec	0.10 sec
15	**Dead Machine Protection**	50/27 I Stage Pickup	4.5 A	4.5 A	NA	NA	2.5 A	2.5 A
		50/27 Release Threshold V1<	77.0 V	77.0 V	NA	NA	77.0 V	77.0 V
		50/27 Pickup Time Delay T V1<	2.00 sec	2.00 sec	NA	NA	2.00 sec	2.00 sec
16	**Rotor earth fault protection 1-3Hz method**	64R-1 Pickup	80.0 kOhm	80.0 kOhm	NA	NA	80.0 kOhm	80.0 kOhm
		64R-2 Pickup	10.0 kOhm	10.0 kOhm	NA	NA	10.0 kOhm	10.0 kOhm
		64R-1 Time Delay	5.00 sec	5.00 sec	NA	NA	5.00 sec	5.00 sec
		64R-2 Time Delay	2.00 sec	2.00 sec	NA	NA	2.00 sec	2.00 sec
17	**Inter turn Fault Protection**	64-1 Ground Displacement Voltage	20.0 V	20.0 V	16.5 V	16.5 V	NA	NA
		64-1 Time Delay	1.00 sec	1.00 sec	1.00 sec	1.00 sec	NA	NA

8.1 DC Measurements:

DC battery and chargers are very important units as they are required to operate the protection relays. In this section, the details of the batteries and chargers are provided.

Following is the measurement of DC source which was taken:

A. **220 V DC Source:**

Sl. No.	Description	**Switch yard 1&2**		**Switch yard 3&4**	
		DC1	**DC2**	**DC1**	**DC2**
1	Voltage	240 V	240 V	240 V	240 V
	1) Positive to earth	**213**	130	127	127
	2)Negative to earth	**28**	111	114	114

Sl. No.	Description	Unit#1		Unit#2	
		DC1	**DC2**	**DC1**	**DC2**
1	Voltage	240V	240V	240V	240V
	1) Positive to earth	129	129	128	129
	2)Negative to earth	112	112	113	112
Sl. No.	Description	Unit#3		Unit#4	
		DC1	**DC2**	**DC1**	**DC2**
1	Voltage	240V	240V	240V	240V
	1) Positive to earth	129	129	130	129
	2)Negative to earth	113	112	113	112

B. **48V DC Source:**

Sl. No.	Description	Switch yard 1&2	Switch yard 3&4
1	Voltage	48V	48V
	1) Positive to earth	0	0
	2)Negative to earth	-50.2	-47

Observations

Electrical protection team conducted the annual internal protection audit for Generators, Transformers, and 400kV Substation at CTPP, Chhabra-RRVUNL (4*250 MW**) .** The different Protection that were covered under the audit are (i) Line Protection (ii) GT,UAT,ICT&ST Protection (iii) Reactor protection and (iv) Bus bar Protection (v) Generator Protection.

This report pertains to the audit carried out for Generators, Transformers, and 400kV Substation at CTPP, Chhabra-RVUNL (4*250 MW). The Protection audit of the substation was carried out from 01/10/2024 to 21/10/2024. CTPP, Chhabra-RRVUNL (4*250 MW) have (a) Four 400 kV transmission lines (b) Two 220kV transmission lines (c) Four Generators, Four GTs, Eight UATs, One ICT and Four ST's. After viewing the downloaded settings at substation for all the aforementioned equipments most of the settings are found to be in line with the recommended settings as per guidelines. As above report following Observation founded:

1. On the basis of Third party protection audit report the distance protection i.e. Main-I & II Zone 1, Zone 1B and Zone 3 impedance reach setting for 400&220KV line are properly set and some revisions are required in Zone-2 impedance reach settings which will be implemented in upcoming shutdown of lines.
2. The Auto reclose function is enabled with the Dead time of 1.0 sec and Reclaim time of 25.0 Sec.
3. The Pole discrepancy time setting is coordinated with the auto reclose function and set as PD time setting = (Auto reclose dead time + time delay of 200-500ms)
4. It is observed that DC source for switchyard 1&2is having earth fault. It will be attended and rectify.

5. The differential protection setting for Generator are properly set and stable
6. The differential protection setting for transformers are properly set and stable.
7. The impedance protection setting for reactor is properly set and stable.
8. The differential protection setting for bus-bar is properly set and stable.

INTERNAL PROTECTION AUDIT OF
765/400kV SWITCHYARD AT
ANPARA –DTPS

REPORT

SUBMITTED BY:

ELECTRICAL MAINTENANCE DIVISION-III
ANPARA 'D' THERMAL POWER STATION
ANPARA, SONBHARDRA
UTTAR PRADESH– 231225

01/10/2024 - 10/10/2024

EXECUTIVE SUMMARY

The scope of this Protection Audit involves the Review of the implemented protection schemes/philosophy & review of main & backup Protection setting & coordination in the switchyard which includes protection of Generator Transformer, Transmission Lines, ICT Bank, Station transformer, reactor, circuit breakers, bus bar etc. as per CBIP/NRLDC/NRP etc. guidelines. This also involves Reviewing of availability/healthiness of communication links like PLCC, healthiness/ adequacy of 110/ 48/ 24 V DC, GPS/TSU, and circuit breaker report.

In view of this, EMD-III, DTPS, Anpara, UPRVUNL carried out the onsite Protection audit from 01/10/2024 and 10/10/2024 and have a compressive review of switchyard. Protection schemes and setting has been carried out as per Northern region Power Committee Protection Guidelines.

The major equipment for which protection audit has been carried out are as under:

- Generator Transformer bank (2X 600 MW)
- ICT Bank (1X1000 MVA)
- Station Transformer (2 X 80MVA)
- 765 & 400kV Transmission Lines
- Bus Reactor (189 MVAR)
- 765 & 400kV Bus bar and LBB protection system.

As a general finding from this audit, it is observed that 765/400 kV DTPS substation equipment are well protected as per Northern region Power Committee recommendation. Both 765 kV and 400 kV lines have independent main-1 and main-2 functional Numerical protection. Bus bar, 765KV and 400KV lines, transformers and bus reactor are also well protected as per NRPC defined Protection schemes.

The state of DC supply at substation was also checked and was found in order. Time Functionality of GPS/TSU, circuit breaker, relay resting reports is also inspected and all are found in satisfactory state.

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1. SCOPE OF WORK

1.1 SCOPE OF WORK:

Internal protection audit of 756/400kV SWITCHYARD at Anpara, DTPS have following scope of work:

1) Review of implemented protection schemes/philosophy & setting in the generating station and switchyard which includes Protection of transmission lines, transformers, bus bar reactors, review of relay & circuit breaker test reports with reference to CBIP /NRLDC/NRPC guidelines
2) To check the adequacy for the adequacy/ healthiness of the primary& backup protection scheme & Settings, Suggest corrective measures in case of any problems.
3) Review of availability/healthiness of communication links like PLCC, optical fiber used for protection.
4) To check the healthiness/adequacy of 220 V/48 V /24 V DC systems at Substation for protection and suggest corrective measures in the case of any problem.
5) Review of availability/Healthiness of GPS system and ensure time synchronization of different relays / devices etc.
6) Review of DR/EL
7) Review of test report of circuit breakers for assessing their healthiness -healthiness of trip and close coil, Breaker close & open timings, SF6& operational media pressure setting of alarm, auto reclose lock out and breaker operational lock out and pole discrepancy operation.
8) Review of test reports for healthiness of 765KV and 400KV Current Transformer and Relays
9) Field collection of technical data for audit work from DTPS Switchyard.
10) Field inspection of protection device for obsolescence of technology, suitability, and healthiness

1.2 PROTECTION CHECKLIST

Check List for Transmission Lines

Name of Substation	:	'D' Thermal Power Station, Anpara, Sonebhadra.
Voltage Level	:	765/400kV
Generation Capacity	:	2X500MW

Sl. No	Protection Scheme	Status **	Remarks			
			765KV Line-1	765KV Line-2	400KV Line-1	400KV Line-2
1.	**Main I-Distance Protection**	Yes/No	Yes	Yes	Yes	Yes
2.	**Main II-Distance Protection of directional comparison protection or phase segregated line differential protection**	Yes/No	Yes	Yes	Yes	Yes
3.	**Directional instantaneous definite minimum time (IDMT) type earth fault relay**	Yes/No	Yes	Yes	Yes	Yes
4.	**Directional IDMT over current and earth fault back up protection**	Yes/No	Yes	Yes	Yes	Yes
5.	**Two stages over voltage protection**	Yes/No	Yes	Yes	Yes	Yes
6.	**Auto Reclosing**	Yes/No	Yes	Yes	Yes	Yes
7.	**Carrier aided inter-tripping/blocking. feature**	Yes/No	Yes	Yes	Yes	Yes
8.	**Are Power Line Carrier Communication (PLCC) equipment with Protection Coupler complete for speech transmission, line protection and data channels? Provided?**	Yes/No	N/A	Yes	N/A	N/A
9.	**Are 100% back up Communication. Channels provided for transmission line & line compensating equipment?**	Yes/No	N/A	Yes	N/A	N/A
10.	**Disturbance Recorder**	Yes/No	Yes	Yes	Yes	Yes
11.	**Distance to Fault Locator**	Yes/No	Yes	Yes	Yes	Yes
12.	**Event Logger:** **i) Stand Alone** **ii) Part of S/S or switchyard automation system**		ii)	ii)	ii)	ii)
13.	**Are Time Synchronizing Equipment (TSE) complete with antenna, all cables, processing equipments etc. provided to receive synchronizing pulse through Global Positioning System (GPS) compatible for? synchronization of event logger, disturbance recorder and SCADA/automation system?**	Yes/No	Yes	Yes	Yes	Yes

14.	**Is all protection employed Numerical? type?**	Yes/No	Yes	Yes	Yes	Yes
15.	**Are two protection channels in addition to one speech plus data channel provided for each direction?**	Yes/No	N/A	Yes	N/A	N/A
16.	**Local Breaker Backup Protection (LBB)**	Yes/No	Yes	Yes	Yes	Yes
17.	**CVT fuse fail detection function**	Yes/No	Yes	Yes	Yes	Yes
18.	**(a) What are the zones blocked on Power swing block function:** **(b) Unblock time setting (typical 02sec)** **(c) Out of step trip enabled**	Z1/Z2/ Z3/Z4 Yes/No	Z2, Z3, Z4 No	Z2, Z3, Z4 02 sec No	Z1/Z2/ Z3/Z4 No	Z1/Z2/ Z3/Z4 No
19.	**SPS Protection**	Yes/No	N/A	Yes	N/A	N/A
20.	**Any other Protection**					

** Check the availability & functional healthiness.

Note:

a) **Sl No.2 is optional at voltage level 220KV & not required at voltage level 132KV.**

b) **Sl No.3 is required at 220 KV if both Main-I & Main-II are distance protections, otherwise not required. At 132 KV level it is not required.**

c) **Sl No.4 is required at 220 KV level if Main-II is not provided, otherwise not.**

d) **Sl No.14 is required at 220KV and above.**

Check List for Transformers

Name of Substation : 'D' Thermal Power Station, Anpara, Sonebhadra.

Voltage Level : 765/400kV

Generation Capacity : 2X500MW

Sl. No	Protection Scheme	Status **	Remarks
1.	**Differential Protection**	Yes/No	Yes
2.	**Over Fluxing**	Yes/No	Yes
3.	**Restricted Earth Fault**	Yes/No	Yes
4.	**Backup directional over current and earth fault protection (HV & LV side) or impedance protection**	Yes/No	Yes
5.	**Buchholz**	Yes/No	Yes
6.	**Winding Temperature Indicator (WTI)**	Yes/No	Yes
7.	**Oil Temperature Indicator (OTI)**	Yes/No	Yes
8.	**Magnetic Oil Gauge (MOG) with low oil level alarm**	Yes/No	Yes
9.	**Oil Surge Relay (OSR) for On Load Tap Changer (OLTC)**	Yes/No	GT-N/A, ST/ICT-Yes
10.	**Pressure Relieve Device (PRD)**	Yes/No	Yes
11.	**Surge Arrester (SA) on both primary and secondary sides of transformers located outdoors and connected to overhead lines.**	Yes/No	Yes
12.	**Tertiary winding protection**	Yes/No	Yes, in ICT
13.	**Overload alarm**	Yes/No	Yes
14.	**Cooling**		ST-ONAF GT, ICT-ODAF
15.	**Disturbance Recorder**	Yes/No	Yes
16.	**Any other protection**		

** Check the availability & functional healthiness. Note:

a) **Sl No.6 is required at voltage level 220KV for 100MVA & above rating.**

b) **OTI is required for 1 MVA and above.**

Check List for Bus Reactor

Name of Substation : 'D' Thermal Power Station, Anpara, Sonebhadra.

Voltage Level : 765/400kV

Generation Capacity : 2X500MW

Sl. No	Protection Scheme	Status **	Remarks
1.	**Differential**	Yes/No	Yes
2.	**Restricted Earth Fault (REF)**	Yes/No	Yes
3.	**Reactor backup protection (impedance type or definite time over current (O/C) and earth fault (E/F) protection)**	Yes/No	Yes
4.	**Buchholz**	Yes/No	Yes
5.	**Winding Temperature Indicator (WTI)**	Yes/No	Yes
6.	**Magnetic Oil Gauge (MOG)**	Yes/No	Yes
7.	**Oil Temperature Indicator (OTI)**	Yes/No	Yes
8.	**Surge Arrestor (SA)**	Yes/No	Yes
9.	**Cooling**		ONAN
10.	**Any other Protection**		

** Check the availability & functional healthiness.

Check List for Sub-Station/Switchyard

Name of Substation : 'D' Thermal Power Station, Anpara, Sonebhadra.

Voltage Level : 765/400kV

Generation Capacity : 2X500MW

Sl. No	Protection Scheme	Status **	Remarks
1.	**Local Breaker Backup (LBB)**	Yes/No	Yes
2.	**Event Logger (EL)**	Yes/No	Yes
3.	**Synchronizing Facility**	Yes/No	Yes
4.	**Are Synchro Check Relay provided with requisite settings?**	Yes/No	Yes
5.	**DC supply:** **i) 48V** **ii) 110V** **iii) 220V**	 Yes/No Yes/No Yes/No	 Yes
6.	**Availability of Battery Charger** **i) 48V** **ii) 110V** **iii) 220V**	 Yes/No Yes/No Yes/No	 Yes
7.	**DG set**	Yes/No	Yes
8.	**Auxiliary Supply** **Average trippings per month**	Yes/No ____	Yes
9.	**Special Protection Scheme (SPS)**	Yes/No	Yes
10.	**Under Frequency Relay(UFR):** **i) Stage I** **ii) Stage II** **iii) Stage III**	 Yes/No Yes/No Yes/No	 No No No
11.	**Has the Fault level Increased since connected to grid?**	Yes/No	No
12.	**If status at Sl.No 1 isYes, then whether Sectionalisation of the bus/ Series Reactor on the line or bus provided to limit the fault level?**	Yes/No	No
13.	**Has the size and number of ICT in the S/S been planned in a way that the outage of any single unit does not overload the remaining ICTs or the underlying transmission system**	Yes/No	Yes
14.	**SCADA:** **i) Voice** **ii) Data**	 Yes/No Yes/No	 Yes Yes
15.	**Switching Schemes**	Yes/No	Breaker & a half

16.	**Are Circuit Breakers suitable for single-phase and three-phase auto reclosing?**	Yes/No	Yes
17.	**Are Circuit Breakers provided with two trip coils?**	Yes/No	Yes
18.	**Are Circuit Breakers provided with Pre Insertion Resistors?**	Yes/No	Yes
19.	**Are Earthing Switches provided at appropriate locations to facilitate earthing of outgoing transmission lines to enable maintenance?**	Yes/No	Yes
20.	**Are all main protection relays of numerical type?**	Yes/No	Yes
21.	**Are protection functions subdivided into two independent groups & capable of providing uninterrupted protection even in the event of one protection groups failing?**	Yes/No	Yes
22.	**Are two sets of DC sources (220V or 110V) available?**	Yes/No	Yes
23.	**If status to Sl.No 21 is Yes, then whether relays are electrically and physically segregated into two groups to obtain redundancy and to take protection systems out for maintenance while the equipment remains in service?**	Yes/No	Yes
24.	**If status to Sl.No 21 is No, then whether relays are electrically and physically segregated into two groups by giving DC supplies through separate fuses?**	Yes/No	Yes
25.	**Are two sets of DC sources (48V) available?**	Yes/No	Yes
26.	**Bus Bar Protection**	Yes/No	Yes
27.	**Bus Bar Protection scheme has provision for future expansion**	Yes/No	Yes
28.	**Any other Protection**		

** Check the availability & functional healthiness. Note:

a) Requirements for Sl No.14 are:

Switching Scheme	Voltage level
Main & Transfer Bus or Double bus	66KV & 132 KV
Double Main & Transfer Bus or Double bus	220KV
Breaker & a half or Double Main and Transfer bus	400KV

2. General Observation and Philosophy adopted in substations.

2.1 Philosophy used for Distance protection:

The philosophy adopted for 765/400kV lines Distance protection relay settings is given below which is generally in accordance with CBIP guidelines, given below.

Distance protection settings:

Zone-1 Reach : Set to 80% of the Protection line

Zone-1 Time : Instantaneous

Zone-2 Reach : 100% of the protected line + 50% of the shortest line emanating from the far end bus bar, or, 120% of the Protected line, whichever is higher

or

100% of the protected line + 25% of the ICT Transformer impedance.

Zone-2 Time : 300ms for short lines (<100km) and 550ms for long lines >100km

Zone-3 Reach : 120% of the protected line + 100% of the longest line emanating from the far end bus bar, or 100% of the Protected line + 100% of the longest line emanating from the far end bus bar + 25% of the longest line emanating from the far end of the second line considered, whichever is lower.

or

100% of the protected line + 50% of the ICT Transformer impedance

The zone setting to be limited such that it will not reach into the next voltage level

Zone-3 Time : 1000ms

Zone-3R or Zone 4: 20% of the Zone-1 reaches

Zone-3R or Zone 4 Time : 1000ms

2.2 Philosophy used for Transformer protection:

The philosophy adopted for Transformer protection relay settings is given below which is generally in accordance with CBIP guidelines, given below

Group-A			Group-B	
Differential Protection	**HV Back Up Over Current and Earth Fault**	**Over Fluxing Protection**	**LV Back Up Over Current and Earth Fault**	**Restricted Earth Fault**

2.3 General protections in 765/400kV switchyard:

765/400kV Switchyard-DTPS Protection System Review		
SL NO	**Description**	**765/400KV**
1	**Name Of Grid Substation**	765/400 kV Switchyard-DTPS
2	**Highest Voltage Level**	765kV
3	**Year Of Installation**	
4	**No Of Feeders**	4 -2(765KV),2(400KV)
5	**No of Units**	2
6	**No of Transformers, Make and Capacity**	GT'S: 2*600MVA(765/21)kV - AREVA ICT'S:1*1000MVA(765/400)kV – AREVA ST'S:2*80 MVA (400/11.5-11.5)kV-BHEL
7	**Busbar Arrangement**	2 (765kV buses)and 2 (400kV buses)
8	**Present Busbar Switching Status**	Fully Commissioned. bays are connected to different buses
9	**Busbar Protection**	Provided
10	**Relay System Status**	In Service
11	**DC Supply System**	Transmission Unit i)Eight Nos of Battery Bank with 110 V DC,400AH Capacity in service ii)Eight no's of battery Chargers for 110V System (Float cum Boost) are in service
12	**DC Supply Capacity And Adequacy**	DC system is adequate for the station load
13	**DC System Earth Fault Status**	Both the systems are Healthy
14	**PLCC**	Provided to Obra -C Line
15	**GPS Clock Receiver & Synchronization Of Relay Status**	Provided and Synchronized
16	**Common Event Logger Status**	Provided
17	**Line Disturbance Recorder**	Provided
18	**Breaker Failure Relay Status**	Provided
19	**General Observation of Relay And Protection System**	System is working satisfactorily.

2.4 Relays used for transmission line, Transformer, Bus bar, and Reactor:

Relay used for Transmission Line Protection:-

Sl.no	Name of the Feeder	Main-I	Main-II	Backup
1	765kV Anpara-D -Lanco line	ABB REL-670	MICOM P-543	MICOM P-921
2	765kV Anpara-D -Obra-C line	ABB REL-670	MICOM P-543	-
3	400kV Anpara D- Anpara B Line-1&2	ABB REL-670	MICOM P-543	-

Relays used for Transformer Protection:

Sl. No.	Transformer Details	Group-A			Group-B	
		Differential Protection	HV Back Up Over Current and Earth Fault	Over Fluxing Protection	LV Back Up Over Current and Earth Fault	Restricted Earth Fault
1	ICT Bank 765/400kV	MICOM P-633,P-643, (TEE2:P-633)	MICOM P-141, (TEE1:P-122)	MICOM P-643,P-643	MICOM P-141, (TEE1:P-122)	MICOM P-643,P-633
2	GT-6 Bank 765/21kV	MICOM P-633,P-643, (TEE2:P-633)	MICOM P-141,P-643 (TEE1:P-122)	MICOM P-643,P-643	-	MICOM P-643,P-633
3	GT-7 Bank 765/21kV	MICOM P-633,P-643, (TEE2:P-633)	MICOM P-141,P-643 (TEE1:P-122)	MICOM P-643,P-643	-	MICOM P-643,P-643
4	ST-1 400/11.5-11.5kV	MICOM P-633,P-643, (TEE2:P-633)	MICOM P-141, (TEE1:P-122)	MICOM P-643,P-643	MICOM P-141, (TEE1:P-122)	MICOM P-633
5	ST-2 400/11.5-11.5kV	MICOM P-633,P-643, (TEE2:P-633)	MICOM P-141, (TEE1:P-122)	MICOM P-643,P-643	MICOM P-141, (TEE1:P-122)	MICOM P-633

Relay used for Busbar Protection:-

Sl.No.	Name of Bay	Main-I	Main-II	BACK UP
1	765kV Bus-1	MICOM P-743	MICOM P-746	MICOM P-921
2	765kV Bus-2	MICOM P-743	MICOM P-746	MICOM P-921
3	400kV Bus-1	MICOM P-743	MICOM P-746	MICOM P-921
4	400kV Bus-2	MICOM P-743	MICOM P-746	MICOM P-921

Relay used for Reactor Protection:

Sl. No.	Name of Reactor	Differential Protection (Make & Model)	REF Protection (Make & Model)	Back-Up Impedance Protection (Make & Model)
1	Bus Reactor	ALSTOM, P-632	-	ALSTOM P141

2.5 INPUT DATA FOR 765kV TRANSMISSION LINE PROTECTION

S. No.	Description	Units	Value	Value
0	**Station Name**		765kV Line-I	765kV Line-II
1	**Line Reference**		Anpara-Lanco line	Anpara –Obra-C line
1.1	Line voltage level	kV	765	765
1.2	Name of remote substation		765kV Lanco	765kV Obra-C
2	**Main 1**			
2.1	Protection Type		Numerical	Numerical
2.2	Model & Make		ABB REL-670	ABB REL-670
3	**Main 2 protection**		YES	YES
3.1	Protection Type		Numerical	Numerical
3.2	Model & Make		MICOM P-543	MICOM P-543
4	**LBB Protection**		YES	NO
4.1	Protection Type		Numerical	-
4.2	Model & Make		MiCOM P-921	-
5	**CT data for Main 1**			
5.1	Ratio	A/A	2000/1	2000/1
5.2	Class		PS	PS
5.3	Vk / VA burden	V / VA	2000	2000
5.4	Rct	Ohms	-	-
5.5	Imag @ Vk/2 or Vk/4	mA	60	60
6	**CT data for Main 2**			
6.1	Ratio	A/A	2000/1	2000/1
6.2	Class		PS	PS
6.3	Vk / VA burden	V / VA	2000	2000
6.4	Rct	Ohms	-	-
6.5	Imag @ Vk/2 or Vk/4	mA	60	60
7	**CT data for LBB**			
7.1	Ratio	A/A	3000/1	-
7.2	Class		PS	-
7.3	Vk / VA burden	V / VA	2000	-
7.4	Rct	Ohms	-	-
7.5	Imag @ Vk/2 or Vk/4	mA	60	-

8	PT Ratio	kV/V	765kV/110V	765kV/110V
Sl. No.	**Description**	**Units**	**Value**	**Value**
9	PROTECTED LINE DATA		Anpara-Lanco line	Anpara –Obra-C line
9.1	Line Length	Km	2.63	426.149
9.2	Positive seq. resistance	Ohms/Km	0.0114	0.0114
9.3	Positive seq. reactance	Ohms/Km	0.2853	0.2853
9.4	Zero seq. resistance	Ohms/Km	0.2399	0.2399
9.5	Zero seq. Reactance	Ohms/Km	0.938073	0.938073
10	Transformers details (from remote bus)		765kV Lanco	765kV Obra-C
10.1	Transformer connected to the remote bus		YES	YES
10.2	Voltage ratio of the transformer	kV/kV	765 /400	765/400
10.3	MVA of the transformer	MVA	2*1000	3*1000
10.4	Impedance of the transformer	%	15	14.20

2.6 Review of 765KV TRANSMISSION LINE PROTECTION SETTINGS:

2.6.1 Review of 765KV Anpara D-Lanco Line settings:

Name of Transmission Line								
Main I	**ABB REL-670**		Existing Settings	Reviewed Settings	Existing Settings	Reviewed Settings	Existing Settings	Reviewed Settings
Settings	Existing Settings	Reviewed Settings						
Distance Protection	Zone 1		Zone 2		Zone 3		Zone 4	
Direction	Forward	Forward	Forward	Forward	Forward	Forward	Reverse	Reverse
X1PP/PE (Ω)	0.60	0.60	59.094	59.094	117.438	117.438	0.150	0.150
R1PP/PE (Ω)	0.024	0.020	2.3613	2.3613	4.693	4.693	0.006	0.006
X0PE (Ω)	1.971	1.97	194.039	194.039	385.615	385.615	0.493	0.493
R0PE (Ω)	0.5	0.5	49.690	49.690	98.750	98.750	0.126	0.126
RFPP (Ω)	1.801	1.801	60	60	75.000	75.000	0.450	0.450
RFPE (Ω)	2.701	2.701	60	60	100.000	100.000	0.675	0.675
tPP (ms)	0	0	400	400	1000	1000	1000	1000
tPE (ms)	0	0	400	400	1000	1000	1000	1000
Main II	**MICOM P-543**							
Line Differential	ON	ON						
87-1 Pickup(A)	0.2	0.2						

Slope k1(%)	30	30						
Slope k2(%)	150	150						
time delay (ms)	0	0						
Over Current and Earth Fault								
Over current	ON	ON						
Function	DT	DT						
Pick up (A)	1.5	1.5						
Time delay (S)	1.5	1.5						
Earth Fault								
Function	DT	DT						
Pick up (A)	0.2	0.2						
Time delay (A)	1.5	1.5						
Broken conductor								
Pick up (A)	0.2	0.2						
Time delay(S)	2	2						
LBB	MICOM P-921							
Name of Line	Anpara-D Lanco line							
Protection	Over voltage							
Function	DMT	DMT						
Pickup U>	121	121						
Time dial	3	3						
Pickup U>>	154	154						
Time dial	0.1	0.1						

2.6.2 Review of 765KV Anpara D-Obra-C Line settings:

Name of Transmission Line								
Main I	**ABB REL-670**		Existing Settings	Reviewed Settings	Existing Settings	Reviewed Settings	Existing Settings	Reviewed Settings
Setting	Existing Settings	Reviewed Settings						
Distance Protection	Zone 1		Zone 2		Zone 3		Zone 4	
Direction	Forward	Forward	Forward	Forward	Forward	Forward	Reverse	Reverse
X1PP/PE (Ω)	97.264	97.264	179.924	179.924	238.268	238.268	24.316	24.316
R1PP/PE (Ω)	3.886	3.886	7.189	7.189	9.521	9.521	0.972	0.972
X0PE (Ω)	319.373	319.373	590.791	590.791	782.368	782.368	79.843	79.843
R0PE (Ω)	81.787	81.787	151.292	151.292	200.352	200.352	20.447	20.447
RFPP (Ω)	30	30	60.000	60.000	75.000	75.000	72.948	72.948
RFPE (Ω)	40	40	60.000	60.000	100.000	100.000	100.000	100.000
tPP (ms)	0	0	550	550	750	750	1000	1000
tPE (ms)	0	0	550	550	750	750	1000	1000
Main II	**Alstom P4543**							
	Existing Settings	Reviewed Settings	**Existing Settings**	Reviewed Settings	**Existing Settings**	Reviewed Settings	**Existing Settings**	Reviewed Settings
Distance Protection Settings	Zone 1		Zone 2		Zone 3		Zone 4	
Direction	Forward	Forward	Forward	Forward	Forward	Forward	Reverse	Reverse
Resistive reach-phase (Ω)	17.24	17.24	21.59	21.59	26.99	26.99	26.99	26.99
Resistive reach-ground (Ω)	23.30	23.30	28.79	28.79	35.98	35.98	35.98	35.98
Impedance -phase resistive reach (Ω)	27.99	27.99	43.388	43.388	75.57	75.57	5.598	5.598
Time delay (ms)	0	0	550	550	1000	1000	1000	1000

2.7 INPUT DATA FOR 400kV TRANSMISSION LINE PROTECTION

S. No.	Description	Units	Value
0	**Station Name**		400kV Line-I &II
1	**Line Reference**		Anpara D –Anpara B
1.1	Line voltage level	kV	400
1.2	Name of remote substation		400kV Anpara-B
2	**Main 1**		
2.1	Protection Type		Numerical
2.2	Model & Make		ABB REL-670
3	**Main 2 protection**		YES
3.1	Protection Type		Numerical
3.2	Model & Make		MICOM P-543
4	**LBB Protection**		-
4.1	Protection Type		-
4.2	Model & Make		-
5	**CT data for Main 1**		
5.1	Ratio	A/A	2000/1
5.2	Class		PS
5.3	Vk / VA burden	V / VA	2000
5.4	Rct	Ohms	-
5.5	Imag @ Vk/2 or Vk/4	mA	60
6	**CT data for Main 2**		
6.1	Ratio	A/A	2000/1
6.2	Class		PS
6.3	Vk / VA burden	V / VA	2000
6.4	Rct	Ohms	-
6.5	Imag @ Vk/2 or Vk/4	mA	60
7	**CT data for LBB**		
7.1	Ratio	A/A	3000/1
7.2	Class		PS
7.3	Vk / VA burden	V / VA	2000
7.4	Rct	Ohms	-
7.5	Imag @ Vk/2 or Vk/4	mA	60
8	**PT Ratio**	kV/V	400kV/110V
9	**PROTECTED LINE DATA**		**Anpara D-Anpara B Line**

9.1	Line Length	Km	5.03
SL. No.	**Description**	**Units**	**Value**
9.2	Positive seq. RESISTANCE	Ohms/Km	0.014612
9.3	Positive seq. REACTANCE	Ohms/Km	0.2509
9.4	Zero seq. RESISTANCE	Ohms/Km	0.189595
9.5	Zero seq. REACTANCE	Ohms/Km	0.83347
10	Transformers details (from remote bus)		
10.1	Transformer connected to the remote bus		
10.2	Voltage of the transformer		2*400
10.3	MVA of the transformer		600
10.4	Impedance of the transformer		15%

2.8 Review of 400kV TRANSMISSION LINE PROTECTION SETTINGS:

Name of Transmission Line								
Main I	**ABB REL-670**		Existing Settings	Reviewed Settings	Existing Settings	Reviewed Settings	Existing Settings	Reviewed Settings
Settings	**Existing Settings**	**Reviewed Settings**						
Distance Protection	Zone 1		Zone 2		Zone 3		Zone 4	
Direction	Forward	Forward	Forward	Forward	Forward	Forward	Reverse	Reverse
X1PP/PE (Ω)	1.010	1.010	5.764	5.764	89.63903	89.63903	0.252	0.252
R1PP/PE (Ω)	0.059	0.059	4.575	4.575	7.415998	7.415998	0.015	0.015
X0PE (Ω)	3.354	3.354	3.532155	3.532155	226.7288	226.7288	0.838	0.838
R0PE (Ω)	0.763	0.763	15.52755	15.52755	51.57553	51.57553	0.191	0.191
RFPP (Ω)	3.029	3.029	18.786	18.786	33.786	33.786	0.757	0.757
RFPE (Ω)	4.543	4.543	28.179	28.179	50.679	50.679	1.136	1.136
tPP (ms)	0	0	350	350	1000	1000	1000	1000
tPE (ms)	0	0	350	350	1000	1000	1000	1000
Main II	**MICOM P-543**							
Line Differential	ON	ON						
87-1 Pickup(A)	0.2	0.2						
Slope k1(%)	30	30						
Slope k2(%)	150	150						
time delay (ms)	0	0						

Over Current and Earth Fault								
Over current	ON	ON						
Function	DT	DT						
Pick up (A)	1.5	1.5						
Time delay (S)	1.5	1.5						
Earth Fault								
Function	DT	DT						
Pick up (A)	0.2	0.2						
Time delay (A)	1.5	1.5						
Broken conductor								
Pick up (A)	0.2	0.2						
Time delay(S)	2	2						

2.9 INPUT DATA FOR TRANSFORMER PROTECTION:

S. No.	Description	Units	Value	Value	Value	Value	Value
0	**Substation Name**		765KV bay	765KV bay	765KV bay	400KV bay	400KV bay
1	**Transformer Name**		ICT Bank	GT-6 Bank	GT-7 Bank	ST-1	ST-2
2	**Rating**						
2.1	MVA	KVA	1000	600	600	80	80
2.2	Voltage Ratio	kV/kV	765/400/33	765/21	764/21	400/11.5-11.5	400/11.5-11.5
3	**Impedance**	%	14	15	15	18.5	18.5
4	**Vector Group**		YNynd11	YNd11	YNd11		
5	**OLTC Data**						
5.1	Min Tap (%)	% (-)	5.2	4.96	4.96	10	10
5.2	Max Tap (%)	% (+)	5.6	5.09	5.09	10	10
5.3	No. of Steps		23	17	17		
6	**Differential Protection**		YES	YES	YES	YES	YES
6.1	Differential CT Ratio						
6.2	HV CT Ratio (Main & ICT)	A/A	1000/1	800/1	800/1	600/1	600/1
6.3	LV1 CT Ratio (Main & ICT)	A/A	3000/1	20000/1	20000/1	2500/1	2500/1
6.3	LV2 CT Ratio(Main & ICT)	A/A	800/1	-	-	2500/1	2500/1
6.4	Differential Relay						

6.5	Make		MICOM	MICOM	MICOM	MICOM	MICOM
6.6	Model		P-633,P-643 (TEE-2 P-633)	P-633,P-643 (TEE-2 P-633)	P-633,P-643 (TEE-2 P-633)	P-633,P-643 (TEE-2 P-633)	P-633,P-643 (TEE-2 P-633)
7	**REF Protection**		YES	YES	YES	YES	YES
7.1	REF Protection CTs						
7.2	CT Ratio	A/A	800/1	800/1	800/1	200/1	200/1
7.6	REF Relay						
7.7	Make		MICOM	MICOM	MICOM	MICOM	MICOM
7.8	Model		P-633.P-643	P-633,P-643	P-633,P-643	P-633	P-633
7.9	Rstab Range (Ω)	Ohms	-	-	-	-	-
8	**Over Fluxing Protection**		YES	YES	YES	YES	YES
8.1	Make		MICOM	MICOM	MICOM	MICOM	MICOM
8.2	Model		P-633,P-643	P-633,P-643	P-633,P-643	P-633,P-643	P-633,P-643
8	**HV Back-up Protection**		YES	YES	YES	YES	YES
8.1	HV Back-up Protection Relay		Numerical	Numerical	Numerical	Numerical	Numerical
8.2	Make		MICOM	MICOM	MICOM	MICOM	MICOM
8.3	Model		P-643,P-141	P-643,P-141	P-643,P-141	P-141	P-141
8.4	HV Back-up Protection CTs						
8.5	Ratio	A/A	800/1	800/1	800/1	600/1	600/1
9	**LV Back-up Protection**		YES	NO	NO	YES	YES
9.1	LV Back-up Protection Relay		Numerical	-	-	Numerical	Numerical
9.2	Make		MICOM	-	-	SEL	SEL

9.3	Model		P-141, (TEE1:P-122)	-	-	751A IC	751A IC
9.4	LV Back-up Protection CTs			-	-		
9.5	Ratio	A/A	1600/1	-	-	2500/1	2500/1

2.10 REVIEW OF TRANSFORMER PROTECTION RALAY SETTINGS

Main-I	ICT		GT-6		GT-7		S T-1		S T-2					
Relay make	**MICOM P-633**		**MICOM P-633**		**MICOM P-633**		**MICOM P-633**		**MICOM P-633**					
Differential Protection	Existing settings	Reviewed Settings	Existing settings	Reviewed Settings	Existing settings	Reviewed Settings	Existing settings	Reviewed Settings	Existing settings	Reviewed Settings	Unit		CT ratio	
diff Id	0.15	0.15	0.15	0.15	0.15	0.15	0.2	0.2	0.2	0.2	A	Iref	ICT	HV-1000/1
Diff I>>	8	8	10	10	10	10	10	10	10	10	A	Iref		LV-1600/1
Diff I>>>	12	12	12	12	12	12	12	12	12	12	A	Iref	GT-6	HV-800/1
slope 1	20	20	20	20	20	20	20	20	20	20		%		LV-20000/5
slope 2	80	80	80	80	80	80	80	80	80	80		%	GT-7	HV-800/1
														LV-20000/5
Over Fluxing Protection														
V/f	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	V/Hz		ST-1	HV-600/1
Time delay	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	sec			LV-2500/1
V/f	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	V/Hz		ST-2	HV-600/1
Time delay	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	sec			LV-2500/1
V/f	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15	V/Hz		Neutral CT ratios	
Time delay	120	120	120	120	120	120	120	120	120	120	sec		ICT	800/1
V/f	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	V/Hz		GT-6	600/1
Time delay	70	70	70	70	70	70	70	70	70	70	sec		GT-7	600/1

V/f	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	V/Hz	ST-1	200/1
Time delay	50	50	50	50	50	50	50	50	50	50	sec	ST-2	200/1
V/f	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	V/Hz		
Time delay	30	30	30	30	30	30	30	30	30	30	sec		
V/f	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35	V/Hz		
Time delay	10	10	10	10	10	10	10	10	10	10	sec		
V/f	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	V/Hz		
Time delay	4	4	4	4	4	4	4	4	4	4	sec		
V/f	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	V/Hz		
Time delay	2	2	2	2	2	2	2	2	2	2	sec		
V/f	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	V/Hz		
Time delay	1	1	1	1	1	1	1	1	1	1	sec		
V/f	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55	V/Hz		
Time delay	1	1	1	1	1	1	1	1	1	1	sec		
V/f	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	V/Hz		
Time delay	1	1	1	1	1	1	1	1	1	1	sec		
V/f													
Time delay													
REF Protection HV side													
High Impedance Type													
Pickup	-	-	-	-	-	-	0.2	0.2	0.2	0.2	A		
Stabilizing Resistor	-	-	-	-	-	-	121.60	73.91	121.60	73.91	Ohm		
Low Impedance Type													
Idiff	0.22	0.22	0.15	0.15	0.15	0.15	-	-	-	-	A	Iref	

M1 slope	20	20	100	100	100	100	-	-	-	-	%		
M2 slope	150	150	101	101	101	101	-	-	-	-	%		
MAIN-II	ICT		GT-6		GT-7		S T-1		S T-2				
Relay make	**MICOM P-643**		**MICOM P-643**		**MICOM P-643**		**MICOM P-643**		**MICOM P-643**				
Differential Protection	Existing settings	Reviewed Settings	Existing settings	Reviewed Settings	Existing settings	Reviewed Settings	Existing settings	Reviewed Settings	Existing settings	Reviewed Settings	Unit		CT Ratio
IS1	0.15	0.15	0.15	0.15	0.15	0.15	0.2	0.2	0.2	0.2	A	ref	ICT HV-1000/1
HS1	8	8	10	10	10	10	15	15	15	15	A	Iref	ICT LV-1600/1
HS2	12	12	12	12	12	12	30	30	30	30	A	Iref	GT-6 HV-800/1
slope 1	20	20	20	20	20	20	30	30	30	30	%		GT-6 LV-20000/5
slope 2	80	80	80	80	80	80	70	70	70	70	%		
Over Fluxing Protection													
V/f	2.530	2.530	2.530	2.530	2.530	2.530	2.530	2.530	2.530	2.530	V/Hz		GT-7 HV-800/1
Time delay	120	120	120	120	120	120	120	120	120	120	V/Hz		GT-7 LV-20000/5
V/f	2.640	2.640	3.080	3.080	3.080	3.080	2.530	2.530	2.530	2.530	V/Hz		ST-1 HV-600/1
Time delay	70	70	4	4	4	4	60	60	60	60	V/Hz		ST-1 LV-2500/1
V/f	2.860	2.860	-	-	-	-	3.080	3.080	3.080	3.080	V/Hz		ST-2 HV-600/1
Time delay	30	30	-	-	-	-	4	4	4	4	V/Hz		ST-2 LV-2500/1
V/f	3.080	3.080	-	-	-	-	-	-	-	-	V/Hz		
Time delay	4	4	-	-	-	-	-	-	-	-	V/Hz		
V/f	3.300	3.300	-	-	-	-	-	-	-	-	V/Hz		

Time delay	1	1	-	-	-	-	-	-	-	-	V/Hz		
REF Protection												Neutral CT ratios	
Pickup (mA)	0.2	0.2	0.2	0.2	0.2	0.2							
K1(%)	105	105	105	105	105	105	-	-	-	-	A	GT-6	600/1
K2(%)	105	105	105	105	105	105	-	-	-	-	ohm	GT-7	600/1
Over current and Earth fault protection													
HV side													
Over current													
function	-	-	IEC S Inverse	IEC S Inverse	-	-	-	-	-	-			
Pick up (A)	-	-	1	1	-	-	-	-	-	-			
Time delay(s)	-	-	1	1	-	-	-	-	-	-			
Earth Fault Protection													
function	-	-	IEC S Inverse	IEC S Inverse	-	-	-	-	-	-			
Pickup(mA)	-	-	0.2	0.2	-	-	-	-	-	-			
Time delay(S)	-	-	1	1	-	-	-	-	-	-			
LV side													
Over current													
function	-	-	IEC S Inverse	IEC S Inverse	-	-	-	-	-	-			
Pick up (A)	-	-	5	5	-	-	-	-	-	-			
Time delay(s)	-	-	1	1	-	-	-	-	-	-			
Earth Fault Protection													

function	-	-	IEC S Inverse	IEC S Inverse	-	-	-	-	-	-			
Pickup(A)	-	-	1	1	-	-	-	-	-	-			
Time delay(S)	-	-	1.5	1.5	-	-	-	-	-	-			
Back up	ICT		GT-6		GT-7		S T-1		S T-2				
Relay make	MICOM-P-141		MICOM-P-141		MICOM-P-141		MICOM-P-141		MICOM-P-141				
HV side Over current and Earth fault protection													
Over Current	Existing settings	Reviewed Settings	Existing settings	Reviewed Settings	Existing settings	Reviewed Settings	Existing settings	Reviewed Settings	Existing settings	Reviewed Settings			
Function	IEC S Inverse	IEC S Inverse	IEC S Inverse	IEC S Inverse	IEC S Inverse	IEC S Inverse	IEC S Inverse	IEC S Inverse	IEC S Inverse	IEC S Inverse			
Pick up (A)	0.37	0.37	0.66	0.66	0.66	0.66	0.26	0.26	0.26	0.26			
Time Delay (Sec)	0.5	0.5	0.55	0.55	0.55	0.55	0.25	0.25	0.25	0.25			
Earth Fault	Existing settings	Reviewed Settings	Existing settings	Reviewed Settings	Existing settings	Reviewed Settings	Existing settings	Reviewed Settings	Existing settings	Reviewed Settings			
Function	IEC S Inverse	IEC S Inverse	IEC S Inverse	IEC S Inverse	IEC S Inverse	IEC S Inverse	IEC S Inverse	IEC S Inverse	-	-			
Pick up (A)	0.8	0.8	0.12	0.12	0.12	0.12	0.8	0.8	0.8	0.8			
Time Delay (Sec)	0.1	0.1	0.55	0.55	0.55	0.55	0.78	0.78	0.78	0.78			
LV side Over current and Earth fault protection													
Over Current	Existing settings	Reviewed Settings	Existing settings	Reviewed Settings	Existing settings	Reviewed Settings	Existing settings	Reviewed Settings	Existing settings	Reviewed Settings			
Function	IEC S Inverse	IEC S Inverse	-	-	-	-	IEC S Inverse	IEC S Inverse	IEC S Inverse	IEC S Inverse			
Pick up (A)	1.040	1.040	-	-	-	-	0.3	0.3	0.3	0.3			

Time Delay (Sec)	0.49	0.49	-	-	-	-	0.05	0.05	0.05	0.05			
Earth Fault	Existing settings	Reviewed Settings	Existing settings	Reviewed Settings	Existing settings	Reviewed Settings	Existing settings	Reviewed Settings	Existing settings	Reviewed Settings			
Pick up (A)	-	-	-	-	-	-	-	-	-	-			
Time Delay (Sec)	-	-	-	-	-	-	-	-	-	-			

TEE2	765 Anpara –C line+GT-6+765kV Bus-1		Bus Reactor+765 Obra-C line+765kV Bus- 2		765kV Bus -2+GT-7+TEE-F		GT-7+ICT765kV HV+765kV Bus-2		ICT-400kV -LV+ST-2+400KVBUS-1				
Relay make	**MICOM P-633**		**MICOM P-633**		**MICOM P-633**		**MICOM P-633**		**MICOM P-633**				
Differential Protection	Existing settings	Reviewed Settings	Existing settings	Reviewed Settings	Existing settings	Reviewed Settings	Existing settings	Reviewed Settings	Existing settings	Reviewed Settings	UNIT		CT Ratio
IS1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	A	Iref	ICT 3000/1
HS1	8	8	10	10	10	10	10	10	10	10	A	Iref	GT-6 3000/1
HS2	12	12	32	32	12	12	12	12	12	12	A	Iref	GT-7 3000/1
slope 1	20	20	30	30	20	20	20	20	20	20	%		ST-1 3000/1
slope 2	80	80	80	80	80	80	80	80	80	80	%		ST-2 3000/1

TEE2	400kV LINE-1+ST-2+400KVBUS-2		705 Bay+765 Obra-C line+765Bus 1		400KV Bus 1+ST-2+400kV LINE-1		400kV Line-2+400kV BUS-1+ST-1		400kV BUS-2+TEE-J+ST-2				
Relay make	**MICOM P-633**		**MICOM P-633**		**MICOM P-633**		**MICOM P-633**		**MICOM P-633**				
Differential Protection	Existing settings	Reviewed Settings	Existing settings	Reviewed Settings	Existing settings	Reviewed Settings	Existing settings	Reviewed Settings	Existing settings	Reviewed Settings	UNIT		
IS1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	A	ref	
HS1	8	8	10	10	10	10	10	10	10	10	A	Iref	
HS2	12	12	32	32	12	12	12	12	12	12	A	Iref	
slope 1	20	20	30	30	20	20	20	20	20	20	%		
slope 2	80	80	80	80	80	80	80	80	80	80	%		

TEE1	765 Anpara –C line+GT-6+765kV Bus-1		Bus Reactor+765 Obra-C line+765kV Bus- 2		765kV Bus -2+GT-7+TEE-F		GT-7+ICT765kV HV+765kV Bus-2		ICT-400kV -LV+ST-2+400KVBUS-1				
Relay make	**MICOM P-122**		**MICOM P-122**		**MICOM P-122**		**MICOM P-122**		**MICOM P-122**				
Over Current Protection	Existing settings	Reviewed Settings	Existing settings	Reviewed Settings	Existing settings	Reviewed Settings	Existing settings	Reviewed Settings	Existing settings	Reviewed Settings	UNIT		
Pick up	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	A	ref	

Time Delay	0	0	0	0	0	0	0	0	0	0	sec		
TEE1	400kV LINE-1+ST-2+400KVBUS-2		705 Bay+765 Obra-C line+765Bus 1		400KV Bus 1+ST-2+400kV LINE-1		400kV Line-2+400kV BUS-1+ST-1		400kV BUS-2+TEE-J+ST-2				
Relay make	**MICOM P-122**		**MICOM P-122**		**MICOM P-122**		**MICOM P-122**		**MICOM P-122**				
Over Current Protection	Existing settings	Reviewed Settings	Existing settings	Reviewed Settings	Existing settings	Reviewed Settings	Existing settings	Reviewed Settings	Existing settings	Reviewed Settings	UNIT		
IS1	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	A	Iref	
HS1	0	0	0	0	0	0	0	0	0	0	A	Iref	

2.11 REVIEW NOTES ON TRANSFORMER PROTECTION:

765/400KV Switchyard of DTPS was audited and it was observed that Transformer main -I, main-II, and Back up protection settings are in order.

2.12 INPUT DATA FOR BUS REACTOR PROTECTION:

Sl. No	Description	Unit	Value
	Substation Name		
1	**Name**		Bus Reactor
2	**Rating**		
2.1	MVA	MVAR	189
2.2	Voltage Level	kV	765
3	**Impedance**	%	3092.70
4	**Differential Protection**		YES
4.1	Differential CT Ratio		
4.2	HV CT Ratio (Main & ICT)	A/A	600/1
4.3	LV CT Ratio (Main & ICT)	A/A	500/1
4.4	Differential Relay		Numerical
4.5	Make		MICOM
4.6	Model		P-632
5	**REF Protection**		NO
5.1	REF Protection neutral side		-
5.2	CT Ratio	A/A	-
5.3	REF Relay		-
5.4	Make		-
5.5	Model		-
5.6	Rstab Range (Ω)	Ohms	-
6	**Back-up Protection**		YES
6.1	Back-up Protection Relay		Numerical
6.2	Make		MICOM
6.3	Model		P-141
6.4	Back-up Protection CTs Ratio	A/A	600/1

2.13 REVIEW OF BUS REACTOR PROTECTION:

Sl No.	Description			BUS REACTOR	
				Adopted Settings	Recommended Settings
1	**Make**			ALSTOM	
2	**Capacity(MVAR)**			189	
3	**Voltage Level (KV)**			765	
4	**% Impedance**			3092.70	
5	**MAIN**			**MAIN-I**	**MAIN-I**
6	**Differential**	**Relay Model &make**		MICOM P-632	
		Adopted CT Ratio	**HV**	600/1	600/1
			LV	600/1	600/1
		Biased	**M1 (%)**	20	20
			M2 (%)	80	80
			Is/Id min	0.10	0.10
	MAIN			**MAIN-II**	**MAIN-II**
7	**Over current**	**Relay Model &make**		MICOM P-141	MICOM P-141
		Pick up (A)		0.10	0.1
		Time delay(Sec)		0	0
8	**Back Up Over Current**	**Relay Model &make**			
		CT Ratio	**HV**	600/1	600/1
			LV	600/1	600/1
		Settings			
		Over current	**Pick up (A)**	0.28	0.28
			Time delay(Sec)	0.5	0.5
		Earth fault	**Pick up (A)**	0.13	0.13
			Time delay(Sec)	1	1
9	**REF**	**Relay Model &make**		-	
		CT RATIO	**HV**	-	-
			LV	-	-
			NEUTRAL	-	-
		Setting	**Pick up (A)**	-	-
			Time delay (Sec)	-	-
			R Stab(ohm) Rct=5Ω(assumed)	-	-

Remark:- Bus Reactor settings were reviewed and was found in order.

2.14 REVIEW OF BUS BAR PROTECTION:

Sl. No.	BAY	PROTECTION	Main-I		Main-II	
			Existing settings	Recommended Settings	Existing settings	Recommended Settings
1	765 kV BUS-1	Dead Zone	Pick up I=2490 A Time delay=0.05	Pick up I=2490 A Time delay=0.05 sec	Pick up I> 83% Time delay=0.5 sec	Pick up I> 83% Time delay=0.5 sec
		Over Current	Pick up I=3480 A Time delay=0.05	Pick up I=3480A Time delay=0.05 sec	Pick up I=3480 A Time delay=0.05 sec	Pick up I=3480 A Time delay=0.05 sec
		Differential	-	-	I pick up = 2500 A K1=30% K2=60% T diff=0 sec	I pick up = 2500 A K1=30% K2=60% T diff=0 sec
2	765 kV BUS-2	Dead Zone	Pick up I=2490 A Time delay=0.05	Pick up I=2490 A Time delay=0.05 sec	Pick up I> 83% Time delay=0.5 sec	Pick up I> 83% Time delay=0.5 sec
		Over Current	Pick up I=3480 A Time delay=0.05 sec	Pick up I=3480A Time delay=0.05 sec	Pick up I=3480 A Time delay=0.05 sec	Pick up I=3480 A Time delay=0.05 sec
		Differential	-	-	I pick up = 2500 A K1=30% K2=60% T diff=0 sec	I pick up = 2500 A K1=30% K2=60% T diff=0 sec
3	400 kV BUS-1	Dead Zone	Pick up I=2010 A Time delay=1 sec	Pick up I=2010 A Time delay=1 sec	-	-
		Over Current	Pick up I=3480 A Time delay=0.35 sec	Pick up I=3480A Time delay=0.35 sec	Pick up I=3480 A Time delay=0.35 sec	Pick up I=3480 A Time delay=0.35 sec
		Differential	-	-	I pick up = 2000 A K1=0% K2=60% T diff=0 sec	I pick up = 2000 A K1=0% K2=60% T diff=0 sec

4	400 kV BUS-2	Dead Zone	Pick up I=2010 A Time delay=1 sec	Pick up I=2010 A Time delay=1 sec	-	-
		Over Current	Pick up I=3480 A Time delay=0.35 sec	Pick up I=3480A Time delay=0.35 sec	Pick up I=3480 A Time delay=0.35 sec	Pick up I=3480 A Time delay=0.35 sec
		Differential	-	-	I pick up = 2000 A K1=0% K2=60% T diff=0 sec	I pick up = 2000 A K1=0% K2=60% T diff=0 sec

2.15 Review of Auxiliary Protection Infrastructure:-

In this section, the details of the batteries and chargers are described. There are two sets of battery banks of 110 V for one CRB in switchyard. In total eight banks for four CRB's. The DC system in DTPS is adequate for the station and it is satisfactory.

Details of DC system data are given below:-

Table-1 Review of 110 V battery bank for CRB-1

DC BATTER SYSTEM OF 765 kV SWITCH YARD 110 V (2 Battery Banks) IN CRB-1		
Bank	Bank-1	Bank-2
Make	HBL	HBL
Type	Nickel–cadmium battery	Nickel–cadmium battery
Year of Commissioning	2013	2013
No Of Cells	87*1.38V	87*1.39V
Capacity	400Ah	400Ah
Charger Details	CHARGER DETAILS	CHARGER DETAILS
Make	HBL	HBL
Style	FLOATCUM BOOST CHARGER	FLOATCUM BOOST CHARGER
DC Checking		
Positive-Negative	116 V	114 V
Positive-Earth	58 V	58 V
Negative-Earth	56 V	56 V

Table-2 Review of 110 V battery bank for CRB-2

DC BATTER SYSTEM OF 765 kV SWITCH YARD 110 V (2 Battery Banks) IN CRB-2		
Bank	Bank-1	Bank-2
Make	HBL	HBL
Type	Nickel–cadmium battery	Nickel–cadmium battery
No Of Cells	87*1.44V	87*1.43V
Year of Commissioning	2013	2013
Capacity	400Ah	400Ah
Charger Details	CHARGER DETAILS	CHARGER DETAILS
Make	HBL	HBL
Style	FLOATCUM BOOST CHARGER	FLOATCUM BOOST CHARGER
DC Checking		
Positive-Negative	118 V	114 V
Positive-Earth	60 V	58 V
Negative-Earth	58 V	58 V

Table-3 Review of 110 V battery bank for CRB-3

DC BATTER SYSTEM OF 765 kV SWITCH YARD 110 V (2 Battery Banks) IN CRB-3		
Bank	Bank-1	Bank-2
Make	HBL	HBL
Type	Nickel–cadmium battery	Nickel–cadmium battery
No Of Cells	87*1.42V	87*1.41V
Year of Commissioning	2013	2013
Capacity	400Ah	400Ah
Charger Details	CHARGER DETAILS	CHARGER DETAILS
Make	HBL	HBL
Style	FLOATCUM BOOST CHARGER	FLOATCUM BOOST CHARGER
DC Checking		
Positive-Negative	116 V	114 V
Positive-Earth	58V	60 V
Negative-Earth	56 V	58 V

Table-4 Review of 110 V battery bank for CRB-4

DC BATTER SYSTEM OF 765 kV SWITCH YARD 110 V (2 Battery Banks) IN CRB-4		
Bank	Bank-1	Bank-2
Make	HBL	HBL
Type	Nickel–cadmium battery	Nickel–cadmium battery
No Of Cells	87*1.41V	87*1.41V
Year of Commissioning	2013	2013
Capacity	400Ah	400Ah
Charger Details	CHARGER DETAILS	CHARGER DETAILS
Make	HBL	HBL
Style	FLOATCUM BOOST CHARGER	FLOATCUM BOOST CHARGER
DC Checking		
Positive-Negative	125 V	116 V
Positive-Earth	62 V	58 V
Negative-Earth	62 V	58 V

3. Review of 765KV and 400KV Circuit Breaker, Current Transformers and Relays' Test Reports.

3.0 765KV and 400KV Circuit Breaker

All 765KV and 400KV Circuit Breaker test reports were reviewed and were found in order. Closing time is less than 110ms and opening time of 20 ms and are in order. The Overall performance of all the circuit breaker is satisfactory as per testing reports and site performance.

3.1 Current Transformers (CT)

All the Current Transformer's Tan Delta test reports and loop resistance values were checked and were found in order.

3.2 765KV and 400KV Relay Test Reports

All the 765KV and 400KV Relay Test Reports were checked and found in coherence with reviewed relay settings.

4. Audit finding and observation

4.0 Audit finding and observations:

4.1 Audit finding and observations:

1. 765 kV Lines are protected as main differential and distance protection. 400 kV lines are also protected as main differential and distance protection.
2. All GT Banks, ICT Bank and station transformers are well protected.
3. Bus Reactor is well protected with REF protection. Line Reactor was shifted to Obra-C and hence its protections had been removed.
4. The substation Power equipment Earthing is measured a few sample locations. It is found that Earthing of power equipment with substation ground mat is proper and its value is 0.5 ohm.
5. The DC bank supply is measured and it is observed that they are well maintained.
6. The periodic test reports of Circuit breakers are reviewed and it is found that their performance is satisfactory in terms of breaker opening, closing times. Also test reports for Current Transformers and relays have been reviewed and were found in order.

Table-19 Review of 765 kV Anpara D-Lanco line , 765KV Anpara D-Unnao line & 400 kV Anpara D-Anpara B line I&II.

Name of Transmission Line								
Main I	ABB REL-670							
Setting	Existing Settings	Reviewed Settings	Existing Settings	Reviewed Settings	Existing Settings	Reviewed Settings	Existing Settings	Reviewed Settings
Distance Protection	Zone 1		Zone 2		Zone 3		Zone 4	
Direction	Forward	Forward	Forward	Forward	Forward	Forward	Reverse	Reverse
XIPP/PE (Q)	0.60	0.60	59.094	59.094	117.438	117.438	0.150	0.150
R IPP/PE (Q)	0.024	0.020	2.3613	2.3613	4.693	4.693	0.006	0.006
XOPE (Q)	1.971	1.97	194.039	194.039	385.615	385.615	0.493	0.493
ROPE (Q)	0.5	0.5	49.690	49.690	98.750	98.750	0.126	0.126

RFPP (Q)	1.801	1.801	60	60	75.000	75.000	0.450	0.450
RFPE (Q)	2.701	2.701	60	60	100.000	100.000	0.675	0.675

Name of Transmission Line			Anpara D -Obra-C line					
Main I	ABB REL-670							
Setting	Existing Setting	Reviewed Settings	Existing Settings	Reviewed Settings	Existing Settings	Reviewed Settings	Existing Settings	Reviewed Settings
Distance Protection	Zone I		Zone 2		Zone 3		Zone 4	
Direction	Forward	Forward	Forward	Forward	Forward	Forward	Reverse	Reverse
XIPP/PE (Q)	97.264	97.264	179.924	179.924	238.268	238.268	24.316	24.316
R IPP/PE (Q)	3.886	3.886	7.189	7.189	9.521	9.521	0.972	0.972
XOPE (Q)	319.373	319.373	590.791	590.791	782.368	782.368	79.843	79.843
ROPE (Q)	81.787	81.787	151.292	151.292	200.352	200.352	20.447	20.447
RFPP (Q)	30	30	60.000	60.000	75.000	75.000	72.948	72.948
RFPE (Q)	40	40	60.000	60.000	100.000	100.000	100.000	100.000
Setting	Existing Settings	Reviewed Settings	Existing Settings	Reviewed Settings	Reviewed Settings	Existing Settings	Reviewed Settings	Reviewed Settings
Distance Protection	Zone I		Zone 2		Zone 3		Zone 4	
Direction	Forward	Forward	Forward	Forward	Forward	Forward	Reverse	Reverse
Resistive reach- phase (Q)	17.24	17.24	21.59	21.59	26.99	26.99	26.99	26.99
Resistive reach- ground (Q)	23.30	23.30	28.79	28.79	35.98	35.98	35.98	35.98
Impedance - phase resistive (Q)	27.99	27.99	43.388	43.388	75.57	75.57	5.598	5.598

400 kV Anpara D-Anpara B Line I&II								
XIPP/PE (Q)	1.010	1.010	5.764	5.764	89.63903	89.63903	0.252	0.252
R IPP/PE (Q)	0.059	0.059	4.575	4.575	7.415998	7.415998	0.015	0.015
XOPE (Q)	3.354	3.354	3.532155	3.532155	226.7288	226.7288	0.838	0.838
ROPE (Q)	0.763	0.763	15.52755	15.52755	51.57553	51.57553	0.191	0.191
RFPP (Q)	3.029	3.029	18.786	18.786	33.786	33.786	0.757	0.757
RFPE (Q)	4.543	4.543	28.179	28.179	50.679	50.679	1.136	1.136

765/400KV Switchyard of DTPS was audited and it is observed that Transmission Lines protection settings are in order.

Pragati Power Corporation Limited
Report of Internal Protection Audit

A: General Information

I) Name of Utility	Pragati Power Station -I	IV) Type of Bus-Switching Scheme	Double Main Bus Scheme
II) Voltage Level of Sub-Station	220 KV	V) Name & Organisation of Audit Team	**Sh. Yogender Aggarwal**, Manager (T), Electrical, PPS-I , **Sh. Manoj Goyal**, Dy. Manager (T) Protection
III) Date of Commissioning	N/A	VI) Name of Representative from Utility whose Audit is being carried out	**Sudhir Kumar** Dy. G.M.(T) Protection, PPS-I

Date ;- 25.10.2024

B: Check List for Protection Audit

S. No.	Check	Availability	Functional/Non Functunal / Enable/Disable	Type of Relay* (Numerical/Static / Electromechanical)	Setting as found in the field	Remarks
1	**D C System of GT#1**					
	Nos. of independent DC source	02 Nos. 125V DC	Functional			
	Potential between +ve & earth (Source-I).....V	1F-D; 125V DCDB			62.1	
	Potential between -ve & earth (Source-I).....V	1F-D; 125V DCDB			66.5	
	Potential between +ve & earth (Source-II).....V	1F-E; 125V DCDB			57.8	
	Potential between -ve & earth (Source-II).....V	1F-E; 125V DCDB			66.7	
2	**D C System of GT#2**					
	Nos. of independent DC source	02 Nos. 125V DC	Functional			
	Potential between +ve & earth (Source-I).....V	1F-F; 125V DCDB UNIT#1			62.9	
	Potential between -ve & earth (Source-I).....V	1F-F; 125V DCDB UNIT#1			66.8	

Er. SUDHIR KUMAR
Dy. General Manager (T) Protection
Pragati Power Station-I
IPGCL-PPCL, New Delhi

25/10/24
DM(T)

25/10/2024
Mgr(T) Electrical
PPS-I

	Potential between +ve & earth (Source-II).....V	2F-C; 125V DCDB UNIT#2			62.5	
	Potential between -ve & earth (Source-II).....V	2F-C; 125V DCDB UNIT#2			66.6	
3	**D C System of STG**					
	Nos. of independent DC source	02 Nos. 125V DC	Functional			
	Potential between +ve & earth (Source-I).....V	3F-E; 125V DCDB UNIT#1			61.6	
	Potential between -ve & earth (Source-I).....V	3F-E; 125V DCDB UNIT#1			66.1	
	Potential between +ve & earth (Source-II).....V	3F-D; 125V DCDB UNIT#1			61.8	
	Potential between -ve & earth (Source-II).....V	3F-D; 125V DCDB UNIT#1			66.2	
4	**Event logger panel**	Yes			In built in Numerical Protection Relay	
5	**Event Logger Time Synchronised**	Yes				
I	Disturbance Recorder	Yes	Functional		In built in Numerical Protection Relay	
ii	DR Time Synchronised	Yes				
6	**Transformer Protection Panel GTGT #1 (114 MVA)**					
	Tripping by Buchholz Relay (Alar	Yes	Functional		Alarm as well as Trip	
	Differential Protection	Yes	Functional	Numerical / ALSTOM/MICOM P643	Is1 = 0.1, SLOPE 1-0.2I/In, Is2 = 1.5,SLOPE 2-0.8 I/In	
	2nd Harmonic Block (Setting)	Yes	Functional	Numerical/ ALSTOM/ MICOM P643	2nd - 20%, 5th - 20%	
	Event Logger Operation	Yes	Functional		In built in Numerical Protection Relay	
	REF Protection	Yes		Numerical/ ALSTOM/MICOM P643	200mA, time - 0 Sec.	
	Event Logger Operation	Yes	Functional		In built in Numerical Protection Relay	

Er. SUDHIR KUMAR
Dy. General Manager (T) Protection
Pragati Power Station-I
IPGCL-PPCL, New Delhi

	Back up Over Current	No*				
	Event Logger Operation	Yes	Functional			
	Earth Fault Protection	Yes	Functional	Numerical/ ALSTOM/MICOM P643	100mA, time - 2 Sec	
	Event Logger Operation	Yes	Functional			
	Over Flux Protection	Yes	Functional	Numerical/ ALSTOM/ MICOM P643	In built in Numerical Protection Relay V/Hz >1 alarm - 2.310 V/Hz.,time-5 sec (A) V/Hz >1 Trip- 2.420 V/Hz ,time-250 msec V/Hz >2 - 2.660 V/Hz , time-0 sec	
	Event Logger Operation	Yes	Functional			
	Local Breaker Back up (GCB)	Yes	Functional	Numerical/ ALSTOM/ MICOM P141	In built in Numerical. Protection Relay I< = 250mA , 200 mSec.	
7	**Transformer Protection Panel GTGT #2 (114 MVA)**					
	Tripping by Buchholz Relay (Alar	Yes	Functional		Alarm as well as Trip	
	Differential Protection	Yes	Functional	Numerical/ ALSTOM/ MICOM P643	Is1 = 0.1, SLOPE 1-0.2I/In, Is2 = 1.5,SLOPE 2-0.8 I/In	
	2nd Harmonic Block (Setting)	Yes	Functional		2nd - 20%, 5th - 20%	
	Event Logger Operation	Yes	Functional		In built in Numerical Protection Relay	
	REF Protection	Yes		Numerical/ ALSTOM/MICOM P643	200mA, time - 0 Sec.	
	Event Logger Operation	Yes	Functional			
	Back up Over Current	No*			In built in Numerical Protection Relay	
	Event Logger Operation	Yes	Functional			
	Earth Fault Protection	Yes	Functional	Numerical/ ALSTOM/MICOM P643	100mA, time - 2 Sec	
	Event Logger Operation	Yes	Functional		In built in Numerical Protection Relay	
	Over Flux Protection	Yes	Functional	Numerical/ ALSTOM/ MICOM P643	V/Hz >1 alarm - 2.310 V/Hz.,time-5 sec (A) V/Hz >1 Trip- 2.420 V/Hz ,time-250 msec V/Hz >2 - 2.660 V/Hz , time-0 sec	
	Event Logger Operation	Yes	Functional		In built in Numerical Protection Relay	

23/10/24
Er. SUDHIR KUMAR
Dy. General Manager (T) Protection
Pragati Power Station-I
IPGCL-PPCL, New Delhi
(A Govt. of NCT of Delhi Undertaking)

23/10/2024
Manager (T)-Electrical
PPS-I

25/10/24
DGM (T)

	Local Breaker Back up (GCB)	Yes	Functional	Numerical/ ALSTOM/ MICOM P141	I< = 250mA , 200 mSec.	
8	**Transformer Protection Panel STGT (146 MVA)**					
	Tripping by Buchholz Relay (Alar	Yes	Functional		Alarm as well as Trip	
	Differential Protection	Yes	Functional	Numerical/ GE/MICOMP643	Is1 = 0.1, SLOPE 1 - 0.2I/In, Is2 = 1.5,SLOPE 2-0.8 I/In	
	2nd Harmonic Block (Setting)	Yes	Functional	Numerical/ GE/MICOMP643	2nd - 20%, 5th - 20%	
	Event Logger Operation	Yes	Functional		In built in Numerical Protection Relay	
	REF Protection	Yes		Numerical/ GE/MICOM P642	100mA, time - 0 Sec.	
	Event Logger Operation	Yes	Functional		In built in Numerical Protection Relay	
	Back up Over Current	No*				
	Event Logger Operation	Yes	Functional			
	Earth Fault Protection	Yes	Functional	Numerical/ GE//MICOMP643	100mA, time - 2 Sec	
	Event Logger Operation	Yes	Functional		In built in Numerical Protection Relay	
	Over Flux Protection	Yes	Functional	Numerical/ GE/MICOMP643	V/Hz >1 alarm - 2.310 V/Hz ,time-5 sec (A) V/Hz >1 Trip- 2.420 V/Hz ,time-400 msec V/Hz >2 - 2.660 V/Hz ,time-0 sec	
	Event Logger Operation	Yes	Functional		In built in Numerical Protection Relay	
	Local Breaker Back up (GCB)	Yes	Functional	Numerical/ GE/MICOM P141	I< = 250mA , 200 mSec.	

23/10/24

Er. SUDHIR KUMAR
Dy. General Manager (T) Protection
Pragati Power Station-I
IPGCL-PPCL, New Delhi
(Govt. of NCT of Delhi Undertaking)

23/10/2024
Mgr(T)-Electrical
PPS-I

25/10/24
DGM(T)

INDRAPRASTHA POWER GENERATION CO. LTD.

&

PRAGATI POWER CORPORATION LIMITED

(A Govt. of NCT of Delhi Undertaking)

Website - http://www.ipgcl-ppcl.gov.in/

Pragati Power Station – I,

IP Estate, Ring Road, New Delhi - 110002

Observations on the internal Protection Audit Conducted in the Month of October'2024

1) DC Supply System of all three GRPs found healthy and balanced.
2) The GPS clock was found to be healthy and functional.
3) All relays were synchronized to the GPS clock.
4) Most of the settings of Generator Transformers found matching as per the recommendations of the OEM i.e. M/s BHEL.
5) Few settings which are not found as per recommendation / norms are as under:
   a) IInd harmonic block setting found 20%.
   b) REF protection current setting of GTGT#1 & GTGT#2 found 200mAmps. / 20%.
   c) The REF protection current setting of STGT found 100mAmps. / 10%.
   d) Earth fault Protection setting found 100mAmps. with time delay 2 Sec. (Definite time curve).
   e) Over Fluxing Protection setting found as below:
      V/Hz >1, Alarm – 2.310 V/Hz (1.05), time- 5 Sec.
      V/Hz >1, Trip – 2.420 V/Hz (1.10), time- 250mSec.
      V/Hz >2, Trip – 2.660 V/Hz (1.2), time- 0 Sec.

12/11/24

Sudhir Kumar
Dy. General Manager (T)
Protection, PPS-I

CONSULTANCY REPORT

PROTECTION AUDIT OF 765kV & 220kV SWITCHYARD LALITPUR

VOLUME - II

(LINES, ICT'S , ST'S, BUSBAR & REACTORS)

Client's Reference: Service Order No 8900000052

CPRI Report No : 2/9/PSD/RT105/2024

CLIENT:

M/s. Lalitpur Power Generation Company Limited
Mirchwara Burogaon, Tehsil Mehrauni,
Lalitpur -284 123 Uttar Pradesh

CONSULTANT:

POWER SYSTEMS DIVISION
CENTRAL POWER RESEARCH INSTITUTE
P.B. NO. 8066, SADASHIVANAGAR P.O
BANGALORE – 560 080
website: http://www.cpri.res.in

JUNE 2024

POWER SYSTEMS DIVISION
CENTRAL POWER RESEARCH INSTITUTE
Sir. C.V. RAMAN ROAD P.B.No.8066, BANGALORE 560080
Website: https://cpri.res.in

Ref.File No.: 2/9/PSD/CPRI/LPGCL/2023-24 Dated. 21-06-2024

Title	**Third Party Protection audit at 765kV & 220kV Switchyard Lalitpur**
Project Objectives	Review of Protection Scheme, Relay Settings of various element & associated system of 765kv & 220kv Switchyard Lalitpur
Name and Address of the Customer	M/s, Lalitpur Power Generation Company Limited Village Mirchwara Burogaon, Tehsil Mehrauni, Lalitpur -284 123 ,Uttar Pradesh.
Client's Reference and Date	Service Order No 8900000052, Dated 08-02-2024
CPRI report No:	2/9/PSD/RT105/2024
Name(s) of investigator(s) from CPRI	1. Mr. Ramesh Patil, Engineering Officer 2. Mr. Suraj D Naik, Project Engineer 3. Mr. Manoj Kumar S, Project Engineer
Name of Lalitpur Power Generation Company Limited officers, associated in providing support to CPRI	1. Mr. R.N Bedi, Head Maintenance (President) 2. Mr. Vikas Kumar Sharma,Electrical (HOD) 3. Mr. Abhimanyu Upadhyay,Electrical (GM) 4. Mr. Mukesh Pokharna, Electrical BTG (GM) 5. Mr.Manivannan V, Electrical (Senior Manager)
Report contains	Number of pages : 65 Annexure-1 : 985
Report prepared by: Mr.Ramesh Patil Engineering Officer Power Systems Division, CPRI Signature:	Report Approved by: Dr. J. Sreedevi Additional Director & HoD Power Systems Division, CPRI Signature:

ACKNOWLEDGEMENT

CPRI wishes to thank Lalitpur Power Generation Company Limited, for awarding the contract of Third Party Protection audit of 765kv & 220kv Switchyard Lalitpur PO No. Service Order No 8900000052, Dated 08-02-2024 to CPRI. CPRI wishes to thank all the Officers/Engineers of Lalitpur Power Generation Company Limited 765kv & 220kv Switchyard Lalitpur who were associated in this work for their co-operation in providing the required data and for their interaction during the visit to the substation. CPRI Team specially thank the following personnel for their excellent co-operation without which this work would not have been possible,

1. Mr. R.N Bedi, Head Maintenance (President)
2. Mr. Vikas Kumar Sharma,Electrical (HOD)
3. Mr. Abhimanyu Upadhyay,Electrical (G.M)
4. Mr. Mukesh Pokharna, Electrical BTG (GM)
5. Mr.Manivannan V, Electrical (Senior Manager)

Minutes of Meeting

MOM Between	Date
CPRI, Bangalore & M/s LPGCL ,Lalitpur	04-04-2024

1. **Participants**:

Organization	Name of the Officials
CPRI, Bangalore	Shri Ramesh Patil, Engineering Officer
M/s. LPGCL BAJAJ ENERGY	Shri R.N Bedi , Head Maintenance (President) Shri Vikas Kumar Sharma, Electrical (HOD) Shri Abhimanyu Upadhyay , Electrical (G.M) Shri Mukesh Pokharna , Electrical BTG (GM) Shri Manivannan V, Electrical (Senior Manager)

2. **Meeting Details**:

Subject:	Visit for Protection Audit of M/s. LPGCL ,Lalitpur
Reference:	PO. No. 8900000052 Dated: 08/02/2024

3. **Notes of Meeting**:

- CPRI officials visited LPGCL substation on 26/03/2024 and briefed about the Electrical Protection System audit of the M/s Lalitpur Power Generation Co. Ltd.
- During the Electrical Protection System audit work, the existing setting of Numerical protection IEDs of all lines (765 kV & 220 kV) & all Generating Units (all & Generator, GT , UT & ST) , were downloaded and taken for setting for further calculations.
- CPRI observed that SANDS make time synchronization unit is available for 765kV & 220 kV Lines, and MASIBUS make time synchronization unit is available for Generating Units and found in order.
- CPRI Officers went around GT, ST, UT, DG & Battery Bank to check the maintenance of the Generating Units and measured the DC voltage at Battery Bank as mentioned below.

Generating Unit		Positive to Negative	Positive to Earth	Negative to Earth
DC Bank 1	1A	245 V	115.6 V	129.6V
	1B	245.7V	115.6V	129.6V
DC Bank 2	2A	244V	114.5V	129.9V
	2B	244.2	114.6V	129.3V

- CPRI Officers went around 765kV and 220kV Switchyard to check the maintenance of the substation and measured the DC voltage at Battery Bank are given below and found in order.

Switchyard		Positive to Negative	Positive to Earth	Negative to Earth
220 V	Bank 1	221.8 V	115.8 V	105.4
220 V	Bank 2	240.8 V	115.8 V	124.9
48 V	Bank 1	51.37	0	51.26
48 V	Bank 2	51.95	0	51.20

- The functioning of DRs, EL & PLCC were checked by CPRI and found in order.
- CPRI observed that the routine testing of CT, CVT, Numerical Protection IEDs and CBs have been done periodically and it is in line with system requirement.
- The test report of CTs, CVTs, Numerical protection IEDs and CBs are available for 220 & 765 kV system are reviewed.
- It is recommended by CPRI that report format need to be standardized, it may include calibration details, equipment's used & manufacture declared limit/range/tolerance or any specified by regulatory requirements of grid compliance/grid code. M/s LPGCL will incorporate the same.
- It is recommended by CPRI that all the Numerical Protection IEDs shall be tested once in 3/4/5 years as per the best practices adopted by the other organization such as STU, PGCIL etc. M/s LPGCL noted.
- As per CPRI , Switchyard of 765kV & 220 kV is being maintained properly with good practice of earthing system and it is neat and clean.
- It is recommended by CPRI that Relay Test System and other testing equipment must be calibrated from NABL Accreditated Laboratory & the calibration must include voltage, current, frequency, phase angle, power and time. The calibration point shall be decided as per the setting of Numerical Protection IEDs. M/s LPGCL noted.
- CPRI informed that Final report will be submitted as per date indicated in PO. However M/s LPGCL requested CPRI to submit draft report within 4 Months in phased manner report.

The CPRI audit team thanks to the officials of the M/s LPGCL for arranging & Co-ordinating the Electrical Protection System audit.

M/s CPRI 04/04/2024

1. Ramesh Patil
   ENSS officer.
2. Suraj. D. Naik.
   Project Engineer 04/04/2024

M/s LPGCL

1. VIKAS SHARMA
2. (C.V. MANIVANNAN) 04/04/2024

1. Executive Summary

Power Systems Division of Central Power Research Institute conducted the third party protection audit of 765kV & 220kV Switchyard Lalitpur as per the PO No. 8900000052, Dated 08-02-2024. The different protection that were covered under the audit are (i) Distance Protection (ii) ICT Protection and (iii) Bus bar Protection. It also included the checking of (i) DC Supply (ii) AC Supply with DG (iii) Communication system with DR (iv) Circuit Breaker (v) CT and (vi) CVT (vii) Synchro-Check. The audit format was provided by CPRI and the respective data was filled by the substation officers.

This report pertains to the audit carried out for ***765kV & 220kV Switchyard Lalitpur***. The protection audit of the substation was carried out on 26th March 2024. ***765 kV & 220 kV Switchyard Lalitpur*** have (a) Two 765 kV transmission lines (b) Four 220 kV transmission lines (c) 765 kV Two Bus Reactor's (d) 765 kV Two Line Reactor's (e) Two ICT's (f) Two ST's (g) Three GT's (h) Six UT's (i) Three Generators After viewing the downloaded settings at substation for lines, transformer and busbar most of the settings are found to be in line with the recommended settings as per guidelines. However, some of the deviations found are given below:

1. The distance protection Main-I and Main II ,of all Zone's impedance reach setting for 765KV Lalitpur-Agra/Fathehabad Ckt#01 & Ckt #02 lines are requires some minor revisions .
2. The distance protection Main-I ,Zone 1 impedance reach setting for 220KV Lalitpur-Dunara Ckt#01 lines are properly set and some minor revisions are required in Zone 2 Zone 3 and Zone 5 impedance reach settings.
3. The distance protection Main-II ,Zone 1 impedance reach setting for 220KV Lalitpur-Dunara Ckt#01 lines are properly set and some minor revisions are required in Zone 2 Zone 3 and Zone 4 impedance reach settings.
4. The distance protection Main-I of all Zones impedance reach setting for 220KV Lalitpur-Babina Ckt#01 lines require some minor revisions .
5. The distance protection Main-II ,Zone 1 , Zone 3 and Zone 4 impedance reach setting for 220KV Lalitpur-Babina Ckt#01 lines are properly set and some minor revisions are required in Zone 2 impedance reach settings.

6. The distance protection Main-I ,Zone 1 and Zone 2 impedance reach setting for 220KV Lalitpur-Kalyanpura Ckt#01 And Ckt #02 lines are properly set and some minor revisions are required in Zone 3 and Zone 5 impedance reach settings.
7. The distance protection Main-II ,Zone 1 Zone 2 and Zone 4 impedance reach setting for 220KV Lalitpur-Kalyanpura Ckt#01 And Ckt #02 lines are properly set and some minor revisions are required in Zone 3 impedance reach settings.

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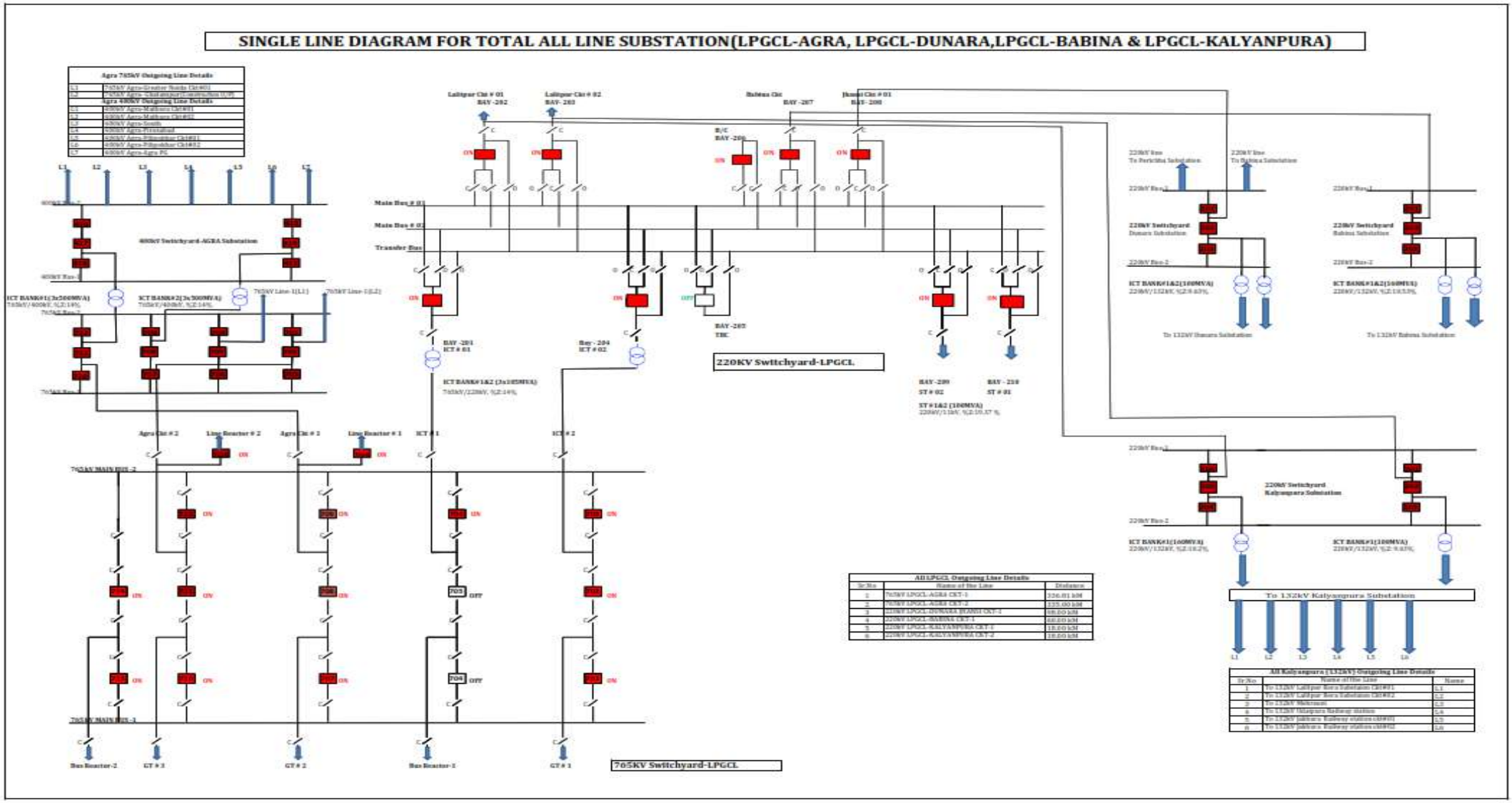
1.0: LINE DIAGRAM OF 765kV & 220kV SWITCHYARD LALITPUR .



1.1: PROTECTION SYSTEM OVERALL REVIEW

765KV &220KV SWITCHYARD LALITPUR		
DATE OF AUDIT BY CPRI TEAM : 26-03-2024		
Sl. No	**Title**	**Details**
1	**Name Of Grid Substation**	765KV &220KV SWITCHYARD LALITPUR
2	**Highest Voltage Level**	765 kV
3	**Year Of Installation**	2014
4	**No Of Feeders**	Two 765kV Feeder & Four 220 kV Feeder
5	**No of Transformers, Make and Capacity**	2*315 MVA
6	**Busbar Arrangement**	765kV - One and Half Scheme 220kV - Double Main Bus with Transfer Scheme
7	**Present Busbar Switching Status**	Commissioned
8	**Busbar Protection**	Commissioned
9	**Relay System Status**	In Service
10	**DC Supply System**	[1] 220/110 V DC-1 [2] 220/110 V DC-2 [3] 48 V DC-1 [4] 48 V DC-2
11	**DC Supply Capacity And Adequacy**	Battery is adequate for the station load.
12	**DC System Earth Fault Status**	Healthy condition.
13	**GPS Receiver Make & Model**	SANDS and MASIBUS
14	**GPS Clock Receiver & Synchronization Of Relay Status**	Relays are synchronised
15	**Common Event Logger Status**	In-built feature in numerical relay is used
16	**Line Disturbance Recorder**	In-built feature in numerical relay is used
17	**Fault Locator in Line**	Provided
18	**Breaker Failure Relay Status**	Provided
19	**Circuit Breaker test reports**	Available
20	**Relay test reports**	Available
21	**General Observation of Relay And Protection System**	It is recommended that the all the Numerical Protection IEDs shall be tested once in 3 or 4 years as per the best practices.

Protection audit teams at site:

LPGCL Team Members:

1	Mr. R.N Bedi	Head Maintenance (President)
2	Mr. Vikas Kumar Sharma	Electrical (HOD)
3	Mr. Abhimanyu Upadhyay	Electrical (G.M)
4	Mr. Mukesh Pokharna	Electrical BTG (GM)
5	Mr. Manivannan V	Electrical (Senior Manager)
6	Mr. R.N Bedi	Head Maintenance (President)

CPRI Team Members:

1	Mr. Ramesh Patil	Engineering Officer
2	Mr. Suraj D Naik	Project Engineer
3	Mr Manoj Kumar S	Project Engineer

1.2: Relays Used for Transmission Line, Transformer, Reactor and Bus Bar Protection Substation

1.2.1: Relays used for Transmission Line Protection

Sl. No.	Name of the Feeder	Main-I	Main-II
1	LALITPUR-AGRA CKT#01	ABB- REL670	SCHNEIDER-P545
2	LALITPUR-AGRA CKT#02	ABB- REL670	SCHNEIDER-P545
3	LALITPUR-KALYANPURA CKT#01	ABB- REL670	SCHNEIDER-P444
4	LALITPUR-KALYANPURA CKT#02	ABB- REL670	SCHNEIDER-P444
5	LALITPUR-DUNARA CKT#01	ABB- REL670	SCHNEIDER-P444
6	LALITPUR-BABINA CKT#01	ABB- REL670	SCHNEIDER-P444

1.2.2: Relays used for Transformer Protection:

Sl. No.	Transformer		Primary Protection	Back Up protection		
			Differential Protection	Over fluxing protection	Back up over current	Back Up REF
1	ICT BANK#01		SCHNEIDER-P642	SCHNEIDER-P642	SCHNEIDER-P141	SCHNEIDER-P141
2	ICT BANK#02		SCHNEIDER-P642	SCHNEIDER-P642	SCHNEIDER-P141	SCHNEIDER-P141
3	ST #01		SCHNEIDER-P643	SCHNEIDER-P642	-	SCHNEIDER-P643
4	ST #02		SCHNEIDER-P643	SCHNEIDER-P642	-	SCHNEIDER-P643
5	GT #01	765 Side	SCHNEIDER-P643	SCHNEIDER-P645	-	SCHNEIDER-P141
6	GT #02		SCHNEIDER-P643	SCHNEIDER-P645	-	SCHNEIDER-P141
7	GT #03		SCHNEIDER-P643	SCHNEIDER-P645	-	SCHNEIDER-P141
11	Gen 01	UTA	SCHNEIDER-P643	-		SCHNEIDER-P141
12		UTB	SCHNEIDER-P643	-	-	SCHNEIDER-P141
13	Gen 02	UTA	SCHNEIDER-P643	-	-	SCHNEIDER-P141
14		UTB	SCHNEIDER-P643	-	-	SCHNEIDER-P141
15	Gen 03	UTA	SCHNEIDER-P643	-	-	SCHNEIDER-P141
16		UTB	SCHNEIDER-P643	-	-	SCHNEIDER-P141

1.2.3: Relays used for BUSBAR Protection

Sl. No.	Voltage level	Make	Model
1.	220kV	MICOM	P741
2	765kV	MICOM	P741

1.2.4: Relays used for REACTOR Protection:

SI. No.	Name of Reactor	Differential Proection (Make & Model)	REF Protection (Make & Model)	Back-Up Impedance Protection (Make & Model)
1	765KV AGRA CKT#01 LINE REACTOR	SCHNEIDER-P643	SCHNEIDER-P141	SCHNEIDER-P141
2	765KV AGRA CKT#02 LINE REACTOR	SCHNEIDER-P643	SCHNEIDER-P141	SCHNEIDER-P141
3	765KV BUS-1 REACTOR	SCHNEIDER-P643	SCHNEIDER-P141	SCHNEIDER-P141
4	765KVBUS-2 REACTOR	SCHNEIDER-P643	SCHNEIDER-P141	SCHNEIDER-P141

2.0 Input Data for Transmission Lines

2.1.Input Data for Transmission Lines Substation -765kV Lalitpur – Agra/ Fathehabad CKT#01

Sl. No.	Description	Units	Value
	Station Name	**765kV &220kV SWITCHYARD LALITPUR**	
1	**Line Reference**	**765kv Lalitpur-Agra/Fatehabad Ckt#01**	
1.1	Line voltage level	kV	765
1.2	Name of remote substation		**765 kV Fathehabad/Agra**
2	**Main 1 Protection**		
2.1	Protection Type		Numerical
2.2	Model & Make		ABB & REL670
3	**Main 2 Protection**		
3.1	Protection Type		Numerical
3.2	Model & Make		Schnieder & P545
4	**CT data for Main 1**		
4.1	Ratio	A/A	3000/1
4.2	Class		PS
4.3	Vk / VA burden	Vk/VA	3000/20
4.4	Rct	Ohms	5
4.5	Imag @ Vk	mA	20
5	**CT data for Main 2**		
5.1	Ratio		3000/1
5.2	Class		PS
5.3	Vk / VA burden		3000/20
5.4	Rct		5
5.5	Imag @ Vk		20
6	**PT Ratio**	kV/V	765kV/110V
7	**PROTECTED LINE DATA**		
7.1	Line Length	Km	336.81
7.2	Positive seq. RESISTANCE	Ohms/Km	0.0114
7.3	Positive seq. REACTANCE	Ohms/Km	0.2855
7.4	Zero seq. RESISTANCE	Ohms/Km	0.1898
7.5	Zero seq. REACTANCE	Ohms/Km	0.7671
8	**ADJACENT SHORTEST LINE DATA (from remote bus)**		
8.1	Name of the substation to which the shortest adjacent line is connected		**765kV Fatehabad-Gr. Noida Line**
8.2	Line Length of shortest adjacent line	Km	159.32
8.3	Positive seq. RESISTANCE of shortest adjacent line	Ohms/Km	0.0114
8.4	Positive seq. REACTANCE of shortest adjacent line	Ohms/Km	0.2855
8.5	Zero seq. RESISTANCE of	Ohms/Km	0.1898

	shortest adjacent line		
8.6	Zero seq. REACTANCE of shortest adjacent line	Ohms/Km	0.7671
9	**ADJACENT LONGEST LINE DATA (from remote bus)**		
9.1	Name of the substation to which the longest adjacent line is connected		**765 KV Fatehabad-LPGCL Circuit#2**
9.2	Line Length of longest adjacent line	Km	335
9.3	Positive seq. RESISTANCE of longest adjacent line	Ohms/Km	0.0114
9.4	Positive seq. REACTANCE of longest adjacent line	Ohms/Km	0.2855
9.5	Zero seq. RESISTANCE of longest adjacent line	Ohms/Km	0.1898
9.6	Zero seq. REACTANCE of longest adjacent line	Ohms/Km	0.7671
10	**Is there a transformer connected to the remote bus**	Yes/No	YES
10.1	Number of Transformers		1
10.2	Voltage ratio of the Transformer	kV	765/400
10.3	MVA of the transformers 1	MVA	3*500
10.4	% Impedance of the transformers1	%	14.43

2.2. Input Data for Transmission Lines Substation – 765kV Lalitpur -Agra/Fathehabad CKT#02

Sl. No.	Description	Units	Value
	Station Name	**765KV &220KV SWITCHYARD LALITPUR**	
1	**Line Reference**	**765kv Lalitpur-Agra/Fatehabad Ckt#02**	
1.1	Line voltage level	kV	765
1.2	Name of remote substation		**765 kV Fathehabad/Agra**
2	**Main 1 Protection**		
2.1	Protection Type		Numerical
2.2	Model & Make		ABB & REL670
3	**Main 2 Protection**		
3.1	Protection Type		Numerical
3.2	Model & Make		Schnieder & P545
4	**CT data for Main 1**		
4.1	Ratio	A/A	3000/1
4.2	Class		PS
4.3	Vk / VA burden	Vk/VA	3000/20
4.4	Rct	Ohms	5
4.5	Imag @ Vk	mA	20
5	**CT data for Main 2**		
5.1	Ratio		3000/1
5.2	Class		PS
5.3	Vk / VA burden		3000/20
5.4	Rct		5
5.5	Imag @ Vk		20
6	**PT Ratio**	kV/V	765kV/110V
7	**PROTECTED LINE DATA**		
7.1	Line Length	Km	335
7.2	Positive seq. RESISTANCE	Ohms/Km	0.0114
7.3	Positive seq. REACTANCE	Ohms/Km	0.2855
7.4	Zero seq. RESISTANCE	Ohms/Km	0.1898
7.5	Zero seq. REACTANCE	Ohms/Km	0.7671
8	**ADJACENT SHORTEST LINE DATA (from remote bus)**		
8.1	Name of the substation to which the shortest adjacent line is connected		**765kV Fatehabad-Gr. Noida Line**
8.2	Line Length of shortest adjacent line	Km	159.32
8.3	Positive seq. RESISTANCE of shortest adjacent line	Ohms/Km	0.0114
8.4	Positive seq. REACTANCE of shortest adjacent line	Ohms/Km	0.2855
8.5	Zero seq. RESISTANCE of shortest adjacent line	Ohms/Km	0.1898

8.6	Zero seq. REACTANCE of shortest adjacent line	Ohms/Km	0.7671
9	**ADJACENT LONGEST LINE DATA (from remote bus)**		
9.1	Name of the substation to which the longest adjacent line is connected		**765 KV Fatehabad-LPGCL Circuit#1**
9.2	Line Length of longest adjacent line	Km	336.81
9.3	Positive seq. RESISTANCE of longest adjacent line	Ohms/Km	0.0114
9.4	Positive seq. REACTANCE of longest adjacent line	Ohms/Km	0.2855
9.5	Zero seq. RESISTANCE of longest adjacent line	Ohms/Km	0.1898
9.6	Zero seq. REACTANCE of longest adjacent line	Ohms/Km	0.7671
10	**Is there a transformer connected to the remote bus**	Yes/No	YES
10.1	Number of Transformers		1
10.2	Voltage ratio of the Transformer	kV	765/400
10.3	MVA of the transformers 1	MVA	3*500
10.4	% Impedance of the transformers1	%	14.43

2.3.Input Data for Transmission Lines Substation – 220KV Lalitpur-Kalyanpura Ckt#01

Sl. No.	Description	Units	Value
	Station Name	**765KV &220KV SWITCHYARD LALITPUR**	
1	**Line Reference**	**220kv Lalitpur-Kalyanpura Ckt#01**	
1.1	Line voltage level	kV	220
1.2	Name of remote substation		220 kV Kalyanpura-LPGCL
2	**Main 1 Protection**		
2.1	Protection Type		Numerical
2.2	Model & Make		ABB & REL670
3	**Main 2 Protection**		
3.1	Protection Type		Numerical
3.2	Model & Make		Schnieder & P444
4	**CT data for Main 1**		
4.1	Ratio	A/A	800/1
4.2	Class		PS
4.3	Vk / VA burden	Vk/VA	800
4.4	Rct	Ohms	5
4.5	Imag @ Vk	mA	45
5	**CT data for Main 2**		
5.1	Ratio		800/1
5.2	Class		PS
5.3	Vk / VA burden		800
5.4	Rct		5
5.5	Imag @ Vk	mA	45
6	**PT Ratio**	kV/V	220kV/110V
7	**PROTECTED LINE DATA**		
7.1	Line Length	Km	18.52
7.2	Positive seq. RESISTANCE	Ohms/Km	0.0800
7.3	Positive seq. REACTANCE	Ohms/Km	0.4002
7.4	Zero seq. RESISTANCE	Ohms/Km	0.2401
7.5	Zero seq. REACTANCE	Ohms/Km	1.2010
8	**ADJACENT SHORTEST LINE DATA (from remote bus)**		
8.1	Name of the substation to which the shortest adjacent line is connected		**220 KV KALYANPURA-LPGCL Ckt#02**
8.2	Line Length of shortest adjacent line	Km	18.52
8.3	Positive seq. RESISTANCE of shortest adjacent line	Ohms/Km	0.0800
8.4	Positive seq. REACTANCE of shortest adjacent line	Ohms/Km	0.4002
8.5	Zero seq. RESISTANCE of shortest adjacent line	Ohms/Km	0.2401
8.6	Zero seq. REACTANCE of	Ohms/Km	1.2010

	shortest adjacent line		
9	**ADJACENT LONGEST LINE DATA (from remote bus)**		
9.1	Name of the substation to which the longest adjacent line is connected		**220 KV KALYANPURA-LPGCL Ckt#02**
9.2	Line Length of longest adjacent line	Km	18.52
9.3	Positive seq. RESISTANCE of longest adjacent line	Ohms/Km	0.0800
9.4	Positive seq. REACTANCE of longest adjacent line	Ohms/Km	0.4002
9.5	Zero seq. RESISTANCE of longest adjacent line	Ohms/Km	0.2401
9.6	Zero seq. REACTANCE of longest adjacent line	Ohms/Km	1.2010
10	**Is there a transformer connected to the remote bus**	Yes/No	YES
10.1	Number of Transformers		1
10.2	Voltage ratio of the Transformer	kV	220/132
10.3	MVA of the transformers 1	MVA	160
10.4	% Impedance of the transformers1	%	10.2

2.4 Input Data for Transmission Lines Substation – 220KV Lalitpur-Kalyanpura Ckt#02

Sl. No.	Description	Units	Value
	Station Name	**765KV &220KV SWITCHYARD LALITPUR**	
1	**Line Reference**	**220kv Lalitpur-Kalyanpura Ckt#02**	
1.1	Line voltage level	kV	220
1.2	Name of remote substation		220 kV Kalyanpura-LPGCL
2	**Main 1 Protection**		
2.1	Protection Type		Numerical
2.2	Model & Make		ABB & REL670
3	**Main 2 Protection**		
3.1	Protection Type		Numerical
3.2	Model & Make		Schnieder & P444
4	**CT data for Main 1**		
4.1	Ratio	A/A	800/1
4.2	Class		PS
4.3	Vk / VA burden	Vk/VA	800
4.4	Rct	Ohms	5
4.5	Imag @ Vk	mA	45
5	**CT data for Main 2**		
5.1	Ratio		800/1
5.2	Class		PS
5.3	Vk / VA burden		800
5.4	Rct		5
5.5	Imag @ Vk	mA	45
6	**PT Ratio**	kV/V	220kV/110V
7	**PROTECTED LINE DATA**		
7.1	Line Length	Km	18.52
7.2	Positive seq. RESISTANCE	Ohms/Km	0.0800
7.3	Positive seq. REACTANCE	Ohms/Km	0.4002
7.4	Zero seq. RESISTANCE	Ohms/Km	0.2401
7.5	Zero seq. REACTANCE	Ohms/Km	1.2010
8	**ADJACENT SHORTEST LINE DATA (from remote bus)**		
8.1	Name of the substation to which the shortest adjacent line is connected		**220 KV KALYANPURA-LPGCL Ckt#01**
8.2	Line Length of shortest adjacent line	Km	18.52
8.3	Positive seq. RESISTANCE of shortest adjacent line	Ohms/Km	0.0800
8.4	Positive seq. REACTANCE of shortest adjacent line	Ohms/Km	0.4002
8.5	Zero seq. RESISTANCE of shortest adjacent line	Ohms/Km	0.2401
8.6	Zero seq. REACTANCE of	Ohms/Km	1.2010

	shortest adjacent line		
9	**ADJACENT LONGEST LINE DATA (from remote bus)**		
9.1	Name of the substation to which the longest adjacent line is connected		**220 KV KALYANPURA-LPGCL Ckt#01**
9.2	Line Length of longest adjacent line	Km	18.52
9.3	Positive seq. RESISTANCE of longest adjacent line	Ohms/Km	0.0800
9.4	Positive seq. REACTANCE of longest adjacent line	Ohms/Km	0.4002
9.5	Zero seq. RESISTANCE of longest adjacent line	Ohms/Km	0.2401
9.6	Zero seq. REACTANCE of longest adjacent line	Ohms/Km	1.2010
10	**Is there a transformer connected to the remote bus**	Yes/No	YES
10.1	Number of Transformers		1
10.2	Voltage ratio of the Transformer	kV	220/132
10.3	MVA of the transformers 1	MVA	100
10.4	% Impedance of the transformers1	%	9.63

2.5 Input Data for Transmission Lines Substation – 220KV Lalitpur-Dunara Ckt#01

Sl. No.	Description	Units	Value
	Station Name	**765KV &220KV SWITCHYARD LALITPUR**	
1	**Line Reference**	**220kv Lalitpur-Dunara Ckt#01**	
1.1	Line voltage level	kV	220
1.2	Name of remote substation		220KV DUNARA-LPGCL
2	**Main 1 Protection**		
2.1	Protection Type		Numerical
2.2	Model & Make		ABB & REL670
3	**Main 2 Protection**		
3.1	Protection Type		Numerical
3.2	Model & Make		Schnieder & P444
4	**CT data for Main 1**		
4.1	Ratio	A/A	800/1
4.2	Class		PS
4.3	Vk / VA burden	Vk/VA	800
4.4	Rct	Ohms	5
4.5	Imag @ Vk	mA	45
5	**CT data for Main 2**		
5.1	Ratio		800/1
5.2	Class		PS
5.3	Vk / VA burden		800
5.4	Rct		5
5.5	Imag @ Vk	mA	45
6	**PT Ratio**	kV/V	220kV/110V
7	**PROTECTED LINE DATA**		
7.1	Line Length	Km	92.30
7.2	Positive seq. RESISTANCE	Ohms/Km	0.0800
7.3	Positive seq. REACTANCE	Ohms/Km	0.4002
7.4	Zero seq. RESISTANCE	Ohms/Km	0.2401
7.5	Zero seq. REACTANCE	Ohms/Km	1.2010
8	**ADJACENT SHORTEST LINE DATA (from remote bus)**		
8.1	Name of the substation to which the shortest adjacent line is connected		**220KV DUNARA-PARICHHA**
8.2	Line Length of shortest adjacent line	Km	14.20
8.3	Positive seq. RESISTANCE of shortest adjacent line	Ohms/Km	0.0800
8.4	Positive seq. REACTANCE of shortest adjacent line	Ohms/Km	0.4002
8.5	Zero seq. RESISTANCE of shortest adjacent line	Ohms/Km	0.2401

8.6	Zero seq. REACTANCE of shortest adjacent line	Ohms/Km	1.2010
9	**ADJACENT LONGEST LINE DATA (from remote bus)**		
9.1	Name of the substation to which the longest adjacent line is connected		**220KV DUNARA-BABINA**
9.2	Line Length of longest adjacent line	Km	39
9.3	Positive seq. RESISTANCE of longest adjacent line	Ohms/Km	0.0800
9.4	Positive seq. REACTANCE of longest adjacent line	Ohms/Km	0.4002
9.5	Zero seq. RESISTANCE of longest adjacent line	Ohms/Km	0.2401
9.6	Zero seq. REACTANCE of longest adjacent line	Ohms/Km	1.2010
10	**Is there a transformer connected to the remote bus**	Yes/No	YES
10.1	Number of Transformers		2
10.2	Voltage ratio of the Transformer	kV	220/132
10.3	MVA of the transformers 1	MVA	100
10.4	% Impedance of the transformers1	%	9.63

2.6 Input Data for Transmission Lines Substation – 220KV Lalitpur-Babina Ckt#01

Sl. No.	Description	Units	Value
	Station Name	**765KV &220KV SWITCHYARD LALITPUR**	
1	**Line Reference**	**220kv Lalitpur-Babina Ckt#01**	
1.1	Line voltage level	kV	220
1.2	Name of remote substation		220KV BABINA-LPGCL
2	**Main 1 Protection**		
2.1	Protection Type		Numerical
2.2	Model & Make		ABB & REL670
3	**Main 2 Protection**		
3.1	Protection Type		Numerical
3.2	Model & Make		Schnieder & P444
4	**CT data for Main 1**		
4.1	Ratio	A/A	800/1
4.2	Class		PS
4.3	Vk / VA burden	Vk/VA	800
4.4	Rct	Ohms	5
4.5	Imag @ Vk	mA	45
5	**CT data for Main 2**		
5.1	Ratio		800/1
5.2	Class		PS
5.3	Vk / VA burden		800
5.4	Rct		5
5.5	Imag @ Vk	mA	45
6	**PT Ratio**	kV/V	220kV/110V
7	**PROTECTED LINE DATA**		
7.1	Line Length	Km	60.33
7.2	Positive seq. RESISTANCE	Ohms/Km	0.0800
7.3	Positive seq. REACTANCE	Ohms/Km	0.4002
7.4	Zero seq. RESISTANCE	Ohms/Km	0.2401
7.5	Zero seq. REACTANCE	Ohms/Km	1.2010
8	**ADJACENT SHORTEST LINE DATA (from remote bus)**		
8.1	Name of the substation to which the shortest adjacent line is connected		**220KV BABINA-DUNARA**
8.2	Line Length of shortest adjacent line	Km	39
8.3	Positive seq. RESISTANCE of shortest adjacent line	Ohms/Km	0.0800
8.4	Positive seq. REACTANCE of shortest adjacent line	Ohms/Km	0.4002
8.5	Zero seq. RESISTANCE of shortest adjacent line	Ohms/Km	0.2401

8.6	Zero seq. REACTANCE of shortest adjacent line	Ohms/Km	1.2010
9	**ADJACENT LONGEST LINE DATA (from remote bus)**		
9.1	Name of the substation to which the longest adjacent line is connected		**220KV BABINA-DUNARA**
9.2	Line Length of longest adjacent line	Km	39
9.3	Positive seq. RESISTANCE of longest adjacent line	Ohms/Km	0.0800
9.4	Positive seq. REACTANCE of longest adjacent line	Ohms/Km	0.4002
9.5	Zero seq. RESISTANCE of longest adjacent line	Ohms/Km	0.2401
9.6	Zero seq. REACTANCE of longest adjacent line	Ohms/Km	1.2010
10	**Is there a transformer connected to the remote bus**	Yes/No	YES
10.1	Number of Transformers		2
10.2	Voltage ratio of the Transformer	kV	220/132
10.3	MVA of the transformers 1	MVA	1*160
10.4	% Impedance of the transformers1	%	10.53 & 9.27

3. Transmission line protective relay settings review

Line Name	765KV Lalitpur-Agra / Fatehabad CKT#01	
Main I/II	**Main-I**	
Relay	**ABB & REL670**	
Description/Parameter	**Existing setting**	**Reviewed setting**
ZONE 1		
Operation	On	On
IBase	3000	3000.00
UBase	765	765.00
OperationDir	Forward	Forward
X1	76.13	76.93
R1	3.06	3.07
X0	**252.53**	**206.69**
R0	**63.33**	**51.14**
RFPP	**20**	**30.00**
RFPE	50	50.00
TPP	0	0.00
TPE	0	0.00
ZONE 2		
X1	**142.74**	**115.39**
R1	**5.75**	**4.60**
X0	**473.5**	**310.04**
R0	**118.74**	**76.71**
RFPP	**20**	**60.00**
RFPE	**50**	**75.00**
TPP	**0.5**	**0.35**
TPE	**0.5**	**0.35**
ZONE 3		
X1	**190.32**	**230.16**
R1	**7.66**	**9.18**
X0	**631.32**	**618.41**
R0	**158.32**	**153.01**
RFPP	**20**	**75.00**
RFPE	**50**	**125.00**

TPP	**0.8**	**1.50**
TPE	**0.8**	**1.50**
ZONE 5		
X1	9.52	9.62
R1	0.38	0.38
X0	**31.57**	**25.84**
R0	**7.92**	**6.39**
RFPP	**20**	**60.00**
RFPE	**50**	**75.00**
TPP	**1**	**0.50**
TPE	**1**	**0.50**
Automatic Switch Onto Fault Logic		
Ib	3000	3000
UB	765	765
IPh<	20	20
UPh<	60	60
tDuration	0.3	0.3
tSOTF	0.3	0.3
tDLD	0.3	0.3
AutoInit	On	On
Over Voltage protection		
Operation Step 1	On	On
U1>	109	109
T1	4.00	4.00
U2>	140	140
Over Current protection		
Operation	On	on
SchemeType	Permissive UR	Permissive UR
tCoord	0	0.00
tSendMin	0.1	0.10
Unblock	off	off
tSecurity	0.035	0.04
Operation	On	on
Power Swing		
X1InFw	**209.36**	**253.18**

R1L1n	8.42	9.18
R1F1nFw	22	82.50
RLdOutFw	354.04	74.82
RLdOutRw	354.04	74.82
KLdRFw	0.9	0.75

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Description	Existing Setting	Reviewed Setting
MICOM P442	**765KV Lalitpur-Agra / Fatehabad CKT#01**	
Line Settings	**MAIN-2**	
Line Length	336.81	336.81
Line Impedance	**95.23**	**96.23**
Line Angle	**88**	**87.716**
Zone Settings		
ZONE 1		
kZ1 Res Compensation	**0.81**	**0.599**
kZN1 Res Angle	-17	-18.053
Z1 Ph Angle	88	87.761
Z1 Ph Reach	76.2	76.989
R1G	**59.86**	**43.663**
R1Ph	**59.86**	**30**
tZ1	0	0.000
ZONE 2		
kZ2 Res Compensation	**0.81**	**0.599**
kZN2 Res Angle	-17	-18.053
Z2 Ph Angle	88	87.761
Z2 Ph Reach	**142.8**	**115.483**
R2G	**59.86**	**43.663**
R2Ph	**59.86**	**32.747**
tZ2	**0.5**	**0.35**
ZONE 3		
kZ3 Res Compensation	**0.81**	**0.599**
kZN3 Res Angle	-17	-18.053
Z3 Ph Angle	88	87.761
Z3 Ph Reach	**190.5**	**230.345**
R3G	**59.86**	**43.663**
R3Ph	**59.86**	**32.747**
tZ3	**0.8**	**1.5**
ZONE 4		
Z4 Ph Reach	9.52	9.624
R4G	**59.86**	**43.663**
R4Ph	**59.86**	**32.747**
tZ4	**1.0**	**0.500**
POWER SWING		
COND 1		
ΔR or R5	**37.95**	**8.733**
ΔX or Z5	**37.95**	**8.733**

Line Name	765KV Lalitpur-Agra / Fatehabad CKT#02	
Main I/II	**Main-I**	
Relay	**ABB & REL670**	
Description/Parameter	**Existing setting**	**Reviewed setting**
ZONE 1		
Operation	On	On
IBase	3000	3000.00
UBase	765	765.00
OperationDir	Forward	Forward
X1	76.13	76.51
R1	3.06	3.05
X0	**252.53**	**205.58**
R0	**63.33**	**50.87**
RFPP	**20**	**30.00**
RFPE	50	50.00
TPP	0	0.00
TPE	0	0.00
ZONE 2		
X1	**142.74**	**114.77**
R1	**5.75**	**4.58**
X0	**473.5**	**308.37**
R0	**118.74**	**76.30**
RFPP	**20**	**60.00**
RFPE	**50**	**75.00**
TPP	**0.5**	**0.35**
TPE	**0.5**	**0.35**
ZONE 3		
X1	**190.32**	**230.16**
R1	**7.66**	**9.18**
X0	**631.32**	**618.41**
R0	**158.32**	**153.01**
RFPP	**20**	**75.00**
RFPE	**50**	**125.00**
TPP	**0.8**	**1.50**

TPE	**0.8**	**1.50**
ZONE 5		
X1	9.52	9.56
R1	0.38	0.38
X0	**31.57**	**25.70**
R0	**7.92**	**6.36**
RFPP	**20**	**60.00**
RFPE	**50**	**75.00**
TPP	**1**	**0.50**
TPE	**1**	**0.50**
Automatic Switch Onto Fault Logic		
Ib	3000	3000
UB	765	765
IPh<	20	20
UPh<	60	60
tDuration	0.3	0.3
tSOTF	0.3	0.3
tDLD	0.3	0.3
AutoInit	On	On
Over Voltage protection		
Operation Step 1	On	On
U1>	109	109
T1	4.00	4.00
U2>	140	140
Over Current protection		
Operation	On	on
SchemeType	Permissive UR	Permissive UR
tCoord	0	0.00
tSendMin	0.1	0.10
Unblock	off	off
tSecurity	0.035	0.04
Operation	On	on
Power Swing		
X1InFw	**209.36**	**253.18**
R1L1n	8.42	9.18

R1F1nFw	22	82.50
RLdOutFw	354.04	74.82
RLdOutRw	354.04	74.82
KLdRFw	0.9	0.75

Description	Existing Setting	Reviewed Setting
MICOM P442	**765KV Lalitpur-Agra / Fatehabad CKT#02**	
Line Settings	**MAIN-2**	
Line Length	335	335
Line Impedance	95.23	95.71
Line Angle	**88**	**87.716**
Zone Settings		
ZONE 1		
kZ1 Res Compensation	**0.81**	**0.599**
kZN1 Res Angle	-17	-18.053
Z1 Ph Angle	88	87.761
Z1 Ph Reach	76.2	76.575
R1G	**59.86**	**43.663**
R1Ph	**59.86**	**30**
tZ1	0	0.000
ZONE 2		
kZ2 Res Compensation	**0.81**	**0.599**
kZN2 Res Angle	-17	--18.053
Z2 Ph Angle	88	87.761
Z2 Ph Reach	**142.8**	**114.862**
R2G	**59.86**	**43.663**
R2Ph	**59.86**	**32.747**
tZ2	**0.5**	**0.35**
ZONE 3		
kZ3 Res Compensation	**0.81**	**0.599**
kZN3 Res Angle	-17	-18.053
Z3 Ph Angle	88	87.761
Z3 Ph Reach	**190.5**	**230.345**
R3G	**59.86**	**43.663**
R3Ph	**59.86**	**32.747**
tZ3	**0.8**	**1.5**
ZONE 4		
Z4 Ph Reach	9.52	9.572
R4G	**59.86**	**43.663**
R4Ph	**59.86**	**32.747**
tZ4	**1.0**	**0.500**
POWER SWING		
COND 1		
ΔR or R5	**37.95**	**8.733**
ΔX or Z5	**37.95**	**8.733**

Line Name	220KV LALITPUR-DUNARA CKT#01	
Main I/II	**Main-I**	
Relay	**ABB & REL670**	
Description/Parameter	**Existing setting**	**Reviewed setting**
ZONE 1		
Operation	On	On
IBase	800	800.00
UBase	220	220.00
OperationDir	Forward	Forward
X1	29.55	29.55
R1	5.91	5.91
X0	88.68	88.68
R0	17.73	17.73
RFPP	**20**	**30.00**
RFPE	**50**	**50.00**
TPP	0	0.00
TPE	0	0.00
ZONE 2		
X1	**39.94**	**55.41**
R1	**7.98**	**11.08**
X0	**169.33**	**166.28**
R0	**36.7**	**33.24**
RFPP	**20**	**60.00**
RFPE	**50**	**75.00**
TPP	**0.35**	**0.50**
TPE	**0.35**	**0.50**
ZONE 3		
X1	**42.94**	**63.06**
R1	**8.58**	**12.60**
X0	**128.87**	**189.23**
R0	**25.76**	**37.83**
RFPP	**20**	**75.00**
RFPE	**50**	**125.00**
TPP	**1**	**1.50**
TPE	**1**	**1.50**

ZONE 5		
X1	**0.5**	**7.39**
R1	**0.1**	**1.48**
X0	**6.75**	**22.17**
R0	**0.5**	**4.43**
RFPP	**1**	**60.00**
RFPE	**1**	**75.00**
TPP	**1**	**0.50**
TPE	**1**	**0.50**
Automatic Switch Onto Fault Logic		
Ib	800	800
UB	220	220
IPh<	20	20
UPh<	60	60
tDuration	0.3	0.3
tSOTF	0.3	0.3
tDLD	0.3	0.3
AutoInit	On	On
Over Voltage Protection		
Operation Step 1	ON	ON
U1>	110	110
T1	0.025	3.00
U2>	140	140
T2	0.1	0.1
Over Current protection		
Operation	On	On
SchemeType	Permissive UR	Permissive UR
tCoord	0	0.00
tSendMin	0	0.00
Unblock	off	off
tSecurity	0.035	0.035
Power Swing		
X1InFw	47.23	69.36
R1L1n	8.58	12.60
R1F1nFw	22	82.50

RLdOutFw	78.43	74.82
RLdOutRw	78.43	74.82
KLdRFw	0.59	0.75

Description	Existing Setting	Reviewed Setting
MICOM P442	**220KV LPGCL- DUNARA Circuit#1**	
Line Settings	**MAIN-2**	
Line Length	92.3	92.3
Line Impedance	15.07	15.06
Line Angle	78.70	78.696
Zone Settings		
ZONE 1		
kZ1 Res Compensation	0.667	0.667
k Z1 Angle	-0.001	-0.001
Z1	12.05	12.054
R1G	**33.87**	**6.991**
R1Ph	**25.4**	**5.243**
tZ1	0	0.000
ZONE 2		
kZ2 Res Compensation	0.873	0.667
k Z2 Angle	-0.001	-0.001
Z2	**16.29**	**22.602**
R2G	**33.87**	**6.991**
R2Ph	**25.88**	**5.243**
tZ2	**0.35**	**0.500**
ZONE 3		
kZ3 Res Compensation	0.667	0.667
k Z3 Angle	-100	-0.001
Z3	**17.52**	**25.721**
R3G	**33.87**	**6.991**
R3Ph	**25.4**	**5.243**
tZ3	**1**	**1.500**
ZONE 4		
Z4	**2.411**	**1.205**
R4G	**33.87**	**6.991**
R4Ph	**25.4**	**5.243**
tZ4	**1**	**0.500**
POWER SWING		
ΔR	**5.08**	**1.398**
ΔX	**5.08**	**1.398**

Line Name	220KV LALITPUR-BABINA CKT#01	
Main I/II	Main-I	
Relay	ABB & REL670	
Description/Parameter	Existing setting	Reviewed setting
ZONE 1		
Operation	On	On
IBase	800	800.00
UBase	220	220.00
OperationDir	Forward	Forward
X1	**29.55**	**19.32**
R1	**5.91**	**3.86**
X0	**88.68**	**57.97**
R0	**17.73**	**11.59**
RFPP	**20**	**30.00**
RFPE	50	50.00
TPP	0	0.00
TPE	0	0.00
ZONE 2		
X1	**39.94**	**36.22**
R1	7.98	7.24
X0	**169.33**	**108.68**
R0	**36.7**	**21.73**
RFPP	**20**	**60.00**
RFPE	**50**	**75.00**
TPP	**0.35**	**0.50**
TPE	**0.35**	**0.50**
ZONE 3		
X1	**42.94**	**47.70**
R1	**8.58**	**9.54**
X0	**128.87**	**143.15**
R0	**36.7**	**28.62**
RFPP	**20**	**75.00**
RFPE	**25.76**	**125.00**
TPP	**1**	**1.50**
TPE	**1**	**1.50**

ZONE 5		
X1	**0.5**	**4.83**
R1	0.1	0.97
X0	**6.75**	**14.49**
R0	0.5	2.90
RFPP	**1**	**60.00**
RFPE	**1**	**75.00**
TPP	**1**	**0.50**
TPE	**1**	**0.50**
Automatic Switch Onto Fault Logic		
Ib	800	800
UB	220	220
IPh<	20	20
UPh<	60	60
tDuration	0.3	0.3
tSOTF	0.3	0.3
tDLD	0.3	0.3
AutoInit	On	On
Over Voltage Protection		
Operation Step 1	ON	ON
U1>	110	110
T1	3.00	3.00
U2>	140	140
T2	0.1	0.1
Over Current protection		
Operation	On	On
SchemeType	Permissive UR	Permissive UR
tCoord	0.3	0.30
tSendMin	0.3	0.30
Unblock	off	off
tSecurity	0.3	0.30
Operation	On	On
Power Swing		
X1InFw	47.23	69.36
R1L1n	8.58	12.60

R1F1nFw	22	82.50
RLdOutFw	78.43	74.82
RLdOutRw	78.43	74.82
KLdRFw	0.58	0.75

Description	Existing Setting	Reviewed Setting
MICOM P442	**220KV LPGCL- BABINA Circuit#1**	
Line Settings	**MAIN-2**	
Line Length	60.330	60.330
Line Impedance	9.850	9.848
Line Angle	78.60	78.69
Zone Settings		
ZONE 1		
kZ1 Res Compensation	0.667	0.667
k Z1 Angle	-100	-0.001
Z1 Secondary	7.88	7.879
R1G	**22.86**	**6.991**
R1Ph	**20.32**	**5.243**
T1	0	0.000
ZONE 2		
kZ2 Res Compensation	0.667	0.667
k Z2 Angle	-100	-0.001
Z2 Secondary	**13.66**	**14.773**
R2G	**22.86**	**6.991**
R2Ph	**20.86**	**5.243**
T2	0.35	0.35
ZONE 3		
kZ3 Res Compensation	0.667	0.667
k Z3 Angle	-100	-0.001
Z3 Secondary	19.44	19.458
R3G	**22.86**	**6.991**
R3Ph	**20.32**	**5.243**
T3	**0.8**	**1.500**
ZONE 4		
Z4 Secondary	0.78	0.788
R4G	**22.86**	**6.991**
R4Ph	**20.32**	**5.243**
T4	**1**	**0.500**
POWER SWING		
ΔR	**4.06**	**2.796**
ΔX	**4.06**	**2.796**

Line Name	220 KV LPGCL- KALYANPURA Circuit#1	
Main I/II	**Main-I**	
Relay	**ABB & REL670**	
Description/Parameter	**Existing setting**	**Reviewed setting**
ZONE 1		
Operation	On	On
IBase	800	800.00
UBase	220	220.00
OperationDir	Forward	Forward
X1	5.93	5.93
R1	1.19	1.19
X0	17.8	17.79
R0	3.56	3.56
RFPP	20	17.79
RFPE	26.69	26.68
TPP	0	0.00
TPE	0	0.00
ZONE 2		
X1	11.12	11.12
R1	2.22	2.22
X0	**43.3**	**33.36**
R0	**9.23**	**6.67**
RFPP	**20**	**35.58**
RFPE	**50**	**40.02**
TPP	0.35	0.35
TPE	0.35	0.35
ZONE 3		
X1	**14.82**	**17.79**
R1	**2.96**	**3.56**
X0	**44.49**	**53.38**
R0	**8.89**	**10.67**
RFPP	**20**	**44.47**
RFPE	**50**	**66.71**
TPP	**1**	**1.50**
TPE	**1**	**1.50**

ZONE 5		
X1	**1.19**	**1.48**
R1	**0.24**	**0.30**
X0	**3.56**	**4.45**
R0	**7.11**	**0.89**
RFPP	**7.11**	**60.00**
RFPE	**5.33**	**75.00**
TPP	**1**	**0.50**
TPE	**1**	**0.50**
Automatic Switch Onto Fault Logic		
Ib	800	800
UB	220	220
IPh<	20	20
UPh<	60	60
tDuration	0.3	0.3
tSOTF	0.3	0.3
tDLD	0.3	0.3
AutoInit	On	On
Over Voltage Protection		
Operation Step 1	ON	ON
U1>	110	110
T1	3.00	3.00
U2>	140	140
T2	0.5	0.5
Over Current protection		
Operation	On	On
SchemeType	Permissive UR	Permissive UR
tCoord	0.3	0.30
tSendMin	0.3	0.30
Unblock	off	off
tSecurity	0.35	0.35
Power Swing		
X1InFw	16.30	19.57
R1L1n	2.96	3.56
R1F1nFw	22	48.92

RLdOutFw	78.43	74.82
RLdOutRw	78.43	74.82
KLdRFw	0.58	0.75

Description	Existing Setting	Reviewed Setting
MICOM P442	**220 KV LPGCL- KALYANPURA Circuit#1**	
Line Settings	**MAIN-2**	
Line Length	18.52	18.52
Line Impedance	3.024	3.0233
Line Angle	78.70	78.696
Zone Settings		
ZONE 1		
kZ1 Res Compensation	0.667	0.667
k Z1 Angle	-100	-0.001
Z1 Secondary	2.419	2.419
R1G	**33.87**	**6.991**
R1Ph	**25.4**	**5.243**
T1	**0**	**0.000**
ZONE 2		
kZ2 Res Compensation	0.873	0.667
k Z2 Angle	-100	-0.001
Z2 Secondary	4.536	4.535
R2G	**33.87**	**6.991**
R2Ph	**25.4**	**5.243**
T2	0.35	0.350
ZONE 3		
kZ3 Res Compensation	0.667	0.667
k Z3 Angle	-100	-0.001
Z3 Secondary	**6.048**	**7.256**
R3G	33.87	**6.991**
R3Ph	25.4	**5.243**
T3	1	**1.500**
ZONE 4		
Z4 Secondary	**0.484**	**0.605**
R4G	**33.87**	**6.991**
R4Ph	**25.4**	**5.243**
T4	**1**	**0.500**
POWER SWING		
ΔR	**5.08**	**1.398**
ΔX	**5.08**	**1.398**

Line Name	220 KV LPGCL- KALYANPURA Circuit#2	
Main I/II	**Main-I**	
Relay	**ABB & REL670**	
Description/Parameter	**Existing setting**	**Reviewed setting**
ZONE 1		
Operation	On	On
IBase	800	800.00
UBase	220	220.00
OperationDir	Forward	Forward
X1	5.93	5.93
R1	1.19	1.19
X0	17.8	17.79
R0	3.56	3.56
RFPP	20	17.79
RFPE	26.69	26.68
TPP	0	0.00
TPE	0	0.00
ZONE 2		
X1	11.12	11.12
R1	2.22	2.22
X0	**43.3**	**33.36**
R0	9.23	6.67
RFPP	20	35.58
RFPE	50	40.02
TPP	0.35	0.35
TPE	0.35	0.35
ZONE 3		
X1	**14.82**	**17.79**
R1	2.96	3.56
X0	**44.49**	**53.38**
R0	8.89	10.67
RFPP	20	44.47
RFPE	50	66.71
TPP	1	1.00
TPE	1	1.00

ZONE 5		
X1	1.19	1.48
R1	0.24	0.30
X0	**3.56**	**4.45**
R0	7.11	0.89
RFPP	7.11	60.00
RFPE	5.33	75.00
TPP	1	0.50
TPE	1	0.50
Automatic Switch Onto Fault Logic		
Ib	800	800
UB	220	220
IPh<	20	20
UPh<	60	60
tDuration	0.3	0.3
tSOTF	0.3	0.3
tDLD	0.3	0.3
AutoInit	On	On
Over Voltage Protection		
Operation Step 1	ON	ON
U1>	110	110
T1	3.00	3.00
U2>	140	140
T2	0.5	0.5
Over Current protection		
Operation	On	On
SchemeType	Permissive UR	Permissive UR
tCoord	0.3	0.30
tSendMin	0.3	0.30
Unblock	off	off
tSecurity	0.35	0.35
Power Swing		
X1InFw	16.30	19.57
R1L1n	2.96	3.56
R1F1nFw	22	48.92

RLdOutFw	78.43	74.82
RLdOutRw	78.43	74.82
KLdRFw	0.58	0.75

Description	Existing Setting	Reviewed Setting
MICOM P442	**220 KV LPGCL- KALYANPURA Circuit#2**	
Line Settings	**MAIN-2**	
Line Length	18.52	18.52
Line Impedance	3.024	3.0233
Line Angle	78.70	78.696
Zone Settings		
ZONE 1		
kZ1 Res Compensation	0.667	0.667
k Z1 Angle	-100	-0.001
Z1 Secondary	2.419	2.419
R1G	**33.87**	**6.991**
R1Ph	**25.4**	**5.243**
T1	**0**	**0.000**
ZONE 2		
kZ2 Res Compensation	0.873	0.667
k Z2 Angle	-100	-0.001
Z2 Secondary	4.536	4.535
R2G	**33.87**	**6.991**
R2Ph	**25.4**	**5.243**
T2	0.35	0.350
ZONE 3		
kZ3 Res Compensation	0.667	0.667
k Z3 Angle	-100	-0.001
Z3 Secondary	**6.048**	**7.256**
R3G	**33.87**	**6.991**
R3Ph	**25.4**	**5.243**
T3	1	**1.500**
ZONE 4		
Z4 Secondary	**0.484**	**0.605**
R4G	**33.87**	**6.991**
R4Ph	**25.4**	**5.243**
T4	**1**	**0.500**
POWER SWING		
ΔR	**5.08**	**1.398**
ΔX	**5.08**	**1.398**

4.0 765 kV Bus Reactor Protective Relay Settings Review

SUBSTATION Name	765/220kV Lalithpur Substation		
DIFFERENTIAL PROTECTION FOR Reactor	765kv Bus-1 Reactor 87R		
Relay used	GE P643		
TRANSFORMER PARAMETERS	UNITS	EXISTING	REVIEWED
CAPACITY	MVA		330
VOLTAGE RATIO		765	765/765
Rectance (HV- LV)	%	40	40
VOLTAGE HV nominal	Kv		765
VOLTAGE LV nominal	Kv		765
VOLTAGE TV nominal	Kv		765
CT RATIO			
HV Side			
CT ratio(HV)		2000/1	2000/1
Primary ct on HV side	A		2000
Secondary ct on HV side	A		1
LV Side			
CT ratio(LV)		2000/1	2000/1
Primary ct on LV side	A		2000
Secondary ct on LV side	A		1
TV Side			
CT ratio(TV)			2000/1
Primary ct on TV side			2000
Secondary ct on TV side			1
OLTC			
Min	%		0
Max	%		0
CALCULATIONS			
Rated ct on HV			249.053
CT current on Sec HV			0.125
Rated ct on LV			249.053
Ct current on Sec LV			0.125
Rated ct on TV			249.053
Ct current on Sec TV			0.125
Compensation factor			
compensation factor on HV CT		8.03	8.030
compensation factor on LV CT		8.03	8.030
compensation factor on TV CT		8.03	8.030
Compensated current on CT Sec LV Side			1.000
Compensated current on CT Sec HV Side			1.000

Compensated current on CT Sec TV Side			1.000
For Min Tap of OLTC			
HV SIDE			
Full load ct			249.053
Sec ct HV winding			0.125
Compensated current on CT Sec			1.000
For MAX Tap of OLTC			
HV SIDE			
Full load ct			249.053
Sec ct HV winding			0.125
Compensated current on CT Sec			1.000
BIAS SETTING			
K1		**0.3**	**0.2000**
K2		**0.8**	**0.8000**
Is1, PU	**A**	**0.2**	**0.20**
Is2, PU	**A**	**1**	**1.50**

5.0 765 kV Line Reactor Protective Relay Settings Review

SUBSTATION Name	765/220kV Lalithpur Substation		
DIFFERENTIAL PROTECTION FOR Reactor	765KV AGRA CKT#01 LINE REACTOR 87R		
Relay used	SCHNEIDER P643		
SETTING VALUE	Secondary		
TRANSFORMER PARAMETERS	UNITS	EXISTING	REVIEWED
CAPACITY	MVA	330	330
VOLTAGE RATIO		765	765/765
Rectance (HV- LV)	%	40	40
VOLTAGE HV nominal	kV		765
VOLTAGE LV nominal	kV		765
CT RATIO			
HV Side			
CT ratio(HV)		300/1	300/1
Primary ct on HV side	A		300
Secondary ct on HV side	A		1
LV Side			
CT ratio(LV)		300/1	300/1
Primary ct on LV side	A		300
Secondary ct on LV side	A		1
OLTC			
Min	%		0
Max	%		0
CALCULATIONS			
Rated ct on HV			249.053
CT current on Sec HV			0.830
Rated ct on LV			249.053
Ct current on Sec LV			0.830
Compensation factor			
compensation factor on HV CT		1.205	1.205
compensation factor on LV CT		1.205	1.205
Compensated current on CT Sec LV Side			1.000
Compensated current on CT Sec HV Side			1.000
For Min Tap of OLTC			
HV SIDE			
Full load ct			249.053
Sec ct HV winding			0.830
Compensated current on CT Sec			1.000

For MAX Tap of OLTC			
HV SIDE			
Full load ct			249.053
Sec ct HV winding			0.830
Compensated current on CT Sec			1.000
BIAS SETTING			
K1	**-**	**0.3**	0.2000
K2	**-**	**0.8**	0.8000
Is1, PU	**A**	**0.2**	0.20
Is2, PU	**A**	**1**	1.50

6.0 Input Data for Transformer Protection

Sl. No.	Description	Units	Value
1	**Transformer Name**		ICT-Unit 1,2
1.1	**Ratings**		
1.2	MVA	MVA	315
2	Voltage Ratio	kV/kV	765/
3	**Impedance**	%	14
4	**Vector Group**		YNd11
`5	**NGR Data (if Present)**	Ohms	-
5.1	**OLTC Present**	Yes/No	Yes
5.2	OLTC Data		
5.3	Min Tap (%)	% (-)	-5.5
5.4	Max Tap (%)	% (+)	5.5
6	No. of Steps		5
6.1	**Differential Protection provided**	Yes/No	Yes
6.2	Differential CT Ratio		
6.3	HV CT Ratio (Main & ICT)	A/A	2000/1
7	LV CT Ratio (Main & ICT)	A/A	1000/1
7.1	**Differential Relay**		
7.2	Make		MICOM
8	Model		P642

8.1	**Backup REF provided**	Yes/No	Yes
8.2	REF Protection CTs Ratio **(Main & ICT)**	A/A	HV: 1000/1 LV: NIL
8.3	Acc Class		PS
8.4	RCT (Ω)	Ohms	5
8.5	Vk(V)	V	>2000
8.6	Im@Vk/2	mA	30
8.7	Longest sec. one way lead R Ω	Ohms	3.484
8.8	REF Relay		
8.9	Make		Schneider
8.10	Model		P141
9	Rstab Range (Ω)	Ohms	868.72
9.1	**Over fluxing Protection provided**	Yes/No	Yes
9.2	Over fluxing Protection Relay		
9.3	Make		MICOM
10	Model		P643
10.1	**Backup Over Current**	Yes/No	Yes
10.2	Backup Over Current Protection Relay		
10.3	Make		MICOM
10.4	Model		P642
10.5	Back-Up Over Current Protection CTs Ratio	A/A	-

6.1 Transformers Protection Relay Setting Review

l. No.				ICT 1 & 2	
	PROTECTION			Existing	Reviewed
1	**Differential**	**Relay Make & Model**		MICOM P642	
		Biased	K1%	30	30
			K2%	80	80
			Is/Id	0.2	0.2
			Ih(2)%	20	20
			Ih(5)%	20	20
			HS 1	7.7	7.7
			HS 2	10.0	10.0
2	**Over Fluxing**	**Relay Make & Model**		MICOM - P643	
		Voltage for Relay		765	765
		V/HZ >1		2.75	1.1
		T(S)		55	1000
		V/HZ >2		3.080	1.2
		T(S)		4.0	42
3	**REF Protection**	**Relay Make & Model**		MICOM - P141	
		Stabilizing Resistance	R stab	868.72	Adopted settings are stable.
		CT Ratio	HV	1000/1	
			LV	200/1	
			NCT	300/1	
4	**Overcurrent Protection**	**Relay Make & Model**		MICOM P-642	
		Pickup Current I >1		0.29	0.29

		TSM(s)	0.25	0.25
		Pickup Current I >2	2.390	2.390
		TSM(s)	0.1	0.1
6	**Earth fault**	**Relay Make & Model**	MICOM - P643	
		PSM(A) IN > 1	160	160
		TSM(s)	0.40	0.40

SUBSTATION NAME	765KV &220KV SWITCHYARD LALITPUR	Existing settings	
PROTECTED EQUIPMENT	TRANSFORMER	ICT 1	ICT 1
RELAY	DIFFERENTIAL - 87T		
RELAY TYPE	MICOM - P642		
Specifications			
MVA	315	315	315
Voltage Ratio (KV)	765/220	765/220	765/220
Primary side Voltage (KV)	765	765	765
Secondary side Voltage (KV)	220	220	220
Current Transformer Ratio (HV)	2000/1	2000/1	2000/1
Primary CT (HV)	2000	2000	2000
Secondary CT(HV)	1	1	1
Current Transformer Ratio (LV)	1000/1	1000/1	1000/1
Primary CT (LV)	1000	1000	1000
Secondary CT(LV)	1	1	1
Percentage impedance %	14	14	14
Minimum Tapping in %	1		
Maximum Tapping in %	23		
Ratio compensation calculation HV and LV side			
Rated current CT primary side (HV)	237.7325		
Rated current CT secondary (HV)	0.1189		
Ratio Compensatin (HV)	8.4128	8.413	8.413
Rated current CT primary side (LV)	826.6606		
Rated current CT secondary (LV)	0.8267		
Ratio Compensatin (LV)	1.2097	1.21	1.21
Calculation OLTC current - MIN and MAX			
Primary Load current at minimum tappping (HV)	235.3787		
Secondary Load current (CT-HV)	0.1177		
Relay current for (HV)	0.9901		
Primary Load current at maximum tappping (HV)	193.2784		
Secondary Load current (CT-HV)	0.0966		
Relay current for (HV)	0.8130		
Differential Current for minimum tapping	0.0099		
Biasing Current	0.9950		

Operating current of relay	0.3990		
90% of operating Current	0.3591		
	STABLE		
Differential Current for maximum tapping	0.1870		
Biasing Current	0.9065		
Operating current of relay	0.3813		
90% of operating Current	0.3432		
	STABLE		
High set 1	8.571428571	**7.7**	**7.7**
High set 2	11.14285714	**10**	**10**

6.2 Station Transformers Protection Relay Setting Review

SUBSTATION NAME	765KV &220KV SWITCHYARD LALITPUR	Existing settings	
PROTECTED EQUIPMENT	TRANSFORMER	ST-1	ST-2
RELAY	DIFFERENTIAL - 87T		
RELAY TYPE	MICOM - P643		
Specifications			
MVA	100	100	100
Voltage Ratio (KV)	220/11		
Primary side Voltage (KV)	220	220	220
Secondary side Voltage (KV)	11	111	111
Current Transformer Ratio (HV)	600/1		
Primary CT (HV)	600	600	600
Secondary CT(HV)	1	1	1
Current Transformer Ratio (LV)	3000/1	3000/1	3000/1
Primary CT (LV)	3000	3000	3000
Secondary CT(LV)	1	1	1
Percentage impedance %	15	15	15
Minimum Tapping in %	-15		
Maximum Tapping in %	5		
Ratio compensation calculation HV and LV side			
Rated current CT primary side (HV)	262.4319		
Rated current CT secondary (HV)	0.4374		
Ratio Compensatin (HV)	2.2863	2.286	2.286
Rated current CT primary side (LV)	5248.6388		
Rated current CT secondary (LV)	1.7495		
Ratio Compensatin (LV)	0.5716	0.597	0.597
Calculation OLTC current - MIN and MAX			
Primary Load current at minimum tappping (HV)	308.7435		
Secondary Load current (CT-HV)	0.5146		
Relay current for (HV)	1.1765		
Primary Load current at maximum tappping (HV)	249.9352		
Secondary Load current (CT-HV)	0.4166		
Relay current for (HV)	0.9524		
Differential Current for minimum tapping	0.1765		
Biasing Current	1.0882		
Operating current of relay	0.4176		

90% of operating Current	0.3759		
	STABLE		
Differential Current for maximum tapping	0.0476		
Biasing Current	0.9762		
Operating current of relay	0.3952		
90% of operating Current	0.3557		
	STABLE		
High set 1	**8**	**4.8**	**4.8**
High set 2	**10.4**	**6.2**	**6.2**

7.0 Busbar Protection Relay Setting Review

Sl. No	Bus Bar Protection			
	Relay Make & Model			MICOM P741
	Differential Bus Bar Protection			
	Setting	Unit	Existing	Reviewed
1	220 kV BUS BAR CUA			
	Phase Slope kCZ	%	30	30
	IDCZ>2 Current	A	2400	2400
	Phase Slope K2	%	60	60
	ID>2 Current	A	2400	2400
2	220 kV BUS BAR CUB			
	Phase Slope kCZ	%	30	30
	IDCZ>2 Current	A	2400	2400
	Phase Slope K2	%	60	60

	ID>2 Current	A	2400	2400
3	**765 kV BUS BAR CUA**			
	Phase Slope kCZ	%	30	30
	IDCZ>2 Current	A	3600	3600
	Phase Slope K2	%	60	60
	ID>2 Current	A	3600	3600
4	**765 kV BUS BAR CUB**			
	Phase Slope kCZ	%	30	30
	IDCZ>2 Current	A	3600	3600
	Phase Slope K2	%	60	60
	ID>2 Current	A	3600	3600

8.0 DC Measurements

DC battery and chargers are very important units as they are required to operate the protection relays. In this section, the details of the batteries and chargers are provided.

Following is the measurement of DC source which was taken during the site visit:

A. DC Supply

Generating Unit			Positive to Negative	Positive to Earth	Negative To Earth
1	Bank 1	1A	245 V	115.6 V	129.6 V
		1B	245.7 V	115.6 V	129.6 V
2	Bank 2	2A	244 V	114.5 V	129.9 V
		2B	244.2	114.6 V	129.3 V

Switchyard Unit			Positive to Negative	Positive to Earth	Negative To Earth
1	220 V	Bank-1	221.8 V	115.8 V	105.4 V
		Bank-2	240.8 V	115.8 V	124.9 V
2	48 V	Bank-1	51.37 V	0	51.26 V
		Bank-2	51.95 V	0	51.20 V

9.0 Protection Review

In general, protection schemes and setting are in order. All the 765 kV lines, 220kV lines, Transformers, Reactors are protected through numerical based Protection schemes.

1. The distance protection Main-I and Main II ,of all Zones impedance reach setting for 765KV Lalitpur-Agra/Fathehabad Ckt#01 & Ckt #02 lines requires some minor revisions in settings.
2. The distance protection Main-I ,Zone 1 impedance reach setting for 220KV Lalitpur-Dunara Ckt#01 lines are properly set and some minor revisions are required in Zone 2 Zone 3 and Zone 5 impedance reach settings.
3. The distance protection Main-II ,Zone 1 impedance reach setting for 220KV Lalitpur-Dunara Ckt#01 lines are properly set and some minor revisions are required in Zone 2 Zone 3 and Zone 4 impedance reach settings.
4. The distance protection Main-I of all Zones impedance reach setting for 220KV Lalitpur-Babina Ckt#01 lines require some minor revisions .
5. The distance protection Main-II ,Zone 1 , Zone 3 and Zone 4 impedance reach setting for 220KV Lalitpur-Babina Ckt#01 lines are properly set and some minor revisions are required in Zone 2 impedance reach settings.
6. The distance protection Main-I ,Zone 1 and Zone 2 impedance reach setting for 220KV Lalitpur-Kalyanpura Ckt#01 And Ckt #02 lines are properly set and some minor revisions are required in Zone 3 and Zone 5 impedance reach settings.
7. The distance protection Main-II ,Zone 1 Zone 2 and Zone 4 impedance reach setting for 220KV Lalitpur-Kalyanpura Ckt#01 And Ckt #02 lines are properly set and some minor revisions are required in Zone 3 impedance reach settings.
8. The earth fault protection is also protected to all line protection. Power swing, CB fail, and broken conductor is also provided on all lines. Minor changes in Power swing.
9. Resistive reach for Ph-Ph & Ph-Gnd may be reviewed for all the Lines. Since, For the calculation of resistive reach (Ph-Ph & Ph-Gnd), CPRI considered the Arc Resistance and Tower footing resistance as 28.864 Ω & 10 Ω respectively. If the Arc Resistance and Tower footing resistance values are different at the substation based on local substation condition, then all resistive reach (Ph-Ph & Ph-Gnd) same setting may be retained.
10. Other Protection functionality for lines like broken conductor Voltage supervision and Carrier communication are working satisfactory.
11. The differential protection setting for transformers are properly set and stable.
12. The differential protection setting for busbar are properly set and stable.
13. Relay co-ordination has been reviewed and some minor variation is required for few settings. The same has been provided in relay coordination sheet.
14. It is suggested to perform the third-party protection audit of substation/generating station periodically.

Note: Difference observed between existing settings and reviewed settings are given in bold font in respective protection

10.0 Observation and Recommendations

Observation and Recommendations							
Sl No	Name	Protection	Zone	Parameter	Existing	Recommendation	Remarks
1	765kv Lalitpur-Agra / Fatehabad Ckt 1	Distance Main-1	ZONE 1	X0PE	252.53	206.69	80% of the protected line reactance / resistance & Resistive Reach as per NRPC Guidelines for REL 670
				R0PE	63.33	51.14	
				RFFWPP	20.00	30.00	
			ZONE 2	X1FwPP	142.74	115.39	For Single CKT:120% and for Double CKT:150% of protected line reactance/resistance & Resistive Reach as per NRPC Guidelines for REL 670
				X0PE	473.50	310.04	
				R0PE	118.74	76.71	
				RFFWPP	20.00	60.00	
				RFFWPE	50.00	75.00	
				tPP	0.50	0.35	-
				tPE	0.50	0.35	-
			ZONE 3	X1FwPP	190.32	230.16	120% of(protected line reactance + remote end longest line reactance) & Resistive Reach as per NRPC Guidelines for REL 670
				R1PP	7.66	9.18	
				X0PE	631.32	618.41	
				R0PE	158.32	153.01	
				RFFWPP	20.00	75.00	
				RFFWPE	50.00	125.00	
				tPP	0.80	1.50	-
				tPE	0.80	1.50	-
			Zone 5	X0PE	31.57	25.84	It was observed that if protected line length is more than 100 km then the reactance of Zone RV is 10% of line reactance & Resistive Reach as per NRPC Guidelines for REL 670
				R0PE	7.92	6.39	
				RFFWPP	20.00	60.00	
				RFFWPE	50.00	75.00	
				tPP	1.00	0.50	-
				tPE	1.00	0.50	-
			ZPSB (Power Swing)	X1InFw	209.36	253.18	-
				R1L1n	8.42	9.18	-
				R1F1nFw	22.00	82.50	-
				RLdOutFw	354.04	74.82	-
				RLdOutRw	354.04	74.82	-
				KLdRFw	0.90	0.75	-
		Distance Main-2	Zone 1	R1G	59.86	43.66	80% of the protected line reactance / resistance
				R1Ph	59.86	30.00	
			Zone 2	Z2 Ph Reach	142.80	115.48	For Single CKT:120% and for Double CKT:150% of protected line reactance/resistance
				R2G	59.86	43.66	
				R2Ph	59.86	32.75	
				tZ2	0.50	0.35	-
			Zone 3	Z3 Ph Reach	190.50	230.35	120% of(protected line reactance + remote end longest line reactance)
				R3G	59.86	43.66	
				R3Ph	59.86	32.75	
				tZ3	0.80	1.50	
			Zone 4	R4G	59.86	43.66	It was observed that if protected line length is more than 100 km then the reactance of Zone RV is 10% of line reactance
				R4Ph	59.86	32.75	
				tZ4	1.00	0.50	
			Power Swing	ΔR or R5	37.95	8.73	-
				ΔX or Z5	37.95	8.73	

1	765kv Lalitpur-Agra / Fatehabad Ckt 2	Distance Main-1	ZONE 1	X0PE	252.53	205.58	80% of the protected line reactance / resistance & Resistive Reach as per NRPC Guidelines for REL 670
				R0PE	63.33	50.87	
				RFFWPP	20.00	30.00	
			ZONE 2	X1FwPP	142.74	114.77	For Single CKT:120% and for Double CKT:150% of protected line reactance/resistance & Resistive Reach as per NRPC Guidelines for REL 670
				X0PE	473.50	308.37	
				R0PE	118.74	76.30	
				RFFWPP	20.00	60.00	
				RFFWPE	50.00	75.00	
				tPP	0.50	0.35	-
				tPE	0.50	0.35	-
			ZONE 3	X1FwPP	190.32	230.16	120% of(protected line reactance + remote end longest line reactance) & Resistive Reach as per NRPC Guidelines for REL 670
				R1PP	7.66	9.18	
				X0PE	631.32	618.41	
				R0PE	158.32	153.01	
				RFFWPP	20.00	75.00	
				RFFWPE	50.00	125.00	
				tPP	0.80	1.50	-
				tPE	0.80	1.50	-
			Zone 5	X0PE	31.57	25.70	It was observed that if protected line length is more than 100 km then the reactance of Zone RV is 10% of line reactance & Resistive Reach as per NRPC Guidelines for REL 670
				R0PE	7.92	6.36	
				RFFWPP	20.00	60.00	
				RFFWPE	50.00	75.00	
				tPP	1.00	0.50	-
				tPE	1.00	0.50	-
			ZPSB (Power Swing)	X1InFw	209.36	253.18	-
				R1L1n	8.42	9.18	-
				R1F1nFw	22.00	82.50	-
				RLdOutFw	354.04	74.82	-
				RLdOutRw	354.04	74.82	-
				KLdRFw	0.90	0.75	-
		Distance Main-2	Zone 1	R1G	59.86	43.66	80% of the protected line reactance / resistance
				R1Ph	59.86	30.00	
			Zone 2	Z2 Ph Reach	142.80	114.86	For Single CKT:120% and for Double CKT:150% of protected line reactance/resistance
				R2G	59.86	43.66	
				R2Ph	59.86	32.75	
				tZ2	0.50	0.35	-
			Zone 3	Z3 Ph Reach	190.50	230.35	120% of(protected line reactance + remote end longest line reactance)
				R3G	59.86	43.66	
				R3Ph	59.86	32.75	
				tZ3	0.80	1.50	-
			Zone 4	R4G	59.86	43.66	It was observed that if protected line length is more than 100 km then the reactance of Zone RV is 10% of line reactance
				R4Ph	59.86	32.75	
				tZ4	1.00	0.50	-
			Power Swing	ΔR or R5	37.95	8.73	-
				ΔX or Z5	37.95	8.73	

2	220kv Lalitpur-Dunara Ckt#01	Distance-1	ZONE 1	RFFWPP	20.00	30.00	Resistive Reach as per NRPC Guidelines for REL 670
				RFFWPE	50.00	50.00	
			ZONE 2	X1FwPP	39.94	55.41	For Single CKT:120% and for Double CKT:150% of protected line reactance/resistance & Resistive Reach as per NRPC Guidelines for REL 670
				R1PP	7.98	11.08	
				X0PE	169.33	166.28	
				R0PE	36.70	33.24	
				RFFWPP	20.00	60.00	
				RFFWPE	50.00	75.00	
				tPP	0.35	0.50	-
				tPE	0.35	0.50	-
			ZONE 3	X1FwPP	42.94	63.06	120% of(protected line reactance + remote end longest line reactance) & Resistive Reach as per NRPC Guidelines for REL 670
				R1PP	8.58	12.60	
				X0PE	128.87	189.23	
				R0PE	25.76	37.83	
				RFFWPP	20.00	75.00	
				RFFWPE	50.00	125.00	
				tPP	1.00	1.50	-
				tPE	1.00	1.50	-
			ZONE 5	X1FwPP	0.50	7.39	It was observed that if protected line length is less than 100 km then the reactance of Zone RV is 20% of line reactance & Resistive Reach as per NRPC Guidelines for REL 670
				R1PP	0.10	1.48	
				X0PE	6.75	22.17	
				R0PE	0.50	4.43	
				RFFWPP	1.00	60.00	
				RFFWPE	1.00	75.00	
				tPP	1.00	0.50	-
				tPE	1.00	0.50	-
			ZPSB (Power Swing)	X1InFw	47.23	69.36	-
				R1L1n	8.58	12.60	-
				R1F1nFw	22.00	82.50	-
				RLdOutFw	78.43	74.82	-
				RLdOutRw	78.43	74.82	-
				KLdRFw	0.59	0.75	-
			Auto reclose	RREC	Off	ON	-
		Distance Main-2	Zone 1	R1G	33.87	6.99	80% of the protected line reactance / resistance
				R1Ph	25.40	5.24	
			Zone 2	Z2	16.29	22.60	For Single CKT:120% and for Double CKT:150% of protected line reactance/resistance
				R2G	33.87	6.99	
				R2Ph	25.88	5.24	
				tZ2	0.35	0.50	-
			Zone 3	Z3	17.52	25.72	120% of(protected line reactance + remote end longest line reactance)
				R3G	33.87	6.99	
				R3Ph	25.40	5.24	
				tZ3	1.00	1.50	-
			Zone 4	Z4	2.41	1.21	It was observed that if protected line length is less than 100 km then the reactance of Zone RV is 20% of line reactance & Resistive Reach
				R4G	33.87	6.99	
				R4Ph	25.40	5.24	
				tZ4	1.00	0.50	-
			Power Swing	Delta R	5.08	1.40	-
				Delta X	5.08	1.40	

3	220kV LALITPUR-BABINA CKT#01	Distance Main-1	ZONE 1	X1FwPP	29.55	19.32	80% of the protected line reactance / resistance & Resistive Reach as per NRPC Guidelines for REL 670
				R1PP	5.91	3.86	
				X0PE	88.68	57.97	
				R0PE	17.73	11.59	
				RFFWPP	20.00	30.00	
			ZONE 2	X1FwPP	39.94	36.22	For Single CKT:120% and for Double CKT:150% of protected line reactance/resistance & Resistive Reach as per NRPC Guidelines for REL 670
				X0PE	169.33	108.68	
				R0PE	36.70	21.73	
				RFFWPP	20.00	60.00	
				RFFWPE	50.00	75.00	
				tPP	0.35	0.50	-
				tPE	0.35	0.50	-
			ZONE 3	X1FwPP	42.94	47.70	120% of(protected line reactance + remote end longest line reactance) & Resistive Reach as per NRPC Guidelines for REL 670
				R1PP	8.58	9.54	
				X0PE	128.87	143.15	
				R0PE	36.70	28.62	
				RFFWPP	20.00	75.00	
				RFFWPE	25.76	125.00	
				tPP	1.00	1.50	-
				tPE	1.00	1.50	-
			ZONE 5	X1FwPP	0.50	4.83	It was observed that if protected line length is less than 100 km then the reactance of Zone RV is 20% of line reactance & Resistive Reach as per NRPC Guidelines for REL 670
				X0PE	6.75	14.49	
				R0PE	0.50	2.90	
				RFFWPP	1.00	60.00	
				RFFWPE	1.00	75.00	
				tPP	1.00	0.50	-
				tPE	1.00	0.50	-
			ZPSB (Power Swing)	X1InFw	47.23	69.36	-
				R1L1n	8.58	12.60	-
				R1F1nFw	22.00	82.50	-
				RLdOutFw	78.43	74.82	-
				RLdOutRw	78.43	74.82	-
				KLdRFw	0.58	0.75	-
			Auto reclose	RREC	Off	ON	-
		Distance Main-2	Zone 1	R1G	22.86	6.99	80% of the protected line reactance / resistance
				R1Ph	20.32	5.24	
			Zone 2	Z2	13.66	14.77	For Single CKT:120% and for Double CKT:150% of protected line reactance/resistance
				R2G	22.86	6.99	
				R2Ph	20.86	5.24	
			Zone 3	R3G	22.86	6.99	120% of(protected line reactance + remote end longest line reactance)
				R3Ph	20.32	5.24	
				tZ3	0.80	1.50	-
			Zone 4	R4G	22.86	6.99	It was observed that if protected line length is less than 100 km then the reactance of Zone RV is 20% of line reactance & Resistive Reach
				R4Ph	20.32	5.24	
				tZ4	1.00	0.50	-
			Power Swing	Delta R	4.06	2.80	-
				Delta X	4.06	2.80	

4	220kv Lalitpur-Kalyanpura Ckt 1 and 2	Distance Main-1	ZONE 2	X0PE	43.30	33.36	For Single CKT:120% and for Double CKT:150% of protected line reactance/resistance & Resistive Reach as per NRPC Guidelines for REL 670
				R0PE	9.23	6.67	
				RFFWPP	20.00	35.58	
				RFFWPE	50.00	40.02	
			ZONE 3	X1FwPP	14.82	17.79	120% of(protected line reactance + remote end longest line reactance) & Resistive Reach as per NRPC Guidelines for REL 670
				R1PP	2.96	3.56	
				X0PE	44.49	53.38	
				R0PE	8.89	10.67	
				RFFWPP	20.00	44.47	
				RFFWPE	50.00	66.71	
				tPP	1.00	1.50	-
				tPE	1.00	1.50	-
			ZONE 5	X1FwPP	1.19	1.48	It was observed that if protected line length is less than 100 km then the reactance of Zone RV is 20% of line reactance & Resistive Reach as per NRPC Guidelines for REL 670
				R1PP	0.24	0.30	
				X0PE	3.56	4.45	
				R0PE	7.11	0.89	
				RFFWPP	7.11	60.00	
				RFFWPE	5.33	75.00	
				tPP	1.00	0.50	-
				tPE	1.00	0.50	-
			ZPSB (Power Swing)	X1InFw	16.30	19.57	-
				R1L1n	2.96	3.56	-
				R1F1nFw	22.00	48.92	-
				RLdOutFw	78.43	74.82	-
				RLdOutRw	78.43	74.82	-
				KLdRFw	0.58	0.75	-
			Auto reclose	RREC	Off	ON	-
		Distance Main-2	Zone 1	R1G	33.87	6.99	80% of the protected line reactance / resistance
				R1Ph	25.40	5.24	
			Zone 2	R2G	33.87	6.99	For Single CKT:120% and for Double CKT:150% of protected line reactance/resistance
				R2Ph	25.40	5.24	
			Zone 3	Z3	6.05	7.26	120% of(protected line reactance + remote end longest line reactance)
				R3G	33.87	6.99	
				R3Ph	25.40	5.24	
				tZ3	1.00	1.50	-
			Zone 4	Z4	0.48	0.61	It was observed that if protected line length is less than 100 km then the reactance of Zone RV is 20% of line reactance & Resistive Reach
				R4G	33.87	6.99	
				R4Ph	25.40	5.24	
				tZ4	1.00	0.50	-
			Power Swing	Delta R	5.08	1.40	-
				Delta X	5.08	1.40	

NOTE:

1) For the calculation of resistive reach (Ph-Ph & Ph-Gnd) Arc Resistance and Tower footing resistance considered as 15 &10 respectively. If the Arc Resistance and Tower footing resistance value at the substation vary based on local substation condition, then all resistive reach (Ph-Ph & Ph-Gnd) same setting may be retained.

2) It is observed that the Auto reclosure function is kept OFF in all 220kV lines. It is recommended to ON the auto reclosure function. However, if this setting kept OFF intentionally based on local substation condition, then same may be retained.

Other Protection functionality for lines like SOTF, broken conductor, Voltage supervision, carrier protection, LBB are working satisfactory

3) Differential Protection, REF, HV & LV provided for ICT are stable and found in order

3) Differential Protection, REF provided for ICT's are stable and found in order

4) The performance of circuit breaker and relays is reviewed through provided commissioning/periodic testing reports collected during onsite Protection Audit. Their Performance is found stable and satisfactory

11.0 Review of reports

Review of test reports of CTs & CVTs:

Pre-commissioning test reports were provided for all relays and CTs & CVT and these were reviewed.

1. It is recommended by CPRI that report format need to be standardized, it may include calibration details, equipment's used & manufacture declared limit/range/tolerance or any specified by regulatory requirements of grid compliance/grid code. *M/s* LPGCL will incorporate the same.

2. It is recommended by CPRI that all the Numerical Protection IEDs shall be tested once in 3/4/5 years as per the best practices adopted by the other organization such as STU, PGCIL etc. *M/S* LPGCL noted.

3. It is recommended by CPRI that Relay Test System and other testing equipment must be calibrated from NABL Accreditated Laboratory & the calibration must include voltage, current, frequency, phase angle, power and time. The calibration point shall be decided as per the setting of Numerical Protection IEDs. M/s LPGCL noted.

Review of test reports of Circuit Breaker:

Test reports of all Circuit Breakers were provided and reviewed.

AGRA ZONE

AGRA DIVISION

Annexure-IX

REPORT OF PROTECTION AUDIT
Elect. Test & Commissioning Division, Agra
Elect. Test & Commissioning Sub-Division, 400 KV S/S Agra

S. no	Protection element	Deficiencies found	Action taken
1	400 KV UNNAO & FTBD 1	IDMT Dir E/F, PSB, VTFF, in M2 relay found disabled.	IDMT Dir. E/F settings updated, PSB was already enabled in Unnao and now enabled in FTBD I, VTFF was already enabled in Unnao and now enabled in FTBD I.
		VTFF time delay in M1 is 1s which must be 5s as per the norms.	1 sec is maximum limit of relay
		VTFF time delay in M1 is 1s which is also its max value limit in ziv make relay.	1 sec is maximum limit of relay
		Load enchroachment, PSB in M1 relay found disabled.	Load enchroachment and PSB function enabled in MI.
2	500 MVA ICT-I & II	As the CTR HV&LV is well above full load current. Thus in accordance to respective full load current, IDMT O/C PU is 0.77A in HV side and 0.66A in LV side. A similar approach for grading of other pickup values such as E/F IDMT, O/C HS& E/F HS may be adopted.	500 MVA ICT-I & II HV side and LV side IDMT O/C settings are 0.72 and 0.66; E/F IDMT 0.2A, E/F DMT and O/C DMT is 8A. Settings were recommended by then higher officers, and no false relay operation observed till date.
3	315 MVA ICT-III	As the CTR LV is well above full load current. Thus in accordance to respective full load current, IDMT O/C PU is 1.0A in LV side. A similar approach for grading of other pickup values such as E/F IDMT, O/C HS& E/F HS may be adopted.	315 MVA ICT-III HV and LV side O/C settings are 1.0A and 1.0A; E/F is 0.2A; E/F DMT and O/C DMT are 7A. These settings were updated on last audit and no false relay opeation observed till date.
4	160 MVA ICT I	As the CTR HV is 800/1. Thus in accordance to respective full load current, IDMT O/C PU is 0.52A. A similar approach for grading of other pickup values such as E/F IDMT, O/C HS& E/F HS may be adopted.	160 MVA ICT-I HV and LV side O/C settings are 0.52A and 0.87A; E/F is 0.2A; E/F DMT and O/C DMT are 9A. Settings were recommended by then higher officers, and no false relay operation observed till date.
5	22 KV IOCL I, IOCL II, GOKUL, AGRA I, & AGRA II	Zone 4 time delay found 500 ms which must be 450 ms. The same was corrected during protection audit.	Setting are updated as per audit recommendation.
		BRC delay is 3s which must be 5s as per the norms.	Setting are updated as per audit recommendation.
		VTFF in distance protection relay is either disabled or active with 10s delay. VTFF must be enabled in all distance protection relay with 5s delay.	Setting are updated as per audit recommendation.
6	132 KV SADABAD	Dir IDMT O/C in backup relay is set @1.1A PU & 0.19s TMS. It should be 1A PU. @0.24s TMS.	Setting are updated as per audit recommendation.
		Dir IDMT E/F in backup relay is set @0.2A PU & 0.2s TMS. It should be 0.2A PU. @0.24s TMS.	Setting are updated as per audit recommendation.
7	132 KV DAYALBAGH-I&II, ETMADPUR, BHIMNAGRI & TAJ	Dir IDMT O/C in backup relay is set @1.1A PU & 0.19s TMS. It should be 1A PU. @0.24s TMS. As per the norms.	Setting are updated as per audit recommendation.
		Dir IDMT E/F in backup relay is set @0.2A PU & 0.2s TMS. It should be 0.2A PU. @0.24s TMS. As per the norms.	Setting are updated as per audit recommendation.
8	20 MVA T/F	Dir IDMT O/C&E/F in HV backup relay is set @0.15s TMS. TMS should be @0.2s. As per the norms.	T/F is used as station transformer, and as per instructions of higher officers settings are adopted below then recommended.
		Dir IDMT O/C&E/F in LV backup relay is set @0.1s TMS. TMS should be @0.15s. As per the norms.	T/F is used as station transformer, and as per instructions of higher officers settings are adopted below then recommended.

PROTECTION AUDIT					
TRANSMISSION		**TRANSMISSION SW ZONE AGRA**			
SUBSTATION		**765KV S/S AGRA**			
SUBJECT		**DEFICIENCIES OBSERVED**			
REFERENCE					
DATE		**10.01.24**			
S.No.	**BAY NAME/BUS**	**VOLTAGE**	**PROTECTION /ELEMENT/ EQUIPMENTS/ SYSTEM AUDITED**	**SETTINGS**	**DEFICIENCIES/Non-conformities observed**
1	765kV LINES	765KV	765KV LALITPUR CKT 1&2	Settings enclosed as annexture A1	In Main 1 & Main 2 protection, over voltage protection is Ph-N. But as per guidelines, it should be Ph-Ph. Backup directional over current setting is 1.5A (pickup) at 0.1s DT delay, which is not as per the norms. DTPC not commissioned. Backup directional earth fault setting is 0.1A (pickup) at 0.295s TMS, which is not as per the norms. Present setting of Ph-N over voltage is 69.3V @ 6s delay for stage 1 & 95.3V @ 0.1s delay for stage 2(150%). As per guidelines, over voltage setting for stage 2 should be 140%.
2	765kV LINES	765KV	765KV Ghatampur & Gr Noida		In Main 1 & Main 2 protection, over voltage protection is Ph-N. But as per guidelines, it should be Ph-Ph. Carrier is unhealthy for both the lines. DTPC not commissioned in 765KV Gr. Noida line. Backup directional over current setting is 1.5A (pickup) at 0.1s DT delay, which is not as per the norms. Backup directional earth fault setting is 0.1A (pickup), which is not as per the norms. BRC delay is 15s which should be 5s as per the guidelines. SOTF delay is 10s which should be reduced as per the norms. Carrier aided scheme for 67/67N must be disabled which is currently ON- PUTT mode.
3	400kV LINES	400KV	400KV Agra Firozabad		In Main 1 & Main 2 protection, over voltage protection is Ph-N. But as per guidelines, it should be Ph-Ph. Backup directional over current setting is 1.5A (pickup) at 0.1s DT delay, which is not as per the norms. Backup directional earth fault setting is 0.1A (pickup), which is not as per the norms. Present setting of Ph-N over voltage is 69.3V @ 7s delay for stage 1 & 95.3V @ 0.1s delay for stage 2(150%). As per guidelines, over voltage setting for stage 2 should be 140%. Both M1 & M2 relays are of same make but as per the norms, they should be of different make. Carrier aided scheme for 67/67N must be disabled which is currently ON-PUTT mode.
4	400kV LINES	400KV	400KV Agra South 1		In Main 1 & Main 2 protection, over voltage protection is Ph-N. But as per guidelines, it should be Ph-Ph. Backup directional over current setting is 1.5A (pickup) at 0.1s DT delay, which is not as per the norms. Backup directional earth fault setting is 0.1A (pickup), which is not as per the norms. Present setting of Ph-N over voltage is 69.3V @ 5s delay for stage 1 & 95.3V @ 0.1s delay for stage 2(150%). As per guidelines, over voltage setting for stage 2 should be 140%. Both M1 & M2 relays are of same make but as per the norms, they should be of different make. Carrier aided scheme for 67/67N must be disabled which is currently ON-PUTT mode.
5	400kV LINES	400KV	400KV Agra pilipokhar-1		In Main 1 & Main 2 protection, over voltage protection is Ph-N. But as per guidelines, it should be Ph-Ph. Backup directional over current setting is 1.5A (pickup) at 0.1s DT delay, which is not as per the norms. Backup directional earth fault setting is 0.1A (pickup) at 0.595s TMS, which is not as per the norms. Present setting of Ph-N over voltage is 69.9V @ 5s delay for stage 1 & 95V @ 0.1s delay for stage 2(150%). As per guidelines, over voltage setting for stage 2 should be 140%.
6	400kV LINES	400KV	400KV Agra pilipokhar-2		In Main 1 & Main 2 protection, over voltage protection is Ph-N. But as per guidelines, it should be Ph-Ph. Backup directional over current setting is 1.5A (pickup) at 0.1s DT delay, which is not as per the norms. Backup directional earth fault setting is 0.1A (pickup) at 1.13s TMS, which is not as per the norms. Present setting of Ph-N over voltage is 69.9V @ 5s delay for stage 1 & 95V @ 0.1s delay for stage 2(150%). As per guidelines, over voltage setting for stage 2 should be 140%.
7	400kV LINES	400KV	400KV Manth Mathura 1 & 2		In Main 1 & Main 2 protection, over voltage protection is Ph-N. But as per guidelines, it should be Ph-Ph. Zone 2 time delay for circuit 1st is 0.5s but for circuit 2nd is 0.35s. This should be reviewed. Backup directional over current setting is 1.5A (pickup) at 0.1s DT delay, which is not as per the norms. Backup directional earth fault setting is 0.1A (pickup) at 0.52s TMS, which is not as per the norms. Present setting of Ph-N over voltage is 71.1V @ 6s delay for stage 1 & 95V @ 0.1s delay for stage 2(150%). As per guidelines, over voltage setting for stage 2 should be 140%.
8	400kV LINES	400KV	400KV PG line		In Main 1 & Main 2 protection, over voltage protection is Ph-N. But as per guidelines, it should be Ph-Ph. Carrier aided scheme for 67/67N must be enabled in POTT modefor such short line length, which is currently in PUTT mode. DTPC not commissioned. Backup directional over current setting is 1.5A (pickup) at 0.1s DT delay, which is not as per the norms. Backup directional earth fault setting is 0.1A (pickup) at 0.645s TMS, which is not as per the norms. Present setting of Ph-N over voltage is 69.9V @ 6s delay for stage 1 & 95V @ 0.1s delay for stage 2(150%). As per guidelines, over voltage setting for stage 2 should be 140%.
9	ICT	765KV/ 400KV	1500MVA ICT 1 & 2		Backup HV O/C setting IDMT: 0.74A (pickup) at 0.1s TMS & High set at 0.05s DT delay is not as per the norms. Backup HV E/F setting IDMT: 0.11A (pickup) at 0.16s TMS & High set at 0.05s DT delay is not as per the norms. Backup LV O/C setting IDMT: 0.94A (pickup) at 0.07s TMS & High set at 0.05s DT delay is not as per the norms. Backup LV E/F setting IDMT: 0.14A (pickup) at 0.05s TMS & High set at 0.05s DT delay is not as per the norms.

				Display of REF Is malfunctioning.
				REF setting is 180A primary which is equal to 0.06A secondary current which is not as per the norms.
10	REACTOR	765KV	3*80MVAR 765KV Lalitpur 1&2 line reactor	REF setting is 18A primary pickup current which is not as per the norms
				There is only one slope in differential, thus slope setting must be reviewed.
				As secondary settings are more reliable as compared to primary values. Thus, implementation of secondary settings must be done in REF relay.
11	REACTOR	765KV	3*80MVAR 765KV Gr. Noida & Ghatampur line reactor	REF setting is 15A (in Ghatampur), 18A (in Gr. Noida) primary pickup current which is not as per the norms.
				As secondary settings are more reliable as compared to primary values. Thus, implementation of secondary settings must be done in REF relay.
12	REACTOR	765KV	3*80MVAR 765KV BUS reactor	REF setting is 27A primary pickup current which is not as per the norms
				As secondary settings are more reliable as compared to primary values. Thus, implementation of secondary settings must be done in REF relay.
13	REACTOR	400KV	125MVAR 400KV Bus reactor	REF setting is 12A primary pickup current which is not as per the norms.
				As secondary settings are more reliable as compared to primary values. Thus, implementation of secondary settings must be done in REF relay.
14	BUS-BAR	765KV	765KV BUS BAR	Setting is 1A which is not in accordance to protection guidelines
15	BUS-BAR	400KV	400KV BUS BAR	Setting is 1A which is not in accordance to protection guidelines

S. No	BAY NAME/BUS	SYSTEM AUDITED	status observed
16	DC Status	DC E/F	NO (+ve to earth=115.1V & -ve to earth = 115.8V
		BATTERIES	Battery no 61 in battery bank no 1 is defective.
		CHARGERS	HEALTHY
17	ANALYSIS OF TRIPPINGS FROM JULY 2023	NO OF ELEMENTS TRIPPED MORE THAN 2 TIMES IN MONTH	NO OF ELEMENTS TRIPPED MORE THAN 2 TIMES IN A MONTH = 0
		MULTIPLE TRIPPINGS	MULTIPLE TRIPPINGS=0
		TRIPPINGS UNEXPLAINED	TRIPPINGS UNEXPLAINED=1
18	SPS/CB/CT/CVT /SEL	STATUS OF SPS	SPS INSTALLED AT LALITPUR END
		STSTUS OF CB TESTING	CHECKED IN R/T AND FOUND OK(not tested through CB Analyser)
		STSTUS OF CT/CVT	OK
		STSTUS OF SEL	OK(SCADA)
19	Remdial action taken on the observation made in previous protection audit (Internal/Tthird party)		enclosed as annexture in sheet A2

REPORT OF PROTECTION AUDIT

Electy . Test & Commissioning Division , Agra,

Electy . Test & commissioning SubDivision, Bah

S.NO.	Protection Element	Deficiencies Found	Action Taken
1	200 KV ORAI LINE	Main 2 Relay ABB Make appears to be defective	Main 2 defective ABB Relay Replaced with new ABB Relay
		BUS BAR not available hense ZONE 4 Setting is 160 mS	BUS BAR Pannel requirement sent to design circle by transmission wing
2	220 KV TBC	Backup Non Directional O/C setting is 5 Amp at 0 DT Delay	Settings Updated as per norms
		Backup Non Directional E/F setting is 2 Amp at 0 DT Delay, is not as per norms	Settings Updated as per norms
		CB Found unhealthy for tripping	Inform to Transmission wing for CB wiring Check
3	160 MVA T/F I & II	REF relay is found in Hang Position in both Tranformers	Inform to Transmission wing for resolve the relay hanging problem
		LV O/C & E/F feature is non directional in both Tranformers	No provision of PT in relay according to drawing due to this LV O/C & E/F feature is non directional
		HV O/C & E/F Relay in 160 MVA T/F II found in hang position	Inform to Transmission wing for resolve the relay hanging problem
4	132 KV BAH TSS	Backup IDMT O/C Setting is 1 Amp at .15 TMS is not as per the norms	Settings Updated as per norms
		Backup IDMT E/F setting is 0.2A at 0.2s TMS which is not as per norms	Settings Updated as per norms
5	132 KV FATEHBAD TSS	Backup IDMT O/C Setting is 1 Amp at .15 TMS is not as per the noms	Settings Updated as per norms
		Backup IDMT E/F setting is 0.2A at 0.2s TMS which is not as per norms	Settings Updated as per norms
6	40 MVA T/F II	LV TC 2 295 unheathy	Problem Resoleved
7	33 KV FEEDERS	Backup IDMT O/C & E/F TMS setting is 0.05 S TMS which must be 0.06 as per the Norms	Settings Updated as per norms

REPORT OF PROTECTION AUDIT

Electy . Test & Commissioning Division , Agra,

ETCU FIROZABAD

S.NO.	Name of S/S	Protection Element	Deficiencies Found	Action Taken
1	220kV S/S FIROZABAD	220KV FZD-MNP PG LINE	Main 2 relay is Defective.	Card damage & Informed to Trans. wing.
			Autoreclose is unhealthy.	PLCC prot.Pannel not commissioned.Informed to Trans.Wing
			PLCC is not commissioned.	Informed to Trans. wing.
			Zone 4 trip delay time is 250ms which must be 450ms as per Norms.	Zone 4 time is set as per Norms
			Dir.IDMT E/F TMS is 0.3s which must be 0.2s as per the Norms.	Settings Updated as per Norms
2		220KV FZD-FZD(400kV) PJFTL LINE	Carrier and DTPC unhealthy.	Informed to Trans. Wing & PJFTL.
			Autoreclose is unhealthy.	PLCC & DTPC Unhealthy.Informed to Trans. Wing & PJFTL.
			Zone 4 trip delay time is 250ms which must be 450ms as per Norms.	Zone 4 time is set as per Norms
			Dir.IDMT E/F TMS is 0.3s which must be 0.2s as per the Norms.	Settings Updated as per Norms
3		160MVA T/F	O/C HS P/U value in HV backup relay is 8.3A whereas E/F HS P/U is 3.5A	Settings Updated as per Norms
			O/C HS P/U value in LV backup relay is 8.5A whereas E/F HS P/U is 3.5A	Settings Updated as per Norms
4		150MVA T/F	O/C HS P/U value in HV backup relay is 8.3A whereas E/F HS P/U is 3.5A	Settings Updated as per Norms
			O/C HS P/U value in LV backup relay is 8.5A whereas E/F HS P/U is 3.5A	Settings Updated as per Norms
5		100MVA T/F	O/C HS P/U value in HV backup relay is 5.4A whereas E/F HS P/U is 3.5A	Settings Updated as per Norms
			O/C HS P/U value in LV backup relay is 5.6A whereas E/F HS P/U is 3.5A	Settings Updated as per Norms
6		132KV TUNDLA LINE	TMS in IDMT E/F is 0.15s it should be 0.24s as per the Norms.	Settings Updated as per Norms
			BRC is disabled & PSB is ON.As per the norms,PSB may be disabled & BRC may be enabled in 132kV line.	Settings Updated as per Norms
7		132KV PINHAT LINE	TMS in IDMT E/F is 0.2s it should be 0.24s as per the Norms.	Settings Updated as per Norms
			DC supervision fail alarm seen.It must be rectified at earliest.	Informed to Trans.Wing for wiring check.
8	220kV S/S SIRSAGANJ	220kV SRGJ-MNP UPPTCL LINE	E/F HS @5A PU current with 0 ms delay found. which is not as per the Norms.	Settings Updated as per Norms
			BRC is not enabled.	Settings Updated as per Norms
			PSB is set at block for all Zones.as per the Norms it should be blocked for all zones except Zone 1.	Settings Updated as per Norms
			be 450ms as per Norms. (for healthy Bus-Bar system)	Settings Updated as per Norms
9		220kV SRGJ-MNP PGCIL LINE	E/F HS @5A PU current with 0 ms delay found which is not as per the Norms.	Settings Updated as per Norms
			BRC is not enabled.	Settings Updated as per Norms
			PSB is set at block for all Zones.as per the Norms it should be blocked for all zones except Zone 1.	Settings Updated as per Norms
			be 450ms as per Norms. (for healthy Bus-Bar system)	Settings Updated as per Norms
10		220kV BUS-BAR	Bur-Bar relay not installed.	Informed to Trans.Wing & Requirement sent to Design Circle.
10		100MVA T/F-I	O/C HS P/U value in HV backup relay is 5.4A whereas E/F HS P/U is 3.5A	Settings Updated as per Norms
			O/C HS P/U value in LV backup relay is 5.6A whereas E/F HS P/U is 3.5A	Settings Updated as per Norms
11		100MVA T/F-II	O/C HS P/U value in HV backup relay is 5.4A whereas E/F HS P/U is 3.5A	Settings Updated as per Norms

		100MVA T/F-II	O/C HS P/U value in LV backup relay is 5.6A whereas E/F HS P/U is 3.5A	Settings Updated as per Norms
		132kV BUS-COUPLER	IDMT E/F is set at 0.4A pu@TMS0.35s.It should be0.2A as per Norms.	Settings Updated as per Norms
			O/C HS@ 5Apu & 0delay found in backup relay which is not as per Norms	Settings Updated as per Norms
			NO active O/C IDMT & HS stage found.	Settings Updated as per Norms
12	220kV S/S TUNDLA	220kV TUNDLA- AGRA PG LINE	VTFF is ON with 1s delay in M1 relay. It should be 5s as per the Norms.	Settings Updated as per Norms
			E/F is not enabled in both M1 & M2 relays.	Settings Updated as per Norms
			BRC dalay is 3s in M1 which must be 5s as per the Norms.	Settings Updated as per Norms
			Zone 4 trip delay time is 500ms which must be 450ms as per Norms.	Settings Updated as per Norms
13		220kV TUNDLA- FZD(400) PJFTL LINE	VTFF is ON with 1s dalay in M1 relay. It should be 5s as per the Norms.	Settings Updated as per Norms
			E/F is not enabled in both M1 & M2 relays.	Settings Updated as per Norms
			BRC dalay is 3s in M1 which must be 5s as per the Norms.	Settings Updated as per Norms
			Zone 4 trip delay time is 500ms which must be 450ms as per Norms.	Settings Updated as per Norms
14		132kV FARIHA,TUNDLA,TBC,BC & OTHER BAYS	Dir.IDMT E/F in Backup ralay is set @0.15s TMS.It should be 0.2A PU @0.24sTMS	Settings Updated as per Norms
15		132/33kV 40MVA T/F-I & II	TMS in HV O/C & E/F relay is 0.15s for both O/C&E/F.It should be 0.2s.	Settings Updated as per Norms
			TMS in LV O/C & E/F relay is 0.10s for both O/C&E/F.It should be 0.15s.	Settings Updated as per Norms

REPORT OF PROTECTION AUDIT

Electy . Test & Commissioning Division , Agra,

Electy . Test & commissioning SubDivision, Shamshabad

S.NO.	Protection Element	Deficiencies Found	Action Taken
1	220KV AGRA PG LINE	Zone 4 trip delay time is 200ms which must be 450ms as per Norms	Zone 4 time is set as per Norms
2	220KV AGRA (400) KV LINE	Zone 4 trip delay time is 200ms which must be 450ms as per Norms	Zone 4 time is set as per Norms
3	160MVA T/F I	Backup Directional IDMT E/F Setting is 0.3A(Pickup)at 0.3s TMS which is not as per Norms	Settings Updated as per Norms
		High Set in o/c & E/F Relay is 0.3s Which must be 0.25s as per Norms	Settings Updated as per Norms
4	160MVA T/F II	Backup Directional IDMT E/F Setting is 0.3A(Pickup)at 0.3s TMS which is not as per Norms	Settings Updated as per Norms
		High Set in o/c & E/F Relay is 0.3s Which must be 0.25s as per Norms	Settings Updated as per Norms
		REF relay not found in CRP	REF realy is inbuilt present in the diffrential relay
5	132KV Metro 1	Incorrect high set stage at 4.5A @150ms DT, 2A @2s DT& 3A @ 3s DT found in O/C	Settings Updated as per Norms
		incorrect high set stage at 4.5A @150ms DT found in o/c	Settings Updated as per Norms
6	132KV Metro 2	Incorrect high set stage at 4.5A @150ms DT, 2A @2s DT& 3A @ 3s DT found in O/C	Settings Updated as per Norms
		incorrect high set stage at 4.5A @150ms DT found in o/c	Settings Updated as per Norms
7	63 MVA T/F	Backup IDMT E/F setting is 0.2A at 0.2s TMS which is not as per norms	Settings Updated as per Norms
		Differential pickup current is 0.13A which is not as per the Norms	Settings Updated as per Norms
8	33 kv feeders	Backup IDMT O/C & E/F TMS setting is 0.05s TMS which must be 0.06 as per the Norms	Since relay are electromechanical & static type and TMS can only be changed in 0.05s Steps, same is informed to transmission wing for replacement of these relays with Numerical Relay
		High Set in o/c & E/F Relay is 0.05s Which must be 0.06s as per Norms	Since relay are electromechanical & static type so H/S delay provision is not present same is informed to transmission wing for replacement of these with Numerical Relay

REPORT OF PROTECTION AUDIT

Electy . Test & Commissioning Division , Agra,

Electy . Test & commissioning SubDivision, Sikandra

S.NO.	Protection Element	Deficiencies Found	Action Taken
1	220KV Saifai	Zone 4 trip delay time , BU Settings, BRC Delay and panel conditions	Panel, Relays CT, PT etc managed by PGCIL.
2	220 KV Auriya	Zone 4 trip delay time , BU Settings, BRC Delay and panel conditions	Panel, Relays CT, PT etc managed by PGCIL.
3	220 KV Agra 1st & 2nd	TC 2 Unhealthy	Corrected.
		AR not working	PLCC is not working at Both End
4	160MVA T/F 1&2	REF Relay malfunctioning & all other relays ar Electromechanical	All Relays are Electromechanical,work under process for panel replacement .
5	100MVA T/F	Backup DT E/F Setting is 4A for O/C & 2A for E/F & Delay is 0 which is not as per Norms	Settings Updated as per Norms
		REF Relay malfunctioning .	Bushing CTs are not available in T/F.
6	60 MVA T/F-1	NO high set stage for O/C & E/F & BU Settings are 1.1 for o/c & 0.3 for E/F which is not as per Norms	High set for O/C & E/F & BU Settings Updated as per Norms
7	132KV Railway 1	Zone-2 time delay, Zone 4 Time delay, VT FF time delayDT E/F settings, BU E/F Settings are not as per norms	Settings Updated as per Norms
		Bus PT is used in protection	Line PT connected
8	132KV Railway 2	Bus PT is used in protection	Line PT connected
		BU O/c settings is 1A & tms is 0.15, which is not as per norms	Settings Updated as per Norms
9	63 MVA T/F1&2	All other relays ar Electromechanical	All Relays are Electromechanical,Panels are not avalaible.

Action Taken Report of Internal Protection Audit- 2024

Name of Division :- **Electricity Test & Commissiong Division, Aligarh** **Date** **08.08.2024**

S.No.	Name of Transmission Division	Name of Substation	Name of element	Defficiency found	Action Taken	Remark
1	ETD-I Aligarh	220kV S/S Boner	Auto reclose	As per SOP the dead time should be 1.0 sec.	The dead time of A/R is changed to 1.0 sec as per SOP	
			Circuit Breaker	Found healthy and testing is not done in yaer 2023	To be done by Transmission wing. Informed to transmission wing.	
2	ETD-II Aligarh	220kV S/S Sikandrarao	220kv Aligarh-I line	Backup E/F Found desable.	Backup E/F is make Enabled.	
				A/R dead Time found 0.6 sec. whereas it should be 1.0 sec	A/R dead time is changed to 1.0 sec as per SOP.	
			220kv Aligarh-II line	Backup E/F Found desable.	Backup E/F is make Enabled.	
				A/R dead Time found 0.6 sec. whereas it should be 1.0 sec	A/R dead time is changed to 1.0 sec as per SOP.	
			220kv Harduaganj line	Backup E/F Found desable.	Backup E/F is make Enabled.	
				A/R dead Time found 0.6 sec. whereas it should be 1.0 sec	A/R dead time is changed to 1.0 sec as per SOP.	
			220kv Kasganj line	Backup E/F Found desable.	Backup E/F is make Enabled.	
				A/R dead Time found 0.6 sec. whereas it should be 1.0 sec	A/R dead time is changed to 1.0 sec as per SOP.	
			160 MVA ICT-I	Low set TMS value of ICT-I & II at LV side found 0.25 as per SOP it is 0.2	TMS of E/F is changed to 0.2 as per SOP	
			160 MVA ICT-II	Low set TMS value of ICT-I & II at HV side found 0.25 as per SOP it is 0.3	Low set TMS value of ICT-I & II at HV side is 0.25 as per SOP.	
			Circuit Breaker	Found healthy and testing is not done in yaer 2023	To be done by Transmission wing. Informed to transmission wing.	
3	ETD-1 ALIGARH	220 KV SUBSTATION KHAIR	220 KV KHAIR Meetai Line	Zone-4 Setting need changed as per SOP	Zone-4 setting changed as per SOP	
			BAS BAR Protection	Installed but In-operational since 27.05.2022	To be done by Trasmission wing	
			GPS CLOCK	Healthy But Relay is not Synchronised	Relays are Synchronised to GPS	
			220 KV KHAIR Akarabad Line	Review of Zone-4 Sett. As per Sop requried	Zone-4 setting changed as per SOP	
			Circuit Breaker	Found Healthy &testing not done in year 2023	To be done by Trasmission wing. Inform to Transmission	
			DC leakage	DC Leakage found in Battery Set 1 & Battery Set 2	DC leakage Fault is resolved.	
			132 KV Cap. Bank	Not healthy due to C.B. Defective	C. B. Replaced (Healthy)	

4	ETD-2 ALIGARH	220 KV SUBSTATION ATRAULI	220 KV HDJ LINE	Back UP E/F TMS Found 0.35 it can be done 0.2	TMS of E/F is changed to 0.2 as per SOP	
				A/R DEAD TIME 0.6 SEC WHERE AS IT SHOULD 1 SEC	A/R DEAD Time of Relay as per SOP 1.0 sec.	
			220 KV NAPP LINE	Back UP E/F TMS Found 0.35 it can be done 0.2	TMS of E/F is changed to 0.2 as per SOP	
				A/R DEAD TIME 0.6 SEC WHERE AS IT SHOULD 1 SEC	PD Relay has max. time delay 1.0 Sec. Therefore dead time of A/R can not be changed to 1.0 sec. in relay	
			220 KV ALIGARH-1 LINE	Back UP E/F TMS Found 0.35 it can be done 0.2	TMS of E/F is changed to 0.2 as per SOP	
				A/R DEAD TIME 0.6 SEC WHERE AS IT SHOULD 1 SEC	PD Relay has max. time delay 1.0 Sec. Therefore dead time of A/R can not be changed to 1.0 sec. in relay	
			220 KV ALIGARH-2 LINE	Back UP E/F TMS Found 0.35 it can be done 0.2	TMS of E/F is changed to 0.2 as per SOP	
				A/R DEAD TIME 0.6 SEC WHERE AS IT SHOULD 1 SEC	PD Relay has max. time delay 1.0 Sec. Therefore dead time of A/R can not be changed to 1.0 sec. in relay	
			circuit Breaker	Found Healthy &testing not done in year 2023	To be done by Trasmission wing. Inform to Transmission wing.	
			GPS Clock	Relay not synchronise	To be done by Trasmission wing. Inform to Transmission wing.	
5	400KV Aligarh	400KV Aligarh	SPS	Not Avilable	Inform To transmmision Wing	
			Event Loggger	Not Avilable	Inform To transmmision Wing	Events are Received From SCADA System
			REF Relay	Testing is Not Done in ICT-I,II & III.	-	-
			Over Flux	Testing is Not Done in ICT-I,II & III.	-	-
			PLCC 220KV Khair	PLCC Change & found unhealthy.	Inform To Related SDO Trans.400kv s/s Aligarh	
			PLCC 220KV Sikandra Rao-1	PLCC Change & found unhealthy.	Inform To Related SDO Trans.400kv s/s Aligarh	
			PLCC 220KV Sikandra Rao-2	PLCC Change & found unhealthy.	Inform To Related SDO Trans.400kv s/s Aligarh	
			PLCC 220KV Boner-1	PLCC Change & found unhealthy.	Inform To Related SDO Trans.400kv s/s Aligarh	
			PLCC 220KV Atrauli-1	PLCC Change & found unhealthy.	Inform To Related SDO Trans.400kv s/s Aligarh	
			PLCC 220KV Atrauli-2	PLCC Change & found unhealthy.	Inform To Related SDO Trans.400kv s/s Aligarh	
			500 MVA ICT-I	As per SOP HV side Dir. O/C, E/F low set can be done 0.3 and LV side 0.25	To be Discussed	
			315 MVA ICT-II	As per SOP HV side Dir. O/C, E/F low set can be done 0.3 and LV side 0.26	To be Discussed	

			500 MVA ICT-III	As per SOP HV side Dir. O/C, E/F low set can be done 0.3 and LV side 0.27	To be Discussed	
6	ETD-Mainpuri	220 KV SUBSTATION Mainpuri	220 KV Mainpuri-Saifai Line	A/R Not Enabled	Relay Panel Replaced With M-1,M-2 A/R Enebale	
			220 KV Mainpuri-PG Mainpuri Line	Trip Circuit-1,Unhealthy	Problem resolved	
			220 KV Mainpuri-PG Mainpuri Line	A/R Dead TIME Should be 1 Sec. & BRC Time Should be 5 Sec.	Setting Updated As par Norms	
			220 KV Mainpuri-PG Kanpur Line	A/R Dead TIME Should be 1 Sec. & BRC Time Should be 5 Sec.	Setting Updated As par Norms	
			Backup E/F	backup E/F Should be 0.2 in All 220 KV Lines	Setting Updated As par Norms	
			GPS CLOCK	Healthy But Relay is not Synchronised	Inform to Transmission Wing to Laying New Cable in All Panel.	
			Event logger	Not Installed	Inform to Transmission Wing.	
			DC leakage	DC Leakage found in Battery Set 1 & Battery Set 2	DC leakage Fault is resolved.	
			160 MVA T/F (EMCO)	O/C Set TMS Found 0.3 it Should be 0.25 Sec.	Setting Updated As par Norms	
7	ETD-Mainpuri	220 KV SUBSTATION Etah	220 KV Etah-PG Mainpuri Line	A/R Dead TIME Should be 1 Sec. & BRC Time Should be 5 Sec.	Setting Updated As par Norms	
			220 KV Etah-Harduaganj Line	A/R Dead TIME Should be 1 Sec. & BRC Time Should be 5 Sec.	Setting Updated As par Norms	
			160 MVA T/F-1 (EMCO)	Testing Not Done	Testing Done On 10-01-2024	
			160 MVA T/F-2 (BHEL)	Testing Not Done	Testing Done On 10-01-2024	
				Main-II (Dist. Prot.)Relay Required as Par Prot. Scheme in Both 220 KV Line	To be done by Trasmission wing. Inform to Transmission	
			Status of SPS	Installed But Not Healthy	Inform by Transmission,it is Not Workingt Since Long And deffective	
			GPS Clock	Relay not synchronised	To be done by Trasmission wing. Inform to Transmission for New Cables in All Panels	
			Event logger	Not Installed	Inform to Transmission Wing	
			DC leakage	DC Leakage found in Battery Set 1 & Battery Set 2	DC leakage Fault is resolved.	
8	ETD-Mainpuri	220 KV SUBSTATION Kasganj (Soron)	220 KV Kasganj-JTPS Line	BRC Time Should be 5 Sec.	Setting Updated As par Norms	
			220 KV Kasganj-Sikandra Rao Line	BRC Time Should be 5 Sec.	Setting Updated As par Norms	
			160 MVA T/F-1	HV Side Dir. O/C, Low set TMS found 0.3 sec it should be0.25sec HV Side, O/C low set TMS found 0.25sec it should be 0.20S, review of HS Value required	Setting Updated As par Norms	

		Kasganj (SUPUR)	160 MVA T/F-2	HV Side Dir. O/C, Low set TMS found 0.3 sec it should be0.25sec HV Side, O/C low set TMS found 0.25sec it should be 0.20S, review of HS Value required	Setting Updated As par Norms	
			DC leakage	DC Leakage found in Battery Set 1 & Battery Set 2	DC leakage Fault is resolved.	

(Surbhi Rajput)
Executive Engineer

KANPUR -I DIVISION

REPORT OF PROTECTION AUDIT

Electy . Test & Commissioning Division - I Panki , Knapur

Name of S/S - 220KV Phoolbagh

S.NO.	Protection Element	Deficiencies Found	Action Taken
1	220 KV UNNAO LINE 1	CARRIER PROTECTION UNHEALTHY/DTPC NOT WORKING FOR PERMISSIVE	Informed to Maintenance wing for arranging the DTPC card .
2	220 KV UNNAO LINE 2	CARRIER PROTECTION UNHEALTHY/DTPC NOT WORKING FOR PERMISSIVE	Informed to Maintenance wing for arranging the DTPC card .
3	60MVA T/F I	Deficiency not found	
4	60MVA T/F II	Deficiency not found	
S.No.	**Bay name /Bus**	**Status Observed**	
1	Status of Bus Bar	FUNCTIONAL	
2	DC staus	DC EARTH FAULT : YES (-ve to earth -78.0V while +ve to earth is 39.9 V) for 110 V Set-1, (-ve to earth -39.4V while +ve to earth is 81.3V) for 110 V Set-2 , 48V BATTERIES CHARGER NOT AVAILABLE	Problem resolved. New D.C. status as below- (-ve to earth -64.80V , +ve to earth is 56.20V for 110 V Set-1, (-ve to earth -55.6V , +ve to earth is 66.50V) for 110 V Set-2. 48 V battery charger is not required.
3	Staus of C.B. timing	CIRCUIT BREAKER TIMING HAS NOT BEEN TAKEN ON YEARLY BASIS	Informed to Maintenance wing .
4	Staus of SEL	Healthy	
5	Status of CT/CVT	ok	

REPORT OF PROTECTION AUDIT

Electy . Test & Commissioning Division - I Panki , Knapur

Name of S/S - 220KV Sikandara

S.NO.	Protection Element	Deficiencies Found	Action Taken
1	220 KV ORAI LINE	PLCC DEFECTIVE/CARRIER PROTECTION UNHEALTHY	Panel is there but not commissioned. Informed to Maintenance wing for commissioning of it.
		A/R PROTECTION ONLY WORKING ON R PHASE	A/R cable traced from relay panel to circuit breaker , it is found ok. It is the problem of breaker so informed to maintenance wing.
		BRC PROTECTION SETTINGS ARE DISABLED OR NOT CONFIGURED	BRC function is not available in relay. Informed to maintenance team for configuring this function in relay.
		THERE IS ONLY SINGLE MAIN AND BACKUP PROTECTION RELAY	Informed to maintenance team for arranging and installing Main-1 & Main -2 protection scheme for 220 KV lines.
2	220KV PG (Bhauti) LINE	PLCC DEFECTIVE/CARRIER PROTECTION UNHEALTHY	Panel is there but not commissioned. Informed to Maintenance wing for commissioning of it.
		A/R PROTECTION ONLY WORKING ON R PHASE	A/R cable traced from relay panel to circuit breaker , it is found ok. It is the problem of breaker so informed to maintenance wing.
		BRC PROTECTION SETTINGS ARE DISABLED OR NOT CONFIGURED	BRC function is not available in relay. Informed to maintenance team for configuring this function in relay.
		THERE IS ONLY SINGLE MAIN AND BACKUP PROTECTION RELAY	Informed to maintenance team for arranging and installing Main-1 & Main -2 protection scheme for 220 KV lines.

3	160MVA T/F I	OVERFLUX PROTECTION SETTINGS ARE DISABLED OR NOT CONFIGURED	Informed to Maintenance wing for Shut down to configure the Overflux settings
4	160MVA T/F II	OVERFLUX PROTECTION SETTINGS ARE DISABLED OR NOT CONFIGURED	Informed to Maintenance wing for Shut down to configure the Overflux settings
S.No.	**Bay name /Bus**	**Status Observed**	
1	Status of Bus Bar	FUNCTIONAL	
2	DC staus	Deficiency not found	
3	Staus of C.B. timing	CIRCUIT BREAKER TIMING HAS NOT BEEN TAKEN ON YEARLY BASIS	Informed to Maintenance wing .
4	Staus of SEL	Healthy	
5	Status of CT/CVT	ok	

REMEDIAL ACTION ON PROTECTION AUDIT 2024 OBSERVATION

400 KV SUBSTATION PANKI, KANPUR.

S. NO.	BAY NAME/BUS	VOLTAGE	PROTECTION/ELEMENT/EQUIPMENTS/SYSTEM AUDITED	DIFFICIENCIES/NON-CONFORMITIES OBSERVED	STATUS OF REMEDIAL ACTION.
1	400 KV BAYS	400 KV	400 KV Aligarh	Both main1 & main2 protection relay have Siemens 7SA611 relay.	Information for differentiate the both M1 & M2 relay with different make conveyed to transmission wing.
				BRC Protn. setting are not enabled/configured in both Main1 & Main2 relay.	BRC Protn. setting is not configured in both Main1 & Main2 relay as this binary input setting will be configured by particular service enginner.
				Load Encroachment settings/features are not enabled or configured.	Load Encroachment settings is not configured in both M1 & M2 relay as the setting will be configured by particular service engineer. In SOP this particular setting delais are not available.
2	400 KV BAYS	400 KV	400 KV Rewa Road	Backup Earth Fault protection disabled in both Main1 & Main2 relays.	Backup Earth Fault protection setting is now enabled in Main1 relay.
				Over Voltage protection Stage2 setting are not enabled.	Over Voltage protection Stage2 setting is enabled now.
				Load Encroachment settings/features are not enabled or configured.	Load Encroachment settings is not configured in both M1 & M2 relay as the setting will be configured by particular service engineer. In SOP this particular setting delais are not available.
3	400 KV BAYS	400 KV	400 KV Unnao	Backup Earth Fault protection disabled in both Main1 & Main2 relays.	Backup Earth Fault protection setting is now enabled in Main1 relay.
				Load Encroachment settings/features are not enabled or configured.	Load Encroachment settings is not configured in both M1 & M2 relay as the setting will be configured by particular service engineer. In SOP this particular setting delais are not available.
4	400 KV BAYS	400 KV	400 KV Fatehpur-1 PGCIL	Load Encroachment settings/features are not enabled or configured.	Load Encroachment settings is not configured in both M1 & M2 relay as the setting will be configured by particular service engineer. In SOP this particular setting delais are not available.
5	400 KV BAYS	400 KV	400 KV Fatehpur-2 PGCIL	Load Encroachment settings/features are not enabled or configured.	Load Encroachment settings is not configured in both M1 & M2 relay as the setting will be configured by particular service engineer. In SOP this particular setting delais are not available.
6	400 KV BAYS	400 KV	400 KV PTPS-1	Load Encroachment settings/features are not enabled or configured.	Load Encroachment settings is not configured in both M1 & M2 relay as the setting will be configured by particular service engineer. In SOP this particular setting delais are not available.
7	400 KV BAYS	400 KV	400 KV PTPS-2	Load Encroachment settings/features are not enabled or configured.	Load Encroachment settings is not configured in both M1 & M2 relay as the setting will be configured by particular service engineer. In SOP this particular setting delais are not available.
8	ICT	400/220KV	500 MVA ICT-1		
9	ICT	400/220KV	315 MVA ICT-2		
10	REACTOR	400 KV	400 KV Aligarh Line Reactor	400 KV Line reactor Backup Impedance relay, EE make had been taken out since long.	Information for not availability of Backup Impedance relay of Aligarh line reactor had been already conveyed to transmission wing for necessary action.

S. NO.	BAY NAME/BUS	EQUIPMENTS/SYSTEM AUDITED	Status Observed	STATUS OF REMEDIAL ACTION.
	STATUS OF BUSBAR		400 KV Busbar protection is having EE make Electromechanical relays	Busbar protection numerical relays panel already came in 400 KV S/S but commissioning work not started yet. Information for replacement of electromechanical busbar protection panel to numerical relays panel conveyed to transmission wing.
11	DC STATUS	DC E/F	(a). Yes (-ve to earth = -86V while +ve to earth =148V) (b).220V DC Supply in 400 KV TBC control panel meant for TC1 and TC2 has also been used for BBP, alarm & annunciation.	(a). -ve to earth = -86V while +ve to earth =148V (b). For separate DC information conveyed to transmission wing and they informed T&C that there is no spare/space in DCDB for separating the DC supply.
		Batteries	Healthy	
		Chargers	Healthy	
12	ANALYSIS OF TRIPPING FROM JULY 2023	Number of elements tripped more than 2 times in a month	0	
		Multiple trippings	2	
		Tripping Un-explained	0	
13	SPS/CB/CT/CVT/SEL	Status of SPS	Not Available	
		Status of CB testing	(a). 400 KV ICT-1 & 2 CBs are having PIR (b). Annual timing of 400 KV CBs of Aligarh, Rewa Road, Unnao, 315 MVA ICT-2, 500 MVA ICT-1 and Bus Coupler bay have not been taken.	(a). For replacement of PIR CB to Non-PIR CB in both ICTs conveyed to transmission wing. (b). Information for performing CBs timing conveyed to transmission wing.
		Status of CT/CVT	400 KV Bus-1 R-phase CVT is having 0.5 accuracy class.	Information for replacement of 0.5 accuracy class CVT by 0.2 class CVT conveyed to transmission wing
		Status of SEL	Not working properly.	Information for rectification of existing problems conveyed to transmission wing.

REPORT OF PROTECTION AUDIT

Electy . Test & Commissioning Division - I Panki , Knapur

Name of S/S - 220KV kidwai nagar

S.NO.	Protection Element	Deficiencies Found	Action Taken
1	220 KV kidwai nagar- (PGCIL) Line	AR Disable	There is 220 KV HT Cable used in Line, therefore AR Disable
2	220 KV kkidwai nnagar Panki line Line	AR Disable	
3	220 KV BusBar	out of service (Due to relay defective)	repaired relay installed on 09/04/2024, BusBar protection is in service

Name of S/S - 220KV S/S bithoor

S.NO.	Protection Element	Deficiencies Found	Action Taken
1	220 KVMetro Line-1	AR Disable	There is 220 KV HT Cable used in Line, therefore AR Disable
2	220 KVMetro line-2	AR Disable	
3	220 KV Panki Line	AR Disable	Not in Scheme
4	220 KV Unnao Line	AR Disable	

Name of S/S - 220KV S/S Panki

S.NO.	Protection Element	Deficiencies Found	Action Taken
1	220 KV BusBar	Unhealthy	Inform to transmission wing, under progress
2	220 KV Rania Line	AR Disable	all O/c & E/F Relay needs to replaced by main 2 (distance relay) After installation of Relays AR Wiil be Enable. Work in Progress
3	220 KV Kidwai nagar line	AR Disable	
4	220 kv kanpur South Line	AR Disable	
5	220 KV Bithoor Line	AR Disable	
6	220 kv RPH Line	AR Disable	
7	220 kV Chibra mau Line	AR Disable	

REPORT OF PROTECTION AUDIT

Electy . Test & Commissioning Division - I Panki , Knapur

Name of S/S - 220KV Rania

S.NO.	Protection Element	Deficiencies Found	Action Taken
1	220 KV Rania-Panki LINE	PLCC DEFECTIVE/CARRIER PROTECTION UNHEALTHY	Informed to Maintenance wing for replacement of PLCC panel
		BACKUP EARTHFAULT SETTINGS ARE DISABLED OR NOT CONFIGURED/RELAY NOT AVALIABLE	Already Main-1 & Main-2 Distance relays are there . No need of Back Up earth fault relay when two distance relays are installed.
2	220KV PG (Bhauti) LINE	PLCC DEFECTIVE/CARRIER PROTECTION UNHEALTHY	Informed to Maintenance wing for replacement of PLCC panel
		BACKUP EARTHFAULT SETTINGS ARE DISABLED OR NOT CONFIGURED/RELAY NOT AVALIABLE	Already Main-1 & Main-2 Distance relays are there . No need of Back Up earth fault relay when two distance relays are installed.
3	100 MVA T/F I	OVERFLUX PROTECTION SETTINGS ARE DISABLED OR NOT CONFIGURED	Informed to Maintenance wing for Shut down to configure the Overflux settings
4	100 MVA T/F II	OVERFLUX PROTECTION SETTINGS ARE DISABLED OR NOT CONFIGURED	Informed to Maintenance wing for Shut down to configure the Overflux settings
5	100 MVA T/F III	OVERFLUX PROTECTION SETTINGS ARE DISABLED OR NOT CONFIGURED	Informed to Maintenance wing for Shut down to configure the Overflux settings

		LBB Protection not configured in 100 MVA ICT-3	Informed to Maintenance wing for configure the LBB settings in the relay by Engineer.
S.No.	**Bay name /Bus**	**Status Observed**	
1	Status of Bus Bar	FUNCTIONAL BUT IN 100MVA ICT-3RD HAS NOT BEEN INCORPORATED	Informed to Maintenance wing for configure the LBB settings in the relay by Engineer.
2	DC staus	Deficiency not found	
3	Staus of C.B. timing	CIRCUIT BREAKER TIMING HAS NOT BEEN TAKEN ON YEARLY BASIS	Informed to Maintenance wing .
4	Staus of SEL	Healthy	
5	Status of CT/CVT	ok	

REPORT OF PROTECTION AUDIT

Electy . Test & Commissioning Division - I Panki , Knapur

Name of S/S - 220KV RPH

S.NO.	Protection Element	Deficiencies Found	Action Taken
1	220 KV PANKI LINE	CARRIER PROTECTION UNHEALTHY	Due to defective PLCC panel.Informed to Maintenance wing for replacement of PLCC panel
		A/R UNHEALTHY	Cables are not there for A/R from relay to Circuit breaker, Informed to maintenance team for arranging and laying the cable.
		BACKUP-EARTHFAULT SETTINGS ARE DISABLED OR NOT CONFIGURED/RELAY NOT AVAILABLE	Not applicable because of Main-1 & main-2 Distance relay scheme is there.
		TESTING NOT DONE IN 2023	Testing done on date 15.05.2024
2	220 KV UNNAO LINE	CARRIER PROTECTION UNHEALTHY	Due to defective PLCC panel.Informed to Maintenance wing for replacement of PLCC panel
		A/R UNHEALTHY	Cables are not there for A/R from relay to Circuit breaker, Informed to maintenance team for arranging and laying the cable.
		BACKUP-EARTHFAULT SETTINGS ARE DISABLED OR NOT CONFIGURED/RELAY NOT AVAILABLE	Not applicable because of Main-1 & main-2 Distance relay scheme is there.
		MAIN-2 PROTECTION RELAY DEFECTIVE	Informed to maintenance team for replacing the relay.
3	60MVA T/F I	REF PROTECTION RELAY INOPERATIVE	Relay working but keypad is not working. Informed to maintenance team for repairing or replcement of key pad.

4	60MVA T/F II	Deficiency not found	
5	60MVA T/F III	Deficiency not found	
S.No.	**Bay name /Bus**	**Status Observed**	
1	Status of Bus Bar	FUNCTIONAL	
2	DC staus	DC EARTH FAULT : YES(-ve to earth -34.65V while +ve to earth is 88.4 V) for 110 V Set-1 , (-ve to earth -46.2V while +ve to earth is 80.5V) for 110 V Set-2 {-ve to earth -41.1V while +ve to earthis2.8V) for 48 V Set-1	Problem resolved. New D.C. status as below- (-ve to earth -55.8V, +ve to earth is 65.4V) for 110 V Set-1 , (-ve to earth --57.40V, +ve to earth is 60.60V) for 110 V Set-2 , {-ve to earth -47.70V, +ve to earth 2.4V) for 48 V Set-1
3	Staus of C.B. timing	CIRCUIT BREAKER TIMING HAS NOT BEEN TAKEN ON YEARLY BASIS	Informed to Maintenance wing .
4	Staus of SEL	Not available	Informed to Maintenance wing for arranging the SEL .
5	Status of CT/CVT	ok	

KANPUR-II DIVISION

REPORT OF PROTECTION AUDIT

Electy . Test & Commissioning Division-II , Panki Kanpur

220 KV S/S Bharthna

S.NO.	Protection Element	Deficiencies Found	Action Taken
1	220 kV PARICHHA LINE	BRC PROTECTION SETTING ARE DISABLED OR NOT CONFIGURED	Settings Updated as per Norms
2	220 kV SAIFAI LINE	BRC PROTECTION SETTING ARE DISABLED OR NOT CONFIGURED	Settings Updated as per Norms
3	100 MVA T/F	OVERFLUX STAGE-2 TRIPPING TIME IS 500ms WHICH IS NOT AS PER NORMS	Settings Updated as per Norms
4	160 MVA T/F-I	OVERFLUX STAGE-2 TRIPPING TIME IS 500ms WHICH IS NOT AS PER NORMS	Settings Updated as per Norms
5	160 MVA T/F-II	OVERFLUX STAGE-2 TRIPPING TIME IS 500ms WHICH IS NOT AS PER NORMS	Settings Updated as per Norms
6	STATUS OF CB TESTING	CIRCUIT BREAKER TIMING HAS NOT BEEN TAKEN ON YEARLY BASIS	Informed to Trans. Wing

REPORT OF PROTECTION AUDIT

Electy . Test & Commissioning Division , Kanpur-II

220 KV S/S Chhibramau

S.NO.	Protection Element	Deficiencies Found	Action Taken
1	160 MVA ICT- I	Overflux stage-2 tripping time is 500 ms which is not as per norm	Settings Updated as per norms
2	160 MVA ICT-II	Overflux stage-2 tripping time is 500 ms which is not as per norm	Settings Updated as per norms
3	220 KV Panki	No, deiciencies found	
4	220 KV Mainpuri	No, deiciencies found	
5	220 KV Farrukhabad Ckt-I	No, deiciencies found	
6	220 KV Farrukhabad Ckt-II	No, deiciencies found	

REPORT OF PROTECTION AUDIT

Electy . Test & Commissioning Division , Kanpur-II

220 KV S/S Farrukhabad

S.NO.		Protection Element	Deficiencies Found	Action Taken
1	220 KV FARRUKHABAD	160 MVA ICT- I	Overflux stage-2 tripping time is 500 ms which is not as per norm	Settings Updated as per norms
2		160 MVA ICT-II	Overflux stage-2 tripping time is 500 ms which is not as per norm	Settings Updated as per norms
3		220 KV Mainpuri PGCIL	No, deiciencies found	
4		220 KV Neebkarori	No, deiciencies found	
5		220 KV Chhibramau Ckt-I	No, deiciencies found	
6		220 KV Chhibramau Ckt-II	No, deiciencies found	

REPORT OF PROTECTION AUDIT

Electy . Test & Commissioning Division - II Panki , Knapur

Name of S/S - 220KV Kanpur South

S.NO.	Protection Element	Deficiencies Found	Action Taken
1	220KV Kanpur South - Fathehpur (PGCIL) line	No, deiciencies found	Settings Updated as per L. N. 237ET&CC(G) Dated 26.04.2024
		No, deiciencies found	Settings Updated as per L. N. 237ET&CC(G) Dated 26.04.2024
2	220KV Kanpur South - Panki line (At the time of audit this line was connected to 220KV S/S Naubasta.)	No, deiciencies found	Settings Updated as per L. N. 237ET&CC(G) Dated 26.04.2024
		No, deiciencies found	Settings Updated as per L. N. 237ET&CC(G) Dated 26.04.2024
3	60 MVA T/F I	No, deiciencies found	Settings Updated as per L. N. 237ET&CC(G) Dated 26.04.2024
		No, deiciencies found	Settings Updated as per L. N. 237ET&CC(G) Dated 26.04.2024
		No, deiciencies found	Settings Updated as per L. N. 237ET&CC(G) Dated 26.04.2024
4	60 MVA T/F II	No, deiciencies found	Settings Updated as per L. N. 237ET&CC(G) Dated 26.04.2024
		No, deiciencies found	Settings Updated as per L. N. 237ET&CC(G) Dated 26.04.2024
		No, deiciencies found	Settings Updated as per L. N. 237ET&CC(G) Dated 26.04.2024
5	60 MVA T/F III	No, deiciencies found	Settings Updated as per L. N. 237ET&CC(G) Dated 26.04.2024
		No, deiciencies found	Settings Updated as per L. N. 237ET&CC(G) Dated 26.04.2024
		No, deiciencies found	Settings Updated as per L. N. 237ET&CC(G) Dated 26.04.2024

REPORT OF PROTECTION AUDIT

Electy . Test & Commissioning Division - II Panki , Knapur

Name of S/S - 220KV Naubasta

S.NO.	Protection Element	Deficiencies Found	Action Taken
1	220 KV Naubasta - Bhauti (PGCIL) Line	No, deiciencies found	Settings Updated as per L. N. 237ET&CC(G) Dated 26.04.2024
		Main 2 Relay GE D60 Multilin to be defective	To be inform E.E. ETD-II, Govind Nagar, Kanpur Nagar
2	220 KV Naubasta - Fatehpur (PGCIL) Line	No, deiciencies found	Settings Updated as per L. N. 237ET&CC(G) Dated 26.04.2024
		No, deiciencies found	Settings Updated as per L. N. 237ET&CC(G) Dated 26.04.2024
3	160 MVA T/F I	REF relay is faulty	To be inform E.E. ETD-II, Govind Nagar, Kanpur Nagar
		Back up E/F setting 0.25 change in to 0.20	Settings Updated as per L. N. 237ET&CC(G) Dated 26.04.2024
		Back up O/C setting 880.0 mA change in to 0.9mA	Settings Updated as per L. N. 237ET&CC(G) Dated 26.04.2024
4	160 MVA T/F II	No, deiciencies found	Settings Updated as per L. N. 237ET&CC(G) Dated 26.04.2024
		No, deiciencies found	Settings Updated as per L. N. 237ET&CC(G) Dated 26.04.2024
		No, deiciencies found	Settings Updated as per L. N. 237ET&CC(G) Dated 26.04.2024

REPORT OF PROTECTION AUDIT

Electy . Test & Commissioning Division , Kanpur-II

220 KV S/S Neebkarori

S.NO.	Protection Element	Deficiencies Found	Action Taken
1	160 MVA ICT-I	Overflux stage-2 tripping time is 500 ms which is not as per norm	Settings Updated as per norms
2	100 MVA ICT-I	Overflux stage-2 tripping time is 500 ms which is not as per norm	Settings Updated as per norms
3	100 MVA ICT-II	Overflux stage-2 tripping time is 500 ms which is not as per norm	Settings Updated as per norms
4	220 KV Farrukhabad	No, deiciencies found	
5	220 KV Mainpuri PGCIL	No, deiciencies found	

REPORT OF PROTECTION AUDIT

Electy . Test & Commissioning Division-II , Panki Kanpur

220 Kv S/S SAIFAI

1	220 kV MAINPURI LINE	CARRIER PROTECTION UNHEALTHY	Informed to Trans. Wing
		THERE IS ONLY SINGLE MAIN AND BACKUP PROTECTION RELAY	Informed to Trans. Wing
2	220 kV BHARTHANA LINE	THERE IS ONLY SINGLE MAIN AND BACKUP PROTECTION RELAY	Informed to Trans. Wing
3	220 kV AURAIYA LINE	No, deiciencies found	Settings Updated as per Norms
4	220 kV SIKANDARA LINE	No, deiciencies found	Settings Updated as per Norms
5	160 MVA T/F-I	OVERFLUX PROTECTION SETTING ARE DISABLED OR NOT CONFIGURED	Settings Updated as per Norms
6	160 MVA T/F-I	OVERFLUX PROTECTION SETTING ARE DISABLED OR NOT CONFIGURED	Settings Updated as per Norms
7	STATUS OF CB TESTING	ANNUAL TIME TEST OF 220kV CBs OF MAINPURI,BHARTHANA LINE,160MVA ICT-I&II HAS NOT BEEN TAKEN ON YEARLY BASIS	Informed to Trans. Wing

REPORT OF PROTECTION AUDIT

Electy . Test & Commissioning Division - II Panki , Knapur

Name of S/S - 220KV Sarh

S.NO.	Protection Element	Deficiencies Found	Action Taken
1	220KVSarh - Fathehpur (PGCIL) line I	No, deiciencies found	Settings Updated as per L. N. 237ET&CC(G) Dated 26.04.2024
		No, deiciencies found	Settings Updated as per L. N. 237ET&CC(G) Dated 26.04.2024
2	220KVSarh - Fathehpur (PGCIL) line II	No, deiciencies found	Settings Updated as per L. N. 237ET&CC(G) Dated 26.04.2024
		No, deiciencies found	Settings Updated as per L. N. 237ET&CC(G) Dated 26.04.2024
3	160 MVA T/F I	No, deiciencies found	Settings Updated as per L. N. 237ET&CC(G) Dated 26.04.2024
		No, deiciencies found	Settings Updated as per L. N. 237ET&CC(G) Dated 26.04.2024
		No, deiciencies found	Settings Updated as per L. N. 237ET&CC(G) Dated 26.04.2024
4	160 MVA T/F II	No, deiciencies found	Settings Updated as per L. N. 237ET&CC(G) Dated 26.04.2024
		No, deiciencies found	Settings Updated as per L. N. 237ET&CC(G) Dated 26.04.2024
		No, deiciencies found	Settings Updated as per L. N. 237ET&CC(G) Dated 26.04.2024

MATHURA DIVISION

	PROTECTION AUDIT

TRANSMISSION	TRANSMISSION SW ZONE AGRA
SUBSTATION	220 KV S/S Chhata
SUBJECT	DEFICIENCIES OBSETVED
REFERENCE	
DATE	

S.NO.	BAY NAME /BUS	VOLTAGE		SETTINGS	DEFICIENCIES/Non-conformities observed	Action taken/Remarks
1	220KV BAYS	220KV	220 KV Vrindavan	Settings enclosed as annexure A-1	Auto reclose is not working in 220kv manth & 220 vrindavan line	It has been intimated to Tranmission wing to replace relay panel and A/R wiil be enable in new panel
2	220KV BAYS	220KV	220 KV MANT		Main -II distance protection required as per prot scheme for 220kv Manth & Vrinda	

	PROTECTION AUDIT

TRANSMISSION	TRANSMISSION SW ZONE AGRA
SUBSTATION	220 KV S/S GOKUL
SUBJECT	DEFICIENCIES OBSETVED
REFERENCE	
DATE	

S.NO	BAY NAME /BUS	VOLTAGE		SETTINGS	DEFICIENCIES/Non-conformities observed	Action taken/Remarks
1	220KV BAYS	220KV	220 KV AGRA	Settings enclosed as annexure A-1	Multiple Trip circuit supervision relays in both trip circuit 1 as well as 2 found unhealthy. It should be properly checked and rectified at earliest. VT FF delay is 10s which must be 5s as per the norms.	Trip supervision relay also availble in control panel and is healthy and VT FF delay corrected 5 sec as per noms.
2	220KV BAYS	220KV	220 KV MANT		Additional high set setting of earth fault at 3A pickup current and 50ms DT delay seen in backup relay.	additional high set setting of E/F is disable as per norms
					Zone 4 trip delay time found 500ms which must be 450ms as per the norms. It has been corrected during the protection audit. VT FF delay is 10s which must be 5s as per the norms.	Zone 4 trip delay time corrected as per noms and VT FF Also Corrected 5 sec as per norms.
3	220KV/132KV T/F	220KV/132 KV	160 MVA T/F 1		No provision of High set in transformer O/C & E/F relays HV & LV.	Old panel has Electromechnical relay and there was no provision of highset. New panel having numerical reays installed and HV/LV O/C &E/F high set settings are as per noms done.
					TMS In HV O/C&E/F relay Is 0.3s for both O/C & E/F. It should be 0.25s	TMS In HV O/C&E/F relay Is Corrected 0.3s to 0.25 for both O/C & E/F as per norms
					TMS in LV O/C&E/F relay is 0.25s for both O/C & E/F. It should be 0.20s	TMS In LV O/C&E/F relay Is Corrected 0.25s to 0.20 for both O/C & E/F as per norms
					IDMT E/F LV relay is out of service.	Old Panel is Replaced By new Panel.
					All relays are electromechanical.	Old Panel was Replaced by New panel and all Realys is Numerical.
4	220KV/132KV T/F	220KV/132 KV	160 MVA T/F 2		In accordance to field LV CTR, LV O/C IDMT PU has been set at 0.77A. Similarly, other settings like O/C Highset, E/F HS, E/F IDMT PU can also be changed accordingly.	All Settings are corrected as per norms
					TMS in HV O/C&E/F relay is 0.3s for both O/C & E/F. It should be 0.25s	TMS In HV O/C&E/F relay Is Corrected 0.3s to 0.25 for both O/C & E/F as per norms
					TMS In LV O/C&E/F relay is 0.25s for both O/C & E/F. It should be 0.20s	TMS In LV O/C&E/F relay Is Corrected 0.25s to 0.20 for both O/C & E/F as per norms
5	132KV/33KV T/F	132KV/33K V T/F	63 MVA T/F		In accordance to field LV CTR, LV O/C IDMT PU has been set at 0.7A. Similarly, other settings like O/C Highset, E/F HS,E/F IDMT PU can also be changed accordingly.	All Settings are corrected as per norms

S.NO.	BAY NAME /BUS	EQUIPMENTS/SYSTEM AUDITED	status observed	REMARK EXN
6	DC Status	DC E/F	NO (- ve to earth-63.5V while +ve to earth Is 54.8V)	
		BATTERIES	HEALTHY	
		CHARGERS	HEALTHY	
7	ANALYSIS OF TRIPPINGS FROM JULY 2023	NO OF ELEMENTS TRIPPED MORE THAN 2 TIMES IN A MONTH	0	
		MULTIPLE TRIPINGS	0	
		TRIPPINGS UNEXPLAINED	0	
8	SPS/CB/CT/CVT/SEL	STATUS OF SPS	NA	
		STATUS OF CB TESTING	CHECKED IN R/T AND FOUND OK(not tested through CB Analyser)	
		STATUS OF CT / CVT	OK	
		STATUS OF SEL	OK(SCADA)	
9	Remedial action taken on the obseervations made in previous protection audit (Internal/Third party)		Not available	

	PROTECTION AUDIT

TRANSMISSION	TRANSMISSION SW ZONE AGRA
SUBSTATION	220 KV S/S Kirawali
SUBJECT	DEFICIENCIES OBSERVED
REFERENCE	
DATE	

S.NO.	BAY NAME /BUS	VOLTAGE		SETTINGS	DEFICIENCIES/Non-conformities observed	Action taken/Remarks
1	220KV BAYS	220KV	220 KV Sikandra	Settings enclosed as annexure A-1	No E/F stage active found in either M1 or M2, So, during audit, IDMT E/F has been enable in M2 relay.	Settings updated as per norms.
2	220KV BAYS	220KV	220 KV BC		O/C high set settings not found as per norms.	Settings updated as per norms.
3	220KV BAYS	220KV	220 KV TBC		Although settings of bakeup relay has been corrected in audit but HV & LV Bakeup relay settings must be once again reviewed and it would be better to keep them in non- directional mode	Settings updated as per norms.
4	220KV/132KV T/F	220KV/132 KV	100 MVA-I&II		Although settings of bakeup relay has been corrected in audit but HV & LV Bakeup relay settings must be once again reviewed and it would be better to keep them in directional mode	Setting may be changed as per availability of shutdown
					In accordance to field LV CTR, LV O/C IDMT PU has been set at 0.77A. Similarly, other settings like O/C Highset, E/F HS, E/F IDMT PU can also be changed accordingly.	
					TMS In HV O/C&E/F relay Is 0.3s for both O/C & E/F. It should be 0.25s	Settings updated as per norms.
					TMS in LV O/C&E/F relay is 0.25s for both O/C & E/F. It should be 0.20s	Settings updated as per norms.
					REF in both T/f found disabled	REF in disabled due to non availability of turret CT
5	220KV/132KV T/F	220KV/132 KV	160 MVA T/F 2		There is no 160MVA T/F at 220kV S/S Kiraoli	
6	132KV/33KV T/F	132KV/33KV T/F	40 MVA T/F-I		Although settings of bakeup relay has been corrected in audit but HV & LV Bakeup relay settings must be once again reviewed and it would be better to keep HV in directional & LV in non- directional mode as per norms.	Settings are corrected as per norms
7	132 KV BAY	132 KV	132 KV Kirawali		No E/F stage active found in either M1 or M2.	Settings updated as per norms.
8	132 KV BAY	132 KV	132 KV Mathura		No E/F stage active found in either M1 or M2.	Settings updated as per norms.
9	132 KV BAY	132 KV	132 KV Fatehpur Sikri		TMS in IDMT E/F stage found @ 0.2S. As per it should be 0.24S	Settings updated as per norms.
10	132 KV BAY	132 KV	132 KV BC		CTR 220/1 must be reviewed and corrected as per actual field CTR.	Settings updated as per norms.
					Although settings of bakeup relay has been corrected in audit but HV & LV Bakeup relay settings must be once again reviewed and it would be better to keep them in non- directional mode	Settings updated as per norms.

S.NO.	BAY NAME /BUS	EQUIPMENTS/SYSTEM AUDITED	status observed	REMARK EXN
6	DC Status	DC E/F	Yes (- ve to earth-19.2 V while +ve to earth Is 97.3V)	As per latest measurement on dated 07.08.2024 (- ve to earth-54 V while +ve to earth Is 61V)
		BATTERIES	HEALTHY	
		CHARGERS	HEALTHY	
7	ANALYSIS OF TRIPPINGS FROM JULY 2023	NO OF ELEMENTS TRIPPED MORE THAN 2 TIMES IN A MONTH	0	
		MULTIPLE TRIPINGS	0	
		TRIPPINGS UNEXPLAINED	0	
8	SPS/CB/CT/CVT/SEL	STATUS OF SPS	NA	
		STATUS OF CB TESTING	CHECKED IN R/T AND FOUND OK(not tested through CB Analyser)	
		STATUS OF CT / CVT	OK	
		STATUS OF SEL	OK(SCADA)	
9	Remedial action taken on the obseervations made in previous protection audit (Internal/Third party)		Not available	

	PROTECTION AUDIT

TRANSMISSION	TRANSMISSION SW ZONE AGRA
SUBSTATION	220 KV S/S mant
SUBJECT	DEFICIENCIES OBSETVED
REFERENCE	
DATE	

S.NO.	BAY NAME /BUS	VOLTAGE		SETTINGS	DEFICIENCIES/Non-conformities observed	Action taken/Remarks
1	220KV BAYS	220KV	220 KV MANT	Settings enclosed as annexure A-1	1.As per sop zone-III delay time -800ms and zone-IV =450ms may be done,also in back up protection IDMT E/F Tms-0.2. 2. A/R found disabled. 3.differential scheme required.	1.All Settings are corrected as per norms. 2.intertripping plcc are not available. 3.Inform to transmission division.
2	220KV BAYS	220KV	220 KV Hathras		1.As per sop zone-III delay time -800ms and zone-IV =450ms may be done,also in back up protection IDMT E/F TMS-0.2 2. A/R found disabled	1.All Settings are corrected as per norms. 2.intertripping plcc are not available
3	220KV/132KV T/F	220KV/132KV	160 MVA T/F 1(BHEL make)		1. Differential relay 2nd slope should be range between 60 to 80%	All Settings are corrected as per norms
4	220KV/132KV T/F	220/132kv	160 MVA T/F 2 (T&R make)		1. Differential relay 2nd slope should be range between 60 to 80%	All Settings are corrected as per norms

S.NO.	BAY NAME /BUS	EQUIPMENTS/SYSTEM AUDITED	status observed	REMARK EXN
6	DC Status	DC E/F	NO (- ve to earth-62.5V while +ve to earth Is 65.8V)	
		BATTERIES	HEALTHY	
		CHARGERS	HEALTHY	
7	ANALYSIS OF TRIPPINGS FROM JULY 2023	NO OF ELEMENTS TRIPPED MORE THAN 2 TIMES IN A MONTH	0	
		MULTIPLE TRIPINGS	0	
		TRIPPINGS UNEXPLAINED	0	
8	SPS/CB/CT/CVT/SEL	STATUS OF SPS	0	
		STATUS OF CB TESTING	0	
		STATUS OF CT / CVT	0	
		STATUS OF SEL	0	
9	Remedial action taken on the obseervations made in previous protection audit (Internal/Third party)		Not available	

	PROTECTION AUDIT

TRANSMISSION	TRANSMISSION SW ZONE AGRA
SUBSTATION	220 KV S/S Meetai
SUBJECT	DEFICIENCIES OBSETVED
REFERENCE	
DATE	

S.NO.	BAY NAME /BUS	VOLTAGE		SETTINGS	DEFICIENCIES/Non-conformities observed	Action taken/Remarks
1	220KV BAYS	220KV	220 KV Meetai - Maant line	Settings enclosed as annexure A-1	Auto reclosre not avilable	M1M2 panel requirement send by transmission wing
2	220KV BAYS	220KV	220 KV MANT		OPGW not working Since one year	OPGW in working condition now
3	220KV BAYS	220KV	220 Meetai - Khair line		OPGW not working Since one year	OPGW in working condition now
4	220KV BAYS	220KV	220 KV Agra line		OPGW not working Since one year	OPGW in working condition now
5	220KV BAYS	220KV	220 /132 KV Transformer I		Electrostatic relay found must be replaced with numerical	New Relay panel has been configured for this transformer,will be replace when load adjustment is possible
6	220KV BAYS	220KV	220 /132 KV Transformer II		Backup relay is electromechnical type required replacement numerical relay	requirement sent for new numerical relay panel for this Transfomrer by Transmission wing
7	220KV BAYS	220KV	Busbar protection		Busbar protection found out of service	contact with service engg , problem rectify as soon as possible
8	Event logger		Event logger		Event logger not available	requirement send by Transmission wing, in progress
9	GPS Clock		GPS Clock		GPS defective and not synchronised	requirement send by Transmission wing
10	Battery	110 V	Battery		leakage found in 110 v battery set 2	problem rectified no leakage in 110 V battery set 2 now

	PROTECTION AUDIT

TRANSMISSION	TRANSMISSION SW ZONE AGRA
SUBSTATION	400 KV S/S Agra South
SUBJECT	DEFICIENCIES OBSERVED
REFERENCE	
DATE	

S.NO.	BAY NAME /BUS	VOLTAGE		SETTINGS	DEFICIENCIES/Non-conformities observed	Action taken/Remarks
1	400KV BAYS	400KV	400 KV Firozabad	Settings enclosed as annexure A-1	As given in the protection audit sheet	These settings are calculated by PGCIL and there is no false tripping history.
2	400KV BAYS	400KV	400 KV Firozabad		As given in the protection audit sheet	
3	400KV/132KV ICT-1st	400/132KV	ICT 1st		As given in the protection audit sheet	
4	400KV/132KV ICT-1st	400/132KV	ICT 2nd		As given in the protection audit sheet	
5	400KV/132KV ICT-1st	400/132KV	ICT 3rd		As given in the protection audit sheet	
6	400KV Reactor	400KV	80MVAR Reactor		As given in the protection audit sheet	
7	132 KV BAY	132 KV	132 KV Bodla, Kheragarh 1, Mathura, Gwalior road , Agra cant		As given in the protection audit sheet	Dir HS O/C and Dir HS E/F settings are updated as per norms. These settings are calculated by PGCIL and there is no false tripping history.
8	132 KV BAY	132 KV	132 KV Bodla, Kheragarh 2		As given in the protection audit sheet	
9	132 KV BAY	132 KV	132KV Railway		As given in the protection audit sheet	
S.NO.	BAY NAME /BUS	EQUIPMENTS/SYSTEM AUDITED			status observed	REMARK EXN
9	DC Status			DC E/F	No (- ve to earth-115 V while +ve to earth Is 110V)	
				BATTERIES	HEALTHY (All Dry Cells)	
				CHARGERS	HEALTHY	
10	ANALYSIS OF TRIPPINGS FROM JULY 2023			NO OF ELEMENTS TRIPPED MORE THAN 2 TIMES IN A MONTH	0	
				MULTIPLE TRIPINGS	0	
				TRIPPINGS UNEXPLAINED	0	
11	SPS/CB/CT/CVT/SEL			STATUS OF SPS	NA	
				STATUS OF CB TESTING	CHECKED IN R/T AND FOUND OK(not tested through CB Analyser)	
				STATUS OF CT / CVT	OK	
				STATUS OF SEL	OK(SCADA)	
12	Remedial action taken on the obseervations made in previous protection audit (Internal/Third party)				Enclosed as annexure in sheet A2	

Protection audit

Details of relays Settings of ict's of 400 kv substation manth

Difficiency/Non Conformities observed

315 MVA ICT-I :- As Per SOP the value of REF Pick =0.2 & HV Side, EF TMS=0.3 may be
315 MVA ICT-II :- As Per SOP the value of REF Pick =0.2 & HV Side, EF TMS=0.3 may be
500 MVA ICT-III :- As Per SOP the value of REF Pick =0.2 may be done

Action Taken:-

These settings are calculated by PGCIL and there is no tripping history since 2017.

GORAKHPUR ZONE

Electricity Test & Commissioning Circle, Gorakhpur

STATUS OF ACTION BEING TAKEN OF INTERNAL PROTECTION AUDIT REPORT OF YEAR 2024

18/09/24

ET&C Division, Azamgarh

S. N.	Name of Substation	Discripencies as per Internal Protection Audit Report	Action Taken by T&C	Action Taken by Transmission	Remark
1	400 KV S/S Azamgarh	CB Testing not done in 2023	N/A	It is scheduled in upcomming Shutdowns	
		Sequential Event logger is installed but not working.	N/A	troubleshooting of event logger has been completed on 05-09-2024	
2	220 KV S/S Azamgarh-1 (Hafizpur)	SPS at 220 KV S/S Azamgarh is not provided	Scheme available at 400 KV S/S Azamgarh for tripping at 220 KV S/S Azamagarh.	Scheme available at 400 KV S/S Azamgarh for tripping at 220 KV S/S Azamagarh.	
		LBB Protection Relays are not provided at 160MVA ICT-1, 160MVA ICT-2 & 200MVA ICT	N/A	Requirement of LBB panel has been sent	
		PLCC Channel Link not commissioned at 220 KV Azamgarh-Harhua Line	N/A	Line is operated radially. PLCC panel for Haruha Line is available at Azamgarh End but its pair is not available Haruha End.	
		PLCC Channel not working at 220 KV Azamgarh-Jaunpur Line	PLCC panel is healthy at 220KV Azamgarh end and not healthy at 220KV Jaunpur end	PLCC panel is healthy at 220KV Azamgarh end and not healthy at 220KV Jaunpur end	Under scope TSC
		No CB Testing done in Year-2023	N/A	will be scheduled in upcoming shutdowns	
		Sequential Event logger is not installed.	N/A	Inbuilt in SCADA system (SAS S/S)	
3	220 KV S/S Azamgarh-2 (Badgahan)	LBB Protection Relays are not provided at 160MVA ICT-1, 160MVA ICT-2 & 200MVA ICT	N/A	LBB Protection inbuilt in relay.	
		No DTPC/PLCC channel at 220 KV Badgahan-Sarnath Line	N/A	-	To be taken up by transmission/Microwave
		REF protection Relays are not provided at 2 No. 220/132KV 160MVA ICT and 1 No. 200MVA ICT	Relay is available but not commissioned	-	To be taken up by transmission.
		SPS at 220 KV S/S Badgahan is not provided	N/A	-	To be taken up by transmission.
		Sequential Event logger is not installed.	N/A	Inbuilt in SCADA system (SAS S/S)	
		No CB Testing done in Year-2023	N/A	will be scheduled in upcoming shutdowns	
		Bus bar Protection (ZIV Make) is not working.	Bus bar protection working.	-	

Continued

S. N.	Name of Substation	Discripencies as per Internal Protection Audit Report	Action Taken by T&C	Action Taken by Transmission	Remark
4	400 KV S/S Kasara, Mau	LBB Prot. Relays of All 400KV Lines are Non-Numerical	N/A	PR for relay panel has been created at division level . PR No. is 103000193	
		LBB Prot. Relay & REF Prot. Relays of 3No. 400/132/33KV 200 MVA ICT-1, 200 MVA ICT-2 & 200 MVA ICT-3 are Non-Numerical	N/A	All relay of ICT 3rd are numerical. and REF numerical relay procurement for ICT-1 & ICT-2 is under process. Since relay panel and wiring are very old, further retrofitting is not possible so,PR of relay panel for ICT-1 & ICT-2 has been created at division level . PR No. is 103000193.	
		LV side Prot. Relay of 3No. 400/132/33KV 200 MVA ICT-1, 200 MVA ICT-2 & 200 MVA ICT-3 are not time sync.	Now sync. Through eathernet cable.	N/A	
		PLCC Channel-2 is not healthy at 400 KV Mau-Azamgarh Line	M-1 Prot. Is on PLCC & M-2 Prot. is on DTPC. (DTPC Commissioned)	N/A	
		PLCC Channel-2 is not healthy at 400 KV Mau-Anpara Line	PLCC Channel -2 Make BPL is Defective since 2017 (DTPC not Available due to OPGW)	As per SOP one channel of protection should be DTPC, BUT OPGW not available on 400KV Mau Anpara L6 line so, DTPC commissioning not possible. OPGW Laying work is under jurisdiction of ETD Ghazipur.	
		400 KV Mau-PGCIL (Ballia) Line Relay is not time sync.	Communication cable has been changed and both M-1 & M-2 Relays are Time Sync.	Communication cable has been changed and both M-1 & M-2 Relays are Time Sync.	
		CB Testing was not done in Year-2023 except 400 KV Azamgarh Line	N/A	(1) CB testing of 400kV ICT 3rd done on date-04.04.2024. (2) CB testing of 400kV 125MVAr Bus Reactor done on date-05.04.2024. (3) CB testing of 400kV ICT 1st done on dt -07.04.2024. (4) CB testing of 400kV ICT 2nd done on dt.-07.04.2024. (5) CB testing of 400kV Anpara L6 line done on dt.-08.04.2024. (6) CB testing of 400kV TBC bay done on dt.-08.04.2024. **Testing of remaining CB will be done in upcoming month after shutdown approval.**	
		Sequential Event logger records only alarms & not updating events.	Software updation is required.	Purchase Order has been placed to M/S GE T&D India Ltd. Service engineer visit.	
5	400 KV S/S Rasara (GIS)	SPS at 400 KV S/S Rasara (GIS) is not provided	N/A	Approval for SPS logic will be sent to SLDC at earliest.	
		No CB Testing done in Year-2023	N/A	DRs are being checked for relay trip time. CBs of relays with high tripping time will be tested	
		Sequential Event logger is not installed.	N/A	Inbuilt in SCADA system (SAS S/S)	

Continued

S. N.	Name of Substation	Discripencies as per Internal Protection Audit Report	Action Taken by T&C	Action Taken by Transmission	Remark
6	220 KV S/S Rasara (AIS)	A/R in M-1 Protection is not configurable & not working at 220 KV Rasara-Deoria Line	N/A	Requirement for main 2 Distance Protection relay has been sent to HQ, A/R will be configured at the time of retrofitting of main 2 realy.	
		A/R in M-1 Protection is not configurable & not working at 220 KV Rasara-Rasara(400) Line	N/A	Requirement for main 2 Distance Protection relay has been sent to HQ, A/R will be configured at the time of retrofitting of main 2 realy.	
		LBB Protection Relays are not provided at 2No. 220/132KV 160MVA ICT-1 &160MVA ICT-2	N/A	Requirement for LBB protection relays has been sent to HQ. It will be configured after the allotment.	
		REF protection are not Provided at 2No. 220/132KV 160 MVA ICT-1 & 160MVA ICT-2	Turret CT not installed in both ICTs to enable REF Prot.		To be taken up by transmission.
		No CB Testing done in Year-2023	N/A	DRs are being checked for relay trip time, CBs of relays with high tripping time will be tested.	
		SPS at 220 KV S/S Rasara (AIS) is not provided.	N/A	SPS is not provided since Load at 220KV S/S Rasara is less tha 50%.	
		Sequential Event logger is not installed.	N/A	Inbuilt in SCADA system (SAS S/S)	
		Bus bar Protection is not Provided.	N/A	Not in scheme as 220KV S/S has one Main Bus and one transfer bus.	

Continued

Electricity Test & Commissioning Circle, Gorakhpur

STATUS OF ACTION BEING TAKEN OF INTERNAL PROTECTION AUDIT REPORT OF YEAR 2024

ET&C Division, Basti

S.N.	Name of Substation	Discripencies as per Internal Protection Audit Report	Action Taken by T&C	Action Taken by Transmission	Remark
1	400 KV S/S Basti	Only one PLCC channel working at 400 KV Basti-Gorakhpur ckt-2	N/A	Order has been placed to GE T&D in the month of august 2024 for rectification of PLCC card. PLCC channel will be normalised after to receiving rectified PLCC card from GE T&D service center.	
		PLCC Link/DTPC not available at 220 KV Basti(4)-Basti(2) line	N/A	Installation of OPGW is pending. After completion of OPGW laying work DTPC will be taken in service.	Either PLCC/DTPC may be installed.To be taken up by Transmission/Microwave
		PLCC Link/DTPC not available at 220 KV Basti(4)-Gonda ckt-I	N/A	Installation of OPGW is in progress. After completion of OPGW laying work DTPC will be taken in service.	Either PLCC/DTPC may be installed To be taken up by Transmission/Microwave
		PLCC Link/DTPC not available at 220 KV Basti(4)-Gonda ckt-II	N/A	Construction of line is done by ETD Gonda. Installation of DTPC in the scope of ETD Gonda.	Either PLCC/DTPC may be .To be taken up by Transmission/Microwave
		Routine testing is not done of 400 KV Basti-Tanda ckt-1 in 2023	N/A	Routine testing was not done due to unavailibility of shutdown it will be caaried out as per availibility of shutdown in this year	Routine testing was in scope of M/S Elite power tech Pvt Ltd Sec-63 Noida under supervision of Transmission & in presence of T&C.To be taken up by Transmission
		Routine testing is not done of 400 KV Basti-Tanda ckt-2 in 2023	N/A		
		Routine testing is not done of 400 Kv Basti-Gorakhpur ckt-1 in 2023	N/A		
		LBB protection are not provided at 2 No. 400/220/33KV 500 MVA Transformers, 2 No. 220/132/11KV 200 MVA Transformers	N/A	LBB Protection provided.	
		SPS at 400KV S/S Basti is not provided	N/A	Requirement of SPS panel is being sent. After receiving it will be installed.	No SPS installed till date.
		No CB testing done in year 2023	N/A	In month of May 2024, CB testing has been done.	
		Sequential Event Logger is not installed	N/A	Inbuilt in SCADA system (SAS S/S)	
2	220 KV S/S Basti (AIS)	Backup Protection relay of 220KV Basti-Tanda line is Electromechanical type	N/A	Requirement of distance protection panel has been sent to design circle. After receiving it will be replaced.	
		No PLCC Channel is working and Auto-reclose function not working	N/A	DTPC has been installed after installation of OPGW at connecting transmission lines DTPC will be taken in service. Auto reclosed function will be configured by T&C Basti.	All PLCC Panels are scrap.Either PLCC/DTPC May be installed .To be taken up by Transmission/Microwave. For Auto-reclose, Termination work has to be done from breaker to relay panel by transmission wing and configuration of relay by relay Engineer for Auto-reclose also pending. To be taken up by Transmission.
		SPS at 220KV S/S Basti (AIS) is not provided	N/A	Requirement of SPS panel is being sent . After receiving it will be installed.	No SPS installed till date.To be taken up by transmission
		No CB testing done in year 2023	N/A	CB testing of some breakers has been done in the month of auguest 2024 remaining CB testing will be done as per availibility of shut down	
		Sequential Event Logger is not installed	N/A	Requirement of Event Logger panel has been sent to design circle. After receiving it will be installed.	

Continued

S.N.	Name of Substation	Discripencies as per Internal Protection Audit Report	Action Taken by T&C	Action Taken by Transmission	Remark
3	220 KV S/S Bansi	Relays of 2 No. 220/132KV 160MVA Transformers are not time sync	GPS clock is defective	GPS clock repairing firm has been contacted for repair. Time synchronisation will be done after repair	Replacement/ Repair work is under scope of Transmission wing.To be taken up by transmission
		M1 and Backup relays are not time Sync at 220 KV Bansi-PGCIL line			
		M1 and Backup relays are not time Sync at 220 KV Bansi-Basti line			
		DTPC not installed at 220 KV Bansi-PGCIL line	N/A	DTPC Requirement to ECCDC is being sent	
		DTPC not installed at 220 KV Bansi-Basti(220 KV) line	N/A		
		DC Earth fault observed at time of audit	Current status Source-I +VE To E116.3 -VE To E 3.08 V Source-II +VE To E 71.8 -VE To E42.2 V	DC Earth fault is being detected and shall be resolved shortly	
		SPS at 220KV Bansi(AIS) Substation is not provided	N/A	Requirement is being sent, after receiving it will be installed	No SPS installed till date.To be taken up by transmission
		No CB testing done in year 2023	N/A	CB testing equipment is not available. Third party firm for CB testing has been contacted	
		Sequential Event Logger is not installed	N/A	Inbuilt in SCADA system (SAS S/S)	
4	220 KV S/S Dulhipar	DTPC not Provided and A/R Not working at 220 KV Dulhipar-Bansi line	A/R is working cheked by T&C on dated 03.09.2024 DTPC is not provided.	DTPC has been installed after installation of OPGW at connecting transmission lines DTPC will be taken in service. Auto reclose is working check by T&C Basti on dt. 03.09.2024	To be taken by Transmission/Microwave (Line is only charged to LILO portion from 220 KV Dulhipar end.)
		DTPC not Provided and A/R Not working at 220 KV Dulhipar-Gorakhpur(PG) line	A/R is not working which is checked on dated 03.09.2024 by T&C, will be checked again by T&C team as per availibility of shut down. DTPC is not provided.	A/R is not working which is checked on dated 03.09.2024 by T&C and will be checked again by T&C team as per availibility of shut down. DTPC has been installed after installation of OPGW at connecting transmission lines DTPC will be taken in service.	To be taken by Transmission/Microwave. Line is only charged to LILO portion from Dulhipar end.
		A/R not working at 220 KV Dulhipar-Basti(4) ckt-2	A/R will be checked by T&C as per availibility of shut down.	A/R will be checked by T&C as per availibility of shutdown	
		A/R not working at 220 KV Dulhipar-Basti (4)ckt-1	A/R is working, checked by T&C on dated 03.09.2024 during Shutdown.	A/R is working, checked by T&C on dated 03.09.2024 during Shutdown.	
		SPS at 220KV S/S Dulhipar(AIS) is not provided	N/A	Requirement of SPS panel is being sent . After receiving it will be installed.	No SPS installed till date.To be taken up by transmission
		No CB testing done in year 2023	N/A	CB testing will be done in upcoming months	
		Sequential Event Logger is not installed	N/A	Inbuilt in SCADA system (SAS S/S)	

Continued

Electricity Test & Commissioning Circle, Gorakhpur

STATUS OF ACTION BEING TAKEN OF INTERNAL PROTECTION AUDIT REPORT OF YEAR 2024

ET&C Division, GORAKHPUR

S. N.	Name of Substation	Discripencies as per Internal Protection Audit Report	Action Taken by T&C	Action Taken by Transmission	Remark
1	220KV S/S BARAHUWA	Relays of all the lines/Transformers/busbar are not time synchronised.	Although GPS clock on S/s is healthy, still relays are not time synchronised.	company engineer being requisitioned for relay synchronising	
		All the 4 lines are provided with PLCC links are old and defective not working.	DTPC on 220KV Barhuwa-Khorabar line is working	DTPC requirements has been raised and will be made functional in coordination with Microwave wing	DTPC on other lines are not installed yet.
		A/R on all 4 lines are not working	A/R is working on 220KV Barhuwa-Khorabar line	carrier will be made healthy in coordination with Microwave wing once DTPC links will be available	Still carrier is not healthy on other 3 lines thus A/R is still not working
		Backup Protection relay of 220KV Barahua-PGCIL line is Electromechanical type	N/A	requirement for numeric relay has been sent	
		SPS at 220KV S/S Barahuwa is not provided	N/A	proposal for SPS being made	
		Sequential event logger is not installed	N/A	Requirement for SEL has been sent	
2	220KV S/S GOLA	Relays of all the lines/Transformers are not time synchronised.	Defective GPS Clock has been changed. Now all relays are time sync.	Now all relays are time sync.	
		CB Testing is not done in year 2023	N/A	CB testing will be done in upcoming months	
		SPS at 220KV S/S Gola is not provided	N/A	-	To be taken up by transmission.
		Sequential event logger is not installed	N/A	Inbuilt in SCADA system (SAS S/S)	
3	220KV S/S Deoria	DTPC not healty and AR not working at 220 KV Deoria-Rasara (AIS) line	N/A	-	To be taken up by transmission/Microwave
		PLCC channel not healthy and AR not working at 220KV Deoria-Gorakhpur line	Card defective	-	To be taken up by transmission.
		DTPC not healty and AR not working at 220KV Deoria-Hata ckt-I	N/A	-	To be taken up by transmission/Microwave
		DTPC not healty and AR not working at 220KV Deoria-Hata ckt-II	N/A	EE Microwave has been requested for DTPC Installation at 220 KV Hata Ckt -II at Both end	
		SPS at 220KV Deoria S/S is not provided	N/A	Proposal is being made	
		CB Testing is not done in year 2023	N/A	Testing is proposed as per availability of S/D	
		Sequential event logger is not installed	N/A	Requirement send to HQ. PR. No. 1010003432	
4	220 KV S/S Anand Nagar	SPS at 220KV S/S Anand Nagar is not provided	N/A	Inbuilt in SCADA system (SAS S/S)	
		Sequential event logger is not installed	N/A	Inbuilt in SCADA system (SAS S/S)	
5	220 KV S/S Maharajganj	SPS at 220KV S/S Maharajganj is not provided	N/A	-	To be taken up by transmission.
		CB Testing is not done in year 2023	N/A	CB testing will be done in upcoming months	
		Sequential event logger is not installed	N/A	Inbuilt in SCADA system (SAS S/S)	
6	220 KV S/S Hata, KUSHINAGAR	Relays of all the lines/Transformers/busbar are not time synchronised.	Although GPS clock on S/S is healthy, stil relays are not time synchronised.	LAN wire laying under progress	
		All lines are not provided with carrier protection	N/A	work is in progress	DTPC on all lines are not installed yet.
		SPS at 220KV S/S Hata is not provided	N/A	proposal for SPS being made	
		Sequential event logger is not installed	N/A	Inbuilt in SCADA system (SAS S/S)	

Continued

S. N.	Name of Substation	Discripencies as per Internal Protection Audit Report	Action Taken by T&C	Action Taken by Transmission	Remark
7	400 KV S/S GORAKHPUR	CTs are to be provided on 125 MVAR Reacter	No CTs Installed till date.	Requirement has been sent to Headquarter by concerned division.	
		CB timings are to be taken annually and no record found	N/A	08 Nos. 400 KV/220 KV C.B. has been tested rest will be tested along with routine testing.	
		220KV Bus-I and Bus-II have been extended with Section Isolator, Circuit Breaker and CTs. Sectionalized zone got unprotected which may result mal tripping of Main Buses.	N/A	220 kV Bus bar Protection has been available for sectiolized zone at 400 kV SS, Gorakhpur.	
		LBB relay of 400KV Azamgarh line is Electromechanical type	N/A	Requirement has been sent to Headquarter by concerned division.	
		LBB relay of 400KV Azamgarh line is not Time sync	N/A		To be taken up by transmission.
		SPS at 400KV S/S Gorakhpur is not Time synchronised	SPS is now time sync SPS has been time synchronised on dated 20.06.2024		
		CB Testing is not done in year 2023	N/A	CB testing will be done in upcoming months.	
		Neutral Earthing Delta is not Earthed with Substation Earthmat on 400KV Transformers	N/A		To be taken up by transmission.
		Sequential Event Logger(Alstom) is not Healthy.	N/A		No Sequential Event Logger is installed till date Tender under process in Zonal office.
8	220 KV S/S Gorakhpur	DTPC is not provided. PLCC Link is not Healthy and A/R not working at 220KV Gorakhpur-Barahua line	N/A		DTPC not available till now. Requirement has been sent to Head Quarter by concerned Division.
		DTPC not available at 220KV Gorakhpur-Deoria line	DTPC Card Faulty.		To be taken up by transmission/Microwave wing.
		PLCC/DTPC panel is not available at 220 KV Hata ckt-I&II and 220KV Deoria line.	N/A	DTPC Panel connection is in progress of 220 KV Hata-I&II and 220 KV Deoria Line.	
		PLCC/DTPC panel is not available/functional at 220 KV Gorakhpur ckt-I&II	N/A	DTPC Panel connection is in progress of 220 KV Gorakhpur Ckt-I & DTPC Panel requirement has been sent to Head Quarter for 220 KV Gorakhpur Ckt-II.	
		CB timings are to be taken annually and no record found	N/A	02 Nos. 220 KV C.B. has been tested in month of 09/2024. 03 Nos. 132 KV C.B. has been tested in month of 09/2024.	
		220KV Bus-I and Bus-II have been extended with Section Isolator, Circuit Breaker and CTs. Sectionalized zone got unprotected which may result mal tripping of Main Buses.	N/A	No Changes 220 kV Bus bar Protection has been available for sectionalized zone at 400 kV SS, Gorakhpur.	
		220KV Barahua line is not Time sync.	Obsolete panel.	Requirement has been sent to Head Quarter by concerned Division.	
		No CB testing done in year 2023.	N/A		To be taken up by transmission.
		Sequential Event Logger is not installed.	N/A	Requirement has been sent to Headquarter by concerned division.	

EE(A)

(Sanjay Singh)
Superintending Engineer

U.P.POWER TRANSMISSION CORPORATION LIMITED JHANSI ZONE
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पत्रांकः– 310 /वि0परी0एवंपरि0मं0(झाँसी)/ दिनांकः– 31/08/24

विषयः–Protection Audit 2023 में अंकित कमियों के सम्बन्ध में कृत कार्यवाही।

मुख्य अभियन्ता,
पारेषण दक्षिण–मध्य,
झाँसी।

ई–मेल द्वारा

उपरोक्त विषयक आपको अवगत कराना है कि इस जोन का प्रोटेक्शन ऑडिट 2023 अधीक्षण अभियन्ता, विद्युत परीक्षण एवं परिचालन मण्डल, आगरा द्वारा किया गया था जिसकी रिपोर्ट उनके कार्यलय पत्रांक सं0–139 ET&CC/A/ Jhansi Protection Audit date 11.03.2024 द्वारा इस कार्यालय को प्राप्त हुयी थी।

प्रोटेक्शन ऑडिट रिपोर्ट–2023 में विद्युत उपकेन्द्र वाइज अंकित कमियों पर कृत कार्यवाही संलग्न कर सूचनार्थ एवं अग्रिम आवश्यक कार्यवाही हेतु प्रेषित।

संलग्नकः–यथोपरि।

(संदीप सिंह कुशवाहा)
अधीक्षण अभियन्ता

पत्रांकः– 310 /वि0परी0एवंपरि0मं0(झाँसी)/ दिनांकः– 31/08/24

प्रतिलिपि निम्नलिखित को ई0–मेल द्वारा सूचनार्थ एवं आवश्यक कार्यवाही हेतु प्रेषितः–

1. निदेशक (आपरेशन), उ0प्र0पा0ट्रा0का0लि0, लखनऊ।
2. अधीक्षण अभियन्ता, विद्युत परीक्षण एवं परिचालन मण्डल, मेरठ।

(संदीप सिंह कुशवाहा)
अधीक्षण अभियन्ता

PROTECTION AUDIT ANALYSIS OF ET&CC JHANSI

SR. NO.	NAME OF S/S	REMARK	ACTION TAKEN
1	400KV S/S ORAI	1. E/F TMS 220KV LINE IS NOT AS PER SOP.	Updated as directed on 20.06.2024
		2. REF IN 160MVA ICT-II IS OUT OF SERVICE.	DUE TO UNAVAILABILITY IN BUSHING CT which has informed to ETD Jhansi on dated 14/8/2024
		3. HIGH SET CURRENT SETTING IS NOT AS PER SOP.	Updated as directed on 20.06.2024
		4. BU RELAY TMS IN ICT'S IS NO AS PER SOP.	Updated as directed on 20.06.2024
		5. DC E/F PRESENT IN 220V DC SET-I	E/F rectified on 14.08.2024
2	400KV S/S BANDA	1. CARRIER IS UNHEALTHY IN ALL 400KV LINES AND 220KV MAHOBA LINE.	1. 400 KV Banda Rewa Road Line-Ist carrier problem Reactified. 2.400 KV Banda Rewa Road Line-IInd carrier reactification problem under process (The service code for reactification of PLCC panel is not listed in ERP so the mail has been sent by EE, 400KV Banda to ERP team to list the service code by which PR can be generated.) 3.400 KV Banda Orai Line-Ist Channel- Ist carrier reactification problem Reactified. 4. 400 KV Banda Orai Line-Ist Channel- II nd & 400 KV Banda Orai line IInd carrier reactification problem under process, informed by EE 400KV Orai. 5. 220KV Banda Mahoba line carrier reactification problem under process.(The service code for reactification of PLCC panel is not listed in ERP so the mail has been sent by EE, 400KV Banda to ERP team to list the service code by which PR can be generated.)
3	220KV S/S ORAI	1. CARRIER IS UNHEALTHY IN ALL 220KV LINES.	For 220KV Orai (400KV S/S)-Orai (220KV S/S) feeder work order has been done by SE, ETC Jhansi and for other remaining still work in progress by ETD orai.
		2. AR IS NOT HEALTHY IN SOME 220KV LINES.	Informed to ETD Orai via Written Letter about AR issue in 220KV Orai-Moth and 220KV Orai-Parichha line.ETD Orai has written letter to visit Company Engineer.Siemens Engineer was contacted through online Communication but couldn't execute Auto reclosing function. AR in all other lines all in fuction.
		3.DISTANCE PROT. MAIN-II RELAYS IS ABSENT ONLY ELEC. MECH. BU RELAY IS PRESENT IN 220KV MOTH AND PARICHHA LINE.	Informed to ETD Orai,Requirment of Numerical relay panel has been sent through PR(No-1050000321)allotment awaited.
		4. REF IS ABSENT IN 160MVA ICT-II.	It has been connected on dated 01.07.2024
		5. IN ICT-II BU HV & LV RELAYS ARE ELCT. MECH.	Informed to ETD Orai,Requirment of Numerical relay panel has been sent through PR(No-1050000321) allotment awaited.
		6. DC E/F PRESENT IN BATTERY SET-II	Informed to ETD Orai, The problem was identified and for resolving this work in progress by ETD Orai.
		7. GPS CLOCK FAULTY.	Informed to ETD Orai,They informed that GPS clock tender is under process.(Opening Date-22.08.2024)
4	220KV S/S BANDA	NO REMARK	

5	220KV S/S MAHOBA	1. BUS BAR RELAY IS FAULTY.	Informed to ETD Hamirpur to repair/replace the relay. ETD Hamirpur has sent demand of new panel to ESDC 1. PR no. - 1010003496
		2. DIST. RELAY OF 220KV BANDA LINE IS FAULTY..	Informed to ETD Hamirpur to repair/replace the relay. ETD Hamirpur has sent demand of new panel to ESDC 1. PR no - 1010003496
		3. ZONE FOR TIMING IN 220KV LINE IS NOT AS PER SOP.	Time settings updated as per SOP.
		4. FLOAT CHARGER OF BETTERY CHARGER-2 IS FAULTY.	Informed to ETD Hamirpur to repair/replace the battery charger. Company Engineer will visit the substation on 27/08/2024.
6	220KV S/S PAHADI	1. REF IS ABSENT IN 100MVA ICT-I.	REF Is enable and issue resolved on date 11.04.2024
		2. CB & ISOLATOR ALARM PRESENT IN BUS BAR RELAY.	Issue Rectified on date 25.03.2024
		3. CPU-I BATTERY ALARM OCCURS IN MAIN-I DIST. RELAY IN ALL 220KV LINES.	Issue is Rectified on date 17.04.2024
		4. CPU-I & CPU-II BATTERY ALARM OCCURS IN DIFF. RELAY IN 100MVA ICT-II.	Issue is Rectified on date 17.04.2024
7	220KV S/S KALYANPURA (LALITPUR)	1. BUS BAR IS OUT OF SERVICE DUE TO CT ISSUE	The CT issue has been resolved and Busbar protection is in service.
		2.BRC & VTFF IS ABSENT IN DIST. RELAY.	This feature is absent in SEIMENS make relay.
		3. REF RELAY IS ABSENT 160MVA & 100MVA ICTS.	Due to unavailability of Busing CT for REF protection & Absence of any spare core in LV CT in 100MVA Transformer. Absence of REF protection wiring and relay in 160MVA.These both have informed to ETD Jhansi on dated 14/8/2024
		4. 110V BETTERY BANK-I &II ARE OLD.	As informed by SDO(T), Tender floating process is under progress.
8	220KV S/S MOTH	1. 220KV BUS BAR NOT COMMISIONED.	comissioned on dated 03/03/2024
9	220KV S/S BABINA	1. CARRIER FAILED IN 220KV DUNARA LINE.	Rectified on dated 10.06.2024
		2. REF RELAY IS NOT ACTIVE IN160MVA -1	DUE TO UNAVAILABILITY IN BUSHING CT which has informed to ETD Jhansi dated on 09/8/2024
		3. BUS-I BLOCK ALARM OCCERS IN 220KV BUS BAR RELAY.	Rectified on dated 10.06.2024
10	220KV S/S DUNARA	1. CARRIER FAILED IN 220KV PARICHHA-II LINE.	Rectified on dated 15.06.2024
		2. REF RELAY IS NOT ACTIVE IN 100MVA ICT-I &II	DUE TO UNAVAILABILITY IN BUSHING CT which has informed to ETD Jhansi dated on 09/8/2024

LUCKNOW ZONE

DIVISION : ET&C Division Bareilly
SUBSTATION : 400 KV Substation bareilly
AUDIT DATE: 20.03.2024

S.No.	Name of Bay	Name of Protection	Status of Protection	Remark	Action to be taken by
1	Remedial Action taken on the observations made in Previous Protection Audit (Internal/Third Party)		Time synchronization of relays done, some relays replaced with numeric relay panels	Main2 protection is reqired in Pantnagar, CB Ganj1, Pilibhit1 and numeric relay panel required for 80 MVAR Bus reactor and 400 KV Bus bar	Relay requirement has been sent, will be retrofitted after recieving of relays.
2	**Lines**				
	a.	Healthiness of Main-1,	Healthy		
	b.	Settings	OK		
	c.	Reach	OK		
	d.	Time	OK		
	e.	SOTF	OK		
	f.	BRC Alarm	OK		
	g.	Power Swing	OK		
	h.	Fuse Fail Monitoring	OK		
	i.	Auto Reclose	Functional		
	j.	Healthiness of Carrier Protection	In 220 KV Dohna-Bareilly I PLCC is OK but there is problem in coaxial and lmu.		
	k.	GPS Clock	Available	it's defective not working properly	It will be replaced soon
	l.	GPS Synchronization	relays time synchronized except CSC and ERL.		
	m.	Last testing	testing done in time	testing done in time	
3	**Transformer/ Reactor**				
	a.	Healthiness of Differential, Backup, REF Protection	all relays are ok		
	b.	Settings	settings are kept as per the recommendation		
	c.	Last testing	testing done in time		
4	**Bus Bar & LBB**				
	a.	Healthiness	At 400 KV Bareilly 400 kv system bus bar relay is in healtyhy220 kv bus bar relays out of service due to exhausted capacity	at 400 kv bareilly 220 kv system new bus bar relay panel is to be comissioned after receving of control cable	220KV Busbar Numerical panel recieved but 4cx2,5sqmm cable avaited from design which is to be required for its commissioning

	b.	Settings	OK		
	c.	Status	OK		
5	**Status of DC System**				
	a.	DC Earth Fault	**Charger No.1 at 400 KV bareilly**	Positive is fully grounded. soon rectification will be done soon.	Maintenance team with the help of T&C team trying to rectify DC problem, work is under progress.
			Positive to Negative=233v		
			Positive to Earth=2V		
			Negative to Earth= -231V		
			Charger No.2	Positive is fully grounded. rectification will be done soon.	Maintenance team with the help of T&C team trying to rectify DC problem, work is under progress.
			Positive to Negative=238V		
			Positive to Earth= 0.4V		
			Negative to Earth= -238V		
			Charger No.3 & 4 (48V)		
			OK		
	b.	Batteries-220V/110V/48V			
		Make	Exide/HBL		
		Battery Status	OK		
		Gravity	OK		
	c.	Chargers Make	AZ ELECTRONICS		
		Status	OK		
	d.	DCDB Make	Vikas engineering associates		
		Status	OK		
6	**Analysis of tripping from July 2023**				
	a.	Name of Element tripped more than two times in a month	Unnao ckt-1 unnao ckt-2		
	b.	Multiple Trippings	YES		
	c.	Trippings Unexplained	All Explained		
7	**Status of SPS**		Not Installed		
8	**Status of CB Testing**		done in 2021		Tender in process for testing of CB
9	**Status of CT/CVT**		CT & CVT Testing done at the time of commissioning		Tender of PD/Tan-Delta testing of all CTs is under process will be done soon.
10	**Status of Sequential Event Logger (SEL)**		Installed but capacity exhausted		Requirement send to Design Circle for upgradation

SUBSTATION : 220 KV Substation Dohna
AUDIT DATE: 20.03.2024

S.No.	Name of Bay	Name of Protection system	Status of Protection System	Remark	Action to be taken by Transmission wing
1	Remedial Action taken on the observations made in Previous Protection Audit (Internal/Third Party)				
2	**Lines**				
	a.	Healthiness of Main-1, Main-2, & Backup relays	Healthy		
	b.	Settings	OK		
	c.	Reach	OK		
	d.	Time	OK		
	e.	SOTF	OK		
	f.	BRC Alarm	OK		
	g.	Power Swing	OK		
	h.	Fuse Fail Monitoring	OK		
	i.	Auto Reclose	Functional		
	j.	Healthiness of Carrier Protection	In 220 KV Dohna-Bareilly I PLCC is OK but there is problem in coaxial and lmu.		
	k.	GPS Clock	Available		
	l.	GPS Synchronization	relays not time synchronized		
	m.	Last testing	testing done in time		
3	**Transformer/ Reactor**				
	a.	Healthiness of Differential, Backup, REF Protection	all relays are ok		
	b.	Settings	settings are kept as per the recommendation		
	c.	Last testing	testing done in time		
4	**Bus Bar & LBB**				
	a.	Healthiness	relay healthy		
	b.	Settings	OK		
	c.	Status	OK		
5	**Status of DC System**				
	a.	DC Earth Fault	**Charger No.1 at 400 KV bareilly**	negative is partially grounded. soon rectification will be done soon	
			Positive to Negative=119.6v		
			Positive to Earth=88.1V		
			Negative to Earth= -31.6V		

			Charger No.2	negative is partially grounded. soon rectification will be done soon	
			Positive to Negative=118.8V		
			Positive to Earth= 88.2V		
			Negative to Earth= -31.8V		
			Charger No.3 & 4 (48V)		
			OK		
	b.	Batteries-220V/110V/48V			
		Make	Exide		
		Battery Status	OK/48 volt cell no		
		Gravity	OK		
	c.	Chargers Make	radetron & statcon power controls ltd		
		Status	OK		
	d.	DCDB Make	statcon power controls ltd		
		Status	OK		
6	**Analysis of tripping from July 2023**				
	a.	Name of Element tripped more than two times in a month	nil		
	b.	Multiple Trippings	YES		
	c.	Trippins Unexplained	All Explained		
7	**Status of SPS**		Not Installed		
8	**Status of CB Testing**		not done		
6	**Status of CT/CVT**		CT & CVT Testing done during comissioning		
	Status of Sequential Event Logger		not installed		
	b.	Multiple Trippings	Nil		
	c.	Trippins Unexplained	Nil (All Explained)		
7	Status of SPS		Not Installed		
8	Status of CB Testing		220 KV CB testing is not done.		
9	Status of CT/CVT		CT & CVT Testing done at the time of commissioning		
10	Status of Sequential Event Logger		Not Available		

DIVISION : ET&C Division Bareilly
SUBSTATION : 220 KV Substation Amariya
AUDIT DATE: 21.03.2024

S.No.	Name of Bay	Name of Protection system	Status of Protection System	Remark	Action to be taken by Transmission wing
1	Remedial Action taken on the observations made in Previous Protection Audit (Internal/Third Party)		**NO record found**		
2	**Lines**				

	a.	Healthiness of Main-1, Main-2, & Backup relays	Healthy		
	b.	Settings	settings ok		
	c.	Reach	OK		
	d.	Time	OK		
	e.	SOTF	OK		
	f.	Fuse Fail Monitoring	OK		
	g.	BRC Alarm	OK		
	h.	Power Swing	OK		
	i.	Auto Reclose	Functional		
	j.	Healthiness of Carrier Protection	OK		
	k.	GPS Clock	Available		
	l.	GPS Synchronization	OK		
	m.	Last testing	testing done in time		
3	**Transformer/ Reactor**				
	a.	Healthiness of Differential, Backup, REF Protection	ok		
	b.	Settings	ok		
	c.	Last testing	testing		
4	**Bus Bar & LBB**				
	a.	Healthiness	Healthy		
	b.	Settings	OK		
	c.	Status	ok		
5	**Status of DC System**				
	a.	DC Earth Fault	**Charger No.1 (110V)**		
			Positive to Negative=120V	In DCDB-1 positive of DC found partially grounded.	Defect has been removed Now There is No Leakage at Present
			Positive to Earth=53.8V		
			Negative to Earth= -66.2V		
			Charger No.2 (110V)		
			Positive to Negative=118.9V		
			Positive to Earth= 58.9V		
			Negative to Earth= -59.9V		
			Charger No.3 (48V)		
			48 Battery bank is not available. It is obtained by Chopper limit and convert it from 110V to 48V.		
	b.	Batteries-220V/110V/48V	Battery Bank I & II		
		Make	Exide Industrial		
		Battery Status	Healthy		
		Gravity	OK		
	c.	Chargers Make	Charger No.1 (110V Make STATCON ENERGIAA)		

		Status	ok		
		Chargers Make	Charger No.2 (110V Make STATCON ENERGIAA)		
		Status	ok		
	d.	DCDB Make	continental electricalind pvt ltd		
		Status	OK		
6	Analysis of tripping from July 2023				
	a.	Name of Element tripped more than two times in a month	Nil		
	b.	Multiple Trippings	Nil		
	c.	Trippins Unexplained	No		
7	Status of SPS		Not Installed		
8	Status of CB Testing		Testing done		
9	Status of CT/CVT		Testing done		
10	Status of Sequential Event Logger (SEL)		Available. It is SAS (SCADA) based system.		

DIVISION : ET&C Division Bareilly
SUBSTATION : 220 KV Substation Pilibhit
AUDIT DATE: 21.03.2024

S.No.	Name of Bay	Name of Protection system	Status of Protection System	Remark	Action to be taken by Transmission wing
1	Remedial Action taken on the observations made in Previous Protection Audit (Internal/Third Party)		**No record found.**		
2	**Lines**				
	a.	Healthiness of Main-1, Main-2, & Backup relays	Healthy		
	b.	Settings	OK		
	c.	Reach	ok		
	d.	Time Settings.	OK		
	e.	SOTF	OK		
	f.	Fuse Fail Monitor	OK		
	g.	BRC Alarm	ok		
	h.	Power Swing	OK		
	i.	Auto Reclose	operational		
	j.	Healthiness of Carrier Protection	OK		
	k.	GPS Clock	Available but defective		Tendering is in Process
	l.	GPS Synchronization	Defective		
	m.	Last testing	testing done in time		

3	**Transformer/ Reactor**				
	a.	Healthiness of Differential, Backup, REF Protection	Healthy		
	b.	Settings	ok		
	c.	Last testing	Testing done.		
4	**Bus Bar & LBB**				
	a.	Healthiness	Healthy		
	b.	Settings	ok		
	c.	Status	Healthy		
5	**Status of DC System**				
	a.	DC Earth Fault	**Charger No.1 (110V)**		
			Positive to Negative=119.9V		
			Positive to Earth=58.1V		
			Negative to Earth= -61.9V		
			Charger No.1 (110V)		
			Positive to Negative=119.9V		
			Positive to Earth=58.1V		
			Negative to Earth= -61.9V		
	b.	Batteries-220V/110V/48V			
			110V Battery Bank I & II (Make Exide Industrial)		
		Battery Status	Healthy		
		Gravity	OK		
	c.	Chargers Make	chloride power sytem & solution ltd		
		Status	In 110V Chargers Negative of DC is fully grounded and in 48V charger Positive of DC is fully grounded.		
		DCDB Make	chloride power sytem & solution ltd		
		Status	OK		
6	Analysis of tripping from July 2023				
	a.	Name of Element tripped more than two times in a month	Nil		
	b.	Multiple Trippings	Nil		
	c.	Trippins Unexplained	Nil		
7	Status of SPS		Not Installed		

8	Status of CB Testing		not done		
9	Status of CT/CVT		Testing done during comissioning		
10	Status of Sequential Event Logger (SEL)		Available. It is SAS (SCADA) based system.		

SUBSTATION : 220 KV Substation Faridpur
AUDIT DATE: 22.03.2024

S.No.	Name of Bay	Name of Protection system	Status of Protection System	Remark	Action to be taken by Transmission wing
1	Remedial Action taken on the observations made in Previous Protection Audit (Internal/Third Party)		**No record found.**		
2	**Lines**				
	a.	Healthiness of Main-1, Main-2, & Backup relays	Healthy	All protection relays are healthy & MAIN-I & MAIN-II schemes are available at all lines.	
	b.	Settings	OK		
	c.	Reach	OK		
	d.	Time	OK		
	e.	SOTF	OK		
	f.	BRC Alarm	OK		
	g.	Power Swing	OK		
	h.	Fuse Fail Monitoring	OK		
	i.	Auto Reclose	Functional		
	j.	Healthiness of Carrier Protection	Unhealthy	Carrier communication is not healthy and carrier inter tripping is inactive due to non-availability of DTPC.	OPGW is not avaible in lines, work is in process
	k.	GPS Clock	Available		
	l.	GPS Synchronization	All Protection relays Synchronized with GPS		
	m.	Last testing	Annual routine testing of protective relays is done timely.		
3	**Transformer/ Reactor**				
	a.	Healthiness of Differential, Backup, REF Protection	Healthy		
	b.	Settings	All setting have been done as per Recommandation.		
	c.	Last testing			
4	**Bus Bar & LBB**				
	a.	Healthiness	Unhealthy	Bus Bar Protection Relay is available but commissioning is pending by ABB service engineer.	ABB Relay has been called for commissioning of Bus Bar Protection Relay
	b.	Settings	Not Configured		

	c.	Status	Isolator & CB status are as per recomendation.		
5	**Status of DC System**				
	a.	DC Earth Fault	**Charger No.1**		
			Positive to Negative=1100V		
			Positive to Earth=55V		
			Negative to Earth= -55V		
			Charger No.2		
			Positive to Negative=1100V		
			Positive to Earth=55V		
			Negative to Earth= -55V		
			Charger No.3 (48V)		
			48 Battery bank is available and healthy.		
	b.	Batteries-220V/110V/48V			
		Make	Exide		
		Battery Status	OK		
		Gravity	OK		
	c.	Chargers Make	Chhavi Electrical Make		
		Status	OK		
	d.	DCDB Make	Nitya Electricals		
		Status	OK		
6	**Analysis of tripping from July 2023**				
	a.	Name of Element tripped more than two times in a month	Nil		
	b.	Multiple Trippings	Nil		
	c.	Tripping Unexplained	Nil (All Explained)		
7	**Status of SPS**		SPS is not available.	SPS is not available.	
8	**Status of CB Testing**		Breaker timing test is pending.		
9	**Status of CT/CVT**		CT & CVT Testing done at the time of commissioning		
10	**Status of Sequential Event Logger (SEL)**		Installed and healthy		

SUBSTATION : 220 KV Substation C.B.Ganj
AUDIT DATE: 20.03.2024

S.No.	Name of Bay	Name of Protection system	Status of Protection System	Remark	Action to be taken by Transmission wing
1	Remedial Action taken on the observations made in Previous Protection Audit (Internal/Third Party)		**No record found.**		
2	**Lines**				

	a.	Healthiness of Main-1, Main-2, & Backup relays	All protection relays are healthy except 220KV Roza line & for five 220KV lines Main & BU scheme are available in place of MAIN-I & MAIN-II schemes.	Main 2 Relay Need to be Installed on all 220 KV Line except 220 KV Sitarganj and 220 KV Tanakpur Line	
	b.	Settings	OK		
	c.	Reach	OK		
	d.	Time	OK		
	e.	SOTF	OK		
	f.	BRC Alarm	OK		
	g.	Power Swing	OK		
	h.	Fuse Fail Monitoring	OK		
	i.	Auto Reclose	Non Functional	AR is not available in all lines and service engineer is required for incorporation of A/R in current scheme along with Testing except 220 KV Sitarganj and 220 KV Tanakpur Line	Requirement has been sent for Replacement / Retrofitting of Relays where A/R is not available
	j.	Healthiness of Carrier Protection	Unhealthy	Carrier communication is not healthy and carrier inter tripping is inactive except 220KV Tanakpur & 220KV Sitarganj lines	Requirement will be sent soon for DTPC cabinet for 220KV lines except 220KV Roza & OCBTL whose requirement already has been sent
	k.	GPS Clock	Available		
	l.	GPS Synchronization	All Protection relays Not Synchronized with GPS	GPS is available but not healthy due to which and relays time not synchronized	GPS repaired work is in process.
	m.	Last testing	220KV BLY- I, II, 220KV Rampur routine testing has been done on which was due in MAY 2024	220KV BLY- I, II,220KV Rampur routine testing has been done on 12.06.2024, Routine testing of 220kv OCBTL has been done on 15.05.2024	
3	**Transformer/ Reactor**				
	a.	Healthiness of Differential, Backup, REF Protection	Healthy	220MVA T/F II Backup protection relay in Electomechanical need to be replaced by numeric relay	Requirement has been sent for Replacement of Backup Electromechanical relays by Numeric Relays
	b.	Settings	All setting have been done as per Recommandation. Recommandation.		

	c.	Last testing	Routine Testing of 200MVA T/F-I& II completed which was due Apr in -2024	Routine Testing of 200MVA T/F-I& II completed on 30.04.2024	
4	**Bus Bar & LBB**				
	a.	Healthiness	Bus Bar is out of protection	Bus Bar is out of protection due to Fail status of Isolator and Breaker and 220KV Roza line is not incorporated.	Busbar protection work is in process and final testing work is remain.
	b.	Settings	OK		
	c.	Status	Isolator & CB status are incorporated		
5	**Status of DC System**				
	a.	DC Earth Fault	**Charger No.1**	It seems that negative is ground, faulty feeders have not been identified, soon identification/rectification will be done soon as per availability of the Shutdown	
			Positive to Negative=108V		
			Positive to Earth=80V		
			Negative to Earth= -26V		
			Charger No.2	It seems that negative is ground, faulty feeders have not been identified, soon identification/rectification will be done soon as per availability of the Shutdown	
			Positive to Negative=118V		
			Positive to Earth=87V		
			Negative to Earth= -27V		
			Charger No.3 (48V)		
			48 Battery bank is available and healthy.		
	b.	Batteries-220V/110V/48V			
		Make	Exide		
		Battery Status	OK		
		Gravity	OK		
	c.	Chargers Make	Redetron Electrical Make/JVV		
		Status	OK		
	d.	DCDB Make	Redetron /Uptron		
		Status	OK		
6	**Analysis of tripping from July 2023**				
	a.	Name of Element tripped more than two times in a month	Nil		
	b.	Multiple Trippings	Nil		
	c.	Tripping Unexplained	Nil (All Explained)		
7	**Status of SPS**		SPS is not available.	SPS is not available.	
8	**Status of CB Testing**		Breaker timing test is pending.		
9	**Status of CT/CVT**		CT & CVT Testing done at the time of commissioning		
10	**Status of Sequential Event Logger (SEL)**		SEL are not available at the substation.	SEL are not available at the substation.	Requirement has been sent for Event logger

SUBSTATION : 220 KV Substation Badaun
AUDIT DATE: 21.03.2024

S.No.	Name of Bay	Name of Protection system	Status of Protection System	Remark	Action to be taken by Transmission wing
1	Remedial Action taken on the observations made in Previous Protection Audit (Internal/Third Party)		**No record found.**		
2	**Lines**				
	a.	Healthiness of Main-1, Main-2, & Backup relays	Healthy	Main 1 & Main 2 relays installed for 220KV Roza -II & 220KV OCBTL -II , 220KV Roza-I and 220KV OCBTL-I have Main & Backup Relays	Requirement has been sent for Replacement of Main Backup relays by Main 1/ Main 2 Relays
	b.	Settings	OK		
	c.	Reach	OK		
	d.	Time	OK		
	e.	SOTF	OK		
	f.	BRC Alarm	OK		
	g.	Power Swing	OK		
	h.	Fuse Fail Monitoring	OK		
	i.	Auto Reclose	Functional	AR is not available in all lines and service engineer is required for incorporation of A/R in current scheme along with Testing.	Concerned Relay service Enginner is required to be called for configuring A/R in lines along with testing
	j.	Healthiness of Carrier Protection	Healthy	Carrier communication is not healthy and carrier inter tripping is inactive in all lines.	OPGW is available only on 220KV OCBTL-II
	k.	GPS Clock	Available		
	l.	GPS Synchronization	All Protection relays Synchronized with GPS accept to 240MVA ICT-II.	GPS is not available and relays time not synchronized.	GPS Tendering work is in process
	m.	Last testing		Routine testing of all lines at 220KV Badaun has been done on dated 06.05.2024 & 09.05.2024	
3	**Transformer/ Reactor**				
	a.	Healthiness of Differential, Backup, REF Protection	Healthy	REF protection Relay in 200 MVA T/F-II is malfunctioning , REF Relay is required to be checked by GE T&D Engineer	Relay Repairing work is in process
	b.	Settings	All setting have been done as per Recommandation.		
	c.	Last testing	10.05.2024 (Routine Testing of 200MVA T/F-I& II completed which was due June in -2024)		
4	**Bus Bar & LBB**				
	a.	Healthiness	Healthy		
	b.	Settings	OK		
	c.	Status	Isolator & CB status are as per recomendation.		
5	**Status of DC System**				
	a.	DC Earth Fault	**Charger No.1**	It seems that negative is ground, faulty feeders	

			Positive to Negative=120V	have not been identified, soon identification/rectification will be done soon as per availability of the Shutdown	
			Positive to Earth=119.4V		
			Negative to Earth= -2V		
			Charger No.2		
			Positive to Negative=119V		
			Positive to Earth= 55V		
			Negative to Earth= -56V		
			Charger No.3 (48V)		
			48 Battery bank is available and healthy.		
	b.	Batteries-220V/110V/48V			
		Make	Exide		
		Battery Status	OK		
		Gravity	OK		
	c.	Chargers Make	ZBB Electrotech Make		
		Status	OK		
	d.	DCDB Make	Expo fyn make		
		Status	OK		
6	**Analysis of tripping from July 2023**				
	a.	Name of Element tripped more than two times in a month	Nil		
	b.	Multiple Trippings	Nil		
	c.	Trippins Unexplained	Nil (All Explained)		
7	**Status of SPS**		Not installed		
8	**Status of CB Testing**		Breaker timing test is pending.		
9	**Status of CT/CVT**		CT & CVT Testing done at the time of commissioning		
10	**Status of Sequential Event Logger**		Not installed		

SUBSTATION : 220 KV Substation Dataganj
AUDIT DATE: 21.03.2024

S.No.	Name of Bay	Name of Protection system	Status of Protection System	Remark	Action to be taken by Transmission wing
1	Remedial Action taken on the observations made in Previous Protection Audit (Internal/Third Party)		**No record found.**		
2	**Lines**				
	a.	Healthiness of Main-1, Main-2, & Backup relays	Healthy		
	b.	Settings	OK		
	c.	Reach	OK		
	d.	Time	OK		
	e.	SOTF	OK		
	f.	BRC Alarm	OK		
	g.	Power Swing	OK		

	h.	Fuse Fail Monitoring	OK		
	i.	Auto Reclose	Functional		
	j.	Healthiness of Carrier Protection	Healthy		
	k.	GPS Clock	Available		
	l.	GPS Synchronization	All Protection relays Synchronized with GPS		
	m.	Last testing	Routine Testing of 220KV OCBTL I & II completed which was due in Aug-2024	Routine testing of 220KV OCBTL I & II Carried out on 19.04.2024 & 20.04.2024 respectively.	
3	**Transformer/ Reactor**				
	a.	Healthiness of Differential, Backup, REF Protection	Healthy		
	b.	Settings	All setting have been done as per Recommandation. Over fluxing setting are enable in 160 MVA ICT-I, II. OTI, WTI Fan Start, Pump Start etc settings has bben made as per Recommandation.		
	c.	Last testing	Routine Testing of 160MVA T/F-I & II completed which was due in July-2024	Routine testing of 220KV 160MVA T/F-I & II Carried out on 17.04.2024 & 18.04.2024 respectively.	
4	**Bus Bar & LBB**				
	a.	Healthiness	Healthy		
	b.	Settings	OK		
	c.	Status	Isolator & CB status are as per recomendation.		
5	**Status of DC System**				
	a.	DC Earth Fault	**Charger No.1**		
			Positive to Negative=110V		
			Positive to Earth=55V		
			Negative to Earth= -56V		
			Charger No.2		
			Positive to Negative=110V		
			Positive to Earth= 54V		
			Negative to Earth= -56V		
			Charger No.3 (48V)		
			48 Battery bank is available and healthy.		
	b.	Batteries-220V/110V/48V			
		Make	Exide		
		Battery Status	OK		

		Gravity	OK		
	c.	Chargers Make	chlorite Make		
		Status	OK		
	d.	DCDB Make	Nitya Electro controls pvt ltd		
		Status	OK		
6	**Analysis of tripping from July 2023**				
	a.	Name of Element tripped more than two times in a month	Nil		
	b.	Multiple Trippings	Nil		
	c.	Trippins Unexplained	Nil (All Explained)		
7	**Status of SPS**		Not installed		
8	**Status of CB Testing**		Breaker timing test is pending.		
9	**Status of CT/CVT**		CT & CVT Testing done at the time of commissioning		
10	**Status of Sequential Event Logger**		Installed and healthy		

2024

DIVISION : ET&C Division Gonda
SUBSTATION : 220 KV Substation Bahraich
AUDIT DATE: 29.02.2024

S.No.	Name of Bay	Name of Protection system	Status of Protection System	Remark	Action to be Taken by Transmission Wing
1	Remedial Action taken on the observations made in Previous Protection Audit (Internal/Third Party)		**NO record found**		
2	**Lines**				
	a.	Healthiness of Main-1, Main-2, & Backup relays	Healthy		
	b.	Settings	OK		
	c.	Reach	OK		
	d.	Time	OK		
	e.	SOTF	OK		
	f.	Fuse Fail Monitoring	OK		
	g.	BRC Alarm	OK		
	h.	Power Swing	OK		
	i.	Auto Reclose	Functional		
	j.	Healthiness of Carrier Protection	DTPC panels are available for 220kV Balrampur line & 220 KV Sohawal (PGCIL) line.		
	k.	GPS Clock	Available		
	l.	GPS Synchronization	All relays synchronised with GPS.		
	m.	Last testing	08.06.2024 (Routine testing of 220kV Bahraich-Balrampur line and 220 KV PGCIL line has been done which was due in Dec 2023)	All ements has been tested which were due till July 2024.	
3	**Transformer/ Reactor**				
	a.	Healthiness of Differential, Backup, REF Protection	Healthy		
	b.	Settings	All setting have been done as per Recommandation. OTI, WTI Fan Start, Pump Start etc settings has been made as per Recommandation		
	c.	Last testing	17.01.2024 (Routine testing of 160 MVA T/F-I & 160 MVA T/F-II) , 16.01.2024 (100 MVA T/f) has been done which was due in March 2024	All ements has been tested which were due till July 2024.	
4	**Bus Bar & LBB**				
	a.	Healthiness	Healthy		
	b.	Settings	OK		
	c.	Status	Isolator & CB status are healthy		
5	**Status of DC System**				
	a.	DC Earth Fault	**Charger No.1 (110V)**		
			Positive to Negative=108V		
			Positive to Earth=51.8V		
			Negative to Earth= -56.3V		
			Charger No.2 (110V)		
			Positive to Negative=120V		
			Positive to Earth=62V		
			Negative to Earth= -60V		
			Charger No.3 (48V)		
			48V Battery set is available and healthy		
		Batteries- 220V/110V/48V			
		Make	Exide Industrial		
	b.	Battery Status	Healthy		
		Gravity	OK		

	b.	Chargers Make	HBL Ltd. Make		
		Status	Healthy		
	c.	DCDB Make	Asian switchgear(P) Ltd		
		Status	Healthy		
		Chargers Make	HBL Ltd. Make		
		Status	Healthy		
	d.	DCDB Make	Asian switchgear(P) Ltd		
		Status	Healthy		
6	Analysis of tripping from July 2023				
	a.	Name of Element tripped more than two times in a month	Nil		
	b.	Multiple Trippings	Nil		
	c.	Trippins Unexplained	Nil (All Explained)		
7	**Status of SPS**		Not Applicable	SPS is not applicable for 220 KV S/s	
8	**Status of CB Testing**		Not Done	Circuit breaker testing not done till date for which intimated to Transmission wing wide lett. no. 266/ET&CD,Gonda dtd.09.10.24	
9	**Status of CT/CVT**		CT & CVT Testing done at the time of commissioning		
10	**Status of Sequential Event Logger (SEL)**		Not Available		

DIVISION : ET&C Division Gonda
SUBSTATION : 220 KV Substation Gonda
AUDIT DATE: 28.02.2024

S.No.	Name of Bay	Name of Protection system	Status of Protection System	Remark	Action to be Taken by Transmission Wing
1	Remedial Action taken on the observations made in Previous Protection Audit (Internal/Third Party)		**No record found.**		
2	**Lines**				
	a.	Healthiness of Main-1, Main-2, & Backup relays	Healthy		
	b.	Settings	OK	Now settings have been kept as per recommendation	
	c.	Reach	OK		
	d.	Time	OK		
	e.	SOTF	OK		
	f.	Fuse Fail Monitoring	OK		
	g.	BRC Alarm	OK		
	h.	Power Swing	OK		
	i.	Auto Reclose	Functional		
	j.	Healthiness of Carrier Protection	DTPC		
	k.	GPS Clock	Available		
	l.	GPS Synchronization	Synchronised		
	m.	Last testing		All ements has been tested which were due till July 2024.	
3	**Transformer/ Reactor**				
	a.	Healthiness of Differential, Backup, REF Protection	Healthy		
	b.	Settings	All setting have been done as per Recommandation. OTI, WTI Fan Start, Pump Start etc settings has been made as per Recommandation		
	c.	Last testing		All ements has been tested which were due till July 2024.	
4	**Bus Bar & LBB**				
	a.	Healthiness	Healthy		
	b.	Settings	OK		
	c.	Status	Isolator & CB status are healthy		
	Status of DC System				
			Charger No.1 (110V)		

5	a.	DC Earth Fault	Positive to Negative=122V		
			Positive to Earth=58V		
			Negative to Earth= -64V		
			Charger No.2 (110V)		
			Positive to Negative=122V		
			Positive to Earth=60V		
			Negative to Earth= -62V		
			Charger No.3 (48V)		
			48 Battery bank is available and healthy.		
	b.	Batteries- 220V/110V/48V			
		Make	Exide Industrial		
		Battery Status	Healthy		
		Gravity	OK		
	c.	Chargers Make	JBB Electricals		
		Status	Healthy		
	d.	DCDB Make	Asian		
		Status	Healthy		
6	Analysis of tripping from July 2023				
	a.	Name of Element tripped more than two times in a month	Nil		
	b.	Multiple Trippings	Nil		
	c.	Trippins Unexplained	Nil (All Explained)		
7	**Status of SPS**		Not Applicable	SPS is not applicable for 220 KV S/s	
8	**Status of CB Testing**		Not Done	Circuit breaker testing not done till date for which intimated to Transmission wing wide lett. no. 266/ET&CD,Gonda dtd.09.10.24	
9	**Status of CT/CVT**		CT & CVT Testing done at the time of commissioning		
10	**Status of Sequential Event Logger (SEL)**		Not Available		

DIVISION : ET&C Division Gonda
SUBSTATION : 220 KV Substation Balrampur
AUDIT DATE: 28.02.2024

S.No.	Name of Bay	Name of Protection system	Status of Protection System	Remark	Action to be Taken by Transmission Wing
1	Remedial Action taken on the observations made in Previous Protection Audit (Internal/Third Party)		**No record found.**		
2	**Lines**				
	a.	Healthiness of Main-1, Main-2, & Backup relays	Healthy		
	b.	Settings	OK		
	c.	Reach	OK		
	d.	Time Settings.	OK		
	e.	SOTF	OK		
	f.	Fuse Fail Monitor	OK		
	g.	BRC Alarm	OK		
	h.	Power Swing	OK		
	i.	Auto Reclose	Functional		
	j.	Healthiness of Carrier Protection	DTPC panels are available for 220kV Bahraich line & 220 KV Gonda(400) line.		
	k.	GPS Clock	Available		
	l.	GPS Synchronization	Synchronized		
	m.	Last testing	24.12.2023		
3	**Transformer/ Reactor**				
	a.	Healthiness of Differential, Backup, REF Protection	Healthy		
	b.	Settings	All setting have been done as per Recommandation. OTI, WTI Fan Start, Pump Start etc settings has been made as per Recommandation		
	c.	Last testing	21.12.2023		

4	**Bus Bar & LBB**				
	a.	Healthiness	Healthy		
	b.	Settings	OK		
	c.	Status	Functional		
5	**Status of DC System**				
	a.	DC Earth Fault	**Charger No.1 (110V)**		
			Positive to Negative=121V		
			Positive to Earth=59V		
			Negative to Earth= -62V		
			Charger No.2 (110V)		
			Positive to Negative=122V		
			Positive to Earth=60V		
			Negative to Earth= -62V		
			Charger No.3 (48V)		
			NA		
	b.	Batteries- 220V/110V/48V			
		Make	Exide Industrial		
		Battery Status	Healthy		
		Gravity	OK		
	c.	Chargers Make	Charger No.1 & 2 (110V Make Statcon Energia)		
		Status	Healthy		
		Chargers Make	NA		
		Status	NA		
	d.	DCDB Make	Siemens Electrical		
		Status	Healthy		
6	Analysis of tripping from July 2023				
	a.	Name of Element tripped more than two times in a month	Nil		
	b.	Multiple Trippings	Nil		
	c.	Trippins Unexplained	Nil (All Explained)		
7	**Status of SPS**		Not Applicable	SPS is not applicable for 220 KV S/s	
8	**Status of CB Testing**		Not Done	Circuit breaker testing not done till date for which intimated to Transmission wing wide lett. no. 266/ET&CD,Gonda dtd.09.10.24	
9	**Status of CT/CVT**		CT & CVT Testing done at the time of commissioning		
10	**Status of Sequential Event Logger (SEL)**		Not Available		

PROTECTION AUDIT OF UPPTCL SUBSTATION 220KV CHINHAT

Previous Protection Audit

	OBSERVATIONS	N/A
	REMEDIAL ACTIONS IF ANY	N/A

(A) Lines

		220 KV SATRIKH ROAD	220KV PG LKO	220KV GOMTINAGAR	220KV K.ROAD	220 KV LMRC I	220 KV LMRC II			Remarks	Action to be taken by Transmission wing
1	Healthiness of Main 1	OK	OK	OK	OK	OK	OK				
2	Healthiness of Main 2	OK	OK	OK	OK	OK	OK				
3	Healthiness of B/U	OK	OK	OK	OK	OK	OK	A/R not applicable in LMRC I & II Due to UG Cable			
4	Settings-Reach	OK	OK	OK	OK	OK	OK				
5	Settings-Time	OK	OK	OK	OK	OK	OK				
6	Healthiness of carrier protection	OK	OK	OK	OK	OK	OK				
7	Healthiness of Auto Reclosure	Not working	Not working	Not working	OK	U/G	U/G			Proposed in month of sept 24	Timely Shutdown will be arranged.
8	Last Routine testing	01.07.2024	18.07.2023	22.04.2024	19.07.2023	22.09.2023	23.09.2023				

(B) Transformers / Reactor

		200 MVA T/F-1	200 MVA T/F-II							
1	Healthiness of Differential Relay	OK	OK							---
2	Healthiness of REF Relay	OK	OK							
3	Healthiness of BACKUP Relay(HV)	OK	OK							
4	Healthiness of BACKUP Relay(LV)	OK	OK							
5	SETTINGS	OK	OK							
6	LAST TESTING	19.03.2024	19.12.2023							NO Routine testing pending

(C) BUSBAR & LBB

		220 KV BUS								
1	HEALTHINESS	OK								---
2	SETTINGS	OK								

(D) Status of DC system

			Positive to negative	Positive to earth	-ve to earth						
1	DC EARTH FAULT	I	120V	112	8V					Need to be checked by Transmission wing	To identify the DC Earth Fault exact location, shutdown of all the feeders is required which will be performed in the coming winter season .
2	BATTERIES (220V/110V)	II	119 V	111	7.6						
	48 V		52 V	0.5 V	52 V						
3	CHARGERS		3								

(E) ANALYSIS OF TRIPPINGS FROM JULY 2023

1	Name of element tripped more than 2 times in a month	NO								
2	Multiple trippings	NO								
3	Trippings unexplained	NO								---

(F) STATUS OF SPS

		Not Applicable								

(G) STATUS OF CB TESTING

		LMRC I & II	REMARK	220KV K.ROAD	220KV PG LKO	220 KV SATRIKH ROAD	220 KV GNR	200 MVA T/F-I	200 MVA T/F-II	
1	TIMING TEST	03.08.2018		14.09.2021	07.07.2020	23.11.2021	10.01.2023	06.01.2021	23.12.2022	
2	OVERHAULING									
3	CRM/DCRM									

(H) STATUS OF CT

		220 KV SATRIKH ROAD	220KV PG LKO	220KV K.ROAD	220 KVGNR	220 KV LMRC I	220 KV LMRC II			
1	ACCUARACY CLASS FOR PROTECTION	PS, PS, PS	PS, PS, PS	PS, PS, PS	PS, PS, PS	PS, PS, PS	PS, PS, PS			
2	ACCUARACY CLASS FOR METERING	0.2, 1.0, 0.2	0.5, 0.5, 0.5	0.5, 0.5, 0.5	1.0, 0.2, 0.2	0.2, 0.2, 0.2	0.2, 0.2, 0.2			
		200 MVA T/F-I	**200 MVA T/F-II**							
	ACCUARACY CLASS FOR PROTECTION	PS, PS, PS	PS, PS, PS							
	ACCUARACY CLASS FOR METERING	0.5, 0.2, 0.2	2.0, 0.5, 0.5							

(I) STATUS OF CVT

		220 KV SATRIKH ROAD	220KV PG LKO	220KV K.ROAD	220 KVGNR	220 KV LMRC I	220 KV LMRC II			
1	ACCUARACY CLASS FOR PROTECTION	3P, 3P, 3P	3P, 3P, 3P	3P, 3P, 3P	3, 3P, 3P	3P	3P			
2	ACCUARACY CLASS FOR METERING	1.0, 0.2, 0.2	0.5, 0.5, 0.5	0.5, 0.5, 0.5	0.5, 0.2, 0.2	0.2	0.2			
		200 MVA T/F-I	**200 MVA T/F-II**							
	ACCUARACY CLASS FOR PROTECTION	3.0, 3P, 3.0	3.0, 3P, 3.0							
	ACCUARACY CLASS FOR METERING	0.5, 0.2, 0.5	0.5, 0.2, 0.5							

(J)	**STATUS OF SEQUENTIAL EVENT LOGGER**											
	NOT AVAILABLE											
	PROTECTION AUDIT OF UPPTCL SUBSTATION 220 KV BKT											
	Previous Protection Audit											
	Previous prot. dt 05.03.2019											
	OBSERVATIONS	Relay settings were to be reviewed										
	REMEDIAL ACTIONS IF ANY	settings of 220 kv lines and both TFs has been checked and changed as per SOP										
(A)	**Lines**										**Remarks**	**Action to be taken by Transmission wing**
		220 KV SITAPUR LINE	**220 KV PGCIL LINE**									
1	Healthiness of Main 1	OK	OK								AR Problem of both lines was resolved on 26.04.2024	Problem Resolved
2	Healthiness of Main 2	NA	NA									
3	Healthiness of B/U	OK	OK									
4	Settings-Reach	OK	OK									
5	Settings-Time	OK	OK									
6	Healthiness of carrier protection	OK	OK									
7	Healthiness of Auto Reclosure	Not Working	Not Working									
8	Last Routine testing	26.04.2024	26.04.2024								No routine testing is pending	No routine testing is pending
(B)	**Transformers / Reactor**											
		60 MVA T/F-I	**60 MVA T/F-II**									
1	Healthiness of Differential Relay	OK	OK									Every Relay and Control Panel is Healthy
2	Healthiness of REF Relay	NA	NA								OK	
3	Healthiness of BACKUP Relay(HV)	OK	OK									
4	Healthiness of BACKUP Relay(LV)	OK	OK									
5	SETTINGS	OK	OK									
6	LAST TESTING	29.08.2024	29.08.2024								No routine testing is pending	
(C)	**BUSBAR & LBB**											
		220KV BUS									LOI has been issued by transmission wing for recitification purpose	Engineer will come after one week.
1	HEALTHINESS	Not Working										
2	SETTINGS											
(D)	**Status of DC system**											
			Positive to negative	**Positive to earth**	**-ve to earth**						Need to be checked by Transmission wing	Resolved on 04.09.2024.
1	DC EARTH FAULT	110 V	120 V	1.7 V	- 118V							
2	BATTERIES (220V/110V/48V)	48 V	52V	52V								
3	CHARGERS		3	0.2	-51 V							
(E)	**ANALYSIS OF TRIPPINGS FROM JULY 2023**											
												No Tripping
1	Name of element tripped more than 2 times in a month	NO										
2	Multiple trippings	NO										
3	Trippings unexplained											
(F)	**STATUS OF SPS**	NOT AVAILABLE										NOT AVAILABLE
(G)	**STATUS OF CB TESTING**											
		220 KV LINE SITAPUR	**REMARK**									
1	TIMING TEST	05.10.2023		220 KV PGCIL, 60 MVA T/F-I &II Not Done								As Soon Bkr Timing testing will be start.
2	OVERHAULING	05.10.2023										
3	CRM/DCRM	05.10.2023										
(H)	**STATUS OF CT**											
		220 KV SITAPUR LINE	**220 KV PGCIL LINE**	**60 MVA T/F-I**	**60 MVA T/F-II**							
1	ACCUARACY CLASS FOR PROTECTION R,Y,B ϕ	PS	PS	PS	PS							OK
2	ACCUARACY CLASS FOR METERING R,Y,B ϕ	0.2	0.2	0.2	0.2							
(I)	**STATUS OF CVT**											
		220 KV SITAPUR LINE	**220 KV PGCIL LINE**	**60 MVA T/F-I**	**60 MVA T/F-II**							
1	ACCUARACY CLASS FOR PROTECTION R,Y,B ϕ	3P	3P	3P	3P							OK
2	ACCUARACY CLASS FOR METERING	0.2	0.2	0.2	0.2							

(J)	**STATUS OF SEQUENTIAL EVENT LOGGER**												
			SCADA	Available								Partially Working	Partially Working
	PROTECTION AUDIT OF UPPTCL SUBSTATION 220 KV KURSI ROAD												
	Previous Protection Audit dt 06-03-2019												
	OBSERVATIONS			Relay setting were to be reviewed									
	REMEDIAL ACTIONS IF ANY			settings of 220 kv lines and both TFs has been checked and changed as per SOP									
(A)	**Lines**												
				220 KV PGCIL I	**220 KV PGCIL II**	**220 KV H. ROAD**	**220 KV CHINHAT**					**Remarks**	**Action to be taken by Transmission wing**
1	Healthiness of Main 1			OK	OK	OK	OK						
2	Healthiness of Main 2			NA	NA	NA	NA						
3	Healthiness of B/U			OK	OK	OK	OK						
4	Settings-Reach			OK	OK	OK	OK						
5	Settings-Time			OK	OK	OK	OK						
6	Healthiness of carrier protection			OK	OK	OK	OK						
7	Healthiness of Auto Reclosure			Not Working	Not Working	OK	Not Working					AR problem of Chinhat line resolved on 03/09/2024. AR problem of PG-1 was tried to be resolved on 04/09/2024, but due to configuration problem of relay , the prblem could not be resolved. Transmission wing was informed regarding the same and they were asked to inform the company to depute a relay engineer so that the problem can be resolved.	shutdown arranged for rectifying Auto Reclosure.
8	Last Routine testing			11.09.2023	14.09.23	15.04.23	17.04.23						
(B)	**Transformers / Reactor**												
				200 MVA	100 MVA TF	160 MVA TF							
1	Healthiness of Differential Relay			OK	OK	OK							
2	Healthiness of REF Relay			OK	OK	OK							
3	Healthiness of BACKUP Relay(HV)			OK	OK	OK							
4	Healthiness of BACKUP Relay(LV)			OK	OK	OK							
5	SETTINGS			OK	OK	OK							
6	LAST TESTING			09.05.2024	10.05.2024	10.05.2024							
(C)	**BUSBAR & LBB**												
				220KV BUS								LOI has been issued by transmission wing for rectification purpose	Work in progress
1	HEALTHINESS			Not Working									
2	SETTINGS												
(D)	**Status of DC system**												
					Positive to negative	**Positive to earth**	**-ve to earth**					Need to be checked by Transmission wing	DC earth being traced by taking shutdowns in phased manner without disturbing load supply.
1	DC EARTH FAULT				122 V	0.8 V	-119 V						
2	BATTERIES (220V/110V/48V)				53 V	0.2	-53 V						
3	CHARGERS												
(E)	**ANALYSIS OF TRIPPINGS FROM JULY 2023**												
1	Name of element tripped more than 2 times in a month												
2	Multiple trippings			NO									
3	Trippings unexplained												

(F)	STATUS OF SPS				NOT AVAILABLE								
(G)	STATUS OF CB TESTING												
						REMARK							
1	TIMING TEST				PGCIL I	PGCIL II	160 MVA	CHT	H. Road				
2	OVERHAULING				26.09.23	26.09.23	17.01.20	02.06.2013	02.06.2013				
3	CRM/DCRM												
(H)	STATUS OF CT												
					220 KV PGCIL I	220 KV PGCIL II	220 KV H. ROAD	220 KV CHINHAT	200 MVA TF	100 MVA TF	160 MVA TF		
1	ACCUARACY CLASS FOR PROTECTION				PS	PS	PS	PS	PS	PS	PS		
2	ACCUARACY CLASS FOR METERING				0.2	0.2	0.2	0.2	0.2	0.2	0.2		
(I)	STATUS OF CVT												
					220 KV PGCIL I	220 KV PGCIL II	220 KV H. ROAD	220 KV CHINHAT	200 MVA TF	100 MVA TF	160 MVA TF		
1	ACCUARACY CLASS FOR PROTECTION				3P	3P	3P	3P	3P	3P	3P		
2	ACCUARACY CLASS FOR METERING				0.2	0.2	0.2	0.2	0.2	0.2	0.2		
(J)	STATUS OF SEQUENTIAL EVENT LOGGER												
			SCADA	Available								Partially Working	PR submitted for AMC of SCADA
	PROTECTION AUDIT OF UPPTCL SUBSTATION 220 KV KANPUR ROAD												
	Previous Protection Audit												
	OBSERVATIONS			NA									
	REMEDIAL ACTIONS IF ANY			No									
(A)	Lines											Remarks	Action to be taken by Transmission wing
					220 KV S.NAGAR LINE	220 KV UNNAO LINE							
1	Healthiness of Main 1				OK	OK							
2	Healthiness of Main 2				NA	NA							
3	Healthiness of B/U				OK	OK						1- Kanpur Road -Sarojini Nagar and Kanpur road - Unnao Line- currently M1 and line differential relay available, M1 is ok, Line differential is not working due to FOTE is not available, hence back up protection needed to be activated in Differential relay, but it dosen't have feature of Directional Earth fault protection, Hence back up protection is not working currently. 2- Main2 relay required for Unnao line.	For 220 KV Kanpur-Unnao Line there is differenital realy at kanpur side though there is a need of distance protection relay as M2, as the line comprises both section of UG and OH. the requirement of Distance relay is being sent to design circle.
4	Settings-Reach				OK	OK							
5	Settings-Time				OK	OK							
6	Healthiness of carrier protection				NA	NA							
7	Healthiness of Auto Reclosure				NA	NA						NO ROUTINE TESTING PENDING	
8	Last Routine testing				08.08.2023	08.08.2023							
(B)	Transformers / Reactor												
					60 MVA T/F-I	60 MVA T/F-II	60 MVA T/F-III						
1	Healthiness of Differential Relay				OK	OK	OK						
2	Healthiness of REF Relay				NA	NA	NA					OK	
3	Healthiness of BACKUP Relay(HV)				OK	OK	OK						
4	Healthiness of BACKUP Relay(LV)				OK	OK	OK						
5	SETTINGS				OK	OK	OK						
6	LAST TESTING				30.04.2024	30.04.2024	30.04.2024					NO ROUTINE TESTING PENDING	
(C)	BUSBAR & LBB												
					220KV BUS								
1	HEALTHINESS				OK							OK	
2	SETTINGS				OK								
(D)	Status of DC system												

		Positive to negative	**Positive to earth**	**-ve to earth**						OK	
1	DC EARTH FAULT	233 V	114 V	114 V							
2	BATTERIES (220V/110V/48V)	220 V									
3	CHARGERS	2									
(E)	**ANALYSIS OF TRIPPINGS FROM JULY 2023**										
1	Name of element tripped more than 2 times in a month	0								OK	
2	Multiple trippings	0									
3	Trippings unexplained	0									
(F)	**STATUS OF SPS**	NOT AVAILABLE									
(G)	**STATUS OF CB TESTING**										
			REMARK							OK	
1	TIMING TEST	NA									
2	OVERHAULING	NA									
3	CRM/DCRM	NA									
(H)	**STATUS OF CT**										
		220 KV TL	**221 KV TL**	**60 MVA T/F-I**	**60 MVA T/F-II**	**60 MVA T/F-III**				OK	
1	ACCUARACY CLASS FOR PROTECTION	PS	PS	PS	PS	PS					
2	ACCUARACY CLASS FOR METERING	0.2	0.2	0.2	0.2	0.2					
(I)	**STATUS OF CVT**										
		220 KV TL	**221 KV TL**	**60 MVA T/F-I**	**60 MVA T/F-II**	**60 MVA T/F-III**				OK	
1	ACCUARACY CLASS FOR PROTECTION	PS	PS	PS	PS	PS					
2	ACCUARACY CLASS FOR METERING	0.2	0.2	0.2	0.2	0.2					
(J)	**STATUS OF SEQUENTIAL EVENT LOGGER**									OK	
	Working										

PROTECTION AUDIT OF UPPTCL SUBSTATION 220 KV HARDOI ROAD

	Previous Protection Audit										
	OBSERVATIONS	No Record found									
	REMEDIAL ACTIONS IF ANY	---									
(A)	**Lines**	**220 KV S.NAGAR LINE CKT-I**	**220 KV KURSI ROAD LINE**	**220KV JEHTA CKT-I**	**220KV JEHTA CKT-II**					**Remarks**	**Action to be taken by Transmission wing**
1	Healthiness of Main 1	OK	OK	OK	OK					OK	
2	Healthiness of Main 2	OK	OK	OK	OK						
3	Healthiness of B/U	NA	NA	NA	NA						
4	Settings-Reach	OK	OK	OK	OK						
5	Settings-Time	OK	OK	OK	OK						
6	Healthiness of carrier protection	OK	OK	OK	OK						
7	Healthiness of Auto Reclosure	OK	OK	OK	OK						
8	Last Routine testing	31.01.2024	27.04.2024	06.04.2024	04.05.2024					NO ROUTINE TESTING PENDING	
(B)	**Transformers / Reactor**										
		200 MVA T/F-I	**200 MVA T/F-II**								
1	Healthiness of Differential Relay	OK	OK							OK	
2	Healthiness of REF Relay	OK	NA (Relay not available)								
3	Healthiness of BACKUP Relay(HV)	OK	OK								
4	Healthiness of BACKUP Relay(LV)	OK	OK								
5	SETTINGS	OK	OK							No Routine testing Pending	
6	LAST TESTING	18.03.2024	20.03.2024								
(C)	**BUSBAR & LBB**										
		220KV BUS								OK	
1	HEALTHINESS	OK (Working)									
2	SETTINGS	OK									
(D)	**Status of DC system**										
			Positive to negative	**Positive to earth**	**-ve to earth**						
1	DC EARTH FAULT		125 V	70 V	53 V					OK	

2	BATTERIES (220V/110V/48V)		110 V									
3	CHARGERS		2									
(E)	**ANALYSIS OF TRIPPINGS FROM JULY 2023**											
1	Name of element tripped more than 2 times in a month	0									OK	
2	Multiple trippings	0										
3	Trippings unexplained	0										
(F)	**STATUS OF SPS**	NOT AVAILABLE										
(G)	**STATUS OF CB TESTING**											
			REMARK								OK	
1	TIMING TEST	NA										
2	OVERHAULING	NA										
3	CRM/DCRM	NA										
(H)	**STATUS OF CT**											
		220 KV TL	**200 MVA T/F-I**	**200 MVA T/F-II**							OK	
1	ACCUARACY CLASS FOR PROTECTION	PS	PS	PS								
2	ACCUARACY CLASS FOR METERING	0.5 except Jehta-I,II (0.2)	0.5	0.5								
(I)	**STATUS OF CVT**											
		220 KV TL	**200 MVA T/F-I**	**200 MVA T/F-II**							OK	
1	ACCUARACY CLASS FOR PROTECTION R,Y,B ϕ	PS	PS	PS								
2	ACCUARACY CLASS FOR METERING	0.5 except Jehta-I,II (0.2)	0.5	0.5								
(J)	**STATUS OF SEQUENTIAL EVENT LOGGER**											
	NA											
	PROTECTION AUDIT OF UPPTCL SUBSTATION 220 KV CG CITY											
	Previous Protection Audit											
	OBSERVATIONS	NO RECORD FOUND										
	REMEDIAL ACTIONS IF ANY	---										
(A)	**Lines**										**Remarks**	**Action to be taken by Transmission wing**
		220 KV PGCIL-RBL LINE	**220 KV SATRIKH LINE**									
1	Healthiness of Main 1	OK	OK									
2	Healthiness of Main 2	OK	OK									
3	Healthiness of B/U	NA	NA									
4	Settings-Reach	OK	OK									
5	Settings-Time	OK	OK									
6	Healthiness of carrier protection	OK	OK									
7	Healthiness of Auto Reclosure	NA Due to cable part	NA Due to cable part									
8	Last Routine testing	14.06.2024	21.06.2024								NO ROUTINE TESTING PENDING	
(B)	**Transformers / Reactor**											
		60 MVA T/F-II	**60 MVA T/F-III**									
1	Healthiness of Differential Relay	OK	OK								OK	
2	Healthiness of REF Relay	OK	OK									
3	Healthiness of BACKUP Relay(HV)	OK	OK									
4	Healthiness of BACKUP Relay(LV)	OK	OK									
5	SETTINGS	OK	OK									
6	LAST TESTING	07.10.2023	07.08.2023								NO ROUTINE TESTING PENDING	
(C)	**BUSBAR & LBB**											
		220KV BUS									LOI has been issued by transmission for rectification purpose	
1	HEALTHINESS	Not Working										shutdown will be arraged in sep last after avilabilty of service engineer
2	SETTINGS											
(D)	**Status of DC system**											
		Positive to negative	**Positive to earth**	**-ve to earth**								

1	DC EARTH FAULT	119.9 V	68 V	51.9 V								
2	BATTERIES (220V/110V/48V)	110 V, 48V										
		48 V Charger										
3	CHARGERS	3										
(E)	**ANALYSIS OF TRIPPINGS FROM JULY 2023**											
1	Name of element tripped more than 2 times in a month	NIL										
2	Multiple trippings	NIL										
3	Trippings unexplained	NIL										
(F)	**STATUS OF SPS**	NOT AVAILABLE										
(G)	**STATUS OF CB TESTING**											
			REMARK									
1	TIMING TEST											
2	OVERHAULING											
3	CRM/DCRM	NOT DONE										
(H)	**STATUS OF CT**											
		220 KV TL	**220 KV TL**	**60 MVA T/F-II CT**	**60 MVA T/F-III CT**							
1	ACCUARACY CLASS FOR PROTECTION	PS	PS	PS	PS							
2	ACCUARACY CLASS FOR METERING	0.2	0.2	0.2	0.2							
(I)	**STATUS OF CVT**											
		220 KV TL	**220 KV TL**	**60 MVA T/F-II**	**60 MVA T/F-III**							
1	ACCUARACY CLASS FOR PROTECTION	3P	3P	3P	3P							
2	ACCUARACY CLASS FOR METERING	0.2	0.2	0.2	0.2							
(J)	**STATUS OF SEQUENTIAL EVENT LOGGER**											
	SCADA Available										Partially Working	BOQ has been sent for rectification
	PROTECTION AUDIT OF UPPTCL SUBSTATION 220 KV GOMTI NAGAR											
	Previous Protection Audit dt 08-03-2019											
	OBSERVATIONS	Relay setting were to be reviewed										
	REMEDIAL ACTIONS IF ANY	Settings of 220 kv lines and both TFs has been checked and changed as per SOP										
												Action to be taken by Transmission wing
(A)	**Lines**										**Remarks**	
		220 KV S.NAGAR LINE	**220 KV CHINHAT LINE**									
1	Healthiness of Main 1	OK	OK									
2	Healthiness of Main 2	OK	OK									
3	Healthiness of B/U	NA	NA								AR Problem of both lines was resolved on dt 04.03.2024 & 05.03.2024	
4	Settings-Reach	OK	OK									
5	Settings-Time	OK	OK									
6	Healthiness of carrier protection	OK	OK									
7	Healthiness of Auto Reclosure	Not Working	Not Working									
8	Last Routine testing	05.03.2024	04.03.2024									
(B)	**Transformers / Reactor**											
		60 MVA T/F-I	**60 MVA T/F-II**	**60 MVA T/F-III**	**60 MVA T/F-IV**							
1	Healthiness of Differential Relay	OK	OK	OK	OK							
2	Healthiness of REF Relay	OK	OK	OK	OK						OK	
3	Healthiness of BACKUP Relay(HV)	OK	OK	OK	OK							
4	Healthiness of BACKUP Relay(LV)	OK	OK	OK	OK							
5	SETTINGS	OK	OK	OK	OK							
6	LAST TESTING	09.02.2024	08.12.2023	08.12.2023	14.07.2024						No Routine testing pending	
		220KV BUS									All testing work related to bus bar has been completed on dt 07.09.2024.relay now kept under observation and informed to transmission wing.	all shudown arranged for testing of bus bar protection panel by testing team and service engineer .testing completed on 07.09.2024.relay now kept under obervation.
1	HEALTHINESS	Not Working										
2	SETTINGS											
(D)	**Status of DC system**											
		Positive to negative	**Positive to earth**	**-ve to earth**								

1	DC EARTH FAULT	119 V	0	118						Need to be checked by Transmission wing	Tracing of cable has done to rectify the problem.
2	BATTERIES (220V/110V/48V)	110 V, 48V									
3	CHARGERS	3									
(E)	**ANALYSIS OF TRIPPINGS FROM JULY 2023**										
1	Name of element tripped more than 2 times in a month	60 MVA T/F-4	3 TIMES								
2	Multiple trippings	NIL									
3	Trippings unexplained	NIL									
(F)	**STATUS OF SPS**	NOT AVAILABLE									
(G)	**STATUS OF CB TESTING**										
			REMARK								
1	TIMING TEST										
2	OVERHAULING										
3	CRM/DCRM	NOT DONE									
(H)	**STATUS OF CT**										
		220 KV TL	**220 KV TL**	**60 MVA T/F-I CT**	**60 MVA T/F-II CT**	**60 MVA T/F-III CT**	**60 MVA T/F-IV CT**				
1	ACCUARACY CLASS FOR PROTECTION	PS	PS	PS	PS	PS	PS				
2	ACCUARACY CLASS FOR METERING	0.5	0.5	0.5	0.5	0.5	0.2				
(I)	**STATUS OF CVT**										
		220 KV TL	**220 KV TL**	**60 MVA T/F-I**	**60 MVA T/F-II**	**60 MVA T/F-III**	**60 MVA T/F-IV**				
1	ACCUARACY CLASS FOR PROTECTION	PS	PS	PS	PS	PS	PS				
2	ACCUARACY CLASS FOR METERING	0.5	0.5	0.5	0.5	0.5	0.5				
(J)	**STATUS OF SEQUENTIAL EVENT LOGGER**										
	Not Available										
	PROTECTION AUDIT OF UPPTCL SUBSTATION 220 KV BIJNOR										
	Previous Protection Audit										
	OBSERVATIONS	NA									
	REMEDIAL ACTIONS IF ANY	--									
											Action to be taken by Transmission wing
(A)	**Lines**									**Remarks**	
		220 KV S.NAGAR LINE	**220 KV BACHHARAWAN LINE**								
1	Healthiness of Main 1	OK	OK							OK	
2	Healthiness of Main 2	OK	OK								
3	Healthiness of B/U	NA	NA								
4	Settings-Reach	OK	OK								
5	Settings-Time	OK	OK								
6	Healthiness of carrier protection	OK	OK								
7	Healthiness of Auto Reclosure	OK	OK								
8	Last Routine testing	29.09.2023	29.09.2023							NO ROUTINE TESTING PENDING	
(B)	**Transformers / Reactor**										
		160 MVA T/F-I	**160 MVA T/F-II**								
1	Healthiness of Differential Relay	OK	OK							OK	
2	Healthiness of REF Relay	OK	OK								
3	Healthiness of BACKUP Relay(HV)	OK	OK								
4	Healthiness of BACKUP Relay(LV)	OK	OK								
5	SETTINGS	OK	OK								
6	LAST TESTING	06.09.2023	07.09.2023							NO ROUTINE TESTING PENDING	
(C)	**BUSBAR & LBB**										
		220KV BUS								OK	
1	HEALTHINESS	OK									
2	SETTINGS	OK									
(D)	**Status of DC system**										
		Positive to negative	**Positive to earth**	**-ve to earth**							
1	DC EARTH FAULT	120.4 V	61 V	-59						OK	

2	BATTERIES (220V/110V/48V)	110 V									
3	CHARGERS	2									
(E)	**ANALYSIS OF TRIPPINGS FROM JULY 2023**										
1	Name of element tripped more than 2 times in a month	0								OK	
2	Multiple trippings	0									
3	Trippings unexplained	0									
(F)	**STATUS OF SPS**	NOT AVAILABLE									
(G)	**STATUS OF CB TESTING**										
			REMARK							OK	
1	TIMING TEST	29.09.23 (TL)	06.09.23 (TFS)								
2	OVERHAULING	29.09.23 (TL)	06.09.23 (TFS)								
3	CRM/DCRM	29.09.23 (TL)	06.09.23 (TFS)								
(H)	**STATUS OF CT**										
		220 KV TL 1	**220 KV TL 2**	**60 MVA T/F-I**	**60 MVA T/F-II**					OK	
1	ACCUARACY CLASS FOR PROTECTION	PS	PS	PS	PS						
2	ACCUARACY CLASS FOR METERING	0.2	0.2	0.2	0.2						
(I)	**STATUS OF CVT**										
		220 KV TL 1	**220 KV TL 2**	**60 MVA T/F-I**	**60 MVA T/F-II**					OK	
1	ACCUARACY CLASS FOR PROTECTION	3P	3P	3P	3P						
2	ACCUARACY CLASS FOR METERING	0.2	0.2	0.2	0.2						
(J)	**STATUS OF SEQUENTIAL EVENT LOGGER**										
	Working									OK	

PROTECTION AUDIT OF UPPTCL SUBSTATION 400 KV JEHTA

	Previous Protection Audit										
	OBSERVATIONS	NA									
	REMEDIAL ACTIONS IF ANY	NA									
(A)	**Lines**	**400 UNNAO CKT-1**	**400 UNNAO CKT-1**	**400 KV KURSI ROAD-1**	**400 KV KURSI ROAD-2**	**220KV HARDOI ROAD-1**	**220KV HARDOI ROAD-2**	**220 KV MALLAWAN 1**	**221 KV MALLAWAN 2**	**Remarks**	**Action to be taken by Transmission wing**
1	Healthiness of Main 1	OK	OK	OK	OK	OK	OK	OK	OK		
2	Healthiness of Main 2	OK	OK	OK	OK	OK	OK	OK	OK		
3	Healthiness of B/U	OK	OK	OK	OK	OK	OK	OK	OK		
4	Settings-Reach	OK	OK	OK	OK	OK	OK	OK	OK	OK	
5	Settings-Time	OK	OK	OK	OK	OK	OK	OK	OK		
6	Healthiness of carrier protection	OK	OK	OK	OK	OK	OK	OK	OK		
7	Healthiness of Auto Reclosure	OK	OK	OK	OK	OK	OK	OK	OK		
8	Last Routine testing	21.12.2023	22.12.2023	23.12.2023	05.10.2023	24.03.2023	25.03.2023	12.04.2023	12.04.2023	NO ROUTINE TESTING PENDING	
(B)	**Transformers / Reactor**										
		500 MVA ICT-1	**500 MVA ICT-2**	**200 MVA ICT-1**	**200 MVA ICT-2**	**63 MVAR BUS REACTOR**					
1	Healthiness of Differential Relay	OK	OK	OK	OK	OK					
2	Healthiness of REF Relay	OK	OK	OK	OK	OK					
3	Healthiness of BACKUP Relay(HV)	OK	OK	OK	OK	OK	OK				
4	Healthiness of BACKUP Relay(LV)	OK	OK	OK	OK	OK					
5	SETTINGS	OK	OK	OK	OK	OK					
6	LAST TESTING	18.12.2023	19.12.2023	21.09.2023	28.12.2023	20.12.2023	NO ROUTINE TESTING PENDING				
(C)	**BUSBAR & LBB**										
		400 KV BUS	**220 KV BUS**								
1	HEALTHINESS	OK	OK	OK						OK	
2	SETTINGS	OK	OK								
(D)	**Status of DC system**										
			Positive to negative	**Positive to earth**	**-ve to earth**		**Note:-**				
1	DC EARTH FAULT	NO	236 V	118 V	117 V		NA= NOT AVAILABLE				

2	BATTERIES (220V/110V/48V)	220 V, 48 V				OK	Settings-OK (As Per NRPC Guidelines)					
3	CHARGERS	2										
(E)	**ANALYSIS OF TRIPPINGS FROM JULY 2023**											
1	Name of element tripped more than 2 times in a month	0									OK	
2	Multiple trippings	0										
3	Trippings unexplained	0										
(F)	**STATUS OF SPS**	NOT AVAILABLE										
(G)	**STATUS OF CB TESTING**											
			REMARK									
1	TIMING TEST	Dec-23									OK	
2	OVERHAULING	NA										
3	CRM/DCRM	Dec-23										
(H)	**STATUS OF CT**											
		400 KV TL	**400 KV TL**	**500 MVA ICT**	**200MVA ICT**						OK	
1	ACCUARACY CLASS FOR PROTECTION	0.5	0.5	0.5	0.5							
2	ACCUARACY CLASS FOR METERING	0.2S	0.2S	0.2S	0.2S							
(I)	**STATUS OF CVT**											
		400 KV TL	**400 KV TL**	**500 MVA ICT**	**200MVA ICT**						OK	
1	ACCUARACY CLASS FOR PROTECTION	0.5	0.5	0.5	0.5							
2	ACCUARACY CLASS FOR METERING	0.2S	0.2S	0.2S	0.2S							
(J)	**STATUS OF SEQUENTIAL EVENT LOGGER**											
	Working										OK	
	PROTECTION AUDIT OF UPPTCL SUBSTATION 220 KV SATRIKH ROAD											
	Previous Protection Audit											
	OBSERVATIONS	N/A										
	REMEDIAL ACTIONS IF ANY	-										
(A)	**Lines**	**220 KV CHINHAT LINE**	**220 KV CG CITY LINE**	**220KV BARABANKI I LINE**	**220KV BARABANKI II LINE**						**Remarks**	**Action to be taken by Transmission wing**
1	Healthiness of Main 1	OK	OK	OK	OK						OK	
2	Healthiness of Main 2	OK	OK	OK	OK							
3	Healthiness of B/U	NA	NA	NA	NA							
4	Settings-Reach	OK	OK	OK	OK							
5	Settings-Time	OK	OK	OK	OK							
6	Healthiness of carrier protection	OK	OK	OK	OK							
7	Healthiness of Auto Reclosure	OK	OK	OK	OK							
8	Last Routine testing	20.07.2023	19.05.2022	19.05.2022	19.05.2022						Pending routine testing is to be done by FIRM . The firm & Transmission wing have been informed accordingly	Working agency informed us that they will perform the Routinre testing of relay and all the equipments in the 2nd week of september-24.
	Latest Routine testing		09.02.2024	07.02.2024	08.02.2024							
(B)	**Transformers / Reactor**											
		60 MVA T/F-I	**60 MVA T/F-II**									
1	Healthiness of Differential Relay	OK	OK								OK	
2	Healthiness of REF Relay	OK	OK									
3	Healthiness of BACKUP Relay(HV)	OK	OK									
4	Healthiness of BACKUP Relay(LV)	OK	OK									
5	SETTINGS	OK	OK									
6	LAST TESTING	26.12.23	12.02.2024								No routine testing is pending	
(C)	**BUSBAR & LBB**											
		220KV BUS										
1	HEALTHINESS	OK									OK	
2	SETTINGS	OK										
(D)	**Status of DC system**											
		Positive to negative	**-ve to earth**	**Positive to earth**								
1	DC EARTH FAULT	113 V	Fluctuating	Fluctuating							Problem Resoloved	
2	BATTERIES (220V/110V/48V)	110 V										
3	CHARGERS											

(E)	**ANALYSIS OF TRIPPINGS FROM JULY 2023**											
1	Name of element tripped more than 2 times in a month	NIL										
2	Multiple trippings	NIL										
3	Trippings unexplained	NIL										
(F)	**STATUS OF SPS**	Not Available										
(G)	**STATUS OF CB TESTING**											
		220 BBK-I	**REMARK**	**220 BBK-II**	**220 KV CG City**	**220 CHT**	**60MVA-I**	**60MVA-II**				
1	TIMING TEST	19.05.22		19.05.2022	19.05.2022	30.11.2021	24.03.2022	03.12.2021				
2	OVERHAULING											
3	CRM/DCRM											
(H)	**STATUS OF CT**											
		220 KV CHINHAT LINE	**220 KV CG CITY LINE**	**220KV BARABANKI I LINE**	**220KV BARABANKI II LINE**	**60 MVA T/F-I**	**60 MVA T/F-II**					
1	ACCUARACY CLASS FOR PROTECTION	PS	PS	PS	PS	PS	PS					
2	ACCUARACY CLASS FOR METERING	0.2	0.2	0.2	0.2	0.2	0.2					
(I)	**STATUS OF CVT**											
		220 KV CHINHAT LINE	**220 KV CG CITY LINE**	**220KV BARABANKI I LINE**	**220KV BARABANKI II LINE**	**60 MVA T/F-I**	**61 MVA T/F-II**					
1	ACCUARACY CLASS FOR PROTECTION	3P	3P	3P	3P	3P	3P					
2	ACCUARACY CLASS FOR METERING	0.2	0.2	0.2	0.2	0.2	0.2					
(J)	**STATUS OF SEQUENTIAL EVENT LOGGER**											
	SCADA Available										OK	

PROTECTION AUDIT OF UPPTCL SUBSTATION 220 KV BARABANKI

Previous Protection Audit

	OBSERVATIONS	No Record found
	REMEDIAL ACTIONS IF ANY	----

(A)	**Lines**	**220 KV PGCIL I**	**220 KV PGCIL II**	**220 KV SATRIKH I**	**220 KV SATRIKH II**					**Remarks**	**Action to be taken by Transmission wing**
1	Healthiness of Main 1	OK	OK	OK	OK					AR Problem of PG-I & II lines was resolved on dated 21.05.2024 & 22.05.2024 and satrikh line I &II praposed in month of sept 24	No tipping Since problem resolved
2	Healthiness of Main 2	OK	OK	OK	OK						
3	Healthiness of B/U	NA	NA	NA	NA						
4	Settings-Reach	OK	OK	OK	OK						
5	Settings-Time	OK	OK	OK	OK						
6	Healthiness of carrier protection	OK	OK	OK	OK						
7	Healthiness of Auto Reclosure	Not Working	Not Working	Not Working	Not Working						
8	Last Routine testing	21.05.2024	22.05.2024	18.12.2023	18.12.2023					No routine is pending	
(B)	**Transformers / Reactor**										
		160 MVA TF I	**160 MVA TF II**								
1	Healthiness of Differential Relay	OK	OK							OK	
2	Healthiness of REF Relay	OK	OK								
3	Healthiness of BACKUP Relay(HV)	OK	OK								
4	Healthiness of BACKUP Relay(LV)	OK	OK								
5	SETTINGS	OK	OK								
6	LAST TESTING	27.04.2024	27.07.2024							NO routine testing is pending	OK
(C)	**BUSBAR & LBB**										
		220KV BUS									
1	HEALTHINESS	Not Working								LOI has been issued by transmission for rectification purpose	02 Nos ZIV Make peripheral relays found defective, have been send to ZIV Bangaluru for recticication ,soon will be rectified.
2	SETTINGS										
(D)	**Status of DC system**										
			Positive to negative	**Positive to earth**	**-ve to earth**						
1	(DCDB) DC EARTH FAULT	110-I/110-II/48V	107/119.6/51.4	55.8/56.1/6.3	51.1/63.5/44.9						
2	BATTERIES (220V/110V/48V)		12/0.9/12/0.8/52.2								
3	CHARGERS	110V-I/II	120.4/120	55.4/56.7	640/64.1						
	48 V	51.9	8	44							
(E)	**ANALYSIS OF TRIPPINGS FROM JULY 2023**										

1	Name of element tripped more than 2 times in a month	NO										
2	Multiple trippings	NO										
3	Trippings unexplained											
(F)	**STATUS OF SPS**	Not Available										
(G)	**STATUS OF CB TESTING**											
			REMARK									
1	TIMING TEST		NOT DONE									
2	OVERHAULING		NOT DONE									
3	CRM/DCRM		NOT DONE									
(H)	**STATUS OF CT**											
		220 KV PGCIL I	**220 KV PGCIL II**	**220 KV SATRIKH I**	**220 KV SATRIKH II**	**160 MVA TF I**	**160 MVA TF II**					
1	ACCUARACY CLASS FOR PROTECTION	PS	PS	PX	PX	PS	PS					
2	ACCUARACY CLASS FOR METERING	0.2	0.2	0.2	0.2	0.2	0.2					Tender of PD/Tan-Delta testing of all CTs is under process will be done soon.
(I)	**STATUS OF CVT**											
		220 KV PGCIL I	**220 KV PGCIL II**	**220 KV SATRIKH I**	**220 KV SATRIKH II**	**160 MVA TF I**	**160 MVA TF II**					
1	ACCUARACY CLASS FOR PROTECTION	3P	3P	3P	3P	3P	3P					
2	ACCUARACY CLASS FOR METERING	0.2	0.2	0.2	0.2	0.2	0.2					
(J)	**STATUS OF SEQUENTIAL EVENT LOGGER**											
	SCADA Available										Working	OK

CONCLUSION OF PROTECTION AUDIT 2024

DIVISION : ET&C Division Sarojini Nagar

SUBSTATION : 765kV Substation Unnao
AUDIT DATE: 11.03.2024

S.No.	Name of Bay	Name of Protection system	Status of Protection System	Remark	Action to be taken by Transmission wing
1	Remedial Action taken on the observations made in Previous Protection Audit (Internal/Third Party)		**No record found.**		
2	**Lines**				
	a.	Healthiness of Main-1, Main-2, & Backup relays	Healthy		
	b.	Settings	OK		
	c.	Reach	OK		
	d.	Time	OK		
	e.	SOTF	OK		
	f.	Fuse Fail Monitor	OK		
	g.	BRC Alarm	OK		
	h.	Power Swing	OK		
	i.	Auto Reclose	OK		
	j.	Healthiness of Carrier Protection	PLCC available and DT enable but OPGW is not Through at both 765KV lines. Earthwire is available only at 765KV UNNAO-ANPARA C line.		PLCC channels are healthy & inter-tripping tested in Jul-2024, found healthy at 765kV Unnao end. OPGW is installed on only Obra C-Unnao line but not through upto Obra C end .
	k.	GPS Clock	No GPS clock available & Requirement sent.		Work tender in process

	l.	GPS Synchronization	Time is synchronised in relay by SNTP		
	m.	Last testing	Testing Completed in 2023.		
3	**Transformer/ Reactor**				
	a.	Healthiness of Differential, Backup, REF Protection	Healthy		
	b.	Settings	In 1000MVA ICT I,II & III, IDMT O/C & E/F is not proper & required to correct. In 1000MVA ICT I&II, E/F High set setting is not correct as per Recommandation and 5th Harmonics is set at 10% only which is also require to correct it.		All the settings are as set by Manufacture's recommended Commissioning Engineer. Departmental Guidelines is required regarding 765/400kV ICTs.
	c.	PMU			
	d.	Last testing	Testing done.		
4	**Bus Bar & LBB**				
	a.	Healthiness	Healthy		
	b.	Settings	OK		
	c.	Status	In Ckt.		
5	**Status of DC System**				
	a.	DC Earth Fault	**Battery Bank No.1 (110V)**		
			Positive to Negative=120.4V		
			Positive to Earth=60.2V		
			Negative to Earth= -60.2V		

			Battery Bank No.2 (110V)		
			Positive to Negative=121.4V		
			Positive to Earth=59.4V		
			Negative to Earth= -62.0V		
			Battery Bank No.3 (110V)	In 110V Battery Bank 3, Positive of DC is partially grounded.	Partially grounded DC is rectified.
			Positive to Negative=118V		
			Positive to Earth=52.7V		
			Negative to Earth= -66.2V		
			Battery Bank No.4 (110V)	In 110V Battery Bank 4, Positive of DC is partially grounded.	Partially grounded DC is rectified.
			Positive to Negative=119.5V		
			Positive to Earth=53.56V		
			Negative to Earth= -65.9V		
			Battery Bank No.5 (110V)		
			Positive to Negative=123.3V		
			Positive to Earth=65V		
			Negative to Earth= -57.5V		
			Battery Bank No.6 (110V)		
			Positive to Negative=120.0V		
			Positive to Earth=61.4V		
			Negative to Earth= -58.8V		
			Battery Bank No.7 (48V)	In 48V Battery Bank 1, Positive of DC is fully grounded.	For PLCC panel, Positive of DC is kept grounded.
			Positive to Negative=51.0V		
			Positive to Earth= 0.00V		

			Negative to Earth= -51.0V		
			Charger No.8 (48V)	In 48V Battery Bank 2, Positive of DC is fully grounded.	For PLCC panel, Positive of DC is kept grounded.
			Positive to Negative=51.2V		
			Positive to Earth= 0.00V		
			Negative to Earth= -50.7V		
	b.	Batteries-220V/110V/48V			
		Make	HBL		
		Battery Status	Healthy		
		Gravity	OK		
	c.	Chargers Make	Charger No.1 to 6 (110V Make HBL), Charger No. 7 (48V Make Shah Shahib) and Charger No.8 (48V Make Max Power)		
		Status	Healthy		
	d.	DCDB Make			
		Status	OK		
6	Analysis of tripping from July 2023				
	a.	Name of Element tripped more than two times in a month	Nil		
	b.	Multiple Trippings	Nil		
	c.	Trippins Unexplained	Nil		
7	Status of SPS		Not Installed		SPS installation is yet to be proposed.
8	Status of CB Testing		Testing done		

9	Status of CT/CVT		Testing done		
10	Status of Sequential Event Logger (SEL)		Not Installed separately and requirement sent.		SCADA INBUILT

SUBSTATION : 400 KV Substation Unnao
AUDIT DATE: 11.03.2024

S.No.	Name of Bay	Name of Protection system	Status of Protection System	Remark	Action to be taken by Transmission wing
1	Remedial Action taken on the observations made in Previous Protection Audit (Internal/Third Party)		**No record found.**		
2	**Lines**				
	a.	Healthiness of Main-1, Main-2, & Backup relays	Healthy		
	b.	Settings	In 400KV Unnav-Agra line Earth Fault setting is found at 0.8Amp with definete time which is not correct & require to correct.In Backup relay in all 220KV lines Earth Fault plug setting is at 0.5Amp which is also required to update.	In220 KV Unnav - RPH line and 220 KV Unnav -Bithur &220 KV Unnav-GIS Kanpur line Back -up relay is static required to replace with numerical relay.	Recommended settings updated. Requirement to replace static with numerical relays had been sent.
	c.	Reach	OK		

d.	Time	In 400 KV Jehta I&II lines,Zone 3 time setting is set at 1.5 Sec which is required to correct as per recommandation.	Both are Power grid lines	PGCIL team have been intimated to update the recommended settings.
e.	SOTF	OK		
f.	Fuse Fail Monitor	OK		
g.	BRC Alarm	OK		
h.	Power Swing	Power swing is block for all zones in 400KV Jehta I & II lines.	(Both are power grid line)	PGCIL team have been intimated to update the recommended settings.
i.	Auto Reclose	In 220KV Unnav-DahiChauki line, 220KV Unnav-GIS Kanpur line,220KV Unnav-RPH line & 220KV Unnav-Bithur line, Auto Reclose did not function properly.		While testing for A/R, SEL311 relays are giving false 3-phase tripping. Service engineer is requirement is being sent.
j.	Healthiness of Carrier Protection	No DTPC & No PLCC in 220KV Unnav-DahiChauki line, 220KV Unnav-RPH line & 220KV Unnav-Bithur line.		220kV Unnao-DahiChauki line have differential line protection. On 220kV Unnao-RPH line & 220kV Unnao-Bithoor line, PLCC/DTPC requirement is being sent for A/R
k.	GPS Clock	OK		

	l.	GPS Synchronization	All 400 KV lines are synchronised but 220 KV lines are not synchronised		Additional GPS clock ports are not available for synchronisation of 220kV lines
	m.	Last testing	Testing done		
3	**Transformer/ Reactor**				
	a.	Healthiness of Differential, Backup, REF Protection	Healthy		
	b.	Settings	In 315MVA ICT-II, HV&LV side O/C & E/F plug setting is not proper. It should be according to the full load current of Transformer.In the same way in 160MVA T/F-III, HV&LV side O/C & E/F plug setting is not found ok & required to updated.	Diff realy& REF Relay of 315 MVA-1 is static,and HV side and LV side o/c and earth fault relay is Electromechanical requred to replace with numerical relay. In 160 MVA-1 Diff and REF Relay is static and hv and lv side o/c and e/f relay is electromechanical it is required to replace with numerical relay.	Due to static and electromechanical relays in 315MVA ICT-1 , the settings as per given guidelines could not be updated, requires Numerical relays. In 160 MVA-1 Diff and REF Relay is static and HV and LV side OC and EF relay is electromechanical so settings could not be fed in relay as per guidelines, it is required to replace with numerical relay. Requirement for numercal relays have been sent.
	c.	PMU	Available.		
	d.	Last testing	Testing done.		
4	**Bus Bar & LBB**				
	a.	Healthiness	Healthy		
	b.	Settings	OK		
	c.	Status	In Ckt.		

5	**Status of DC System**				
	a.	DC Earth Fault	**Battery Bank No.1 (220V)**	In 220V Battery Bank 1, Positive of DC is partially grounded.	Maintenance team trying to rectify DC problem, work is under progress.
			Positive to Negative=235V		
			Positive to Earth=89.1V		
			Negative to Earth= -146.1V		
			Battery Bank No.2 (220V)	In 220V Battery Bank 2, Positive of DC is partially grounded.	Maintenance team trying to rectify DC problem, work is under progress.
			Positive to Negative=240V		
			Positive to Earth=94V		
			Negative to Earth= -146.9V		
			Battery Bank No.3 (48V)	In 48V Battery Bank 1, Positive of DC is fully grounded.	For PLCC panel, Positive of DC is kept grounded.
			Positive to Negative=52.0V		
			Positive to Earth= 0.663V		
			Negative to Earth= -51.2V		
			Battery Bank No.4 (48V)	In 48V Battery Bank 2, Positive of DC is partially grounded.	For PLCC panel, Positive of DC is kept grounded.
			Positive to Negative=52.4V		
			Positive to Earth= 1.106V		
			Negative to Earth= -51.3V		
	b.	Batteries-220V/110V/48V			
		Make	Exide Industrial		
		Battery Status	Healthy		
		Gravity	OK		

	c.	Chargers Make	Charger No.1 & 2 (220V Make A-Z), Charger No. 3 (48V Make A-Z) and Charger No.4 (48V Make EFCO)		
		Status	Healthy		
	d.	DCDB Make			
		Status	OK		
6	Analysis of tripping from July 2023				
	a.	Name of Element tripped more than two times in a month	Nil		
	b.	Multiple Trippings	Nil		
	c.	Trippins Unexplained	Nil		
7	Status of SPS		Installed but out of service. Service Engineer is awaited.		New transducers are available at substation. Service engineer have been informed to replace defective transducers.
8	Status of CB Testing		Testing done		
9	Status of CT/CVT		Testing done		
10	Status of Sequential Event		Installed		

SUBSTATION : 220kV Substation Dahi Chauki, Unnao
AUDIT DATE: 11.03.2024

S.No.	Name of Bay	Name of Protection system	Status of Protection System	Remark	Action to be taken by Transmission wing
1	Remedial Action taken on the		No record found.		
2	Lines				

	a.	Healthiness of Main-1, Main-2, & Backup relays	Healthy		
	b.	Settings	OK		
	c.	Reach	OK		
	d.	Time	In 220KV Dahi Chauki- Sarojini Nagar line, Zone 4 time setting is 500 ms which is incorrect & required to update and backup earth fault time is incorrect also.		Recommended setting have been updated. Zone-4 time = 450msec
	e.	SOTF	In 220KV Dahi Chauki- Sarojini Nagar line, SOTF is OFF.		SOTF enabled & tested during routine testing.
	f.	Fuse Fail Monitor	In 220KV Dahi Chauki- Sarojini Nagar line, VT Fuse Fail is OFF.		VT Fuse Fail function enabled & found ok.
	g.	BRC Alarm	OK		
	h.	Power Swing	OK		
	i.	Auto Reclose	OK		
	j.	Healthiness of Carrier Protection	PLCC & Optical Fibre is not available at 220KV Dahi Chauki-Unnav line.		Short line, Differential line protection relay available & Functional.
	k.	GPS Clock	OK		
	l.	GPS Synchronization	OK		
	m.	Last testing	Testing done		
3	**Transformer/ Reactor**				

	a.	Healthiness of Differential, Backup, REF Protection	Healthy		
	b.	Settings	OK		
	c.	Last testing	Testing done.		
4	**Bus Bar & LBB**				
	a.	Healthiness	Healthy		
	b.	Settings	OK		
	c.	Status	In Ckt.		
5	**Status of DC System**				
	a.	DC Earth Fault	**Battery Bank No.1 (110V)**		
			Positive to Negative=124.1V		
			Positive to Earth=62.0V		
			Negative to Earth= -60.8V		
			Battery Bank No.2 (110V)		
			Positive to Negative=124.2V		
			Positive to Earth=63.3V		
			Negative to Earth= -60V		
			Battery Bank No.3 (48V)	In 48V Battery Bank 1, Positive of DC is fully grounded.	For PLCC panel, Positive of DC is kept grounded.
			Positive to Negative=51.9V		
			Positive to Earth= 0.90V		
			Negative to Earth= -50.7V		
	b.	Batteries-220V/110V/48V			
		Make	Exide Industrial		
		Battery Status	Healthy		
		Gravity	OK		

	c.	Chargers Make	Charger No.1 & 2 (110V Make Redtron), Charger No. 3 (48V Make Redtron)		
		Status	Healthy		
	d.	DCDB Make			
		Status	OK		
6	Analysis of tripping from July 2023				
	a.	Name of Element tripped more than two times in a month	Nil		
	b.	Multiple Trippings	Nil		
	c.	Trippins Unexplained	Nil		
7	Status of SPS		Installed		
8	Status of CB Testing		Testing done		
9	Status of CT/CVT		Testing done		
10	Status of Sequential Event		Installed		

CONCLUSION OF PROTECTION AUDIT 2024

DIVISION : ET&C Division Shahjahanpur
SUBSTATION : 220 KV Substation Mallawan
AUDIT DATE:. 19.02.2024

S.No.	Name of Bay	Name of Protection system	Status of Protection System	Remark	Action to be taken by Transmission wing
1	Remedial Action taken on the observations made in Previous Protection Audit (Internal/Third Party)		**No record found.**		Substation is newly energised on 03.08.2022
2	**Lines**				
	a.	Healthiness of Main-1, Main-2, & Backup relays	Healthy		
	b.	Settings	OK		
	c.	Reach	OK		
	d.	Time	OK		
	e.	SOTF	OK		
	f.	BRC Alarm	OK		
	g.	Power Swing	OK		
	h.	Fuse Fail Monitoring	OK		
	i.	Auto Reclose	Functional		
	j.	Healthiness of Carrier Protection	In 220 KV Mallawa-Jehta I & II line DTPC is OK but there is problem in Optical Fiber.	Because OPGW work is in progress, due to this carrier communication has been disturbed, The same has been communicated to concerned ETD/firm for rectification	Repairing work of OPGW has been completed. Now OPGW is healthy.
	k.	GPS Clock	Available		
	l.	GPS Synchronization	ABB relay REL 650 did not Synchronized with GPS.	The working AMC agency has been informed about the issue but it is still not resolved yet .	Letters have been issued to firm for scada maintenance, however action is not taken by firm yet.Continuous correspondence is being done.
	m.	Last testing	11.03.2022(Testing was done at Commissioning Time).After that testing is overdue.	Routine testing of 220KV Hardoi line, 220KV PG line, 132KV Railway line, Baghauli Ckt-1 & 2 , Bilhaur line have been done in M/O June -2024, and 40MVA TF-1 & 2 have been done in M/O Feb-2024, and rest of elements will tested as per availability of the concerned firm & shutdown	Relay testing of all transformers and lines have been done. Busbar protection testing is scheduled in oct'24 .
3	**Transformer/ Reactor**				
	a.	Healthiness of Differential, Backup, REF Protection	REF relay is ok. But IN 160 MVA-1 Differential relay (Make Silfang CSC-326) is found faulty & out of ckt. It is send to repair in factory. In 160 MVA-2 REF relay & Diff relay is found ok.	After repair of diiferential realy. It has been taken into service on dated 12.06.2024	Differential relay has been replaced by firm and is being taken into service.
	b.	Settings	Normal current setting & High set setting of O/C is OK but High set of E/F is set at 1.5Amp with time delay .06 sec for HV side as well as LV side in both Transformers. It is required to correct with equal to High set of O/C as per Recommandation. Over fluxing setting is disabled in both Transformer 160 MVA T/F-I & II and is required to enable. OTI, WTI Fan Start, Pump Start setting are not as per Recommandation.	Now settings have been kept as per the recommendation	
	c.	Last testing	Testing done in 2023	June- 2024	
4	**Bus Bar & LBB**				
	a.	Healthiness	Healthy		
	b.	Settings	OK		
	c.	Status	Isolator & CB status is not proper. Due to that CB Fail Isolator fail alarm is showing on bus-bar.Bus-bar protection is in circuit	Required to maintain isolator status and C.B.status.	Busbar protection testing is scheduled in oct'24
5	**Status of DC System**				
	a.	DC Earth Fault	**Charger No.1** Positive to Neeative=121.65V Positive to Earth=50.7V Negative to Earth= -70.8V	It seems that positive is partially grounded, faulty feeders have been identified, soon rectification will be done soon as per availability of the Shutdown	Positive is partially grounded, faulty feeders have been identified, rectification is being done
			Chareer No.2 Positive to Negative=121.6V Positive to Earth= 70.9V Negative to Earth= -50.5V	It seems that Negative is partially grounded. faulty feeders have been identified, soon rectification will be done soon as per availability of the	Negative is partially grounded, faulty feeders have been identified, rectification is being done
			Charger No.3 (48V) 48 Battery bank is not available. It is obtained by Chopper limit and convert it from 110V to 48V for Carrier.		
	b.	Batteries: 220V/110V/48V			
		Make	Exide		
		Battery Status	OK		
		Gravity	OK		
	c.	Chargers Make	Make Chloride		
		Status	OK		
	d.	DCDB Make	Nitya Electro Control		
		Status	OK		
6	**Analysis of tripping from July 2023**				
	a.	Name of Element tripped more than two times in a month	Nil		
	b.	Multiple Trippings	Nil		
	c.	Trippins Unexplained	Nil (All Explained)		
7	**Status of SPS**		Not Installed		
8	**Status of CB Testing**		Not done yet (Although it is new commissioning)		Trip/ close time testing of all 220kV and 132kV CB done
9	**Status of CT/CVT**		CT & CVT Testing done		
10	**Status of Sequential Event Logger (SEL)**		Not Installed		

DIVISION : ET&C Division Shahjahanpur
SUBSTATION : 220 KV Substation Hardoi
AUDIT DATE:. 20.02.2024

S.No.	Name of Bay	Name of Protection system	Status of Protection System	Remark	Action to be taken by Transmission wing
1	Remedial Action taken on the observations made in Previous Protection Audit (Internal/Third Party)		**No record found.**		
2	**Lines**				
	a.	Healthiness of Main-1, Main-2, & Backup relays	Healthy		
	b.	Settings	Zone -4 Settings are incorrect in both 220 KV Hardoi-Mallawn line and 220 KV Hardoi- Shahjahanpur line. In 220 KV Hardoi-Mallawn line High set E/F is enabled in Backup relay which is not recommended. In 220 KV Hardoi Shahjahanpur line Backup relay plug setting is 0.4 Amp which is incorrect and required to correct. P.D. Timing is 0.4sec which is incorrect also.	Now settings have been kept as per recommendation	
	c.	Reach	OK		
	d.	Time	ok		
	e.	SOTF	OK		
	f.	Fuse Fail Monitoring	General Supervision is OFF in 220 KV Hardoi-Shahjahanpur line.fuse fail monitoring is off.	Now settings have been changed as per recommendation	
	g.	BRC Alarm	OK		
	h.	Power Swing	OK		
	i.	Auto Reclose	Functional		
	j.	Healthiness of Carrier Protection	In 220 KV Hardoi - Shahjahanpur line OPGW cable laying work completed and DTPC required.	DTPC is to be installed	Discussion with microwave wing,it was informed that DTPC is being installed only in new lines.
	k.	GPS Clock	Available		
	l.	GPS Synchronization	OK		

	m.	Last testing	220 kv Hardoi - Shahjahanpur line last testing date is 01.02.2023. 220 KV Hardoi - Mallawa line testing was due in 2023.	Routine testing of 220 kv Hardoi - Shahjahanpur line and 220 KV Hardoi - Mallawa line have been done on dated 22.05.2024	
3	**Transformer/ Reactor**				
	a.	Healthiness of Differential, Backup, REF Protection	Healthy		
	b.	Settings	In 160 MVA T/F -1 & 160 MVA T/F-2 settings are not OK. CT mentioned in HV side O/C & E/F relay is 300/1 while it should be 500/1. High Set settings in HV & LV side relay are not found OK. It should be as per Percentage Impedance of T/F & is required to correct. Over fluxing settings (over fluxing timing) also are not found OK in 160 MVA T/F-1 & 160 MVA T/F-2. In 160 MVA T/F-2 outdoor settings (Fan Start/Fan Dropout, Pump Start/Pump dropout, OTI Alarm/Trip, WTI Alarm/Trip) are not found OK.	Now settings have been changed as per recommendation	
	c.	Last testing	Last Testing of Both Transformers done in Feb 2023. Testings are not done properly e.g. 2nd & 5th Harmonics testing and Slope Testing are not done. It is required to perform testing properly.	Routine testing of 160MVA TF has been done on dated 12.04.2024 and Routine testing of 160MVA TF -2 has been done on dated 18.03.2024	
4	**Bus Bar & LBB**				
	a.	Healthiness	Healthy		
	b.	Settings	OK		
	c.	Status	In Ckt		
5	**Status of DC System**				
	a.	DC Earth Fault	**Charger No.1 (110V)**		
			Positive to Negative=124.9V		
			Positive to Earth=61.5V		
			Negative to Earth= -63.2V		
			Charger No.2 (110V)		
			Positive to Negative=117.6V		
			Positive to Earth= 67.6V		
			Negative to Earth= -49.2V		
			Charger No.3 (48V)	Positive of 48 volt DC found fully grounded.	Faulty cable has been identified and same has been rectified.
			Positive to Negative=49V		
			Positive to Earth= 0.00V		
			Negative to Earth= -49V		
	b.	Batteries- 220V/110V/48V			
		Make			
		Battery Status	OK		
		Gravity	OK		
	c.	Chargers Make	Charger No.1 (110V Make STATCON ENERGIAA)		
		Status	Old & Need to replace		
		Chargers Make	Charger No.2 (110V Make Volt Electronics)		
		Status	Old & Need to replace		Charger replaced with new JVV make charger
		Chargers Make	Charger No.3 (48V Make Shah Shahib)		
		Status	OK		
	d.	DCDB Make			
		Status	OK		
6	Analysis of tripping from July 2023				
	a.	Name of Element tripped more than two times in a month	Nil		
	b.	Multiple Trippings	Nil		
	c.	Trippins Unexplained	Nil (All Explained)		
7	Status of SPS		Not Installed		
8	Status of CB Testing		132 KV CB testing done in 2023 but 220 KV CB testing is not done.		Trip/Close time test of 220KV CB done.
9	Status of CT/CVT		CT & CVT Testing done at the time of commissioning		
10	Status of Sequential Event Logger (SEL)		Not Available		

SUBSTATION : 220 KV Substation Azizpur
AUDIT DATE: 20.02.2024

S.No.	Name of Bay	Name of Protection system	Status of Protection System	Remark	Action to be taken by Transmission wing
1	Remedial Action taken on the observations made in Previous Protection Audit (Internal/Third Party)		**NO record found**		
2	**Lines**				
	a.	Healthiness of Main-1, Main-2, & Backup relays	Healthy		
	b.	Settings	Zone 3 & Zone 4 setting is not correct and required to revise. P.D. time is revised because it was set at 3 sec.	Now settings have been changed as per recommendation	
	c.	Reach	OK		
	d.	Time	OK		
	e.	SOTF	OK		
	f.	Fuse Fail Monitoring	OK		
	g.	BRC Alarm	OK		
	h.	Power Swing	OK		
	i.	Auto Reclose	Functional		
	j.	Healthiness of Carrier Protection	OK		
	k.	GPS Clock	Available		
	l.	GPS Synchronization	OK		
	m.	Last testing	Testing was due in 2023.		
3	**Transformer/ Reactor**				
	a.	Healthiness of Differential, Backup, REF Protection	IN 160 MVA-1 & 160 MVA T/F-2 Differential relay, Backup relay & REF relay is found Healthy.		
	b.	Settings	In 160 MVA T/F -1 & 160 MVA T/F-2 settings are not OK. High Set settings in HV & LV side relay are not correct as per recommendation & It is required to correct. CB Tripping time of 220 KV TBC and 160MVA T/F-I is more than the permissible value and is unacceptable. Multsifier is not Installed also.	Now settings have been changed as per recommendation	
	c.	Last testing	Last Testing of Both Transformers done in December 2023.	Concerned testing firm has been requested to do due routine testing	
4	**Bus Bar & LBB**				
	a.	Healthiness	Healthy		
	b.	Settings	OK		
	c.	Status	Both Transformers 160MVA-I & 160MVA-II is not incorporated in Bus Bar.	Multiple letters have been written to M/S RKI for the completion of the pending work. But still No response has been given by the firm.	
5	**Status of DC System**				
	a.	DC Earth Fault	**Charger No.1 (110V)**		
			Positive to Negative=119V	In Both Charger Negative of DC found partially grounded.	
			Positive to Earth=95.6V		
			Negative to Earth= -23.2V		
			Charger No.2 (110V)		
			Positive to Negative=119V		
			Positive to Earth= 96.1V		
			Negative to Earth= -23.6V		
			Charger No.3 (48V)		
			48 Battery bank is not available. It is obtained by Chopper limit and convert it from 110V to 48V.		
	b.	Batteries- 220V/110V/48V	Battery Bank I & II		
		Make	Exide Industrial		
		Battery Status	Healthy		
		Gravity	OK		
	c.	Chargers Make	Charger No.1 (110V Make STATCON ENERGIAA)		
		Status	ok		
		Chargers Make	Charger No.2 (110V Make STATCON ENERGIAA)		
		Status	ok		
	d.	DCDB Make			
		Status	OK		
6	Analysis of tripping from July 2023				
	a.	Name of Element tripped more than two times in a month	Nil		
	b.	Multiple Trippings	Nil		

	c.	Trippins Unexplained	No		
7	Status of SPS		Not Installed		
8	Status of CB Testing		Testing done		
9	Status of CT/CVT		Testing done		
10	Status of Sequential Event Logger (SEL)		Available. It is SAS (SCADA) based system.		

SUBSTATION : 220 KV Substation Shahjahanpur
AUDIT DATE: 21.02.2024

S.No.	Name of Bay	Name of Protection system	Status of Protection System	Remark	Action to be taken by Transmission wing
1	Remedial Action taken on the observations made in Previous Protection Audit (Internal/Third Party)		No record found.		
2	Lines				
	a.	Healthiness of Main-1, Main-2, & Backup relays	220 KV Shahjahanpur Azizpur line distance Protection Relay did not function properly.	Distance Relay has been declared unreliable , C& R panel will be replaced soon	New Panel have been received , will be commissioned during off load season
	b.	Settings	OK		
	c.	Reach	Reach settings are incorrect in 220KV Shahjahanpur- ROZA-II line.	Now settings have been changed as per recommendation	
	d.	Time Settings.	OK		
	e.	SOTF	OK		
	f.	Fuse Fail Monitor	OK		
	g.	BRC Alarm	BRC setting is 0.5 Amp in 220 KV ROZA-II line.		
	h.	Power Swing	OK		
	i.	Auto Reclose	In 220KV ROZA-II line, Auto Reclose is OK but Reclaime time ie incorrect . In 220KV Hardoi line, Auto reclose setting are OK but did not function.	Now settings have been changed as per recommendation	
	j.	Healthiness of Carrier Protection	OK		
	k.	GPS Clock	Available		
	l.	GPS Synchronization	Defective	tendering is in process	
	m.	Last testing	220 KV Hardoi line testing was due in 2023.		
3	Transformer/ Reactor				
	a.	Healthiness of Differential, Backup, REF Protection	Healthy		
	b.	Settings	In 200MVA T/F-I & 160 MVA T/F-II, O/C IDMT & E/F IDMT setting is OK but High set setting for O/C & E/F is not proper and time delay is 100 msec as it should be 60msec for high set setting.In 160 MVA T/F-I, high set setting is disabled in relay. In 200 MVA T/F, WTI alarm/Trip, OTI alarm/Trip settings are not found OK. In 200MVA T/F, 160MVA T/F-I & 160MVA T/F- II, over fluxing setting is disabled & require to enable also.	Now settings have been changed as per recommendation	
	c.	Last testing	Testing done.		
4	Bus Bar & LBB				
	a.	Healthiness	Healthy		
	b.	Settings	It is suggested to run the bus bar without closing the bus coupler.		
	c.	Status	Out of Ckt since last 2019.Cabling Tender work is finalize. It will taken into service within a month.		
5	Status of DC System				
	a.	DC Earth Fault	Charger No.1 (110V)		
			Positive to Negative=121.9V	Faulty feeder has been identified & rectified on dated 24.04.2024	
			Positive to Earth=120.1V		
			Negative to Earth= -1.5V		
			Charger No.2 (110V)		
			Positive to Negative=123.2V		
			Positive to Earth=120.5V		
			Negative to Earth= -1.4V		
			Charger No.3 (48V)	Rectified on dated 12.03.2024	
			Positive to Negative=55.5V		
			Positive to Earth= 0.00V		
			Negative to Earth= -55.0V		
	b.	Batteries- 220V/110V/48V			
			110V Battery Bank I & II (Make Exide Industrial)		
		Battery Status	Healthy		
		Gravity	OK		
	c.	Chargers Make	Charger No.1 ,2 & 3 (Make JVV)		
		Status	In 110V Chargers Negative of DC is fully grounded and in 48V charger Positive of DC is fully grounded.		
		DCDB Make			
		Status	OK		
6	Analysis of tripping from July 2023				
	a.	Name of Element tripped more than two times in a month	Nil		
	b.	Multiple Trippings	Nil		
	c.	Trippins Unexplained	Nil		
7	Status of SPS		Not Installed		
8	Status of CB Testing		Only 220 KV Shahjahanpur-Azizpur line CB has been tested. Rest is not completed & required to complete it.	Tendering is in process.	
9	Status of CT/CVT		Testing done but 220 KV PGCIL CT is 0.5 class which is required to change as earliest.	Recommended	
10	Status of Sequential Event Logger (SEL)		Not Installed	Tendering is in process.	

SUBSTATION : 220 KV Substation GOLA
AUDIT DATE: 21.02.2024

S.No.	Name of Bay	Name of Protection system	Status of Protection System	Remark	Action to be taken by Transmission wing
1	Remedial Action taken on the observations made in Previous Protection Audit (Internal/Third Party)		No record found.		
2	Lines				
	a.	Healthiness of Main-1, Main-2, & Backup relays	Healthy		
	b.	Settings	E/F High set enable in 220 KV GOLA-Shahjahanpur line which is not required as per recommandation.	Setting are as per recommandation.	
	c.	Reach	OK		
	d.	Time	OK		
	e.	SOTF	OK		
	f.	VT Fuse Fail	OK		
	g.	BRC Alarm	OK		
	h.	Power Swing	OK		
	i.	Auto Reclose	Functional		
	j.	Healthiness of Carrier Protection	NO DTPC and NO OPGW cable was layed at 220 KV GOLA-Shahjahanpur line and 220 KV GOLA-NIGHASAN line	Status is as it was.	
	k.	GPS Clock	Available		
	l.	GPS Synchronization	OK		
	m.	Last testing	Testing was due in 2023.	Persueing for testing to working agency as per AMC.	
3	Transformer/ Reactor				
	a.	Healthiness of Differential, Backup, REF Protection	Healthy		
	b.	Settings	OK		
	c.	Last testing	Last Testing of Transformer done in Feb 2022 and due in 2023.	Persueing for testing to working agency as per AMC.	
4	Bus Bar & LBB				
	a.	Healthiness	Healthy		
	b.	Settings	OK		
	c.	Status	New line PG-I & PG-II(Shahjahanpur) is not incorporated in the Bus Bar. During Audit Bus- Bar Protection was out of Service but Audit Team taken 4 Nos. Of Bays in the central unit of Bus Bar protection and Bus Bar is taken into service on dated 21.02.2024	Required work completed.	
5	Status of DC System				
	a.	DC Earth Fault	Charger No.1 (110V)		
			Positive to Negative=114.9V		
			Positive to Earth=61.9V		
			Negative to Earth= -53.5V		
			Charger No.2 (110V)		
			Positive to Negative=116.3V		
			Positive to Earth= 61.9V		
			Negative to Earth= -53.9V		
	b.	Batteries- 220V/110V/48V	Battery Bank I & II		
		Make	Exide Industrial		
		Battery Status	Healthy		
		Gravity	OK		
	c.	Chargers Make	Charger No.1 (110V Make Chhabi Electrical)		
		Status	Healthy		

		Chargers Make	Charger No.2 (110V Make Chhabi Electrical)		
		Status	Healthy		
	d.	DCDB Make			
		Status	OK		
6	Analysis of tripping from July 2023				
	a.	Name of Element tripped more than two times in a month	Nil		
	b.	Multiple Trippings	Nil		
	c.	Trippings Unexplained	Yes (On dated 09.01.24 and 18.01.24 Bus Dead)	PGCIL Ckt 1&2 were not assigned in bus bar protection scheme. The same was resolved at the time of protection audit.	
7	Status of SPS		Not Installed		
8	Status of CB Testing		Testing not done		
9	Status of CT/CVT		Testing done		
10	Status of Sequential Event Logger (SEL)		Available and Healthy		

SUBSTATION : 220 KV Substation Nighasan
AUDIT DATE: 21.02.2024

S.No.	Name of Bay	Name of Protection system	Status of Protection System	Remark	Action to be taken by Transmission wing
1	Remedial Action taken on the observations		No record found.		
2	**Lines**				
	a.	Healthiness of Main-1, Main-2, & Backup relays	Healthy		
	b.	Settings	OK		
	c.	Reach	OK		
	d.	Time	OK		
	e.	SOTF	OK		
	f.	Fuse Fail Monitor	OK		
	g.	BRC Alarm	BRC is not Enable in 220KV Nighasan-Kandauni line.	Not Provided from beginning in Settings	
	h.	Power Swing	OK		
	i.	Auto Reclose	Auto Reclose is OFF in 220KV Nighasan-Gola Line.	Now it is in on Position	
	j.	Healthiness of Carrier Protection	Not Applicable		
	k.	GPS Clock	Available	Not Aavilable	
	l.	GPS Synchronization	OK	Not OK	
	m.	Last testing	Testing was due in 2023.	No testing due now	
3	**Transformer/ Reactor**				
	a.	Healthiness of Differential, Backup, REF Protection	Differential & Backup is Healthy but No separate REF relay is installed on 160MVA T/F-I and 100MVA T/F-I.	There is no Provision in Pannel.	
	b.	Settings	In 160 MVA T/F-I High Set setting is not correct in HV side relay as well as LV side relay. It is required to correct as per Norms.	Corrected as per Norms	
	c.	Last testing	Last Testing of Transformers done in December 2023 but due to unavailability of kit 2nd & 5th Harmonics test and slope test did not checked. Tertiary WTI of 160MVA T/F-I is defective which was reported to SDO Transmission on 23.12.23 by T&C wing. Fan Start/Fan Dropout, Pump start/ pump dropout does not checked properly in 100 MVA T/F-II.	Tertiary WTI of 100MVA T/F-III is defective inspite of 160MVA T/F-I. 100 mva I tf now checed properly.	
4	**Bus Bar & LBB**				
	a.	Healthiness	Faulty	Problem conveyed to transmissiom on dt. 08.01.2024, and requested for calling relay engineer regarding rectification.	
	b.	Settings	OK		
	c.	Status	Main Control unit is Faulty.		
5	**Status of DC System**				
	a.	DC Earth Fault	**Charger No.1 (110V)**		
			Positive to Negative=117.9V		
			Positive to Earth=116.3V		
			Negative to Earth= -1.3V		
			Charger No.2 (110V)		
			Positive to Negative=117.7V		
			Positive to Earth= 112.4V		
			Negative to Earth= -4.9V		
			Charger No.3 (48V)		
			Positive to Negative=52.5V	In 48V Charger Positive of DC is fully grounded. in communication system DC + should be earthed.	
			Positive to Earth=0.9V		
			Negative to Earth= -51.3V		
	b.	Batteries- 220V/110V/48V			
		Make	110V Battery Bank I & II (Make HBL) and 48V baterry bank (Make Exide Industrial).		
		Battery Status	Healthy		
		Gravity	OK		
	c.	Chargers Make	Charger No.1 & 2 (110V Make STATCON ENERGIAA)		
		Status	Healthy		
		Chargers Make	Charger No.3 (48V Make A-Z)		
		Status	Healthy		
	d.	DCDB Make			
		Status	ok		
6	Analysis of tripping from July 2023				
	a.	Name of Element tripped more than two times in a month	Yes total 4 nos. of tripping of 220KV Nighasan- Kandauni line.There was problem in disc. Disc was replaced & tripping is normal now.		
	b.	Multiple Trippings	Nil		
	c.	Trippins Unexplained	Nil		
7	Status of SPS		Not Installed		
8	Status of CB Testing		Testing not done		
9	Status of CT/CVT		Testing done		
10	Status of Sequential Event Logger (SEL)		Not Available	SCADA Based event logger is avilable.	

SUBSTATION : 220 KV Substation Kandauni
AUDIT DATE: 22.02.2024

S.No.	Name of Bay	Name of Protection system	Status of Protection System	Remark	Action to be taken by Transmission wing
1	Remedial Action taken on the observations		No record found		
2	**Lines**				
	a.	Healthiness of Main-1, Main-2, & Backup relays	In 220KV PGCIL-I Main-1 distance element is disabled.	It was enabled in presence of A.E. T&C KANDUNI	
	b.	Settings	OK		
	c.	Reach	In all lines Zone 4 settings are not proper and required to update.	updated as per norms.	
	d.	Time	OK		
	e.	SOTF	OK		
	f.	Fuse Fail Monitor	OK		
	g.	BRC Alarm	BRC alarm time setting is 60 sec in 220 KV Kandauni-Nighasan line & 220KV Kandauni- Seetapur line which is incorrect & required to correct as per Norms.	it is corrected as per norms.	
	h.	Power Swing	OK		
	i.	Auto Reclose	OK		
	j.	Healthiness of Carrier Protection	In 220KV Kandauni-Nighasan line OPGW cable laying work is not completed and DTPC is required to installed.	cable laying not complited.	
	k.	GPS Clock	Available		
	l.	GPS Synchronization	OK		
	m.	Last testing	Testing was done in 2023.	s/s not handover to upptcl.	
3	**Transformer/ Reactor**				
	a.	Healthiness of Differential, Backup, REF Protection	LV side O/C & E/F relay HMI is defective of 200MVA T/F-II.Hence setting could not be read.		
	b.	Settings	In 200MVA T/F-I, O/C IDMT & E/F IDMT setting is OK but T.M.S. of E/F is 0.2 & T.M.S. of O/C is 0.25 whereas it is same (0.25) for both O/C & E/F. In the same way High set setting should be same for O/C & E/F, also In 200MVA T/F-II over fluxing setting is disabled also.	settings changed as per norms.	
	c.	Last testing	Testing done. Fan start/dropout, pump start/loump dropout is required to check properly.		
4	**Bus Bar & LBB**				

	a.	Healthiness	Bus Bar Relay Panel is available but did not commissioned till 22.02.24. It will be commissioned soon.	It will commissioned soon.	
	b.	Settings			
	c.	Status			
5	**Status of DC System**				
	a.	DC Earth Fault	**Charger No.1 (110V)**		
			Positive to Negative=121.7V	In Both Charger Positive of DC is found Partially grounded.	
			Positive to Earth=47.2V		
			Negative to Earth= -74.3V		
			Charger No.2 (110V)		
			Positive to Negative=121.7V		
			Positive to Earth=47.2V		
			Negative to Earth= -74.3V		
	b.	Batteries- 220V/110V/48V			
		Make	110V Battery Bank I & II (Make Exide Industrial)		
		Battery Status	Healthy		
		Gravity	OK		
	c.	Chargers Make			
		Status	Healthy		
	d.	DCDB Make			
		Status	OK		
6	Analysis of tripping from July 2023				
	a.	Name of Element tripped more than two times in a month	220KV Kandauni-Nighasan line tripped more than two times in a month because there was a problem in disc & rectified now. 220KV Kandauni- Sitapur line tripped more than three times due to incorrect setting of PSB & problem was rectified by company Engineer.	The problem is rectified.	
	b.	Multiple Trippings	Nil		
	c.	Trippins Unexplained	Nil		
7	Status of SPS		OK		
8	Status of CB Testing		Testing done		
9	Status of CT/CVT		Testing done		
10	Status of Sequential Event Logger (SEL)		OK		

SUBSTATION : 220 KV Substation Sitapur
AUDIT DATE: 22.02.2024

S.No.	Name of Bay	Name of Protection system	Status of Protection System	Remark	Action to be taken by Transmission wing
1	Remedial Action taken on the observations made in Previous Protection Audit (Internal/Third Party)		**No record found.**		
2	**Lines**				
	a.	Healthiness of Main-1, Main-2, & Backup relays	Healthy		
	b.	Settings	KZ1 settings are incorrect in 220KV B.K.T. line.	KZ1 settings changed as per Norms.	
	c.	Reach	OK		
	d.	Time	OK		
	e.	SOTF	OK		
		Fuse Fail Monitor	OK		
	f.	BRC Alarm	OK		
		Power Swing	OK		
		Auto Reclose	Auto Reclose is non operational in 220KV Seetapur- Shahjahanpur line & 220KV B.K.T. line.	Wringing of bay is old and not suitable for auto reclose.	
	g.	Healthiness of Carrier Protection	Carrier is out of ckt in 220KV Seetapur- Shahjahanpur line & 220KV B.K.T. line.	carrier is healthy in bkt line. while out in spn panel because plcc panel not available.	
	h.	GPS Clock	Available		
		GPS Synchronization	Defective		
	i.	Last testing	220KV Sitapur-Shahjahanpur line tesing was due in 2023.	testing done in jan 2024	
3	**Transformer/ Reactor**				
	a.	Healthiness of Differential, Backup, REF Protection	REF relay (ERL T-Pro) is not installed in 100 MVA T/F.	bushing and neutral c.t. not available.	
	b.	Settings	High Set setting are very low in 160MVA T/F & 100MVA T/F which is required to correct. High set setting are disabled in 200MVA T/F which is required to update also. Over fluxing setting are disable in all Transformer and required to enable the setting.	setting changed as per recommendation.	
	c.	Last testing	Testing done		
4	**Bus Bar & LBB**				
	a.	Healthiness	Healthy		
	b.	Settings	OK		
	c.	Status	In Ckt.		
5	**Status of DC System**				
	a.	DC Earth Fault	**Charger No.1 (110V)**		
			Positive to Negative=115.4V	In Both Charger Negative of DC is found fully grounded.	
			Positive to Earth=111.4V		
			Negative to Earth= -3.7V		
			Charger No.2 (110V)		
			Positive to Negative=115.9V		
			Positive to Earth=97.4V		
			Negative to Earth= -17.2V		
			Charger No.3 (48V)	In 48V Charger Positive of DC is fully grounded.	
			Positive to Negative=51.1V		
			Positive to Earth= 1.6V		
			Negative to Earth= -49.1V		
	b.	Batteries- 220V/110V/48V			
		Battery Status	Healthy		
		Gravity	OK		
	c.	Chargers Make	Charger No.1 (110V Make MG Corporati & Charger 2 (110V Make JVV)		
		Status	Healthy		
	d.	DCDB Make			
		Status	OK		
6	Analysis of tripping from July 2023				
	a.	Name of Element tripped more than two times in a month	Nil		
	b.	Multiple Trippings	Yes (1.On dated 08.07.2023 Due to fault on 132KV Sidhauli-Ramgarh sugar mil, Breaker of Sidhauli did not open but relay operates. That's why fault cleared at Transformer and all Transformer(200 MVA T/F, 160MVA T/F & 100MVA T/F) got tripped. 2. On dated 15.10.2023 because of 132KV Hempur-TSS line Jumper broken, TSS line tripped and all the Transformers got tripped along with TSS line.	132 kv sidhauli - ramgah line setting reviewed and routine testing done. 132 kv hempur line setting reviewed.	
	c.	Trippins Unexplained	Nil		
7	Status of SPS		Not Installed	Not Installed	
8	Status of CB Testing		Testing is under planning		
9	Status of CT/CVT		Testing done		
10	Status of Sequential Event Logger (SEL)		Not Installed	Not Installed	

CONCLUSION OF PROTECTION AUDIT 2024

DIVISION : ET&C Division Sultanpur
SUBSTATION : 400 KV Substation Sultanpur
AUDIT DATE: 21.02.2024

S.No.	Name of Bay	Name of Protection system	Status of Protection System	Remark	Action to be Taken by Transmission Wing
1	Remedial Action taken on the observations made in Previous Protection Audit (Internal/Third Party)		**No record found.**		
2	**Lines**				
	a.	Healthiness of Main-1, Main-2, & Backup relays	Healthy	Main 1 & Main 2 relays installed for 400kV OBRA line has same make & model (Siemens Siprotec 7SA52).	Requirement send
	b.	Settings	OK		
	c.	Reach	OK		
	d.	Time	OK		
	e.	SOTF	OK		
	f.	BRC Alarm	OK		
	g.	Power Swing	OK		
	h.	Fuse Fail Monitoring	OK		
	i.	Auto Reclose	Functional		
	j.	Healthiness of Carrier Protection	Healthy		
	k.	GPS Clock	Available		
	l.	GPS Synchronization	All Protection relays Synchronized with GPS accept to 240MVA ICT-II.	400/220kV, 240MVA ICT-II has electromechanical panel so that protection relays installed for this element is not synchronized with GPS.	panel requirement send
	m.	Last testing	12.08.2024 (Routine testing of 220kV Sangipur line has done, which was due in Aug-2024)	Routine testing of 400KV Obra line, 400KV NTPC Tanda line & 50MVAR Obra line reactor have been done in M/O Jan-2024, 315MVA ICT-IV has been done in M/O April-2024, 315MVA ICT-I has been done in July 2024 & 220kV Sangipur line has been done in Aug-2024 and rest of elements will tested as per availability of the concerned firm & shutdown	
3	**Transforme r/ Reactor**				
	a.	Healthiness of Differential, Backup, REF Protection	Healthy		
	b.	Settings	All setting have been done as per Recommandation. Over fluxing setting are enable in 315 MVA ICT-I,III&IV. OTI, WTI Fan Start, Pump Start etc settings has been made as per Recommandation.	Over fluxing relay for 240 MVA ICT-II is defective	panel requirement send for replacement
	c.	Last testing	25.07.2024 (Routine Testing of 315MVA ICT-I completed which was due in July-2024)		
4	**Bus Bar & LBB**				
	a.	Healthiness	Healthy		
	b.	Settings	OK		
	c.	Status	Isolator & CB status are healthy		
	Status of DC System				
			Charger No.1 Positive to Negative=240V Positive to Earth=25V Negative to Earth= -215V	It seems that positive is ground, faulty feeders have not been identified, soon identification/rectification will be done soon as per availability of the Shutdown	It seems that positive is ground, faulty feeders have not been identified, soon identification/rectification will be done soon as per availability of the Shutdown

5	a.	DC Earth Fault	**Charger No.2** Positive to Negative=220V Positive to Earth= 10V Negative to Earth= -210V	It seems that positive is ground, faulty feeders have not been identified, soon identification/rectification will be done soon as per availability of the Shutdown	It seems that positive is ground, faulty feeders have not been identified, soon identification/rectification will be done soon as per availability of the Shutdown
			Charger No.3 (48V)		
			48 Battery bank is available and healthy.		
	b.	Batteries-220V/110V/48V			
		Make	Exide Industrial		
		Battery Status	Healthy		
		Gravity	OK		
	c.	Chargers Make	**Charger No. 1&2 (Chhavi Electrical Make)**		
		Status	Healthy		
	d.	DCDB Make	**L&T Switchgear**		
		Status	Healthy		
6	**Analysis of tripping from July 2023**				
	a.	Name of Element tripped more than two times in a month	Nil		
	b.	Multiple Trippings	Nil		
	c.	Trippins Unexplained	Nil (All Explained)		
7	**Status of SPS**		Available but defective	SPS is defective since July 2023.	SPS OEM APPROVAL FOR MAINTENACE ALREADY SEND
8	**Status of CB Testing**		Breaker timing test is pending.		
9	**Status of CT/CVT**		CT & CVT Testing done at the time of commissioning		
10	**Status of Sequential Event Logger (SEL)**		installed but defective	Sequence Event Logger is defective from 03 Year.	REQUIREMENT OF NEW EL SEND

DIVISION : ET&C Division Sultanpur
SUBSTATION : 220 KV Substation Sultanpur
AUDIT DATE: 21.02.2024

S.No.	Name of Bay	Name of Protection system	Status of Protection System	Remark	Action to be Taken by Transmission Wing
1	Remedial Action taken on the observations made in Previous Protection Audit (Internal/Third Party)		**No record found.**		
2	**Lines**				
	a.	Healthiness of Main-1, Main-2, & Backup relays	Healthy		
	b.	Settings	OK	Now settings have been kept as per recommendation	
	c.	Reach	OK		
	d.	Time	OK		
	e.	SOTF	OK		
	f.	Fuse Fail Monitoring	OK		
	g.	BRC Alarm	OK		
	h.	Power Swing	OK		
	i.	Auto Reclose	Non Functional	Testing of auto reclosure function of all the lines are pending, which would be probably complete in next month.	
	j.	Healthiness of Carrier Protection	PLCC /DTPC panels are not available for 220kV Pratapgarh line & 220kV Sohawal line.	Carrier Communication & Carrier inter tripping is healthy in 200kV New Tanda & 220kV NTPC Tanda and PLCC /DTPC panels are not available at 220kV Pratapgarh line & 220kV Sohawal line	
	k.	GPS Clock	Available		
	l.	GPS Synchronization	All relays synchronised with GPS except 160MVA T/F-I & 220kV Bus Coupler.	Protection panels for 160MVA T/F-I and 220kV Bus coupler are non numerical (English Electric relays), which Should be replaced with numerical panel	Requirement of new numerical panel send
	m.	Last testing	28.06.2024 (Routine testing of132kV TSS Sultanpur Bay has done which was due in March 2024)	All ements has been tested which were due till July 2024.	
	Transformer / Reactor				
	a.	Healthiness of Differential, Backup, REF Protection	Healthy		

3	b.	Settings	All setting have been done as per Recommandation. OTI, WTI Fan Start, Pump Start etc settings has been made as per Recommandation		
	c.	Last testing	08.07.2024 (Routine testing of 63MVA T/F-I has done which was due in March 2024)	All ements has been tested which were due till July 2024.	
4	**Bus Bar & LBB**				
	a.	Healthiness	Healthy		
	b.	Settings	OK		
	c.	Status	Isolator & CB status are healthy		
5	**Status of DC System**				
	a.	DC Earth Fault	**Charger No.1 (110V)**	It seems that negative is ground, faulty feeders have not been identified, soon identification/rectification will be done soon as per availability of the Shutdown	It seems that negative is ground, faulty feeders have not been identified, soon identification/rectification will be done soon as per availability of the Shutdown
			Positive to Negative=114.4V		
			Positive to Earth=97.9V		
			Negative to Earth= -16.2V		
			Charger No.2 (110V)		
			DC Sourcs 2 is not available		
			Charger No.3 (48V)		
			48 Battery bank is available and healthy.		
	b.	Batteries- 220V/110V/48V			
		Make	Exide Industrial		
		Battery Status	Healthy		
		Gravity	OK		
	c.	Chargers Make	The Standard Battries Ltd. Make		
		Status	Healthy		
	d.	DCDB Make	Prem Electric & Auto Corporation make		
		Status	Healthy		
6	Analysis of tripping from July 2023				
	a.	Name of Element tripped more than two times in a month	Nil		
	b.	Multiple Trippings	Nil		
	c.	Trippins Unexplained	Nil (All Explained)		
7	**Status of SPS**		Available but defective	SPS is defective since July 2023.	
8	**Status of CB Testing**		Testing of 03 Nos circuit breaker has been completed.	Breaker timing test has not been completed for 03 Nos Ciecuit Breakers out of 08 Nos Circuit Breakers by transmission wing, which should be done soon	TENDER FOR TIMING TEST FLOATED AFTER TAKING APPROVAL
9	**Status of CT/CVT**		CT & CVT Testing done at the time of commissioning		
10	**Status of Sequential Event Logger (SEL)**		Not Available		

DIVISION : ET&C Division Sultanpur
SUBSTATION : 220 KV Substation GIS Ayodhya
AUDIT DATE: 22.02.2024

S.No.	Name of Bay	Name of Protection system	Status of Protection System	Remark	Action to be Taken by Transmission Wing
1	Remedial Action taken on the observations made in Previous Protection Audit (Internal/Third Party)		**NO record found**		
2	**Lines**				
	a.	Healthiness of Main-1, Main-2, & Backup relays	Healthy		
	b.	Settings	OK		
	c.	Reach	OK		
	d.	Time	OK		
	e.	SOTF	OK		
	f.	Fuse Fail Monitoring	OK		
	g.	BRC Alarm	OK		
	h.	Power Swing	OK		
	i.	Auto Reclose	Functional		
	j.	Healthiness of Carrier Protection	OK		
	k.	GPS Clock	Available		
	l.	GPS Synchronization	OK		

	m.	Last testing	Testing was due in 2023.	220kV Substation GIS Ayodhya is under company O&M and its annual routine testing is pending after commissioning but currently routine testing is under progress by T&C wing in timely manner.	
3	**Transformer / Reactor**				
	a.	Healthiness of Differential, Backup, REF Protection	Healthy		
	b.	Settings	All setting have been done as per Recommandation. OTI, WTI Fan Start, Pump Start etc settings has been made as per Recommandation		
	c.	Last testing	Testing was due in 2023.	220kV Substation GIS Ayodhya is under company O&M and its annual routine testing is pending after commissioning but currently routine testing is under progress by T&C wing in timely manner.	
4	**Bus Bar & LBB**				
	a.	Healthiness	Healthy		
	b.	Settings	OK		
	c.	Status	Functional		
5	**Status of DC System**				
	a.	DC Earth Fault	**Charger No.1 (110V)**		
			Positive to Negative=120V	DC voltage on charger 1&2 are as per order	
			Positive to Earth=60V		
			Negative to Earth= -59V		
			Charger No.2 (110V)		
			Positive to Negative=120V		
			Positive to Earth= 60V		
			Negative to Earth= -61V		
			Charger No.3 (48V)		
			48 Battery bank is not available. It is obtained by Chopper limit and convert it from 110V to 48V.		
	b.	Batteries- 220V/110V/48V			
		Make	Exide Industrial		
		Battery Status	Healthy		
		Gravity	OK		
	c.	Chargers Make	Charger No.1 (110V Make Chloride Power System & Solution)		
		Status	Healthy		
		Chargers Make	Charger No.2 (110V Make Chloride Power System & Solution)		
		Status	Healthy		
	d.	DCDB Make	Asian Switchgear Pvt. Ltd.		
		Status	Healthy		
6	Analysis of tripping from July 2023				
	a.	Name of Element tripped more than two times in a month	Nil		
	b.	Multiple Trippings	Nil		
	c.	Trippins Unexplained	Nil (All Explained)		
7	**Status of SPS**		Not Installed		
8	**Status of CB Testing**		Testing done during routine testing/commissioning work.	Breaker timing test should be taken at least once in a year by transmission wing.	CB timing testing to be done in sept 2024
9	**Status of CT/CVT**		CT & CVT Testing done at the time of commissioning		
10	**Status of Sequential Event Logger (SEL)**		Not Available		SAS system

DIVISION : ET&C Division Sultanpur
SUBSTATION : 220 KV Substation Sohawal
AUDIT DATE: 22.02.2024

S.No.	Name of Bay	Name of Protection system	Status of Protection System	Remark	Action to be Taken by Transmission Wing
1	Remedial Action taken on the observations made in Previous Protection Audit (Internal/Third Party)		**No record found.**		
	Lines				

	a.	Healthiness of Main-1, Main-2, & Backup relays	Healthy	220kV lines Sultanpur & 220kV Gonda lines have One Main & Backup Protection scheme which should be replaced by Main 1 & Main 2 protection scheme	requirement has been send from division level for procurement of Main 2 Relay
	b.	Settings	OK		
	c.	Reach	OK		
	d.	Time Settings.	OK		
	e.	SOTF	OK		
	f.	Fuse Fail Monitor	OK		
2	g.	BRC Alarm	OK		
	h.	Power Swing	OK		
	i.	Auto Reclose	Functional		
	j.	Healthiness of Carrier Protection	Carrier Protection is healthy for 220kV PGCIL Sohawal Ckt.-I&II lines	It is required to connect all 220kV Lines through DTPC regarding healthiness of Carrier Protection.	220Kv GIS darshan nagar connected though DTPC and 220KV sultanpur to be connected when DTPC available. requirement has been send for procurement.
	k.	GPS Clock	Available		
	l.	GPS Synchronization	Not Synchronized	GPS CLOCK HAS SUFFICIENT NO OF PORTS	
	m.	Last testing	25.06.2024 (Routine testing of 220 KV Sultanpur line done which was due in Jan-2024	All ements has been tested which were due till July 2024.	
3	**Transformer / Reactor**				
	a.	Healthiness of Differential, Backup, REF Protection	Healthy		
	b.	Settings	All setting have been done as per Recommandation. OTI, WTI Fan Start, Pump Start etc settings has been made as per Recommandation		
	c.	Last testing	15.04.2024 (Routine testing of 160MVA T/F-II has done which was due in Jan-2024	All ements has been tested which were due till July 2024.	
4	**Bus Bar & LBB**				
	a.	Healthiness	Healthy		
	b.	Settings	OK		
	c.	Status	Functional		
5	**Status of DC System**				
	a.	DC Earth Fault	**Charger No.1 (110V)** Positive to Negative=122V Positive to Earth=95V Negative to Earth= -27V	It seems that negative is ground, faulty feeders have not been identified, soon identification/rectification will be done soon as per availability of the Shutdown	dc earth now improove something Positive to Negative=123V Positive to Earth=80V Negative to Earth= -43V
			Charger No.2 (110V) Positive to Negative=120V Positive to Earth=91V Negative to Earth= -29V	It seems that negative is ground, faulty feeders have not been identified, soon identification/rectification will be done soon as per availability of the Shutdown	dc earth now improove something Positive to Negative=120V Positive to Earth=74V Negative to Earth= -46V
			Charger No.3 (48V) 48 Battery bank is available and healthy.		
	b.	Batteries- 220V/110V/48V			
		Make	Exide Industrial		
		Battery Status	Healthy		
		Gravity	OK		
	c.	Chargers Make	Charger No.1 & 2 (110V Make Chhavi Electrical)		
		Status	Healthy		
		Chargers Make	Charge No. 3 (JVV make)		
		Status	Healthy		
	d.	DCDB Make	Chhavi Electrical		
		Status	Healthy		
6	Analysis of tripping from July 2023				
	a.	Name of Element tripped more than two times in a month	Nil		
	b.	Multiple Trippings	Nil		
	c.	Trippins Unexplained	Nil (All Explained)		
7	**Status of SPS**		Not Installed		
8	**Status of CB Testing**		Testing done during routine testing/commissioning work.	Breaker timing test should be taken at least once in a year by transmission wing.	Breaker timing test work is in progress, will be completed till 31.10.2024
9	**Status of CT/CVT**		CT & CVT Testing done at the time of commissioning		more then 10 year CT Testing to be done in till 30.11.2024
10	**Status of Sequential Event Logger (SEL)**		Not Available		requirement has been send

DIVISION : ET&C Division Sultanpur
SUBSTATION : 220 KV Substation Bachhrawan
AUDIT DATE: 23.02.2024

S.No.	Name of Bay	Name of Protection system	Status of Protection System	Remark	Action to be Taken by Transmission Wing
1	Remedial Action taken on the observations made in Previous Protection Audit (Internal/Third Party)		**No record found.**		
2	**Lines**				
	a.	Healthiness of Main-1, Main-2, & Backup relays	Healthy		
	b.	Settings	OK		
	c.	Reach	OK		
	d.	Time	OK		
	e.	SOTF	OK		
	f.	VT Fuse Fail	OK		
	g.	BRC Alarm	OK		
	h.	Power Swing	OK		
	i.	Auto Reclose	Non Functional	Testing of auto recloser function of all 220kV lines (220kV PGCIL Amawan & 220kV Bijnor Road) are pending, which would be done till 31.10.2024	
	j.	Healthiness of Carrier Protection	Healthy	Carrier Communication & Carrier inter tripping of all lines (220kV PGCIL Amawan & 220kV Bijnor Road) is done via DTPC and is in healthy condition	
	k.	GPS Clock	Available		
	l.	GPS Synchronization	All protection relays synchronized with GPS		
	m.	Last testing	31.01.2024 (Routine Testing of 220kV PGCIL Amawan line has done which was due in Jan-2024)	All ements has been tested which were due till July 2024.	
3	**Transformer / Reactor**				
	a.	Healthiness of Differential, Backup, REF Protection	Healthy		
	b.	Settings	All setting have been done as per Recommandation. OTI, WTI Fan Start, Pump Start etc settings has been made as per Recommandation		
	c.	Last testing	22.06.2024 (Routine Testing of 160MVA T/F-II has done on 22.06.2024 which was due in Jun-2024)	All ements has been tested which were due till July 2024.	
4	**Bus Bar & LBB**				
	a.	Healthiness	Healthy		
	b.	Settings	OK		
	c.	Status	Functional		
5	**Status of DC System**				
	a.	DC Earth Fault	**Charger No.1 (110V)**		
			Positive to Negative=119.1V		
			Positive to Earth=54.8V		
			Negative to Earth= -64.4V		
			Charger No.2 (110V)		
			Positive to Negative=116.4V		
			Positive to Earth= 61.8V		
			Negative to Earth= -54.6V		
	b.	Batteries- 220V/110V/48V			
		Make	HBL Make		
		Battery Status	Healthy		
		Gravity	OK		
	c.	Chargers Make	Charger No.1&2 (110V Make Chloride Power System & Solution)		
		Status	Healthy		
		Chargers Make	Charger No.3 (48V Make Radetron)		
		Status	Healthy		
	d.	DCDB Make	**Maha Mai Engineering make**		
		Status	Healthy		
6	Analysis of tripping from July 2023				
	a.	Name of Element tripped more than two times in a month	Nil		

	b.	Multiple Trippings	Nil		
	c.	Trippings Unexplained	Nil (All Explained)		
7	**Status of SPS**		Not Installed		
8	**Status of CB Testing**		Testing done during routine testing/commissioning work.	Breaker timing test should be taken at least once in a year by transmission wing.	
9	**Status of CT/CVT**		CT & CVT Testing done at the time of commissioning		
10	**Status of Sequential Event Logger (SEL)**		SAS & SEL are available	SAS & SEL (SCADA based Sifang make) are available at the substation.	

DIVISION : ET&C Division Sultanpur
SUBSTATION : 220 KV Substation Amethi
AUDIT DATE: 23.02.2024

S.No.	Name of Bay	Name of Protection system	Status of Protection System	Remark	Action to be Taken by Transmission Wing
1	Remedial Action taken on the observations made in Previous Protection Audit (Internal/Third Party)		**No record found.**		
2	**Lines**				
	a.	Healthiness of Main-1, Main-2, & Backup relays	Healthy		
	b.	Settings	OK		
	c.	Reach	OK		
	d.	Time	OK		
	e.	SOTF	OK		
	f.	Fuse Fail Monitor	OK		
	g.	BRC Alarm	OK		
	h.	Power Swing	OK		
	i.	Auto Reclose	Functional		
	j.	Healthiness of Carrier Protection	Healthy for 220kV Sangipur line	Carrier Communication & Carrier inter tripping is healthy only at 220kV Sangipur line DTPC protection are available at remaining lines but not functional. DTPC module for 220kV Sultanpur – Amethi line is not available, demand for this has been sent	DTPC module for Sultanpur-Amethi line is not available, Requiremenmt has been send and informed to microwave department.
	k.	GPS Clock	Available		
	l.	GPS Synchronization	All protection relays synchronized with GPS		
	m.	Last testing	Last testing had done in year 2024 and Routine testing for year 2024 is due in September 2024 & onwards	All ements would be tested timely in up coming months for year 2024	
3	**Transformer / Reactor**				
	a.	Healthiness of Differential, Backup, REF Protection	Healthy		
	b.	Settings	All setting have been done as per Recommandation. OTI, WTI Fan Start, Pump Start etc settings has been made as per Recommandation		
	c.	Last testing	14.08.2024 (Routine Testing of 160MVA T/F-I has done on 14.08.2024 which was due in Nov-2024)	All ements would be tested timely in up coming months for year 2024	
4	**Bus Bar & LBB**				
	a.	Healthiness	Healthy		
	b.	Settings	OK		
	c.	Status	Functional		
5	**Status of DC System**				
	a.	DC Earth Fault	**Charger No.1 (110V)** Positive to Negative=120.50V Positive to Earth=2.3V Negative to Earth= -118.1V **Charger No.2 (110V)** Positive to Negative=121V Positive to Earth= 1.5V Negative to Earth= -119.2V	It seems that positive is ground, faulty feeders have not been identified, soon identification/rectification will be done soon as per availability of the Shutdown	DC earth fault is being checked during shutdown period of each lines and euipment & will be completed till 30.10.2024
			Charger No.3 (48V) 48 Battery bank is available and healthy.		
	b.	Batteries- 220V/110V/48V			
		Make	Exide Industrial		
		Battery Status	Healthy		
		Gravity	OK		

	c.	Chargers Make	Charger No.1 & 2 (110V Make STATCON ENERGIAA)		
		Status	Healthy		
		Chargers Make	Charger No.3 (48V Make Radetron)		
		Status	Healthy		
	d.	DCDB Make	Asian Switchgear Pvt. Ltd.		
		Status	Healthy		
6	Analysis of tripping from July 2023				
	a.	Name of Element tripped more than two times in a month	Nil		
	b.	Multiple Trippings	Nil		
	c.	Trippins Unexplained	Nil (All Explained)		
7	**Status of SPS**		Not Installed		There is no overloading problem, Requirement of SPS will be send in september-24
8	**Status of CB Testing**		Testing done during routine testing/commissioning work.	Breaker timing test work is under progress by transmission wing, which should be complete till 31.10.2024.	Breaker timing test work is in progress, will be completed till 31.11.2024
9	**Status of CT/CVT**		CT & CVT Testing done at the time of commissioning		
10	**Status of Sequential Event Logger (SEL)**		SAS & SEL are available	SAS & SEL (SCADA based Sifang make) are available at the substation.	

DIVISION : ET&C Division Sultanpur
SUBSTATION : 220 KV Substation New Tanda
AUDIT DATE: 24.02.2024

S.No.	Name of Bay	Name of Protection system	Status of Protection System	Remark	Action to be Taken by Transmission Wing
1	Remedial Action taken on the observations made in Previous Protection Audit (Internal/Third Party)		**No record found**		
2	**Lines**				
	a.	Healthiness of Main-1, Main-2, & Backup relays	Healthy		
	b.	Settings	OK		
	c.	Reach	OK		
	d.	Time	OK		
	e.	SOTF	OK		
	f.	Fuse Fail Monitor	OK		
	g.	BRC Alarm	OK		
	h.	Power Swing	OK		
	i.	Auto Reclose	OK		
	j.	Healthiness of Carrier Protection	Carrier Protection is healthy for 220KV GIS Ayodhya & 220kV PGCIL Sohawal lines	Carrier Protection & Carrier Inter tripping are healthy in two 220kV lines only (220kV GIS Ayodhya & 220kV PGCIL Ayodhya). It is required to connect all 220kV Lines through DTPC regarding healthiness of Carrier Protection.	all lines to be connected soon as DTPC available. reqirement for DTPC has been send.
	k.	GPS Clock	Available		
	l.	GPS Synchronization	Protection relays are not synchronized with GPS clock		to be synchronized in sept month
	m.	Last testing	20.04.2024 (Routine Testing of 220kV NTPC Tanda Ckt.-III line has done on 20.04.2024 which was due in Jan-2024)	All ements would be tested as per availability of Shutdown.	
3	**Transformer / Reactor**				
	a.	Healthiness of Differential, Backup, REF Protection	Healthy		
	b.	Settings	All setting have been done as per Recommandation. OTI, WTI Fan Start, Pump Start etc settings has been made as per Recommandation		
	c.	Last testing	10.01.2024 (Routine Testing of 160MVA T/F-II&III has done on 10.01.2024 which was due in Jan-2024)	All ements would be tested as per availability of Shutdown.	
4	**Bus Bar & LBB**				
	a.	Healthiness	Healthy		
	b.	Settings	OK		
	c.	Status	Functional		
	Status of DC System				

5	a.	DC Earth Fault	**Charger No.1 (110V)**		
			Positive to Negative=121V		
			Positive to Earth=61V		
			Negative to Earth= -61V		
			Charger No.2 (110V)		
			Positive to Negative=121V		
			Positive to Earth=60V		
			Negative to Earth= -61V		
	b.	Batteries- 220V/110V/48V			
		Make	Exide Industrial		
		Battery Status	Healthy		
		Gravity	OK		
	c.	Chargers Make	Charger No.1 & 2 (110V Make HBL Power Systems Ltd.)		
		Status	Healthy		
		Chargers Make	Charger No. 3 (48V Make AZ Electronics)		
		Status	Healthy		
	d.	DCDB Make	HBL Power Systems Ltd.		
		Status	Healthy		
6	Analysis of tripping from July 2023				
	a.	Name of Element tripped more than two times in a month	Nil		
	b.	Multiple Trippings	Nil		
	c.	Trippins Unexplained	Nil (All Explained)		
7	**Status of SPS**		Not Installed		
8	**Status of CB Testing**		Testing done during routine testing/commissioning work.	Breaker timing test should be taken at least once in a year by transmission wing.	Breaker timing test work is in progress, will be completed till 31.10.2024
9	**Status of CT/CVT**		CT & CVT Testing done at the time of commissioning		more then 10 year CT Testing to be done in till 30.11.2024
10	**Status of Sequential Event Logger (SEL)**		SAS & SEL are available	SAS & SEL (SCADA based Sifang make) are available at the substation.	

PRAYAGRAJ ZONE

Action Taken Report Against Protection Audit - 2024

Division	Substation	Conclusion point mention by protection audit team	Action taken report
ET&CD Mirzapur	220 kv Mirzapur	LV OC / EF protection in both realys (CSC-211) of 160 MVA ICT-I and 160 MVA ICT-II are unhelthy	Procurement of New C&R panel under process
		REF Protection is not available in both160 MVA ICT-I and 160 MVA ICT-II	Procurement of New C&R panel under process
	220 kv GIS BHADOHI	Carrier communication is healthy but there are communication issue present in all feeders	1.Fiber optical cable is damaged at 220 kv Machhlishahar end. Informed to maintenance team for resolving issue. 2.220 Kv Rajatalab communication is healthy.

ACTION TAKEN REPORT

PROTECTION AUDIT DATE: 25.01.2024

NAME OF SUBSTATION: 220KV ROBERTSGANJ

SL. NO.	AUDIT POINT	ACTION TAKEN
1	No record of previous audit report is available because substation newly commissioned.	-
2	REF relay is not available in 160 MVA T/F -I	Requirement of Restricted Earth Fault relay of 160MVA T/F-I send to transmission wing.
3	DC system is healthy.	Healthy
4	Bus bar protection system is not available due to these problems- (1) NO BB unit relay present in 160 MVA ICT-II panel (2) BB unit relay of 160 MVA ICT -I is faulty. (3) Ethernet of bus bar protection panel is not available.	For the Bus-Bar Protection following action has been taken: - (1) Requirement of New C&R panel (siemens make bus bar unit relay) for 160MVA T/F-II panel send to transmission wing. (2) The faulty Bus bar unit relay of 160 MVA T/F-I has been replaced with another spare Bus bar unit relay. (3) Ethernet switch of Bus-Bar protection panel has been replaced with another spare Ethernet switch.
5	Carrier communication is not available in both the lines.	Requirement of PLCC send to transmission wing for carrier communication.
6	Protection relay is not synchronized with GPS time.	Service engineer visit is required for GPS synchronization.
7	SEL is not available.	EL available in SCADA.
8	SPS is not available.	-
9	Annual routine testing of relays is done timely.	Timely completed.
10	OTI & WTI protection of both the transformers are healthy.	Healthy

AE (T&C) Obra

J.E (T&C) Obra

(Shiv Dhari Ram)
EE, ET&C
Obra

Action taken report on Protection Audit -220 kV SS Fatehpur Dt-11.03.2024				
Sl No.	Audit point	Brief discription of deficency	Action taken	Remarks
1	3	DC system -I is negatively earthed.	Problem was resloved.	
2	4	DC system -II is negatively earthed.	Problem was resloved.	
3	6	Carrier inter tripping is not Healthy in all 220 kv line.	DTPC installed on 220 kV Sirathu,220 kV Banda and 220 kV Malwan DTPC requirement for other line sended to SE,ECCDC on dt-09/04/24 via PR no- 1010002702	220 kV Banda and 220 kV Malwan is having only Main-I and only Carrier send function,Panel requirement sended to SE,ESDC-I
4	11	Breaker timing test has not been done by Transmission wing	CB timing done in ETD fatehpur in Apr-May 24	
5	12	O/C & E/F protection in transformer are set Nondirectional it shoud be directional		In case of VT fuse fail protection becomes Out of service that will be very serious for protection point of view so,relay in non directional mode may be better for protection point of view.
6	13	LV Backup relay display is Faulty in 200 MVA TF -II	Intimated to transmission wing for repair display of realy.	Relay is in working condition only display is not working.
7	16	Bus bar protection is out of service.	Busbar protection taken back in service on dt- 28/03/2024	
8	17	AR is not healthy in all 220 kv line.	Intimated to transmission wing for cable laying and arrrange visit of service engineer for AR configuration in relay.	
9	18	Main -II relay is not available in 220 kV Unchahar,220 kV Banda and 220 kV Malwan feeder.	220 kV Unchahar,220 kV Banda and 220 kV Malwan feeder relay panel requirement for panel having Main-I & Main-II is sended to SE,ESDC-I on dt-15/03/24 via PR no-1010002584	
10	19	GPS clock is not healthy	Intimated to Tansmission wing to arrange New GPS clock for relay synchronization.	Tender has been process it will be replaced soon.

for

EE(ETDC) Div-I
Prayagraj

Assistant Engineer
Electy Test. & Com. Sub Div. IV
U.P. Power Transmission Corp. Ltd.
Radha Nagar, Fatehpur

Action taken report on Protection Audit-220 kV SS Malwan Dt-11.03.2024

Sl No.	Audit point	Brief discription of deficency	Action taken	Remarks
1	3	DC system -I is negatively earthed.	Problem was resloved.	
2	4	DC system -II is negatively earthed.	Problem was resloved.	
3	6	Carrier inter tripping is not Healthy in all 220 kv line.	DTPC installed on both 220 kV Malwan And 220 kV Unchahar line.	220 kV Malwan fatehpur line is having only Main-I and only Carrier send function at Fatehpur end,Panel requirement sended to SE,ESDC-I
4	11	Breaker timing test has not been done by Transmission wing	CB timing done in ETD fatehpur in apr-may 24	
5	12	O/C & E/F protection in transformer are set Nondirectional it shoud be directional		In case of VT fuse fail protection becomes Out of service that will be very serious for protection point of view so relay in non directional mode may be better for protection point of view.
6	15	GPS synchronization in Bus bar panel.	Problem was resloved.	

for

Assistant Engineer
Electy Test. & Com. Sub Div. IV
U.P. Power Transmission Corp. Ltd.
Radha Nagar, Fatehpur

EE(E&T) Prayagraj

Action Taken Report on Protection Audit 220 KV Jhunsi					Audit Date - 19.02.2024
Sl. No.	**Audit Point**	**Brief description of deficiency**	**Action taken / action plans to rectify deficiency in protection system indicating intermediate milestones with dates.**	**Date on which complete rectification of deficiency has been done / expected**	Remark
1	3	110 V/300AH DC System -1 Battery charger is Faulty	Faulty Battery charger is replaced & Now DC System is helthy.	15.03.2024	
2	10	M1 and M2 Relays Scheme for 220 KV lines distance protection is not available	Transmission wing of 220 KV Jhunsi has been informed and being instructed to update the protection scheme as soon as possible.	Proposal has been send on dated 12-08-2024	

SW
AE, T&C

EE (E) 220 KV Jhunsi

Action Taken Report on Protection Audit-220 KV Phoolpur					Audit 19.02
Sl. No.	Audit Point	Brief description of deficiency	Action taken / action plans to rectify deficiency in protection system indicating intermediate milestones with dates.	Date on which complete rectification of deficiency has been done / expected	Rem
1	2	220 KV Sarangapur line Main-2 Relay is found to be defective.	Transmission wing of 220 KV Phoolpur has been informed and being instructed to replace the same as soon as possible.	Trabsmission has informed that after replacement of old DPP of 220 KV Jhunsi bay , Main -2 relay shall be available and may be replaced . Tender Finalized	
2	3	110 V DC System -1 is found to be Unhealthy	Transmission wing of 220 KV Phoolpur has been informed.	Transmission has informed that DC leakage has been detected in DCDB requirement of same has been submitted. Work under processing	
3	10	Parallel running of both 220 KV incoming lines is not in practice	Both 220 KV incoming Transmission line are now running in parallel.	28.08.2024	
4	12	Auto Reclose Configuration in 220 KV Phulpur-Jhunsi &220 KV Phulpur - Sarangapur are not available.	AR not configure in 220 KV Phulpur - Jhunsi Line And Shutdown not available for 220 KV phulpur - Sarnagapur line	Panel of 220 KV Jhunsi bay is proposed to be replaced for which tender has also finalized Work under processing . For 220 KV Sarangapur ,Shut down is proposed from 13-09-24 to 19-09-24 for another work . Work may be done during above proposed Shut down dates	
5	13	M1 and M2 Relays Scheme for 220 KV lines distance protection is not available	Transmission wing of 220 KV Phoolpur has been informed and being instructed to update the protection scheme as soon as possible.	Mentioned at Sl No . 4	
6	11	All the Relays are not in Time Synchronisation	Transmission wing of 220 KV Phoolpur has been informed and being instructed to complete Time Synchronisationof relays as soon as possible.	Work under processing with coordination by M/S SANDS	

EE (Electrical) Prayagraj

Action Taken Report on Protection Audit-220 KV SANGIPUR				Audit Date – 18.03.2024
Sl. No.	Brief description of deficiency	Action taken / action plans to rectify deficiency in protection system indicating intermediate milestones with dates.	Date on which complete rectification of deficiency has been done / expected	Remark
1	GPS System Not Synchronized with Bus Bar Protection Panel.	Transmission wing of 220 KV Sangipur has been informed and being instructed to update the protection scheme as soon as possible.	Bus-bar Protection panel GPS Synchronization work expected to complete till 31.10.2024	
2	WTI Meter Faulty Of 160 Mva T/F-I.	Transmission wing of 220 KV Sangipur has been informed and being instructed to update the protection scheme as soon as possible.	WTI Meter Under Warranty M/s BHEL assure that WTI Meter will be replaced till 30.09.2024	
3	SAS, SEL & SPS Not Available.	Transmission wing of 220 KV Sangipur has been informed and being instructed to update the protection scheme as soon as possible.	220KV S/S Sangipur is SAS Substation & its SAS System work Normally, SPS is not require at 220 KV Substation	

EE(E&C) ... Prayagraj

AE, TLC

Action Taken Report on Protection Audit-220 KV PRATAPGARH				Audit Date – 18.03.2024
Sl. No.	Brief description of deficiency	Action taken / action plans to rectify deficiency in protection system indicating intermediate milestones with dates.	Date on which complete rectification of deficiency has been done / expected	Remark
1	GPS SYSTEM	Transmission wing of 220 KV Pratapgarh has been informed and being instructed to update the protection scheme as soon as possible.	New GPS System has been expected to install till 31.12.2024	Requirement of New GPS System has been sent on date 13.05.2024
2	DC EARTHING	DC-I & DC-II Earthing attended by transmission wing & rectified at 220KV Pratapgarh	On Dated 28.04.2024 DC-I & DC-II Earthing problem has been attended	
3	SAS, SEL & SPS NOT AVAILABLE	Transmission wing of 220 KV Pratapgarh has been informed and being instructed to update the protection scheme as soon as possible.	220KV S/S Pratapgarh is non SAS Substation, SPS is not require at 220 KV Substation	
4	M1 and M2 Relays Scheme for 220 KV lines distance protection is not available	Transmission wing of 220 KV Pratapgarh has been informed and being instructed to update the protection scheme as soon as possible.	Expected to complete till 31.10.2024	Replacement work tender under process

AE, TAC

EE (ETD) Pratapgarh

Action Taken Report Against Protection Audit - 2024

Sr. No.	Division	Substation	Conclusion point mentioned by Protection Audit team	Action taken report
1	ET&CD-II Prayagraj	220 KV Sirathu, Kaushambi	For 220 KV lines, Main and Back up scheme are available in place of Main-I and Main-II scheme	For 220 KV Fatehpur line, Relay Panel is replaced by Main-I and Main- II relay and for 220 KV REWA ROAD line, Relay Panel replacement is in progress.
			AR is not available in all 220 KV lines	For 220 KV Fatehpur line, Auto Reclose is commissioned in new Relay Panel and for 220 KV REWA ROAD line, Auto Reclose will be commissioned in new relay panel which commissioning is in progress.
		220 KV Cantt, Prayagraj	For 220 KV lines, Main and Back up scheme are available in place of Main-I and Main-II scheme	Procurement of New C&R Panel is under process
			Carrier is unhealthy	Procurement of DTPC Panel is under process
			GPS clock is not installed	Procurement of GPS clock is under process
			Circuit Breaker timing test has not been in practice by Transmission wing	Informed to Transmission wing to annualy take timing of all Circuit Breakers
			All protection relays are healthy except- (i) Main-I relay ABB REL650 of 220 kV Rewa Road-Sirathu line is healthy but keypad is not working. (ii) REF Protection Relay's keypad is not working for 200MVA T/F-I	(i).Panel requirement has been send by transmission wing for 220kv Rewa Road-Sirathu line. (ii). Necessary action regarding rectification of keypad issue isunder process by transmission wing.
			DC System – (i) 110 V DC system-1 is healthy. (ii) 110 V DC system-2 is not healthy (positively earthed =9V) .	Issue has been resolved and Both DC system is now in healthy condition.
			Carrier communication and inter tripping is not healthy.	PLCC and DTPC panel is not available for carrier communication on 220 kV Cantt line ,220 kV Obra-I,III and Mirzapur lines.Requirement of DTPC sent to HQ. Carrier communication and inter tripping is healthy on other 220 kV lines
			SAS & SEL are not available at the substation	SAS & SEL are not available at the substation.Informed transmision wing about the issue.
			SPS is not available.	SPS is not available.Informed transmision wing about the issue.
			Breaker timing test has not been done by transmission wing.	Informed to transmission wing for taking C.B timing test on regular intervals.
			Bus Bar Protection is not healthy due to wrong isolator and CB status.	Isolator and C.B status is now ok. Bus-Bar engineer visit expected for rectification in Bus-Bar relay panel.
			220 KV PGCIL-I, ISOLUX-I and ISOLUX-II Relays are not synchronise with GPS clock remaining all other relays are synchronized.	Ports are not available for 220KV ISOLUX-I & ISOLUX-II. 220KV PGCIL is now time synchronized.

			AR is healthy in 220 kV Obra-I & III line and all other lines AR is not healthy due to wrong CB status.	AR is healthy in all lines(Relay) but not working in 220KV Rewa Road-Cantt line and 220KV Rewa Road-PGCIL-II due to C.B issue. Except these two lines AR is healthy and working in all other 220KV lines.
			Earthing strip of HV side LA in 200 MVA transformer-I is kept common for all phases. It should be kept separate for all phases	Informed to transmission wing for separation of LA phase wise.
			Necessary action should be taken to minimise frequent trippings of 220 kV Rewa Road-Obra III and 220 kV Rewa Road-Mirapur lines.	Informed to transmission wing for proper patrolling of 220 kV Rewa Road-Obra III and 220 kV Rewa Road-Mirapur lines.
		400KV Masauli	Breaker timing test has not been done by transmission wing.	Informed to transmission wing for taking C.B timing test on regular intervals.

ACTION TAKEN REPORT

PROTECTION AUDIT DATE:-15.02.2024

NAME OF SUBSTATION:-220 KV SUBSTATION HARAHUA

Audit Points	Action Taken
1. No record of previous Audit report is available.	Previous Protection Audit has been done by **CPRI** in the year **2019**,but still the Audit Points has not been received.
2. All protection relays are healthy except :-	—
(i) REF relay of 60 MVA T/F – I has been in faulty condition since **12/10/2023.**	New REF relay of 60 MVA T/F-I has been commissioned on date **12/03/2024**.
(ii) Display of LV BCPU relay has been in faulty condition since 2022 but protection is in healthy condition as per TNC VNS team.	Display of LV BCPU relay has been corrected on date **09/05/2024.**
(iii) **ZIV** make **"Decentralised low impedance Bus bar scheme"** Panel (Kiosk system) is available at the substation, which is in unhealthy condition from the commissioning stage due to incomplete configuration in the BB relay panel and the failure of communication link from CU (central unit) to Peripherial units.	Busbar protection is still unhealthy and needs to be corrected by Transmission wing.
3. 110 V DC system – 1 is healthy, but **5 number of cells** of this set is running in unhealthy condition	110 V DC battery system-I is unhealthy and needs to be corrected.
4. 110 V DC system – 2 is healthy	Healthy
5. Data communication (via PLCC) is healthy only for Sarnath line via PLCC.	Data communication (via PLCC) is not healthy for Azamgarh line.
6. SAS & SEL are available at the substation, but it is not working properly.Efforts should be made to revive the SAS.	Revival of SAS is still pending.
7. SPS is not available	—
8. Annual routine testing of protective relays is done timely	—
9. OTI & WTI protection setting of both the Transformers found in order.	—
10.Parallel running of both the 220 KV incoming lines is not in practice.	Still not in practice.
11. Carrier Protection (PLCC/DTPC) are not available on both the lines(220 KV AZAMGARH & SARNATH) available at 220 KV Harahua Substation.	Carrier Protection implementation pending due to unavailability of **OPGW and PLCC ACCESSORIES**.
12.Breaker Timing test has not been in practice by transmission wing,which should be done atleast once in a year.	Breaker timing test report is still pending from transmission wing.

ACTION TAKEN REPORT

PROTECTION AUDIT DATE:-16.02.2024

NAME OF SUBSTATION:-220 KV SUBSTATION BHELUPUR

Audit Points	Action Taken
1. No record of previous Audit report is available.	Previous Protection Audit has been done by **CPRI** in the year **2019**,but still the Audit points has not been received.
2. All protection relays are healthy except there should be **MAIN I & MAIN II** scheme on both the 220 KV lines (Sahupuri-I&II) in place of available one MAIN & Backup.	**MAIN I & MAIN II** Distance protection scheme adoption on 220 KV Sahupuri lines-I&II is still pending.
3. 110 V DC system - 1 is positive earthed but it will be replaced within one week with new charger (Make Chhabi).	110 V DC System-1 positive earthed has beeen rectified,new charger (Make Chabbi) has been replaced and is in running condition.
4. 110 V DC system – 2 is healthy.	Healthy
5. 48 V DC system is healthy.	Healthy
6. Data communication is healthy through microwave.	___
7. SAS & SEL are not available at the substation.	___
8. SPS is not available.	___
9. Annual routine testing of protective relays is done timely.	___
10. OTI & WTI protection setting of both the transformers found in order.	___
11.One Transformer (60 MVA T/F-II) is in damage condition & other is in Commissioning stage.	New 60 MVA T/F -II has been commissioned and charged on date **02/03/2024**.
12.Hi-set timings of BU relays (HV & LV) of Transformers has been kept at 0.1 sec, escalated from earlier 0.06 sec after the rigorous study of,frequent tripping of transformers with 33 KV feeders,inorder to grade the timings with 33 kv feeders tripping ,so as to minimise the frequency of tripping of transformers with 33 feeders (mostly cable based).	___
13.Breaker Timing test has not been in practice by transmission wing,which should be done atleast once in a year.	Breaker timing test report is still pending from transmission wing.
14.Carrier Protection (PLCC/DTPC) is not available at both the lines (Sahupuri-I & II).	Carrier Protection should not be functionalise due to unavailability of OPGW wire and related equipments on both the lines (Sahupuri lines-I&II)
15.220 KV Bus-Bar panel has not been commissioned.	220 KV Busbar Protection panel is not available.

ACTION TAKEN REPORT

PROTECTION AUDIT DATE:-15.02.2024

NAME OF SUBSTATION:-220 KV SUBSTATION RAJA KA TALAB

Audit Points	Action Taken
1. No record of previous Audit report is available.	Previous Protection Audit has been done by CPRI in the year 2019,but still the Audit points has not been received.
2. All protection relays are healthy except :-	—
(i) Bus bar protection has been found in faulty condition since 2018,due to defective BB relay panel.	Defective Central unit of Busbar Relay replaced, and Busbar protection made functional on date 30.04.2024.
(ii) Distance protection (Main I, Make ZIV) of 220 KV GIS BHADOHI LINE has been in faulty condition since 21/10/2023	Distance protection Relay (MAIN I,ZIV) of 220 KV GIS BHADOHI line is in faulty condition.
3. 110 V DC system-1 is healthy	Healthy.
4. 110 V DC system-2 is healthy.	Healthy.
5. Carrier communication is healthy and carrier inter tripping is also active & healthy in both lines.	—
6. SAS & SEL are available at the substation	—
7. SPS is not available.	—
8. Annual routine testing of protective relays is done timely.	—
9. OTI & WTI protection setting of both Transformers found in order	—
10.Breaker Timing test has not been in practice by transmission wing,which should be done atleast once in a year	Breaker timing test report is still pending from transmission wing.

ACTION TAKEN REPORT

PROTECTION AUDIT DATE:-17.02.2024

NAME OF SUBSTATION:-220 KV SUBSTATION GAJOKHAR

Audit Points	Action Taken
1. No record of previous Audit report is available.	Previous Protection Audit has been done by **CPRI** in the year **2019**,but still the Audit points has not been received.
2. All protection relays are healthy,except One Main & BU scheme are available at two lines, 220 KV Samath-I & II lines in place of MAIN-I & MAIN-II scheme.	Implementation of Distance protection MAIN-I & MAIN-II scheme is still pending.
3. 110 V DC system -I(200AH) is healthy.	Healthy
4. 110 V DC system-II(300AH)= -ve earth	Rectification of -ve earth is still pending.
5. 110 V DC system-III(300AH)= -ve earth	Rectification of -ve earth is still pending.
6.48V DC System(300AH)= healthy	Healthy
5. Carrier Protection & Carrier intertripping is available at **220 KV Sarnath-I & 220 KV Jaunpur line** through DTPC and not available at 220 KV Samath-II line.	Carrier Intertripping is still pending on 220 KV Samath-II line.
6. SAS & SEL are not available at the substation.	—
7. SPS is not available.	—
8. Annual routine testing of protective relays is done timely.	—
9. OTI & WTI protection setting of both Transformers found in order.	—
10.Testing of Breaker timing has not been in practice by transmission wing,which should be done atleast once in a year.	Breaker timing test report is still pending from transmission wing.
11.**SEL** make "**Centralised low impedance Busbar Scheme" (Phase wise R,Y,B)** has been commissioned on date **26.11.2018** and is in healthy condition.	—

Action Taken Report		
Protection Audit Report- 16.02.2024		
Name of Substation- 220 kV Substation, Sahupuri		
	Audit Points	**Action taken**
1	Record of previous audit report is available.	------
2	For 110 V DC Set - I & II, -ve DC is earthed i.e. unhealthy	New DCDB is required to ratify this issue. Proposal for New DCDB requirement has been already sent by transmission wing.
3	For 48 V DC Set-II, -ve DC is earthed.	For proper operation of PLCC, -ve part of DC is earthed
4	220 kV Bus Bar Protection (ERL Make) is out of service as Relays are not configured & commissioned as informed by T&C & Transmission Team	Master Card of ERL Make Busbar Protection is damaged & OEM "ERL" has been blacklisted. Hence, proposal for new Busbar Protection Panel has been already sent by transmission Wing
5	Carrier Communications (PLCC & DTPC) are not available for 220 kV Obra, JP Churk & Bhelupur-II Line	Installation of Carrier Communication is still pending due to unavailability of DTPC & PLCC Accessories.
6	For 200 MVA TF-III (Aditya Make), REF Relay (Areva Make, Static Type) may be replaced by Numerical Relay for better Supervision & fault troubleshooting as per NRPC Guidelines.	Installation of Numerical REF Relay is still pending due to its unavailability.

Audit Points		Action Taken
7	Main-2 Protection (21 - DIstance Relay) is recommended instead of Backup Relay (O/C & E/F Protn Relay) for 220 kV Obra & JP Churk Line for better reliability & senstivity for fault Clearance as per NRPC Guidelines.	Installation of Main-2 Protn on this line is still pending due to its unavailability.
8	Auto Recloser (A/R) is not enabled in 220 kV Bhelupur - II & 220 kV Sahupuri - I (400 kV GIS) Interconnector Line as some or whole portion of these lines are underground cables.	Auto Recloser (A/R) is still not enabled in 220 kV Sahupuri – I & Sahupuri-II (400 kV GIS) Interconnector Line as whole portion of these lines are underground cables.
9	SAS (Substation Automation System) & SEL (Sequential Event Logger) are not available in the substation.	-----
10	SPS (Special Protection System) is not available in the substation	-----
11	Annual Routine Testings of Protection Relays are done timely.	-----
12	Settings of OTI & WTI Protection of all three (220 kV/ 132 kV) transformer are found in order	-----
13	Data communication through Microwave is healthy	------
14	Keypads & HMI of REF Relay (Alstom Make, MiCOM - P642) installed on 200 MVA TF-I (Aditya Make) are not responding & found defective.	Ratification of this issue is still pending.

ACTION TAKEN REPORT		
PROTECTION AUDIT DATE: 21.01.2024 & 23.01.2024		
NAME OF SUBSTATION: 400 KV SUBSTATION, SARNATH, VARANASI		
	Audit Point	**Action Taken**
1	220 KV Busbar Protection is not commissioned.	220 KV Busbar protection has been commissioned on date 25.02.2024.
2	Duplicate busbar protection at 400 KV Busbar protection	Installation and commissioning work is in under progress.
3	Carrier aided protection is not available at 220 KV Harhua line, only data is running through PLCC.	PunCom Make PLCC Panel is installed only for data, protection coupler is not available, requirement has been placed by transmission wing on dated 30.07.2021 but panel didn't receive.
4	Carrier aided protection is not available at 220 KV Azamgarh line.	Neither PLCC nor DTPC is available on Line. Requirement of DTPC has been placed by transmission wing on dated 26.08.2021 but panel didn't receive.
5	Carrier aided protection is not available at 220 KV Beerapatti TSS Feeder.	Since Feeder is TSS hence not required.

ACTION TAKEN REPORT	
PROTECTION AUDIT DATE:-18.01.2024	
NAME OF SUBSTATION:- 220/132KV SUBSTATION JAUNPUR	
Audit Points	**Action Taken**
1. No Records of previous audit report is available	--
2. All protection relays are healthy except- (i) Differential protection of 160MVA ICT I is active in REF protection relay (MICOM P642D) because Differential realy (MICOM P643) is faulty. (ii) Keypad issue found in O/C E/F relay of 160MVA T/F III	Keypad now working
3. 110V DC system 2 is slightly -ve earthed	Rectification of this issue is still pending at transmission end
4. DTPC Carrier communication is availabe but not in working in 220KV Machhlishahar Line.	DTPC installed but wiring incomplete.
5. PLCC Carrier communication is defective in 220KV Azamgarh Line	Rectification of this issue is still pending at transmission end
6. SEL is not available	Rectification of this issue is still pending at transmission end
7. SPS is not available	Rectification of this issue is still pending at transmission end
8. 220KV BUS PT is not available at the Substation Due to which HV OC/EF RELAY featured at non directional	Rectification of this issue is still pending at transmission end
9. Annual routine testing of protective relays is done timely	--
10. OTI & WTI protection of both the Transformers are healthy	--

ACTION TAKEN REPORT	
PROTECTION AUDIT DATE:-16.01.2024	
NAME OF SUBSTATION:- 220/132KV SUBSTATION GHAZIPUR	
Audit Points	**Action Taken**
1. No Records of previous audit report is available	--
2. All protection relays are healthy except- (i) Differentional protection relay(SIPROTEC 7UT61) of 160MVA T/F-2 is faulty since 18.10.2023 (ii)HV O/C E/F relay (SIPROTEC 7SJ8031) of 160MVA T/F/- 2 is faulty since 26.01.2023	Tender to replace the panel is finalised at transmission end but due to load constraint it will be changed in winter
3. 110V DC system 1 is -ve earthed	Healthy
4. 110V DC system 2 is +ve earthed	New battery charger is required to rectify this issue. Proposal for new charger has already been sent by transmission wing.
5. Carrier communication is healthy and carrier intertripping is also active in both the lines.	—
6. SAS & SEL are not available at the substation.	--
7. SPS not available	--
8. Annual routine testing of protective relays is done timely.	--
9. OTI & WTI protection of both the transformers are healthy.	--

INDRAPRASTHA POWER GENERATION CO. LTD.

&

PRAGATI POWER CORPORATION LIMITED

(A Govt. of NCT of Delhi Undertaking)

Website - http://www.ipgcl-ppcl.gov.in/

Pragati Power Station – I,

IP Estate, Ring Road, New Delhi - 110002

Compliance on the internal Protection Audit Conducted in the Month of October'2024

1) IInd harmonic block setting found 20%, the setting changed / reduced to 15%.
2) REF protection current setting of GTGT#1 & GTGT#2 found 200mAmps. / 20%, the current setting changed / reduced to 150mAmp. / 15%.
3) The REF protection current setting of STGT found 100mAmps. / 10%, the current setting changed / increased to 150mAmp. / 15%.
4) Earth fault Protection setting found 100mAmps. with time delay 2 Sec. (Definite time curve) the setting changed / revised to 200mAmps./ 20% , TMS-0.2 with IDMT curve.
5) The changed / revised settings of Over Fluxing Protection relays are as under:
   V/Hz >1, Alarm – 2.420 V/Hz (1.10), time- 5 Sec.
   V/Hz >1, Trip – 3.08 V/Hz (1.4), time- 2 Sec.

   The above settings revised / changed on 12.11.2024.

Sudhir Kumar
Dy. General Manager (T)
Protection, PPS-I

Compliance taken by LPGCL for third party observations

External CPRI Audit compliance report			
Sl. No	**3rd Party recommendations (i.e.CPRI) details**	**LPGCL Action**	**Current Status**
1	The Numerical Protection IEDs shall be tested once in 3/4/5 years as per the best practices adopted by the other organization such as STU, PGCIL etc. M/s LPGCL noted.	LPGCL was already performing relay testing during opportunity shutdown .However as per CPRI recommendation , Relay testing started with standard report and record. Testing date and due date sticker also pasted on relay for visual monitoring for due date.	It is continuous process.
2	The Relay testing kit and other Electrical testing equipment must be calibrated from NABL accredited Laboratory & the calibration must include voltage, current, frequency, phase angle, power and time.	LPGCL already co-ordinated with calibration agency and will do the calibration for all testing equipment by June-25.	Pending
3	The distance protection Main-I and Main II of all Zones impedance reach setting for 765KV Lalitpur-Agra/Fathehabad Ckt#01 line is having some minor correction based on new NRPC guidelines and addition of lines in remote station. (G Noida & Ghatampur Line newly added in network)	As per NRPC new guidelines and CPRI recommendation, Zone-2 and resistive reach setting to be corrected in bay-709. LPGCL - Fathehabad-line Circuit-1settings will be revised during next opportunity shutdown.	Pending
4	The distance protection Main-I and Main II ,of all Zones impedance reach setting for 765KV Lalitpur-Agra/Fathehabad Ckt#02 line is having some minor correction based on new NRPC guidelines and addition of lines in remote station. (G Noida Line newly added in network)	As per NRPC new guidelines and CPRI recommendation, Zone-2 and resistive reach setting modified in 712 LPGCL -Fathehabad-line-2.	Completed
5	The distance protection Main-I ,Zone 1 impedance reach setting for 220KV Lalitpur-Dunara Ckt#01 lines are properly set and some minor revisions are required in Zone 2 Zone 3 and Zone 5 impedance reach settings.	As per NRPC new guidelines and CPRI recommendation, Zone-2, Zone-3, Zone-4 impedance. Trip time & resistive reach setting modified in all 220kV Lines.	Completed
6	The distance protection Main-II, Zone 1 impedance reach setting for 220KV Lalitpur-Dunara Ckt#01 lines are properly set and some minor revisions are required in Zone 2 Zone 3 and Zone 4 impedance reach settings.		Completed
7	The distance protection Main-I of all Zones impedance reach setting for 220KV Lalitpur-Babina Ckt#01 lines require some minor revisions.		Completed
8	The distance protection Main-II, Zone 1, Zone 3 and Zone 4 impedance reach setting for 220KV Lalitpur-Babina Ckt#01 lines are properly set and some minor revisions Are required in Zone 2 impedance reach settings.		Completed
9	The distance protection Main-I, Zone 1 and Zone 2 impedance reach setting for 220KV Lalitpur-Kalyanpura Ckt#01 And Ckt #02 lines are properly set and some minor revisions are required in Zone 3 and Zone 5 impedance reach settings.		Completed
10	The distance protection Main-II, Zone 1 Zone 2 and Zone 4 impedance reach setting for 220KV Lalitpur-Kalyanpura Ckt#01 And Ckt #02 lines are properly set and some minor revisions are required in Zone 3 impedance reach settings.		Completed

Annexure-X

~~Annexure-IV 15th NPC~~

सत्यमेव जयते

भारत सरकार/Government of India
विद्युत मंत्रालय/Ministry of Power
केंद्रीय विद्युत प्राधिकरण/Central Electricity Authority
राष्ट्रीय विद्युत समिति प्रभाग/National Power Committee Division

सं./MTGS/SG/NPC/CEA/2024/२११ दिनांक: 10.07.2024

सेवा में/To

(As per distribution list)

विषय: Uniform Protection Protocol for the user of the grid - reg.

Madam/Sir,

As per decision taken in 14th NPC meeting held on 03.02.2024, the Uniform Protection Protocol has been prepared after detailed deliberation in protection sub group of NPC and the same is attached herewith for your kind information and necessary action, please. The same will also be ratified in the next NPC meeting.

Encl: As above

10.07.24

(सत्येंद्र कु. दोतान / Satyendra Kr. Dotan)
Director
Tel: 011-26732045
Email: cenpccea@gmail.com

Distribution List

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UNIFORM PROTECTION PROTOCOL

NATIONAL POWER COMMITTEE

CENTRAL ELECTRICITY AUTHORITY

Prepared in Compliance to

Clause 12(2) and Clause 13 of Central Electricity Regulatory Commission Indian Electricity Grid Code Regulations, 2023

July 2024

Chapters

1. **Background**
2. **Applicability**
3. **Definitions**
4. **General Philosophy of Protection System**
5. **Protection Schemes**
6. **Protection Settings & Coordination**
7. **Disturbance Monitoring, Analysis and Reporting**
8. **Protection Audit Plan**
9. **Performance Monitoring of the Protection Systems**
10. **Compliance Monitoring**

UNIFORM PROTECTION PROTOCOL

1. Background

National Power Committee in its 14th meeting held at Bangalore under the chairmanship of Chairperson, CEA has decided that the protection subgroup of NPC may finalise a Uniform Protection Protocol and Uniform Protection Setting Procedure for all regions in consultation with RLDCs/GRID-India.

1.1. The Uniform Protection Protocol has been prepared in accordance with Clauses 12(2) & 13 of the Indian Electricity Grid Code, 2023 (IEGC 2023) notified by the Central Electricity Regulatory Commission.

1.1.1. **The clause 12(2) of the IEGC 2023:**

"There shall be a uniform protection protocol for the users of the grid:

a) for proper co-ordination of protection system in order to protect the equipment/system from abnormal operating conditions, isolate the faulty equipment and avoid unintended operation of protection system;

b) to have a repository of protection system, settings and events at regional level;

c) specifying timelines for submission of data;

d) to ensure healthiness of recording equipment including triggering criteria and time synchronization; and

e) to provide for periodic audit of protection system."

1.1.2. The clause 13 of the IEGC 2023:

"13. Protection protocol

(1) *All users connected to the integrated grid shall provide and maintain effective protection system having reliability, selectivity, speed and sensitivity to isolate faulty section and protect element(s) as per the CEA Technical Standards for Construction, the CEA Technical Standards for Connectivity, the CEA (Grid Standards) Regulations, 2010, the CEA Technical Standards for Communication and any other applicable CEA Standards specified from time to time.*

(2) *Back-up protection system shall be provided to protect an element in the event of failure of the primary protection system.*

(3) *RPC shall develop the protection protocol and revise the same, after review from time to time, in consultation with the stakeholders in the concerned region, and in doing so shall be guided by the principle that minimum electrical protection functions for equipment connected with the grid shall be provided as per the CEA Technical Standards for Construction, the CEA Technical*

Standards for Connectivity, the CEA Technical Standards for Communication, the CEA (Grid Standards) Regulations, 2010, the CEA (Measures relating to Safety and Electric Supply) Regulations, 2010, and any other CEA standards specified from time to time.

(4) *The protection protocol in a particular system may vary depending upon operational experience. Changes in protection protocol, as and when required, shall be carried out after deliberation and approval of the concerned RPC.*

(5) *Violation of the protection protocol of the region shall be brought to the notice of concerned RPC by the concerned RLDC or SLDC, as the case may be."*

1.2. The Uniform Protection Protocol of stipulates General Protection Philosophy of Protection System, Protection Schemes for Generators & various Transmission Elements in Power System, Protection Settings & their Coordination among entities, Disturbance Monitoring, Analysis and Reporting, Time Synchronization of Protection Systems, Protection Audit Plan, Performance of Protection Systems & Compliance Monitoring.

2. Applicability

The Uniform Protection Protocol shall be applicable to all Regional entities, State/Central/Private Generating Companies/ Generating Stations, SLDCs, RLDCs, CTU, STUs, Transmission Licensees and RPCs, connected at 220 kV (132 kV for NER) and above.

3. Definitions

Words and expressions used in this Uniform Protection Protocol are defined in the Act or any other regulations specified by the Central Commission or Central Electricity Authority shall, unless the context otherwise requires, have the meanings assigned to them under the Act or other regulations specified by the Central Commission, as the case may be.

4. General Philosophy of Protection System

4.1. Protection philosophy shall be in accordance with below mentioned objectives, design criteria and other details. However, protection design in a particular system may vary depending upon judgment and operational experience in the broad contours of the protection philosophy. Consideration must also be given to the type of equipment to be protected as well as the importance of this equipment to the system. Further, protection must not be defeated by the failure of a single component.

4.1.1. **Objectives**:

The basic objectives of any protection schemes should be to:

(i) Protect equipments from abnormal operating conditions.

(ii) Automatically isolate the faulty element.

(iii) Avoid unintended or misoperation of protection system.

(iv) Mitigate the effect of short circuit and other abnormal conditions in minimum possible time and area.

(v) Indicate the location and type of fault and

(vi) Provide effective tools to analyze the fault and decide remedial measures.

4.1.2. **Design Criteria:**

To accomplish the above objectives, the four design criteria for protection that should be considered are:

(i) fault clearance time/speed;
(ii) selectivity;
(iii) sensitivity and
(iv) reliability (dependability and security)

4.1.2.1. **Fault clearance time/speed**: It is defined as the time required to interrupt all sources supplying a faulted piece of equipment. In order to minimize the effect on customers and maintain system stability, Fault clearance time shall be as per CEA Grid Standard Regulations 2010, as amended to date.

4.1.2.2. **Selectivity:** Selectivity is the ability of the protective relaying to trip the minimum circuits or equipment to isolate the fault **.**To ensure Selectivity, coordination shall be ensured with the adjacent protection schemes including breaker failure, transformer downstream relays, generator protection and station auxiliary protection.

4.1.2.3. **Sensitivity**: Sensitivity demands that the relays be capable of sensing minimum fault conditions without imposing limitations on circuit or equipment capabilities. To ensure Sensitivity, the settings must be investigated to determine that they will perform correctly for the minimum fault current envisaged in the system, yet remain stable during transients and power swings from which the system can recover.

4.1.2.4. **Reliability**: Reliability is a measure of protective relaying systems certainly to trip when required (dependability) and not to trip falsely (Security). To ensure Reliability, two independent auxiliary direct current supplies shall be provided for Main-I and Main-II relays. The Main-I and Main-II relays should be from two different makes or operating with different algorithm. The CB´s shall have two independent trip coils and two independent trip circuits. Each protection device should trip at least one of them by independent auxiliary DC- supplies.

4.1.2.5. **Security**: To ensure Security, the protection shouldn't limit the maximum transmission capacity of the element. Distance protection in particular could cause spurious tripping due to specific grid conditions, in case of high load operation. Therefore, any special topologies must be known and considered for protection parameterization. For parallel Over Head Lines it is necessary to consider the rapid increase of load current in the healthy line when the faulty line trips and the protection operation must allow such conditions The

load encroachment detection function of the relays must be used, when the highest distance zone resistance reach conflicts with the maximum transmitted load on the protected element.

4.2. All generating units shall have standard protection system to protect the units not only from faults within the units and within the Station but also from faults in sub-stations and transmission lines.

4.3. The generator, generator transformer, unit auxiliary transformer shall be provided with protection systems connected to two independent channels or groups, such that one channel or group shall always be available for any type of fault in the generator and these transformers;

4.4. Protection relays shall be configured in such a way that analog, digital and milli ampere input points shall not pick up due to stray voltages. All protection relays should enough spare input and output contacts for taking care of future expansions.

4.5. Protective relays shall be used to detect electrical faults, to activate the alarms and disconnect or shut down the faulted apparatus to provide for safety of personnel, equipment and system within shortest possible time.

4.6. Electrical faults shall be detected by the protective relays arranged in overlapping zones of protection.

4.7. The protection relays for the generators, motors, transformers and the transmission lines shall generally be of numerical type.

4.8. All relays used shall be suitable for operation with CTs secondary rated for one ampere or five amperes as per relevant Indian Standards or International Electrotechnical Commission or Institute of Electrical and Electronics Engineers standards.

4.9. Relevant Indian Standards or International Electrotechnical Commission or Institute of Electrical and Electronics Engineers standards shall be applied for protection of generators, transformers and motors.

5. Protection Schemes

The electrical protection functions for equipment connected with the grid shall be provided as per the Central Electricity Authority (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations 2022 amended to date, the CEA (Technical Standards for connectivity to the Grid) Regulations 2007 amended to date, the CEA (Technical Standards for Communication System in Power System Operation) Regulations 2020 amended to date, the CEA (Grid Standards) Regulations 2010 amended to date, the CEA (Measures relating to Safety and Electric Supply) Regulations 2023 amended to date, and any other CEA standards specified from time to time.

5.1. **Protection Scheme for Thermal Generating Units**

The electrical protection functions for generator, generator transformer, unit auxiliary transformer and station transformer of **coal or lignite based thermal generating stations, gas turbine based thermal generating stations, internal combustion (IC) engine based**

thermal generating stations shall be provided in accordance with but not limited to the list given in **SCHEDULE-I** of CEA (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations 2022 amended to date.

5.2. **Protection Scheme for Hydro Generating Units**

5.2.1. For the generating units with a rating of more than one hundred megawatt (100 MW), protection system shall be configured into two independent sets of protection (Group A and B) acting on two independent sets of trip coil fed from independent DC supplies, using separate sets of instrument transformers, and segregated cables of current transformers and voltage transformers.

5.2.2. The protection functions for Generator, Excitation Transformer, Generator, Transformer, Unit Auxiliary Transformer, and Station Auxiliary Transformer shall be provided in accordance with but not limited to the list given in SCHEDULE-IV of CEA (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations 2022 amended to date except for variable speed units which will have specialized protection functions.

5.3. **Protection Scheme for REGs/RHGS/BESS**

Protection Schemes for Renewable Energy (RE) Power Plants of Solar power generation, Wind power generation, Battery Energy Storage System (BESS) and Hybrid of these connected with grid at voltage level above 650 volts shall be in accordance with the Central Electricity Authority (Technical Standards for Construction of Renewable Energy Power Plants) Regulations, 2024 from the date as & when these regulations are notified).). As per Central Electricity Authority (technical Standards for Connectivity of the Distributed Generation Resources) amendment Regulations, 2019 regulation 11A-**Standards for charging station, prosumer, or a person connected or seeking connectivity to the electricity system**;-

(1) The applicant shall provide a reliable protection system to detect various faults and abnormal conditions and provide an appropriate means to isolate the faulty equipment or system automatically.
(2) The applicant shall ensure that fault of his equipment or system does not affect the grid adversely.
(3) The protective relays deployed for inverter protections in RE plants shall possess protections from AC/DC over current, over and under frequency and shall comply features like LVRT/HVRT **(as per CEA Technical Standards for Connectivity).**
(4) The protective relays deployed in RE plants shall be immune from conditions like phase jumps and sharp change in frequency during fault scenarios.
(5) The inverters and BESS in RE plants shall responds to abnormal conditions arises due to system faults within its operating margin in holistic manner.
(6) Protection settings of inverters/WTG shall be coordinated in such a way that it accounts for the voltage rise/drop between inverter/WTG terminal & Point of interconnection (POI). Overvoltage /under voltage trip settings should be configured accordingly.

(7) The protection settings of elements in collector system viz. transformers, cables etc. shall such that it allows RE plants to ensure the compliance of CEA standards at POI.
(8) Sub-cycle transients or measurement inaccuracy shall be factored while configuring the protection settings.

5.4. **Substations & Transmission Line**

5.4.1. All major protection relays for the Voltage levels 66 kV and above shall be of numerical type and communication protocol shall be as per IEC-61850.

5.4.2. Grouping of Protection systems for the voltage level 66 kV and above:

i. The protection circuits and relays shall be electrically and physically segregated into two groups each being independent and capable of providing uninterrupted protection even in the event of one of the protection group fails or taken out for maintenance.

ii. Interconnection between these two groups shall not generally be attempted. However, such interconnection shall be kept to the bare minimum, if found absolutely necessary.

5.4.3. The protections required in respect of transmission lines, transformers, reactors and bus bar protection and local breaker backup protection (breaker failure protection) but not limited to shall be in accordance with **SCHEDULE-V** of CEA (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations 2022 amended to date.

5.5. **HVDC Terminals/ Stations**

5.5.1. **Classical HVDC Terminals/ Stations**

i) HVDC system protection shall consist of two parts:

(A) AC side protection:

AC side protection function shall cover the zone for converter transformer, AC filters, shunt capacitors, shunt reactors, and bus bars. These protections shall generally follow the same philosophy as in a typical substation i.e. detection of fault by relay and tripping of circuit breaker.

(B) DC side protection:

DC side protection shall cover the zones consisting of the valve hall, DC switchyard including smoothing reactor and DC filters, DC line, DMR line / electrode line and ground electrode. The protection equipment shall be designed to be fail safe and shall ensure high security to avoid maloperation/ unwanted shutdown due to protection equipment failures. ii) Following a DC Line fault, the HVDC System shall have the facility to restart, one or more times, the faulted pole at a variable pre-selected DC voltage level(s), not below 80% of the nominal voltage rating. The DC transmission system shall be capable of recovery in a controlled and stable

manner without commutation failures during recovery following ac and dc system faults. The post fault power order shall be equal to the pre-fault power order unless AC/ DC systems dictate otherwise.

ii) Protection system required in respect of Classical HVDC Terminals/ Stations but not limited to shall be in accordance with 13 (b) of Part A of SCHEDULE-VI of CEA (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations 2022 amended to date.

iii) HVDC Stations shall have ensure the open line test (OLT) before charging of lines after DC faults.

iv) All HVDC stations should prioritize the protections with back up for DC line faults, Differential protections for DC yard equipment including converter valves, Filter protections, External block protections for problems like smoke detections, valve cooling etc. AC side protections and protection block for various controller maloperation issues.

5.5.2. **Voltage Source Converter (VSC) based HVDC Terminals/Stations**

i) The protection equipment shall be designed to be fail-safe and shall ensure high security to avoid mal-operation/ unwanted shutdown due to protection equipment failures.

ii) Protection system required in respect of Voltage Source Converter (VSC) based HVDC Terminals/ Stations but not limited to shall be in accordance with 8 (b) of Part B of **SCHEDULE-VI** of CEA (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations 2022 amended to date.

5.5.3 STATCOM: All STATCOM shall be having sensitive and fast acting protection system for coupling transformer, MSC, MSR, MV bus, VSC branches and valve hall.

i) The utility should redundancy for the protections like capacitor unbalance, Neutral displacement, cooling and temperature dependent protections all the time.

5.6. **Philosophy of Transmission Line Protection**

5.6.1. Transmission circuit construction can be considered in three main categories viz.: Overhead construction, Underground cable construction and Composite (overhead plus underground) construction. The requirements of overhead line and cable protection systems vary greatly, due to the exposure of transmission circuits to a wide variety of environmental hazards and are subjected to the wide variations in the format, usage and construction methodologies of transmission circuits. The type of protection signaling (tele- protection) or data communication systems required to work with the protection systems will also influence protection scheme requirements.

5.6.2. Transmission circuit Main protection is required to provide primary protection for the line and clear all type of faults on it within shortest possible time with reliability, selectivity and sensitivity. Transmission circuit back-up protection shall cater for failure of any main protection system to clear any fault that it is expected to clear. A protection function that offers back-up for most faults may also provide main protection for some fault conditions. Combinations of main and back-up protection systems should be used to address the main and application specific requirements for transmission circuits.

5.6.3. **Design Criterions:** While designing the scheme for protection of transmission lines following criteria shall be considered:

i) The systems applied must be capable of detecting all types of faults, including maximum expected arc resistance that may occur at any location on the protected line.

ii) The protection should be set not to trip under system transient conditions, which are not short circuits. Conversely where the short circuit current is low due to local grid conditions (weak network) or due to high resistance of the arc, this must be taken into consideration to trip the relay by using the most appropriate criterion, without jeopardizing the unwanted tripping during heavy load conditions.

iii) The design and settings of the transmission line protection systems must be such that, with high probability, operation will not occur for faults external to the line or under non-fault conditions.

iv) The over current protection for the transmission lines 220 kV and above voltage levels shall generally be in disabled condition.

5.6.4. **Reliability Criterions:**

i) **For transmission line having voltages at 220kV and above:** High speed Duplicated Main Protection (Main-I and Main-II) shall be provided. Main-I protection shall be carrier aided non-switched distance protection. Main-II protection shall be carrier aided non-switched distance protection, or phase segregated line differential protection. For very short line (less than 10 km), cable or combination of overhead line and cable, line differential protection with distance protection as backup (built-in Main relay or standalone) shall be provided mandatorily as Main-I and Main-II.
In addition to above, following shall also be provided:

a) Auto reclose relay (Standalone or as built-in function of Main-I & Main-II relay) suitable for 1 ph or 3 ph (with deadline charging and synchro- check facility) reclosure.

b) Inverse Definite Minimum Time (IDMT) directional E/F relay (Standalone or as built-in function of Main-I & Main-II relay).

c) Inverse Definite Minimum Time (IDMT) Directional over current for 220 kV lines if Main-II is not provided.

Main Protection shall have following features:

a) The Main-I and Main-II protection shall be numerical relays of different makes or employ different fault detection algorithm.

b) Each distance relay shall protect four/five independent zones (three/four forward zones and one reverse zone). It shall be provided with carrier aided tripping through PLCC or OPGW/FOTE communication.

c) The relays should have sufficient speed so that they will provide the clearing times as defined in the CEA Grid Standards Regulations amended time to time.

d) The Main-I and Main-II relays shall be powered by two separate DC sources.

e) Both, Main-I and Main-II shall send initiation signal to Breaker Failure Relay / LBB Protection system.

f) Internal Directional Earth Fault function shall be set to trip the line in case of high resistance earth faults.

g) The Broken Conductor detection shall be used for alarm purpose only.

h) The internal overvoltage function shall be used to protect the line against over voltages. Two stage over voltage protection for the transmission lines (Stage-I as Voltage and Time graded & Stage-II @ 140% of Nominal Voltage with time delay 100ms) shall be implemented for the transmission lines of voltage levels 400kV and above. The OVR grading, Voltage and Time graded, for the Stage-I over voltage protection shall be as recommended by RPC/RLDC. The lines emanating from same substation shall be provided with pickup as well as time grading to avoid concurrent trippings. The overvoltage relay shall have better than 98% drop-off to pick-up ratio (the ratio of the limiting values of the characteristic quantity at which the relay resets and operates). For over voltage detection, though Ph-N voltage is preferable to Ph-to-Ph voltage, to achieve required discrimination for OVR grading on account of limitation imposed by voltage resolution of the relay, Ph-to-Ph voltage to be used for Over Voltage detection.

ii) **For transmission lines having voltages at 132kV/110kV:** There should be at least one carrier aided non-switched four/five zone distance protection scheme. Carrier aided zone protection may be optional for the radial feeders and feeders having intermittent loads In addition to this, another non switched/switched distance scheme or Inverse definite Minimum time(IDMT) directional over current and earth fault relays should be provided as back up. Main protection should be suitable for single or three phase tripping. Additionally, auto-reclose relay suitable for 1 ph or 3 ph (with dead line charging and synchro-check facility) reclosure shall be provided. In case of both line protections being Distance Protections, IDMT type Directional E/F relay (standalone or as built-in function of Main-I & Main-II relay) shall also be provided additionally.

5.6.5. Following types of protection scheme to be adopted to deal with faults on the lines:

i) **Distance Protection Scheme:** The scheme shall be based on the measuring the impedance parameters of the lines with basic requirements as below:

a) Each distance relay shall protect four/five independent zones (three/four forward zones and one reverse zone). It shall be provided with carrier aided tripping through PLCC or OPGW/FOTE) communication.

b) Each Distance Relay:

i. Shall include power swing detection feature for selectively blocking, as required.

ii. Shall include suitable fuse-failure protection to monitor all types of fuse failure and block the protection.

iii. Shall include load encroachment prevention feature like Load blinder.

iv. Shall include Out of Step trip function.

v. Distance relay as Main protection should always be complemented by Directional ground protection to provide protection for high resistive line faults.

vi. Shall be capable to protect the series compensated lines from voltage inversion, Week end infeed and current inversion phenomenon. Special measures must be taken to guard against these phenomenon.

ii) **Line Differential Protection**: The scheme shall be based on the comparing the electrical quantities between input and output of the protected system. Provided that:

a) Due to the fact that short lines (less than 10kM) and/or cables do not have enough electrical length, the current differential relay should always be used.

b) For Cables, at least a differential line protection shall be used in order to guarantee fast fault clearing while maintaining security. The reason being that there are many sources of errors associated to other protection principles, especially for ground faults in cables.

c) The differential protection shall have following requirements:

i. Line differential as Main-I with inbuilt backup Distance Protection shall be installed for all the lines irrespective of length (subject to technical limitations).

ii. Zone-I protection feature shall get automatically enabled in case of communication failure observed by the differential relay.

iii. The differential relays provided in 220 kV and above system must operate in less than 30 ms. RPC/RLDC may decide on differential protection on voltage level below 220 kV.

iv. The current differential protection should a reliable type (preferably digital). The protection should be of the segregate phase type, i.e. it should be able to detect the phase in fault and therefore for the case of single line-ground (SLG) faults to trip only the phase in fault (also to establish single phase A/R). The synchronization of the measured values is done via a communication system. The communication system for differential line protection should be based on fibre optic and any equipment should comply with the IEC 60834.

5.6.6. **Auto Reclosing**:

The single phase high speed auto-reclosure (HSAR) at 220 kV level and above (except for the composite feeders: overhead plus underground) shall be implemented, including on lines emanating from generating stations. If 3-phase auto reclosure is adopted in the application of the same on lines emanating from generating stations should be studied and decision taken on case to case basis. For 132 kV system, three phase auto-reclosure (TPAR) is optional. As per CEA construction standards for construction of electrical plants and lines regulation) 2022, 3 Phase A/R is optional for 132 KV system.

i) **AR Function Requirements:**

It shall have the following attributes:

a) Have single phase or three phase reclosing facilities.

b) Incorporate a facility of selecting single phase/three phase/single and three phase auto-reclose and non-auto reclosure modes.

c) Have facilities for selecting check synchronizing or dead line charging features.

d) Be of high speed single shot type

e) Suitable relays for SC and DLC should be included in the overall auto reclose scheme if three phase reclosing is provided.

f) Should allow sequential reclosing of breakers in one and half breaker or double breaker arrangement.

It may have the following attributes as well:

(1) Have a continuously variable single phase dead time.

(2) Have continuously variable three phase dead time for three phase reclosing.

(3) Have continuously variable reclaim time.

ii) **Scheme Special Requirements:**

a) Modern numerical relays (IEDs) have AR function as built-in feature. However, standalone AR relay or AR function of Bay control unit (BCU) for 220kV and above voltage lines may be used. For 132kV/110kV lines, AR functions built-in Main distance relay IED can be used.

b) Fast simultaneous tripping of the breakers at both ends of a faulty line is essential for successful auto-reclosing. Therefore, availability of protection signaling equipment is a pre-requisite.

c) Starting and Blocking of Auto-reclose Relays:

Some protections start auto-reclosing and others block. Protections which start A/R are Main-I and Main-II line protections. Protections which block A/R are:

i. Breaker Fail Relay
ii. Line Reactor Protections
iii. O/V Protection
iv. Received Direct Transfer trip signals
v. Busbar Protection
vi. Zone 2/3 of Distance Protection
vii. Carrier Fail Conditions
viii. Circuit Breaker Problems.
ix. Phase to Phase Distance Trip
x. AR selection switch in OFF / Non-auto position
xi. Logic AR OFF in SAS
xii. Phase Distance Start (when Auto reclosure is in progress)

When a reclosing relay receives start and block A/R impulse simultaneously, block signal dominates. Similarly, if it receives 'start' for 1-phase fault immediately followed by multi- phase fault the later one dominates over the previous one.

xiii. Fault on reclaim time
xiv. Fault on line charging
xv. Pole discrepancy

iii) **Requirement for Multi breaker Arrangement:**

Following schemes shall be adhered to multi-breaker arrangements of one and half breaker or double breaker arrangement:

a) In a multi-Circuit Breaker (C.B.) arrangement one C.B. can be taken out of operation and the line still be kept in service. After a line fault only those C.Bs which were closed before the fault shall be reclosed.

b) In multi-C.B. arrangement it is desirable to have a priority arrangement so as to avoid closing of both the breakers in case of a permanent fault.

c) A natural priority is that the C.B. near the busbar is reclosed first. In case of faults on two lines on both sides of a tie C.B. the tie C.B. is reclosed after the outer C.Bs. The outer C.Bs. do not need a prioritizing with respect to each other.

iv) **Setting Criteria:**

Auto reclosing requires a dead time which exceeds the de-ionizing time. The circuit voltage is the factor having the predominating influence on the de-ionizing time. Single phase dead time of 1.0 sec. is recommended for 765 kV, 400 kV, 220 kV and 132 kV system. As per CEA construction standards for construction of electrical plants and lines regulation) 2022, 3 Phase A/R is optional for 132 KV system. Therefore, 132kV system may be included based on RPC/RLDC input. For the lines emanating from generating stations single-phase dead time upto 1.5 sec may be adopted.

a) According to IEC 62271-101, a breaker must be capable of withstanding the following operating cycle with full rated breaking current:

O - 0.3 s - CO - 3 min - CO

O- stands for Open

CO- stands for Close-Open

The rated operating cycle of the circuit breaker consisting of an opening, a holding time of 0.3 seconds, a CO cycle, a 3-minute wait, and another CO cycle.

The recommended operating cycle at 765 kV, 400 kV, 220 kV and 132 kV is as per the IEC standard. As per CEA construction standards for construction of electrical plants and lines regulation) 2022, 3 Phase A/R is optional for 132 KV system. Therefore, 132kV system may be included based on RPC/RLDC input. Therefore, reclaim time of 25 Sec. is recommended.

5.6.7. **Power Swing Blocking and Out of Step (OOS) Function**

Large interconnected systems are more susceptible to Power Swings in comparison to the erstwhile smaller standalone systems. Inter-area Power

Swings can be set up even due to some event in far flung locations in the system. During the tenure of such swings, outage of any system element may aggravate the situation and can lead to instability (loss of synchronism). It is hence extremely important that unwanted tripping of transmission elements need to be prevented, under these conditions. Distance protection relays demand special consideration under such a situation, being susceptible to undesirable misoperation during Power swings which may be recoverable or irrecoverable power swings. Following steps may be adopted to achieve above objective:

i) **Block all Zones except Zone-I**

This application applies a blocking signal to the higher impedance zones of distance relay and allows Zone 1 to trip if the swing enters its operating characteristic. Breaker application is also a consideration when tripping during a power swing. A subset of this application is to block the Zone 2 and higher impedance zones for a preset time (Unblock time delay) and allow a trip if the detection relays do not reset.

In this application, if the swing enters Zone 1, a trip is issued, assuming that the swing impedance entering the Zone-1 characteristic is indicative of loss of synchronism. However, a major disadvantage associated with this philosophy is that indiscriminate line tripping can take place, even for recoverable power swings and risk of damage to breaker.

ii) **Block All Zones and Trip with Out of Step (OOS) Function**

This application applies a blocking signal to all distance relay zones and order tripping if the power swing is unstable using the OOS function (function built in modern distance relays or as a standalone relay). This application is the recommended approach since a controlled separation of the power system can be achieved at preselected network locations. Tripping after the swing is well past the 180-degree position is the recommended option from CB operation point of view.

Normally relay is having Power Swing Un-block timer which unblocks on very slow power swing condition (when impedance locus stays within a zone for a long duration). Typically, the Power swing un-blocking time setting is 2sec.

However, on detection of a line fault, the relay has to be de-blocked.

Placement of OOS trip Systems

Out of step tripping protection (Standalone relay or built-in function of Main relay) shall be provided on all the selected lines. The locations where it is desired to split the system on out of step condition shall be decided based on system studies.

The selection of network locations for placement of OOS systems can best be obtained through transient stability studies covering many possible

operating conditions. Based on these system studies, either of the option above may be adopted after the approval of PCSC of RPC.

While applying Power Swing Blocking (PSB) in the distance protection relay a few other important aspects also need to be considered:

- PSB function should not block if negative sequence or zero sequence currents are present. Once blocked, the PSB should unblock if negative sequence or zero sequence currents are detected. Power Swing is a balanced three phase phenomenon and unbalance can only occur in the case of an asymmetrical fault.
- It will be desirable that during tenure of PSB, the distance protection is capable of detecting a fault and tripping. If such a feature is not available in the relay, PSB should be unblocked after a time delay, corresponding to the half cycle period of the slowest expected Swing Frequency (usually 2s corresponding to the slowest swing frequency of 0.25Hz is considered as default), to avoid the protection remaining perpetually blocked.

5.7. **Transmission Relay Loadability**

Transmission Relay Loadability means the loading permitted in the transmission line by the relay including a security margin. The relay Loadability is to be arrived in such a way as far as possible not to interfere with system operator actions, while allowing for short-term overloads, with sufficient margin to allow for inaccuracies in the relays and instrument transformers. Transmission relay do not prematurely trip the transmission elements out-of-service and allow the system operators from taking controlled actions consciously to alleviate the overload.

5.7.1. Protective relay settings shall

i) Not limit transmission Loadability;

ii) Not interfere with system operators' ability to take remedial action to protect system reliability and;

iii) Be set to reliably detect all fault conditions and protect the electrical network from the faults.

5.7.2. The protective functions which could trip with or without time delay, on load current i.e. load responsive phase protection systems including but not limited to:

i) Phase distance.

ii) Out-of-step tripping.

iii) Switch-on-to-fault.

iv) Overcurrent relays.

v) Communications aided protection schemes including but not limited to:

- Permissive overreach transfer trip (POTT).
- Permissive under-reach transfer trip (PUTT).
- Directional comparison blocking (DCB).
- Directional comparison unblocking (DCUB).

vi) Phase overcurrent supervisory elements (i.e., phase fault detectors) associated with current based, communication-assisted schemes (i.e., pilot wire, phase comparison, and line current differential) where the scheme is capable of tripping for loss of communications.

5.7.3. Each Transmission Licensee and Generating Company, shall use any one of the following criteria for any specific circuit terminal to prevent its phase protective relay settings from limiting transmission system loadability while maintaining reliable protection of the Grid for all fault conditions. Relay loadability at 0.85 per unit voltage and a power factor angle of 30 degrees shall be evaluated.

i) For Distance protection relays of transmission lines, the Zone-3 shall prevent load encroachment, considering the following criteria:

a) Maximum load current (I_{max}) may be considered as 1.5 times the thermal rating of the line or 1.5 times the associated bay equipment current rating (the Minimum of the bay equipment individual rating) whichever is lower.

(The rating considered is approximately 15 minutes rating of the Transmission facility).

b) For setting angle for load blinder, a value of 30 degree may be adequate in most cases.

c) The Distance protection relays shall have provision for load blinder characteristic or load encroachment detection. ii) For Directional Overcurrent relays, wherever used in a transmission line (132/110 kV level), the following shall be adopted:

a) An overload alarm shall be set at 110% of the thermal rating of the line with sufficient delay. This alarm shall allow the operator to take corrective action.

b) The Directional Overcurrent relay shall allow the line to carry 1.2 times of the thermal rating of the associated line or bay equipment (whichever is lower) at least 10 minutes.

iii) For transformer protection relays the following shall be adopted:

- Set the definite time transformer overload relay atleast 105% of the transformer ratings with sufficient delay. It shall be wired for alarm purpose only to allow the operator to take corrective action. No tripping shall be issued from this relay.

- The back-up overcurrent relays shall use IDMT characteristics and be suitably coordinated with the upstream transmission network.
- Install supervision for the transformer using either a top oil or simulated winding hot spot temperature element. The alarm and trip settings for these relays shall be set by individual entities based on the manufacturer's recommendation.

Thermal ratings as specified in the prevailing CEA's Manual on Transmission Planning Criterion shall be used for above requirement.

6. *Protection Settings & Coordination*

The purpose is to ensure system protection is coordinated among the grid connected entities. The Protection systems coordination comprises the following:

i) *Each Transmission Licensee, Load Dispatch Centre (LDC) and Generating Company shall keep themselves familiarized with the purpose and limitations of Protection System schemes applied in its area of control.*

ii) *Each Transmission licensee shall coordinate its Protection System schemes with concerned transmission system, sub-transmission system and generators.*

iii) *Each Generating Company shall coordinate its Protection System schemes with concerned transmission system and station auxiliaries.*

iv) *Each Transmission Licensee and Generation Company shall be responsible for settings calculations for protection of elements under its ownership. It shall be the responsibility of the respective asset owner to obtain the inputs (adjacent line settings, infeed values etc.) from STU/Generating Company/ Transmission Licensee necessary for calculation of the settings.*

v) *STU/Generating Company/Transmission Licensee shall provide the infeed values/latest network model to the requesting entity, within 15 days of receipt of such a request from the entity.*

vi) *Each Generating Company and Transmission Licensee, for voltage levels 400kV and above and interstate lines, shall submit the protection settings as per the format prescribed, along with the calculation sheets, co-ordination study reports and input data, in advance, to RPC/RLDC for every new element to be commissioned. The mentioned information shall be submitted to the RPC/RLDC two months in advance for all the elements proposed to be commissioned. RPC shall furnish the approved settings within forty days from the date of submission of the settings by the entity.*

vii) *If required Protection Setting Sub Group (PSSG) may be constituted under PCSC in the RPCs with the expert members from all States & UTs, Major Transmission Licensee in the Region, Major Generating Company in the Region, Grid-India/RLDC & RPC Secretariat for analysing/reviewing the proposed protection settings of the new elements as well as changes in the existing protection settings, as arrived by the*

proposer as per the Chapter 6 of Uniform Protection Protocol. The PSSG recommended protection settings shall be ratified by PCSC of respective RPC.

Or

Any procedure that is finalized and approved by the Protection Sub-Committee of respective RPC.

viii) *The PCSC shall review the settings to ensure that they are properly coordinated with adjacent system and comply with the existing guidelines. The onus to prove the correctness of the calculated settings shall lie with the respective Transmission licensee/Generation Company. In case, the PCSC feels that the adjacent transmission system settings need to be changed, in view of the new element, it shall inform the concerned entity for revision of the existing settings.*

ix) *The PCSC of RPC shall review and approve the settings based on the inputs /report submitted by the entities.*

x) *The approved settings shall be implemented by the entity and proper record of the implemented settings shall be kept. The modern numerical relays have several settings for various features available in the relay. It shall be ensured that only the approved features and settings are enabled in the relay. No additional protection/setting shall be enabled without the prior approval of RPC.*

xi) *Each Transmission licensee and Generating Company shall co-ordinate the protection of its station auxiliaries to ensure that the auxiliaries are not interrupted during transient voltage decay.*

xii) *Any change in the existing protection settings, for voltage levels 400kV and above & interstate lines, shall be carried out only after prior approval from the RPC. The owner entity shall inform all the adjacent entities about the change being carried out.*

xiii) *In case of failure of a protective relay or equipment failure, the Generating Company and Transmission Licensee shall inform appropriate LDC/RLDC/RPC. The Generating Company and Transmission Licensee shall take corrective action as soon as possible.*

xiv) *Each Transmission Licensee shall coordinate Protection Systems on major transmission lines and interconnections with neighbouring Generating Company, Transmission Licensee and appropriate LDC.*

xv) *RPC in consultation with the RLDC & Regional entities shall undertake review of the protection settings, assess the requirement of revisions in protection settings and revise protection settings, from time to time and at least once in a year. The necessary studies in this regard shall be carried out by the RPC & RLDC. The modifications/changes, if any, in protection settings shall be advised to the respective users and STUs.*

xvi) *RPC shall maintain a centralized database and update the same on periodic basis in respect of their respective region containing details of relay settings for grid elements connected to 220 kV and above. RLDC also shall maintain such database. Respective Transmission licensee/Generating Company/Entities are responsible for ensuring to make available the implemented protection settings in the centralized database within fifteen days from the date of commissioning.*

xvii) *If System Protection Schemes(SPS) is recommended to be implemented by the appropriate forum/Sub-Committee of RPC on account of operational & system constraints, the same shall be implemented by the concerned Transmission licensee/Generating Company/Entities within the specified timelines.*

xviii) *IBR settings like phase jump, df/dt settings, over currents settings, over/under frequency, over/under voltage, LVRT/HVRT etc. for Solar, Wind & Battery Energy Storage System (BESS) etc. to be reviewed in protection subcommittee meetings.*

Note: - It was agreed in the meeting held on 28.06.2024 with members of protection Sub group of NPC that there is no need for preparation of separate uniform protection setting procedure. RPCs may develop an internal mechanism to ensure effective coordination among all grid-connected entities to achieve the required procedure. However, RPCs may refer the above Chapter 6 for the purpose of development of such internal mechanisms to review of the protection settings in consultation with the stakeholders of the respective region.

7. Disturbance Monitoring, Analysis and Reporting

The Purpose is to ensure that adequate disturbance data is available to facilitate Grid event analysis. The analysis of power system disturbances is an important function that monitors the performance of protection system, which can provide information related to correct behavior of the system, adoption of safe operating limits, isolation of incipient faults.

7.1. **The Disturbance Monitoring Requirements include the following:**

i) Each Transmission Licensee and Generating Company shall provide Sequence of Event (SOE) recording capability by installing Sequence of Event recorders or as part of another device, such as a Supervisory Control and Data Acquisition (SCADA) Remote Terminal Unit (RTU), Phasor Measurement Unit (PMU), a generator plants Digital (or Distributed) Control System (DCS) or part of Fault recording equipment.

This capability shall be provided at all substations and at locations to record all the events in accordance with CEA Grid Standard Regulations, 2010 amended to date. The following shall also be monitored at each location:

a) Transmission and Generator circuit breaker positions

b) Protective Relay tripping for all Protection Groups that operate to trip circuit breakers identified in (a) above.

c) Tele protection keying and receive

ii) In either case, a separate work station PC shall be identified to function as the event logger front end. The event logger work-station PC should be connected to UPS (Uninterrupted Power Supply).

The event logger signals shall include but not limited to

- All Circuit Breaker and isolator switching Operations
- Auxiliary supply (AC, DC and DG) supervision alarms
- Auxiliary supply switching signals
- Fire-fighting system operation alarms
- Operation signals (Alarm/Trip from all the protection relays.)
- Communication Channel Supervision Signals.
- Intertrip signals receipt and send.
- Global Positioning System (GPS) Clock healthiness.
- Control Switching Device healthiness (if applicable).
- RTU/Gateway PC healthiness
- PMU Healthiness
- All Circuit Breaker Supervision Signals.
- Trip Circuit Supervision Signals.

iii) Each Transmission Licensee/Generating Company/Users shall provide Disturbance recording capability for the following Elements at facilities:

- All transmission lines (Each line shall be provided with facility for distance to fault locator)
- Autotransformers or phase-shifters connected to busses.
- Shunt capacitors, shunt reactors.
- Individual generator line interconnections.
- Dynamic VAR Devices.
- HVDC terminals.
- Bus Bars
- Inverter and PPC
- Generators
- Statcom

iv) The Disturbance recording feature shall be enabled and configured in all the numerical relays installed. Disturbance recording system shall have minimum

recording time of 3 seconds (0.5 seconds for pre-fault and 2.5 seconds for post fault).

v) Each Generating Company shall provide Disturbance recording capability for Generating Plants in accordance with Central Electricity Authority (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations 2022 amended to date, the CEA (Technical Standards for connectivity to the Grid) Regulations 2007 amended to date.

vi) Each Transmission Licensee and Generating Company shall record for Faults, sufficient electrical quantities for each monitored Element to determine the following:

- Three phase-to-neutral voltages. (Common bus-side/line side voltages may be used for lines.)
- Three phase currents and neutral currents.
- Polarizing currents and voltages, if used (As applicable).
- Frequency (As applicable).
- Real and reactive power (As applicable).
- V sync(Synchronizing voltage) (For TPAR)
- Mutual compensation current(In case of parallel line)

The Minimum parameters to be monitored in the Fault record shall be specified by the PCSC of RPCs.

vii) Each Transmission Licensee and Generating Company shall provide Disturbance recording with the following capabilities:

- The Disturbance recorders shall have time synchronization and a standard format for recording analogue and digital signals (DR labels to be standardized as per the Report of FOLD Working Group - 3 on DR Parameter Standardization). The data files shall be capable of being viewed, read, and analyzed with a generic COMTRADE analysis tool as per the latest revision of IEEE Standard C37.111.
- Each Fault record duration and the trigger timing shall be settable and set for a minimum 3 second duration including 0.5 seconds for pre-fault and 2.5 seconds for post fault
- Each Fault recorder shall have sampling frequency of 1 kHz or better.
- Each Fault recorder shall be set to trigger for at least the following:

  Internal protection trip signals, external trigger input and additional triggers may be assigned as necessary.

viii) Each Transmission Licensee and Generating Company shall keep the recording instruments (disturbance recorder and event logger) in proper working condition

and shall establish a maintenance and testing program for Disturbance Recorder (DR) that includes

- Maintenance and testing intervals and their basis.
- Summary of maintenance and testing procedures.
- Monthly verification of communication channels used for accessing records remotely (if the entity relies on remote access and the channel is not monitored to a control centre staffed around the clock, 24 hours a day, 7 days a week (24/7)).
- Monthly verification of time synchronization (if the loss of time synchronization is not monitored to a 24/7 control centre).
- Monthly verification of active analog quantities.
- A requirement to return failed units to service within 90 days. If a Disturbance Recorder (DR) will be out of service for greater than 90 days, the Transmission Licensee and Generating Company shall keep a record of efforts aimed at restoring the DR to service.

ix) The time synchronization of the disturbance recorders shall be corroborated with the PMU data or SCADA event loggers by RLDCs. RLDCs shall list out for Disturbance recorders which are non- compliant for discussion in PCSC meetings of RPCs.

x) Each Transmission Licensee and Generating Company shall submit the data files to the RLDCs conforming to the following format requirements:

- The data files shall be submitted in COMTRADE and PDF format.
- File shall have contained the name of the Relay, name of the Bay, station name, date, time resolved to milliseconds, event point name, status.

The DR archives shall be retained for a period of three years.

xi) A separate work-station PC, powered through UPS (Uninterrupted Power Supply) shall be identified with access to all the relays for extraction of DR. Auto Download facility shall be established for automatic extraction of the DR files to a location on the work- station PC.

xii) **Time Synchronization Equipment**

a) Time Synchronizing Equipment complete with antenna, all cables and processing equipment shall be provided to receive synchronizing pulse through Global Positioning System or Indian Regional Navigation Satellite System Navic compatible for synchronization of event logger, disturbance recorder, Phasor Measurement Units, and Supervisory Control and Data Acquisition System or Substation Automation System.

b) Each substation shall have time synch equipment to synchronize all the numerical relays installed. Before any extension work, the capability of the

existing Time-sync equipment shall be reviewed to ensure the synchronization of upcoming numerical relays.

c) The status of healthiness of the time-sync device shall be wired as "Alarm" to SCADA and as an "Event" to Event Logger.

d) The time synch status of all the installed numerical relays and event logger shall be monitored monthly and recorded. The Monthly records for relays not in time-sync shall be reported to RLDCs and RPCs. This record shall be archived for a period of three years by each concerned agency.

e) Remedial action shall be taken by the concerned substation/ Protection department immediately to make the relays in time synchronization with reference to external time source.

f) All the new Grid elements/Bay extension shall have accurate and precise Time synchronization equipment.

7.2. **Disturbance Analysis and Reporting**

The Disturbance Analysis and Reporting shall be carried out in line with Central Electricity Authority (Grid Standards) Regulations, 2010, IEGC Grid Code Regulations 2023 and as per the revised SOP to address the Grid Disturbances (GDs)/Grid Incidents (GIs)/any other Protection Tripping's approved in the Protection sub group of NPC which is being adopted in all region. (at **Annexure-I**)

8. Protection Audit Plan

The Protection Audit of the substations connected with ISTS system shall be carried out in line with the Central Electricity Authority (Grid Standards) Regulations, 2010,IEGC Grid Code Regulations 2023 and as per the approved SOP for Protection System Audit of the sub group of RPCs/NPC which is being adopted in all region. (at **Annexure-II**)

9. System Protection Schemes (SPS)

If System Protection Schemes(SPS) is recommended to be implemented by the appropriate forum/Sub-Committee of RPCs on account of operational & system constraints, the same shall be implemented by the concerned Transmission licensee/Generating Company/Entities within the specified timelines. The provisions related to SPS as mentioned in CEA regulations and CERC (IEGC) 2023 regulations and their amendments from time to time shall be followed.

10. Performance Monitoring of the Protection Systems

10.1. Users/Entities shall submit the following protection performance indices of previous month to RPCs and RLDCs on monthly basis for 220 kV (132 kV in case of NER) and above by 15th of the subsequent month and the same shall be reviewed in the ensuing PCSC meeting of RPCs.

a) The Dependability Index defined as

$$D = \frac{N_C}{(N_C + N_F)}$$

Where, N_C is the number of correct operations at internal power system faults and N_F is the number of failures to operate at internal power system faults.

b) The Security Index defined as

$$S = \frac{N_C}{(N_C + N_U)}$$

Where, N_C is the number of correct operations at internal power system faults and is the number of unwanted operations.

c) The Reliability Index defined as

$$R = \frac{N_C}{(N_C + N_I)}$$

Where, N_C is the number of correct operations at internal power system faults and N_I is the number of incorrect operations and is the sum of N_F and N_U

10.2. Users/Entities shall furnish the reasons for performance indices less than unity of individual element wise protection system to the RPC and action plan for corrective measures. The action plan will be followed up regularly in the PCSC Meetings.

11. Compliance Monitoring

11.1. The Uniform Protection Protocol shall be reviewed as and when required, in consultation with the stakeholders by Protection Sub Group of NPC after discussion in respective RPC.

11.2. Violation of the Uniform Protection Protocol shall be brought to the notice of RPCs by the RLDCs or concerned SLDC, as the case may be.

11.3. In case any User/Entity fails to comply with the Uniform Protection Protocol or fails to undertake remedial action identified by the PCSC of RPCs within the specified timelines, the RPCs would approach the Commission with all relevant details for suitable directions.

***

2.

Revised Final Standard Operating Procedure (SOP) to address the Grid Disturbances (GDs)/Grid Incidents (GIs)/any other Protection Trippings

1. Immediately following an event (grid disturbance/incidence as defined in the CEA (Grid Standards) Regulations 2010 and subsequent amendment in the system, the concerned user/entity or SLDC shall inform to the RLDC through voice message.
2. Written flash report shall be submitted to RLDC and SLDC by the concerned user/entity within the time line specified in **Table 8** below, as per the IEGC, 2023.
3. In compliance of IEGC, 2023, All the Users, STU/SLDC are required to furnish the following information in respect of Grid Occurrences(GD/GI) within the time line specified in **Table 8** below, to RLDC/ RPC:
   (i) First Information Report (FIR)
   (ii) Event Logger (EL) output
   (iii)Disturbance Recorder (DR) output
   (iv)Trip event analysis report-TR (with pre and post fault system conditions)
   (v) Data Acquisition System (DAS)
4. RLDC shall report the event (grid disturbance or grid incidence) to CEA, RPC and all regional entities within twenty-four (24) hours of receipt of the flash report.
5. After a complete analysis of the event, the user/entity shall submit a detailed report in the case of grid disturbance or grid incidence within one (1) week of the occurrence of event to RLDC and RPC.
6. Based on the above detailed report submitted to RLDC by the entities, RLDC shall Categorize Grid Occurrences into grid incidents (GIs) and grid disturbance (GDs) based on criteria as per the CEA (Grid Standards) Regulations 2010 and subsequent amendment. RLDC shall also submit the Auto Reclosure (A/R) failure events, PLCC related events, any other protection related events to RPCs on monthly basis.
7. RLDCs and NLDC (for events involving more than one region) shall prepare a draft report of each grid disturbance or grid incidence including simulation results and analysis along with associated PMU plots of appropriate resolution, which shall be discussed and finalized at the Protection sub-committee/sub-group of RPC as per the timeline specified in **Table-8** below.

TABLE 8 : REPORT SUBMISSION TIMELINE

Sr. No.	Grid Event^ (Classification)	Flash report submission deadline (users/ SLDC)	Disturbance record and station event log submission deadline (users/ SLDC)	Detailed report and data submission deadline (users/ SLDC)	Draft report submission deadline (RLDC/ NLDC)	Discussion in protection committee meeting and final report submission deadline (RPC)
1	GI-1/GI-2	8 hours	24 hours	+7 days	+7 days	+60 days
2	Near miss event	8 hours	24 hours	+7 days	+7 days	+60 days
3	GD-1	8 hours	24 hours	+7 days	+7 days	+60 days
4	GD-2/GD-3	8 hours	24 hours	+7 days	+21 days	+60 days
5	GD-4/GD-5	8 hours	24 hours	+7 days	+30 days	+60 days

^*The classification of Grid Disturbance (GD)/Grid Incident (GI) shall be as per the* CEA Grid Standards.

(**The above table is as per the IEGC 2023**)

8. RPCs shall circulate all the GDs, GIs, near miss events, A/R events, PLCC mal-operation events, any other protection related event etc. along with the Agenda for Protection Co-Ordination Sub-Committee (PCSC) of RPCs. PCSC meetings are to be held in every month.
9. The implementation of the recommendations of the final report shall be monitored by the protection sub-committee of the RPC. Tripping portals deployed for reporting of the GDs & GIs on RLDCs portal, shall also have compliances reporting of PCSC recommendations on this portal. NLDC shall disseminate the lessons learnt from each event to all the RPCs for necessary action in the respective regions.
10. Constituents/entities shall furnish the following details to RPCs/RLDCs in respect of all the grid occurrences for analysis:

    a) Detailed analysis of the events
    b) SLD or equivalent pictorial representation clearly showing:
        i. Location of fault with distance
        ii. Fault details with type & relay indications
        iii. CT/PT/CVT rating details with location
        iv. Bus-bar arrangement/ Configuration of feeders and other information related to the ratings of the information required for analysis of the disturbance.
        v. CB positions (OPEN/ CLOSE) before and after fault
        vi. Isolator & Earth-switch positions (OPEN/CLOSE)
        vii. Voltage, frequency & power flows with direction at the time of fault
    c) Output of Event logger & Disturbance recorder
    d) Remedial Action(s) taken
    e) Relay setting details

HVDC Station Disturbance : Any additional data such as HVDC transient fault

record, switchyard equipment and any other relevant station data required for carrying out analysis of an event by RPC, NLDC, RLDC and SLDC shall be furnished by the users including RLDC and SLDC, as the case may be, within forty- eight (48) hours of the request. All users shall also furnish high-resolution analog data from various instruments including power electronic devices like HVDC, FACTS, renewable generation (inverter level or WTG level) on the request of RPCs, NLDC, RLDCs or SLDCs.

Generating Station Disturbance: Generating Station shall furnish high-resolution analog data from various instruments including AVR response, PSS response required for analysis of disturbance.

11. The respective entities (for which the Grid occurrence is placed in the PCSC agenda) shall present the Grid Occurrence which shall cover all related aspects such as:

    a) Antecedent conditions,
    b) Bus-configuration,
    c) Reasons of GD/ GI occurrence,
    d) Relevant Diagrams showing location of the fault,
    e) Bus bar arrangement/configuration of feeders and other connected equipment with proper CB positions (OPEN/ CLOSE) at the time of occurrence of the fault,
    f) Type of protections operated,
    g) Substantiation of the protections operated by relevant DRs & ELs,
    h) Reasons for protection systems mal-operation/non-operation,
    i) Remedial measures taken/ proposed, etc.

12. In respect of failure or Non-operation of A/R events, PLCC mal-operation events, any other protection related event as given in the PCSC agenda the concerned entities, shall furnish the reasons along with remedial action taken to RPCs/RLDCs. The same would be analyzed by the PCSC.
13. In the PCSC meetings, all the GDs, GIs, near miss events, A/R non-operation/mal-operation, PLCC mal-operations, other protection related trippings/events as circulated in the agenda shall be analyzed in detail by the PCSC forum and conclude the suitable recommendations to avoid the recurrence of such incidents in the future.
14. The action plan by the entities shall be furnished to RPC for implementation of the PCSC recommendations along with the timelines.
15. The implementation of the PCSC recommendations shall be followed up in the monthly PCSC meetings of RPC.
16. When grid disturbances or grid incidents occurred at major/critical substations and at substations that affected critical/essential/strategic loads, a Protection System Analysis Group (PSAG) shall be constituted consisting of the members from RPC, NLDC, RLDC, PGCIL, a Protection Expert from the region along with the Entity under whose jurisdiction GD/GI occurred to analyze the GD/GI in detail by visiting the respective substation/substations physically and conducting the meetings. PSAG would finalize the remedial actions and recommendations after deliberations and detailed analysis. The progress of implementation of the PSAG shall be followed up in the monthly PCSC Meetings.
17. If grid disturbance or grid incident is due to operational issue or transmission constraint/inadequacy, Grid-India shall share feedback to CTU or respective STU.

18. In case any user/entity fails to undertake remedial action identified by the RPC within the specified timelines as decided by PCSC of RPC, the concerned RPC may approach the Commission with all relevant details for suitable directions.
19. A date depository of the event as maintained by the RLDC shall be accessible to every entity and the entity shall upload all the relevant documents on the RLDC portal of trippings.

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Revised Standard Operating procedure for Third Party Protection System Audit

A protection system audit is a review and evaluation of the protection systems of a substation with an objective to verify whether required protection systems have been put in place at station by the concerned utility, and to recommend suitable measures to provide for the same.

Ministry of Power, had constituted a Committee under the Chairmanship of Chairperson CEA to examine the grid disturbances on the 30th and the 31st July 2012. One of important recommendation of the committee was conducting of extensive audit of protection system. List of sub-stations where protection audit is to be undertaken on priority basis was prepared and audited across the country. This was the beginning of protection audit across the country and large number of important 400 and 220kV substations were audited.

Keeping in view the importance of Protection System Audit, Standard Operating Procedure has been prepared for the reference purpose. It will provides a step-by-step guide for RPCs to follow during the audit process.

1. All users shall conduct third party protection audit of each sub-station at 220 kV and above (132 kV and above in NER) once in five years or earlier as advised by the respective RPC.
2. After analysis of any event, each RPC shall identify a list of substations / and generating stations where third-party protection audit is required to be carried out and accordingly advise the respective users to complete third party audit within three months.
3. Third Party Protection Audit shall be carried out by the third party designated agencies in line with the IEGC Regulations 2023 or by the audit teams constituted by RPCs with the members from other states (at least two) who opt for the RPC coordinated third party protection audit.
4. The third-party protection audit report shall contain information sought in the format as per IEGC 2023 and its further amendments.
5. Annual audit plan for the next financial year shall be submitted by the users to their respective RPC by 31st October. The users shall adhere to the annual audit plan and report compliance of the same to their respective RPC.

6. **Criteria for choosing substations for third party protection audit:**

The following criteria are generally applied during choosing a substation for protection audit.

i. Substations/ Generating (SS/ GS) stations with frequent grid incidences or frequent maloperations or any grid occurrence in any substation which affected supply to large number of substations and caused significant load loss. In this case, third-party protection audit may be carried out within three months or as decided in the Protection sub-Committee Meeting of the RPC.

ii. Important 400kV and 765kV substations (SS) / Generating stations (GS) including newly commissioned SS/ GS. In this case, third-party protection audit may be carried out at a frequency decided in the Protection sub-Committee Meetings of respective RPCs.

7. Protection audit Procedure:

i. After identification of stations for protection audit, the same is communicated to the owner utility seeking nomination of one nodal officer for each Station.
ii. The nodal officer shall provide the details of substation for preparation of protection audit format (in line with IEGC and subsequent amendments).
iii. Meanwhile nominations shall be sought from all utilities to form regional teams for audit. Regional teams comprising of engineers from various utilities /utility (other than the team of host State) of the region shall be formed based on the no. of SS to be audited. (Each team may consists of 3 or 4 engineers from utilities other than the host utility and at the maximum a team will be able to audit 3 to 4 stations in 7-9 days or so)
iv. Once the team details and list of stations to be audited is finalised the details of nodal officers, team members , list of stations to be audited by each team is shared to all for further coordination regarding planning and conduction of audit.
v. Based on the inputs received from nodal officer regarding the list of elements in the substation to be audited, protection audit formats shall be prepared by RPC (in line with IEGC) and circulated to nodal officer. The nodal officer along-with the substation engineers shall fill the audit format and furnish the same along-with various attachments sought as part of the audit format within a week or so. List of attachments shall be given in the covering page of audit format.
vi. In case, other entity's bays /equipment are existing in the substation to be audited, the entity shall furnish all the details of its equipment to the Audit Team/Agency and the other entity shall be available during the Protection Audit.
vii. The filled in audit format along-with the received annexures shall then forwarded to the audit team by the nodal officer and any further clarification regarding the format or attachments shall be taken up by the audit team with the nodal officer under intimation to RPC.
viii. The SS/ GS shall be audited based on the data filled in audit format checking for compliance of Central Electricity Authority (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations, 2022, Central Electricity Authority (Technical Standards for Connectivity to the Grid) Regulations, 2007 & CEA (Measures relating to Safety and Electric Supply) Regulations, 2010, CERC regulations and amendments to the same, approved guidelines of RPC, best practices in industry, report of the Task Force on Power System Analysis Under Contingencies and as per the "Model Setting Calculations For Typical IEDs Line Protection Setting Guide Lines Protection System Audit Check List Recommendations For Protection Management Sub-Committee on Relay/Protection Under Task Force For Power System Analysis Under Contingencies" etc.
ix. After conduct of audit, the shortcomings observed in the audit shall be discussed in detail with the nodal officer and substation engineers and recommendations are finalised.
x. The filled in audit format along-with the recommendations and attachments shall be finalised and final protection audit report RPC (in line with IEGC) shall be compiled.
xi. The audit team shall check the criteria for activation/archival of DR, as decided in the respective Protection sub-Committees of RPC.

xii. Final protection audit report shall be discussed in Protection Coordination Committee and recommendations may be accepted/deleted/modified as per the scope of audit and compliance of various regulations/guidelines etc.

xiii. The recommendations of all SS audited shall be inserted into audit recommendations database and update regarding recommendations shall be sought from respective utilities.

xiv. Action plan for rectification of deficiencies detected, if any, shall be submitted to the respective RPC and RLDC and monthly progress will be submitted.

xv. The travel expense from place of duty to Substation/Generating Station to be audited shall be borne by respective Auditor (Parent Organisation). The expense for boarding, lodging any travel of the team during the audit period shall be borne by the organisation owning the Substation/Generating Station.

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Bays Report from 01-10-2024 to 31-10-2024

S.No	CASE ID	Application Month	Name of element	Owner	Voltage Level (in kV)	Bay No	Bay Type	Substation	State	Approved in SCM/Statuty Body	Remark	Intimation request for charging of new element (Formate4)	Acknowledgement sent by NRLDC (Format I1)	Request for test charging and trial run (Format8)	Provisional Approval for Test Charging/Trial operation(Format I4)	Actual date & time of charging		Request for Trial Operation Certificate(Format C)	Trial Run Operation Certificate Details	
																			Trial Run/Operation Period	Certificate No.
												Date	Date	Date	Date	Date	Time	Date		
1	1119210	Aug - 2024	400kV Main Bay 406 of 400kV Sikar_2(PSTL)-Neemrana(PG)-2 at Sikar_2(PSTL)	PSTL	400kV	406	Main Bay	Sikar_2(PSTL)	RAJASTHAN	30-09-2019 - 10:05, 6, 4.3.5, 11-12		04 Sep 2024 19:54, 29 Aug 2024 16:07	05 Sep 2024 15:07, 02 Sep 2024 16:30	01 Oct 2024 09:14, 30 Sep 2024 12:50, 27 Sep 2024 21:03	01 Oct 2024 12:45, 01 Oct 2024 09:01, 30 Sep 2024 10:09	01-Oct-2024	17:52			
2	1119228	Sep - 2024	220kV Main Bay 209 of 400/220 kV, 500 MVA ICT-3 at Bahadurgarh(PG)	POWERGRID	220kV	209	Main Bay	Bahadurgarh(PG)	HARYANA	28-11-2022 - 10:30, 9, 4.1.4(i), 11		13 Sep 2024 08:37, 11 Sep 2024 11:28	13 Sep 2024 10:53, 12 Sep 2024 15:24	27 Sep 2024 22:21	29 Sep 2024 17:53	01-Oct-2024	18:40	16 Oct 2024 12:50	01-10-2024 - 18:40 to 03-10-2024 - 18:40	
3	1119196	Aug - 2024	400kV Tie Bay 405 of 125MVAR BR-1 and Neemrana(PG)-2 at Sikar_2(PSTL)	PSTL	400kV	405	Tie Bay	Sikar_2(PSTL)	RAJASTHAN	30-09-2019 - 10:00, 6, 4.3.5, 11		29 Aug 2024 16:07	02 Sep 2024 17:25	30 Sep 2024 13:03, 29 Sep 2024 08:49	01 Oct 2024 16:02, 30 Sep 2024 10:12	01-Oct-2024	21:57			
4	1119193	Aug - 2024	400kV Tie Bay 408 of 1500 MVA ICT-2 and Line (Future) at Sikar_2(PSTL)	PSTL	400kV	408	Tie Bay	Sikar_2(PSTL)	RAJASTHAN	30-09-2019 - 10:00, 6, 4.3.5, 11		29 Aug 2024 16:06	04 Sep 2024 15:45	30 Sep 2024 13:02, 29 Sep 2024 23:57	01 Oct 2024 17:13, 30 Sep 2024 10:15	02-Oct-2024	21:15			
5	1119196	Aug - 2024	400kV Main Bay 404 of 125MVAR BR-1 at Sikar_2(PSTL)	PSTL	400kV	404	Main Bay	Sikar_2(PSTL)	RAJASTHAN	30-09-2019 - 10:00, 6, 4.3.5, 11		29 Aug 2024 16:07	02 Sep 2024 17:25	30 Sep 2024 13:03, 29 Sep 2024 08:49	01 Oct 2024 16:02, 30 Sep 2024 10:12	02-Oct-2024	22:19			
6	1119193	Aug - 2024	400kV Main Bay 407 of 1500 MVA ICT-2 at Sikar_2(PSTL)	PSTL	400kV	407	Main Bay	Sikar_2(PSTL)	RAJASTHAN	30-09-2019 - 10:00, 6, 4.3.5, 11		29 Aug 2024 16:06	04 Sep 2024 15:45	30 Sep 2024 13:02, 29 Sep 2024 23:57	01 Oct 2024 17:13, 30 Sep 2024 10:15	05-Oct-2024	01:06			
7	1119193	Aug - 2024	765kV Main Bay 718 of 1500 MVA ICT-2 at Sikar_2(PSTL)	PSTL	765kV	718	Main Bay	Sikar_2(PSTL)	RAJASTHAN	30-09-2019 - 10:00, 6, 4.3.5, 11		29 Aug 2024 16:06	04 Sep 2024 15:45	30 Sep 2024 13:02, 29 Sep 2024 23:57	01 Oct 2024 17:13, 30 Sep 2024 10:15	05-Oct-2024	01:31			
8	1119192	Aug - 2024	765kV Main Bay 715 of 1500MVA ICT-1 at Sikar_2(PSTL)	PSTL	765kV	715	Main Bay	Sikar_2(PSTL)	RAJASTHAN	30-09-2019 - 10:00, 6, 4.3.5, 11		29 Aug 2024 16:06	04 Sep 2024 15:20	01 Oct 2024 18:35, 30 Sep 2024 13:02, 30 Sep 2024 00:05	03 Oct 2024 14:58, 01 Oct 2024 15:55, 30 Sep 2024 10:17	05-Oct-2024	02:15			
9	1119190	Aug - 2024	765kV Main Bay 703 of 765kV Sikar_2(PSTL)-Aligarh(PG)-1 at Sikar_2(PSTL)	PASTL	765kV	703	Main Bay	Sikar_2(PSTL)	RAJASTHAN	30-09-2019 - 10:00, 6, 4.3.6, 13		31 Aug 2024 05:28, 28 Aug 2024 08:46	05 Sep 2024 10:00, 28 Aug 2024 15:58	02 Oct 2024 21:24, 27 Sep 2024 19:58	04 Oct 2024 17:13, 01 Oct 2024 16:04	05-Oct-2024	21:41		05-10-2024 - 23:15 to 06-10-2024 - 23:15	
10	1119190	Aug - 2024	765kV Main Bay 703R of 3 x 110MVAR Switchable Convertable LINE_REACTOR of 765kV Sikar_2(PSTL)-Aligarh(PG)-1 at Sikar_2(PSTL)	PASTL	765kV	703R	Main Bay	Sikar_2(PSTL)	RAJASTHAN	30-09-2019 - 10:00, 6, 4.3.6, 13		31 Aug 2024 05:28, 28 Aug 2024 08:46	05 Sep 2024 10:00, 28 Aug 2024 15:58	02 Oct 2024 21:24, 27 Sep 2024 19:58	04 Oct 2024 17:13, 01 Oct 2024 16:04	05-Oct-2024	23:07		05-10-2024 - 23:15 to 06-10-2024 - 23:15	
11	1119230	Sep - 2024	400kV Main Bay 409 of Line ACME_Deoghar_Fbgh1(PG) - Fatehgarh Pooling (FBTL) bay and Bus-2 at ACME_Deoghar_Fbgh1(PG)	ACME_Deoghar_SPPL	400kV	409	Main Bay	ACME_Deoghar_Fbgh1(PG)	RAJASTHAN	17-08-2018 - 11:00, 14th and 15th meeting of Northern region constituents meetings, 7 and 8 and Serial No 8 and 9, 14/21 and 34/33		17 Sep 2024 14:38, 13 Sep 2024 11:03, 12 Sep 2024 18:57, 11 Sep 2024 13:42, 10 Sep 2024 17:23	17 Sep 2024 15:21, 16 Sep 2024 17:07, 13 Sep 2024 10:42, 11 Sep 2024 16:21, 11 Sep 2024 11:34	04 Oct 2024 17:09, 03 Oct 2024 17:34, 18 Sep 2024 11:35	04 Oct 2024 19:44, 04 Oct 2024 15:59, 20 Sep 2024 11:02	05-Oct-2024	23:54			
12	1119230	Sep - 2024	400kV Main Bay 407 of 400 kV Line ACME_Deoghar_Fbgh1(PG) - Fatehgarh Pooling(FBTL) and 400kV Bus-1 at Fatehearh Poolinel(FBTL)	ACME_Deoghar_SPPL	400kV	407	Main Bay	Fatehgarh Poolinel(FBTL)	RAJASTHAN	17-08-2018 - 11:00, 14th and 15th meeting of Northern region constituents meetings, 7 and 8 and Serial No 8 and 9, 14/21 and 34/33		17 Sep 2024 14:38, 13 Sep 2024 11:03, 12 Sep 2024 18:57, 11 Sep 2024 13:42, 10 Sep 2024 17:23	17 Sep 2024 15:21, 16 Sep 2024 17:07, 13 Sep 2024 10:42, 11 Sep 2024 16:21, 11 Sep 2024 11:34	04 Oct 2024 17:09, 03 Oct 2024 17:34, 18 Sep 2024 11:35	04 Oct 2024 19:44, 04 Oct 2024 15:59, 20 Sep 2024 11:02	05-Oct-2024	23:54			
13	1119230	Sep - 2024	400kV Tie Bay 408 of Line ACME_Deoghar_Fbgh1(PG) - Fatehgarh Pooling (FBTL) bay and BUS-1 at ACME_Deoghar_Fbgh1(PG)	ACME_Deoghar_SPPL	400kV	408	Tie Bay	ACME_Deoghar_Fbgh1(PG)	RAJASTHAN	17-08-2018 - 11:00, 14th and 15th meeting of Northern region constituents meetings, 7 and 8 and Serial No 8 and 9, 14/21 and 34/33		17 Sep 2024 14:38, 13 Sep 2024 11:03, 12 Sep 2024 18:57, 11 Sep 2024 13:42, 10 Sep 2024 17:23	17 Sep 2024 15:21, 16 Sep 2024 17:07, 13 Sep 2024 10:42, 11 Sep 2024 16:21, 11 Sep 2024 11:34	04 Oct 2024 17:09, 03 Oct 2024 17:34, 18 Sep 2024 11:35	04 Oct 2024 19:44, 04 Oct 2024 15:59, 20 Sep 2024 11:02	06-Oct-2024	00:17			
14	1119194	Aug - 2024	765kV Main Bay 709 of 330 MVAR BR-1 at Sikar_2(PSTL)	PSTL	765kV	709	Main Bay	Sikar_2(PSTL)	RAJASTHAN	30-09-2019 - 10:00, 6, 4.3.5, 11		29 Aug 2024 16:07	04 Sep 2024 15:31	01 Oct 2024 19:10, 30 Sep 2024 13:03, 29 Sep 2024 23:57	03 Oct 2024 14:57, 01 Oct 2024 16:10, 30 Sep 2024 10:13	06-Oct-2024	01:40			
15	1119192	Aug - 2024	400kV Main Bay 401 of 1500MVA ICT-1 at Sikar_2(PSTL)	PSTL	400kV	401	Main Bay	Sikar_2(PSTL)	RAJASTHAN	30-09-2019 - 10:00, 6, 4.3.5, 11		29 Aug 2024 16:06	04 Sep 2024 15:20	01 Oct 2024 18:35, 30 Sep 2024 13:02, 30 Sep 2024 00:05	03 Oct 2024 14:58, 01 Oct 2024 15:55, 30 Sep 2024 10:17	06-Oct-2024	03:07			
16	1119230	Sep - 2024	400kV Main Bay 404 of Power Transformer-4 and Bus-1 at ACME_Deoghar_Fbgh1(PG)	ACME_Deoghar_SPPL	400kV	404	Main Bay	ACME_Deoghar_Fbgh1(PG)	RAJASTHAN	17-08-2018 - 11:00, 14th and 15th meeting of Northern region constituents meetings, 7 and 8 and Serial No 8 and 9, 14/21 and 34/33		17 Sep 2024 14:38, 13 Sep 2024 11:03, 12 Sep 2024 18:57, 11 Sep 2024 13:42, 10 Sep 2024 17:23	17 Sep 2024 15:21, 16 Sep 2024 17:07, 13 Sep 2024 10:42, 11 Sep 2024 16:21, 11 Sep 2024 11:34	04 Oct 2024 17:09, 03 Oct 2024 17:34, 18 Sep 2024 11:35	04 Oct 2024 19:44, 04 Oct 2024 15:59, 20 Sep 2024 11:02	06-Oct-2024	16:45			
17	1119195	Aug - 2024	765kV Main Bay 712 of 330MVAR BR-2 at Sikar_2(PSTL)	PSTL	765kV	712	Main Bay	Sikar_2(PSTL)	RAJASTHAN	30-09-2019 - 10:00, 6, 4.3.5, 11		29 Aug 2024 16:07	04 Sep 2024 15:27	30 Sep 2024 13:02, 29 Sep 2024 23:57	01 Oct 2024 17:13, 30 Sep 2024 10:14	07-Oct-2024	17:37			
18	1119191	Aug - 2024	765kV Main Bay 706R of 3 x 110MVAR Switchable Convertable LINE_REACTOR of 765kV Sikar_2(PSTL)-Aligarh(PG)-2 at Sikar_2(PSTL)	PASTL	765kV	706R	Main Bay	Sikar_2(PSTL)	RAJASTHAN	30-09-2019 - 10:00, 6, 4.3.6, 13		31 Aug 2024 05:33, 27 Aug 2024 23:28	05 Sep 2024 10:00, 28 Aug 2024 15:57	02 Oct 2024 21:24, 27 Sep 2024 19:58	04 Oct 2024 17:13, 01 Oct 2024 16:03	07-Oct-2024	19:23		07-10-2024 - 19:25 to 08-10-2024 - 19:25	
19	1119235	Sep - 2024	765kV Main Bay 719R of Line Reactor Bay of 240MVAr Switchable Line Reactor of765 KV Bhadla-II - SIKAR-II line ckt-1 at Bhadla_2 (PG)	PSTL	765kV	719R	Main Bay	Bhadla_2 (PG)	RAJASTHAN	30-09-2019 - 15:30, 6, 4.3 (x) , (xiii), 5		14 Sep 2024 10:00, 13 Sep 2024 01:31	18 Sep 2024 16:58, 13 Sep 2024 11:30	21 Sep 2024 19:17	26 Sep 2024 12:58	08-Oct-2024	23:24			
20	1119218	Aug - 2024	220kV Main Bay 213 of 220 kV at Bikaner_2 ?Prerak Line and ?Prerak line is currently charged through Bay 203 at Bikaner_2 and same shall be shifted to 213 Bay at Bikaner_2) at Bikaner_2 (PBTSL)	PBTSL	220kV	213	Main Bay	Bikaner_2 (PBTSL)	RAJASTHAN	25-08-2022 - 10:00, 1, 3.1.3.2, 4		31 Aug 2024 13:26	02 Sep 2024 14:28	04 Oct 2024 15:05, 02 Oct 2024 15:19, 29 Sep 2024 08:28	07 Oct 2024 16:38, 04 Oct 2024 08:56, 30 Sep 2024 10:11	09-Oct-2024	20:10			
21	1119230	Sep - 2024	400kV Main Bay 406 of Power Transformer-2 and Bus-2 at ACME_Deoghar_Fbgh1(PG)	ACME_Deoghar_SPPL	400kV	406	Main Bay	ACME_Deoghar_Fbgh1(PG)	RAJASTHAN	17-08-2018 - 11:00, 14th and 15th meeting of Northern region constituents meetings, 7 and 8 and Serial No 8 and 9, 14/21 and 34/33		17 Sep 2024 14:38, 13 Sep 2024 11:03, 12 Sep 2024 18:57, 11 Sep 2024 13:42, 10 Sep 2024 17:23	17 Sep 2024 15:21, 16 Sep 2024 17:07, 13 Sep 2024 10:42, 11 Sep 2024 16:21, 11 Sep 2024 11:34	04 Oct 2024 17:09, 03 Oct 2024 17:34, 18 Sep 2024 11:35	04 Oct 2024 19:44, 04 Oct 2024 15:59, 20 Sep 2024 11:02	09-Oct-2024	23:00			
22	1119251	Sep - 2024	400kV Tie Bay 412T (435) of 400 kV Jaisalmer 2 - Corneight parks Pvt. Ltd transmission line and Future Tr. bay at Jaisalmer(RS)	RRVPNL	400kV	412T (435)	Tie Bay	Jaisalmer(RS)	RAJASTHAN	22-06-2018 - 10:00, 40th SCM, C, 114		04 Oct 2024 12:04, 30 Sep 2024 18:22	04 Oct 2024 15:10, 03 Oct 2024 09:58	09 Oct 2024 14:17, 06 Oct 2024 12:55	10 Oct 2024 09:31, 07 Oct 2024 16:59	10-Oct-2024	21:16			
23	1119251	Sep - 2024	400kV Main Bay 412A (434) of 400 kV Jaisalmer 2 - Corneight parks Pvt. Ltd transmission line at Jaisalmer(RS)	RRVPNL	400kV	412A (434)	Main Bay	Jaisalmer(RS)	RAJASTHAN	22-06-2018 - 10:00, 40th SCM, C, 114		04 Oct 2024 12:04, 30 Sep 2024 18:22	04 Oct 2024 15:10, 03 Oct 2024 09:58	09 Oct 2024 14:17, 06 Oct 2024 12:55	10 Oct 2024 09:31, 07 Oct 2024 16:59	10-Oct-2024	21:16			
24	1119252	Oct - 2024	400kV Main Bay 401 of 400 kV S/C line from 400 kV GSS Jaisalmer 2 at Corneight Parks Pvt. Limited	Corneight Parks Pvt. Limited	400kV	401	Main Bay	Corneight Parks Pvt. Limited	RAJASTHAN	21-08-2023 - 10:00, 1, 1, 2		01 Oct 2024 17:27	03 Oct 2024 16:55	08 Oct 2024 18:17, 07 Oct 2024 10:47	10 Oct 2024 20:06, 07 Oct 2024 16:59	11-Oct-2024	00:40			
25	1119252	Oct - 2024	400kV Tie Bay 402 of 400 kV S/C line from 400 kV GSS Jaisalmer 2 and 400/33 kV , 200 MVA, ICT-1 at Corneight Parks Pvt. Limited	Corneight Parks Pvt. Limited	400kV	402	Tie Bay	Corneight Parks Pvt. Limited	RAJASTHAN	21-08-2023 - 10:00, 1, 1, 2		01 Oct 2024 17:27	03 Oct 2024 16:55	08 Oct 2024 18:17, 07 Oct 2024 10:47	10 Oct 2024 20:06, 07 Oct 2024 16:59	11-Oct-2024	01:00			
26	1119252	Oct - 2024	400kV Main Bay 403 of 400/33 kV , 200 MVA, ICT-1 at Corneight Parks Pvt. Limited	Corneight Parks Pvt. Limited	400kV	403	Main Bay	Corneight Parks Pvt. Limited	RAJASTHAN	21-08-2023 - 10:00, 1, 1, 2		01 Oct 2024 17:27	03 Oct 2024 16:55	08 Oct 2024 18:17, 07 Oct 2024 10:47	10 Oct 2024 20:06, 07 Oct 2024 16:59	11-Oct-2024	01:09			
27	1119252	Oct - 2024	400kV Main Bay 406 of 400/33 kV , 200 MVA, ICT-2 at Corneight Parks Pvt. Limited	Corneight Parks Pvt. Limited	400kV	406	Main Bay	Corneight Parks Pvt. Limited	RAJASTHAN	21-08-2023 - 10:00, 1, 1, 2		01 Oct 2024 17:27	03 Oct 2024 16:55	08 Oct 2024 18:17, 07 Oct 2024 10:47	10 Oct 2024 20:06, 07 Oct 2024 16:59	11-Oct-2024	01:19			
28	1119252	Oct - 2024	400kV Tie Bay 405 of 400/33 kV , 200 MVA, ICT-2 and FUTURE BAY at Corneight Parks Pvt. Limited	Corneight Parks Pvt. Limited	400kV	405	Tie Bay	Corneight Parks Pvt. Limited	RAJASTHAN	21-08-2023 - 10:00, 1, 1, 2		01 Oct 2024 17:27	03 Oct 2024 16:55	08 Oct 2024 18:17, 07 Oct 2024 10:47	10 Oct 2024 20:06, 07 Oct 2024 16:59	11-Oct-2024	01:19			
29	1119199	Aug - 2024	400kV Main Bay 403 of 400kV Sikar_2(PSTL)-Neemrana(PG)-1 at Sikar_2(PSTL)	PSTL	400kV	403	Main Bay	Sikar_2(PSTL)	RAJASTHAN	30-09-2019 - 10:00, 6, 4.3.5, 11-12		04 Sep 2024 19:54, 29 Aug 2024 16:07	05 Sep 2024 15:06, 03 Sep 2024 10:29	01 Oct 2024 09:14, 30 Sep 2024 12:50, 27 Sep 2024 21:03	01 Oct 2024 12:09, 01 Oct 2024 09:00, 30 Sep 2024 10:08	11-Oct-2024	23:57			
30	1119192	Aug - 2024	400kV Tie Bay 402 of 1500MVA ICT-1 and Neemrana(PG)-1 at Sikar_2(PSTL)	PSTL	400kV	402	Tie Bay	Sikar_2(PSTL)	RAJASTHAN	30-09-2019 - 10:00, 6, 4.3.5, 11		29 Aug 2024 16:06	04 Sep 2024 15:20	01 Oct 2024 18:35, 30 Sep 2024 13:02, 30 Sep 2024 00:05	03 Oct 2024 14:58, 01 Oct 2024 15:55, 30 Sep 2024 10:17	12-Oct-2024	00:08			
31	1119236	Sep - 2024	765kV Main Bay 722R of 240 MVAR Switchable Convertible LINE_REACTOR of 765 KV Bhadla-II-SIKAR-II line ckt-2 at Bhadla_2 (PG)	PSTL	765kV	722R	Main Bay	Bhadla_2 (PG)	RAJASTHAN	30-09-2019 - 15:30, 6, 4.3 (x) , (xiii) , 5		14 Sep 2024 10:00, 13 Sep 2024 01:31	18 Sep 2024 16:57, 13 Sep 2024 11:30	21 Sep 2024 19:17	26 Sep 2024 12:58	16-Oct-2024	00:57			
32	1119230	Sep - 2024	400kV Main Bay 401 of Power Transformer-3 and Bus-1 at ACME_Deoghar_Fbgh1(PG)	ACME_Deoghar_SPPL	400kV	401	Main Bay	ACME_Deoghar_Fbgh1(PG)	RAJASTHAN	17-08-2018 - 11:00, 14th and 15th meeting of Northern region constituents meetings, 7 and 8 and Serial No 8 and 9, 14/21 and 34/33		17 Sep 2024 14:38, 13 Sep 2024 11:03, 12 Sep 2024 18:57, 11 Sep 2024 13:42, 10 Sep 2024 17:23	17 Sep 2024 15:21, 16 Sep 2024 17:07, 13 Sep 2024 10:42, 11 Sep 2024 16:21, 11 Sep 2024 11:34	04 Oct 2024 17:09, 03 Oct 2024 17:34, 18 Sep 2024 11:35	04 Oct 2024 19:44, 04 Oct 2024 15:59, 20 Sep 2024 11:02	19-Oct-2024	19:22			
33	1119230	Sep - 2024	400kV Tie Bay 402 of Power Transformer -3 and Power Transformer -1 at ACME_Deoghar_Fbgh1(PG)	ACME_Deoghar_SPPL	400kV	402	Tie Bay	ACME_Deoghar_Fbgh1(PG)	RAJASTHAN	17-08-2018 - 11:00, 14th and 15th meeting of Northern region constituents meetings, 7 and 8 and Serial No 8 and 9, 14/21 and 34/33		17 Sep 2024 14:38, 13 Sep 2024 11:03, 12 Sep 2024 18:57, 11 Sep 2024 13:42, 10 Sep 2024 17:23	17 Sep 2024 15:21, 16 Sep 2024 17:07, 13 Sep 2024 10:42, 11 Sep 2024 16:21, 11 Sep 2024 11:34	04 Oct 2024 17:09, 03 Oct 2024 17:34, 18 Sep 2024 11:35	04 Oct 2024 19:44, 04 Oct 2024 15:59, 20 Sep 2024 11:02	19-Oct-2024	19:50			
34	1118883	Aug - 2023	765kV Main Bay 812 of GT-1 at Ghatampur_TPS(UP)	NUPPL	765kV	812	Main Bay	Ghatampur_TPS(UP)	UTTAR PRADESH	20-01-2016 -00:00, 37, 1.2.2.2 (a), 4		02 Sep 2023 15:59	07 Sep 2023 11:20	01 Oct 2023 20:51, 27 Oct 2023 16:33	31 Oct 2023 20:58, 31 Oct 2023 20:27	21-Oct-2024	01:51			
35	1119216	Aug - 2024	220kV Main Bay 201 of 220 kV Bikaner_2 - ACME Line at Bikaner_2 (PBTSL)	PBTSL	220kV	201	Main Bay	Bikaner_2 (PBTSL)	RAJASTHAN	25-08-2022 - 10:00, 1, 3.1, 4		31 Aug 2024 13:30	02 Sep 2024 14:28	23 Oct 2024 01:37	24 Oct 2024 09:06	25-Oct-2024	21:56			
36	1119192	Aug - 2024	765kV Tie Bay 714 of 1500MVA ICT-1 and Bhadla_3 Line-1 (Future) at Sikar_2(PSTL)	PSTL	765kV	714	Tie Bay	Sikar_2(PSTL)	RAJASTHAN	30-09-2019 - 10:00, 6, 4.3.5, 11		29 Aug 2024 16:06	04 Sep 2024 15:20	01 Oct 2024 18:35, 30 Sep 2024 13:02, 30 Sep 2024 00:05	03 Oct 2024 14:58, 01 Oct 2024 15:55, 30 Sep 2024 10:17	29-Oct-2024	23:40			
37	1119193	Aug - 2024	765kV Tie Bay 717 of 1500 MVA ICT-2 and Bhadla_3 Line-2 (Future) at Sikar_2(PSTL)	PSTL	765kV	717	Tie Bay	Sikar_2(PSTL)	RAJASTHAN	30-09-2019 - 10:00, 6, 4.3.5, 11		29 Aug 2024 16:06	04 Sep 2024 15:45	30 Sep 2024 13:02, 29 Sep 2024 23:57	01 Oct 2024 17:13, 30 Sep 2024 10:15	30-Oct-2024	00:13			
38	1119197	Aug - 2024	765kV Main Bay 710 of 765kV Sikar_2(PSTL)-Bhadla_2(PG)-1 at Sikar_2(PSTL)	PSTL	765kV	710	Main Bay	Sikar_2(PSTL)	RAJASTHAN	30-09-2019 - 10:00, 6, 4.3.5, 11		05 Sep 2024 14:17, 29 Aug 2024 16:07	09 Sep 2024 17:16, 02 Sep 2024 16:24	29 Oct 2024 09:33, 24 Oct 2024 08:38	29 Oct 2024 14:56, 25 Oct 2024 15:03	30-Oct-2024	01:03			
39	1119197	Aug - 2024	765kV Main Bay 710R of 330MVAR LR of 765kV Sikar_2(PSTL)-Bhadla_2(PG)-1 at Sikar_2(PSTL)	PSTL	765kV	710R	Main Bay	Sikar_2(PSTL)	RAJASTHAN	30-09-2019 - 10:00, 6, 4.3.5, 11		05 Sep 2024 14:17, 29 Aug 2024 16:07	09 Sep 2024 17:16, 02 Sep 2024 16:24	29 Oct 2024 09:33, 24 Oct 2024 08:38	29 Oct 2024 14:56, 25 Oct 2024 15:03	30-Oct-2024	01:03			
40	1119198	Aug - 2024	765kV Main Bay 707 of 765kV Sikar_2(PSTL)-Bhadla_2(PG)-2 at Sikar_2(PSTL)	PSTL	765kV	707	Main Bay	Sikar_2(PSTL)	RAJASTHAN	30-09-2019 - 10:00, 6, 4.3.5, 11		05 Sep 2024 14:18, 29 Aug 2024 16:07	09 Sep 2024 17:16, 02 Sep 2024 16:24	29 Oct 2024 09:33, 24 Oct 2024 08:38	29 Oct 2024 14:56, 25 Oct 2024 15:04	30-Oct-2024	01:56			
41	1119198	Aug - 2024	765kV Tie Bay 708 of 765kV Sikar_2(PSTL)-Bhadla_2(PG)-2 and 330MVAR BR-2 at Sikar_2(PSTL)	PSTL	765kV	708	Tie Bay	Sikar_2(PSTL)	RAJASTHAN	30-09-2019 - 10:00, 6, 4.3.5, 11		05 Sep 2024 14:18, 29 Aug 2024 16:07	09 Sep 2024 17:16, 02 Sep 2024 16:24	29 Oct 2024 09:33, 24 Oct 2024 08:38	29 Oct 2024 14:56, 25 Oct 2024 15:04	30-Oct-2024	02:10			
42	1119197	Aug - 2024	765kV Tie Bay 711 of 765kV Sikar_2(PSTL)-Bhadla_2(PG)-1 and 330MVAR BR-2 at Sikar_2(PSTL)	PSTL	765kV	711	Tie Bay	Sikar_2(PSTL)	RAJASTHAN	30-09-2019 - 10:00, 6, 4.3.5, 11		05 Sep 2024 14:17, 29 Aug 2024 16:07	09 Sep 2024 17:16, 02 Sep 2024 16:24	29 Oct 2024 09:33, 24 Oct 2024 08:38	29 Oct 2024 14:56, 25 Oct 2024 15:03	30-Oct-2024	02:18			
43	1119266	Oct - 2024	220kV Main Bay 213 of 220 kV METL Ckt-2 at Bahaduranh(PG)	POWERGRID	220kV	213	Main Bay	Bahaduranh(PG)	HARYANA	28-09-2022 - 10:30, 9, 4.1.4 (ii) & (iii), 11		17 Oct 2024 17:48	21 Oct 2024 14:52	29 Oct 2024 09:45, 24 Oct 2024 16:58	29 Oct 2024 15:00, 25 Oct 2024 10:32	30-Oct-2024	19:49			
44	1119266	Oct - 2024	220kV Main Bay 212 of 220 kV METL Ckt-1 at Bahadurgarh(PG)	POWERGRID	220kV	212	Main Bay	Bahadurgarh(PG)	HARYANA	28-09-2022 - 10:30, 9, 4.1.4 (ii) & (iii), 11		17 Oct 2024 17:48	21 Oct 2024 14:52	29 Oct 2024 09:45, 24 Oct 2024 16:58	29 Oct 2024 15:00, 25 Oct 2024 10:32	30-Oct-2024	19:57			
45	1119266	Oct - 2024	220kV Main Bay 210 of 220 kV Kharkhoda pocket B Ckt-1 at Bahadurgarh(PG)	POWERGRID	220kV	210	Main Bay	Bahadurgarh(PG)	HARYANA	28-09-2022 - 10:30, 9, 4.1.4 (ii) & (iii), 11		17 Oct 2024 17:48	21 Oct 2024 14:52	29 Oct 2024 09:45, 24 Oct 2024 16:58	29 Oct 2024 15:00, 25 Oct 2024 10:32	30-Oct-2024	20:01			
46	1119266	Oct - 2024	220kV Main Bay 211 of 220 kV Kharkhoda pocket B Ckt-2 at Bahadurgarh(PG)	POWERGRID	220kV	211	Main Bay	Bahadurgarh(PG)	HARYANA	28-09-2022 - 10:30, 9, 4.1.4 (ii) & (iii), 11		17 Oct 2024 17:48	21 Oct 2024 14:52	29 Oct 2024 09:45, 24 Oct 2024 16:58	29 Oct 2024 15:00, 25 Oct 2024 10:32	30-Oct-2024	20:06			
47	1119198	Aug - 2024	765kV Main Bay 707R of 330MVAR LR of 765kV Sikar_2(PSTL)-Bhadla_2(PG)-2 at Sikar_2(PSTL)	PSTL	765kV	707R	Main Bay	Sikar_2(PSTL)	RAJASTHAN	30-09-2019 - 10:00, 6, 4.3.5, 11		05 Sep 2024 14:18, 29 Aug 2024 16:07	09 Sep 2024 17:16, 02 Sep 2024 16:24	29 Oct 2024 09:33, 24 Oct 2024 08:38	29 Oct 2024 14:56, 25 Oct 2024 15:04	30-Oct-2024	20:41			

BUS Report from 01-10-2024 to 31-10-2024

S.No	CASE ID	Applicatio n Month	Name of element	Owner	Voltage Level (in kV)	Bus No	Bus Type	Bus Scheme	Fault Level	Normal Current Capacity	Substation	State	Approved in SCM/Statuto Body	Remark	Intimation request for charging of new element (Format-A)	Acknowledment sent by NRLDC (Format-B)	Request for test charging and trial run (Format-B	Provisional Approval for Test Charging/Trial oueration(Format-IV)	Actual date & time of chargine		Request for Trial Operation Certificate(Format-C)	Trial Run Operation Certificate Details	
															Date	Date	Date	Date	Date	Time	Date	Trial Run/Operation Period	Certificate No.
1	1110230	Sep - 2024	400kV Main Bus Main Bus 2 at ACME_Deodhar_PathSPGI	ACME_Deodhar_SPPL	400kV	Main Bus 2	Main Bus	One & Half Breaker	50kA	2000A	ACME_Deoghar_Flight1(PGI	RAJASTHAN	17-08-2018 - 11:00, 14th and 15th meeting of Northern region constituents meetings, 7 and 8 and Serial No 8 and 9, 14/21 and 14/33		17 Sep 2024 14:38, 13 Sep 2024 11:01, 12 Sep 2024 18:57, 11 Sep 2024 13:42, 10 Sep 2024 17:23	17 Sep 2024 15:21, 16 Sep 2024 17:07, 13 Sep 2024 10:42, 11 Sep 2024 16:21, 11 Sep 2024 11:34	04 Oct 2024 17:09, 03 Oct 2024 17:34, 18 Sep 2024 11:35	04 Oct 2024 19:44, 04 Oct 2024 15:59, 20 Sep 2024 11:02	06-Oct-2024	23:58			
2	1110230	Sep - 2024	400kV Main Bus Main Bus 1 at ACME_Deodhar_PathSPGI	ACME_Deodhar_SPPL	400kV	Main Bus 1	Main Bus	One & Half Breaker	50kA	2000A	ACME_Deoghar_Flight1(PGI	RAJASTHAN	17-08-2018 - 11:00, 14th and 15th meeting of Northern region constituents meetings, 7 and 8 and Serial No 8 and 9, 14/21 and 14/33		17 Sep 2024 14:38, 13 Sep 2024 11:01, 12 Sep 2024 18:57, 11 Sep 2024 13:42, 10 Sep 2024 17:23	17 Sep 2024 15:21, 16 Sep 2024 17:07, 13 Sep 2024 10:42, 11 Sep 2024 16:21, 11 Sep 2024 11:34	04 Oct 2024 17:09, 03 Oct 2024 17:34, 18 Sep 2024 11:35	04 Oct 2024 19:44, 04 Oct 2024 15:59, 20 Sep 2024 11:02	06-Oct-2024	00:17			
3	1110240	Sep - 2024	33kV Main Bus Bus-2 (Panel-2) at ACME_Deodhar_PathSPGI	ACME_Deodhar_SPPL	33kV	Bus-2 (Panel-2)	Main Bus	Single Bus	25kA	3150A	ACME_Deoghar_Flight1(PGI	RAJASTHAN	11-09-2018 - 11:00, 15th meeting of Northern region constituents meetings, 8, 9/33		17 Sep 2024 14:30, 13 Sep 2024 18:36, 13 Sep 2024 11:20	17 Sep 2024 15:21, 16 Sep 2024 17:04, 13 Sep 2024 16:54	05 Oct 2024 22:09, 05 Oct 2024 11:25, 03 Oct 2024 18:58	06 Oct 2024 13:16, 05 Oct 2024 19:28, 04 Oct 2024 16:59	06-Oct-2024	17:20			
4	1110240	Sep - 2024	33kV Main Bus Bus-1 (Panel-1) at ACME_Deodhar_PathSPGI	ACME_Deodhar_SPPL	33kV	Bus-1 (Panel-1)	Main Bus	Single Bus	25kA	3150A	ACME_Deoghar_Flight1(PGI	RAJASTHAN	11-09-2018 - 11:00, 15th meeting of Northern region constituents meetings, 8, 9/33		17 Sep 2024 14:30, 13 Sep 2024 18:36, 13 Sep 2024 11:20	17 Sep 2024 15:21, 16 Sep 2024 17:04, 13 Sep 2024 16:54	05 Oct 2024 22:09, 05 Oct 2024 11:25, 03 Oct 2024 18:58	06 Oct 2024 13:16, 05 Oct 2024 19:28, 04 Oct 2024 16:59	06-Oct-2024	17:22			
5	1110218	Aug - 2024	220kV Main Bus 3 at Bikaner_2 (PGTSL)	PGTSL	220kV	3	Main Bus	Double Main & Transfer	50kA for 1sec.	4000A	Bikaner_2 (PGTSL)	RAJASTHAN	25-08-2022 - 10:00, 1, 3.1.3.2 .4		21 Aug 2024 13:26	02 Sep 2024 14:28	04 Oct 2024 15:05, 02 Oct 2024 15:19, 29 Sep 2024 08:28	07 Oct 2024 16:38, 04 Oct 2024 08:56, 30 Sep 2024 10:11	09-Oct-2024	20:09			

BUS REACTOR Report from 01-10-2024 to 31-10-2024

S.No	CASE ID	Application Month	Name of element	Owner	Voltage Level	MVAR Capacity	Substation	Make	Configuration	Serial No	State	Approved in SCM/Sitaury Body	Remark	Bus Reactor Details	OLD MVAR Capacity	Intimation request for charging of new element (Format-A)	Acknowledgement sent by NRLDC (Format-B)	Request for test charging and trial run (Format-B)	Provisional Approval for Test Charging/Trial operation(Format-IV)	Actual date & time of chargine		Request for Trial Operation Certificate(Format-C)	Trial Run Operation Certificate Details	
																							Trial Run/Operation Period	Certificate No.
																Date	Date	Date	Date	Date	Time	Date		
1	1119696	Aug - 2024	400kV, 125MVAR Bus Reactor 1 at Sikar_2(PSTL)	PSTL	400kV	125MVAR	Sikar_2(PSTL)	CG POWER	3-Phase	BHR11453E/1	RAJASTHAN	30-09-2019 - 10:00, 6, 4.3.5, 11		New		29 Aug 2024 16:07	02 Sep 2024 17:25	30 Sep 2024 13:03, 29 Sep 2024 08:49	01 Oct 2024 16:02, 30 Sep 2024 10:12	01-Oct-2024	21:57			
2	1119694	Aug - 2024	765kV, 3x110 MVAR Bus Reactor 1 at Sikar_2(PSTL)	PSTL	765kV	3x110 MVAR	Sikar_2(PSTL)	GE	3x1-Phase	Gopo170-180-L0710, Gopo170-170-L0709, Gopo170-120-L0769	RAJASTHAN	30-09-2019 - 10:00, 6, 4.3.5, 11		New		29 Aug 2024 16:07	04 Sep 2024 15:31	01 Oct 2024 19:10, 30 Sep 2024 13:03, 29 Sep 2024 23:57	03 Oct 2024 14:57, 01 Oct 2024 16:10, 30 Sep 2024 10:13	06-Oct-2024	01:40			
3	1119695	Aug - 2024	765kV, 3x110MVAR Bus Reactor 2 at Sikar_2(PSTL)	PSTL	765kV	3x110MVAR	Sikar_2(PSTL)	GE	3x1-Phase	Gopo170-90- L0701, Gopo170-160-L0708, Gopo170-150-L0707	RAJASTHAN	30-09-2019 - 10:00, 6, 4.3.5, 11		New		29 Aug 2024 16:07	04 Sep 2024 15:27	30 Sep 2024 13:02, 29 Sep 2024 23:57	01 Oct 2024 17:13, 30 Sep 2024 10:14	07-Oct-2024	17:37			

BUS SECTIONALIZER Report from 01-10-2024 to 31-10-2024

S.No	CASE ID	Application Month	Name of element	Owner	Voltage Level (In kV)	Associated Transmission Element1	Associated Transmission Element2	Substation	State	Approved in SCM/Statury Body	Remark	Intimation request for charging of new element (FormatA)	Acknowledment sent by NRLDC (Format II)	Request for test charging and trial run (FormatB)	Provisional Approval for Test Charging/Trial operation(Formtat IV)	Actual date & time of charging		Request for Trial Operation Certificate(Format C)	Trial Run Operation Certificate Details	
												Date	Date	Date	Date	Date	Time	Date	Trial Run/Operation Period	Certificate No.
1	1119218	Aug - 2024	220kV Bus Sectionalizer Bay 211 of 220 KV Bus-1 and 220 KV Bus-3 at Bikaner 2 (PBTSL)	PBTSL	220kV	220 KV Bus-3	220 KV Bus-1	Bikaner 2 (PBTSL)	RAJASTHAN	25-08-2022 - 10:00_1_1.1.3.2_4		31 Aug 2024 13:26	02 Sep 2024 14:28	04 Oct 2024 15:05, 02 Oct 2024 15:19, 29 Sep 2024 08:28	07 Oct 2024 16:38, 04 Oct 2024 08:56, 30 Sep 2024 10:11	09-Oct-2024	20:09			

GENERATING UNIT Report from 01-10-2024 to 31-10-2024

S.No	CASE ID	Application Month	Name of element	Owner	Voltage LeveL	Installed Capacity (MW)	MVA Capacity	Max Continuous Gen Capacity	Min Continuous Gen Capacity	Auxilliary Consumption	Make	Serial No	Configuration	State	SCM/CEA/CTU/NRPC Meeting minutes	Remark	Intimation request for charging of new element (FormatA)	Acknowledment sent by NRLDC (Format II)	Request for test charging and trial run (FormatB)	Provisional Approval for Test Charging/Trial operation(Format IV)	Actual date & time of charging		Request for Trial Operation Certificate(Format C)	Trial Run Operation Certificate Details		COD Date	CMD/CEO/MD Certificate	Board of Directors Certificate
																	Date	Date	Date	Date	Date	Time	Date	Trial Run/Operation Period	Certificate No.	Date	Date	Date
1	1119184	Jul - 2024	660 MW, 777 MVA 21 kV Make BHEL Unit No 1 at 2X660MW THDC STPP.KHURJA(Stage 1)	THDC	21kV	660 MW	777 MVA	693.6 MW	363 MW	6.75%	BHEL	10857A13501	3-Phase	Select State	22-06-2018 - 15:00, 40, 20.1, 76		05 Aug 2024 16:14, 03 Aug 2024 15:58	07 Aug 2024 17:01, 05 Aug 2024 12:05	12 Aug 2024 17:06, 12 Aug 2024 12:21, 12 Aug 2024 10:57, 08 Aug 2024 10:07	12 Aug 2024 17:49, 12 Aug 2024 15:47, 12 Aug 2024 11:33, 12 Aug 2024 09:40	28-Oct-2024	08:07						

LINE REACTOR Report from 01-10-2024 to 31-10-2024

S.No	CASE ID	Application Month	Name of element	Owner	Voltage Level (in kV)	MVAR Capacity	Line Name	Substation	Make	Configuration	Serial No	State	Approved in SCM/Statury Body	Remark	Line Reactor Details	OLD MVAR Capacity	Intimation request for charging of new element (Format-I)	Acknowledment sent by NRLDC (Format-II)	Request for test charging and trial run (Format-III)	Provisional Approval for Test Chaging/Trial operation(Format-IV)	Actual date & time of charging		Request for Trial Operation Certificate(Format-V)	Trial Run/Operation Certificate Details	
																	Date	Date	Date	Date	Date	Time	Date	Period	Certificate No.
1	1119190	Aug - 2024	3 x 110MVAR Switchable Convertable LINE_REACTOR of 765kV Sikar_2(PGTL)-Aligarh(PG)-1 at Sikar_2(PGTL)	PGTL	765kV	3 x 110MVAR	765kV Sikar_2(PGTL)-Aligarh(PG)-1	Sikar_2(PGTL)	GE T&D LTD	3x1-Phase	Gopal72-40-LGT59, Gopal72-40-LGT61, Gopal72-00-LGT66	RAJASTHAN	30-09-2019 - 10:00, 6, 4.3.6. 13		New		31 Aug 2024 05:28, 28 Aug 2024 08:46	05 Sep 2024 10:00, 28 Aug 2024 15:58	02 Oct 2024 21:24, 27 Sep 2024 19:58	04 Oct 2024 17:13, 01 Oct 2024 16:04	05-Oct-2024	23:07		05-10-2024 - 23:15 to 06-10-2024 - 23:15	
2	1119191	Aug - 2024	3 x 110MVAR Switchable Convertable LINE_REACTOR of 765kV Sikar_2(PGTL)-Aligarh(PG)-2 at Sikar_2(PGTL)	PGTL	765kV	3 x 110MVAR	765kV Sikar_2(PGTL)-Aligarh(PG)-2	Sikar_2(PGTL)	GE T&D LTD	3x1-Phase	Gopal72-50-LGT62, Gopal72-70-LGT64, Gopal75-10-LGT58	RAJASTHAN	30-09-2019 - 10:00, 6, 4.3.6. 13		New		31 Aug 2024 05:33, 27 Aug 2024 23:58	05 Sep 2024 10:00, 28 Aug 2024 15:57	02 Oct 2024 21:24, 27 Sep 2024 19:58	04 Oct 2024 17:13, 01 Oct 2024 16:03	05-Oct-2024	23:33		07-10-2024 - 19:25 to 08-10-2024 - 19:25	
3	1119215	Sep - 2024	240 MVAR Switchable Convertable LINE_REACTOR of 765 KV Bhadla-II - SIKAR-II line ckt-1 at Bhadla_2 (PG)	PSTL	765kV	240 MVAR	765 KV Bhadla-II - SIKAR-II line ckt-1	Bhadla_2 (PG)	GE	3x1-Phase	GDPG170/2/3/10	RAJASTHAN	30-09-2019 - 15:30, 6, 4.3 Jul. Addl. 5		New		14 Sep 2024 10:00, 13 Sep 2024 01:31	18 Sep 2024 16:58, 13 Sep 2024 11:30	21 Sep 2024 19:17	24 Sep 2024 12:58	08-Oct-2024	23:24			
4	1119216	Sep - 2024	240 MVAR Switchable Convertable LINE_REACTOR of 765 KV Bhadla-II - SIKAR-II line ckt-2 at Bhadla_2 (PG)	PSTL	765kV	240 MVAR	765 KV Bhadla-II - SIKAR-II line ckt-2	Bhadla_2 (PG)	GE	3x1-Phase	GDPG170/5/6/4	RAJASTHAN	30-09-2019 - 15:30, 6, 4.3 Jul. Addl. 5		New		14 Sep 2024 10:00, 13 Sep 2024 01:31	18 Sep 2024 16:57, 13 Sep 2024 11:30	21 Sep 2024 19:17	24 Sep 2024 12:58	16-Oct-2024	00:57			
5	1119268	Oct - 2024	50 Non-Switchable Non-Convertable LINE_REACTOR of 400 KV Kanpur-Agra(PG) Ckt-1 at Kanpur(PG)	POWERGRID	400kV	50	400 KV Kanpur-Agra(PG) Ckt-1	Kanpur(PG)	T&R	3-Phase	PM3200232	UTTAR PRADESH	29-04-2022 - 11:55, 53 NRPC 4.3.2 3 & 4		Replacement	50	22 Oct 2024 12:27	22 Oct 2024 09:49	25 Oct 2024 14:34, 24 Oct 2024 14:32, 23 Oct 2024 13:55	28 Oct 2024 12:28, 25 Oct 2024 08:47, 23 Oct 2024 14:36	29-Oct-2024	10:59		29-10-2024 - 11:00 to 30-10-2024 - 11:00	
6	1119307	Aug - 2024	3x110MVAR Switchable Convertable LINE_REACTOR of 765kV Sikar_2(PGTL)-Bhadla_2(PG)-1 at Sikar_2(PGTL)	PGTL	765kV	3x110MVAR	765kV Sikar_2(PGTL)-Bhadla_2(PG)-1	Sikar_2(PGTL)	GE	3x1-Phase	111	RAJASTHAN	30-09-2019 - 10:00, 6, 4.3.5. 11		New		05 Sep 2024 14:17, 29 Aug 2024 14:07	09 Sep 2024 17:16, 02 Sep 2024 16:24	29 Oct 2024 09:33, 24 Oct 2024 08:38	29 Oct 2024 14:56, 25 Oct 2024 15:03	30-Oct-2024	01:03			
7	1119308	Aug - 2024	3x110MVAR Switchable Convertable LINE_REACTOR of 765kV Sikar_2(PGTL)-Bhadla_2(PG)-2 at Sikar_2(PGTL)	PGTL	765kV	3x110MVAR	765kV Sikar_2(PGTL)-Bhadla_2(PG)-2	Sikar_2(PGTL)	GE	3x1-Phase	111	RAJASTHAN	30-09-2019 - 10:00, 6, 4.3.5. 11		New		05 Sep 2024 14:18, 29 Aug 2024 14:07	09 Sep 2024 17:16, 02 Sep 2024 16:24	29 Oct 2024 09:33, 24 Oct 2024 08:38	29 Oct 2024 14:56, 25 Oct 2024 15:04	30-Oct-2024	20:45			

New AC Lines Report from 01-10-2024 to 31-10-2024

S.No	CASE ID	Application Month	Name of element	Owner	Voltage Level (in kV)	Circuit No	Line Length	Conductor Type	Tower Configuration	State	Approved in SCM/Statury Body	Remark	Intimation request for charging of new element (FormatA)	Acknowledment sent by NRLDC (Format II)	Request for test charging and trial run (FormatB)	Provisional Approval for Test Charging/Trial operation(Format IV)	Actual date & time of charging		Request for Trial Operation Certificate(Format C)	Trial Run Operation Certificate Details	
													Date	Date	Date	Date	Date	Time	Date	Trial Run/Operation Period	Certificate No.
1	1119210	Aug - 2024	400kV Sikar_2(PSTL)-Neemrana(PG)-2	PSTL	400kV	2	133.5 kM	Twin HTLS	Double	RAJASTHAN to RAJASTHAN	30-09-2019 - 10:05, 6, 4.3.5, 11-12		04 Sep 2024 19:54, 29 Aug 2024 16:07	05 Sep 2024 15:07, 02 Sep 2024 16:30	01 Oct 2024 09:14, 30 Sep 2024 12:50, 27 Sep 2024 21:03	01 Oct 2024 12:45, 01 Oct 2024 09:01, 30 Sep 2024 10:09	01-Oct-2024	17:31			
2	1119190	Aug - 2024	765kV Sikar_2(PSTL)-Aligarh(PG)-1	PASTL	765kV	1	256.937 kM	AL59 Zebra	Double	RAJASTHAN to UTTAR PRADESH	30-09-2019 - 10:00, 6, 4.3.6, 13		31 Aug 2024 05:28, 28 Aug 2024 08:46	05 Sep 2024 10:00, 28 Aug 2024 15:58	02 Oct 2024 21:24, 27 Sep 2024 19:58	04 Oct 2024 17:13, 01 Oct 2024 16:04	05-Oct-2024	21:41		05-10-2024 - 23:15 to 06-10-2024 - 23:15	
3	1119230	Sep - 2024	400kV Fatehgarh Pooling(FBTL)-ACME_Deoghar_Ftgh1(PG)-1	ACME_Deoghar_SPPL	400kV	1	16.03	AL59 Moose	Single	RAJASTHAN to RAJASTHAN	17-08-2018 - 11:00, 14th and 15th meeting of Northern region constituents meetings, 7 and 8 and Serial No 8 and 9, 14/21 and 14/33		17 Sep 2024 14:38, 13 Sep 2024 11:03, 12 Sep 2024 18:57, 11 Sep 2024 13:42, 10 Sep 2024 17:23	17 Sep 2024 15:21, 16 Sep 2024 17:07, 13 Sep 2024 10:42, 11 Sep 2024 16:21, 11 Sep 2024 11:34	04 Oct 2024 17:09, 03 Oct 2024 17:34, 18 Sep 2024 11:35	04 Oct 2024 19:44, 04 Oct 2024 15:59, 20 Sep 2024 11:02	05-Oct-2024	23:54			
4	1119191	Aug - 2024	765kV Sikar_2(PSTL)-Aligarh(PG)-2	PASTL	765kV	2	256.937 kM	AL59 Zebra	Double	RAJASTHAN to UTTAR PRADESH	30-09-2019 - 10:00, 6, 4.3.6, 13		31 Aug 2024 05:33, 27 Aug 2024 23:28	05 Sep 2024 10:00, 28 Aug 2024 15:57	02 Oct 2024 21:24, 27 Sep 2024 19:58	04 Oct 2024 17:13, 01 Oct 2024 16:03	07-Oct-2024	19:23		07-10-2024 - 19:25 to 08-10-2024 - 19:25	
5	1119252	Oct - 2024	400kV Jaisalmer(RS)-Corneight Parks Pvt. Limited -1	Corneight Parks Pvt. Limited	400kV	1	15.208	Twin Moose	Double	RAJASTHAN to RAJASTHAN	21-08-2023 - 10:00, 1, 1, 2		01 Oct 2024 17:27	03 Oct 2024 16:55	08 Oct 2024 18:17, 07 Oct 2024 10:47	10 Oct 2024 20:06, 07 Oct 2024 16:59	10-Oct-2024	23:39			
6	1119199	Aug - 2024	400kV Sikar_2(PSTL)-Neemrana(PG)-1	PSTL	400kV	1	133.5 kM	Twin HTLS	Double	RAJASTHAN to RAJASTHAN	30-09-2019 - 10:00, 6, 4.3.5, 11-12		04 Sep 2024 19:54, 29 Aug 2024 16:07	05 Sep 2024 15:06, 03 Sep 2024 10:29	01 Oct 2024 09:14, 30 Sep 2024 12:50, 27 Sep 2024 21:03	01 Oct 2024 12:09, 01 Oct 2024 09:00, 30 Sep 2024 10:08	11-Oct-2024	23:57			

SOLAR ICR/BLOCK Report from 01-10-2024 to 31-10-2024

S.No	CASE ID	Application Month	Plant Name	Capacity to be charged	Voltage Level	Total Installed Capacity of Plant	Type of RE	Feeder No	Solar ICR/Block No	IDT No	IDT Make	IDT MVA Rating	IDT Votage Rating(HV/LV)	Inverter Type	Inverter Make	Total No of Inverters	Inverter AC Rating	Agency/ Owner	Evacuation Path	Remark	Intimation request for charging of new element (FormatA)	Acknowledment sent by NRLDC (Format II)	Request for test charging and trial run (FormatB)	Provisional Approval for Test Charging/Trial operation(Format IV)	Actual date & time of charging		Power Flow Started		COD Declared by Transmission Licensee	Other Blocks
																					Date	Date	Date	Date	Date	Date	Date	Date		
1	1119246	Sep - 2024	Transition Sustainable Energy Services One Private Limited(TSES1PL)	55.6 MW	33kV	55.6 MW	SOLAR PV PLANT	29	36	36	Danish	13.2 MVA	33 KV/0.66 KV	Central Inveter	SUNGROW	4	3.3 MVA	TSES1PL			25 Sep 2024 10:39, 24 Sep 2024 21:16	27 Sep 2024 15:47, 25 Sep 2024 09:26	07 Oct 2024 17:27, 05 Oct 2024 11:57, 30 Sep 2024 20:55	09 Oct 2024 16:57, 07 Oct 2024 15:41, 03 Oct 2024 11:34	09-Oct-2024	21:37				
2	1119246	Sep - 2024	Transition Sustainable Energy Services One Private Limited(TSES1PL)	55.6 MW	33kV	55.6 MW	SOLAR PV PLANT	2	35	35	Danish	13.2 MVA	33 KV/0.66 KV	Central Inveter	SUNGROW	4	3.3 MVA	TSES1PL			25 Sep 2024 10:39, 24 Sep 2024 21:16	27 Sep 2024 15:47, 25 Sep 2024 09:26	07 Oct 2024 17:27, 05 Oct 2024 11:57, 30 Sep 2024 20:55	09 Oct 2024 16:57, 07 Oct 2024 15:41, 03 Oct 2024 11:34	09-Oct-2024	21:37				
3	1119246	Sep - 2024	Transition Sustainable Energy Services One Private Limited(TSES1PL)	55.6 MW	33kV	55.6 MW	SOLAR PV PLANT	30	38	1	Danish	13.2 MVA	33 KV/0.66 KV	Central Inveter	SUNGROW	4	3.3 MVA	TSES1PL			25 Sep 2024 10:39, 24 Sep 2024 21:16	27 Sep 2024 15:47, 25 Sep 2024 09:26	07 Oct 2024 17:27, 05 Oct 2024 11:57, 30 Sep 2024 20:55	09 Oct 2024 16:57, 07 Oct 2024 15:41, 03 Oct 2024 11:34	09-Oct-2024	21:37				
4	1119246	Sep - 2024	Transition Sustainable Energy Services One Private Limited(TSES1PL)	55.6 MW	33kV	55.6 MW	SOLAR PV PLANT	2	34	34	Danish	13.2 MVA	33 KV/0.66 KV	Central Inveter	SUNGROW	4	3.3 MVA	TSES1PL			25 Sep 2024 10:39, 24 Sep 2024 21:16	27 Sep 2024 15:47, 25 Sep 2024 09:26	07 Oct 2024 17:27, 05 Oct 2024 11:57, 30 Sep 2024 20:55	09 Oct 2024 16:57, 07 Oct 2024 15:41, 03 Oct 2024 11:34	09-Oct-2024	21:37				
5	1119246	Sep - 2024	Transition Sustainable Energy Services One Private Limited(TSES1PL)	55.6 MW	33kV	55.6 MW	SOLAR PV PLANT	29	37	37	Danish	13.2 MVA	33 KV/0.66 KV	Central Inveter	SUNGROW	4	3.3 MVA	TSES1PL			25 Sep 2024 10:39, 24 Sep 2024 21:16	27 Sep 2024 15:47, 25 Sep 2024 09:26	07 Oct 2024 17:27, 05 Oct 2024 11:57, 30 Sep 2024 20:55	09 Oct 2024 16:57, 07 Oct 2024 15:41, 03 Oct 2024 11:34	09-Oct-2024	21:37				
6	1119233	Sep - 2024	ACME Deoghar Solar Power Private Limited	253MW	33kV	253MW	Solar	2-IC03-Panel-2	21	21	TESLA	12.5MVA	33kV/4x0.66 kV	Central Inveter	Sungrow	4	3.036 MVA	ACME_Deoghar_SPPL			17 Sep 2024 14:27, 13 Sep 2024 18:36, 13 Sep 2024 14:30, 13 Sep 2024 11:08	17 Sep 2024 15:22, 16 Sep 2024 16:58, 13 Sep 2024 16:57, 13 Sep 2024 12:31	08 Oct 2024 19:31, 07 Oct 2024 21:09, 06 Oct 2024 09:24, 03 Oct 2024 19:29	09 Oct 2024 15:37, 08 Oct 2024 17:09, 07 Oct 2024 10:18, 04 Oct 2024 16:58	11-Oct-2024	17:15				
7	1119254	Oct - 2024	Kolayat Solar Power Plant NTPC Limited	32.9MW	33kV	531.68MW	Solar	17	10	10	Toshiba	12.5 MVA	33kV/0.6kV	Central Inveter	Kehua Tech	4	3.188MVA	NTPC_KOLAYAT SL			06 Oct 2024 22:22	09 Oct 2024 17:03, 09 Oct 2024 16:58, 09 Oct 2024 16:58	10 Oct 2024 10:14	14 Oct 2024 12:54	15-Oct-2024	00:53				
8	1119254	Oct - 2024	Kolayat Solar Power Plant NTPC Limited	32.9MW	33kV	531.68MW	Solar	33	21	21	Toshiba	12.5 MVA	33/0.6	Central Inveter	Kehua Tech	4	3.188MVA	NTPC_KOLAYAT SL			06 Oct 2024 22:22	09 Oct 2024 17:03, 09 Oct 2024 16:58, 09 Oct 2024 16:58	10 Oct 2024 10:14	14 Oct 2024 12:54	15-Oct-2024	00:53				
9	1119254	Oct - 2024	Kolayat Solar Power Plant NTPC Limited	32.9MW	33kV	531.68MW	Solar	29	18	18	Toshiba	12.5 MVA	33kV/0.6kV	Central Inveter	Kehua Tech	4	3.188MVA	NTPC_KOLAYAT SL			06 Oct 2024 22:22	09 Oct 2024 17:03, 09 Oct 2024 16:58, 09 Oct 2024 16:58	10 Oct 2024 10:14	14 Oct 2024 12:54	15-Oct-2024	00:53				
10	1119233	Sep - 2024	ACME Deoghar Solar Power Private Limited	253MW	33kV	253MW	Solar	2-IC02-Panel-2	19	19	TESLA	12.5MVA	33kV/4x0.66 kV	Central Inveter	Sungrow	4	3.036 MVA	ACME_Deoghar_SPPL			17 Sep 2024 14:27, 13 Sep 2024 18:36, 13 Sep 2024 14:30, 13 Sep 2024 11:08	17 Sep 2024 15:22, 16 Sep 2024 16:58, 13 Sep 2024 16:57, 13 Sep 2024 12:31	08 Oct 2024 19:31, 07 Oct 2024 21:09, 06 Oct 2024 09:24, 03 Oct 2024 19:29	09 Oct 2024 15:37, 08 Oct 2024 17:09, 07 Oct 2024 10:18, 04 Oct 2024 16:58	15-Oct-2024	17:00				
11	1119233	Sep - 2024	ACME Deoghar Solar Power Private Limited	253MW	33kV	253MW	Solar	2-IC03-Panel-2	16	16	TESLA	12.5MVA	33kV/4x0.66 kV	Central Inveter	Sungrow	4	3.036 MVA	ACME_Deoghar_SPPL			17 Sep 2024 14:27, 13 Sep 2024 18:36, 13 Sep 2024 14:30, 13 Sep 2024 11:08	17 Sep 2024 15:22, 16 Sep 2024 16:58, 13 Sep 2024 16:57, 13 Sep 2024 12:31	08 Oct 2024 19:31, 07 Oct 2024 21:09, 06 Oct 2024 09:24, 03 Oct 2024 19:29	09 Oct 2024 15:37, 08 Oct 2024 17:09, 07 Oct 2024 10:18, 04 Oct 2024 16:58	15-Oct-2024	17:00				
12	1119233	Sep - 2024	ACME Deoghar Solar Power Private Limited	253	33kV	253MW	Soolar	1-IC02-Panel-1	5	5	NUCON	12.5 MVA	33kV/4x0.66 kV	Central Inveter	Sungrow	4	3.036 MVA	ACME_Deoghar_SPPL			17 Sep 2024 14:27, 13 Sep 2024 18:36, 13 Sep 2024 14:30, 13 Sep 2024 11:08	17 Sep 2024 15:22, 16 Sep 2024 16:58, 13 Sep 2024 16:57, 13 Sep 2024 12:31	08 Oct 2024 19:31, 07 Oct 2024 21:09, 06 Oct 2024 09:24, 03 Oct 2024 19:29	09 Oct 2024 15:37, 08 Oct 2024 17:09, 07 Oct 2024 10:18, 04 Oct 2024 16:58	16-Oct-2024	16:00				
13	1119233	Sep - 2024	ACME Deoghar Solar Power Private Limited	253	33kV	253	Solar	1-IC01-Panel-1	12	12	NUCON	12.5 MVA	33kV/4x0.66 kV	Central Inveter	Sungrow	4	3.036 MVA	ACME_Deoghar_SPPL			17 Sep 2024 14:27, 13 Sep 2024 18:36, 13 Sep 2024 14:30, 13 Sep 2024 11:08	17 Sep 2024 15:22, 16 Sep 2024 16:58, 13 Sep 2024 16:57, 13 Sep 2024 12:31	08 Oct 2024 19:31, 07 Oct 2024 21:09, 06 Oct 2024 09:24, 03 Oct 2024 19:29	09 Oct 2024 15:37, 08 Oct 2024 17:09, 07 Oct 2024 10:18, 04 Oct 2024 16:58	16-Oct-2024	17:00				
14	1119233	Sep - 2024	ACME Deoghar Solar Power Private Limited	253MW	33kV	253MW	Solar	1-IC02-Panel-1	6	6	NUCON	12.5MVA	33kV/4x0.66 kV	Central Inveter	Sungrow	4	3.036 MVA	ACME_Deoghar_SPPL			17 Sep 2024 14:27, 13 Sep 2024 18:36, 13 Sep 2024 14:30, 13 Sep 2024 11:08	17 Sep 2024 15:22, 16 Sep 2024 16:58, 13 Sep 2024 16:57, 13 Sep 2024 12:31	08 Oct 2024 19:31, 07 Oct 2024 21:09, 06 Oct 2024 09:24, 03 Oct 2024 19:29	09 Oct 2024 15:37, 08 Oct 2024 17:09, 07 Oct 2024 10:18, 04 Oct 2024 16:58	18-Oct-2024	16:00				
15	1119233	Sep - 2024	ACME Deoghar Solar Power Private Limited	253MW	33kV	253MW	Solar	1-IC04-Panel-1	10	10	TESLA	12.5MVA	33kV/4x0.66 kV	Central Inveter	Sungrow	4	3.036 MVA	ACME_Deoghar_SPPL			17 Sep 2024 14:27, 13 Sep 2024 18:36, 13 Sep 2024 14:30, 13 Sep 2024 11:08	17 Sep 2024 15:22, 16 Sep 2024 16:58, 13 Sep 2024 16:57, 13 Sep 2024 12:31	08 Oct 2024 19:31, 07 Oct 2024 21:09, 06 Oct 2024 09:24, 03 Oct 2024 19:29	09 Oct 2024 15:37, 08 Oct 2024 17:09, 07 Oct 2024 10:18, 04 Oct 2024 16:58	18-Oct-2024	16:00				
16	1119233	Sep - 2024	ACME Deoghar Solar Power Private Limited	253MW	33kV	253MW	Solar	1-IC03-Panel-1	3	3	TESLA	12.5MVA	33kV/4x0.66 kV	Central Inveter	Sungrow	4	3.036 MVA	ACME_Deoghar_SPPL			17 Sep 2024 14:27, 13 Sep 2024 18:36, 13 Sep 2024 14:30, 13 Sep 2024 11:08	17 Sep 2024 15:22, 16 Sep 2024 16:58, 13 Sep 2024 16:57, 13 Sep 2024 12:31	08 Oct 2024 19:31, 07 Oct 2024 21:09, 06 Oct 2024 09:24, 03 Oct 2024 19:29	09 Oct 2024 15:37, 08 Oct 2024 17:09, 07 Oct 2024 10:18, 04 Oct 2024 16:58	18-Oct-2024	17:00				
17	1119233	Sep - 2024	ACME Deoghar Solar Power Private Limited	253MW	33kV	253MW	Solar	1-IC04-Panel-1	11	11	TESLA	12.5MVA	33kV/4x0.66 kV	Central Inveter	Sungrow	4	3.036 MVA	ACME_Deoghar_SPPL			17 Sep 2024 14:27, 13 Sep 2024 18:36, 13 Sep 2024 14:30, 13 Sep 2024 11:08	17 Sep 2024 15:22, 16 Sep 2024 16:58, 13 Sep 2024 16:57, 13 Sep 2024 12:31	08 Oct 2024 19:31, 07 Oct 2024 21:09, 06 Oct 2024 09:24, 03 Oct 2024 19:29	09 Oct 2024 15:37, 08 Oct 2024 17:09, 07 Oct 2024 10:18, 04 Oct 2024 16:58	18-Oct-2024	17:00				
18	1119233	Sep - 2024	ACME Deoghar Solar Power Private Limited	253MW	33kV	253MW	Solar	2-IC01-Panel-2	22	22	TESLA	12.5MVA	33kV/4x0.66 kV	Central Inveter	Sungrow	4	3.036 MVA	ACME_Deoghar_SPPL			17 Sep 2024 14:27, 13 Sep 2024 18:36, 13 Sep 2024 14:30, 13 Sep 2024 11:08	17 Sep 2024 15:22, 16 Sep 2024 16:58, 13 Sep 2024 16:57, 13 Sep 2024 12:31	08 Oct 2024 19:31, 07 Oct 2024 21:09, 06 Oct 2024 09:24, 03 Oct 2024 19:29	09 Oct 2024 15:37, 08 Oct 2024 17:09, 07 Oct 2024 10:18, 04 Oct 2024 16:58	22-Oct-2024	13:50				
19	1119233	Sep - 2024	ACME Deoghar Solar Power Private Limited	253MW	33kV	253MW	Solar	2-IC04-Panel-2	15	15	NUCON	12.5MVA	33kV/4x0.66 kV	Central Inveter	Sungrow	4	3.036 MVA	ACME_Deoghar_SPPL			17 Sep 2024 14:27, 13 Sep 2024 18:36, 13 Sep 2024 14:30, 13 Sep 2024 11:08	17 Sep 2024 15:22, 16 Sep 2024 16:58, 13 Sep 2024 16:57, 13 Sep 2024 12:31	08 Oct 2024 19:31, 07 Oct 2024 21:09, 06 Oct 2024 09:24, 03 Oct 2024 19:29	09 Oct 2024 15:37, 08 Oct 2024 17:09, 07 Oct 2024 10:18, 04 Oct 2024 16:58	22-Oct-2024	13:50				

Transformer Report from 01-10-2024 to 31-10-2024

S.No	CASE ID	Application Month	Name of element	Owner	Voltage Level (HV/LV/Tertiary)	MVA Capacity	Type of Transformer	Make	Configuration	Total Tap	Nominal Tap	Present Tap	Vector Group	% Impedance	HV Stattion	State	Approved in SCM/Statury Body	Remark	Transformer Details	OLD MVA Capacity	Intimation request for charging of new element (FormatA)	Acknowledment sent by NRLDC (Format II)	Request for test charging and trial run (FormatB)	Provisional Approval for Test Charging/Trial operation(Format IV)	Actual date & time of charging (HV Side)		Actual date & time of charging (LV Side)		Power Flow Started	Request for Trial Operation Certificate(Format C)	Trial Run Operation Certificate Details		Actual date & time of charging	
																					Date	Date	Date	Date	Date	Time	Date	Time	Date	Date	Trial Run/Operation Period	Certificate No	Date	Time
1	1119193	Aug - 2024	765/400/33kV, 1500 MVA, 3x1-Phase, GE, ICT - 2 at	PSTL	765/400/33kV	1500	ICT	GE	3x1-Phase	NA	NA	NA	YNa0d11, YNa0, d11	14	Sikar_2(PSTL)	RAJASTHAN	30-09-2019 - 10:00, 6, 4.3.5, 11		New		29 Aug 2024 16:06	04 Sep 2024 15:45	30 Sep 2024 13:02, 29 Sep 2024 23:57	01 Oct 2024 17:13, 30 Sep 2024 10:15									02-Oct-2024	21:15
2	1119238	Sep - 2024	400/220/33kV, 315MVA MVA, 3-Phase, BHEL 1988, ICT - 2 at Mundka(DV)	DTL	400/220/33kV	315MVA	ICT	BHEL 1988	3-Phase	17	9b	9b	d11_YN_a0	11.7	Mundka(DV)	DELHI	15-05-2024 - 11:00, 219th OCC Meeting of NRPC, A15 of 219th OCC Meeting of NRPC, Page No. 13-14 of 219th OCC meeting of NRPC		Replacement	315	17 Sep 2024 13:40, 13 Sep 2024 15:07, 12 Sep 2024 16:53	17 Sep 2024 17:07, 16 Sep 2024 15:21, 12 Sep 2024 17:11	04 Oct 2024 16:17, 03 Oct 2024 14:42, 25 Sep 2024 12:54, 23 Sep 2024 12:50	04 Oct 2024 17:12, 04 Oct 2024 08:48, 26 Sep 2024 15:12, 25 Sep 2024 09:23, 25 Sep 2024 09:11, 25 Sep 2024 08:59									04-Oct-2024	20:10
3	1119192	Aug - 2024	765/400/33kV, 1500 MVA, 3x1-Phase, GE, ICT - 1 at Sikar_2(PSTL)	PSTL	765/400/33kV	1500	ICT	GE	3x1-Phase	NA	NA	NA	YNa0, d11	14	Sikar_2(PSTL)	RAJASTHAN	30-09-2019 - 10:00, 6, 4.3.5, 11		New		29 Aug 2024 16:06	04 Sep 2024 15:20	01 Oct 2024 18:35, 30 Sep 2024 13:02, 30 Sep 2024 00:05	03 Oct 2024 14:58, 01 Oct 2024 15:55, 30 Sep 2024 10:17									05-Oct-2024	02:15
4	1119240	Sep - 2024	400/33kV, 315 MVA, 3-Phase, Toshiba, Power Transformer - 1 at ACME_Deoghar_Ftgh1(PG)	ACME_Deoghar_SPPL	400/33/na	315	Power Transformer	Toshiba	3-Phase				YN_yn0yn0	14.5	ACME_Deoghar_Ftgh1(PG)	RAJASTHAN	11-09-2018 - 11:00, 15th meeting of Northern region constituents meetings, 8, 9/33		New		17 Sep 2024 14:30, 13 Sep 2024 18:36, 13 Sep 2024 15:20	17 Sep 2024 15:21, 16 Sep 2024 17:04, 13 Sep 2024 16:54	05 Oct 2024 22:09, 05 Oct 2024 11:25, 03 Oct 2024 18:58	06 Oct 2024 13:16, 05 Oct 2024 19:28, 04 Oct 2024 16:59									06-Oct-2024	16:52
5	1119252	Oct - 2024	400/33kV, 200 MVA, 3-Phase, SHIRDI SAI, ICT - 1 at Corneight Parks Pvt. Limited	Corneight Parks Pvt. Limited	400/33/na	200	ICT	SHIRDI SAI	3-Phase	17	5	5	YNyn0yn0, YNyn0yn0	15%	Corneight Parks Pvt. Limited	RAJASTHAN	21-08-2023 - 10:00, 1, 1, 2		New		01 Oct 2024 17:27	03 Oct 2024 16:55	08 Oct 2024 18:17, 07 Oct 2024 10:47	10 Oct 2024 20:06, 07 Oct 2024 16:59									11-Oct-2024	01:00
6	1119252	Oct - 2024	400/33kV, 200 MVA, 3-Phase, SHIRDI SAI, ICT - 2 at Corneight Parks Pvt. Limited	Corneight Parks Pvt. Limited	400/33/na	200	ICT	SHIRDI SAI	3-Phase	17	5	5	YNyn0yn0, YNyn0yn0	15%	Corneight Parks Pvt. Limited	RAJASTHAN	21-08-2023 - 10:00, 1, 1, 2		New		01 Oct 2024 17:27	03 Oct 2024 16:55	08 Oct 2024 18:17, 07 Oct 2024 10:47	10 Oct 2024 20:06, 07 Oct 2024 16:59									11-Oct-2024	01:24

Annexure-XII

भारत सरकार केंद्रीय विद्युत प्राधिकरण दक्षिण क्षेत्रीय विद्युत समिति 29, रेसकोर्स क्रास रोड बेंगलूर- 560 009	सत्यमेव जयते	Government of India Central Electricity Authority **Southern Regional Power Committee** 29, Race Course Cross Road Bengaluru-560 009
Email:mssrpc-ka@nic.in	Web site: www.srpc.kar.nic.in	Phone: 080-22282516
सं/No. SRPC/SE(O)/TF-AUFLS_dfdt/2023-24/ 4495-45		दिनांक/ Date **29th September 2023**

सेवा में / To

Member Secretary
National Power Committee (NPC)
Central Electricity Authority
New Dlehi-110 066

विषय/ Subject:Report of the "Task Force on Implementation AUFLS & df/dt Scheme" -reg.

Ref: NPC letter No. CEA/GO-15-14/1/2021-NPC Division/280-295 dated 25th August 2023

महोदय/महोदया/ Sir/ Madam,

Enclosed, please find the final Report of the "**Task Force** on Implementation of Automatic Under Frequency Load Shedding (AUFLS) and df/dt scheme".

Submitted for kind needful please.

भवदीय /Yours faithfully,

29/09/2023

(के पी मधु / K P Madhu)
अधीक्षक अभियंता/सदस्य सांयोजक
Superintending Engineer/Member Convener

Copy to:

1. Smt. Rishika Sharan, Chief Engineer & Member Secretary, NPC, New Delhi
2. Shri Chandra Prakash, Chief Engineer GM, CEA, New Delhi
3. Shri P.D.Lone, Superintending Engineer, WRPC, WRPC, Mumbai
4. Shri Shyam Kejriwal, Superintending Engineer, ERPC, Kolkata
5. Shri Santosh Kumar, Superintending Engineer, NRPC, New Delhi
6. Shri S M Aimol, Superintending Engineer NERPC, Shillong.
7. Shri Satyendra Kumar Dotan, Director, NPC, CEA, New Delhi
8. Shri Vivek Pandey, General Manager, NLDC, New Delhi

Copy for kind information to:

1. SA to Chairperson, CEA, New Delhi.
2. SA to Member GO&D, CEA, New Delhi.
3. Chairman & Managing Director, GRID-INDIA, New Delhi.
4. Member Secretary, NRPC, New Delhi.
5. Member Secretary, ERPC, Kolkata.
6. Member Secretary, WRPC, Mumbai.
7. Member Secretary, NERPC, Shillong.

Report
on
Implementation of AUFLS and df/dt Scheme

Task Force Constituted by National Power Committee, CEA
Under Chairmanship of Member Secretary, SRPC

Report No. NPC/CEA/TF-AUFLS-001 September 2023

REPORT

OF

TASK FORCE

ON

IMPLEMENTATION OF

AUFLS AND df/dt SCHEME

EXECUTIVE SUMMARY

REPORT OF THE TASK FORCE ON

IMPLEMENTATION OF AUFLS AND df/dt SCHEME

EXECUTIVE SUMMARY

National Power Committee (NPC), vide letter No. CEA/GO-15-14/1/2021-NPC Division/250 dated 18th August 2023 and vide letter No. CEA/GO-15-14/1/2021-NPC Division/280-295 dated 25th August 2023 constituted a Task Force on Implementation of Automatic Under Frequency Load Shedding (AUFLS) and df/dt scheme with the following Terms of Reference:

i. Review the recommendations of the Report as per directions by the 13th NPC Meeting within two months.

ii. Prioritization of the loads under the AUFLS and df/dt scheme.

iii. To oversee the implementation of the report on Automatic Under Frequency Load Shedding (AUFLS) and df/dt scheme.

iv. Any other suggestions/recommendations on related matters.

The Task Force comprised of the following Members:

1	Member Secretary, SRPC	Shri Asit Singh	**Chairperson**
2	Chief Engineer NPC,CEA	Smt Rishika Sharan	Member
3	Chief Engineer GM,CEA	Shri Chandra Prakash	Member
4	Superintending Engineer, WRPC	Shri P D Lone	Member
5	Superintending Engineer, ERPC	Shri Shyam Kejriwal	Member
6	Superintending Engineer, NRPC	Shri Santhosh Kumar*	Member
7	Superintending Engineer, NERPC	Shri S M Aimol	Member
8	Director, NPC,CEA	Shri Satyendra Kumar Dotan	Member
9	General Manager, NLDC	Shri Vivek Panday	Member
10	Superintending Engineer, SRPC	Shri K P Madhu	**Member Convener**

* NRPC replaced Shri Anzum Parwej.

The Task Force reviewed report of the Sub-Committee to review the AUFLS and df/dt scheme in line with the decisions of NPC in its 13th Meeting and relevant Regulations in Central Electricity Regulatory Commission (Indian Electricity Grid Code) Regulations, 2023 and identified the following:

- Total 25% relief will be planned in 4 stages-49.4 Hz, 49.2 Hz, 49.0 Hz & 48.8 Hz.
- Pumping load will be tripped before first stage (> 49.50 Hz). Battery energy system in charging mode will go in discharging mode (> 49.50 Hz), no storage will be in storage/charging mode at frequency < 49.50 Hz.
- All distribution licensees, STUs and bulk consumers shall provide automatic under frequency relays (UFR) and df/dt relays for load shedding in their respective systems to arrest frequency decline that could result in grid failure as per the plan given by the RPCs from time to time. The default UFR settings shall be as follows:

Sr. No.	***Stage of UFR Operation***	***Frequency (Hz)***
1	***Stage-1***	*49.40*
2	***Stage-2***	*49.20*
3	***Stage-3***	*49.00*
4	***Stage-4***	*48.80*
Note 1: All states (or STUs) shall plan UFR settings and df/dt load shedding schemes depending on their local load generation balance in coordination with and approval of the concerned RPC. *Note 2: Pumped storage hydro plants operating in pumping mode or ESS operating in charging mode shall be automatically disconnected before the first stage of UFR*		

- The following shall be factored in while designing and implementing the UFR and df/dt relay schemes:

  (a) The under-frequency and df/dt load shedding relays are always functional.

  (b) Demand disconnection shall not be set with any time delay in addition to the operating time of the relays and circuit breakers.

  (c) There shall be a uniform spatial spread of feeders selected for UFR and df/dt disconnection.

  (d) SLDC shall ensure that telemetered data of feeders (MW power flow in real time and circuit breaker status) on which UFR and df/dt relays are installed is available at its control centre. SLDC shall monitor the combined load in MW of these feeders at all times. SLDC shall share the above data with the respective RLDC in real time and submit a monthly exception report to the respective RPC. RLDC shall inform SLDCs as well as the concerned RPC on a quarterly basis, durations during the quarter when the combined load in MW of these feeders was below the level considered while designing the UFR scheme by the RPC. SLDC shall take corrective measures within a reasonable period and inform the respective RLDC and RPC, failing which suitable action may be initiated by the respective RPC.

(e) RPC shall undertake a monthly review of the UFR and df/dt scheme and also carry out random inspection of the under-frequency relays. RPC shall publish such a monthly review along with an exception report on its website.

(f) SLDC shall report the actual operation of UFR and df/dt schemes and load relief to the concerned RLDCs and RPCs and publish the monthly report on its website.

Through detailed deliberations, the Task Force finalized the methodology for identification quantum of relief at each stages of AUFLS, distribution among Regions by NPC, distribution of relief quantum among State/UT in Regions by respective RPCs for implementation in the Region, guidelines for identification of feeders, Mapping of feeders, Reporting by SLDCs/RLDCs, Testing/inspection of UFRs, setting of UFR for Pumps & Energy Storage Systems (ESS).The observations and recommendations are elaborated in the Task Force Report,

Salient observations & conclusion by the Task Force are summarized below:

- **AUFLS Set Points and Quantum of Relief**

  Total 25% relief would be planned in four stages: Stage-1 at 49.4 Hz, Stage-2 at 49.2 Hz, Stage-3 at 49.0 Hz & Stage-4 at 48.8 Hz. The 25% total relief distribution in four stages would be in such a way that 5% in Stage-1, 6% in Stage-2 and 7% each in Stage 3 & 4.

- **Identification of AUFLS Quantum by NPC and RPCs**

  NPC Division to communicate the Region wise relief quantum (based on Regional Peak Demand Met during the previous year) by **31st of May** to RPCs for implementation in the next Financial Year (FY). Distribution of relief among State/UT to be carried out based on Regional relief and demand contribution in the average of Peak demand met ratio and demand met (consumption) ratio of State/UT in the previous FY.

- **Quantum Identification for AUFLS by States/UT and monthly vetting**

  Each SLDC shall carry out month-wise Stage-wise analysis and furnish to RPC/RLDC in the following manner:

  AUFLS Stage -1:

  Actual Relief for the month = Average actual load (for the month) of all the feeders identified in the stage**.** For this Feeders are to be mapped at SLDC. The mapping would be extended to RLDC. If feeders are not mapped then values are to be collected from field. (Any outage would not be excluded).

  Desired Relief for the month = (Recommended AUFLS quantum in the stage x Average demand for the month of State/UT)/Demand Contribution of the State/UT

  The same exercise would be repeated for each Stage.

As a general guideline Actual Relief for the month should be 10% more than the Desired Relief for the month considering the Relay/breaker issues and a resilient safety net.

The data would be vetted by RLDC and discussed in OCC Meetings of RPC.

- **Analysis of AUFLS Event**

AUFLS Stage-1:

Actual Relief during incident = (Actual relief (during incident) of all the feeders identified in the stage)

Desired Relief during incident= (Recommended AUFLS quantum in the stage x demand of State/UT at time of incident)/Demand Contribution of the State.

The same exercise would be repeated for each Stage.

The data would be vetted by RLDC and discussed in OCC Meetings of RPC.

- **Guidelines for identification of AUFLS feeders**

AUFLS relays under Stage-1 & Stage-2 should be implemented preferably on downstream network at 11/22/33 kV level and AUFLS relays under Stage-3 & Satge-4 should be implemented on upstream network at EHV (66/110/132 kV) level so that load relief obtained is fast and reliable.

- **Mapping of AUFLS feeders**

SLDCs in coordination with STU/Discoms, map the feeders for loading, breaker status etc. and create display for monitoring of all the stages. The SLDC would extend the mutually agreed displays to RLDC. SLDCs also develop the SCADA Displays Discom-wise/Sub SLDC wise as applicable as well as feeder wise for all the stages.

Mapping verification between SLDC and Discom/STU to be carried out at least once in three (3) months and between RLDC and SLDCs at least once in six (6) months.

SLDCs shall download the data and store it for two years. The Data should be made available to RPCs/RLDCs/CEA/CERC for further studies or analysis.

- **Settings of UFR for Pumping load/Energy Storage Systems**

All Energy Storage Systems would change from charging mode to discharging mode at 49.50 Hz. If it is not possible then they would be tripped at 49.50 Hz. If ESS is injecting active power at 49.50 Hz not to be tripped.

Pumping load will be tripped before AUFLS first stage. Irrigation Pumps would be tripped at 49.50 Hz

All the relays procured in future to have a sampling period ranging from three (03) cycles to five (05) Cycles. No additional time delay to be incorporated in the relay other than the inherent measuring time.

- **Testing/Inspection of UFR**

SLDCs shall in consultation with the Utilities responsible for testing should chalk out a plan of relays testing schedule before 1st of December and submit the same to RPC/RLDC. The periodicity of testing of relays shall be twice in a year at 110 / 132 kV level and above Substations and once in a year at 66 kV level and below Substations.

RPC would carry UFR inspection randomly on sample basis by the RPC Secretariat or through RLDC.

- **df/dt Scheme**

The df/dt load shedding is specific to regions and therefore, the quantum of load shedding required to be wired up under the df/dt scheme may be discussed at regional levels in the RPCs. The RPCs in consultation with the stakeholders can decide the set points and quantum of Load shedding required under df/dt scheme.

Various aspects as brought out above have been deliberated by the Task Force and action by the agencies have been finalized. However, SLDCs and concerned utilities to ensure proper setting of relays considering sluggishness to achieve the desired load relief at all the stages of AUFLS and df/dt.

REPORT

OF

TASK FORCE

ON

IMPLEMENTATION

OF

AUFLS & df/dt SCHEME

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	ACKNOWLEDGEMENT	
ANNEXURE - I	Copy of letters dated 18th & 25th August 2023 from NPC regarding constitution of Task Force	
ANNEXURE – II	Format for testing of AUFLS Relays	
ANNEXURE – III	Sample RPC Inspection Report Format	

REPORT OF THE TASK FORCE ON

IMPLEMENTATION OF AUFLS AND df/dt SCHEME

1.0 INTRODUCTION

National Power Committee (NPC) in its 13th Meeting held on 05.07.2023 had accepted the report of the Sub-Committee (constituted as per the decision in 10th meeting of NPC) to review the AUFLS and df/dt scheme with the following observations:

a) The first stage will be set at 49.4 Hz.

b) Total 25% relief will be planned in 4 stages-49.4 Hz, 49.2 Hz, 49.0 Hz & 48.8 Hz.

c) Pumping load will be tripped before first stage (> 49.4 Hz). Battery energy system in charging mode will go in discharging mode (> 49.4 Hz), no storage will be in storage/charging mode at frequency < 49.4 Hz.

d) A Task Force under chairmanship of MS, SRPC with Members from Grid India, RPCs/NPC may be formed. The task force will also oversee the implementation of the report.

Keeping this in view, MS NPC, vide letters dated 18.08.2023 & 25.08.2023 constituted Task Force on Implementation of Automatic Under Frequency Load Shedding (AUFLS) and df/dt scheme with the following Terms of Reference:

i. Review the recommendations of the Report as per directions by the 13th NPC Meeting within two months.

ii. Prioritization of the loads under the AUFLS and df/dt scheme.

iii. To oversee the implementation of the report on Automatic Under Frequency Load Shedding (AUFLS) and df/dt scheme.

iv. Any other suggestions/recommendations on related matters.

A copy of the letters is at **Annexure-I**.

The Task Force committee was constituted with the following Members:

1.	**Shri Asit Singh,** Member Secretary, SRPC ……**Chairperson**	2.	Smt. Rishika Sharan, Chief Engineer NPC,CEA ……. Member
3.	Shri Chandra Prakash, Chief Engineer GM,CEA …… Member	4.	Shri P D Lone Superintending Engineer, WRPC …… Member
5.	Shri Shyam Kejriwal Superintending Engineer, ERPC ..…….. Member	6.	Shri Santhosh Kumar* Superintending Engineer,NRPC …….. Member
7.	Shri S M Aimol Superintending Engineer, NERPC …….. Member	8.	Shri Satyendra Kumar Dotan Director, NPC,CEA …….. Member
9.	Shri Vivek Pandey General Manager, NLDC …….. Member	10.	**Shri K P Madhu** Superintending Engineer, SRPC ……. **Member Convener**

* NRPC replaced Shri Anzum Parwej.

The Task Force had its Meeting on 11.09.2023 through Video Conferencing (VC) and deliberated various aspects in the implementation of AUFLS & df/dt scheme. During the deliberations, it was observed that the frequency setting adopted by all the Regions for the four stages of AUFLS are uniform and same as mandated in CERC (IEGC) Regulations, 2023. It emerged that the load relief to obtained shall be reviewed yearly based on the actual peak met during the previous Financial Year and implemented in the next Financial Year. Mapping of identified feeders at SLDC/RLDC needed to be ensured by the utilities and monitoring of the feeders at real time by control rooms.

2.0 PROVISIONS IN CERC REGULATIONS

Central Electricity Regulatory Commission (Indian Electricity Grid Code) Regulations, 2023 effective from 01st October 2023 provides the following in respect of AUFLS and df/dt:

Regulation No.29: ***SYSTEM SECURITY***

……..

(12) All distribution licensees, STUs and bulk consumers shall provide automatic under frequency relays (UFR) and df/dt relays for load shedding in their respective systems to arrest frequency decline that could result in grid failure as per the plan given by the RPCs from time to time. The default UFR settings shall be as specified in Table-2 below:

Sr. No.	*Stage of UFR Operation*	*Frequency (Hz)*
1	*Stage-1*	*49.4*
2	*Stage-2*	*49.2*
3	*Stage-3*	*49.0*
4	*Stage-4*	*48.8*
Note 1: All states (or STUs) shall plan UFR settings and df/dt load shedding schemes depending on their local load generation balance in coordination with and approval of the concerned RPC. *Note 2: Pumped storage hydro plants operating in pumping mode or ESS operating in charging mode shall be automatically disconnected before the first stage of UFR.*		

(13) The following shall be factored in while designing and implementing the UFR and df/dt relay schemes:

(a) The under-frequency and df/dt load shedding relays are always functional.

(b) Demand disconnection shall not be set with any time delay in addition to the operating time of the relays and circuit breakers.

(c) There shall be a uniform spatial spread of feeders selected for UFR and df/dt disconnection.

(d) SLDC shall ensure that telemetered data of feeders (MW power flow in real time and circuit breaker status) on which UFR and df/dt relays are installed is available at its control centre. SLDC shall monitor the combined load in MW of these feeders at all times. SLDC shall share the above data with the respective RLDC in real time and submit a monthly exception report to the respective RPC. RLDC shall inform SLDCs as well as the concerned RPC on a quarterly basis, durations during the quarter when the combined load in MW of these feeders was below the level considered while designing the UFR scheme by the RPC. SLDC shall take corrective measures within a reasonable period and inform the respective RLDC and RPC, failing which suitable action may be initiated by the respective RPC.

(e) RPC shall undertake a monthly review of the UFR and df/dt scheme and also carry out random inspection of the under-frequency relays. RPC shall publish such a monthly review along with an exception report on its website.

(f) SLDC shall report the actual operation of UFR and df/dt schemes and load relief to the concerned RLDCs and RPCs and publish the monthly report on its website.

3.0 AUFLS SET POINTS AND QUANTUM OF RELIEF

The AUFLS setting with %age of quantum of load shedding concluded in the Report is given below (Table 10.1 in the Report):

Sr. No.	*Stage*	*Frequency*	*Demand Disconnection*	*Total Quantum of LS*
Stage-I Defense plan- Load Shedding				
1	I-A	49.2 Hz	3.50%	
2	I-B	49.0 Hz	3.50%	
3	I-C	48.8 Hz	4.00%	
4	I-D	48.7 Hz	4.50%	
5	I-E	48.6 Hz	4.50%	**20%**
Stage-II Desperate plan- Load Shedding				
6	II-F	48.4 Hz	6.00%	
7	II-G	48.2 Hz	6.00%	
8	II-H	48.0 Hz	6.00%	**18%**
Grand Total (Stage-I + II)				**36%**

In the 13th Meeting of NPC, it had been observed that the first stage will be set at 49.4 Hz and total 25% relief will be planned in four stages-49.4 Hz, 49.2 Hz, 49.0 Hz & 48.8 Hz. The AUFLS settings to be adopted for total relief of 25% of previous year peak demand met for implementation in the subsequent year.

The percentage relief from Stage-1 may be kept as 5 % since it is better to check the falling frequency and get sufficient quantum of relief at initial level itself and there may not arise the occasion for further reduction of frequency leading to more load shedding at other stages. In the Report of Expert Committee on IEGC also equal quantum of Load Relief was proposed for all stages. Keeping lower quantum of relief at higher level may lead to activation of lower stages since in most of the real time conditions the desired relief may not be achieved.

The Task Force recommended the following AUFLS Set Points and Percentage Quantum of Relief for implementation:

Table 1: AUFLS Set Points and Percentage Quantum of Relief

Sl No	Stage	UFR set points in Hz	Quantum of Relief
1	**Stage-1**	**49.4**	**5%**
2	**Stage-2**	**49.2**	**6%**
3	**Stage-3**	**49.0**	**7%**
4	**Stage-4**	**48.8**	**7%**
		Total	**25%**

4.0 IDENTIFICATION OF AUFLS QUANTUM BY NPC AND RPCs

NPC Division to communicate the Region wise relief quantum (based on Regional Peak Demand Met during the previous year) by **30th of June** to RPCs.

If the peak demand is lower than the previous year peak demand, the same settings should be continued (settings remain unchanged).

4.1. Methodology for AUFLS Quantum (MW) Distribution among Regions:

Let All India Peak Demand in Previous Year in MW= **AP**

Sum of Regional Peak in MW = (RP_{NR}+ RP_{WR} + RP_{SR} + RP_{ER} +RP_{NER})**= RP**

Table 2: Methodology for AUFLS Quantum (MW) Distribution among Regions

Region	Regional Peak Demand (MW)	Stage-1 49.4 Hz (5%)	Stage-2 49.2 Hz (6%)	Stage-3 49.0 Hz (7%)	Stage-4 48.8 Hz (7%)	Total (MW)
	(1)	(2)	(3)	(4)	(5)	(6)
Northern Region	RP_{NR}	0.05* RP_{NR}*AP/RP	0.06* RP_{NR}*AP/RP	0.07* RP_{NR}*AP/RP	0.07* RP_{NR}*AP/RP	Sum Clmn. (2) to (5)
Western Region	RP_{WR}	0.05* RP_{WR}*AP/RP	0.06* RP_{WR}*AP/RP	0.07* RP_{WR}*AP/RP	0.07* RP_{WR}*AP/RP	Sum Clmn. (2) to (5)
Southern Region	RP_{SR}	0.05* RP_{SR}*AP/RP	0.06* RP_{SR}*AP/RP	0.07* RP_{SR}*AP/RP	0.07* RP_{SR}*AP/RP	Sum Clmn. (2) to (5)
Eastern Region	RP_{ER}	0.05* RP_{ER}*AP/RP	0.06* RP_{ER}*AP/RP	0.07* RP_{ER}*AP/RP	0.07* RP_{ER}*AP/RP	Sum Clmn. (2) to (5)
North Eastern Region	RP_{NER}	0.05* RP_{NER}*AP/RP	0.06* RP_{NER}*AP/RP	0.07* RP_{NER}*AP/RP	0.07* RP_{NER}*AP/RP	Sum Clmn. (2) to (5)
All India	AP	Sum above	Sum above	Sum above	Sum above	25% OF AP

Sample calculation for AUFLS Quantum (MW) for 2023-24 is given below:

All India Peak Demand in 2022-23: 2,07,231 MW

Table 2A: Computation of AUFLS Quantum (MW) Distribution among Regions

Region	Regional Peak Demand (MW)	Stage-1 49.4 Hz (5%)	Stage-2 49.2 Hz (6%)	Stage-3 49.0 Hz (7%)	Stage-4 48.8 Hz (7%)	Total (MW)
	(1)	(2)	(3)	(4)	(5)	(6)
Northern Region	76,561	3270	3924	4577	4577	**16,348**

Western Region	71,677	3061	3673	4285	4285	**15,305**
Southern Region	64,337	2748	3297	3847	3847	**13,738**
Eastern Region	27,218	1162	1395	1627	1627	**5,812**
North Eastern Region	3,603	154	185	215	215	**769**
All India	**2,07,231**	**10394**	**12473**	**14552**	**14552**	**51,972**

4.2. Three options were considered by the Task Force for distribution of relief among State/UT. The Task Force recommended that Distribution of relief among State/UT to be carried out based on Regional relief and demand contribution in the average of Peak demand met ratio and demand met (consumption) ratio of State/UT in the previous FY.

4.3. After the receipt of the allocated load shedding quantum of the Region from NPC, AUFLS relief quantum should be distributed among the State/UT in the region by the RPCs by **July /August** in consultation with the stakeholders (in OCC Meeting).

Sample calculation for Northern Region is given below:

Table 3: State/UT contribution ratio for AUFLS Relief Quantum

State/UT	Actual Consumption in MU for 2022-23	Consumption Ratio	Actual Demand Met in 2022-23	Demand Met Ratio	State/ UT Contribution
	(1)	(2)=(1)/(A)	(3)	(4)=(3)/(B)	(5)=[(2)+(4)]/2
Chandigarh	1788	0.004	407	0.005	**0.004**
Delhi	35143	0.077	7695	0.089	**0.083**
Haryana	60945	0.133	12768	0.147	**0.140**
Himachal Pradesh	12542	0.027	2071	0.024	**0.026**
UT J&K & Ladhak	19322	0.042	2967	0.034	**0.038**
Punjab	69220	0.151	14311	0.165	**0.158**
Rajasthan	100057	0.219	17206	0.199	**0.209**
Uttar Pradesh	143050	0.313	26589	0.307	**0.310**
Uttarakhand	15386	0.034	2599	0.030	**0.032**
Total	457453 **(A)**	1.000	**86613 (B)**	**1.000**	1.000

4.4. Each State/UT relief quantum would be computed by RPC by distributing the NPC communicated Regional relief quantum based on ratio at 4.2. This quantum would become the base for monthly analysis of visible relief and also the analysis during any event.

Sample calculation of Demand Distribution for Northern Region:

Table 4: State/UT Demand Distribution in MW

State/UT	State/ UT Contribution	Load Relief in MW
	(a)=Column (5) of Table 3	(b)=a* B in Column (3) of Table 3
Chandigarh	0.004	330
Delhi	0.083	6342
Haryana	0.140	10743
Himachal Pradesh	0.026	1965
UT J&K & Ladhak	0.038	2928
Punjab	0.158	12118
Rajasthan	0.209	15978
Uttar Pradesh	0.310	23722
Uttarakhand	0.032	2436
Total	1.000	76561 **(C)**

4.5. Each State/UT Stage-wise AUFLS quantum would be computed by RPC. This Stage-wise recommended AUFLS quantum shall become the base for monthly analysis of visible relief and also the analysis during any tripping.

Sample calculation for NR is as follows:

Table 5: State/UT Stage-wise AUFLS in MW

State/UT	State/ UT Contribution	Stage-1 49.4 Hz (5%)	Stage-2 49.2 Hz (6%)	Stage-3 49.0 Hz (7%)	Stage-4 48.8 Hz (7%)	Total
	(c)=Column (5) of Table 3	NR in Column (2) of Table 2A* (c)	NR in Column (3) of Table 2A* (c	NR in Column (4) of Table 2A* (c	NR in Column (5) of Table 2A* (c	
Chandigarh	0.004	14	17	20	20	70

Delhi	0.083	271	325	379	379	1354
Haryana	0.140	459	551	642	642	2294
Himachal Pradesh	0.026	84	101	117	117	420
UT J&K & Ladhak	0.038	125	150	175	175	625
Punjab	0.158	517	621	724	724	2587
Rajasthan	0.209	682	819	955	955	3412
Uttar Pradesh	0.310	1013	1216	1418	1418	5065
Uttarakhand	0.032	104	125	146	146	520
Total	1.000	3270	3924	4577	4577	16348

5.0 QUANTUM IDENTIFICATION FOR AUFLS BY STATES/UT AND MONTHLY VETTING

5.1. States/UT shall identify the load relief for each stage considering the Quantum of relief and their demand contribution considering the intra-day, seasonality etc. 10% additional relief would be finalised considering the demand growth of the year, planned and forced outages, UFR and breaker issues etc. SLDC would communicate feeder-wise, Stage-wise details etc. to RPC/RLDC.

5.2. Each SLDC shall carry out month-wise Stage-wise analysis and furnish to OCC in the following manner:

AUFLS Stage -1:

Actual Relief for the month = Average actual load (for the month) of all the feeders identified in the stage**.** For this Feeders are to be mapped at SLDC. The mapping would be extended to RLDC. If feeders are not mapped then values are to be collected from field. (Any outage would not be excluded).

Desired Relief for the month = (Recommended AUFLS quantum in the stage x Average demand for the month of State/UT)/Demand Contribution of the State/UT

Similar exercise for each Stage.

The data would be vetted by RLDC and discussed in OCC Meetings of RPC.

5.3. Self-checking scheme: If Actual Relief for the month is **less the Desired Relief** for the month, **SLDC** would carry out feeder –wise analysis and in consultation with Discoms/STU take **corrective action** (like identifying new feeder, additional feeder, modifying the declared relief of feeders, verifying the mapped figures etc.). The same

would be implemented by SLDC/STU/Discoms before next OCC by submitting a compliance Report.

5.4. A**s a general guideline Actual Relief for the month should be 10% more than the Desired Relief for the month considering the Relay/breaker issues and a resilient safety net.**

Table 6: AUFLS – Monthly Report - …….(Month)

State/UT:……..

	Stage-1 49.4 Hz	Stage-2 49.2 Hz	Stage-3 49.0 Hz	Stage-4 48.8 Hz	**STATE TOTAL**
Recommended (A)					
Implemented (B)					
SCADA monitored (C)					
Actual flow on SCADA monitored (D)					
Balance implemented (E) = (B) – (C)					
Actual flow on balance implemented (F)					
Desired relief (G)= (B)x Average State Demand for the month/(State Demand Contribution)					
Actual relief (H) = (D+F)					
Deficit (-)/Surplus (+) H-G					

6.0 ANALYSIS OF AUFLS EVENTS

6.1. The following methodology to be adopted for AUFLS analysis during event:

AUFLS Stage-1:

Actual Relief during incident = (Actual relief (during incident) of all the feeders identified in the stage)

Desired Relief during incident= (Recommended AUFLS quantum in the stage x demand of State/UT at time of incident)/Demand Contribution of the State.

Similar exercise for each Stage.

The data would be vetted by RLDC and discussed in OCC Meetings of RPC.

6.2. If Actual Relief during incident is less the Desired Relief during incident, SLDC would carry out feeder –wise analysis and in consultation with Discoms/STU take corrective action. Necessary directions will be issued to Discoms/STU by SLDC. The same would be implemented by SLDC/STU/Discoms before next OCC by submitting a compliance Report.

6.3. The relief realization to be analyzed based on the demand at the time of incident. The data needed to be vetted by RLDC and discussed in OCC Meetings of RPC. Reason for non-tripping of the relays during the incident needed to be mentioned. If Actual Relief during incident is less than the Desired Relief during incident, SLDC would carry out feeder –wise analysis and in consultation with Discoms/STU take corrective action. Necessary directions shall be issued to Discoms/STU by SLDC. The same would be implemented by SLDC/STU/Discoms before next OCC by submitting a compliance Report.

6.4. SLDCs shall issue directions to state utilities to carry out self-testing of the relays and where ever tripping is not observed (due to discrepancy in measured frequency), such relays are recommended to retune to set the points accordingly at 49.41 Hz. or 49.42 Hz. etc. The implementation of the same is being monitored in OCC.

Table 7: AUFLS – Tripping Report at ….. hrs on ……..

State/UT:……..

Description	Stage-1 49.4 Hz	Stage-2 49.2 Hz	Stage-3 49.0 Hz	Stage-4 48.8 Hz	STATE TOTAL
Recommended (A)					
Implemented (B)					
SCADA monitored (C)					
Actual flow on SCADA monitored (D)					
Balance implemented (E) = (B) – (C)					
Actual flow on balance implemented (F)					
Desired relief (G)= (B)x State Demand at the time of tripping/(State Demand Contribution)					
Actual relief (H) = (D+F)					
Deficit (-)/Surplus (+) H-G					

Further feeder wise and Stage-wise details will also be furnished as per the Table given below:

Table 8: AUFLS – Feeder-wise Tripping Report at ….. hrs on ……..

AUTOMATIC UNDER FREQUENCY LOAD SHEDDING STAGE-1 (49.4)						
Sl No	Sub Station	Feeder Description	Average load per year (In MW)	Tripped (Y/N)	Reason if not tripped	Actual flow in MW
1						
2						
3						
4						
TOTAL MW RELIEF						

7.0 GUIDELINES FOR IDENTIFICATION OF AUFLS FEEDERS

The following to be considered for identification of feeders:

i. AUFLS relays under Stage-1 & Stage-2 should be implemented preferably on downstream network at 11/22/33 kV level.

ii. AUFLS relays under Stage-3 & Satge-4 should be implemented on upstream network at EHV (66/110/132 kV) level so that load relief obtained is fast and reliable as it is a desperate measure for areas that have disintegrated.

iii. As far as possible the feeders/transformers are feeding radial loads shall be identified.

iv. Telemetry availability would be considered as important factor so that the feeders/transformer loading can be extended to SLDC/RLDC for mapping

v. Feeders catering to critical loads are to be avoided. VIP areas, Airport, Metro, Railways, Defence, Govt Hospitals, Government Offices, continuous process industries etc. needs to be prioritized

vi. No mixed feeders with RE/Distributed generations should be identified. If identified the feeder should be never in injecting mode. Steps to segregate the feeder (load/RE/Distributed generation) would be taken.

vii. If Grid feeder is identified the other side breakers should be in normally open condition. If they are to be closed frequently then UFR with same set points to be provided at other ends.

viii. The feeders identified for AUFLS would be as far as possible not common for df/dt, scheduled power cuts, load shedding, SPS, ADMS etc. In case of difficulty to

identify dedicated feeders the same is to be approved in OCC/PCSC. Adequate care is to be taken if round robin scheme is adopted for ADMS, SPS etc.

ix. The Islanding loads/feeders which are to be retained would not be enabled for AUFLS. However loads in the Island can be identified for AUFLS but same has to be factored while designing the Island.

Chairperson, Task Force observed that the sampling rate is configured by the OEM and cannot be changed by S/S officials. There are relays with 3 cycle sampling rate and also with 6-10 cycle sampling rate. The only way to achieve the tripping at desired frequency is to set the relay set points based on the behaviour of each relay. 3-5 cycle sampling time is advisable since if response time is below 3 cycles, during some transients also unwanted tripping may happen.

NERPC mentioned that in their system most of the 33 kV feeders are radially loaded and 132 kV feeders are grid connected and difficult to get desired relief in tripping of 132 kV grid connected feeder since if relay trip at one S/s the load may be fed from other end. Requested that NER may be given some relaxation such that the feeders at 33 kV also may be identified at lower stages.

It was clarified that these are General Guidelines in which some changes may be carried according to specific constraints. However, if Grid feeder is identified the other side breakers should be in normally open condition. If they are to be closed frequently then UFR with same set points to be provided at other end also.

8.0 MAPPING OF AUFLS FEEDERS

SLDC in coordination with STU/Discoms map the feeders for loading, breaker status etc. and create display for monitoring. The SLDC would extend the mutually agreed display to RLDC. Display to be implemented at SLDC which would be extended to RLDC.

Table 9: AUFLS Monitoring in MW

Description	Stage-1 49.4 Hz	Stage-2 49.2 Hz	Stage-3 49.0 Hz	Stage-4 48.8 Hz	TOTAL (all the Stages)
Recommended (A)					
Implemented (B)					
Unmapped quantum (C)					
SCADA monitored (D)					
Actual flow (E)					
Desired relief (F)= (D)x State Demand/(State Demand Contribution)					
Deficit (-)/Surplus (+) E-F					

SLDC would further develop the SCADA Displays Discom-wise/Sub SLDC wise as applicable as given below:

Table 10: AUFLS Monitoring in MW STAGE-1 (49.4)

Description	DISCOM / SUB SLDC -1	DISCOM / SUB SLDC -2	DISCOM / SUB SLDC -3	.....	STATE TOTAL
Recommended (A)					
Implemented (B)					
Unmapped quantum (C)					
SCADA monitored (D)					
Actual flow (E)					
Desired relief (F)= (D)x Discom Demand/(Discom Demand Contribution)					
Deficit (-)/Surplus (+) E-F					

Similar display for all stages.

SLDC would further develop the SCADA Displays feeder wise as given below:

Table 11: Feeder wise AUFLS monitoring in MW

AUTOMATIC UNDER FREQUENCY LOAD SHEDDING STAGE-1 (49.4)											
Sl.No	Discom/ SUB-LDC	Voltage level	Substation / Feeder Name (A-B)	Average load (MW)	Relay function enabled (Y/N)	SCADA Visibility (Y/N)	Radial feeder (Y/N)	RE injection feeder (Y/N)	CB Status Both ends	Actual flow in MW(A)	Actual flow in MW (B)
1											
2											
3											
TOTAL (MW)											

Similar display for all Stages.

SLDCs would download the data and store it for two years. SLDCs would collect feeder loading details of unmapped feeders.

Concrete action plan with definitive timelines would be made by SLDC/STU/Discom to achieve 100% mapping. This would be followed up in OCC.

Mapping verification between SLDC and Discom/STU would carried out at least once in three (3) months. Mapping verification between RLDC and SLDC would be carried at least once in six (6) months.

Any change in feeder would be informed to RPC & RLDC and mapping would be ensured.

SE(P) WRPC informed that 85-90% of AUFLS relays installed in WR are at the voltage level of 11kV/22kV/33kV and also these relays are installed in many switching distribution level remotely located substations of the States. The implementation of the AUFLS display on SCADA system was deliberate in various forum of WRPC. However the States have expressed inability to implement the display in SCADA due to communication issues in remotely located S/Ss. However, efforts are still being made to improve the visibility of these feeders in SCADA.

9.0 SETTINGS OF UFR/PUMP LOADS/ESS

All Energy Storage Systems would change from charging mode to discharging mode at 49.45 Hz. If it is not possible then they would be tripped at 49.45 Hz. If ESS is injecting active power at 49.45 Hz not to be tripped.

Pumping load will be tripped before AUFLS first stage. Irrigation Pumps would be tripped at 49.45 Hz.

Load disconnection shall not be set with any time delay in addition to the operating time of the relays and circuit breakers.

During Testing if delay is observed (> 75 msec) in Relay Pick up and sending the command to breaker then set points to be enhanced to 49.41 Hz, 49.21 Hz, 49.01 Hz and 48.81 Hz as applicable or any higher value to ensure tripping 49.40 Hz, 49.20 Hz, 49.00 Hz and 48.80 Hz

All the relays to be procured in future to have a sampling period ranging from three cycles to five Cycles. No additional time delay to be incorporated in the relay other than the inherent measuring time.

With reference to the discussions regarding the trip setting of storage device operating in charging/pumping mode it is requested to consider the following inputs from NLDC.

(A) CEA Technical Standards of connectivity to the grid Regulations (2019 amendment), Connectivity standards mandate the wind generating stations, generating stations using inverters, wind - solar photo voltaic hybrid systems and energy storage systems as under

Quote

" The generating unit shall be capable of operating in the frequency range 47.5 to 52 Hz and be able to deliver rated output in the frequency range of 49.5 Hz to 50.5 Hz"

Unquote

In future several storage systems (BESS, PSP) are expected to be commissioned. Few hybrid RE stations with BESS/PSP are also envisaged. Considering the possible derating of inverter based resources at frequency below 49.5 Hz, it is desirable to take measures to arrest the frequency decline below 49.5 Hz. It is therefore desirable that the storage device operating in charging/pumping mode are tripped in a graded manner before the frequency dips below 49.5 Hz.

(B) Grid India vide its letter dated 2nd Jul 2018 had suggested to raise the UFR stage-I setting to 49.6 Hz and consider 49.8 Hz for initiating the tripping of pump storage/BESS operating in charging pumping mode. Thus keeping a margin of 0.2 Hz between tripping of storage and AUFLS stage-I.

(C) The Expert Group on IEGC considered 49.50 Hz as the nadir frequency for working out the AUFLS setting. Relevant extracts are quote below:

Under Frequency Relay (UFR) Settings: (a) Considering the All India electricity grid operating as a synchronous grid and being one of the largest grids in the world, the defence plans now need to be looked at from a national level rather than regional level. The same needs to be mandated in the IEGC itself rather than any discussion at the RPC level. As indicated in the section on primary response, for the reference contingency of 4500 MW generating station outage, the frequency would dip to 49.50 Hz and quickly recover to 49.70 Hz. So, the chances of the frequency falling below 49.50 Hz in an integrated large power system like India would be rare. The frequency would fall below this value only in case of part separation of systems leading to a generation deficit in one system

(D) The IEGC-2023 has mandated UFR stage-I as 49.4 Hz

It is suggested that the tripping of storage system (in charging pumping mode) may be initiated in a graded manner from 49.6 Hz onwards and to be complete by 49.5 Hz.

In view of NLDC observations the following is recommended:

All Energy Storage Systems would change from charging mode to discharging mode at 49.50 Hz. If it is not possible then they would be tripped at 49.50 Hz. If ESS is injecting active power at 49.50 Hz not to be tripped.

Pumping load will be tripped before AUFLS first stage. Irrigation Pumps would be tripped at 49.50 Hz.

10.0 TESTING/INSPECTION OF UFR

Testing Procedure SLDC for UFR by Discoms/STU:

i. Wherever relays are installed at 110 / 132 kV level and above S/s: The periodicity of testing shall be Twice in a year.

ii. Wherever relays are installed at 66 kV level and below S/s: The periodicity of testing shall be once in a year.

iii. SLDCs shall in consultation with the Utilities responsible for testing should chalk out a plan of relays testing schedule before 1st of December and submit the same to RPC/RLDC.

iv. Test shall be carried out by the State testing teams and report of the test carried out should be submitted to SLDC. SLDC shall submit a compiled progressive report of the same to RPC/RLDC every month. The format for testing of AUFLS relays is at **Annexure-II.**

v. SLDC should monitor the periodicity of test and ensure that the relays are tested as per the schedule. Deviation if any shall be intimated to RPC/RLDC with proper justification.

vi. If possible, relays through test up to breakers may be carried out. If this is not possible the continuity of trip circuit of UFR up to the trip coil of breaker should be checked during the testing.

vii. SLDC's shall ensure that at least 10% of the total relay testing be witnessed/carried out by other Circle Testing Engineer/RLDC/RPC.

Inspection of UFR Relays by RPC:

RPC would carry UFR inspection randomly on sample basis by the **RPC Secretariat or through RLDC.** The Sample Inspection Report is at **Annexure-III.**

Based on Inspection Report necessary directions would be issued by RPC which would be complied within six months.

11.0 df/dt SCHEME

In the Report it is mentioned that enabling frequency should be set at 49.9 Hz. i.e., the relay should always be enabled when the system frequency is below 49.9Hz. The following given in the Report:

Stage	'X' in MW = Largest generating station or peak import in the region whichever is higher			
	Enabling Frequency 'Hz'	df/dt setting 'Hz/sec'		Quantum of Load Shedding 'MW'
		RE rich	RE low	
Stage-1	49.9	0.10	0.05	30% of 'X'
Stage-2	49.9	0.15	0.10	40% of 'X'
Stage-3	49.9	0.20	0.25	50% of 'X'
The quantum is for a region as whole, and the RPCs shall decide how to further distribute the quantum amongst the States.				

The df/dt load shedding is specific to regions and therefore, the quantum of load shedding required to be wired up under the df/dt scheme be discussed at regional levels in the RPCs.

The RPCs in consultation with the stakeholders can decide on the quantum of Load shedding required to be wired up in Stage-1, 2 & 3 of the df/dt schemes.

In the Report, df/dt suggested for largest generating station/peak import in the region. Further the set point is suggested at 49.9 Hz which is lower most operating range of IEGC. The set point should be away from the operating range. **df/dt may be for credible contingency of each Region.**

The Task Force observed that df/dt load shedding is specific to regions and therefore, the quantum of load shedding required to be wired up under the df/dt scheme may be discussed at regional levels in the RPCs. The RPCs in consultation with the stakeholders can decide on the quantum of Load shedding required to be wired up in Stage-1, 2 & 3 of the df/dt schemes.

General Observations:

CE (GM), CEA opined that a comprehensive study needed to be carried out at National Leve l on the implementation of df/dt relays in the States. A common umbrella is needed at National Level (integrated grid) even though the issue is region specific.

NLDC suggested that it is very important that there should be a common methodology for df/dt relays at National Level. The settings/quantum may be Region Specific based on the LGB of each region taking care of most credible contingencies. He observed that in Rajasthan, there is concentrated RE and in case of trippings, the rate of fall of frequency may be high where as in WR where distributed RE generation are there the rate of fall in frequency may be less for the same quantum of trippings of generation. However it is pertinent to note that the same relay operation methodology (time duration for the operation of relay) should be identified for tripping of relays also.

MS SRPC informed that df/dt relays are implemented only in three regions (WR, NR and SR). Further studies needed to be carried out on the settings/quantum of df/dt relays and its implementation. In SR there are seven Islanding schemes in place, many SPSs, and other protection schemes and it is very difficult to get feeders for further protection schemes.

WRPC observed that the set points may be close to operating frequency.

MS SRPC informed that on other hand there was some recommendation that all protection settings should be away from operating range and accordingly df/dt settings in SR was kept at 49.5 Hz **& (0.2Hz/sec fall of frequency) and 49.3 Hz& & (0.3Hz/sec fall of frequency).** He opined that at present the concentration may be on implementation of AUFR relays. Subsequently df/dt relay issues may be discussed at NPC level and

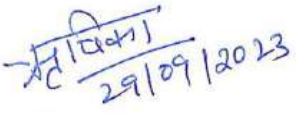
accordingly decision may be taken. At present df/dt relay implementation may be discussed and finalised at Regional Level.

GM, NLDC informed that it is appreciable to note that the recommendations are in line with New IEGC. He added that the df/dt relays are also equally important and need to take up seriously. It is not compulsory that all the regions need to have same set points since the contingencies will be different w.r.t different states. Monitoring certainly will help in getting confidence on safety net. Unfortunately most of the feeders are at lower voltage levels. For SLDCs it will be a challenge to acquire 100 % visibility but effort to be put to achieve the same. In Islanding visibility takes a significant role.

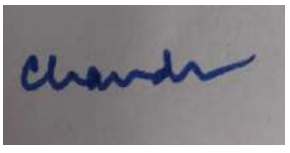
Acknowledgement

The Task Force is thankful to SRPC Secretariat for their assistance and support in preparation of the Report.

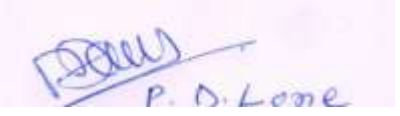
1. Superintending Engineer (O)
   SRPC
   - Convener of the Task Force



2. Chief Engineer (NPC)
   CEA

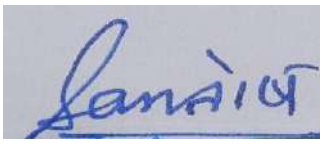


3. Chief Engineer (GM)
   CEA



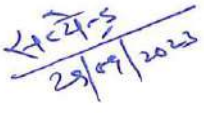
4. Superintending Engineer
   WRPC

5. Superintending Engineer
   ERPC

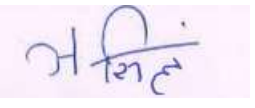


6. Superintending Engineer
   NRPC

7. Superintending Engineer
   NERPC



8. Director (NPC)
   CEA



9. General Manager
   NLDC

10. Member Secretary
    SRPC
    - Chairperson Task Force

ANNEXURE-I

Copy of letters dated 18th & 25th August 2023 from NPC

सत्यमेव जयते

भारत सरकार/Government of India
विद्युत मंत्रालय/ Ministry of Power
केन्द्रीय विद्युत प्राधिकरण/Central Electricity Authority
राष्ट्रीय विद्युत समिति प्रभाग/NPC Division
1st Floor, Wing-5, West Block-II, R.K. Puram, New Delhi-66

No. CEA-GO-15-14/1/2021-NPC Division/250 Date: 18 .08.2023

To,

(As per distribution list)

विषय:- आटोमेटिक अंडर फ्रीक्वेंसी लोड शेडिंग (एयूएफएलएस) और डीएफ/डीटी योजना पर टास्क फोर्स के गठन के संबंध में।

Subject: - Constitution of task force on Automatic Under Frequency Load Shedding (AUFLS) and df/dt scheme-reg.

It was decided in the 13th NPC meeting held on 05.07.2023 at Kolkata that a task force under chairmanship of MS, SRPC with Members from GRID-INDIA, RPCs/NPC may be formed.

Accordingly, the Constitution of the task force is as follows:-

1	Member Secretary, SRPC	Chairperson
2	Chief Engineer NPC,CEA	Member
3	Chief Engineer GM,CEA	Member
4	Representative from WRPC	Member
5	Representative from NRPC	Member
6	Representative from, ERPC	Member
7	Representative from NERPC	Member
8	Representative from NPC, CEA	Member
9	Representative from GRID-INDIA	Member
10	K.P Madhu, SE, SRPC	Member Convener

Taskforce may opt other members from any organization, if required.

2. Terms of Reference of the Taskforce is as follows:-
   i. Review of the recommendations of the report as per directions by the 13th NPC meeting within 2 months.
   ii. Prioritization of the loads under AUFLS and df/dt scheme.
   iii. To oversee the implementation of the report on Automatic Under Frequency Load Shedding (AUFLS) and df/dt scheme.
   iv. Any other suggestions/recommendations on related matters.

3. In this regard, it is requested that RPCs and GRID-INDIA may send their nominations (of the Rank not below SE from RPCs and GM from GRID-INDIA) to cenpccea@gmail.com by 22.08.2023.

This letter is issued with the approval of the competent authority.

भवदीय/Yours faithfully

18/8/2023

(ऋषिका शरण/Rishika Sharan)
मुख्य अभियन्ता एवं सदस्य सचिव,रा.वि.स /
Chief Engineer & Member Secretary, NPC

Distribution list:

1. CMD, GRID-INDIA, B-9 (1st Floor), Qutab Institutional Area, Katwaria Sarai, New Delhi 110016.
2. Member secretary, SRPC
3. Member secretary, ERPC
4. Member secretary, WRPC
5. Member secretary, NRPC
6. Member secretary, NERPC
7. Chief Engineer GM,CEA

Copy for kind information to:

1. SA to Chairprson,CEA
2. SA to Member GO&D, CEA

******

सत्यमेव जयते

भारत सरकार/Government of India
विद्युत मंत्रालय/ Ministry of Power
केन्द्रीय विद्युत प्राधिकरण/Central Electricity Authority
राष्ट्रीय विद्युत समिति प्रभाग/NPC Division
1st Floor, Wing-5, West Block-II, R.K. Puram, New Delhi-66

No. CEA-GO-15-14/1/2021-NPC Division/289-295 Date: 25.08.2023

To,

(As per distribution list)

विषयः- आटोमेटिक अंडर फ्रीक्वेंसी लोड शेडिंग (एयूएफएलएस) और डीएफ/डीटी योजना पर टास्क फोर्स के गठन के संबंध में।

Subject: - Constitution of task force on Automatic Under Frequency Load Shedding (AUFLS) and df/dt scheme-reg.

It was decided in the 13th NPC meeting held on 05.07.2023 at Kolkata that a task force under chairmanship of MS, SRPC with Members from GRID-INDIA, RPCs/NPC may be formed.

In this regards, NPC division vide letter No- CEA-GO-15-14/1/2021-NPC Division/250 dated 18.08.2023 requested RPCs and GRID-INDIA to send nomination for task force on Automatic Under Frequency Load Shedding (AUFLS) and df/dt scheme.

Accordingly, based on the nomination received from RPCs and GRID-INDIA the Constitution of the task force is as follows:-

1	Member Secretary, SRPC	Shri Asit Singh	**Chairperson**
2	Chief Engineer NPC,CEA	Smt. Rishika Sharan	Member
3	Chief Engineer GM,CEA	Shri Chandra Prakash	Member
4	Superintending Engineer,WRPC	Shri P.D.Lone	Member
5	Superintending Engineer,ERPC	Shri Shyam Kejriwal	Member
6	Superintending Engineer, NRPC	Shri Anzum Parwej	Member
7	Superintending Engineer NERPC	Shri S M Aimol	Member
8	Director,NPC,CEA	Shri Satyendra Kumar Dotan	Member
9	General Manager, NLDC	Shri Vivek Panday	Member
10	Superintending Engineer, SRPC	Shri K.P Madhu	**Member Convener**

2. Terms of Reference of the Taskforce is as follows:-

i. Review of the recommendations of the report as per directions by the 13th NPC meeting within 2 months.

ii. Prioritization of the loads under AUFLS and df/dt scheme.

iii. To oversee the implementation of the report on Automatic Under Frequency Load Shedding (AUFLS) and df/dt scheme.

iv. Any other suggestions/recommendations on related matters.

Task force can co-opt any member, if required.

भवदीय/Yours faithfully

ऋषिका 21(2)
25/8/23

(ऋषिका शरण/Rishika Sharan)
मुख्य अभियन्ता एवं सदस्य सचिव,रा.वि.स /
Chief Engineer & Member Secretary, NPC

Distribution list:

1. Shri Asit Singh, Member Secretary, SRPC, No.29, Race Course Cross Road, Bengaluru-560009. [Email: mssrpc-ka@nic.in]
2. Shri Chandra Prakash, Chief Engineer GM, CEA, Sewa Bhawan, RK Puram. New Delhi. [Email: cp_cea@nic.in]
3. Shri P.D.Lone, Superintending Engineer,WRPC, WRPC, Plot No- F-3, MIDC Area, Marol, Opp. SEEPZ, Central Road, Andheri (East), Mumbai-400093.[Email: pramod.lone@gmail.com]
4. Shyam Kejriwal, Superintending Engineer,ERPC, 14,Golf Club Road, ERPC Building, Tollygunje,Kolkata-700033.[Email: shyam.kejriwal@gov.in]
5. Shri Anzum Parwej, Superintending Engineer, NRPC, 18-A, Shaheed Jeet Singh Marg, Katwaria Sarai, New Delhi-110066.[Email: anjum.parwej@nic.in]
6. Shri S M Aimol, Superintending Engineer NERPC, NERPC Complex, Dong Parmaw, Lapalang, Shillong-793006.[Email: smaimol@gmail.com]
7. Shri Satyendra Kumar Dotan, Director, NPC, CEA,1st Floor, Wing-5, West Block-II, R.K. Puram, New Delhi-110066.[Email: skdotancea@nic.in]
8. Shri Vivek Panday, General Manager, NLDC, , B-9, Qutab Institutional Area, Katwaria Sarai, New Delhi -110016.[Email: vivek.pandey@grid-india.in]
9. Shri K.P Madhu, Superintending Engineer, SRPC, No.29, Race Course Cross Road, Bengaluru-560009.[Email: kp.madhu@gov.in]

Copy for kind information to:

1. SA to Chairperson, CEA, Sewa Bhawan, RK Puram. New Delhi.
2. SA to Member GO&D, CEA, Sewa Bhawan, RK Puram. New Delhi.
3. Shri S. R. Narasimhan, Chairman & Managing Director, GRID-INDIA , B-9, Qutab Institutional Area, Katwaria Sarai, New Delhi -110016. [Email: cmd@posoco.in]
4. Shri N.S. Mondal, Member Secretary, ERPC,14,Golf Club Road, ERPC Building, Tollygunje,Kolkata-700033. [Email: mserpc-power@nic.in]
5. Shri K B Jagtap, Member Secretary, NERPC, NERPC Complex, Dong Parmaw, Lapalang, Shillong-793006. [Email: ms-nerpc@gov.in]
6. Shri V.K.Singh, Member Secretary, NRPC, 18-A, Shaheed Jeet Singh Marg, Katwaria Sarai, New Delhi-110066.[Email: ms-nrpc@nic.in]
7. Shri Deepak Kumar., Member Secretary, WRPC, Plot No- F-3, MIDC Area, Marol, Opp. SEEPZ, Central Road, Andheri (East), Mumbai-400093.[email: ms-wrpc@nic.in]

******

ANNEXURE-II

Format for testing of AUFLS Relays

Annexure - II

REGION:

Inspection of AUFLS Relays at Site: **Date & Time:**

Details of Relay: **System frequency:**

Make of Relay	Serial no.	Stage	Date of Inspection

State/Name of Power Utilities:

Name of Sub-station:

Sr. No.	Name of feeder	Normal load relief envisaged in MW	UFR setting 49.2/49.0/ 48.8/48.7/ 48.6/48.4/ 48.2/48.0 Hz	Actual load at the time of inspection	Whether the feeder included in any other load shedding (such as SPS, Islanding, manual /ADMS etc)	Frequency Testing equipment used		Relay pick up frequency, Hz	Pick up time, sec	Relay drop off frequency, Hz	Relay drop off time, sec	Relay through trip test carried out Breaker Tripped or not	If Realy trip test is not carried out then continuity of Trip circuit upto Breaker trip coil checked
						Make	Sr. No.						

Name, Designation & Signature of the Site Engineer present at that time of inspection

Name & designation & sign of 3rd party inspecting officer

Note: 1. The functional testing has to be carried out by readjusting the relay setting to the present grid frequency.

2. Details of UFR operational & load relief obtained may be furnished in separate annexures.

ANNEXURE-III

Sample RPC Inspection Report Format

Annexure-III

UFR and df/dt Relay Inspection Report

Name of Substation:

Owned by (Licensee):

Date of Inspection/Testing by RPC:

Sl. No.	Name of the feeder/PTR	Setting Details of UFR & df/dt Relay	Expected Load Relief (declared) MW)	Maximum load (MW) *	Average load (MW)*	Status of SCADA Mapping	Type of Feeder (Radial/Ring)	Observations (Including make of Relay)	Action to be taken

*** Load during previous six months**

rhps.phem@sjvn.nic.in

From:	Power House Electrical MaintenanceDEPARTMENT <rhps.phem@sjvn.nic.in>
Sent:	09 September 2024 10:30
To:	rohit sharma; nrldcso2; rtamcjammu; nrldcoutage; nrldcso; sunil kumar1; Santosh Kumar
Cc:	prakashchand197; Sanjeev Kumar; VAIBHAV VIVEK, 20717 Dy Manager, PHD, RHPS; 20406 Sanjeet Singh Parmar
Subject:	Re: Regarding failed carrier protection at PLCC panel of Jhakri- Rampur ckt-2.
Attachments:	IED events 01Sep-08Sept. 2024.pdf; IED events 18th Aug -25th Aug 2024.pdf; IED events 25th Aug-01Sep 2024.pdf

Sir,
With reference to trailing emails, carrier protection for Rampur- Jhakri-ckt-2 failed in regular intervals in AUG- 2024 to till date for both channels 1&2 (IED event is attached herewith).
Further, you are once again requested to take the necessary action as no action has been taken since last 2 years.

Regards

From: "rhps phem" <rhps.phem@sjvn.nic.in>
To: "rohit sharma" <rohit.sharma@powergrid.in>, "nrldcso2" <nrldcso2@gmail.com>, "rtamcjammu" <rtamcjammu@powergrid.in>, "nrldcoutage" <nrldcoutage@grid-india.in>, "nrldcso" <nrldcso@grid-india.in>, "sunil kumar1" <sunil.kumar1@powergridindia.com>, "Santosh Kumar" <seo-nrpc@nic.in>
Cc: "prakashchand197" <prakashchand197@gmail.com>, "Sanjeev Kumar" <sanjeev_kr@sjvn.nic.in>, "VAIBHAV VIVEK, 20717 Dy Manager, PHD, RHPS" <vaibhav.vivek@sjvn.nic.in>, "20406 Sanjeet Singh Parmar" <ss_parmar@sjvn.nic.in>
Sent: Tuesday, August 20, 2024 10:27:10 AM
Subject: RE: Regarding failed carrier protection at PLCC panel of Jhakri- Rampur ckt-2.

Sir,
With reference to previous emails, carrier protection for Rampur- Jhakri-ckt-2 failed many times in AUG- 2024 for both channels 1&2 (IED event is attached herewith).
Further, you are once again requested to take the necessary action as no action has been taken since last 2 years.

Regards

-O/O-
GM(Elect.)/HOD),
Power House Electrical Maintenance Deptt. (PHEM)
412MW Rampur Hydro Power Station, SJVN Limited,
Vill. Bayal, P.O. Koyal, Tehsil Nirmand,
Distt. Kullu, H.P., Pin 172023

From: Power House Electrical MaintenanceDEPARTMENT <rhps.phem@sjvn.nic.in>
Sent: 04 April 2024 10:09
To: rohit sharma <rohit.sharma@powergrid.in>; nrldcso2 <nrldcso2@gmail.com>; rtamcjammu <rtamcjammu@powergrid.in>; nrldcoutage <nrldcoutage@grid-india.in>; nrldcso <nrldcso@grid-india.in>; sunil kumar1 <sunil.kumar1@powergridindia.com>

Cc: 20711 Arun Kumar <arun_kr@sjvn.nic.in>; 20406 Sanjeet Singh Parmar <ss_parmar@sjvn.nic.in>; prakashchand197 <prakashchand197@gmail.com>; Sanjeev Kumar <sanjeev_kr@sjvn.nic.in>
Subject: Re: Regarding failed carrier protection at PLCC panel of Jhakri- Rampur ckt-2.

Sir,
With reference to previous emails, carrier protection for Rampur- Jhakri-ckt-2 failed many times in March 2024 for both channels 1&2 (IED event is attached herewith)., however there is no corrective action initiated till date from your end.
Further, you are once again requested to take the necessary action as early as possible at your end

---

From: "Power House Electrical MaintenanceDEPARTMENT" <rhps.phem@sjvn.nic.in>
To: "rohit sharma" <rohit.sharma@powergrid.in>, "nrldcso2" <nrldcso2@gmail.com>, "rtamcjammu" <rtamcjammu@powergrid.in>
Cc: "20711 Arun Kumar" <arun_kr@sjvn.nic.in>, "20406 Sanjeet Singh Parmar" <ss_parmar@sjvn.nic.in>, "prakashchand197" <prakashchand197@gmail.com>, "Sanjeev Kumar" <sanjeev_kr@sjvn.nic.in>
Sent: Saturday, March 2, 2024 1:07:16 PM
Subject: Re: Regarding failed carrier protection at PLCC panel of Jhakri- Rampur ckt-2.

Sir,
With reference to previous emails, carrier protection for Rampur- Jhakri-ckt-2 failed many times in Feb 2024 for both channels 1&2 (IED event is attached herewith).
Further, you are once again requested to take the necessary action as early as possible at your end.

From: "Power House Electrical MaintenanceDEPARTMENT" <rhps.phem@sjvn.nic.in>
To: "rohit sharma" <rohit.sharma@powergrid.in>, "nrldcso2" <nrldcso2@gmail.com>, "rtamcjammu" <rtamcjammu@powergrid.in>
Cc: "20711 Arun Kumar" <arun_kr@sjvn.nic.in>, "20406 Sanjeet Singh Parmar" <ss_parmar@sjvn.nic.in>, "prakashchand197" <prakashchand197@gmail.com>, "Sanjeev Kumar" <sanjeev_kr@sjvn.nic.in>
Sent: Friday, February 2, 2024 5:43:39 PM
Subject: Re: Regarding failed carrier protection at PLCC panel of Jhakri- Rampur ckt-2.

Sir,
With reference to previous emails, carrier protection failed for Jhakri-Rampur ckt-2 instead of Rampur-Nalagarh ckt-2.
Further, you are once again requested to take the necessary action as early as possible at your end.

From: "Power House Electrical MaintenanceDEPARTMENT" <rhps.phem@sjvn.nic.in>
To: "rohit sharma" <rohit.sharma@powergrid.in>, "nrldcso2" <nrldcso2@gmail.com>, "rtamcjammu" <rtamcjammu@powergrid.in>
Cc: "20711 Arun Kumar" <arun_kr@sjvn.nic.in>, "20406 Sanjeet Singh Parmar" <ss_parmar@sjvn.nic.in>, "prakashchand197" <prakashchand197@gmail.com>, "Sanjeev Kumar" <sanjeev_kr@sjvn.nic.in>
Sent: Friday, February 2, 2024 5:22:36 PM
Subject: Re: Regarding failed carrier protection at PLCC panel of Jhakri- Rampur ckt-2.

Sir,

With reference to previous emails, carrier protection for Rampur-Nalagarh ckt-2 failed many times in Jan 2024 for both channels 1&2 (IED event is attached herewith).
Further, you are once again requested to take the necessary action as early as possible at your end.

From: "Power House Electrical MaintenanceDEPARTMENT" <rhps.phem@sjvn.nic.in>
To: "rohit sharma" <rohit.sharma@powergrid.in>
Cc: "20711 Arun Kumar" <arun_kr@sjvn.nic.in>, "20406 Sanjeet Singh Parmar" <ss_parmar@sjvn.nic.in>, "prakashchand197" <prakashchand197@gmail.com>, "Sanjeev Kumar" <sanjeev_kr@sjvn.nic.in>
Sent: Monday, November 13, 2023 3:40:42 PM
Subject: Re: Regarding failed carrier protection at PLCC panel of Jhakri- Rampur ckt-2.

Sir,
Please find the PLCC panels photograph including nameplate details for Jhakri end.

From: "Power House Electrical MaintenanceDEPARTMENT" <rhps.phem@sjvn.nic.in>
To: "rohit sharma" <rohit.sharma@powergrid.in>
Cc: "20711 Arun Kumar" <arun_kr@sjvn.nic.in>, "20406 Sanjeet Singh Parmar" <ss_parmar@sjvn.nic.in>, "prakashchand197" <prakashchand197@gmail.com>, "Sanjeev Kumar" <sanjeev_kr@sjvn.nic.in>
Sent: Monday, November 13, 2023 12:41:55 PM
Subject: Re: Regarding failed carrier protection at PLCC panel of Jhakri- Rampur ckt-2.

Sir,
With reference to trailing mail, PLCC panels photograph including name plate details have been attached herewith.

Regards & Thanks

-O/O-
AGM(Elect.)/HOD),
Power House Electrical Maintenance Deptt. (PHEM)
412MW Rampur Hydro Power Station, SJVN Limited,
Vill. Bayal, P.O. Koyal, Tehsil Nirmand,
Distt. Kullu, H.P., Pin 172023

From: "rohit sharma" <rohit.sharma@powergrid.in>
To: "Power House Electrical MaintenanceDEPARTMENT" <rhps.phem@sjvn.nic.in>
Sent: Monday, November 13, 2023 11:22:37 AM
Subject: Re: Regarding failed carrier protection at PLCC panel of Jhakri- Rampur ckt-2.

Dear sir,

M/s ABB is asking for photograph . please provide photographs of panels including name plate details.

with regards,
Rohit Sharma
Nalagarh

From: Power House Electrical MaintenanceDEPARTMENT <rhps.phem@sjvn.nic.in>
Sent: Tuesday, October 31, 2023 5:46 PM

To: Rtamcjammu <Rtamcjammu@powergrid.in>; nrldcso2 <nrldcso2@gmail.com>; Rohit Sharma {□□□□□ □□□□□} <rohit.sharma@powergrid.in>; Sunil Kumar {□□□□□ □□□□□} <sunil.kumar1@powergrid.in>; nrpc@nic.in <nrpc@nic.in>; Santosh Kumar <seo-nrpc@nic.in>; Dev Kumar {□□□ □□□□□} <devkumar@powergrid.in>; cpccjammu <cpccjammu@gmail.com>; cpccnr1 <cpccnr1@powergrid.in>; nrldcso2@grid-india.in <nrldcso2@grid-india.in>; alok kumar <alok.kumar@grid-india.in>
Cc: 20711 Arun Kumar <arun_kr@sjvn.nic.in>; 20406 Sanjeet Singh Parmar <ss_parmar@sjvn.nic.in>; prakashchand197 <prakashchand197@gmail.com>; Sanjeev Kumar <sanjeev_kr@sjvn.nic.in>
Subject: Re: Regarding failed carrier protection at PLCC panel of Jhakri- Rampur ckt-2.

Sir,
With reference to the subject cited, PLCC panels in both power station of Nathpa-Jhakri & Rampur HPS of SJVN is property of power grid along with panel maintenance. As earlier one-way communication with power grid authorities was already done many times via mail or telephonically but there has been no satisfactory response till date. Carrier protection has been down/off (as the Plcc panel not receiving any gain) for the last 6 months. Further, the IED event is attached for the last 15 days w.r.t 15.10.2023 to 29.10.2023 for your information.
Therefore, you are requested to depute an engineer to resolve the above-mentioned fault at the PLCC panel of Jhakri -Rampur ckt-2.

Regards

-O/O-
AGM(Elect.)/HOD),
Power House Electrical Maintenance Deptt. (PHEM)
412MW Rampur Hydro Power Station, SJVN Limited,
Vill. Bayal, P.O. Koyal, Tehsil Nirmand,
Distt. Kullu, H.P., Pin 172023

From: "Power House Electrical MaintenanceDEPARTMENT" <rhps.phem@sjvn.nic.in>
To: "RTAMC Jammu" <rtamcjammu@powergrid.co.in>, "nrldcso2" <nrldcso2@gmail.com>, "Rohit Sharma □□□□□ □□□□" <rohit.sharma@powergrid.in>, "SUNIL KUMAR □□□□□ □□□□□" <sunil.kumar1@powergrid.in>, nrpc@nic.in
Cc: "20711 Arun Kumar" <arun_kr@sjvn.nic.in>, "20406 Sanjeet Singh Parmar" <ss_parmar@sjvn.nic.in>, "prakashchand197" <prakashchand197@gmail.com>, "Sanjeev Kumar" <sanjeev_kr@sjvn.nic.in>
Sent: Monday, October 16, 2023 4:47:58 PM
Subject: Re: Regarding failed carrier protection at PLCC panel of Jhakri- Rampur ckt-2.

Sir,
With reference to the subject cited, PLCC panels in both power station of Nathpa-Jhakri & Rampur HPS of SJVN is property of power grid along with panel maintenance. As earlier one-way communication with power grid authorities was already done many times via mails or telephonically but there has been no satisfactory response till date. Carrier protection has been down/off (as the Plcc panel not receiving any gain) for the last 6 months. Further, the IED event is attached for the last 15 days w.r.t 01.10.2023 to 14.10.2023 for your information.
Therefore, you are requested to depute an engineer to resolve the above-mentioned fault at the PLCC panel of Jhakri -Rampur ckt-2.

Regards

From: "Power House Electrical MaintenanceDEPARTMENT" <rhps.phem@sjvn.nic.in>
To: "RTAMC Jammu" <rtamcjammu@powergrid.co.in>, "nrldcso2" <nrldcso2@gmail.com>, "Rohit Sharma □□□□□ □□□□" <rohit.sharma@powergrid.in>, "SUNIL KUMAR □□□□□ □□□□□" <sunil.kumar1@powergrid.in>
Cc: "20711 Arun Kumar" <arun_kr@sjvn.nic.in>, "20406 Sanjeet Singh Parmar" <ss_parmar@sjvn.nic.in>
Sent: Tuesday, October 3, 2023 1:19:37 PM
Subject: Fwd: Regarding failed carrier protection at PLCC panel of Jhakri- Rampur ckt-2.

Sir,
With reference to the subject cited, carrier protection for Jhakri -Rampur-ckt-2 failed for both channels 1&2 (the IED event is attached for the last week w.r.t 24.09.2023 to 30.09.2023).
Further, you are requested to take the necessary action as early as possible at your end.

Regards

From: "Power House Electrical MaintenanceDEPARTMENT" <rhps.phem@sjvn.nic.in>
To: "RTAMC Jammu" <rtamcjammu@powergrid.co.in>, "nrldcso2" <nrldcso2@gmail.com>, "Rohit Sharma □□□□□ □□□□" <rohit.sharma@powergrid.in>, "SUNIL KUMAR □□□□□ □□□□□" <sunil.kumar1@powergrid.in>
Cc: "Prakash Chand, 20452" <prakash_chand@sjvn.nic.in>, "Sanjeev Kumar" <sanjeev_kr@sjvn.nic.in>, "20711 Arun Kumar" <arun_kr@sjvn.nic.in>, "20406 Sanjeet Singh Parmar" <ss_parmar@sjvn.nic.in>
Sent: Tuesday, October 3, 2023 12:37:48 PM
Subject: Fwd: Regarding failed carrier protection at PLCC panel of Jhakri- Rampur ckt-2.

Sir,
With reference to the subject cited, carrier protection for Jhakri -Rampur-ckt-2 failed for both channels 1&2 (the IED event is attached for the last week w.r.t 24.09.2023 to 30.09.2023).
Further, you are requested to take the necessary action as early as possible at your end.

Regards

From: "Power House Electrical MaintenanceDEPARTMENT" <rhps.phem@sjvn.nic.in>
To: "RTAMCJammu" <rtamcjammu@powergrid.co.in>, "nrldcso2" <nrldcso2@gmail.com>, "Rohit Sharma □□□□□ □□□□" <rohit.sharma@powergrid.in>, "SUNIL KUMAR □□□□□ □□□□□" <sunil.kumar1@powergrid.in>
Cc: "Prakash Chand, 20452" <prakash_chand@sjvn.nic.in>, "20711 Arun Kumar" <arun_kr@sjvn.nic.in>, "20406 Sanjeet Singh Parmar" <ss_parmar@sjvn.nic.in>, "Sanjeev Kumar" <sanjeev_kr@sjvn.nic.in>
Sent: Monday, September 25, 2023 5:23:40 PM
Subject: Re: Regarding failed carrier protection at PLCC panel of Jhakri- Rampur ckt-2.

Sir,
With reference to the subject cited, carrier protection for Jhakri -Rampur-ckt-2 failed for both channels 1&2 (the IED event is attached for the last week w.r.t 17.09.2023 to 24.09.2023).
Further, you are requested to take the necessary action as early as possible at your end.

Regards

-O/O-

AGM(Elect.)/HOD),
Power House Electrical Maintenance Deptt. (PHEM)

412MW Rampur Hydro Power Station, SJVN Limited,
Vill. Bayal, P.O. Koyal, Tehsil Nirmand,
Distt. Kullu, H.P., Pin 172023

From: "Power House Electrical MaintenanceDEPARTMENT" <rhps.phem@sjvn.nic.in>
To: "RTAMCJammu" <rtamcjammu@powergrid.co.in>, "nrldcso2" <nrldcso2@gmail.com>, "Rohit Sharma □□□□□ □□□□" <rohit.sharma@powergrid.in>, "SUNIL KUMAR □□□□□ □□□□□" <sunil.kumar1@powergrid.in>
Cc: "Prakash Chand, 20452" <prakash_chand@sjvn.nic.in>, "20711 Arun Kumar" <arun_kr@sjvn.nic.in>, "20406 Sanjeet Singh Parmar" <ss_parmar@sjvn.nic.in>, "Sanjeev Kumar" <sanjeev_kr@sjvn.nic.in>
Sent: Tuesday, September 19, 2023 12:57:18 PM
Subject: Re: Regarding failed carrier protection at PLCC panel of Jhakri- Rampur ckt-2.

Sir,
As telephonically discussed, requisite PLCC panel detail and status are attached herewith.

Regards

-O/O-

AGM(Elect.)/HOD),
Power House Electrical Maintenance Deptt. (PHEM)
412MW Rampur Hydro Power Station, SJVN Limited,
Vill. Bayal, P.O. Koyal, Tehsil Nirmand,
Distt. Kullu, H.P., Pin 172023

From: "Power House Electrical MaintenanceDEPARTMENT" <rhps.phem@sjvn.nic.in>
To: "RTAMCJammu" <rtamcjammu@powergrid.co.in>, "nrldcso2" <nrldcso2@gmail.com>, "Rohit Sharma □□□□□ □□□□" <rohit.sharma@powergrid.in>, "SUNIL KUMAR □□□□□ □□□□□" <sunil.kumar1@powergrid.in>
Cc: "Prakash Chand, 20452" <prakash_chand@sjvn.nic.in>, "20711 Arun Kumar" <arun_kr@sjvn.nic.in>, "20406 Sanjeet Singh Parmar" <ss_parmar@sjvn.nic.in>, "Sanjeev Kumar" <sanjeev_kr@sjvn.nic.in>
Sent: Monday, September 18, 2023 4:51:19 PM
Subject: Re: Regarding failed carrier protection at PLCC panel of Jhakri- Rampur ckt-2.

Sir,
With reference to the subject cited, carrier protection for Jhakri -Rampur-ckt-2 failed for both channels 1&2 (the IED event is attached for the last 7 days).
Further, you are requested to take the necessary action as early as possible at your end.

Regards

-O/O-

AGM(Elect.)/HOD),
Power House Electrical Maintenance Deptt. (PHEM)
412MW Rampur Hydro Power Station, SJVN Limited,
Vill. Bayal, P.O. Koyal, Tehsil Nirmand,
Distt. Kullu, H.P., Pin 172023

From: "Power House Electrical MaintenanceDEPARTMENT" <rhps.phem@sjvn.nic.in>
To: "RTAMCJammu" <rtamcjammu@powergrid.co.in>, "nrldcso2" <nrldcso2@gmail.com>, "Rohit Sharma

□□□□□ □□□□" <rohit.sharma@powergrid.in>, "SUNIL KUMAR □□□□□ □□□□□"
<sunil.kumar1@powergrid.in>
Cc: "Prakash Chand, 20452" <prakash_chand@sjvn.nic.in>, "20711 Arun Kumar" <arun_kr@sjvn.nic.in>,
"20406 Sanjeet Singh Parmar" <ss_parmar@sjvn.nic.in>
Sent: Monday, September 11, 2023 10:50:38 AM
Subject: Re: Regarding failed carrier protection at PLCC panel of Jhakri- Rampur ckt-2.

Sir,
With reference to the subject cited, carrier protection for Jhakri -Rampur-ckt-2 failed for both channels 1&2 (the IED event is attached for the last 7 days).
Further, you are requested to take the necessary action as early as possible at your end.

Regards

-O/O-

AGM(Elect.)/HOD),
Power House Electrical Maintenance Deptt. (PHEM)
412MW Rampur Hydro Power Station, SJVN Limited,
Vill. Bayal, P.O. Koyal, Tehsil Nirmand,
Distt. Kullu, H.P., Pin 172023

From: "Power House Electrical MaintenanceDEPARTMENT" <rhps.phem@sjvn.nic.in>
To: "RTAMCJammu" <rtamcjammu@powergrid.co.in>, "nrldcso2" <nrldcso2@gmail.com>, "Rohit Sharma
□□□□□ □□□□" <rohit.sharma@powergrid.in>, "SUNIL KUMAR □□□□□ □□□□□"
<sunil.kumar1@powergrid.in>
Cc: "Prakash Chand, 20452" <prakash_chand@sjvn.nic.in>, "20711 Arun Kumar" <arun_kr@sjvn.nic.in>,
"vinay painuly" <vinay.painuly@gmail.com>, "20406 Sanjeet Singh Parmar" <ss_parmar@sjvn.nic.in>
Sent: Monday, August 28, 2023 3:37:09 PM
Subject: Re: Regarding failed carrier protection at PLCC panel of Jhakri- Rampur ckt-2.

Sir,
With reference to the subject cited, carrier protection for Jhakri -Rampur-ckt-2 failed for both channels 1&2 (the IED event is attached for the last 7 days).
Further, you are requested to take the necessary action as early as possible at your end.

Regards,

From: "Power House Electrical MaintenanceDEPARTMENT" <rhps.phem@sjvn.nic.in>
To: "RTAMCJammu" <rtamcjammu@powergrid.co.in>, "nrldcso2" <nrldcso2@gmail.com>, "Rohit Sharma
□□□□□ □□□□" <rohit.sharma@powergrid.in>, "SUNIL KUMAR □□□□□ □□□□□"
<sunil.kumar1@powergrid.in>
Cc: "Prakash Chand, 20452" <prakash_chand@sjvn.nic.in>, "20711 Arun Kumar" <arun_kr@sjvn.nic.in>,
"vinay painuly" <vinay.painuly@gmail.com>, "20406 Sanjeet Singh Parmar" <ss_parmar@sjvn.nic.in>
Sent: Friday, August 11, 2023 3:56:43 PM
Subject: Re: Regarding failed carrier protection at PLCC panel of Jhakri- Rampur ckt-2.

Sir,
Regarding the subject cited, carrier protection for Jhakri -Rampur-ckt-2 failed for both channels 1&2 (the IED event is attached for last 15 days).
Further, you are requested to take the necessary action as early as possible at your end.

Regards,

From: "Power House Electrical MaintenanceDEPARTMENT" <rhps.phem@sjvn.nic.in>
To: "RTAMCJammu" <rtamcjammu@powergrid.co.in>, "nrldcso2" <nrldcso2@gmail.com>, "Rohit Sharma □□□□□ □□□□" <rohit.sharma@powergrid.in>, "SUNIL KUMAR □□□□□ □□□□□" <sunil.kumar1@powergrid.in>
Cc: "Prakash Chand, 20452" <prakash_chand@sjvn.nic.in>, "20711 Arun Kumar" <arun_kr@sjvn.nic.in>, "vinay painuly" <vinay.painuly@gmail.com>, "20406 Sanjeet Singh Parmar" <ss_parmar@sjvn.nic.in>
Sent: Wednesday, July 26, 2023 4:31:21 PM
Subject: Re: Regarding failed carrier protection at PLCC panel of Jhakri- Rampur ckt-2.

Sir,
With reference to trailing mail, please find attachment of details regarding carrier fail protection at Jhakri-Rampur ckt -2 channel 1&2 for your information please.

From: "Power House Electrical MaintenanceDEPARTMENT" <rhps.phem@sjvn.nic.in>
To: "RTAMCJammu" <rtamcjammu@powergrid.co.in>, "nrldcso2" <nrldcso2@gmail.com>, "Rohit Sharma □□□□□ □□□□" <rohit.sharma@powergrid.in>, "SUNIL KUMAR □□□□□ □□□□□" <sunil.kumar1@powergrid.in>
Cc: "Prakash Chand, 20452" <prakash_chand@sjvn.nic.in>, "Sanjeev Kumar" <sanjeev_kr@sjvn.nic.in>, "20711 Arun Kumar" <arun_kr@sjvn.nic.in>, "vinay painuly" <vinay.painuly@gmail.com>, "20406 Sanjeet Singh Parmar" <ss_parmar@sjvn.nic.in>
Sent: Friday, June 9, 2023 9:55:55 AM
Subject: Fwd: Regarding failed carrier protection at PLCC panel of Jhakri- Rampur ckt-2.

Sir,
With reference to subject cited, once again carrier protection for Jhakri -Rampur-ckt-2 failed for both channels 1&2 (IED event is attached herewith).
Further, you are requested to take the necessary action as early as possible at your end.

Regards,

From: "Power House Electrical MaintenanceDEPARTMENT" <rhps.phem@sjvn.nic.in>
To: "RTAMCJammu" <rtamcjammu@powergrid.co.in>, "nrldcso2" <nrldcso2@gmail.com>, "Rohit Sharma □□□□□ □□□□" <rohit.sharma@powergrid.in>, "SUNIL KUMAR □□□□□ □□□□□" <sunil.kumar1@powergrid.in>
Cc: "Prakash Chand, 20452" <prakash_chand@sjvn.nic.in>, "Sanjeev Kumar" <sanjeev_kr@sjvn.nic.in>, "20711 Arun Kumar" <arun_kr@sjvn.nic.in>, "vinay painuly" <vinay.painuly@gmail.com>, "20406 Sanjeet Singh Parmar" <ss_parmar@sjvn.nic.in>
Sent: Monday, June 5, 2023 11:51:11 AM
Subject: Fwd: Regarding failed carrier protection at PLCC panel of Jhakri- Rampur ckt-2

Sir,
With reference to subject cited, once again carrier protection for Jhakri -Rampur-ckt-2 failed for both channels 1&2 (IED event is attached herewith).
Further, you are requested to take the necessary action as early as possible at your end.

Regards,

From: "Power House Electrical MaintenanceDEPARTMENT" <rhps.phem@sjvn.nic.in>
To: "RTAMCJammu" <rtamcjammu@powergrid.co.in>, "nrldcso2" <nrldcso2@gmail.com>, "Rohit Sharma □□□□□ □□□□" <rohit.sharma@powergrid.in>, "SUNIL KUMAR □□□□□ □□□□□"

<sunil.kumar1@powergrid.in>
Cc: prakashchand197@gmail.com, "20711 Arun Kumar" <arun_kr@sjvn.nic.in>, "vinay painuly" <vinay.painuly@gmail.com>, "20406 Sanjeet Singh Parmar" <ss_parmar@sjvn.nic.in>, "Sanjeev Kumar" <sanjeev_kr@sjvn.nic.in>
Sent: Thursday, June 1, 2023 10:02:32 AM
Subject: Re: Regarding failed carrier protection at PLCC panel of Jhakri- Rampur ckt-2

Sir,
With reference to subject cited, once again carrier protection for Jhakri -Rampur-ckt-2 failed for both channels 1&2 (IED event is attached herewith).
Further, you are requested to take the necessary action as early as possible at your end.

Regards

From: "Power House Electrical MaintenanceDEPARTMENT" <rhps.phem@sjvn.nic.in>
To: "RTAMCJammu" <rtamcjammu@powergrid.co.in>, "nrldcso2" <nrldcso2@gmail.com>, "Rohit Sharma □□□□□ □□□□" <rohit.sharma@powergrid.in>, "SUNIL KUMAR □□□□□ □□□□□" <sunil.kumar1@powergrid.in>
Cc: prakashchand197@gmail.com, "20711 Arun Kumar" <arun_kr@sjvn.nic.in>, "vinay painuly" <vinay.painuly@gmail.com>, "20406 Sanjeet Singh Parmar" <ss_parmar@sjvn.nic.in>, "Sanjeev Kumar" <sanjeev_kr@sjvn.nic.in>
Sent: Saturday, May 27, 2023 5:48:13 PM
Subject: Re: Regarding failed carrier protection at PLCC panel of Jhakri- Rampur ckt-2

Sir,
With reference to previous mail, carrier protection for Jhakri -Rampur-ckt-2 failed for both channels 1&2 (IED event is attached herewith).
Further, you are once again requested to take the necessary action as early as possible at your end.

From: "Power House Electrical MaintenanceDEPARTMENT" <rhps.phem@sjvn.nic.in>
To: "RTAMCJammu" <rtamcjammu@powergrid.co.in>, "nrldcso2" <nrldcso2@gmail.com>, "Rohit Sharma □□□□□ □□□□" <rohit.sharma@powergrid.in>, "SUNIL KUMAR □□□□□ □□□□□" <sunil.kumar1@powergrid.in>, "sunil kumar1" <sunil.kumar1@powergridindia.com>
Cc: prakashchand197@gmail.com, "20711 Arun Kumar" <arun_kr@sjvn.nic.in>, "vinay painuly" <vinay.painuly@gmail.com>, "20406 Sanjeet Singh Parmar" <ss_parmar@sjvn.nic.in>, "Sanjeev Kumar" <sanjeev_kr@sjvn.nic.in>
Sent: Friday, May 26, 2023 4:23:49 PM
Subject: Re: Regarding failed carrier protection at PLCC panel of Jhakri- Rampur ckt-2

Sir,
With reference to previous emails, carrier protection for Jhakri -Rampur-ckt-2 failed today at 14:41 hrs for both channels 1&2 (IED event is attached herewith).
Further, you are once again requested to take the necessary action as early as possible at your end

---

From: "Power House Electrical MaintenanceDEPARTMENT" <rhps.phem@sjvn.nic.in>
To: "RTAMCJammu" <rtamcjammu@powergrid.co.in>, "nrldcso2" <nrldcso2@gmail.com>, "Rohit Sharma □□□□□ □□□□" <rohit.sharma@powergrid.in>, "SUNIL KUMAR □□□□□ □□□□□" <sunil.kumar1@powergrid.in>, "sunil kumar1" <sunil.kumar1@powergridindia.com>
Cc: prakashchand197@gmail.com, "20711 Arun Kumar" <arun_kr@sjvn.nic.in>, "vinay painuly" <vinay.painuly@gmail.com>, "20406 Sanjeet Singh Parmar" <ss_parmar@sjvn.nic.in>, "Sanjeev Kumar" <sanjeev_kr@sjvn.nic.in>
Sent: Friday, May 26, 2023 3:30:30 PM
Subject: Re: Regarding failed carrier protection at PLCC panel of Jhakri- Rampur ckt-2

Sir,
With reference to previous emails, once again carrier protection for Rampur-Nalagarh ckt-2 failed today at 14:41 hrs for both channels 1&2 (IED event is attached herewith).
Further, you are once again requested to take the necessary action as early as possible at your end

---

From: "Power House Electrical MaintenanceDEPARTMENT" <rhps.phem@sjvn.nic.in>
To: "RTAMCJammu" <rtamcjammu@powergrid.co.in>, "nrldcso2" <nrldcso2@gmail.com>, "Rohit Sharma □□□□□ □□□□" <rohit.sharma@powergrid.in>, "SUNIL KUMAR □□□□□ □□□□□" <sunil.kumar1@powergrid.in>, "sunil kumar1" <sunil.kumar1@powergridindia.com>
Cc: prakashchand197@gmail.com, "20711 Arun Kumar" <arun_kr@sjvn.nic.in>, "vinay painuly" <vinay.painuly@gmail.com>, "Er. Pintu Das DGM Rampur HPS SJVN Ltd" <pintu.das@sjvn.nic.in>, "20406 Sanjeet Singh Parmar" <ss_parmar@sjvn.nic.in>, "Sanjeev Kumar" <sanjeev_kr@sjvn.nic.in>
Sent: Wednesday, November 9, 2022 5:51:57 PM
Subject: Re: Regarding failed carrier protection at PLCC panel of Jhakri- Rampur ckt-2

Sir,
This has reference to previous trailing mails and telephonically discussed dated 07/11/2022 regarding the subject cited, as per your request IED events of carrier protection failure for both channels 1&2 have been submitted for NJ-RH ckt-2 (events are attached herewith)
Further, you are once again requested to take the necessary action as early as possible at your end

---

From: "Phem" <rhps.phem@sjvn.nic.in>
To: "Rohit Sharma ?????????????? ????????????" <rohit.sharma@powergrid.in>, "Rohit Sharma ?????????????? ????????????" <rohitsharma@powergrid.in>
Cc: prakashchand197@gmail.com, "20711 Arun Kumar" <arun_kr@sjvn.nic.in>, "vinay painuly" <vinay.painuly@gmail.com>, "Er. Pintu Das DGM Rampur HPS SJVN Ltd" <pintu.das@sjvn.nic.in>, "20406 Sanjeet Singh Parmar" <ss_parmar@sjvn.nic.in>, "Sanjeev Kumar" <sanjeev_kr@sjvn.nic.in>
Sent: Tuesday, October 18, 2022 6:04:39 PM
Subject: Re: Regarding failed carrier protection at PLCC panel of Jhakri- Rampur ckt-2

Sir,
Its gentle reminder 4!!!,
As communicated to you many times in recent past, carrier protection of NJ- RH - 2 has failed in regular intervals and still not resolved till dated.
Therefore you are again requested to take necessary action at your end please.

-O/O-

AGM(Elect.)/HOD),
Power House Electrical Maintenance Deptt. (PHEM)
412MW Rampur Hydro Power Station, SJVN Limited,
Vill. Bayal, P.O. Koyal, Tehsil Nirmand,
Distt. Kullu, H.P., Pin 172023

Sent from Android device

On Oct 6, 2022 10:11, Power House Electrical MaintenanceDEPARTMENT <rhps.phem@sjvn.nic.in> wrote:

From: "Power House Electrical MaintenanceDEPARTMENT" <rhps.phem@sjvn.nic.in>
To: "Rohit Sharma □□□□□ □□□□" <rohit.sharma@powergrid.in>, "Rohit Sharma □□□□□ □□□□" <rohitsharma@powergrid.in>
Cc: prakashchand197@gmail.com, "20711 Arun Kumar" <arun_kr@sjvn.nic.in>, "vinay painuly" <vinay.painuly@gmail.com>, "Er. Pintu Das DGM Rampur HPS SJVN Ltd" <pintu.das@sjvn.nic.in>, "20406 Sanjeet Singh Parmar" <ss_parmar@sjvn.nic.in>, "Sanjeev Kumar" <sanjeev_kr@sjvn.nic.in>
Sent: Wednesday, September 28, 2022 11:09:47 AM
Subject: Re: Regarding failed carrier protection at PLCC panel of Jhakri- Rampur ckt-2

SIr,

Gentle reminder 2!!!

From: "Power House Electrical MaintenanceDEPARTMENT" <rhps.phem@sjvn.nic.in>
To: "Rohit Sharma □□□□□ □□□□" <rohit.sharma@powergrid.in>, "Rohit Sharma □□□□□ □□□□" <rohitsharma@powergrid.in>
Cc: prakashchand197@gmail.com, "20711 Arun Kumar" <arun_kr@sjvn.nic.in>, "vinay painuly" <vinay.painuly@gmail.com>, "Sanjeev Kumar" <sanjeev_kr@sjvn.nic.in>, "Er. Pintu Das DGM Rampur HPS SJVN Ltd" <pintu.das@sjvn.nic.in>, "20406 Sanjeet Singh Parmar" <ss_parmar@sjvn.nic.in>
Sent: Saturday, September 24, 2022 12:37:29 PM
Subject: Re: Regarding failed carrier protection at PLCC panel of Jhakri- Rampur ckt-2

In view of the above, you are requested to inform us what action is

---

From: "Power House Electrical MaintenanceDEPARTMENT" <rhps.phem@sjvn.nic.in>
To: nkmeena@powergrid.in
Cc: "sunil kumar1" <sunil.kumar1@powergrid.in>, "rohit sharma" <rohit.sharma@powergrid.in>, prakashchand197@gmail.com, "20711 Arun Kumar" <arun_kr@sjvn.nic.in>, "vinay painuly" <vinay.painuly@gmail.com>, "Sanjeev Kumar" <sanjeev_kr@sjvn.nic.in>, "Er. Pintu Das DGM Rampur HPS SJVN Ltd" <pintu.das@sjvn.nic.in>
Sent: Tuesday, August 9, 2022 5:08:40 PM
Subject: Re: Regarding failed carrier protection at PLCC panel of Jhakri- Rampur ckt-2

Sir,
In continuation to your trailing mail, it has further been submitted that PLCC panels in both power station of Nathpa-Jhakri & Rampur HPS of SJVN are property of power grid along with panel maintenance. We had

already informed regarding frequent carrier protection fail alarm which is still persisting in interval and need rectification or any other alternate solution. As you have informed in trailing mail that E1 channel connectivity has been created on tejas panel, however, interconnection between PLCC panel and E1 channel is still opened in both power station of Nathpa-Jhakri & Rampur HPS and need to be completed.
Therefore, you are further requested to depute an engineer to accomplish the above said work either through the E1 channel connectivity to PLCC panel or rectify the existing scheme of PLCC at both end in order to mitigate the failure risk of carrier protection when it needed most during fault condition.

From: pradeepk@tejasnetworks.com
To: nkmeena@powergrid.in
Cc: "sunil kumar1" <sunil.kumar1@powergrid.in>, "rohit sharma" <rohit.sharma@powergrid.in>, "Power House Electrical MaintenanceDEPARTMENT" <rhps.phem@sjvn.nic.in>, prakashchand197@gmail.com, "20711 Arun Kumar" <arun_kr@sjvn.nic.in>, "vinay painuly" <vinay.painuly@gmail.com>, "Sanjeev Kumar" <sanjeev_kr@sjvn.nic.in>, "Er. Pintu Das DGM Rampur HPS SJVN Ltd" <pintu.das@sjvn.nic.in>
Sent: Tuesday, August 2, 2022 4:07:59 PM
Subject: RE: Regarding failed carrier protection at PLCC panel of Jhakri- Rampur ckt-2

Dear Sir,

Please find port details.

E1 channel 1:-

Rampur-SDH-1port#1-107-8

Nathpa Jhakri- SDH-1#port#1-107-8

E1 channel 2:-

Rampur-SDH-1port#1-107-9

Nathpa Jhakri- SDH-1#port#1-107-9

Thanks & Regards,

Pradeep Kumar

9911004204

From: Narendra Kumar Meena {नरेंद्र कुमार मीणा} [mailto:nkmeena@powergrid.in]
Sent: 02 August 2022 11:27
To: Pradeep Kumar <pradeepk@tejasnetworks.com>
Cc: SUNIL KUMAR {सुनील कुमार} <sunil.kumar1@powergrid.in>; Rohit Sharma {रोहित शर्मा} <rohit.sharma@powergrid.in>; Power House Electrical MaintenanceDEPARTMENT <rhps.phem@sjvn.nic.in>; prakashchand197 <prakashchand197@gmail.com>; 20711 Arun Kumar <arun_kr@sjvn.nic.in>; Vinay.painuly <vinay.painuly@gmail.com>; Sanjeev Kumar <sanjeev_kr@sjvn.nic.in>; Er. Pintu Das DGM Rampur HPS SJVN Ltd <pintu.das@sjvn.nic.in>
Subject: RE: Regarding failed carrier protection at PLCC panel of Jhakri- Rampur ckt-2

[External email, Exercise caution]

Please configure 2 nos. of E1 between Rampur & Nathpa Jhakri (SJVNL) , port details may be shared by return mail

Regards,

Narendra Kr Meena

Chief Manager (NR-ULDC)

POWERGRID

RHQ, NRTS-I, Faridabad

Ph. +91-9810082410

From: Power House Electrical MaintenanceDEPARTMENT <rhps.phem@sjvn.nic.in>
Sent: Monday, August 01, 2022 12:39
To: Narendra Kumar Meena {नरेंद्र कुमार मीणा} <nkmeena@powergrid.in>
Cc: SUNIL KUMAR {सुनील कुमार} <sunil.kumar1@powergrid.in>; Rohit Sharma {रोहित शर्मा} <rohit.sharma@powergrid.in>; prakashchand197 <prakashchand197@gmail.com>; 20711 Arun Kumar <arun_kr@sjvn.nic.in>; Vinay.painuly <vinay.painuly@gmail.com>; Sanjeev Kumar

<sanjeev_kr@sjvn.nic.in>; Er. Pintu Das DGM Rampur HPS SJVN Ltd <pintu.das@sjvn.nic.in>
Subject: Re: Regarding failed carrier protection at PLCC panel of Jhakri- Rampur ckt-2

Dear sir,

With reference to the trailing mail, we requested you to provide E1 connectivity with redundant link between both station Rampur & Jhakri for the ckt Rampur-Jhakri 2 on tejas panel.

From: "Narendra Kumar Meena {नरेंद्र कुमार मीणा}" <nkmeena@powergrid.in>
To: "Power House Electrical MaintenanceDEPARTMENT" <rhps.phem@sjvn.nic.in>
Cc: "SUNIL KUMAR {सुनील कुमार}" <sunil.kumar1@powergrid.in>, "Rohit Sharma {रोहित शर्मा}" <rohit.sharma@powergrid.in>, "prakashchand197" <prakashchand197@gmail.com>, "arun_kr" <arun_kr@sjvn.nic.in>, "Vinay.painuly" <vinay.painuly@gmail.com>, "sanjeev_kr" <sanjeev_kr@sjvn.nic.in>
Sent: Sunday, July 31, 2022 11:59:32 AM
Subject: Re: Re: Regarding failed carrier protection at PLCC panel of Jhakri- Rampur ckt-2

Dear sir,

It is understood that this carrier protection system is working on PLCC panel of Jhakri- Rampur (owned by SJVNL). As of now, no communication equipment are involved, however for future requirement purpose, we can provide E1 connectivity between these station on Tejas equipment. SJVNL may procure DTPC system, if not available at site.

Any further clarification/ query may be revert back.

Regards,

Narendra Kr Meena

Chief Manager (NR-ULDC)

POWERGRID

RHQ, NRTS-I, Faridabad

Ph. +91-9810082410

On 30-Jul-2022 at 10:53 am, SUNIL KUMAR {सुनील कुमार} <sunil.kumar1@powergrid.in> wrote:

++

Thanks

With Regards

Sunil Kumar

ULDC

---------- Forwarded message ----------
From: Power House Electrical MaintenanceDEPARTMENT <rhps.phem@sjvn.nic.in>
Date: Jul 30, 2022 10:18 AM
Subject: Re: Regarding failed carrier protection at PLCC panel of Jhakri- Rampur ckt-2
To: Rohit Sharma {रोहित शर्मा} <rohit.sharma@powergrid.in>,SUNIL KUMAR {सुनील कुमार} <sunil.kumar1@powergrid.in>
Cc: prakashchand197 <prakashchand197@gmail.com>,20711 Arun Kumar <arun_kr@sjvn.nic.in>,Vinay painuly <Vinay.painuly@gmail.com>,Sanjeev Kumar <sanjeev_kr@sjvn.nic.in>

It's a reminder

Sir,

With reference to the trailing mail, it is a reminder that carrier protection was again failed in Jhakri- Rampur ckt-2 for both channel 1&2 on dated 28.07.2022 & 29.07.2022(Copy of IED events attached herewith)

This is for your kind information and necessary action at your end please.

From: "Power House Electrical MaintenanceDEPARTMENT" <rhps.phem@sjvn.nic.in>
To: "Rohit Sharma रोहित शर्म" <rohit.sharma@powergrid.in>, "sunil kumar1" <sunil.kumar1@powergridindia.com>

Cc: "prakashchand197" <prakashchand197@gmail.com>, "20711 Arun Kumar" <arun_kr@sjvn.nic.in>, "Vinay painuly" <Vinay.painuly@gmail.com>, "Sanjeev Kumar" <sanjeev_kr@sjvn.nic.in>, "sunil kumar1" <sunil.kumar1@powergridindia.com>, "20711 Arun Kumar" <arun_kr@sjvn.nic.in>,"Vinay painuly" <Vinay.painuly@gmail.com>
Sent: Wednesday, July 27, 2022 5:49:55 PM
Subject: Regarding failed carrier protection at PLCC panel of Jhakri- Rampur ckt-2

Sir,

With the reference to the subject cited, it is informed to you that carrier protection was failed in Jhakri- Rampur ckt-2 for both channel 1&2 on dated 24.07.2022 & 26.07.2022 (copy of IED events attached herewith)

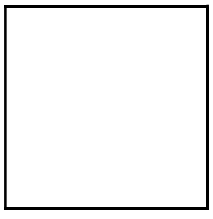
This is for your kind information and necessary action at your end please.

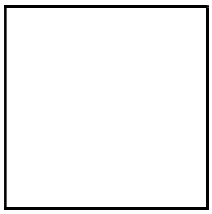
--

-O/O-
AGM(Elect.)/HOD),
Power House Electrical Maintenance Deptt. (PHEM)
412MW Rampur Hydro Power Station, SJVN Limited,
Vill. Bayal, P.O. Koyal, Tehsil Nirmand,
Distt. Kullu, H.P., Pin 172023

--

-O/O-
AGM(Elect.)/HOD),
Power House Electrical Maintenance Deptt. (PHEM)
412MW Rampur Hydro Power Station, SJVN Limited,
Vill. Bayal, P.O. Koyal, Tehsil Nirmand,
Distt. Kullu, H.P., Pin 172023





दावात्याग: यह ईमेल पावरग्रिड के दावात्याग नियम व शर्तों द्वारा शासित है जिसे http://apps.powergrid.in/Disclaimer.htm पर देखा जा सकता है।
Disclaimer: This e-mail is governed by the Disclaimer Terms & Conditions of POWERGRID which may be viewed at http://apps.powergrid.in/Disclaimer.htm

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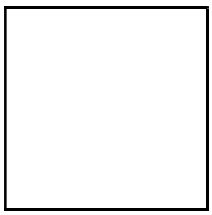
-O/O-
AGM(Elect.)/HOD),
Power House Electrical Maintenance Deptt. (PHEM)
412MW Rampur Hydro Power Station, SJVN Limited,
Vill. Bayal, P.O. Koyal, Tehsil Nirmand,
Distt. Kullu, H.P., Pin 172023



दावात्याग: यह ईमेल पावरग्रिड के दावात्याग नियम व शर्तों द्वारा शासित है जिसे http://apps.powergrid.in/Disclaimer.htm पर देखा जा सकता है।
Disclaimer: This e-mail is governed by the Disclaimer Terms & Conditions of POWERGRID which may be viewed at http://apps.powergrid.in/Disclaimer.htm

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-O/O-
AGM(Elect.)/HOD),
Power House Electrical Maintenance Deptt. (PHEM)
412MW Rampur Hydro Power Station, SJVN Limited,
Vill. Bayal, P.O. Koyal, Tehsil Nirmand,
Distt. Kullu, H.P., Pin 172023

--

-O/O-
AGM(Elect.)/HOD),
Power House Electrical Maintenance Deptt. (PHEM)
412MW Rampur Hydro Power Station, SJVN Limited,
Vill. Bayal, P.O. Koyal, Tehsil Nirmand,
Distt. Kullu, H.P., Pin 172023

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-O/O-
AGM(Elect.)/HOD),
Power House Electrical Maintenance Deptt. (PHEM)
412MW Rampur Hydro Power Station, SJVN Limited,
Vill. Bayal, P.O. Koyal, Tehsil Nirmand,
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--

-O/O-
AGM(Elect.)/HOD),
Power House Electrical Maintenance Deptt. (PHEM)
412MW Rampur Hydro Power Station, SJVN Limited,
Vill. Bayal, P.O. Koyal, Tehsil Nirmand,
Distt. Kullu, H.P., Pin 172023

Sir,
Its gentle reminder 4!!!,
As communicated to you many times in recent past, carrier protection of NJ- RH - 2 has failed in regular intervals and still not resolved till dated.
Therefore you are again requested to take necessary action at your end please.

-O/O-

AGM(Elect.)/HOD),
Power House Electrical Maintenance Deptt. (PHEM)
412MW Rampur Hydro Power Station, SJVN Limited,
Vill. Bayal, P.O. Koyal, Tehsil Nirmand,
Distt. Kullu, H.P., Pin 172023

Sent from Android device

On Oct 6, 2022 10:11, Power House Electrical MaintenanceDEPARTMENT <rhps.phem@sjvn.nic.in> wrote:
>
> Sir,
>
> With reference to trailing mail, It is a gentle reminder 3!!!
>
>
>
> -O/O-

> AGM(Elect.)/HOD),
> Power House Electrical Maintenance Deptt. (PHEM)
> 412MW Rampur Hydro Power Station, SJVN Limited,
> Vill. Bayal, P.O. Koyal, Tehsil Nirmand,
> Distt. Kullu, H.P., Pin 172023
>
>
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> _____
> From: "Power House Electrical MaintenanceDEPARTMENT" <rhps.phem@sjvn.nic.in>
> To: "Rohit Sharma □□□□□ □□□□" <rohit.sharma@powergrid.in>, "Rohit Sharma □□□□□ □□□□" <rohitsharma@powergrid.in>
> Cc: prakashchand197@gmail.com, "20711 Arun Kumar" <arun_kr@sjvn.nic.in>, "vinay painuly" <vinay.painuly@gmail.com>, "Er. Pintu Das DGM Rampur HPS SJVN Ltd" <pintu.das@sjvn.nic.in>, "20406 Sanjeet Singh Parmar" <ss_parmar@sjvn.nic.in>, "Sanjeev Kumar" <sanjeev_kr@sjvn.nic.in>
> Sent: Wednesday, September 28, 2022 11:09:47 AM
> Subject: Re: Regarding failed carrier protection at PLCC panel of Jhakri- Rampur ckt-2
>
> SIr,
>
> Gentle reminder 2!!!
>
>
> _____
> From: "Power House Electrical MaintenanceDEPARTMENT" <rhps.phem@sjvn.nic.in>
> To: "Rohit Sharma □□□□□ □□□□" <rohit.sharma@powergrid.in>, "Rohit Sharma □□□□□ □□□□" <rohitsharma@powergrid.in>
> Cc: prakashchand197@gmail.com, "20711 Arun Kumar" <arun_kr@sjvn.nic.in>, "vinay painuly" <vinay.painuly@gmail.com>, "Sanjeev Kumar" <sanjeev_kr@sjvn.nic.in>, "Er. Pintu Das DGM Rampur HPS SJVN Ltd" <pintu.das@sjvn.nic.in>, "20406 Sanjeet Singh Parmar" <ss_parmar@sjvn.nic.in>
> Sent: Saturday, September 24, 2022 12:37:29 PM
> Subject: Re: Regarding failed carrier protection at PLCC panel of Jhakri- Rampur ckt-2
>
> It's a gentle reminder!!!
>
> Sir,
>
> With reference to the trailing mail, carrier protection for both channels 1&2 of Nj-RH-2 was failed & revived several times in the recent past and the same has been communicated but now carrier protection for both channels 1&2 of Nj-RH-2 is continuously failed since 22/09/2022 at 22:47hrs (Detail of relay event has been attached herewith).
> In view of the above, you are requested to inform us what action is taken at your end.
> _____
> From: "Power House Electrical MaintenanceDEPARTMENT" <rhps.phem@sjvn.nic.in>
> To: nkmeena@powergrid.in
> Cc: "sunil kumar1" <sunil.kumar1@powergrid.in>, "rohit sharma" <rohit.sharma@powergrid.in>, prakashchand197@gmail.com, "20711 Arun Kumar" <arun_kr@sjvn.nic.in>, "vinay painuly" <vinay.painuly@gmail.com>, "Sanjeev Kumar" <sanjeev_kr@sjvn.nic.in>, "Er. Pintu Das DGM Rampur HPS SJVN Ltd" <pintu.das@sjvn.nic.in>
> Sent: Tuesday, August 9, 2022 5:08:40 PM
> Subject: Re: Regarding failed carrier protection at PLCC panel of Jhakri- Rampur ckt-2
>
>
> Sir,
> In continuation to your trailing mail, it has further been submitted that PLCC panels in both power station of Nathpa-Jhakri & Rampur HPS of SJVN are property of power grid along with panel maintenance. We had already informed regarding frequent carrier protection fail alarm which is still persisting in interval and need rectification or any other alternate solution. As you have informed in trailing mail that E1 channel connectivity has been created on tejas panel, however, interconnection between PLCC panel and E1

channel is still opened in both power station of Nathpa-Jhakri & Rampur HPS and need to be completed.
> Therefore, you are further requested to depute an engineer to accomplish the above said work either through the E1 channel connectivity to PLCC panel or rectify the existing scheme of PLCC at both end in order to mitigate the failure risk of carrier protection when it needed most during fault condition.
>
> _____
> From: pradeepk@tejasnetworks.com
> To: nkmeena@powergrid.in
> Cc: "sunil kumar1" <sunil.kumar1@powergrid.in>, "rohit sharma" <rohit.sharma@powergrid.in>, "Power House Electrical MaintenanceDEPARTMENT" <rhps.phem@sjvn.nic.in>, prakashchand197@gmail.com, "20711 Arun Kumar" <arun_kr@sjvn.nic.in>, "vinay painuly" <vinay.painuly@gmail.com>, "Sanjeev Kumar" <sanjeev_kr@sjvn.nic.in>, "Er. Pintu Das DGM Rampur HPS SJVN Ltd" <pintu.das@sjvn.nic.in>
> Sent: Tuesday, August 2, 2022 4:07:59 PM
> Subject: RE: Regarding failed carrier protection at PLCC panel of Jhakri- Rampur ckt-2
>
> Dear Sir,
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> Please find port details.
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>
> E1 channel 1:-
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> Rampur-SDH-1port#1-107-8
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> Nathpa Jhakri- SDH-1#port#1-107-8
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> E1 channel 2:-
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>
>
> Rampur-SDH-1port#1-107-9
>
> Nathpa Jhakri- SDH-1#port#1-107-9
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>
> Thanks & Regards,
>
> Pradeep Kumar
>
> 9911004204
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>
> From: Narendra Kumar Meena {□□□□□□□ □□□□□ □□□□} [mailto:nkmeena@powergrid.in]
> Sent: 02 August 2022 11:27

> To: Pradeep Kumar <pradeepk@tejasnetworks.com>
> Cc: SUNIL KUMAR {□□□□□ □□□□□} <sunil.kumar1@powergrid.in>; Rohit Sharma {□□□□□ □□□□□} <rohit.sharma@powergrid.in>; Power House Electrical MaintenanceDEPARTMENT <rhps.phem@sjvn.nic.in>; prakashchand197 <prakashchand197@gmail.com>; 20711 Arun Kumar <arun_kr@sjvn.nic.in>; Vinay.painuly <vinay.painuly@gmail.com>; Sanjeev Kumar <sanjeev_kr@sjvn.nic.in>; Er. Pintu Das DGM Rampur HPS SJVN Ltd <pintu.das@sjvn.nic.in>
> Subject: RE: Regarding failed carrier protection at PLCC panel of Jhakri- Rampur ckt-2
>
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>
> [External email, Exercise caution]
>
> Please configure 2 nos. of E1 between Rampur & Nathpa Jhakri (SJVNL) , port details may be shared by return mail
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>
> Regards,
>
>
>
> Narendra Kr Meena
>
> Chief Manager (NR-ULDC)
>
> POWERGRID
>
> RHQ, NRTS-I, Faridabad
>
> Ph. +91-9810082410
>
>
>
> From: Power House Electrical MaintenanceDEPARTMENT <rhps.phem@sjvn.nic.in>
> Sent: Monday, August 01, 2022 12:39
> To: Narendra Kumar Meena {□□□□□□□ □□□□□ □□□□} <nkmeena@powergrid.in>
> Cc: SUNIL KUMAR {□□□□□ □□□□□} <sunil.kumar1@powergrid.in>; Rohit Sharma {□□□□□ □□□□□} <rohit.sharma@powergrid.in>; prakashchand197 <prakashchand197@gmail.com>; 20711 Arun Kumar <arun_kr@sjvn.nic.in>; Vinay.painuly <vinay.painuly@gmail.com>; Sanjeev Kumar <sanjeev_kr@sjvn.nic.in>; Er. Pintu Das DGM Rampur HPS SJVN Ltd <pintu.das@sjvn.nic.in>
> Subject: Re: Regarding failed carrier protection at PLCC panel of Jhakri- Rampur ckt-2
>
>
>
> Warning: This email has not originated from POWERGRID. Do not click on attachment or links unless sender is reliable. Malware/ Viruses can be easily transmitted via email.
>
> Dear sir,
>
> With reference to the trailing mail, we requested you to provide E1 connectivity with redundant link between both station Rampur & Jhakri for the ckt Rampur-Jhakri 2 on tejas panel.
>
>
>
> _____

>
> From: "Narendra Kumar Meena {□□□□□□□ □□□□□ □□□□}" <nkmeena@powergrid.in>
> To: "Power House Electrical MaintenanceDEPARTMENT" <rhps.phem@sjvn.nic.in>
> Cc: "SUNIL KUMAR {□□□□□ □□□□□}" <sunil.kumar1@powergrid.in>, "Rohit Sharma {□□□□□ □□□□□}" <rohit.sharma@powergrid.in>, "prakashchand197" <prakashchand197@gmail.com>, "arun_kr" <arun_kr@sjvn.nic.in>, "Vinay.painuly" <vinay.painuly@gmail.com>, "sanjeev_kr" <sanjeev_kr@sjvn.nic.in>
> Sent: Sunday, July 31, 2022 11:59:32 AM
> Subject: Re: Re: Regarding failed carrier protection at PLCC panel of Jhakri- Rampur ckt-2
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> Dear sir,
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> It is understood that this carrier protection system is working on PLCC panel of Jhakri- Rampur (owned by SJVNL). As of now, no communication equipment are involved, however for future requirement purpose, we can provide E1 connectivity between these station on Tejas equipment. SJVNL may procure DTPC system, if not available at site.
>
>
>
> Any further clarification/ query may be revert back.
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>
> Regards,
>
>
>
> Narendra Kr Meena
>
> Chief Manager (NR-ULDC)
>
> POWERGRID
>
> RHQ, NRTS-I, Faridabad
>
> Ph. +91-9810082410
>
>
>>
>> On 30-Jul-2022 at 10:53 am, SUNIL KUMAR {□□□□□ □□□□□} <sunil.kumar1@powergrid.in> wrote:
>>
>> ++
>>
>>
>>
>> Thanks
>>
>> With Regards
>>
>> Sunil Kumar
>>

>> ULDC
>>
>>
>>
>> ---------- Forwarded message ----------
>> From: Power House Electrical MaintenanceDEPARTMENT <rhps.phem@sjvn.nic.in>
>> Date: Jul 30, 2022 10:18 AM
>> Subject: Re: Regarding failed carrier protection at PLCC panel of Jhakri- Rampur ckt-2
>> To: Rohit Sharma {□□□□□ □□□□□} <rohit.sharma@powergrid.in>,SUNIL KUMAR {□□□□□ □□□□□}
<sunil.kumar1@powergrid.in>
>> Cc: prakashchand197 <prakashchand197@gmail.com>,20711 Arun Kumar
<arun_kr@sjvn.nic.in>,Vinay painuly <Vinay.painuly@gmail.com>,Sanjeev Kumar
<sanjeev_kr@sjvn.nic.in>
>>>
>>> Warning: This email has not originated from POWERGRID. Do not click on attachment or links unless sender is reliable. Malware/ Viruses can be easily transmitted via email.
>>>
>>> It's a reminder
>>>
>>> Sir,
>>>
>>> With reference to the trailing mail, it is a reminder that carrier protection was again failed in Jhakri-Rampur ckt-2 for both channel 1&2 on dated 28.07.2022 & 29.07.2022(Copy of IED events attached herewith)
>>>
>>> This is for your kind information and necessary action at your end please.
>>>
>>>
>>>
>>>
>>>
>>>
>>>
>>> _____
>>>
>>> From: "Power House Electrical MaintenanceDEPARTMENT" <rhps.phem@sjvn.nic.in>
>>> To: "Rohit Sharma □□□□□ □□□□" <rohit.sharma@powergrid.in>, "sunil kumar1"
<sunil.kumar1@powergridindia.com>
>>> Cc: "prakashchand197" <prakashchand197@gmail.com>, "20711 Arun Kumar"
<arun_kr@sjvn.nic.in>, "Vinay painuly" <Vinay.painuly@gmail.com>, "Sanjeev Kumar"
<sanjeev_kr@sjvn.nic.in>, "sunil kumar1" <sunil.kumar1@powergridindia.com>, "20711 Arun Kumar"
<arun_kr@sjvn.nic.in>,"Vinay painuly" <Vinay.painuly@gmail.com>
>>> Sent: Wednesday, July 27, 2022 5:49:55 PM
>>> Subject: Regarding failed carrier protection at PLCC panel of Jhakri- Rampur ckt-2
>>>
>>>
>>>
>>> Sir,
>>>
>>> With the reference to the subject cited, it is informed to you that carrier protection was failed in Jhakri-Rampur ckt-2 for both channel 1&2 on dated 24.07.2022 & 26.07.2022 (copy of IED events attached herewith)
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>>> This is for your kind information and necessary action at your end please.
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>>> -O/O-
>>> AGM(Elect.)/HOD),
>>> Power House Electrical Maintenance Deptt. (PHEM)
>>> 412MW Rampur Hydro Power Station, SJVN Limited,
>>> Vill. Bayal, P.O. Koyal, Tehsil Nirmand,
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Annexure-XIV

Forum of Load Despatchers (FOLD)
Secretariat: C/o National Load Despatch Centre, New Delhi
B-9 Qutab Institutional Area, New Delhi-110016
Tel: 011-40234667

Website: www.forumofld.in Email: fold@grid-india.in

Minutes of the 44th Meeting of Forum of Load Despatchers (FOLD)

held on 20th March, 2023 through Online

1. The 44th meeting cum workshop of the Forum of Load Despatchers (FOLD) was held on 20th March 2023. Officials from SLDCs, RLDCs, NLDC participated in the meeting. The NLDC, RLDCs and SLDCs were connected through Team/VC. More than 120 officials from GRID-INDIA and SLDCs have participated the meeting.
2. **The Agenda of the meeting are :**

Presentation on

I. Managing and Leading Team - **presented by Ms. Bindiya Jain , Chief Manager (HRD)**.

II. Knowledge Sharing by Tamil Nadu SLDC on two shift operation of Thermal Power Plant - **presented by TN SLDC.**

III. Final Report Sharing by FOLD Working Group - Disturbance recorder (DR) parameter standardization - **presented by members of the working group.**

IV. Director (MO), GRID-India chaired the meeting. Director (MO) welcomed all the Load Despatchers to the 44th meeting of Forum of Load Despatchers (FOLD) and congratulating them for their 24X7 efforts to manage the integrated grid functioning with Reliability, Economy and Sustainability.

- Director (MO), GRID-INDIA expressed his concern about the high power demand phase and steps that are being taken up to tide over the phase in a planned and effective way.
- He talked about gas generation of 5000 MW by NTPC and 4000 MW tender by NVBN for gas generation from private generating stations to mitigate the high demand period through increased power generation.
- Director (MO) stated that imported coal based generators and gas based generators were unable to bid in day ahead market due to the price cap of Rs. 12.
- Further Director (MO) discussed about the upcoming Basic PSO exam for the System Operators scheduled on 26 March 2023. He congratulated the FOLD secretariat for organising the training program for SLDCs and Grid-India employees to apprise them with the Basic PSO exam syllabus. He motivated the participants to utilise the training

program in getting acquainted with the syllabus of the exam and refresh their knowledge to get certified in the exam.

3. Ms. Bindiya Jain has given a presentation on Leading & Managing Team. She has shared various research done by Google, Mckinsey, Gallup on manging teams. She had share factors that click the team like Psychological safety, dependability, structure & clarity, meaning and impact. The participants appreciated the presentation and have suggested more of such session in a formal way, which can be included as part of the training program.

4. Shri S. Kajamoideen, Chief Engineer, TTPS and Shri A. Ravichandran, Executive Engineer, Technical Service, Tuticorin Thermal Power Station (TTPS) has shared best practice about two shift operation in Tuticorin Thermal Power Station. TTPS officials have share various benefit owing to tow shift operation. Some of the benefit are complete accommodation of RE like solar and wind into the TNEB grid, less coal consumption and reduction of emission Carbon, SOX and SO2 are some of the benefit of two shift operation. Further, TTPS officials has also share the adverse effect like increased in oil consumption due to frequent shutdown and startup operation, increased DM water consumption, increased in auxiliary power consumption and variable cost etc. The participants across SLDCs have appreciated the best practice of TNEB.

5. Member from FOLD working group on Cyber Security, Sh. Amit Prasad Gupta, DGM, NERLDC presented the progress of activity of the group. Shri Gupta has shared that in phase –I, as on date, the SOPs for the following domain areas have been prepared :

- Active Directory Installation in Its and OTs Network
- Network Architect of IT & OT
- Physical security controls
- SOP for peripheral security devices - firewall

Further, the group has plan to publish the SOPs in the Phase –II report by the end of April, 2023 on the following:

- Log Management, policy and procedures
- Website application security
- Remote access management
- Disaster recovery and backup

6. FOLD working group on resource adequacy and reserve estimation presented their progress on the report. The report will be finalized by end of this month. The development on the working group as shared by the members are:

i. As sample study carried out for Karnataka system.

ii. Study was carried out using GAMS. Explored open source software like NREL PRAS and GridPath. But lacked flexibility. That's why GAMS unit commitment module was used.

iii. For creating Monte Carlo simulation of forced outage scenarios RAND function is used.

iv. Requirement of speed improvement of GAMS UC module is there for more accommodating more number of Monte Carlo simulation output i.e. more scenarios.

v. Also the team is exploring modelling of merchant power plants in the context of state RA studies.

vi. Calculation of capacity credits using same GAMS module is under consideration as well.

7. Member of **FOLD** working group on ***Disturbance recorder (DR) parameter standardisation***, Sh Bimal Swargiary, Chief Manager, NERLDC presented the final report and recommendation of the working group. The final report is attached as annexure-I D.

8. Director (MO), GRID-INDIA appreciated the presentations shared by all the respected members of SLDCs/GRID-INDIA.

9. The meeting concluded with the vote of thanks to all.

DISTURBANCE RECORDER (DR) PARAMETER STANDARDIZATION

REPORT OF FOLD WORKING GROUP - 3

ACKNOWLEDGEMENT

The members of the Working Group-3 would like to extend gratitude to the FOLD management for being given the opportunity to be involved with this initiative. We would like to acknowledge the participation of each utility and organization (TRANSCOs, GENCOs, SLDCs, NLDC and RLDCs) for sharing valuable information, engaging in fruitful discussions, collection and improvisation of ideas related to different protection and operational philosophies and procedures which formed the basic building blocks for drafting the report on “Standardization of Disturbance Recorder Parameters”.

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ACRONYMS

DR ……...Disturbance Recorder

DRPC……. ……DR Personal Computer

EL……..……...Event Logger

ROT.....Relay Operating Time

GPS……..…….Global Positioning Satellite

IDMT……Inverse Minimum Definite Time

TOR…….....Terms of Reference

BCU……..Bay Control Unit

SAS……...Substation Automation System

HMI……..…….Human Machine Interface

DCDB……....Direct Current Distribution Board

ACDB……Alternating Current Distribution Board

IED…….Intelligent Electronic Device

NGR……..Neutral Grounding Reactor

CB……..Circuit Breaker

CEA….....Central Electricity Authority of India

CERC……Central Electricity Regulatory Commission

IEGC…….....Indian Electricity Grid Code

RTU……..Remote Terminal Unit

PREFACE

As per the discussion in 41st FOLD Meeting, a Working Group was constituted to streamline the Disturbance Recorder (DR) Parameter Standardization. According, a detailed study of the philosophies adapted by the power utilities in India and abroad was carried out. This report may be used by the power utilities as a guide for effective and optimal Disturbance Recorder Parameter Settings/Configuration in order to enable effective post-fault analysis for finding the root cause of an eventand suggest remedial measures. The present day modern IED's are IEC 61850 complaint and provide all standard features of DR configuration. The same can be utilized by the power utilities to incorporate all the necessary field level data (protection functions, switchgear status, and auxiliary device status) to provide valuable information to the event analysis group.

The **Terms of Reference (TOR)** of this group was to survey and compile prevailing national and international practices and standard regarding DR configuration, health monitoring and DR reader application software. Accordingly Working Group shall submit recommendations on the following aspects:

1. Triggering criteria of DR (Criteria for start of recording)
2. Sampling rate to be adapted for DR to enable verification of system models and to capture harmonics related to transient conditions
3. Recording window to cover pre-trigger, trigger (fault) and post-fault duration
4. Data format for raw data files of DR
5. Power supply arrangement for DR and associated equipment like GPS Receive/Clock, the SCADA/EMS RTU, modems and any other equipment supplying signals to the DR
6. Protocol for monitoring healthiness of DR including loss of supply, time synchronization

The group was mandated to prepare a report and submit within 3 months from the date of constitution of the Working Group.

MEMBERS OF FOLD WORKING GROUP

SN	NAME OF MEMBERS	DESIGNATION	CONTANCT NO.	AFFILIATION
1	Sh. Bimal Swargiary	Chief Manager	9435499779	NERLDC
2	Sh. Shashank Tyagi	Chief Manager	9599441243	NRLDC
3	Sh. Mohit Kumar Gupta	Manager	9650430505	NLDC
4	Sh. Akash Modi	Manager	8584072082	ERLDC
5	Sh. Vamshi Ballikonda	Manager	9480811828	SRLDC
6	Sh. Selvamani Prabaharan M	Deputy Manager	9629125521	WRLDC
7	Sh. Rupanka Kumar Goswami	AGM	9613146565	AEGCL, Assam
8	Ms. Barsha Kashyap	Deputy Manager	9706692773	AEGCL, Assam
9	Sh. Abhishek Kalita	Deputy Manager	8486213068	AEGCL, Assam
10	Sh. Nishanta Baruah	Asst. Manager	8473036988	AEGCL, Assam
11	Ms. Laishram Ritu	DGM	7008178772	SLDC, Manipur
12	Ms. Steffi Okram	Manager	8974724715	SLDC, Manipur
13	Ms. Jayela Wahengbam	DM	9856875084	SLDC, Manipur
14	Sh. B. M. Shah	EE	9925212836	SLDC, Gujarat
15	Sh. Shikhar Nema	AE	9425805299	SLDC, MP
16	Sh. Madhav Pande	Executive Engr.	9833608212	SLDC, Maharashtra
17	Ms. Smita Aparajita Pattanaik	Asst. Manager	9438908321	SLDC, Orissa
18	Sh. P. Balaji	Executive Engr.	9492129949	APTRANSCO
19	Sh. Sandeep Yadav	SE	9310404372	SLDC, Haryana
20	Sh. Munish Satija	Executive Engr.	9315016211	SLDC, Haryana

CHAPTER 1

INTRODUCTION

The Electricity Grid serves as one of the most important contributors for country's economic growth and emergency services. However, power system is prone to various types of faults and disturbances which can range from transient faults on transmission lines and switchyard equipments to system-wide disturbances. Investigation and root cause analysis of each grid disturbance is utmost necessary and critical for optimizing the performance of protection system and increasing reliability of the grid network.

Disturbance Recording devices have been in use since many decades. With advancement in technology and introduction of numerical relays, the capability of the Disturbance Recorder function in the relay has increased manifold. Standalone DR systems were used when internal DR recording facility for relays and BCUs were not available. For systems which still function with external DR recording devices may also incorporate the parameter standards proposed in this report accordingly (subjected to the features available in standalone DR or EL recording system). Recording of analog inputs with high sampling frequency, monitoring the status of internal protection functions, switchgear elements and auxiliary devices are available in modern IEDs. The tools required to perform post-incident analysis include extracted Disturbance Recorder files (Oscillographic Fault Records which include the analog values of currents and voltages, digital status of switchyard equipments and auxiliary relays and status of protection signals with accurate time stamps) and Event Logger files which can capture pre-event, event and post-event system conditions with high degree of accuracy and precise GPS based time stamping.

In the view of the critical importance of DR and EL data for event analysis, IEGC mandates submission of DR and SOE outputs by various entities/utilities for post-event analysis within 24 hours with RLDC. Each grid connected entity has a distinct configuration for DR parameter settings, which pose a challenge while analyzing events involving multiple entities or wide area disturbances. A standard philosophy and set of guidelines for DR parameter settings, analog and digital channel configuration is therefore utmost necessary which can be incorporated by the various utilities for achieving maximum benefit and conclusive results from the DR equipment.

CHAPTER 2

PURPOSE

Post-Despatch Analysis forms an integral part for ensuring system security and reliability. Disturbance Recorder (DR) output from Numerical Relays is an important tool for event analysis, which helps in classifying the cause of fault based on signature patterns and protection event logs. The DR data collected from the IEDs of affected elements along with pre and post fault information of the interconnected grid elements helps in proper root cause analysis to prevent occurrence of such events in future. Submission of DR and EL output is also mandated as per various provisions of CERC (Indian Electricity Grid Code) Regulations, 2010 and CEA (Grid Standards) Regulations, 2010 for quick analysis of the Grid Events. The following regulations can be summarized in brief as below:

As per clause no 5.2 (r) of CERC IEGC, all the users, STU/SLDC and CTU shall send information/data including DR/EL output to RLDC within 24 hours.

As per section clause No. 4.6.3 of IEGC (System Recording Instruments), recording instruments such as Data Acquisition System/DR/EL/FL/Time Synch. Devices shall be provided by all users, STUs and CTUs and shall always be kept in working condition for recording dynamic performance of the system.

As per clause no 12(1) of CEA Grid Standard Regulation, any tripping of generating unit or transmission element shall be promptly reported by the respective Entity (along with relay indications), to the appropriate Load Despatch Centre in prescribed reporting formats.

As per clause no 15(3) of CEA Grid Standard Regulation, all operational data, including disturbance recorder and event logger reports, for analyzing the grid incidents and grid disturbances and any other data which in its view can be useful for analyzing grid incident or grid disturbance shall be furnished by all the Entities within twenty-four hours to the Regional Load Despatch Centre and concerned Regional Power Committee.

However, it has been observed that post-despatch analysis is not effective at times in finding out the root cause of the event due to non-standardization of DR output.

The purpose of this report is to provide a general understanding of the considerations required for standardization of Disturbance Recording output so that uniformity is maintained by the utilities during DR submission.

CHAPTER 3

TRIGGERING CRITERIA FOR DR

Triggers cause a Disturbance Recorder or Micro-processor based relay to capture waveforms for specific power system conditions. Recording events may be triggered by changes in measured analog values, calculated analog values, internal logical statements, operation of protection elements or by change in state of an external input.

The triggering criteria for DR generation should be "**Start of Any Protection Function and Trip Event**" as per the following observation:

During grid disturbances which results in cascade tripping events, studyingbehaviour pattern of various upstream and downstream relays is of utmost importance. The most general cause of underreaching/overreaching and maloperation of unit/non-unit protections are due toimproper grading of individual operating times resulting in inadequate time discrimination among different protections functions (TMS, preset time delay), impedance reach, external discrepancies, internal logical errors and deviation from standard setting guidelines.

If "Start of Any Protection Function and Trip Event" is set in the IEDs as triggering criteria for DR generation, the DR and EL files can be extracted from upstream/downstream and associated elements during a large-scale grid disturbance, a thorough study can be carried out to pinpoint the actual cause of maloperation of the protection scheme. The absence of "Any Start" signal as the triggering criteria will miss out DR generation at crucial places which might lead to a non-conclusive post event analysis.

The internal storage capacity of memory in IEDs may vary for different manufacturers. However, the memory clearing function follows the FIFO(First-In-First-Out) method when the storage memory gets filled up. It should be a practice to extract the DR files immediately after occurrence of a grid disturbance event and transfer the relevant files to a secondary storage device (DRPC or dedicated workstations). This would nullify the chances of overwriting of memory and loss of actual disturbance recorder files.

Recommendation: Triggering Criteria for DR should be “Start of Any Protection Function and Trip Event”

CHAPTER 4

SAMPLING RATE TO BE ADOPTED FOR DR TO ENABLE VERIFICATION OF SYSTEM MODELS AND TO CAPTURE HARMONICS RELATED TO TRANSIENT CONDITIONS

Sampling Frequency can be defined as the number of analog values samples collected per second by the IED. The Sampling Frequency is mostly inbuilt in the relays and is dependent on manufacturer and model number of IED. The same cannot be changed by the user (e.g. ABB, Siemens, MiCOM and ERL the sampling frequency is predefined). However, for GE make relays, the sampling frequency is selectable from a drop-down menu.

SN	Relay Make	Sampling Frequency (fs)
1.	ABB	1000 Hz
2.	SIEMENS	1000 Hz
3.	MICOM	Dependent on model No: P442: 1200 Hz P443: 2400 Hz
4.	GE	3200 Hz (Default) *Selectable
5.	ERL	4800 Hz
6.	ZIVERCOM	1600 Hz

TABLE 1: SAMPLING FREQUENCY VALUESFOR DIFFERENT RELAYS

Note: With increase in value of Sampling Frequency, the number of samples (Data for analog values) recorded or calculated per second increases and digital channels are more frequently time stamped which in turn increases the Data size of the DR file (.dat file)

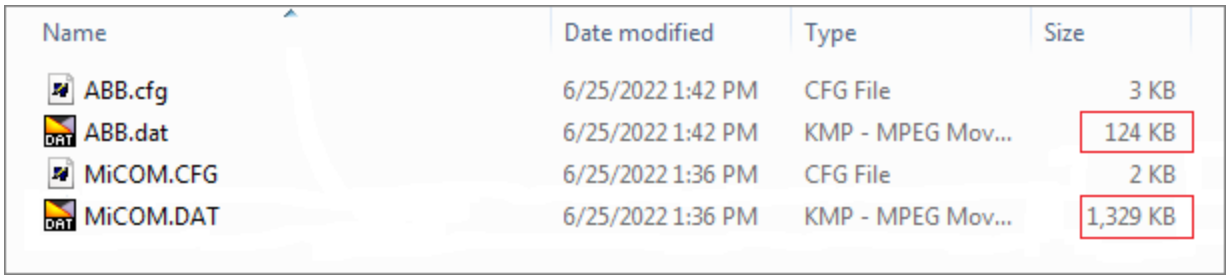

FIG 1: FILE SIZE COMPARISON OF GENERATED DR FILES BY DIFFERENT MAKE RELAYS FOR SAME EVENT

The above figure depicts the DR files generated for a 220kV Line with ABB make Main 1 relay and Alstom MiCOM make Main 2 relay (Difference in size of .dat file can be observed due to different sampling frequency). A comparison of data collected in the DR outputs for fs = 1000 Hz and fs = 2400 Hz for the same recording window, has been carried out with respect to root cause analysis.

Relay Make	**Model**	**Sampling Frequency (fs)**	**Data file size**	**Interval between successive samples**	**Fundamental and lower order harmonic values**
ABB	REL650	1000 Hz	124 KB	1ms apart	Approximately Same
MICOM	P443	2400 Hz	1329 KB	0.417ms apart	Approximately Same

TABLE 2: COMPARISON OF DATA DERIVED FROM DIFFERENT SAMPLING FREQUENCY

i) As per root cause analysis from recorded DR files, it can be observed that adopting a higher sampling frequency of 2400Hz does provide us more frequently collected fault data per interval but from a macroscopic point of view, a sampling frequency of 1000 Hz does not provide any less information for performing necessary observations and study.

ii) DR analysis particularly deals with observation of the sinusoidal trends of current and voltage waveforms (values of voltage, current, phase angle, harmonics etc.) along with the status of protection functions and various switchgear and auxiliary relays. A Sampling Frequency of >= 1000 Hz would be acceptable as each sample can be viewed in the DR at an interval of 1ms apart

iii) Relay Operating Time for Unit Protection functions are instantaneous (<30ms) whereas for backup protection functions it may vary from 50ms to >1 second (e.g. IDMT curve settings,

definite time delays). Hence, sampling at 1ms interval is sufficient for analysis of the sequence of events (start and trip of protection functions and analyzing the sinusoidal values of voltages and currents) for root cause analysis.

Recommendation: Sampling Rate to be adopted should be greater than or equal to 1000 Hz

CHAPTER 5

PARAMETER SETTINGS FOR RECORDING WINDOW TO COVER PRE-TRIGGER, TRIGGER (FAULT) AND POST-FAULT DURATION EFFECTIVELY

Power system protection is basically divided into two parts:

i) Unit Protection
ii) Non-Unit Protection

The unit protections (Differential protection of transformers, line feeders, busbar, and inherent protection of transformers) should separate the faulty section instantaneously with higher accuracy of selectivity and reliability. Whereas the non-unit protections (IDMT overcurrent and earth fault, definite time delayed protections, delayed zones of distance protection) provide as a backup for the main protections in case of its non-operation or underreaching conditions.

The DR recording window should provide sufficient information for capturing the response of the above mentioned protection philosophies along with details about pre-fault scenario and post fault clearance scenario of the grid elements for thorough in-depth analysis.

The pre-fault recording window is an important aspect for DR analog and digital channels due to the following reasons:

i) The direction of power flow and loading prior to the fault
ii) Observing the trends of current and voltage waveforms in the pre-fault state
iii) The status of digital signals prior to the fault (e.g. Carrier Healthy status, CB ready status, VT fuse fail status are vital points for failure of Distance Protection schemes)

A recording window of 500ms to cover the pre-fault scenario may be considered adequate and sufficient for this purpose.

The post-fault time set for DR recording window should have ample recording time to capture the operation of non-unit protections and delayed operation of unit protections from their pickup time. Considering the Auto-reclose dead time of 1s/1.5s, Relay Operating Time for E/F and O/C as a

backup for Zone 2/Zone 3 protections), it can be derived that a minimum of 2.5 seconds of post – fault recording time should be considered to record all the power system events during any generalized fault scenario.

Recommendation:

SN	Description	Settings
1.	Pre-fault Capture Time	500ms
2.	Post-fault Capture Time	2500ms
3.	Total time of DR Window	3000ms

TABLE 3: ALLOTTED TIME FOR CAPTURE TIME OF DR WINDOW

Note:

i) The basic minimum length of DR window to be set is as per the above table. However, utilities may increase the Recording Time if required.

ii) The above setting of "time window parameters" may vary with respect to relay models and manufacturers. E.g. MiCOM relay provide setting field for "Total DR Window Time" and "Trigger Position" in percentage value. The above philosophy can likewise be implemented with respect to different relays.

iii) DR Recording features like "Trigger Mode: Extended" for MICOM relays "Scope of Waveform data: Power System Fault" can be utilized to record the overall sequence of events into a single DR file.

DISTURB RECORDER	MICOM	
Duration	3.000 s	0C.01
TriggerPosition	17.00 %	0C.02
TriggerMode	Extended	0C.03

No.	Settings	SIEMENS	Value
0402A	Waveform Capture		Save with Pickup
0403A	Scope of Waveform Data		Power System fault
0410	Max. length of a Waveform Capture Record		3.00 sec
0411	Captured Waveform Prior to Trigger		0.50 sec

FIG 2: DR PARAMETER SETTINGS EXAMPLE FOR MICOM AND SIEMENS RELAY

CHAPTER 6
DATA FORMAT FOR RAW DATA FILES OF DR

The recorded DR files should comply with the Comtrade Standard IEC 60255-24, IEEE C37.111-2013

Recorded COMTRADE files are basically divided into three parts:

i) .hdr (Header File)
ii) .cfg (Configuration File)
iii) .dat (Data File)

Files with extension .inf and. rioare also present for some manufacturers. (These files store information about the trip events in the relay)

The **.dat file** contains the values measured for each of the input channels defined in the DR configuration for each sample in the record. It also contains the sequence number and time stamp each set of samples. The **.cfg** file contains the information required to interpret the .dat file. The DRs are viewed in third party softwares e.g. Wavewin by ABB, Siemens SIGRA etc.

Recommendation:

i) .cfg and .dat files are sufficient for DR viewing purpose
ii) Other files generated by relays of different manufacturers can be used for other purposes (e.g. Comtrade playback with relay test kit via .rio file).
iii) The .cfg file and .dat file can be edited to alter the Disturbance Recorder viewable information. E.g. the name of digital channels, analog channels can be changed via .cfg file whereas the values of analog quantities can be altered by editing the .dat file using third party softwares (e.g. notepad++). However, the permission to mask and secure the data records of DR files is solely based on relay manufacturers. E.g. ABB masks the .dat file in non-readable format.

CHAPTER 7

POWER SUPPLY ARRANGEMENT FOR DR AND ASSOCIATED EQUIPMENTS LIKE GPS RECEIVER/CLOCK, THE SCADA/EMS RTU, MODEMS AND ANY OTHER EQUIPMENT SUPPLYING SIGNALS TO THE DR

The DR function is inbuilt in the IED which is powered by a DC source. The IED's are connected in a LAN configuration which is further extended to a centralized DRPC. The communication network is established with the help of Ethernet switches which are generally powered by DC source. Fibre Optic Cables, LAN cables, Light Interfacing Units etc. are used for establishing the Ethernet network. The GPS Receiver/Clock unit mostly has provisions for both AC and DC supply. Hence, it is utmost necessary to maintain two independent DC sources at the substation for redundancy.

Recommendation for redundancy in DC supply:

i) Two numbers of separate Battery Banks, Battery Chargers and DCDBs should be maintained
ii) Use of DC changeover relays in the C&R panel to ensure continuous DC supply for the IEDs, Ethernet switches, RTU's, GPS Units etc.

AC Supply is used by SAS Computers, Centralized DRPC, Metering PC and Gateway PCs. For SAS based substations, SAS HMIs plays a vital role in control and monitoring operations. The absence of AC supply can jeopardize the systematic and secure operations during time of emergency. Redundancy in AC supply is hence required to be maintained in the substation.

Recommendation for redundancy in AC supply:

i) Use of Inverters/UPS units (with immediate uninterrupted changeover) which bypasses the station AC supply to the equipments during healthy condition and inverts the DC supply from Battery banks during power supply failure

ii) Two separate set of inverters/UPS units should be used with the following configuration (if applicable) to promote redundancy:

Inverter 1: SAS-1, Gateway-1, DRPC

Inverter 2: SAS-2, Gateway-2, Metering PC etc.

Life contact/Watchdog contact can be utilized if available in case of *Standalone DR/EL system* to monitor its **healthiness** via *annunciator board*.

CHAPTER 8

PROTOCOL FOR MONITORING HEALTHINESS OF DR INCLUDING LOSS OF SUPPLY AND TIME SYNCHRONIZATION

A. Healthiness of IED:

Disturbance Recorder and Event Logger functions are inbuilt in the IEDs. Protection functions may depend on intra-IED Ethernet network link established in the substation (for GOOSE communication) based on adapted scheme. Hence, for monitoring the healthiness of the DR, it is mandatory to monitor the power supply to the IEDs and the healthiness of the Local Area Network.

IEDs come with self-supervision feature. Due to any internal hardware or firmware error, the IED automatically activates the "Error Mode" which can be observed by the 'Error LED' in front HMI or in the 'Event List' in the HMI. IEDs also comprise a "Watchdog/Self-supervision/Internal Fail potential free normally open (NO) contact which is latched in case of power supply failure or IED being in error mode. Such Watchdog contacts are also present in Ethernet switches and RTUs.

The healthiness of one relay can be monitored by the other relay by establishing a hard wiring between the watchdog contacts of the concerned relays with a Binary Input (Opto Input) of the other nearby relays. The same Binary Input can be linked with the DR digital channels.

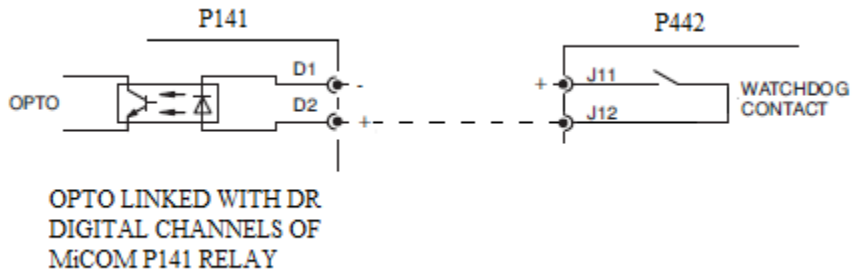

FIG 3: INTRA-IED HEALTHINESS MONITORING SCHEME WITH WATCHDOG CONTACT

E.g. For 132kV Lines, the protection scheme is based on Main Distance Protection relay and a backup Overcurrent and Earth fault relay. A case may arise when the Distance protection relay (say P442) failed to respond to a fault. In that case, if the healthiness of the P442 relay is monitored

by the backup OC and EF relay (say P141), we may find from the extracted DR from P141 relay that, Dir. OC and EF protection had picked up for the fault along with a prevalent "Main relay Unhealthy" status. This would indicate the unhealthiness of the P442 relay during the instant of the fault and the doubt of discrepancy in relay settings can be left out.

Modern IEDs (IEC 61850 complaint) such a MiCOMP442 (in the above example) has inbuilt 'Logical Devices' viz. Control, Measurement, Protection, Records, Systems'. Each Logical Device has a 'Logical Node' called "LPHD" to monitor its health status. E.g. **Protection/LPHD1.ST.PhyHealth.stVal** can be used to monitor the healthiness of the Protection functions in the relay. However, these are suitable for tagging of SAS based alarms. For the purpose of DR channel configuration, fail proof Watchdog contacts should be utilized.

B. Healthiness of Time Synchronization:

The IEDs are in time synchronization with the GPS unit by IRIG-B (Inter-Range Instrument Group Time Code Format B) or SNTP (Simple Network Time Protocol)

For proper and in-depth analysis of power system faults (Sequence of Events, pickup and drop-off of protection functions), it is essential for relays at local and remote ends to be tie synched with the local standard time.

Basic Architecture of GPS time synchronization for IEDs in a substation

i) The GPS Receiver unit is present in the same Ethernet network as the IEDs. The GPS Antennae and the Time Display Unit is connected to the GPS Receiver
ii) The configuration for accessing the time through SNTP is present in the IED. E.g. ABB

SNTP: 1					
ServerIP-Add		172.16.0.140			
RedServIP-Add		0.0.0.0			

FIG 4: TIME SYNCHRONIZATION SETTINGS FOR ABB RELAY

In order to monitor the healthiness of the Time Synchronization, the following procedure can be followed. ABB, Siemens and MiCOM make relays are considered for the description:

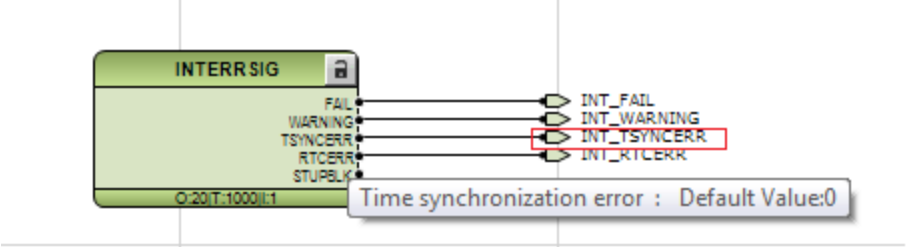

FIG 5: TIME SYNCHRONIZATION MONITORING FOR ABB MAKE RELAYS

The signal "TSYNCERR = Time Synchronization Error" form the functional block "INTERRSIG: Internal Error Signals" can be used. The annunciation and recording of Time Synch error can be achieved by:

i) The signal can be mapped to the DR digital channels
ii) The signal can be linked with SAS alarm tags
iii) The signal can be mapped with an LED of the relay
iv) The signal can be used to latch a Binary Output for connection to an external Annunciator Panel (for audible alarm) in case of loss of time synchronization

Information				Source							
Number	Display text	Long text	Type	BI	F	S	C	1	2	3	4
00067	Resume	Resume	OUT								
00068	Clock SyncError	Clock Synchronization Error	OUT								
00069	DayLightSavTime	Daylight Saving Time	OUT								
	SynchClock	Clock Synchronization	IntSP_E								
00070	Settings Calc.	Setting calculation is running	OUT								
00071	Settings Check	Settings Check	OUT								
00072	Level-2 change	Level-2 change	OUT								

FIG 6: TIME SYNCHRONIZATION MONITORING FOR SIEMENS MAKE RELAYS

The "Clock SyncError" signal in the Siemens relay can be mapped to the Disturbance Recorder Configuration; LED's or tagged as SAS alarms.

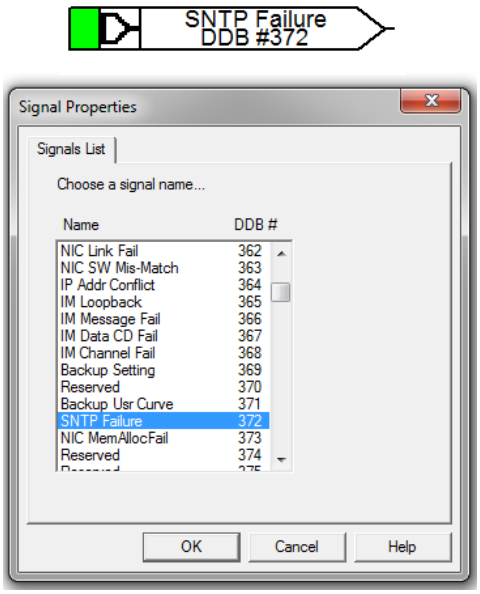

FIG 7: TIME SYNCHRONIZATION MONITORING FOR MICOM MAKE RELAYS

The Internal Input signal "SNTP Failure" can be mapped with the Disturbance Recorder Digital channels, LED's and SAS alarms.

Recommendations:

i) Use of Watchdog contact in IEDs to monitor its healthiness by establishing an intra-IED hard wired network and assigning the same to the digital channels of IED

ii) Use of internal Time Synchronization error signal in relays as input to the DR digital channel to monitor the time synch status of the relays during fault events.

iii) Integrating time synch error in station SCADA and remote RLDC end also

CHAPTER 9

INTERNATIONAL PRACTICES ADOPTED FOR DR PARAMETER SETTINGS

A. Triggering Criteria for DR

As per "An Examination of possible criteria for triggering swing recording in disturbance recorders" by Leonard Swanson & Jeffrey Pond, USA – a power equipment fault causes an instantaneous increase in current magnitude, decrease in the voltage magnitude, increase in power, local change in frequency, decrease in measured apparent impedance and changes in symmetrical component quantities. It is fairly localized in impact on the system. A criteria based on any one of these impacts can be used to determine the presence of a fault and trigger a fault recording event

- Change in magnitude of analog quantities
- Rate of Change of analog quantities
- Oscillation in frequency
- Change of state of External Inputs
- Relay internal logic (programmed) trigger

The above points refer to start or trip of a protection function, operation of relay logics and change of state of switchgear elements or auxiliary equipments.

As per "Requirements for a Fault Recording system" by Rich Hunt and Jeff Pond" – Triggering of records for protective relays is almost always based on the "**Pickup or operation of a protection function**".

B. Sampling rate to be adopted for DR

As per "Alberta Reliability Standard Disturbance Monitoring and Reporting Requirements PRC-002-AB-2" – Each legal owner of a transmission facility, generating unit and aggregated generating facility must have fault recording data that meets a minimum recording rate of 16 samples per cycle

As per "System Monitoring – Fault Recording" by National Grid Electricity Transmission (UK) (NGET), the sampling frequency of analog channels for fault recording purposes shall be at least 1 kHz. The measurements of analog channels shall have an accuracy of 1% or better.

C. Recording window to cover pre-trigger, trigger (fault) and post-fault duration

As per "An Examination of Possible Criteria for Triggering Swing Recording in Disturbance Recorders" by Leonard Swanson & Jeffrey Pond, USA – Recording of power equipment faults is used to verify the operation of the protection system, which should clear faults in a matter of cycles, so record lengths are typically in the range of 20 cycles to 10 seconds.

D. Data format for raw data files of DR

Data format to be followed should be as per IEEE Standard Common Format for Transient Data Exchange (COMTRADE) for power systems. The recorded DR files should comply with the Comtrade Standard IEC 60255 – 24. DR files with extensions (.hdr, .cfg, .dat) are used for viewing the DR data.

E. Power supply arrangement for DR and associated equipments

As per "System Monitoring – Fault Recording" by National Grid Electricity Transmission (UK) (NGET), the fault record shall be stored in a non-volatile memory storage medium for subsequent retrieval by means of a Personal Computer (PC). The equipment shall be capable of retaining its selected parameterization and settings when its auxiliary energizing supply is removed and subsequent reinstated. Fault recording devices need to be powered via a UPS or other supply that would not be disrupted in the event of a de-energization of user's connection.

F. Protocol for monitoring healthiness of DR including loss of supply and time synchronization

As per "Requirement for a Fault Recording System" by Rich Hunt and Jeff Pond –the following ideas are stated:

i) Redundancy in DFR
ii) Using a combination of devices to record the same fault
iii) Cross-triggering using contact wiring among IEDs or with intra-relay communication.

As per “Alberta Reliability Standard Disturbance Monitoring Equipment Installation and Data Reporting PRC-018-AB-1”, disturbance monitoring equipment should be equipped with internal clocks synchronized to within two (2) milliseconds or less of the Universal Coordinated time scale.

CHAPTER 10

RECOMMENDED LIST OF DR CHANNELS FOR GRID ELEMENTS

Generalized Protection schemes are considered for the configuration of the channels. The numbers of IEDs used at substation level may vary depending on the implemented scheme and to promote redundancy in protection schemes. The list of DR channels can be established with the segregation of protection functions and number of IEDs used.

Allocation and number of analog and digital channels varies for different manufacturers and models of relay. E.g. ABB (REL650) provides 40 numbers of analog configurable channels and 96 numbers of digital configurable channels. The "Trigger Decision" can be selected per channel.

MiCOM (P444) provides 8 analog channels and 64 digital channels (out of which the decision to trigger the DR can be set for 32 channels whereas the status of remaining 32 channels would be included in the DR when some protection function triggers it). MiCOM (P442) included 32 settable DR digital channels. Similarly, for Siemens relays, the numbers of allotted digital channels vary from 32 to 64+ depending on model used.

Based on study of practical fault scenarios and the DR analog and digital channels required to correctly arrive at a conclusive decision without ambiguity, the following list of DR channels are proposed for implementation. Keeping in view the constraints in number of allotted digital channels (for previous models of particular relays), the priority wise implementation can be carried out. Some relays have specific internal protection signals not common with other relays (e.g. phase selection logic in ABB relays). The same can be implemented in the DR if required. The following list contains the generalized group of signals which are present for all protection functions.

A. The protection scheme generally implemented for 132kV Transmission lines are as follows:

i) Main 1: Distance Protection Relay (with associated functions)

ii) Main 2: Backup Protection relay (with associated functions)

MAIN 1: DISTANCE PROTECTION RELAY

SL NO.	ANALOG CHANNELS	REMARKS
1	RØ VOLTAGE	
2	YØ VOLTAGE	
3	BØ VOLTAGE	
4	NEUTRAL VOLTAGE	
5	V_SYNCH (SYNCHRONIZING VOLTAGE)	WHEN TPAR IS IMPLEMENTED
6	RØ CURRENT	
7	YØ CURRENT	
8	BØ CURRENT	
9	NEUTRAL CURRENT (IN)	
10	MUTUAL COMPENSATION CURRENT (IM)	FOR PARALLEL LINES

TABLE 4:ANALOG CHANNELS FOR DISTANCE RELAY

SL NO.	DIGITAL CHANNELS	REMARKS
1	ZONE 1 PICKUP	
2	ZONE 2 PICKUP	
3	ZONE 3 PICKUP	
4	ZONE 4 (REV) PICKUP	
5	ZONE 1 TRIP	
6	ZONE 2 TRIP	
7	ZONE 3 TRIP	
8	ZONE 4 (REV) TRIP	
9	CARRIER AIDED ZONE TRIP (PUTT/POTT)	
10	AR BLOCK	
11	CB READY (AS PER AR LOGIC)	
12	AR START	
13	AR CLOSE COMMAND	
14	AR UNSUCCESSFUL	
15	AR SWITCH OUT	
16	SOTF INITIATION	
17	SOTF OPERATED	
18	VT FUSE FAIL	
19	BROKEN CONDUCTOR	
20	POWER SWING BLOCK	
21	CARRIER UNHEALTHY/FAIL	
22	CARRIER SWTICH OUT	
23	CARRIER SEND	

SL NO.	DIGITAL CHANNELS	REMARKS
24	CARRIER RECEIVE	
25	DT SEND	
26	DT RECEIVE	
27	CB CLOSE	
28	CB OPEN	
29	86 RELAY OPTD	
30	MAIN2/BACKUP RELAY/BCU FAIL	
31	TIME SYNCHRONIZATION STATUS	
32	LAN NETWORK STATUS	

TABLE 5: DIGITAL CHANNELS FOR DISTANCE RELAY

If the IED has more than 32 configurable digital channels (currently available IEDs provide more than 32 digital channels), these following signals are to be configured:

SL NO.	DIGITAL CHANNELS	REMARKS
1	RELAY 3Ø TRIP	
2	DISTANCE PICKUP (RØ-EARTH)	
3	DISTANCE PICKUP (YØ-EARTH)	
4	DISTANCE PICKUP (BØ-EARTH)	
5	DISTANCE PICKUP (RØ-YØ)	
6	DISTANCE PICKUP (YØ-BØ)	
7	DISTANCE PICKUP (BØ-RØ)	
8	AR IN PROGRESS	
9	AR SUCCESSFUL	
10	96 RELAY OPERATED	

TABLE 6: OTHER IMPORTANT DR DIGITAL CHANNELS

MAIN 2: BACKUP PROTECTION RELAY

SL NO.	ANALOG CHANNELS	REMARKS
1	RØ VOLTAGE	
2	YØ VOLTAGE	
3	BØ VOLTAGE	
4	NEUTRAL VOLTAGE	
6	RØ CURRENT	
7	YØ CURRENT	
8	BØ CURRENT	
9	NEUTRAL CURRENT (IN)	

TABLE 7: OTHER IMPORTANT DR DIGITAL CHANNELS

SL NO.	DIGITAL CHANNELS	REMARKS
1	RELAY 3Ø TRIP	
2	OVERCURRENT R PHASE START	
3	OVERCURRENT Y PHASE START	
4	OVERCURRENT B PHASE START	
5	OVERCURRENT OPEARTED	
6	EARTHFAULT START	
7	EARTHFAULT OPERATED	
8	CB OPEN	
9	CB CLOSE	
10	86 OPEARTED	
11	96 OPERATED	
12	MAIN1 RELAY FAIL	
13	TIME SYNCHRONIZATION STATUS	
14	LAN NETWORK STATUS	

TABLE 8: DIGITAL CHANNELS FOR BACKUP PROTECTION RELAY

OTHER PROTECTION FUNCTIONS

SL NO.	DIGITAL CHANNELS	REMARKS
1	LBB INITIATION	
2	LBB RETRIP	
3	LBB BUS/BACKUP TRIP	
4	CURRENT REVERSAL OPERATED	
5	WEAK INFEED/ECHO OPERATED	
6	UNDERFREQUENCY START	
7	UNDERFREQUENCY OPEARTED	
8	SPECIAL PROTECTION SCHEME OPERATED	

TABLE 9: DIGITAL CHANNELS OF OTHER PROTECITON FUNCTIONS (IF ENABLED)

*With respect to different relay manufacturers (additional internal protection signals e.g. Zone 1 single phase trip, Zone 1 multi-phase trip (Siemens); Phase selection start (indicating fault loop) in case of ABB etc. are present. These signals are a value addition in terms of DR analysis. If additional DR digital channels are present in the relays, the same can be added.

**The status of "CB Open" may also be utilized for triggering DR as per requirement to keep a track for CB operations (planned or spurious).

***If single pole CB is used for 132kV lines, refer (**TABLE 11)** for digital signals for Single phase Auto-reclosure and CB status.

B. The protection schemes and configuration at 220kV and above are as follows:

i) Main 1: Distance Protection (With associated Functions)

ii) Main 2: Distance Protection (With associated Functions)

SL NO.	ANALOG CHANNELS	REMARKS
1	VOLTAGE RØ	
2	VOLTAGE YØ	
3	VOLTAGE BØ	
4	VOLTAGE NEUTRAL	
5	CURRENT RØ	
6	CURRENT YØ	
7	CURRENT BØ	
8	CURRENT NEUTRAL (IN)	
9	MUTUAL COMPENSATION CURRENT (IM)	FOR PARALLEL LINES

TABLE 10: ANALOG CHANNELS FOR MAIN 1 AND MAIN 2 RELAYS FOR 220kV LINE

SL NO.	DIGITAL CHANNELS	REMARKS
1	TRIP RØ	
2	TRIP YØ	
3	TRIP BØ	
4	ZONE 1 PICKUP	
5	ZONE 2 PICKUP	
6	ZONE 3 PICKUP	
7	ZONE 4 (REV) PICKUP	
8	ZONE 1 TRIP	
9	ZONE 2 TRIP	
10	ZONE 3 TRIP	
11	ZONE 4 (REV) TRIP	
12	CARRIER AIDED ZONE TRIP (PUTT/POTT)	
13	AR BLOCK	
14	CB READY (AS PER AR LOGIC)	
15	AR START	
16	AR CLOSE COMMAND	
17	AR UNSUCCESSFUL	
18	AR SWITCH IN/OUT	
19	SOTF INITIATION	
20	SOTF OPERATED	
21	VT FUSE FAIL	
22	BROKEN CONDUCTOR	
23	POWER SWING BLOCK	
24	CARRIER UNHEALTHY/FAIL	
25	CARRIER SWTICH OUT	
26	CARRIER SEND	
27	CARRIER RECEIVE	
28	DT SEND	
29	DT RECEIVE	
30	EARTH FUALT START	

SL NO.	DIGITAL CHANNELS	REMARKS
31	EARTH FAULT OPERATED	
32	CB RØ CLOSE	
33	CB RØ OPEN	
34	CB YØ CLOSE	
35	CB YØ OPEN	
36	CB BØ CLOSE	
37	CB BØ OPEN	
38	86 RELAY OPTD	
39	96 RELAY OPEARTED	
40	MAIN2/MAIN1/BCU FAIL	
41	TIME SYNCHRONIZATION STATUS	
42	LAN NETWORK STATUS	

TABLE 11: DIGITAL CHANNELS FOR MAIN 1 AND MAIN 2 RELAY OF 220kV LINE

FOR 400kV AND ABOVE LINES WITH 1 AND ½ CB SCHEME

SL NO.	ANALOG AND DIGITAL CHANNELS	REMARKS
1	RØ TIE CT CURRENT	**TABLE 10** and **11** are also applicable for 400kV and above lines. **TABLE 12** are the additional signals which should be configured. N.B. **Pole Discrepancy** relay(PDR) is present in the CB Marshalling box, the status of which may be received in the relay and configured as Digital Input if potential free contact is available.
2	YØ TIE CT CURRENT	
3	BØ TIE CT CURRENT	
4	TIE CT NEUTRAL CURRENT	
5	RØ TIE CB OPEN	
6	RØ TIE CB CLOSE	
7	YØ TIE CB OPEN	
8	YØ TIE CB CLOSE	
9	BØ TIE CB OPEN	
10	BØ TIE CB CLOSE	
11	ALL AR DIGITAL SIGNALS FOR TIE CB	
12	WAIT FOR MASTER	FOR AR LOGIC
13	86 OPERATED TIE CB	
14	STUB PROTECTION OPERATED	

TABLE 12: ANALOG AND DIGITAL SIGNALS IN ADDITION TO TABLE-10&11 FOR 400kV AND ABOVE

SL NO.	DIGITAL CHANNELS	REMARKS
1	DISTANCE PICKUP (RØ-EARTH)	
2	DISTANCE PICKUP (YØ-EARTH)	
3	DISTANCE PICKUP (BØ-EARTH)	
4	DISTANCE PICKUP (RØ-YØ)	
5	DISTANCE PICKUP (YØ-BØ)	
6	DISTANCE PICKUP (BØ-RØ)	
7	AR IN PROGRESS	
8	AR SUCCESSFUL	
9	CARRIER UNHEALTHY/FAIL CH-II	
10	CARRIER SWTICH OUT CH-II	
11	CARRIER SEND CH-II	

12	CARRIER RECEIVE CH-II	
13	DT SEND CH-II	
14	DT RECEIVE CH-II	
15	OVERVOLTAGE START	
16	OVERVOLTAGE STAGE-I OPEARTED	
17	OVERVOLTAGE STAGE-II OPEARTED	
18	UNDERFREQUENCY START	
19	UNDERFREQUENCY OPEARTED	
20	SPECIAL PROTECTION SCHEME	If Any
21	LBB INITIATION	
22	LBB RE-TRIP OPERATED	
23	LBB BUSBAR/BACKUP TRIP OPERATED	

TABLE 13: OTHER IMPORTANT DIGITAL CHANNELS

TRANSFORMER PROTECTION

C. The protection functions implemented for Transformers can be summarized as follows:

i) Differential Protection (and associated functions)

ii) HV Backup overcurrent and Earthfault Protection

iii) LV Backup overcurrent and Earthfault Protection

iv) REF Protection*and other protection functions*

SL NO.	ANALOG CHANNELS	REMARKS
1	HV CURRENT RØ	
2	HV CURRENT YØ	
3	HV CURRENT BØ	
4	HV NEUTRAL CURRENT	
5	LV CURRENT RØ	
6	LV CURRENT YØ	
7	LV CURRENT BØ	
8	LV NEUTRAL CURRENT	
9	DIFFERENTIAL CURRENT RØ	
10	DIFFERENTIAL CURRENT YØ	
11	DIFFERENTIAL CURRENT BØ	
12	DIFFERENTIAL BIAS CURRENT	
13	REF DIFFERENTIAL CURRENT	
14	REF BIAS CURRENT	
15	HIGH IMPEDANCE RESULTANT REF CURRENT	

TABLE 14: ANALOG CHANNELS FOR TRANSFORMERS

*Tie CT current channels should also be included in case of 1 and ½ CB scheme

SL NO.	DIGITAL CHANNELS	REMARKS
1	DIFFERENTIAL RØ START	

2	DIFFERENTIAL YØ START	
3	DIFFERENTIAL BØ START	
4	DIFFERENTIAL RØ TRIP	
5	DIFFERENTIAL YØ TRIP	
6	DIFFERENTIAL BØ TRIP	
7	DIFFERENTIAL TRIP (CURVE)	
8	DIFFERENTIAL UNRESTRAINED TRIP (HIGHSET)	
9	2^{ND} HARMONIC BLOCK OPERATED	
10	5^{TH} HARMONIC BLOCK OPERATED	
11	OVERFLUXING ALARM	
12	OVERFLUXING TRIP	DEFINE STAGES
13	OVERFLUXING HIGHSET TRIP	
14	REF START/ALARM	
15	REF TRIP	
16	BUCHHOLZ ALARM	
17	BUCHHOLZ TRIP	
18	MAIN TANK PRV TRIP	
19	OLTC PRV TRIP	
20	OSR TRIP	
21	HV WTI ALARM	
22	HV WTI TRIP	
23	LV WTI ALARM	
24	LV WTI TRIP	
25	OTI ALARM	
26	OTI TRIP	
27	MOG ALARM	
28	AIRCELL FAILURE	
29	86 OPEARTED HV	
30	96 OPERATED HV	
31	86 OPEARTED LV	
32	96 OPEARTED LV	
33	HV CB OPEN	
34	HV CB CLOSE	
35	LV CB OPEN	
36	LV CB CLOSE	
37	FIREFIGHTING ALARMS/TRIPS	
38	MAIN2/BCU FAULTY	
39	TIME SYNCHRONIZATION STATUS	
40	LAN NETWORK STATUS	

TABLE 15: DIGITAL CHANNELS FOR TRANSFORMERS

*Merged alarm/Trip signals of HV/LV WTI, a single “Differential Start” signals rather than differential start status of each phase etc. can be configured if the IED provides only 32 configurable DR digital channels.

SL NO.	DIGITAL CHANNELS	REMAKRS
1	OVERCURRENT RØ START	
2	OVERCURRENT YØ START	
3	OVERCURRENT BØ START	
4	OVERCURRENT RØ TRIP	
5	OVERCURRENT YØ TRIP	
6	OVERCURRENT BØ TRIP	
7	OVERCURRENT LOWSET TRIP	
8	OVERCURRENT HIGHSET TRIP	
9	EARTH FAULT START	
10	EARTH FAULT LOWSET TRIP	
11	EARTH FAULT HIGHSET TRIP	
12	LBB INITIATION	
13	LBB RETRIP AND BACKUP TRIP	
14	86 OPERATED	
15	96 OPERATED	
16	RELAY FAIL (MAIN/BACKUP/BCU)	
17	TIME SYNCHRONIZATION STATUS	
18	LAN NETWORK STATUS	

TABLE 16: OVERCURRENT AND EARTHFAULT PROTECTION FOR TRANSFORMERS

*The analog channels would comprise (V_R, V_Y, V_B, V_N, I_R, I_Y, I_B, I_N) with respect to HV or LV side in case separate OC & EF relay is provided as considered in the table above

REACTOR PROTECTION

D. The protection functions implemented for Reactors can be summarized as:

i) Differential Protection
ii) Restricted Earth fault Protection
iii) Backup Impedance, Overcurrent protection etc.

SL NO.	ANALOG CHANNELS	REMARKS
1	HV CURRENT RØ	
2	HV CURRENT YØ	
3	HV CURRENT BØ	
4	HV NEUTRAL CURRENT	
5	NCT CURRENT RØ	
6	NCT CURRENT YØ	
7	NCT CURRENT BØ	
8	NCT NEUTRAL CURRENT	
9	DIFFERENTIAL CURRENT RØ	
10	DIFFERENTIAL CURRENT YØ	
11	DIFFERENTIAL CURRENT BØ	
12	DIFFERENTIAL BIAS CURRENT	
13	REF DIFFERENTIAL CURRENT	
14	REF BIAS CURRENT	
15	HIGH IMPEDANCE RESULTANT REF CURRENT	

TABLE 17: ANALOG CHANNELS FOR REACTOR DIFFERENTIAL PROTECTION

SL NO.	DIGITAL CHANNELS	REMARKS
1	DIFFERENTIAL RØ START	
2	DIFFERENTIAL YØ START	
3	DIFFERENTIAL BØ START	
4	DIFFERENTIAL RØ TRIP	
5	DIFFERENTIAL YØ TRIP	
6	DIFFERENTIAL BØ TRIP	
7	DIFFERENTIAL TRIP (CURVE)	
8	DIFFERENTIAL UNRESTRAINED TRIP (HIGHSET)	
9	2^{ND} HARMONIC BLOCK OPERATED	
10	5^{TH} HARMONIC BLOCK OPERATED	
11	OVEREXCITATION START	
12	OVEREXCITATION TRIP	ADD STAGES
13	REF START/ALARM	
14	REF TRIP	
15	BUCHHOLZ ALARM	
16	BUCHHOLZ TRIP	
17	MAIN TANK PRV TRIP	
18	OLTC PRV TRIP	
19	OSR TRIP	
20	HV WTI ALARM	
21	HV WTI TRIP	
22	LV WTI ALARM	
23	LV WTI TRIP	
24	OTI ALARM	
25	OTI TRIP	
26	MOG ALARM	
27	AIRCELL FAILURE	
28	FIREFIGHTING ALARMS/TRIPS	
29	NGR BUCHHOLZ ALARM	
30	NGR BUCHHOLZ TRIP	
31	NGR PRV TRIP	
32	NGR OTI ALARM	
33	86 OPEARTED	
34	96 OPERATED	
35	CB OPEN	
36	CB CLOSE	
37	BACKUP_IMP RELAY FAIL	
38	TIME SYNCHRONIZATION STATUS	
39	LAN NETWORK STATUS	

TABLE 18: DIGITAL CHANNELS FOR REACTOR DIFFERENTIAL PROTECTION

*Inherent Protection signals can be utilized with Backup impedance or REF relay if constraint arises for number of configurable digital channels

SL NO.	ANALOG CHANNELS	REMARKS
1	VOLTAGE RØ	
2	VOLTAGE YØ	
3	VOLTAGE BØ	
4	VOLTAGE NEUTRAL	
5	CURRENT RØ	
6	CURRENT YØ	
7	CURRENT BØ	
8	CURRENT NEUTRAL	

TABLE 19: ANALOG CHANNELS FOR REACTOR BACKUP IMPEDANCE PROTECTION

SL NO.	DIGITAL CHANNELS	REMAKRS
1	ZONE START	
2	ZONE TRIP	
3	OVERCURRENT START	
4	OVERCURRENT TRIP	
5	DIFFERENTIAL RELAY FAIL	
6	CB OPEN	
7	CB CLOSE	
8	86 RELAY OPERATED	
9	96 RELAY OPERATED	
10	TIME SYNCHRONIZATION STATUS	
11	LAN NETWORK STATUS	

TABLE 20: DIGITAL CHANNELS FOR REACTOR BACKUP IMPEDANCE PROTECTION

BUSBAR PROTECTION

E. The protection functions available for bus bar relay are:

i) Bus bar protection

ii) LBB protection

SL NO.	ANALOG CHANNELS	REMARKS
1	BAY 01-CURRENT RØ	
2	BAY 01-CURRENT YØ	
3	BAY 01-CURRENT BØ	
4	BAY 02-CURRENT RØ	
5	BAY 02-CURRENT YØ	
6	BAY 02-CURRENT BØ	FOR ALL BAYS 1..2..3..
7	INCOMING RØ CURRENT IN ZONE A	
8	DIFFERENTIAL RØ CURRENT IN ZONE A	
9	INCOMING YØ CURRENT IN ZONE A	
10	DIFFERENTIAL YØ CURRENT IN ZONE A	
11	INCOMING BØ CURRENT IN ZONE A	
12	DIFFERENTIAL BØ CURRENT IN ZONE A	

TABLE 21: DIGITAL CHANNELS FOR REACTOR BACKUP IMPEDANCE PROTECTION

SL NO.	DIGITAL CHANNELS	REMARKS
1	BAY 01 CONNECTED TO BUS A	
2	BAY 01 CONNECTED TO BUS B	
3	BAY 02 CONNECTED TO BUS A	
4	BAY 02 CONNECTED TO BUS B	
5	BAY 03 CONNECTED TO BUS A	
6	BAY 03 CONNECTED TO BUS B	
7	DIFFERENTIAL TRIP OPERATED	
8	ZONE A COMMON TRIP	ZONE A and ZONE B refer to Main Bus 1 and Main Bus 2
9	ZONE A LBB BACKUP/EXTERNAL TRIP	
10	ZONE A OPEN CT ALARM	
11	ZONE A DIFFERENTIAL ALARM	
12	ZONE A INCOMING CURRENT ALARM	
13	ZONE B COMMON TRIP	
14	ZONE B LBB BACKUP/EXTERNAL TRIP	
15	ZONE B OPEN CT ALARM	
16	ZONE B DIFFERENTIAL ALARM	
17	ZONE B INCOMING CURRENT ALARM	
18	CHECKZONE TRIP	
19	ENDZONE PROTECTION OPERATED	
20	MAIN2/BCU ETC. RELAY FAIL (IF ANY)	
21	TIME SYNCHRONIZATION ERROR	
22	LAN NETWORK ERROR	

TABLE 22: DIGITAL CHANNELS FOR BUSBAR DIFFERENTIAL PROTECTION

LINE DIFFERENTIAL PROTECTION

F. Line differential Relay includes the following protection functions:

i) Line Differential Protection
ii) Backup Overcurrent and Earth fault protection
iii) Distance Protection (if Optical Link is in failed state. Function available as per site requirement)

SL NO.	ANALOG CHANNELS	REMARKS
1	CURRENT RØ	
2	CURRENT YØ	
3	CURRENT BØ	
4	CURRENT NEUTRAL	
5	REMOTE END CURRENT RØ	
6	REMOTE END CURRENT YØ	
7	REMOTE END CURRENT BØ	
8	REMOTE END CURRENT NEUTRAL	
9	DIFFERENTIAL CURRENT RØ	
10	DIFFERENTIAL CURRENT YØ	
11	DIFFERENTIAL CURRENT BØ	
12	BIAS CURRENT	

TABLE 23: ANALOG CHANNELS FOR LINE DIFFERENTIAL PROTECTION

SL NO.	DIGITAL CHANNELS	REMARKS
1	DIFFERENTIAL RØ TRIP	
2	DIFFERENTIAL YØ TRIP	
3	DIFFERENTIAL BØ TRIP	
4	DIFFERENTIAL RESTRAINED TRIP	
5	DIFFERENTIAL UNRESTRAINED TRIP	
6	2^{ND} HARMONIC BLOCK OPERATED	
7	5^{TH} HARMONIC BLOCK OPERATED	
8	RECEIVE SIGNAL 01	
9	RECEIVE SIGNAL 02	
10	SEND SIGNAL 01	
11	SEND SIGNAL 02	
12	REMOTE RELAY ERROR	
13	MAIN2/BACKUP RELAY FAIL	
14	CB OPEN	
15	CB CLOSE	
16	86 OPERATED	
17	96 OPERATED	
18	BACKUP RELAY/BCU FAIL	
19	TIME SYNCHRONIZATION ERROR	
20	LAN NETWORK FAIL	

TABLE 24: DIGITAL CHANNELS FOR LINE DIFFERENTIAL PROTECTION

*AR signals, Distance Protection, OC and EF protection signals, single pole CB status to be included as per scheme implemented for the short line.

If separate OC and EF relay is present, the DR list as inTABLE 7 & 8** are also applicable

CHAPTER 11

DISTURBANCE RECORDER PARAMETERS FOR GENERATING STATIONS

The presently implemented Disturbance Recorder channels were collected from the following generating stations: NEEPCO, NHPC, NTPC, ADANI, KMPCL, OPTC and AGTCPP. With respect to the protection functions kept for Generators, the DR channel list was compiled.

The following compilation of DR analog and digital channels is a summarized list of analog and digital channels comprising all available protections kept for generators. The list is to be segregated with respect to the protection functions available at site.

SN	ANALOG CHANNELS	REMARKS
1	RØ VOLTAGE	
2	YØ VOLTAGE	
3	BØ VOLTAGE	
4	NEUTRAL VOLTAGE	
5	RØ CURRENT (LOAD SIDE)	
6	YØ CURRENT (LOAD SIDE)	
7	BØ CURRENT (LOAD SIDE)	
8	NEUTRAL CURRENT	
9	NEUTRAL CURRENT SENSITIVE)	
10	RØ CURRENT (NEUTRAL SIDE)	
11	YØ CURRENT (NEUTRAL SIDE)	
12	BØ CURRENT (NEUTRAL SIDE)	
13	FREQUENCY	
14	EXCITATION TRAFO HV CURRENT	
15	1^{ST} STAGE RESIDUAL OVERVOLTAGE	
16	2^{ND} STAGE RESIDUAL OVERVOLTAGE	
17	100% STATOR EARTH FAULT VOLTAGE	
18	100% STATOR EARTH FAULT CURRENT	
19	OPEN DELTA VOLTAGE	
20	NGT VOLTAGE	
21	REF CURRENT/VOLTAGE	(Depending on HZ or LZ REF implementation)
22	NEGATIVE SEQUENCE CURRENTS	(If Applicable)
23	STATOR FAULT 20HZ INJ. VOLTAGE	
24	STATOR FAULT 20HZ INJ. CURRENT	

TABLE 25: ANALOG CHANNELS FOR GENERATOR PROTECTION

SN	DIGITAL CHANNELS	REMARKS
1	GENERATOR DIFFERENTIAL START	
2	GENERATOR DIFFERENTIAL RØ TRIP	
3	GENERATOR DIFFERENTIAL YØ TRIP	
4	GENERATOR DIFFERENTIAL BØ TRIP	
5	GENERATOR DIFFERNTIAL TRIP	
6	POWER 1 TRIP	
7	POWER 2 TRIP	
8	OVERCURRENT STAGE-I TRIP	
9	OVERCURRENT STAGE-II TRIP	
10	EARTHFAULT TRIP	
11	UNDER EXCITATION START	
12	UNDER EXCITATION OPERATED	DEFINE STAGES
13	OVER EXCITATION START	
14	OVER EXCITATION OPEATED	DEFINE STAGES
15	OVERVOLTAGE START	
16	OVERVOLTAGE TRIP	DEFINE STAGES
17	UNDERVOLTAGE START	
18	UNDERVOLTAGE TRIP	DEFINE STAGES
19	UNDERFREQUENCY ALARM	
20	UNDERFREQUENCY TRIP	DEFINE STAGES
21	OVERFREQUENCY ALARM	
22	OVERFREQUENCY TRIP	DEFINE STAGES
23	TURBINE TRIP	
24	TURBINE EMERGENCY TRIP	
25	GENERATOR ELECTRICAL FAULT	
26	STATOR EARTH FAULT ALARM	
27	STATOR EARTH FAULT TRIP	
28	NEG. PHASE SEQ THERMAL ALARM	
29	NEG. PHASE SEQ THERMAL TRIP	
30	GENERATOR THERMAL OVERLOAD TRIP	
31	UNDER IMPEDANCE PROTECTION OPERATED	DEFINE STAGES
32	NEUTRAL VOLT. DISPLACEMENT PROT. OPERATED	
33	RESIDUAL OVERVOLTAGE TRIP	DEFINE STAGES
34	RØ CB OPEN	DEFINE FOR GENERATOR CB, FIELD CB ETC. (AS PER APPLICABLE SCHEME) AND AS PER (GANG OPERATED OR SINGLE POLE CB)
35	RØ CB CLOSE	
36	YØ CB OPEN	
37	YØ CB CLOSE	
38	BØ CB OPEN	
39	BØ CB CLOSE	
40	FIELD FAIL ALARM	
41	FIELD FAIL-1 TRIP	
42	FIELD FAIL-2 TRIP	
43	VT FUSE FAIL ALARM	
44	REVERSE POWER TRIP (32G)	DEFINE STAGES
45	SENSITIVE EARTH FAULT TRIP	
46	ANY START	
47	ANY TRIP	
48	ROTOR EARTH FAULT START	
49	ROTOR EARTH FAULT TRIP	DEFINE STAGES

SN	DIGITAL CHANNELS	REMARKS
50	STATOR EARTH FAULT START	
51	STATOR EARTH FAULT 95% TRIP	DEFINE STAGES
52	STATOR EARTH FAULT 100% TRIP	
53	STANDBY EARTH FAULT TRIP	
54	OVERCURRENT START	
55	OVERCURRENT TRIP	DEFINE STAGES
56	EXCITER TRIP	
57	POLE SLIPPING OPERATED	
58	DEAD MACHING TRIP	
59	LOW FORWARD POWER PROTECTION OPERATE	
60	OUT OF STEP TRIP	
61	UNBALANCE LOAD CURRENT OPERATED	
62	100% STATOR EARTH FAULT START (3^{RD} HARM.)	
63	100% STATOR EARTH FAULT TRIP (3^{RD} HARM.)	
64	LBB INITIATION	
65	LBB OPERATED	
66	UNIT MANUAL EMERGENCY TRIP	
67	LOSS OF EXCITATION OPERATED (40G)	
68	NEG. SEQ. CURRENT PROTECTION ALARM	
69	NEG. SEQ. CURRENT PROTECTION TRIP (46G)	
70	86 RELAY OPERATED	86X/Y/Z as per scheme
71	POLE SLIP Z1 TRIP	
72	POLE SLIP Z2 TRIP	
73	ACCIDENTAL ENERGIZATION PROTECTION	
74	CO2 RELEASE	
75	AVR FAULTY	
76	TIME SYNCHRONIZATION ERROR	
77	LAN NETWORK ERROR	
78	MAIN 2/BCU FAIL	

TABLE 26: DIGITAL CHANNELS FOR GENERATOR PROTECTION

The above mentioned DR analog and digital channels are summarized in general for thermal, hydro generating plants. The segregation of protection functions for generators among respective IEDs is based on scheme of C&R Panel (Control and Relay panel) followed at site. The DR channels are to be configured as per protection functions implemented in the relays or nos. of relays. The above **TABLE 25 & 26** may be segregated as such.

ANNEXURE – I

Standardization of Disturbance Recorder Channels is also dependent on additional factors such as: Protection Philosophy followed by the Utilities, Substation level C&R Panel architecture, IED communication network, Switchyard Equipment, Station auxiliaries etc.

A field study was carried out with the participating utilities for visualization of the current state of DR parameters and system architectures on a wide area perspective.

The following points were considered for the conducted questionnaire based data collection:

i) Modern IEDs support communication over local area network (Ethernet) via optical fibre/RJ45/LAN cable, time synchronization over SNTP, GOOSE messaging system. Centralized DRPC is present within the same network for monitoring and operations.
ii) Redundancy in power supply for IEDs and station auxiliaries and monitoring the same via recorded DR data
iii) Status of switchyard equipment and tripping relays (inherent protection, master trip etc.)
iv) Carrier Communication Status
v) Triggering criteria adopted by the utilities and the DR recording window parameters.

As per inputs received from utilities, transmission companies and generation companies from North-Eastern, Eastern, Western, Southern Grid viz. AEGCL, AEML-T, AP TRANSCO, HVPNL, MEPTCL, KMTL, MSPCL, TRIPURA TRANSCO, TPCL, MSETCL, DHARIWAL, ESSAR, INDIGRID, JP NIGRIE, KMPCL, DIKCHU, DVC, JORETHAND, JUSNL, WBSETCL, OPTCL, MPPTCL, MPPGCL, NTPC, NEEPCO, NHPC, OTPC, ADANI, KORBA NTPS, VSTPS, AgTCPP the following status were observed for various grid substations.

TABLE 27: FIELD STATUS WITH RESPECT TO TOR POINTS

SL No.	PARTICULARS	STATUS
1	Are the IED's in the Substation connected using fibre optic/LAN cable into a local Ethernet network?	62% are equipped with optical fibre/LAN cable into a local Ethernet network
2	DR downloading facility at the substation a. Centralized DRPC b. Laptop/PC is manually connected using the front port of the relay for DR files extraction only when a grid disturbance has taken place	57% are equipped with Centralized DRPC whereas front port extraction is carried out for others
3	Is there any standard list of DR analog and digital channel configuration followed by the utility?	Standard list available: 52%
4	Are the IED's in the substation time synchronized with the GPS system?	76% are GPS Synchronized
5	Is redundancy maintained for AC supply (in form of inverters) in the substation for AC appliances (SAS PC, DRPC and Metering PC)?	76%
6	Is redundancy maintained for DC supply for IED's, GPS modules, Ethernet switches etc.?	76%
7	Mode of DR trigger available in the IEDs for protection functions a. DR trigger "only with trip" b. DR trigger with both "Start and trip"	76% have adopted "Start and Trip"
8	Is pre-fault time of 500ms and overall DR capturing time window of 3 sec followed?	73% with minor variations in pre-fault and post trigger timings
9	Is the status of the auxiliary tripping relays and switchgear elements included in the DR digital channels? a. Master trip relays (86), LBB Trip relay (96) b. CB Open/Close Status	90%
10	Is the "setting philosophy" followed as per RK setting Guidelines?	85%
11	Is "Time Synch error" recorded in the DR if an IED is out of time synchronization during a fault event?	41%
12	Is "LAN Error" recorded in the DR if an IED is out of LAN during a fault event?	33%
13	Is the status of all the inherent protection of transformers /reactors/NGRs included in the DR digital channels?	72%
14	Are the signals associated with carrier protection schemes implemented in the DR? a. Carrier Healthy b. Carrier Switch In/Out	A: 86% B: 76%
15	Are "Watchdog contacts/Life contacts" of IEDs used for monitoring the healthiness as a digital channel in the DR?	59%

ANNEXURE – II

The most common cases of tripping events for grid elements occur for transmission lines. As transmission lines travel through various terrains (hilly, half/fully submerged, jungle, lightning prone, vegetation growth along the corridor) it may be practically impossible to maintain absolute healthiness of the transmission line equipments and its corridor clearance throughout the year. However, the utmost motive is to restrict the number of disturbances in transmission lines under acceptable limits and to take measures so that such disturbance can be avoided in future.

It has been observed around the world that, the most common cases of transmission line fault is "Single phase to Earth (1Ø-E)" and transient in nature. Auto-reclosure function plays an important role in saving the grid elements from unnecessary outages during transient single phase to earth faults. From Power System Protection field of view, modern IEDs are equipped with programmable logics which greatly enhances the scope of design of important protection philosophies which otherwise has extensive use of hard wirings and auxiliary relays.

The non-operation/failed operation of Auto-reclosure may be due to various reasons (programmed logic is not fulfilled; nature of fault has changed during dead time). To absolutely pin point the reason for the above, it is necessary that the extracted Disturbance Recorder file should comprise of all the Analog values of voltages and current along with the Digital statuses of all equipments and protection functions (PLCC, CB, auxiliary relays etc., relay internal protection signals). This can only be achieved if the DR parameters and channels are configured to its full capability to capture the sequence of events during the faults.

As such, a list of probable grid disturbances that utilities face were drafted in the form of questionnaire and shared with participating TRANSCO's for sharing the ideas and philosophies they adopt for DR configuration to study fault events.

TABLE 28: CASES OF UNSUCCESSFUL AUTO-RECLOSURE OPERATIONS

Sl No.	Case Description	Probable Explanation	DR channels required for analyzing the event
1.	A single pole (RØ pole) trip is issued by the relay and dead time of AR is started. The relay issues a three pole trip during the dead time and AR is unsuccessful	A three pole trip in dead time is issued if there is an evolving fault in the other two healthy phases.	▪ AR Start ▪ AR in progress ▪ AR Unsuccessful ▪ Protection Status of the other healthy phases
2.	The relay issues a three pole trip in spite of the AR functions being kept ON	AR BLOCK logic may be high in the relay. AR Block may be linked with CB healthy status, CB spring charge, Gas pressure, Carrier Faulty etc.	▪ AR Block Status ▪ CB Ready Status ▪ Carrier Healthy
3.	For an 1 and ½ CB scheme, AR is successful in the Main CB but unsuccessful in the Tie CB	AR Block logic may be high in the Tie CB. "Wait for master" setting for Tie CB might be incorrect	▪ Wait for Master in Tie Bay CB ▪ AR Block Status ▪ CB Ready Status
4.	The relay issues a RØ pole trip to the CB. Thereafter, the whole bus is tripped on LBB Operation	Failure of opening or delay opening of RØ pole CB. Trip wirings for R-pole might be linked with Y or B phase pole	▪ LBB Initiation ▪ CB Open/Close status per pole ▪ Analog values of current ▪ 86R status
5.	For 132kV Level, relay issues a three pole trip and AR dead time is started. However, AR operation is not achieved after elapse of the dead time	Synchro check function might have blocked the AR	▪ Vsynch analog channel

TABLE 29: UNDER/OVER REACHING BY DISTANCE RELAY

Sl No.	Case Description	Probable Explanation	DR channels required for analyzing the event
1.	During a single phase to earth fault, the distance protection is not picked at the local end relay, whereas the upstream relay operated in Zone 3	Dir. EF protection might have picked up for the local end relay due to high resistive nature of the fault. If the upstream end relay belongs to a very long line, the Zone 3 reach may be large enough to sense the fault. The EF setting at local end should be revised	▪ Earth fault start ▪ Zone 3 pickup ▪ Zone 3 Optd ▪ VT Fuse Fail ▪ Time Synch Status
2.	The upstream relay trips on IDMT Earth fault before the local end relay which sensed the fault in Zone 3 reach	The EF ROT for upstream relay is not set with respect to Zone 3-time delay. TMS should be verified	▪ Earth fault Start ▪ Earth fault Operated ▪ Zone 3 pickup ▪ Time Synch Status
3.	For a fault in the mid-portion of a transmission line, the relay at local end trips on Zone 1 protection instantaneously. But the remote end relay fails to sense the fault at the inception, whereas later trips on Zone 2 protection.	The local end source is stronger than the remote end source which might be comparatively very weak. Probable implementation of weak infeed with echo can be studied, Zone settings may be revised and Carrier healthiness be verified	▪ Zone 2, Zone 3 pickups ▪ Carrier Healthy ▪ Earth fault Start ▪ Time Synch Status
4.	"Carrier Send" signal was high in the relay during operation of PUTT scheme. However, the remote end relay failed to receive the carrier input and PUTT was not successful	"Carrier Fail" may be persistent in the PLCC link which may be due to faulty "Rx level" or other associated issues	▪ Carrier Healthy ▪ Zone 2 pickup ▪ Time Synch Status
5.	The relay at local end issues a trip on Zone 1 instantaneously. But the upstream CB is tripped on EF at the same time	EF High set may be enabled for the upstream relay. Transmission lines should not have EF High set protection enabled.	▪ Earth Fault Start ▪ Earth Fault Operate ▪ Time Synch Status
6.	During a fault, the line is tripped on Zone 2 protection but the upstream adjacent transformer is also tripped either on Earth fault of Overcurrent protection instantaneously	The EF and OC High set settings of the transformer are to be re-evaluated. High set should be kept based on %Imp with a delay of 50ms	▪ OC and EF Start ▪ OC and EF Trip ▪ OC and EF HS Optd
7.	Frequent loss of the double circuit line in spite of corridor clearance not being an issue	Lightning faults, poor tower footing earthing	▪ Analog values of current and voltages ▪ Mutual compensation current channel ▪ Time Synch Status

Sl No.	Case Description	Probable Explanation	DR channels required for analyzing the event
8.	A relay in a radial of the line issued a Zone 2 or Zone 3 trip during a single phase to earth fault in spite of the fact that no power source is available for a radial feeder to feed the fault	The substation might be a LILO point along a long radial line. The line might trip due to capacitive current effect during phase to earth faults.	▪ Current and voltage channels ▪ Pre-fault duration of 500ms
9.	A transmission line trips and later when it is charged, it is found healthy. The issue is repeated on many instances in spite of no corridor clearance issues.	Insulator Disc Puncture, Disc Crack, Spurious DT receive signal etc.	▪ Pre-fault duration of 500ms ▪ Current and voltage channels ▪ Carrier and DT signal channels
10.	An important 132kV Line is tripped due to a fault. There is subsequent cascading tripping of associated feeders resulting in a partial blackout.	During peak load conditions, (n-1) contingency may not be maintained which resulted in overcurrent operation of other feeders. The overcurrent settings for the feeders are to be re-evaluated.	▪ Pre-fault duration of 500ms ▪ Overcurrent Start ▪ Overcurrent Trip ▪ Zone pickups and trips ▪ Time Synch Status
11.	Spurious SOTF operation when Zone 2 or Zone 3 was picked up in the relay	"Manual CB close contact" may be false latched. "Auto-initiation" settings might be enabled, initial pre-fault loading of the line might be below the "pole open detect settings" of the relay	▪ Pre-fault duration of 500ms ▪ SOTF initiation ▪ Current and voltage phasors
12.	A radial transmission line trips due to fault. On the first and second charging attempt it trips on SOTF. The line is surveyed but no physical fault is found	If the HV and LV CBs of downstream transformers at remote end substation are kept closed, heavy charging current is down during charging of line and relay senses it as an SOTF	▪ Pre-fault duration of 500ms ▪ SOTF initiation ▪ Current and voltage phasors Harmonic Table
13.	Spurious DT signal which led to the tripping of CB at remote end	Issue of hard wiring in the PLCC Panel	▪ DT Send ▪ Carrier Send ▪ Manual CB Trip

TABLE 30: CASES OF TRANSFORMER DIFFERENTIAL TRIPPINGS

Sl No.	**Case Description**	**Probable Explanation**	**DR channels required for analyzing the event**
1.	During an out of zone fault, the differential protection of the transformer is operated	CT saturation, Loose CT connection	▪ Pre-fault data of 500ms ▪ Idiff and Irest current ▪ HV and LV current values
2.	During an out of zone fault, the restricted earth fault protection is operated	NCT Polarity mismatch, loose connection in CT path	▪ Pre-fault data of 500ms ▪ NCT current value ▪ HZREF resultant current/voltage (if applicable)
3.	Spurious operation of PRD, Buchholz relay	Due to moisture ingress during rainy season, mechanical jerk	▪ Inherent protection operate status ▪ All analog channels ▪ Pre-fault data of 500ms
4.	Tripping of the transformer in differential protection during charging operation	2nd harmonic blocking value should be checked along with fault current (if any)	▪ 2nd harmonic blocking ▪ All analog channels
5.	Mal-operation of the NIFPS system	The status inputs of the NIFPS control box might have mal-operated	▪ Inherent protection operate status ▪ 86 relay status ▪ Analog value of current
6.	Transformer has tripped on Over fluxing. When the voltages are near nominal limit, the first attempt of charging is carried out but it trips again on V/f protection	The V/f pickup should be checked. Whether tailor made curve or IEEE curve is followed and the cooling down period set in the relay	▪ V/f pickup ▪ V/f Alarm ▪ V/f trip operated ▪ Pre-fault values ▪ All voltage channels
7.	Buchholz relay operation during an earthquake	Due to mechanical jerk and improper slant of the pipe connecting conservator with main tank	▪ Buchholz operate status ▪ Pre-fault data of 500ms ▪ Time synch status
8.	Differential protection operated during stormy weather	Damaged lightning arrester	▪ Pre-fault data of 500ms ▪ Analog values of current and voltages

TABLE 31: OPERATION OF BUSBAR PROTECTION

Sl No.	Case Description	Probable Explanation	DR channels required for analyzing the event
1.	During a fault in Bus 1, the busbar relay failed to discriminate the faulty bus and the total system (Bus 1 and Bus 2) were tripped	The inputs of bus isolator status, CB status for feeders are not properly reported to the busbar relay	▪ Analog current values of all the bays ▪ Busbar differential current ▪ Busbar restraint current ▪ Isolator and CB status ▪ Busbar operate Zone status ▪ Busbar trip status
2.	Spurious LBB operation from the busbar relay	Spurious initiation of external protection operated to the busbar relay, double DC earth fault leading to false LBB initiation	▪ 86 status of each bay ▪ LBB initiation ▪ LBB trip ▪ Pre-fault data of 500ms
3.	Busbar mal-operation due to external fault	CT saturation, CT loose connection, CT polarity issue	▪ Pre-fault data of 500ms ▪ Analog current values of all the bays ▪ Busbar differential and restraint current ▪ Bus Zone status ▪ Check Zone status (if any) ▪ Busbar Trip status

CHAPTER 12

EXPLORING THE STANDARDS AND POSSIBILITIES FOR DISTURBANCE RECORDER PARAMETERS FOR RENEWABLE ENERGY (RE) GENERATING STATIONS

A REVIEW OF STANDARDS ADOPTED AT RE GENERATION SITE

The Amguri Solar Plant of North Eastern Region has been considered for understanding the protection philosophy followed at RE Generation Plants and likewise the DR standardization Parameters have been forwarded.

The "Amguri Solar Plant" located at the district of Sivasagar, Assam has a generation capacity of 70MWp. The project was executed by M/s Jackson Power Private Limited and commissioned in the year 2022.

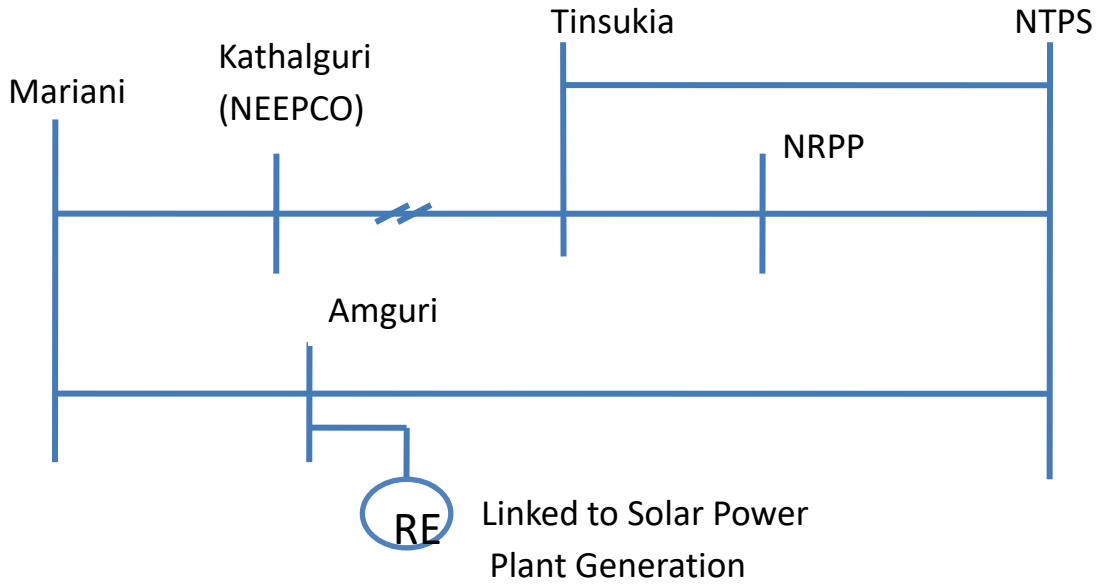

FIG 8: CONNECTIVITY OF AMGURI SOLAR PLANT

The previous 220kV transmission line between 220kV NTPS Grid Substation and 220kV Mariani Grid Substation has been included with 220kV Amguri Power Plant and the new connectivity has been formed as 220kV NTPS – Amguri and 220kV Amguri – Mariani Line.

PROTECTION FUNCTIONS (INVERTERS)

The protection and sustainable operation functions for a RE Generating plant is divided into three categories viz.

A. DC Side Protection
    a. Overvoltage Protection
    b. Overcurrent Protection
    c. Reverse Polarity
    d. Anti PID
    e. Ground Fault Monitoring
    f. Insulation Monitoring
    g. Over heat Protection
    h. Surge Protection
    i. Fan Protection

B. AC Side Protection
    a. Over/Under Voltage Protection
    b. Over Current Protection
    c. Current Balance
    d. Over/Under Frequency Protection
    e. Short Circuit Protection
    f. Surge Protection
    g. Earthfault Protection

C. Grid Support Features
    a. Low Voltage Ride Through (LVRT)
    b. High Voltage Ride Through (HVRT)
    c. Anti-Islanding
    d. Active & Reactive Power Regulation
    e. PF Control
    f. Soft Shutdown

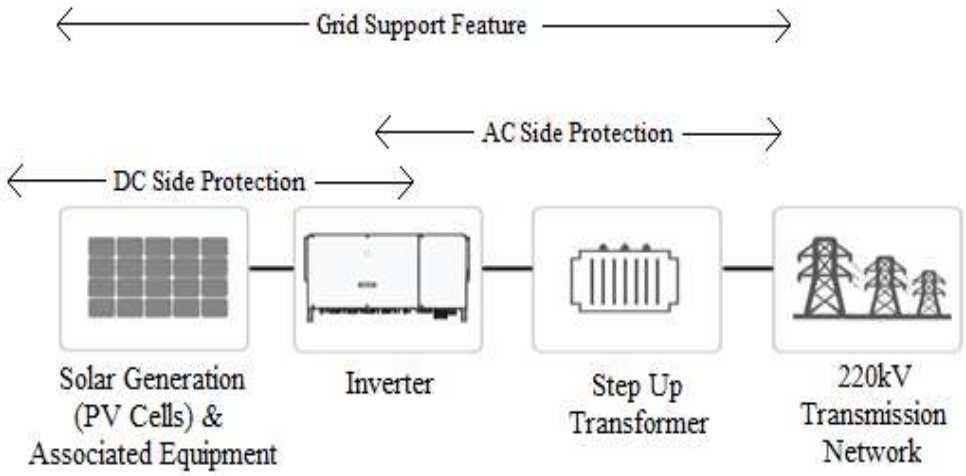

FIG 9: DC SIDE, AC SIDE AND GRID SUPPORT FEATURES IN A RE GENERATION PLANT

The above list has been compiled based on the inputs received from M/s Jackson. As per the inputs received from site, the logics and settings for the above protection functions and Grid Support Features are configured as per CEA Guidelines and IEC 62109, IEC 62116 standards.

CONTROL AND MONITORING SYSTEM

Two different models of PV Grid Connected Inverters are used at Amguri viz. **SG110CX and SG250HZ**

- The PV Grid-Connected String Inverters (Make: Sungrow) communicate with Computers (equipped with monitoring software) using Modbus RTU Protocol. This protocol can read the real-time operating data and fault states of the inverter.
- The analog values of current, voltages, Power, fault states are reported to the monitoring workstation with the help of pre-defined addresses (as per the Inverter Communication Manual) which is linked with the monitoring software.
- All protection functions are inbuilt in the inverter, the status of which is registered in the "event log" present in the inverter which can be extracted using local vendor provided application software. The status of each protection function can be reported to the SCADA system using "Addresses" as per the inverter manual.

No.	Name	Address	Data Type	Unit	Note
22	A-B line voltage/phase A voltage	5019	U16	0.1 V	Output type (address: 5002) is 1: upload phase voltage; 2: upload line voltage
23	B-C line Voltage/phase B Voltage	5020	U16	0.1 V	Output type (address: 5002) is 1: upload phase voltage; 2: upload line voltage
24	C-A line Voltage/phase C Voltage	5021	U16	0.1 V	Output type (address: 5002) is 1: upload phase voltage; 2: upload line voltage
25	Phase A current	5022	U16	0.1 A	
26	Phase B current	5023	U16	0.1 A	
27	Phase C current	5024	U16	0.1 A	
28	Reserved	5025～5026	U32	W	
29	Reserved	5027～5028	U32	W	
30	Reserved	5029～5030	U32	W	
31	Total active power	5031～5032	U32	W	
32	Total reactive power	5033–5034	S32	var	
33	Power factor	5035	S16	0.001	>0 means leading <0 means lagging

FIG 10: SCREENSHOT OF MODBUS ADDRESSES FOR ANALOG VALUES IN INVERTER OPERATION (FROM INVERTER MANUAL)

LCD or APP display (decimal)	Communication send data (hexadecimal)	Description	Classification
011	0x000B	Device abnormal	Fault
012	0x000C	Excessive leakage current	Fault
013	0x000D	Grid abnormal	Fault
014	0x000E	10-minute grid overvoltage	Fault
015	0x000F	Grid high voltage	Fault
016	0x0010	Output overload	Fault
017	0x0011	Grid voltage unbalance	Fault
019	0x0013	Device abnormal	Fault
020	0x0014	Device abnormal	Fault
021	0x0015	Device abnormal	Fault
022	0x0016	Device abnormal	Fault
023	0x0017	PV connection fault	Fault
024	0x0018	Device abnormal	Fault
025	0x0019	Device abnormal	Fault
030	0x001E	Device abnormal	Fault
031	0x001F	Device abnormal	Fault
032	0x0020	Device abnormal	Fault
033	0x0021	Device abnormal	Fault
034	0x0022	Device abnormal	Fault
036	0x0024	Excessively high module temperature	Fault
037	0x0025	Excessively high ambient temperature	Fault
038	0x0026	Device abnormal	Fault

FIG 11: SCRENSHOT OF MODBUS ADDRESSES FOR CONDITION MONITORING OF INVERTER FUNCTIONS (FROM INVERTER MANUAL)

TABLE 32: REMARKS AGAINST TOR POINTS FOR AMGURI RE PLANT

Sl. No	Terms of Reference	Remarks
1	Triggering criteria for DR	At inverter level, the various operations are monitored through the Local SAS HMI. The status of analog and digital values from the inverters is reported to the SAS via Modbus protocol. "Event log" can be viewed from the SAS after any disturbance has occurred. Comtrade DR facility (.cfg, .dat) etc. is not available for the inverter.
2	Sampling rate to be adopted	Not Applicable for Inverters
3	Data format for raw data files of DR	Not Applicable for Inverters
4	Power supply arrangement for DR and associated equipments	2KVA UPS for redundancy in AC supply. Two manually selectable DC sources are present. Automatic DC changeover is absent.
5	Protocol for monitoring healthiness of DR	Not Applicable

Observations and suggestions forwarded by FOLD Working Group 3

1. As per conversation with M/s Jackson, the status of protection functions, grid support features for the inverters etc. are inbuilt within the same inverter module. There is no provision of separate IEDs to monitor the protection functions. Hence, the DR recording facility (in comtrade format as applicable at Generating Stations and Transmission substations) is not applicable to the solar plant inverters at Amguri.
2. The protection at stepped up voltage at 220kV Level at Amguri Plant is as per the protection philosophies followed by other transmission utilities. Hence, the main area of concern is post-fault monitoring of analog values and digital status at inverter level (DC side and AC Side)

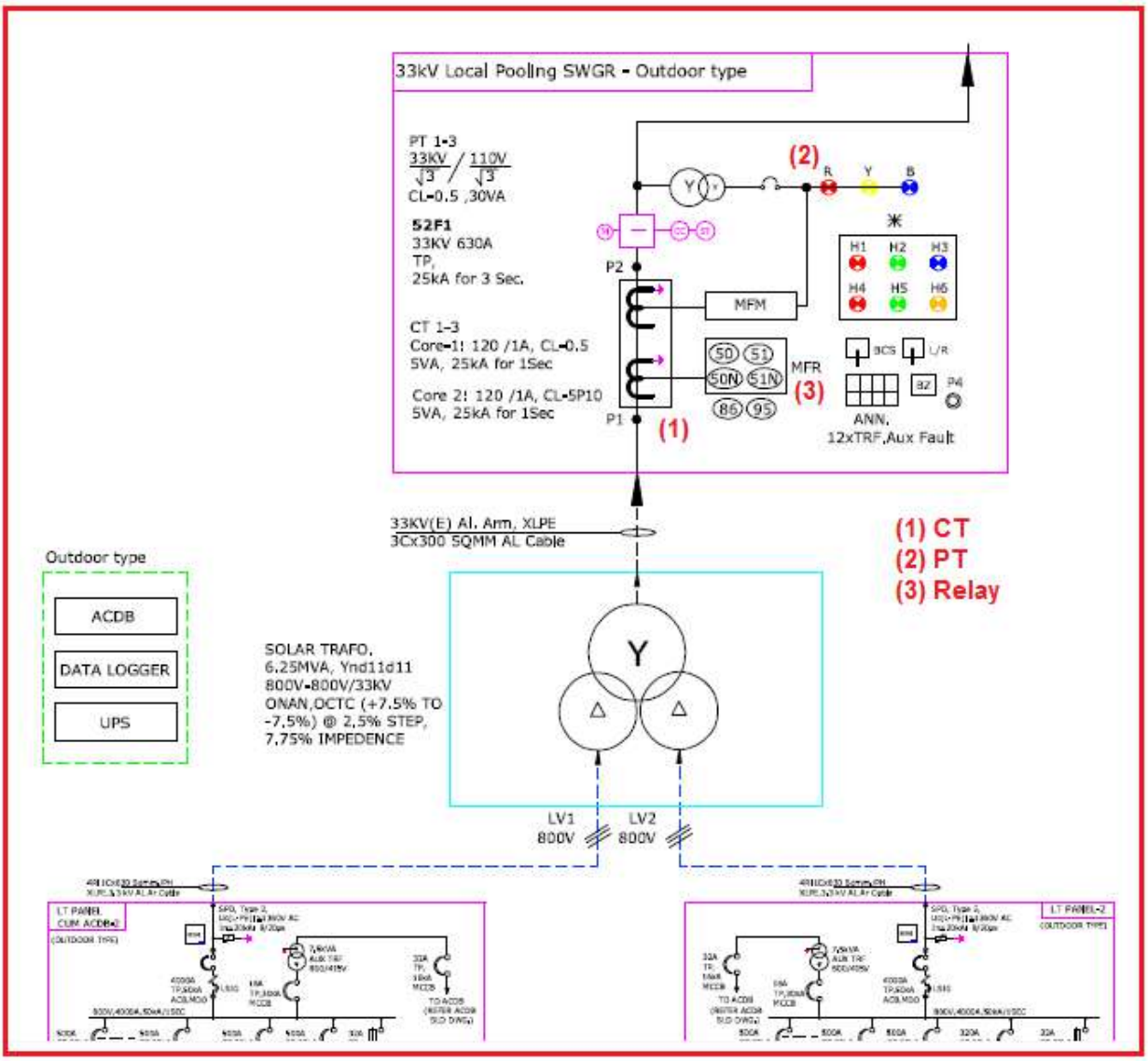

FIG 12: 800V-800V/33kV STEP UP TRANSFORMER CONNECTED TO INVERTER STRINGS

3. The inverters support event logger facility. The status of various protection and control signals can be extracted through the display interface connected to the inverters (The HMI of SAS or via application softwares of the concerned model of inverters.) The status of the inverters is represented by “numerical codes” in the event logger; each code corresponds to a definite status as described in the inverter manual.

4. The polling frequency of inverter data to the SAS at Amguri was reported to be 250ms resolution. The GPS date/time stamp(synchronized to common reference (e.g. Coordinated Universal time(UTC)) of generated inverter event data is not available (or the feature is absent).

5. However, the stepped up 33kV HV Side of the transformer (e.g. 800V/33kV in case of Amguri solar plant) has installed protection relays (refer fig. 11). The response of the inverter can be studied by configuring the DR parameters at the HV side of step up transformer. An idea of the inverter response can be achieved through analysis of the DR data extracted from HV side during grid disturbances.

6. The numerical relays to be installed at Solar plant (Amguri) support MODBUS communication. It is proposed that all numerical relays installed at RE generation plant should be IEC 61850 complaint.

7. It may be proposed that, future RE generation plants should have instrument transformers installed at each voltage level to facilitate installation of numerical relays to record grid disturbance data. The possibility of Digital Fault Recording (DFR)data (such as bus voltage phase quantities, Bus frequency, Current phase quantities, calculated active &reactive power output, dynamic reactive element voltage, frequency, current and power output) equippedwith inverters should also be explored.

8. Installation of stand-alone Disturbance recorder devices, Event logger (with GPS time synch and standard sampling frequency) should be explored.

9. Installation of Phasor measurement units(PMUs) at station bus of RE generation plants can also be explored.

10. Active/Reactive power and voltage oscillation detection feature is generally not available at relays procured for line feeders (33kV and above). DR channels associated with these functions would enable more efficient monitoring of RE Generation at Grid substation

level. The availability of the features for such RE Generation connected features may be explored (discussion and OEM support)

The basic criteria of DR parameter standards for RE Generation plants should be such that, the response of the inverter to grid disturbances and status of the protection functions of the inverters (AC side and DC side) should be recorded in analog and digital form with adequate sampling frequency rate (>=1000Hz) with settable pre and post fault time window.

REFERENCES

1. ABB Technical and Communication Manual
2. MiCOM Technical Manual
3. Siemens Technical Manual
4. Ramakrishna Committee Report
5. Transmission Planning Criteria Manual, 2013
6. General Studies for 765/400/220kV Substation and Switchyard of Thermal/Hydro PowerProjects, CEA, 2012
7. "An Examination of Possible Criteria for Triggering Swing Recording in Disturbance Recorders" by Leonard Swanson & Jeffrey Pond, National Grid USA Rich Hunt, NxtPhase T&D Corporation
8. Alberta Reliability Standard Disturbance Monitoring and Reporting Requirements PRC-002AB-2
9. "Requirements for a Fault Recording System" by Rich Hunt and Jeff Pond
10. "System Monitoring – Fault Recording" by National Grid Electricity Transmission (UK) (NGET)
11. "Requirements for a Fault Recording System" by Rich Hunt and Jeff Pond
12. "Records from DFRs vs. Records from Microprocessor-Based Relays'' by Hugo Davila
13. IEEE Standard Common Format for Transient Data Exchange (COMTRADE) for Power Systems
14. "Considerations for Use Of Disturbance Recorders", A report to the System Protection Subcommittee of the Power System Relaying Committee of the IEEE Power Engineering Society
15. Alberta Reliability Standard Disturbance Monitoring Equipment Installation and Data Reporting PRC-018-AB-1

Annexure-XV

HIMACHAL PRADESH STATE LOAD DESPATCH CENTRE

(an Apex body)

GOVERNMENT OF HIMACHAL PRADESH

No. HPSLDC/SLDC-21D (Volume-01)/ 2024-25- 7328-29 **Dated:** 13-11-2024

To

The Member Secretary,
Northern Regional Power Committee,
18-A, Shaheed Jeet Singh Marg,
Katwaria Sarai, New Delhi-110016.
Email: seo-nrpc@nic.in

Subject: **Approval of protection setting of (i) 220 kV Ckt.-I and Ckt.-II from 400/220 kV GIS of PKATL (Power Grid KalaAmb Transmission Limited) at Arandwala (Kala-Amb) to 220/132/33 kV AIS of HPPTCL at Andheri (Kala-Amb) (ii) 220/132/33 kV ICT at Kala-Amb (HP), (iii) 132 kV transmission line on Multi Ckt. Tower from 220/132/33 kV Substation of HPPTCL at Andheri (Kala-Amb) to T20/T21 of existing 132 kV Jamta-Kala-Amb Transmission Line** - *Regarding agenda for 54th Protection Sub-Committee.*

Reference: **Meeting notice for 54th Protection Sub-Committee meeting, dated: 04.11.2024.**

Sir,

In context to subject cited above, it is requested that subject cited agenda may please be placed in upcoming 54th Protection Sub-Committee. The detail of first-time charging (FTC) of elements has been tabulated hereunder as:

Sr. No.	Element Name	FTC accorded by
1.	220 kV Ckt.-I and Ckt.-II from 400/220 kV GIS of PKATL at Arandwala (Kala-Amb) to 220/132/33 kV AIS of HPPTCL at Andheri (Kala-Amb).	NRLDC (in May-2024)
2.	220/132/33 kV ICT at Kala-Amb (HP)	
3.	132 kV transmission line on Multi Ckt. Tower from 220/132/33 kV Substation of HPPTCL at Andheri (Kala-Amb) to T20/T21 of existing 132 kV Jamta-Kala-Amb Transmission Line.	HPSLDC (in Sept.-2024)

Further, it is submitted that all the deliberations and discussions in respect of protection setting shall be conducted by HPPTCL. **The relevant protection settings are attached herewith for necessary action at your end, please.**

Yours sincerely,

Superintending Engineer,
O/o Managing Director,
HPSLDC, GoHP, Totu, Shimla-11

DA: As above

Copy to the DGM (Prot. & Comm.), HPPTCL, Hamirpur, HP for information and necessary action, Please

Superintending Engineer,
O/o Managing Director,
HPSLDC, GoHP, Totu, Shimla-11

SLDC Complex, Totu, Shimla-171011
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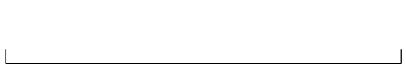
Annexure-XVI

Status of actions points recommended during previous PSC meetings (to be discussed in 54th PSC meeting)

S. No	Agenda	Remdial actions recommended during PSC meeting	Status of remdial action taken (to be updated by respective constituents)		
			52nd PSC	53rd PSC	54th PSC
1	Frequent multiple elements tripping at 220kV Kunihar, Baddi, Upperla Nangal complex and load loss event in HP control area	PSC Forum requested HP to complete the protection audit as per mentioned timelines (protection audit of 220kV Kunihar has been awarded and it would be completed within next 15-20 days. In next phase, by 15th September, protection audit of substations in downstream and upstream of 220kV Kunihar S/s would be completed.) and resolve the protection related issues. HP was also requested to share the reports of protection audit to NRPC & NRLDC after completion of audits.	1. Protection audit of 220kV Kunihar has been awarded to POWERGRID on 09th July 2024 and it would be completed by October 2024. 2. In next phase, protection audit of substations in downstream and upstream of 220kV Kunihar S/s would be completed, tender process of rest of the stations is in process.	HPSEBL representative informed that protection audit of 220kV Kunihar was done during between 17-19th October 2024. Award of protection audit of other stations is yet to be done. Audit report of Kunihar S/s shall be submitted in a week.	
2	Multiple elements tripping at 220kV Hissar(BBMB) 07th May 2024, 11:16 hrs	a) Expedite the implementation of differential protection in short lines to avoid undesired operation of distance protection.	HVPNL representative informed that clearance related to OPGW received from POWERGRID. Matter was forwarded to design team and is pending at that stage.	BBMB representative stated the matter has been taken up with HVPNL and is pending at their end. HVPNL representative informed that design team has compiled all such requirements in Haryana control area and is not working on the further process.	
3	Multiple elements tripping at 400/220kV Akal (RS) on 08th Jun 2024, 19:53 hrs	a) Bus bar protection at 220kV bus at 400/220kV Akal shall be made operational at the earliest. b) Time synchronization of recording instruments (DR/EL) need to be ensured.	Rajasthan representative stated that three faulty PU were replaced from the future bay and one PU is still unhealthy which is in warranty period. Process is getting delayed due to lack of response from the OEM. Process will be expedited and will try to resolve the bus bar protection issue on priority.	RVPNL representative stated that correspondence with the firm is still going on and as an alternative, possibility of replacing healthy PU from any other station is being explored. Issue of time sync will be able to resolve only if bus bar protection get operational.	
4	Multiple elements tripping at 400kV Sainj (HP), 400kV Parbati2 & Parbti3 (NHPC) Stations on 07th May 2024, 16:17 hrs	a) NHPC shall follow up with the relay engineer and taken necessary remedial actions to ensure proper operation of A/R scheme at Parbati2 end. b) NHPC and HPPTCL shall review the healthiness of PLCC at Parbati3 and Sainj end and take necessary actions to ensure their proper operation. c) Expedite the implementation of differential protection in 400kV Parbati2-Sainj line. d) Standardisation of recording instruments (DR/EL) need to be ensured.	1.Shutdown has been planned in 1st week of November 2024, testing of A/R scheme and implementation of differential protection will be done during that period. 2. PLCC card at Parabti3 end will be replaced by the end of September 2024. For dual test of PLCC operation, PLCC at Sianj end also need to be healthy.	As per details received from NHPC present status is as follows: •Due to unavailability of OEM, shudown plan has been now rescheduled in last week of November or 1st week of December. Testing of A/R scheme and implementation of differential protection will be done during that period. •PLCC card at Parabti3 end has been replaced and made functional. However, for dual test, PLCC at Sainj end also need to be functional.	
5	Multiple elements tripping at 400kV Khedar(RGTPS) Station at 10th May 2024, 19:35 hrs	a) Revised corrected protection settings of Main-2 Micome P4442 distance protection relay and A/R scheme at Khedar(RGTPS) end need to implemented at the earliest.	HVPNL representative informed that Khedar(RGTPS) have conducted 3rd party protection audit. Status of corrective action taken yet to be confirmed.	Khedar RGTPS representaitve informed that issues with the settings of the Micom relays has been resolved however in REL 670 relay installed at Khedar end, only 1-ph A/R option is not available. 3-ph A/R has been disabled now and it has been kept as 1-ph/2-ph A/R.	
6	Multiple elements tripping at 400kV Koteshwar(PG) on 17th May 2024, 17:21 hrs	a) In view of short line length of 400KV Koteshwar(PG)-Tehri D/C, POWERGRID shall plan for the differential protection in the line on priority in near future to avoid overreach of distance protection.	Update yet to be received	POWERGRID (NR-1) representative informed that order for the material of differential protection has been placed. It is estimated that materials will get delivered in next 3-months. In addition, to avoid delayed fault clearance in case of high resistive fault, time delay of DEF protection and carrier aided DEF operation has been implemented.	
7	Multiple elements tripping at 220kV Sarna (PS) on 04th May 2024, 07:10 hrs	a) Punjab shall expedite the commissioning of new bus scheme. B) POWERGRID shall revise the Z-4 time delay setting of Kishenpur lines at Sarna (PS) end as 160msec till bus bar get operational.	Punjab representative informed that tender of bus bar protection has been processed, bus bar protection at 220kV Sarna will be commissioned within 4-5 months tentatively.	PSTCL representative informed that tender of bus bar scheme is in process POWERGID(NR-2) representative informed that Z-4 time delay setting of lines of their control area has been revised.	
8	Multiple elements tripping at 400/132kV Masoli(UP) on 29th May 2024, 15:57 hrs	a) Up shall implement the bus bar protection at 132kv level at 400/132kV Masoli S/s.	UP representative informed that this case has been communicated to design team. In response, they have asked the list of all such stations in UP control area. Further follow up actions is expected in due time course.	UPPTCL representative informed that process is still at the design team stage. Design team is compiling all such requirements and further process will be initiated within 1-2 months.	
9	Multiple elements tripping at 220kV KTPS (RVUN) on 21st June 2024, 11:37 hrs	a) Commissioning of bus coupler between 220kV Bus-3 & 5 need to be expedited.	KTPS representaitve informed that tender for the same has been floated.	RVUNL representative informed that process is at same stage. It will take around 01 year to complete all the process and implementation of bus coupler.	
10	Frequent tripping of 220 KV Anta(NT)-Sakatpura(RS) (RS) Ckt-1		Regarding non-operation of A/R, Rajasthan representative informed that relay penal is old, same is planned to be replaced with new within one month.	RVPNL representative informed that request of relay panel has been floated however DI of the same is yet to be issued.	
11	Frequent tripping of 220 KV Saharanpur(PG)-Shamli(UP) (UP) Ckt-1		POWERGRID representaitve stated that they will review the status of A/R operation at Shahranpur(PG) and shall ensure its proper operation in future.	PSC forum requested POWERGRID to review the healthiness of A/R in lines at Saharanpur(PG) end. Any issue in A/R operation need to be rectified at the earliest and A/R should be kept enable. UPPTCL shall take necessary actions to minimise the occurrence of faults in line.	
12	Frequent tripping of 400 KV Dadri(NT)-Panipat(BB) (PG) Ckt-1		NTPC representative stated that they will look into the issue and share the updated on the same.	NTPC representative stated that there is no issue at Dadri(NTPC) end and A/R is also healthy and operational.	
13	Frequent tripping of 220 KV Khara(UP)-Saharanpur(PG) (UP) Ckt-1		UP representative informed that new relay is available at site. Relay will be replaced during lean season as per the shutdown opportunity.	PSC forum requested POWERGRID to review the healthiness of A/R in lines at Saharanpur(PG) end. Any issue in A/R operation need to be rectified at the earliest and A/R should be kept enable. UPPTCL shall expedite the replacement of relay at Khara(UP) end.	
14	Multiple elements tripping event at Baghpat(PG) & Baghpat(UP)		POWERGRID representaitve stated that they will review the status of A/R operation at Shahranpur(PG) and shall ensure its proper operation in future.		
15	Multiple elements tripping event at Patiala(PG)		Continuous follow ups are being done for expeditious delivery of material. Thereafter, new bus bar protection will be implemented.		
16	Multiple elements tripping at 400/220kV Bhadla(RS)	Commissioning of Bus bar protection at 220kV bus at 400/220kV Bhadla(RS) need to be expedited.		RVPNL representative stated that process got delayed. They will expedite the commissioning of Bus bar protection at 220kV bus at 400/220kV Bhadla(RS)	
17	Multiple elements tripping at 400/220kV Lucknow(UP)	Replacement of bus bar relay with numerical bus bar relay need to be expedited.		UPPTCL representative informed that bus bar relay is implemented, and its commissioning will be done in November 2024 as per shutdown availability.	
18	Multiple elements tripping at 400/220kV Muzaffarnagar(UP)	Necessary changes in logic of bay assignment may be done to ensure reliable operation of LBB and bus bar protection.		UPPTCL representative informed that logic has been revised. Now bay assignment will be decided through isolator status only.	
19	Multiple elements tripping at 220kV Shahbad(HR) and 220kV Rajokheri(HR)	Review of protection system need to be done to avoid such undesired operation and proper operation of protection system need to be ensured.	Haryana representative agreed to share the revised details analysis of the event.	HVPNL representative informed that detail analysis and protection review has been done. Necessary changes in setting have also been done. Report of the same is submitted.	
	Frequent tripping of 220 KV Nara(UP)-Roorkee(UK) (UP) Ckt-1			PTCUL representative stated that they will analyse the event and share the analysis.	
	Frequent tripping of 220 KV Sarna(PS)-Udhampur(PDD) (PDD) Ckt-1			PSTCL representative was requested to ensure timely submission of DR/EL so that analysis of the event and necessary remedial action can be taken. PSTCL representative agreed for the same.	
	Frequent tripping of 400 KV Agra-Unnao (UP) Ckt-1			UP was requested to share the DR of over voltage protection and review the operation of over voltage at Unnao end and review the trippings.	

	Multiple elements tripping at 220kV Khodri HEP & Chibro HEP on 5th, 11th & 19th September 2024			⁍Timely submission of disturbance recorder (DR) and event logger (EL) files need to be ensured. As per IEGC clause 37.2 (c), Disturbance Recorder (DR), station Event Logger (EL), Data Acquisition System (DAS) shall be submitted within 24 hrs of the event. ⁍HPPTCL shall taken necessary actions to rectify the protection related issue in 220kV Khdori-Majri ckt-2. ⁍OV protection needs to be disabled in 220kV lines at the earliest. ⁍Over frequency and over current protection operation in units at Khodri HEP need to be reviewed. ⁍A/R should be made operational in Sarsawan line at the earliest. ⁍UJVNL shall share the CPRI audit report and details of remedial action taken within one week. ⁍Replacement of Units breakers need to be expedited.	
	Multiple elements tripping at 400/220kV Jaisalmer(RS) Akal(RS) on 20th September 2024			⁍RVPNL shall share the detailed analysis of the event within one week.	



Third Party Production Audit Product and Compliance in r/o 220/132/33kV Sub Station, Sub-Division, HPSEBL, Kunihar.	
1	220 Kv both Bus Bars Protectors aree kept out of service, the same needs to be taken in.
Reply	The Bus Bars Protection Panels is not commisioned. The matter is take up with the higher authorities of HPSEBl & ABB India Ltd. And the Commissioning of panel will be done soon.
2	132 Kv bus Bars protection is not available/installed, the same needs to be implemented for reliable operation of protection scheme and clearing of faults.
Reply	A Scheme for replacement of all 132 kv cntrol and relay panels is submitted to higher authorities in PSDF - II scheme in which 132 kv bus bars protection panel is also available.
3	In all MICOM P444 relays all the tripping outputs settiungs needs to be changed to DWELL with pickup value 100ms in PSL logic
Reply	All the suggested setting will be changed during Protection ans testing to be planned for 11.12.2024 with proper shut down.
4	In all 220 kv line feeders auto release function is available but not in service. Same needs to be taken into service as per latest guidelines.
Reply	The auto reclosure function is available in 220 kv line feeders and same is activatedfor protection purpose
5	In both ABB and MICOM relays circuit breaker open status is to be added in DR for proper analysis of the Fault.
Reply	Matters has been taken up with Protection and Testing Unit , Soon it will be resolved.
6	In all 220 kv and 132 kv line feeders, there is no PLCC /DTPC available/installed. As the communication is through OPGW, DTPC needs to be installed for implementation of auto-reclose function.
Reply	Matters has been taken up with Protection and Testing Unit , Soon it will be resolved.
7	In 132 kv Distance protection is to be implemented in Barotiwala Ckt - 1 & 2 and Solan 1 & 2 feeders.
Reply	A Scheme for replacement of all 132 kv cntrol and relay panels is submitted to higher authorities in PSDF - II scheme.
8	In 132 Kv feeders there is no LBB protection available, same needs to be implemented.
Reply	A Scheme for replacement of all 132 kv cntrol and relay panels is submitted to higher authorities in PSDF - II scheme.
9	In 132 kv line C&P panels, most of the aux relays are installed but are not healthy such there is no provision of alarm in case of tripping or trouble in other feeders. Non-reporting of tripping, and important alarms like CB lockout, SF6 low, Air pressure low etc. result in poor monitoring and delay in restoration/rectification , so the panels/relays needs to be replaced/modified.
Reply	All 132 kv control and relay panel installed at 220 kv sub-station Kunihar are old and A Scheme for replacement of all 132 kv cntrol and relay panels is submitted to higher authorities in PSDF - II scheme.
10	In all 132 kv line feeders Auto reclose function needs to be implemented as per latest guidelines
Reply	All 132 kv control and relay panel installed at 220 kv sub-station Kunihar are old and A Scheme for replacement of all 132 kv cntrol and relay panels is submitted to higher authorities in PSDF - II scheme.
11	SLD of ACDB and DCDB shall be made available.
Reply	Prepared.

Sr. Executive Engineer,
220 KV ES Division,
HPSEBL Kunihar.

12	Time Synchronization of all IEDs of 220 kv and 132 kv found to fail. There is no GPS signal available in GPS clock due to this all IED's are not time synced. This has to be rectified.
Reply	Matters has been taken up with ABB and soon it will be rectified.
13	No protection testing record available at the site (Pre-Commissioning/Route testing). It is observed that there is no practice of testing the protection system functions. Proper SOP for testing, monitoring and record-keeping of protection system needs to adopt for the betterment of the protection system.
Reply	The testing of relays of ICT - I and ICT - II were done during the periodical testing of Transformers and the matter of testing all the feeder relays during the periodical testing of sub-station is take up with protection and testing team of HPSEBl
14	Protection spares are not available at sites. Healthy relay needs to be kept in a suitable, so that same can be utilizedb during contingencies. Consumable spares eg. FO patch cords, indication lamps, semaphores, indicating meters etc need to be kept at site.
Reply	Few protection spares procured and rest of raise the matter to higher Authorities.
15	Trip Circuit supervision is a very important monitoring mechanism same need to be implemented in all 132 kv systems on a priority basis.
Reply	The panels and wiring of 132 kv system is old and the relays installed these panels are electromechanical type which are not in healthy condition. A Scheme for replacement of all 132 kv cntrol and relay panels is submitted to higher authorities in PSDF - II scheme.
16	DC Earth fault in sources 01 and 02 needs to be removed, present DC system condition is. (A) DC - 1: +ve to -ve 242.3 V, +Ve to E- 140.0 V, -Ve to E- 105.0 V (B) DC- 2: +Ve to -Ve- 248.9V, +Ve toE- 75.0 V, -Ve to E- 170.6 V, there is DC Earth Fault in DC-2, which needs to be rectified.
Reply	For rectification of DC Earth fault the sub-station maintenance team is performing regular duties such as replacement of old DCMCB's Dc fuse and also replacing the old damage terminal blocks.

Sr. Executive Engineer,
220 KV ES Division,
HPSEBL Kunihar

Annexure-XVIII

Grid Event summary for October 2024

S.No.	Category of Grid Incident/ Disturbance	Name of Elements (Tripped/Manually opened)	Affected Area	Owner/ Agency	Outage		Revival		Duration (hh:mm)	Event (As reported)	Energy Unserved due to Generation loss (MU)	Energy Unserved due to Load loss (MU)	Loss of generation / loss of load during the Grid Disturbance		% Loss of generation / loss of load w.r.t Antecedent Generation/Load in the Regional Grid during the Grid Disturbance		Antecedent Generation/Load in the Regional Grid		Fault Clearance time (in ms)
	(GI-1 to GD-V)				Date	Time	Date	Time					Generation Loss(MW)	Load Loss (MW)	% Generation Loss(MW)	% Load Loss (MW)	Antecedent Generation (MW)	Antecedent Load (MW)	
1	GD-1	1) 220 KV Fatehgarh III(PG)- RSRPL_Hyb_FTHG3_PG (RENEW SURYA ROSHNI PRIVATE LIMITED) Ckt	Rajasthan	RSRPL, PGCIL	5-Oct-24	11:50	5-Oct-24	22:25	10:35	i)Generation of 220/33kV RSRPL FTG3 station evacuates through 220 KV Fatehgarh III(PG)- RSRPL_Hyb_FTHG3_PG (RENEW SURYA ROSHNI PRIVATE LIMITED) Ckt. During antecedent condition, RSRPL FTG3 station station was generating approx. 310MW (as per PMU). ii)As reported, at 11:51hrs, 220 KV Fatehgarh III(PG)- RSRPL_Hyb_FTHG3_PG (RENEW SURYA ROSHNI PRIVATE LIMITED) Ckt. was hand tripped due to spark observed in B-Phase line isolator. iii)Due to tripping of 220 KV Fatehgarh III(PG)- RSRPL_Hyb_FTHG3_PG (RENEW SURYA ROSHNI PRIVATE LIMITED) Ckt, both ICT-I & II of 220/33KV also tripped along with 220KV Bus – I and Bus-II. iv)As per PMU, solar generation loss of approx. 312 MW is observed at 220KV RSRPL S/S. v)As per SCADA, during this event, dip in solar generation of approx. 326 MW is observed in NR control area. vi)Due to dip in RE generation, frequency dropped by 0.039 Hz (from 50.036 Hz to 49.997 Hz). vii)As per SCADA, no change in demand is observed in Rajasthan control area.	0	0	310	0	0.488	0.000	63574	70955	NA
2	GD-1	1)220 KV Jauljivi (PG)-Dhauliganga(NH) (PG) Ckt-1 2)220 KV Jauljivi (PG)-Dhauliganga(NH) (PG) Ckt-2 3)70 MW Unit-4 at Dhauliganga(NH)	Uttarakhand	PGCIL, NHPC	5-Oct-24	18:23	5-Oct-24	19:06	00:43	i)During antecedent condition, only 70 MW Unit-4 at Dhauliganga(NH) was running and generating approx. 69MW (as reported, SCADA data not available). Unit-1, 2 & 3 were under shutdown. ii)As reported, at 18:24hrs, 220 KV Jauljivi (PG)-Dhauliganga(NH) (PG) Ckt-1 & 2 tripped due to malfunction of GIS controller software. iii)Along with the same, 70 MW Unit-4 at Dhauliganga(NH) also tripped due to loss of evacuation path. Hence 220kV Dhauliganga(NH) S/s became dead. iv)As per PMU at 400kV Bareilly(PG), no fault signature was observed. v)As per SCADA, no change in NR hydro generation is observed. vi)As reported by Dhauliganga, Generation loss of 69MW was reported at Dhauliganga(NH).	0	0	70	0	0.106	0.000	53633	65902	NA
3	GI-2	1)220kV Obra_A-Sahupuri ckt 2)220kV Obra_A-Rewa Road ckt-2 3)400/220kV 315 MVA ICT 1 at Obra_B(UP) 4)400/220kV 240 MVA ICT 3 at Obra_B(UP)	Uttar Pradesh	UPPTCL	9-Oct-24	11:39	9-Oct-24	12:22	00:43	i)400/220 kV Obra -B substation has 2*315 MVA (ICT-1&2) and one 240MVA ICT (ICT-3). During antecedent condition, 2*315 MVA & 240 MVA ICTs were carrying 104MW (ICT1), 101MW (ICT2) and 78MW (ICT3) respectively. ii)400/220kV 315 MVA ICT-1, 240 MVA ICT-3 at Obra _B, 220kV Obra_A-Allahabad Rewa Road ckt-2 & 220kV Obra_A-Sahupuri ckt were all connected to 220KV Bus-1 during the antecedent condition. iii)As reported at 11:39 hrs, R-Y fault occurred on 220kV Obra-Sahupuri ckt. Fault location was 5km from Sahupuri end. Fault was in Z-1 from Obra end and Z-2 from Sahupuri end. iv)On this fault, distance protection at both ends operated. CB opened from Sahupuri end however, CB at Obra end failed to open. v)As reported, LBB protection didn't operate (relay is of static type) and fault cleared with the tripping of 220kV Obra_A-Allahabad Rewa Road ckt-2 on Z-4 distance protection operation and 400/220kV 315 MVA ICT-1, 240 MVA ICT-3 on directional O/C E/F protection operation. 220kV bus coupler CB also opened on over current protection and 220kV Bus-2 got isolated. vi)After tripping ICT-1 & 3 all the load shifted to ICT-2 and the loading of ICT-2 increased to 240 MW. vii)As per PMU at Anpara(UP), R-Y fault with delayed clearance of ~960msec is observed. viii)Both the transformers were restored back into service at 12:22 hrs (ICT-1) and 14:41 hrs (ICT-3) respectively. ix)As per SCADA, no generation or load loss was observed in UP control area. x)As per SCADA, no change in demand is observed in the Northern Region.	0	0	0	0	0.000	0.000	9381	68876	960
4	GI-2	1)33 MW Unit-1 at Obra HEP (UP) 2)33 MW Unit-2 at Obra HEP (UP) 3)33 MW Unit-3 at Obra HEP (UP) 4)50 MW Unit-1 at Rihand HEP (UP) 5)50 MW Unit-2 at Rihand HEP (UP) 6)50 MW Unit-4 at Rihand HEP (UP) 7)220/132kV 100 MVA ICT-1 at Obra-A (UP) 8)220/132kV 100 MVA ICT-2 at Obra-A (UP) 9)220/132kV 100 MVA ICT-3 at Obra-A (UP)	Uttar Pradesh	UPPTCL	9-Oct-24	17:04	9-Oct-24	17:43	00:39	i)Obra-A has 3, 220/132 KV, 100MVA transformers which were carrying approx. 46MW, 51MW and 45MW during antecedent condition. ii)As reported, during inclement weather conditions, 220/132kV 100 MVA ICT-1 & ICT-2 tripped on B-N earth fault protection at Obra-A(UP) which led to complete shifting of load on 220/132kV 100 MVA ICT-3 at Obra-A (UP). iii)As a result of overloading of the 3rd transformer, ICT-3 also tripped on O/C protection at 17:04hrs. iv)At the same time 17:04hrs, 03 Units at Obra Hydro and 03 Units at Rihand HEP (connected at Bus-2) also tripped leading to a total generation loss of approx. 215 MW. v)Considering the above incident, Rihand manually tripped Obra-A, Obra H1, Obra H2 and Gharwad lines from perspective of safety. vi)As per SCADA, change in demand of approx. 100MW is observed in UP control area.	0	0.065	215	100	0.352	0.164	13090	61049	120
5	GI-2	1)400/220kV 315 MVA ICT-1 at Kashipur(UK) 2)400/220kV 315 MVA ICT-2 at Kashipur(UK) 3)220/132kV 160 MVA ICT-3 at Kashipur(UK) 4)220kV Jafarpur-Kashipur (UK) Ckt 5)220kV Pantnagar – Kashipur (UK) Ckt 6)132kV Kahipur – Jaspur (UK) Ckt	Uttarakhand	PTCUL	10-Oct-24	10:56	10-Oct-24	11:17	00:21	i)400/220/132kV Kashipur has 2*315 400/220kV and 2*160MVA 220/132kV ICTs. ii)As reported, at 10:56:13.086, LV side CB of 315MVA ICT-2 tripped. Uttarakhand-SLDC in its tripping report mentioned the reason for the fault was operation of Restricted Earth Fault (REF) as well as some external fault, which is of contradictory nature. REF is an internal fault of the transformer. Further clarification may be given by Uttarakhand -SLDC on this matter. iii)With the tripping of 315MVA ICT-1 at Kashipur, case-2 of SPS for transformers at 400KV Kashipur (PTCUL) substation operated. As a result of the SPS present in Kashipur sub-station, the following lines also tripped i.220kV Jafarpur-Kashipur (UK) Ckt ii.220kV Pantnagar – Kashipur (UK) Ckt iii. 132kV Kahipur – Jaspur (UK) Ckt iv)Even after tripping of the aforementioned lines, loading of 315MVA ICT-1 didn't reduce and increase to ~339MVA. As reported, load of 220kV Kamalwaganja was being fed from 220kV Pantnagar and 132kV Bajpur. After tripping of 220kV Kashipur-Pantnagar ckt, load of Kamalwaganja which was feeding through Kashipur-Pantnagar shifted to Bajpur source. Due to this, loading of 315MVA ICT-3 didn't reduce after SPS operation. v)Further, at 10:56:24.522,315MVA ICT-1 HV and LV Side tripped on Over Current Protection. However, from the DR of ICT-1, loading of ICT-1 before tripping was ~107%. vi)Further, 220/132kV 160 MVA ICT-3 also tripped at Kashipur. As reported, no flag was observed for the said tripping. vii)As per PMU at Roorkee(PG), no fault in system is observed. viii)As per SCADA, a change in demand of approx. 247MW is observed in Uttarakhand control area.	0	0.082	0	247	0.000	0.366	9411	67486	NA
6	GI-1	1)220 KV Amargarh (INDIGRID)-Ziankote(JK) (PDD JK) Ckt-1 2)220 KV Amargarh (INDIGRID)-Ziankote(JK) (PDD JK) Ckt-2	Jammu & Kashmir	JKPDD & INDIGRID	11-Oct-24	10:03	11-Oct-24	11:09	01:06	i)220/132kV Ziankote S/s have two bus at 220kV side i.e., main bus & reserve bus. 220kV Amargarh-Ziankote ckt-1&2 are on the same tower (D/C tower) and line length is ~21.4km. ii)During antecedent condition, 220kV Amargarh(INDIGRID) –Ziankote(JK) D/C was carrying 114 MW each and feeding Ziankote load. iii)As reported, at 10:03 hrs, 220 KV Amargarh(INDIGRID)-Ziankote(JK) (PDD JK) D/C tripped from both ends on Y-B phase to phase fault. During patrolling it was found that the fault had occurred between Tower no. 76 and 77, as some locals were cutting trees in the vicinity of line and branches of tree had fallen on the line. iv)As per PMU at Amargarh(PG), B-N phase to earth fault which cleared within 80 msec is observed. v)As per SCADA, change in demand of approx. 175MW is observed in J&K control area.	0	0.195	0	175	0.000	0.269	9322	65076	80
7	GI-1	1) 220 KV Wagoora(PG)-Pampore(PDD) (PG) Ckt-1 2) 220 KV Wagoora(PG)-Pampore(PDD) (PG) Ckt-2	Jammu & Kashmir	PDD-JK & PGCIL	16-Oct-24	13:45	16-Oct-24	13:49	00:04	i)220/132kV Pampore(PDD) has single main and transfer Bus arrangement at 220kV side. ii)During antecedent condition, power flow from Wagoora(PG) S/s to Pampore(PDD) S/s was approx. 140 MW (70 MW each) through 220 KV Wagoora(PG)-Pampore(PDD) (PG) D/C. iii)As reported, at 13:45 hrs, Y-phase disc ruptured in 220kV main Bus at Pampore. iv)Due to this, 220kV Wagoora(PG)-Pampore(PDD) (PG) Ckt-1 tripped from Pampore end on Y-N phase to earth fault (exact location of fault and nature of protection operated yet to be shared). v)During the same time, 220kV Wagoora(PG)-Pampore(PDD) (PG) Ckt-2 also tripped from Wagoora end sensing the fault in zone-2 with fault distance of 11.91km from Wagoora end. vi)As per PMU at Amargarh(INDIGRID), Y-N phase to earth fault converted to Y-B-N double phase to earth fault with delayed fault clearing time of 1000ms is observed. vii)As per SCADA, change in demand of approx. 350 MW is observed in J&K control area.	0	0.023	0	350	0.000	0.605	46640	57853	1000
8	GI-2	1) 400kV Muradnagar_2-Mathura (UP) Ckt 2) 400kV Muradnagar_2-Simbholi_PMSTL (UP) Ckt-1 3) 400kV Muradnagar_2-Simbholi_PMSTL (UP) Ckt-2 4) 400 KV Dadri(NT)-Muradnagar_2(UP) (PG) Ckt	Uttar Pradesh	UPPTCL	17-Oct-24	00:43	17-Oct-24	02:48	02:05	i)400/220/132kV Muradnagar-New(UP) has one and half breaker scheme at 400kV level and double main and transfer bus scheme at 220kV level. ii)As reported, at 00:43 hrs, 400kV Muradnagar_2-Mathura (UP) Ckt tripped on Y-N phase to earth fault with fault current of 4.065kA from Muradnagar_2 end and fault clearing time of 291 ms; zone-1 distance protection operated (as per DR at Muradnagar_2 end) and DT received at Mathura end (as reported). iii)Due to delayed opening of CB at Muradnagar_2 end of 400kV Muradnagar_2-Mathura (UP) Ckt, LBB protection operated and both main and tie CBs at Muradnagar_2 end of 400 KV Dadri(NT)-Muradnagar_2(UP) (PG) Ckt and 400kV Muradnagar_2-Simbholi_PMSTL (UP) Ckt-1 & 2 opened and all the 400kV lines connected at Muradnagar_2 tripped. DT received at remote ends (as reported). iv)As informed by SLDC-UP, the logic of LBB operation was wrong in 400kV Muradnagr_2-Simbholi_PMSTL (UP) Ckt-1 & 2: on LBB operation opening command was sent to both main and tie CBs. Reason of opening of tie CB of 400 KV Dadri(NT)-Muradnagar_2(UP) (PG) Ckt is under investigation and yet to be shared. v)As per PMU at Muradnagar1(UP), Y-N phase to earth fault with delayed fault clearing time of 280ms is observed. vi)As per SCADA, no change in demand is observed in UP control area.	0	0	0	0	0.000	0.000	39096	53675	280

S.No.	Category of Grid Incident/ Disturbance	Name of Elements (Tripped/Manually opened)	Affected Area	Owner/ Agency	Outage		Revival		Duration (hh:mm)	Event (As reported)	Energy Unserved due to Generation loss (MU)	Energy Unserved due to Load loss (MU)	Loss of generation / loss of load during the Grid Disturbance		% Loss of generation / loss of load w.r.t Antecedent Generation/Load in the Regional Grid during the Grid Disturbance		Antecedent Generation/Load in the Regional Grid		Fault Clearance time (in ms)
	(GI-1 to GD-V)				Date	Time	Date	Time					Generation Loss(MW)	Load Loss (MW)	% Generation Loss(MW)	% Load Loss (MW)	Antecedent Generation (MW)	Antecedent Load (MW)	
9	GD-1	1) 220 KV Lalsote(RS)-Dausa(RS) (PG) Ckt 2) 220 KV Sawaimadhopur(RS)-Dausa(RS) (PG) Ckt 3) 220 KV Bassi(PG)-Dausa(RS) (PG) Ckt-1 4) 220 KV Bassi(PG)-Dausa(RS) (PG) Ckt-2 5) 220 KV Mandawar(RS)-Dausa(RS) Ckt 6) 220 KV Sikra(RS)-Dausa(RS) Ckt 7) 220/132kV 160MVA ICT-1 at Dausa(RS) 8) 220/132kV 100MVA ICT-2 at Dausa(RS)	Rajasthan	RVPNL, PGCIL	21-Oct-24	15:32	21-Oct-24	16:08	00:36	i)220/132kV Dausa(RS) has double main and transfer bus scheme at 220kV level. ii)During antecedent condition, 220 kV Alwar(RS)-Dausa(RS) Ckt was not in service. iii)As reported, at 15:32 hrs, R-phase CVT of Main-Bus-I flashover occurred due to reptile climbing on structure at Dausa end and bus fault created. Bus bar protection at Dusa(RS) was not operational during the event and due to delay in opening of bus coupler (bus coupler opening delay setting was 110ms), fault was also sensed by Main Bus-II. iv)Due to this bus fault, all the 220kV lines connected to Bus-I & II at Dausa(RS) sensed the fault in zone-4 and fault cleared from Dausa(RS) end in zone-4 (zone-4 delay setting was 160ms). But in 220 KV Lalsote(RS)-Dausa(RS) (PG) Ckt and 220 KV Bassi(PG)-Dausa(RS) (PG) Ckt-2, CB didn't open from Dausa(RS) end and finally fault cleared in zone-2 from remote end. v)During the same time, 220/132kV 160MVA ICT-1 and 100MVA ICT-2 at Dausa(RS) also tripped on over-current protection operation (exact reason yet to be shared). vi)As all the elements connected to both the 220kV buses tripped and there was no source of supply at 132kV level, complete blackout occurred at 220/132kV Dausa(RS) S/s. vii)As per DR at Lalsote end of 220 KV Lalsote(RS)-Dausa(RS) (PG) Ckt, R-N phase to earth fault occurred with fault current of 1.729kA from Lalsote end and fault sensed in zone-2 at Lalsote end. viii)As per PMU at Bassi(PG), R-N phase to earth fault converted to R-B-N double phase to earth fault with delayed fault clearing time of 560ms is observed. ix)As per SCADA, change in demand of approx. 170 MW is observed in Rajasthan control area.	0	0.102	0	170	0.000	0.285	47795	59608	560
10	GI-1	1) 220/132kV 100MVA ICT-1 at Giri(HP) 2) 220/132kV 100MVA ICT-2 at Giri(HP)	Himachal Pradesh	HPPTCL	21-Oct-24	09:42	21-Oct-24	09:52	00:10	i)During antecedent condition, 220/132kV 100MVA ICT-1 & 2 at Giri(HP) were carrying approx. 108 MVA each. ii)As reported, at 09:42 hrs, 220/132kV 100MVA ICT-1 & 2 at Giri(HP) tripped on over-loading (exact reason of over-loading of ICTs yet to be shared). iii)As per SCADA, MVA loading of both the ICTs were approx. 86 MVA each at 09:33hrs. Suddenly within one minute loading increased to approx. 106 MVA each and it gradually increased further to approx. 108 MVA each within another 8 minutes and finally at 09:42 hrs, both the ICTs tripped on over-loading. iv)Since these ICTs were the only source of power at 132kV level, their tripping resulted in tripping of all the feeders connected at 132kV level. v)As per PMU at Shahranpur(PG), no fault is observed in the system. vi)As per SCADA, change in demand of approx. 215 MW is observed in HP control area.	0	0.036	0	215	0.000	0.354	48257	60747	NA
11	GI-2	1) 400KV Bus 1 at Aligarh(UP) 2) 400 KV Panki-Aligarh (UP) Ckt 3) 400 KV Aligarh-Sikandrabad (UP) Ckt 4) 400 KV Aligarh-Mainpuri (UP) Ckt-1 5) 400 KV Aligarh-Shamli (UP) Ckt-2	Uttar Pradesh	UPPTCL	23-Oct-24	12:08	23-Oct-24	12:52	00:44	i)400/220kV Aligarh(UP) has one and half breaker scheme at 400kV level and double main and transfer bus scheme at 220kV level. ii)As reported, at 12:08 hrs, differential protection of line reactor of 400 KV Panki-Aligarh (UP) Ckt operated (exact reason of differential protection operation of line reactor of 400 KV Panki-Aligarh (UP) Ckt yet to be shared). iii)During the same time, Bus bar protection operated at 400kV Bus-1 at Aligarh(UP) also operated (exact reason of bus bar operation of 400kV Bus-1 at Aligarh(UP) yet to be shared). iv)Due to this, all the elements connected to 400kV Bus-1 at Aligarh(UP) tripped and Bus-1 became dead (exact reason of opening of tie CBs of 400 KV lines connected to Bus-1 at Aligarh(UP) yet to be shared). v)As per PMU at Aligarh(PG), no fault is observed in the system. vi)As per SCADA, no change in demand is observed in UP control area.	0	0	0	0	0.000	0.000	52196	60961	NA
12	GI-2	1) 400KV Bus 1 at Obra-B(UP) 2) 400/220 kV 315 MVA ICT 1 at Obra_B(UP) 3) 400 KV Obra_B-Rewa Road (UP) Ckt-1 4) 200 MW Obra TPS - UNIT 09 5) 200 MW Obra TPS - UNIT 11 6) 200 MW Obra TPS - UNIT 13	Uttar Pradesh	UPPTCL	25-Oct-24	12:52	25-Oct-24	14:06	01:14	i)400/220kV Obra-B(UP) has double main and transfer bus scheme at both 400kV and 220kV level. ii)During antecedent condition, 200 MW Obra TPS - UNIT 11 and 13 were generating approx. 48 MW and 102 MW respectively. 200 MW Obra TPS - UNIT 09 was under tripped condition since 09:57 hrs on 25th Oct'24. 400/220 kV 315 MVA ICT 1 at Obra_B(UP), 400 KV Obra_B-Rewa Road (UP) Ckt-1 and 200 MW Obra TPS - UNIT 09, 11 & 13 were connected to 400KV Bus 1 at Obra-B(UP) and rest of the elements were connected to 400KV Bus 2 at Obra-B(UP). iii)As reported, at 12:52 hrs, while synchronizing 200 MW Obra TPS - UNIT 09, busbar differential protection operated at 400KV Bus 1 at Obra-B(UP) (exact reason of busbar protection operation yet to be shared). iv)Due to busbar protection operation, all the elements connected to 400kV Bus-1 at Obra-B(UP) tripped and Bus-1 became dead. v)As per PMU at Anpara-TH(UP), B-N phase to earth fault is observed with fault clearing time of 120 ms. vi)As per SCADA, no change in demand is observed in UP control area. However, generation loss of approx. 150 MW occurred at Obra-B(UP). vii)As reported by Obra-B, after investigation it was found that interrupter unit of CB at 400kV side of 200 MW Obra TPS - UNIT 09 was damaged. This CGL make SF6 type CB which was commissioned on 30th Nov'23 and was continuously in service since 16th Feb'24, is under warranty period. CGL service engineer was called for detailed analysis regarding the same as primarily it seems that there is some manufacturing defect of CB.	0	0	150	0	0.254	0.000	49979	59077	120
13	GD-1	1) 400 KV Alwar(ATIL)-Hindaun(RS) (ATIL) Ckt	Rajasthan	ATIL, RVPNL	30-Oct-24	14:15	30-Oct-24	16:33	02:18	i)400/220kV Alwar400(RS) has one and half-breaker scheme at 400kV level and double main and transfer bus scheme at 220kV level. 400 KV Alwar(ATIL)-Hindaun(RS) (ATIL) Ckt is the only 400kV line connected to Alwar400(RS). The active power coming from Hindaun(RS) goes to Alwar(RS), Alwar MIA(RS), Mandawar(RS) and Dausa(RS) through two 400/220kV ICTs at Alwar400(RS). ii)During antecedent condition, 220kV Alwar400-Dausa(RS) Ckt was on no-load. 400 KV Alwar(ATIL)-Hindaun(RS) (ATIL) Ckt was carrying 356 MW. iii)As reported, at 14:15 hrs, 400 KV Alwar(ATIL)-Hindaun(RS) (ATIL) Ckt tripped on R-Y-N double phase to earth fault with fault current of 5.759kA and 5.272kA in R and Y phase respectively from Hindaun(RS) end; fault sensed in zone-1 at Hindaun(RS) end (exact reason and location of fault yet to be shared). iv)As 400 KV Alwar(ATIL)-Hindaun(RS) (ATIL) Ckt is the only source of power at Alwar400(RS), with the tripping of this line there was no source of power left to any of the 220kV feeders. Hence complete blackout occurred at 400/220kV Alwar400(RS). v)As per SCADA SOE, 220kV Alwar-Kukas(RS) Ckt also tripped during the same time (exact reason of the same yet to be shared). vi)As per PMU at Bassi(PG), R-N phase to earth fault is observed with fault clearing time of 80 ms. vii)As per SCADA, change in demand of approx. 500 MW is observed in Rajasthan control area.	0	1.15	0	500	0.000	0.818	53878	61088	80

Sr No	Element Name	Outage Date	Outage Time	Reason
1	220 KV Nanauta(UP)-Saharanpur(PG) (UP) Ckt-1	02-Oct-24	20:10	Phase to earth fault B-N
		12-Oct-24	07:19	Phase to earth fault B-N
		17-Oct-24	11:05	Phase to earth fault R-N
2	220 KV RAPS_B(NP)-Sakatpura(RS) (RS) Ckt-1	01-Oct-24	13:28	Phase to earth fault B-N
		03-Oct-24	10:30	Phase to Phase Fault Y-B
		06-Oct-24	21:55	Phase to earth fault R-N
		17-Oct-24	08:51	Transient fault
		25-Oct-24	00:51	Transient fault
3	220 KV Saharanpur(PG)-Shamli(UP) (UP) Ckt-1	06-Oct-24	00:11	Phase to earth fault B-N
		11-Oct-24	05:39	Phase to earth fault B-N
		12-Oct-24	23:53	Phase to earth fault B-N
		18-Oct-24	19:33	Three phase fault
		28-Oct-24	00:56	Phase to earth fault Y-N
4	220 KV Sarsawan(UP)-Khodri(UK) (UP) Ckt-1	04-Oct-24	19:59	Phase to earth fault B-N
		04-Oct-24	21:59	Phase to earth fault B-N
		23-Oct-24	14:05	Phase to earth fault R-N
5	400 KV Muradnagar_2-Mathura (UP) Ckt-1	08-Oct-24	05:42	Phase to earth fault R-N
		14-Oct-24	01:47	Phase to earth fault B-N
		16-Oct-24	00:20	Phase to earth fault B-N
		17-Oct-24	00:43	Phase to earth fault Y-N
		18-Oct-24	23:36	Phase to earth fault Y-N
		19-Oct-24	01:02	Phase to earth fault R-N
		26-Oct-24	03:39	Phase to earth fault B-N

Annexure-XX

Grid Event to be discussed in 54th PSC Meeting

S.No.	Category of Grid Incident/ Disturbance (GI-I to GD-V)	Name of Elements (Tripped/Manually opened)	Affected Area	Owner/ Agency	Outage		Event (As reported)	Loss of generation / loss of load during the Grid Disturbance		Fault Clearance time (in ms)	Points of discussion
					Date	Time		Generation Loss(MW)	Load Loss (MW)		
1	GD-1	1)220 KV Jauljivi (PG)-Dhauliganga(NH) (PG) Ckt-1 2)220 KV Jauljivi (PG)-Dhauliganga(NH) (PG) Ckt-2 3)70 MW Unit-4 at Dhauliganga(NH)	Uttarakhand	PGCIL, NHPC	5-Oct-24	18:23	i)During antecedent condition, only 70 MW Unit-4 at Dhauliganga(NH) was running and generating approx. 69MW (as reported, SCADA data not available). Unit-1, 2 & 3 were under shutdown. ii)As reported, at 18:24hrs, 220 KV Jauljivi (PG)-Dhauliganga(NH) (PG) Ckt-1 & 2 tripped due to malfunction of GIS controller software. iii)Along with the same, 70 MW Unit-4 at Dhauliganga(NH) also tripped due to loss of evacuation path. Hence 220kV Dhauliganga(NH) S/s became dead. iv)As per PMU at 400kV Bareilly(PG), no fault signature was observed. v)As per SCADA, no change in NR hydro generation is observed. vi)As reported by Dhauliganga, Generation loss of 69MW was reported at Dhauliganga(NH).	70	0	NA	i) Reason of malfunction in software. ii) Other such software related issues at other NHPC stations? iii) Rmedial action taken to rectify the issues?
2	GI-2	1)220kV Obra_A-Sahupuri ckt 2)220kV Obra_A-Rewa Road ckt-2 3)400/220kV 315 MVA ICT 1 at Obra_B(UP) 4)400/220kV 240 MVA ICT 3 at Obra_B(UP)	Uttar Pradesh	UPPTCL	9-Oct-24	11:39	i)400/220 KV Obra -B substation has 2*315 MVA (ICT-1&2) and one 240MVA ICT (ICT-3). During antecedent condition, 2*315 MVA & 240 MVA ICTs were carrying 104MW (ICT1), 101MW (ICT2) and 78MW (ICT3) respectively. ii)400/220kV 315 MVA ICT-1, 240 MVA ICT-3 at Obra _B, 220kV Obra_A-Allahabad Rewa Road ckt-2 & 220kV Obra_A-Sahupuri ckt were all connected to 220KV Bus-1 during the antecedent condition. iii)As reported at 11:39 hrs, R-Y fault occurred on 220kV Obra-Sahupuri ckt. Fault location was 5km from Sahupuri end. Fault was in Z-1 from Obra end and Z-2 from Sahupuri end. iv)On this fault, distance protection at both ends operated. CB opened from Sahupuri end however, CB at Obra end failed to open. v)As reported, LBB protection didn't operate (relay is of static type) and fault cleared with the tripping of 220kV Obra_A-Allahabad Rewa Road ckt-2 on Z-4 distance protection operation and 400/220kV 315 MVA ICT-1, 240 MVA ICT-3 on directional O/C E/F protection operation. 220kV bus coupler CB also opened on over current protection and 220kV Bus-2 got isolated. vi)After tripping ICT-1 & 3 all the load shifted to ICT-2 and the loading of ICT-2 increased to 240 MW. vii)As per PMU at Anpara(UP), R-Y fault with delayed clearance of ~960msec is observed. viii)Both the transformers were restored back into service at 12:22 hrs (ICT-1) and 14:41 hrs (ICT-3) respectively. ix)As per SCADA, no generation or load loss was observed in UP control area. x)As per SCADA, no change in demand is observed in the Northern Region.	0	0	960	Details analysis of the event and remedial action taken details.
3	GI-2	1)33 MW Unit-1 at Obra HEP (UP) 2)33 MW Unit-2 at Obra HEP (UP) 3)33 MW Unit-3 at Obra HEP (UP) 4)50 MW Unit-1 at Rihand HEP (UP) 5)50 MW Unit-2 at Rihand HEP (UP) 6)50 MW Unit-4 at Rihand HEP (UP) 7)220/132kV 100 MVA ICT-1 at Obra-A (UP) 8)220/132kV 100 MVA ICT-2 at Obra-A (UP) 9)220/132kV 100 MVA ICT-3 at Obra-A (UP)	Uttar Pradesh	UPPTCL	9-Oct-24	17:04	i)Obra-A has 3, 220/132 KV, 100MVA transformers which were carrying approx. 46MW, 51MW and 45MW during antecedent condition. ii)As reported, during inclement weather conditions, 220/132kV 100 MVA ICT-1 & ICT-2 tripped on B-N earth fault protection at Obra-A(UP) which led to complete shifting of load on 220/132kV 100 MVA ICT-3 at Obra-A (UP). iii)As a result of overloading of the 3rd transformer, ICT-3 also tripped on O/C protection at 17:04hrs. iv)At the same time 17:04hrs, 03 Units at Obra Hydro and 03 Units at Rihand HEP (connected at Bus-2) also tripped leading to a total generation loss of approx. 215 MW. v)Considering the above incident, Rihand manually tripped Obra-A, Obra H1, Obra H2 and Gharwad lines from perspective of safety. vi)As per SCADA, change in demand of approx. 100MW is observed in UP control area.	215	100	120	
4	GI-2	1)400/220kV 315 MVA ICT-1 at Kashipur(UK) 2)400/220kV 315 MVA ICT-2 at Kashipur(UK) 3)220/132kV 160 MVA ICT-3 at Kashipur(UK) 4)220kV Jafarpur-Kashipur (UK) Ckt 5)220kV Pantnagar – Kashipur (UK) Ckt 6)132kV Kahipur – Jaspur (UK) Ckt	Uttarakhand	PTCUL	10-Oct-24	10:56	i)400/220/132kV Kashipur has 2*315 400/220kV and 2*160MVA 220/132kV ICTs. ii)As reported, at 10:56:13.086, LV side CB of 315MVA ICT-2 tripped. Uttarakhand -SLDC in its tripping report mentioned the reason for the fault was operation of Restricted Earth Fault (REF) as well as some external fault, which is of contradictory nature. REF is an internal fault of the transformer. Further clarification may be given by Uttarakhand -SLDC on this matter. iii)With the tripping of 315MVA ICT-1 at Kashipur, case-2 of SPS for transformers at 400KV Kashipur (PTCUL) substation operated. As a result of the SPS present in Kashipur sub-station, the following lines also tripped i.220kV Jafarpur-Kashipur (UK) Ckt ii.220kV Pantnagar – Kashipur (UK) Ckt iii.132kV Kahipur – Jaspur (UK) Ckt iv)Even after tripping of the aforementioned lines, loading of 315MVA ICT-1 didn't reduce and increase to ~339MVA. As reported, load of 220kV Kamalwaganja was being fed from 220kV Pantnagar and 132kV Bajpur. After tripping of 220kV Kashipur-Pantnagar ckt, load of Kamalwaganja which was feeding through Kashipur-Pantnagar shifted to Bajpur source. Due to this, loading of 315MVA ICT-3 didn't reduce after SPS operation. v)Further, at 10:56:24.522,315MVA ICT-1 HV and LV Side tripped on Over Current Protection. However, from the DR of ICT-1, loading of ICT-1 before tripping was ~107%. vi)Further, 220/132kV 160 MVA ICT-3 also tripped at Kashipur. As reported, no flag was observed for the said tripping. vii)As per PMU at Roorkee(PG), no fault in system is observed. viii)As per SCADA, a change in demand of approx. 247MW is observed in Uttarakhand control area.	0	247	NA	Details analysis of the event and remedial action taken details.
5	GI-1	1)220 KV Amargarh (INDIGRID)-Ziankote(JK) (PDD JK) Ckt-1 2)220 KV Amargarh (INDIGRID)-Ziankote(JK) (PDD JK) Ckt-2	Jammu & Kashmir	JKPDD & INDIGRID	11-Oct-24	10:03	i)220/132kV Ziankote S/s have two bus at 220kV side i.e., main bus & reserve bus. 220kV Amargarh-Ziankote ckt-1&2 are on the same tower (D/C tower) and line length is ~21.4km. ii)During antecedent condition, 220kV Amargarh(INDIGRID) –Ziankote(JK) D/C was carrying 114 MW each and feeding Ziankote load. iii)As reported, at 10:03 hrs, 220 KV Amargarh(INDIGRID)-Ziankote(JK) (PDD JK) D/C tripped from both ends on Y-B phase to phase fault. During patrolling it was found that the fault had occurred between Tower no. 76 and 77, as some locals were cutting trees in the vicinity of line and branches of tree had fallen on the line. iv)As per PMU at Amargarh(PG), B-N phase to earth fault which cleared within 80 msec is observed. v)As per SCADA, change in demand of approx. 175MW is observed in J&K control area.	0	175	80	Details of protection operation details at Ziankotye(J&K) end.
6	GI-1	1) 220 KV Wagoora(PG)-Pampore(PDD) (PG) Ckt-1 2) 220 KV Wagoora(PG)-Pampore(PDD) (PG) Ckt-2	Jammu & Kashmir	PDD-JK & PGCIL	16-Oct-24	13:45	i)220/132kV Pampore(PDD) has single main and transfer Bus arrangement at 220kV side. ii)During antecedent condition, power flow from Wagoora(PG) S/s to Pampore(PDD) S/s was approx. 140 MW (70 MW each) through 220 KV Wagoora(PG)-Pampore(PDD) (PG) D/C. iii)As reported, at 13:45 hrs, Y-phase disc ruptured in 220kV main Bus at Pampore. iv)Due to this, 220kV Wagoora(PG)-Pampore(PDD) (PG) Ckt-1 tripped from Pampore end on Y-N phase to earth fault (exact location of fault and nature of protection operated yet to be shared). v)During the same time, 220kV Wagoora(PG)-Pampore(PDD) (PG) Ckt-2 also tripped from Wagoora end sensing the fault in zone-2 with fault distance of 11.91km from Wagoora end. vi)As per PMU at Amargarh(INDIGRID), Y-N phase to earth fault converted to Y-B-N double phase to earth fault with delayed fault clearing time of 1000ms is observed. vii)As per SCADA, change in demand of approx. 350 MW is observed in J&K control area.	0	350	1000	Details of protection operation details at Pampore(J&K) end.
7	GI-2	1) 400kV Muradnagar_2-Mathura (UP) Ckt 2) 400kV Muradnagar_2-Simbholi_PMSTL (UP) Ckt-1 3) 400kV Muradnagar_2-Simbholi_PMSTL (UP) Ckt-2 4) 400 KV Dadri(NT)-Muradnagar_2(UP) (PG) Ckt	Uttar Pradesh	UPPTCL	17-Oct-24	00:43	i)400/220/132kV Muradnagar-New(UP) has one and half breaker scheme at 400kV level and double main and transfer bus scheme at 220kV level. ii)As reported, at 00:43 hrs, 400kV Muradnagar_2-Mathura (UP) Ckt tripped on Y-N phase to earth fault with fault current of 4.065kA from Muradnagar_2 end and fault clearing time of 291 ms; zone-1 distance protection operated (as per DR at Muradnagar_2 end) and DT received at Mathura end (as reported). iii)Due to delayed opening of CB at Muradnagar_2 end of 400kV Muradnagar_2-Mathura (UP) Ckt, LBB protection operated and both main and tie CBs at Muradnagar_2 end of 400 KV Dadri(NT)-Muradnagar_2(UP) (PG) Ckt and 400kV Muradnagar_2-Simbholi_PMSTL (UP) Ckt-1 & 2 opened and all the 400kV lines connected at Muradnagar_2 tripped. DT received at remote ends (as reported). iv)As informed by SLDC-UP, the logic of LBB operation was wrong in 400kV Muradnagar_2-Simbholi_PMSTL (UP) Ckt-1 & 2: on LBB operation opening command was sent to both main and tie CBs. Reason of opening of tie CB of 400 KV Dadri(NT)-Muradnagar_2(UP) (PG) Ckt is under investigation and yet to be shared. v)As per PMU at Muradnagar1(UP), Y-N phase to earth fault with delayed fault clearing time of 280ms is observed. vi)As per SCADA, no change in demand is observed in UP control area.	0	0	280	Details analysis of the event and remedial action taken details.

S.No.	Category of Grid Incident/ Disturbance	Name of Elements (Tripped/Manually opened)	Affected Area	Owner/ Agency	Outage		Event (As reported)	Loss of generation / loss of load during the Grid Disturbance		Fault Clearance time (in ms)	Points of discussion
	(GI-I to GD-V)				Date	Time		Generation Loss(MW)	Load Loss (MW)		
8	GD-1	1) 220 KV Lalsote(RS)-Dausa(RS) (PG) Ckt 2) 220 KV Sawaimadhopur(RS)-Dausa(RS) (PG) Ckt 3) 220 KV Bassi(PG)-Dausa(RS) (PG) Ckt-1 4) 220 KV Bassi(PG)-Dausa(RS) (PG) Ckt-2 5) 220 KV Mandawar(RS)-Dausa(RS) Ckt 6) 220 KV Sikrai(RS)-Dausa(RS) Ckt 7) 220/132kV 160MVA ICT-1 at Dausa(RS) 8) 220/132kV 100MVA ICT-2 at Dausa(RS)	Rajasthan	RVPNL, PGCIL	21-Oct-24	15:32	i)220/132kV Dausa(RS) has double main and transfer bus scheme at 220kV level. ii)During antecedent condition, 220 kV Alwar(RS)-Dausa(RS) Ckt was not in service. iii)As reported, at 15:32 hrs, R-phase CVT of Main-Bus-I flashover occurred due to reptile climbing on structure at Dausa end and bus fault created. Bus bar protection at Dusa(RS) was not operational during the event and due to delay in opening of bus coupler (bus coupler opening delay setting was 110ms), fault was also sensed by Main Bus-II. iv)Due to this bus fault, all the 220kV lines connected to Bus-I & II at Dausa(RS) sensed the fault in zone-4 and fault cleared from Dausa(RS) end in zone-4 (zone-4 delay setting was 160ms). But in 220 KV Lalsote(RS)-Dausa(RS) (PG) Ckt and 220 KV Bassi(PG)-Dausa(RS) (PG) Ckt-2, CB didn't open from Dausa(RS) end and finally fault cleared in zone-2 from remote end. v)During the same time, 220/132kV 160MVA ICT-1 and 100MVA ICT-2 at Dausa(RS) also tripped on over-current protection operation (exact reason yet to be shared). vi)As all the elements connected to both the 220kV buses tripped and there was no source of supply at 132kV level, complete blackout occurred at 220/132kV Dausa(RS) S/s. vii)As per DR at Lalsote end of 220 KV Lalsote(RS)-Dausa(RS) (PG) Ckt, R-N phase to earth fault occurred with fault current of 1.729kA from Lalsote end and fault sensed in zone-2 at Lalsote end. viii)As per PMU at Bassi(PG), R-N phase to earth fault converted to R-B-N double phase to earth fault with delayed fault clearing time of 560ms is observed. ix)As per SCADA, change in demand of approx. 170 MW is observed in Rajasthan control area.	0	170	560	Details analysis of the event and remedial action taken details.
9	GI-2	1) 400KV Bus 1 at Aligarh(UP) 2) 400 KV Panki-Aligarh (UP) Ckt 3) 400 KV Aligarh-Sikandrabad (UP) Ckt 4) 400 KV Aligarh-Mainpuri (UP) Ckt-1 5) 400 KV Aligarh-Shamli (UP) Ckt-2	Uttar Pradesh	UPPTCL	23-Oct-24	12:08	i)400/220kV Aligarh(UP) has one and half breaker scheme at 400kV level and double main and transfer bus scheme at 220kV level. ii)As reported, at 12:08 hrs, differential protection of line reactor of 400 KV Panki-Aligarh (UP) Ckt operated (exact reason of differential protection operation of line reactor of 400 KV Panki-Aligarh (UP) Ckt yet to be shared). iii)During the same time, Bus bar protection operated at 400kV Bus-1 at Aligarh(UP) also operated (exact reason of bus bar operation of 400kV Bus-1 at Aligarh(UP) yet to be shared). iv)Due to this, all the elements connected to 400kV Bus-1 at Aligarh(UP) tripped and Bus-1 became dead (exact reason of opening of tie CBs of 400 KV lines connected to Bus-1 at Aligarh(UP) yet to be shared). v)As per PMU at Aligarh(PG), no fault is observed in the system. vi)As per SCADA, no change in demand is observed in UP control area.	0	0	NA	Details analysis of the event and remedial action taken details.
10	GI-2	1) 400KV Bus 1 at Obra-B(UP) 2) 400/220 kV 315 MVA ICT 1 at Obra_B(UP) 3) 400 KV Obra_B-Rewa Road (UP) Ckt-1 4) 200 MW Obra TPS - UNIT 09 5) 200 MW Obra TPS - UNIT 11 6) 200 MW Obra TPS - UNIT 13	Uttar Pradesh	UPPTCL	25-Oct-24	12:52	i)400/220kV Obra-B(UP) has double main and transfer bus scheme at both 400kV and 220kV level. ii)During antecedent condition, 200 MW Obra TPS - UNIT 11 and 13 were generating approx. 48 MW and 102 MW respectively. 200 MW Obra TPS - UNIT 09 was under tripped condition since 09:57 hrs on 25th Oct'24. 400/220 kV 315 MVA ICT 1 at Obra_B(UP), 400 KV Obra_B-Rewa Road (UP) Ckt-1 and 200 MW Obra TPS - UNIT 09, 11 & 13 were connected to 400KV Bus 1 at Obra-B(UP) and rest of the elements were connected to 400KV Bus 2 at Obra-B(UP). iii)As reported, at 12:52 hrs, while synchronizing 200 MW Obra TPS - UNIT 09, busbar differential protection operated at 400KV Bus 1 at Obra-B(UP) (exact reason of busbar protection operation yet to be shared). iv)Due to busbar protection operation, all the elements connected to 400kV Bus-1 at Obra-B(UP) tripped and Bus-1 became dead. v)As per PMU at Anpara-TH(UP), B-N phase to earth fault is observed with fault clearing time of 120 ms. vi)As per SCADA, no change in demand is observed in UP control area. However, generation loss of approx. 150 MW occurred at Obra-B(UP). vii)As reported by Obra-B, after investigation it was found that interrupter unit of CB at 400kV side of 200 MW Obra TPS - UNIT 09 was damaged. This CGL make SF6 type CB which was commissioned on 30th Nov'23 and was continuously in service since 16th Feb'24, is under warranty period. CGL service engineer was called for detailed analysis regarding the same as primarily it seems that there is some manufacturing defect of CB.	150	0	120	Details analysis of the event and remedial action taken details.

Multiple element tripping event at 220kV Dhauliganga(NH)

At 18:23 hrs on 05th October, 2024

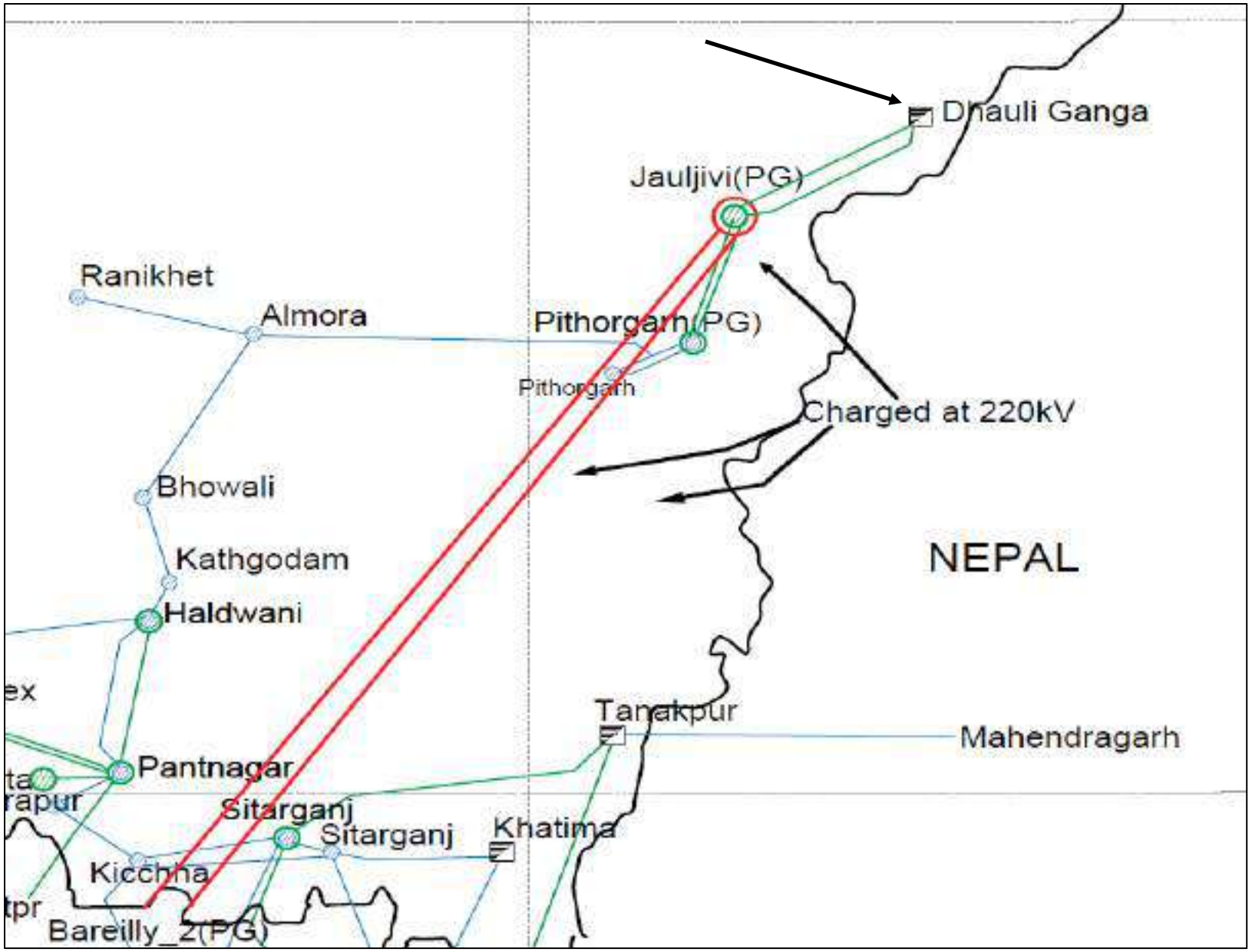
Tripped Elements

S.No.	Name of Element	Tripping Time	Revival Time
1	220 KV Jauljivi (PG)-Dhauliganga(NH) (PG) Ckt-1	18:23 hrs	19:06 hrs
2	220 KV Jauljivi (PG)-Dhauliganga(NH) (PG) Ckt-2		19:07 hrs
3	70 MW Unit-4 at Dhauliganga(NH)		21:30 hrs

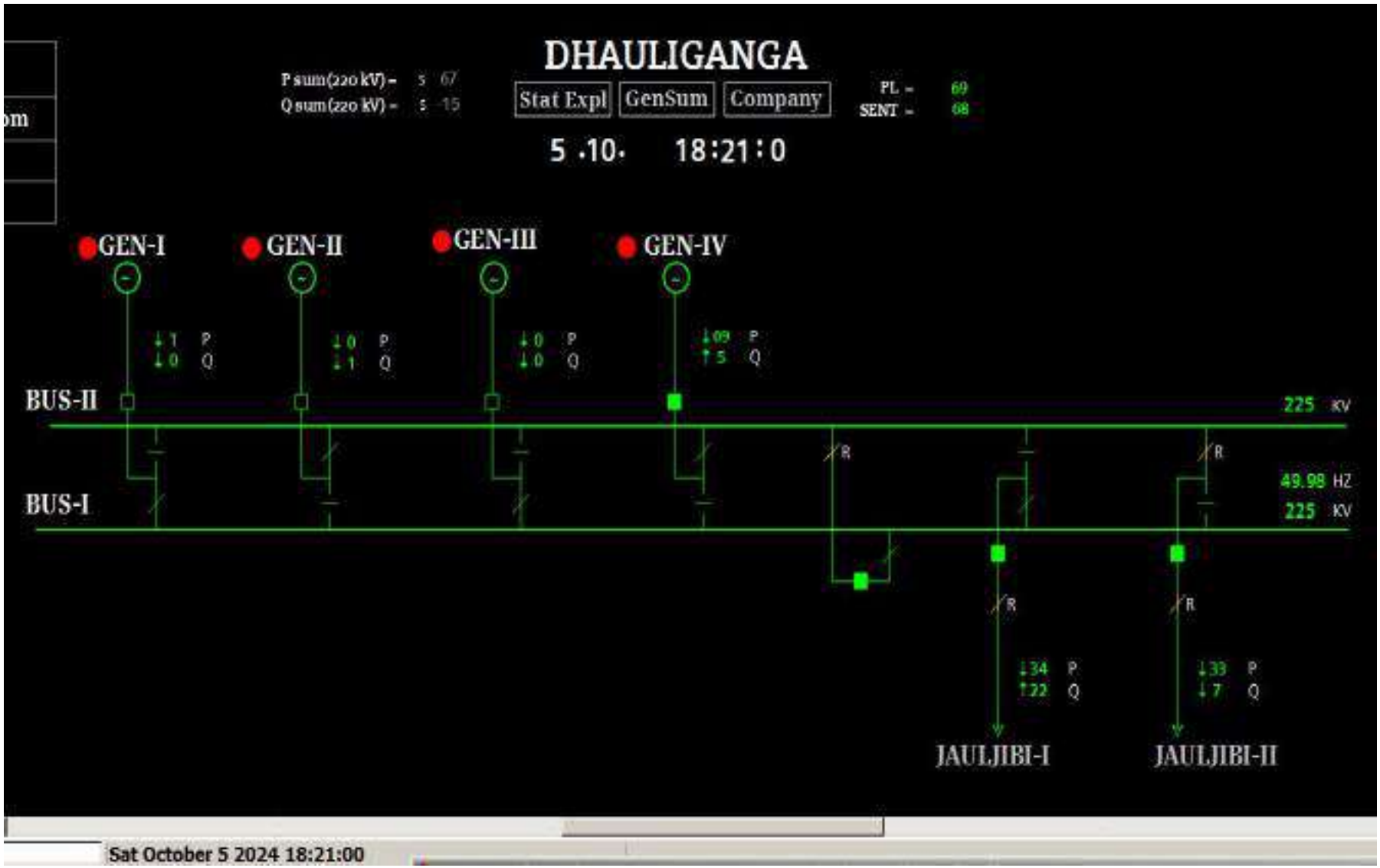
Brief details of the event

- During antecedent condition, only 70 MW Unit-4 at Dhauliganga(NH) was running and generating approx. 70 MW. Unit-1, 2 & 3 were under shutdown. As per schedule, synchronisation of these three units were tried but could not be synchronised due to hanging up of the GIS controller (missing of feedback signals).
- As reported, at 18:23hrs, 220 KV Jauljivi (PG)-Dhauliganga(NH) (PG) Ckt-1 & 2 tripped due to malfunction of GIS controller software.
- While maintenance team tried to reset the GIS controller, trip command was initiated as per existing controller logic from GIS controller to all connected bays i.e. one running unit, 70 MW Unit-4 at Dhauliganga(NH) & two lines, 220 KV Jauljivi (PG)-Dhauliganga(NH) (PG) Ckt-1 & 2. Hence complete blackout occurred at 220kV Dhauliganga(NH) S/s.
- As per PMU at 400kV Bareilly(PG), no fault is observed in the system.
- As per SCADA, change in generation of approx. 70 MW is observed at Dhauliganga HEP (NH).

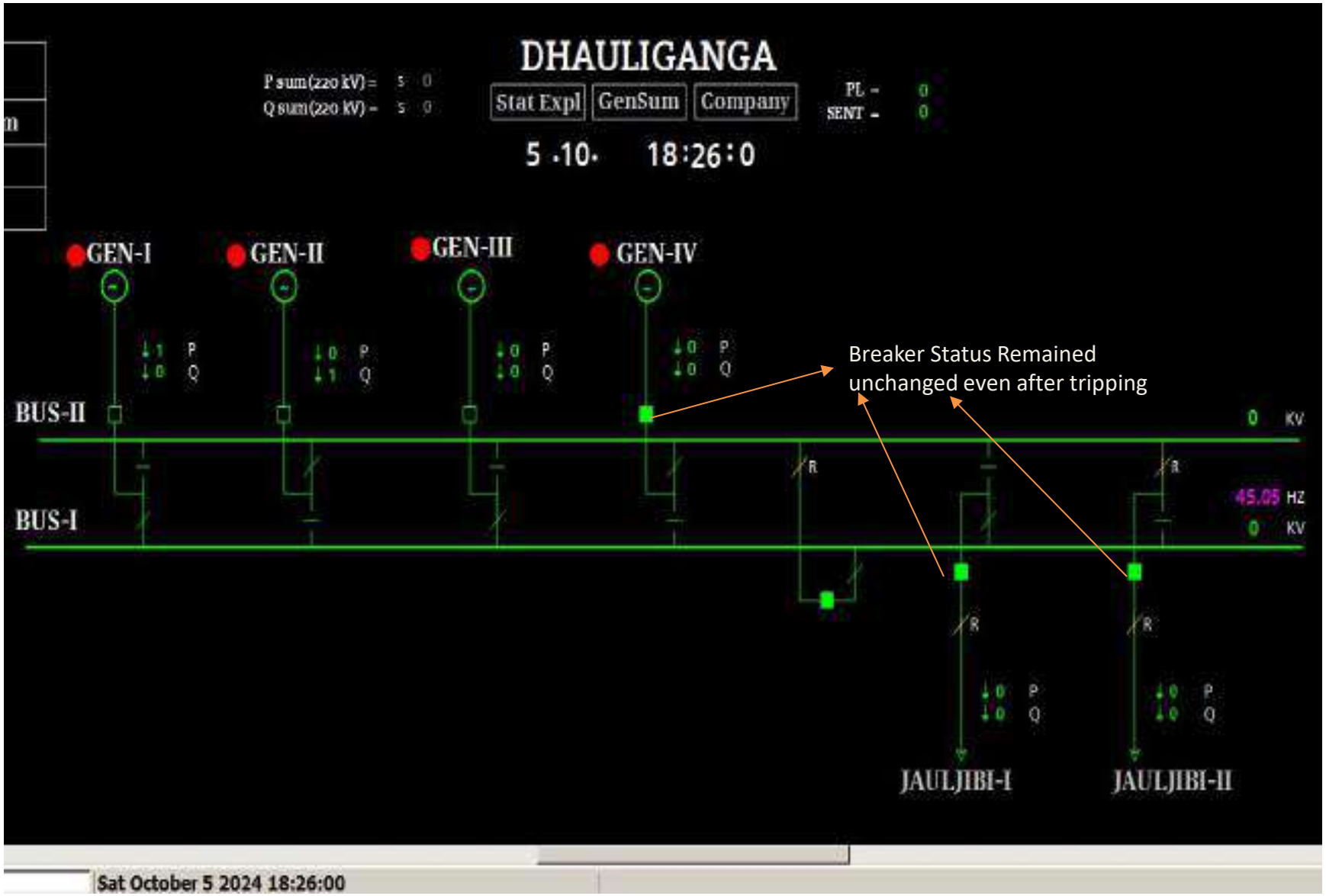
Network Diagram



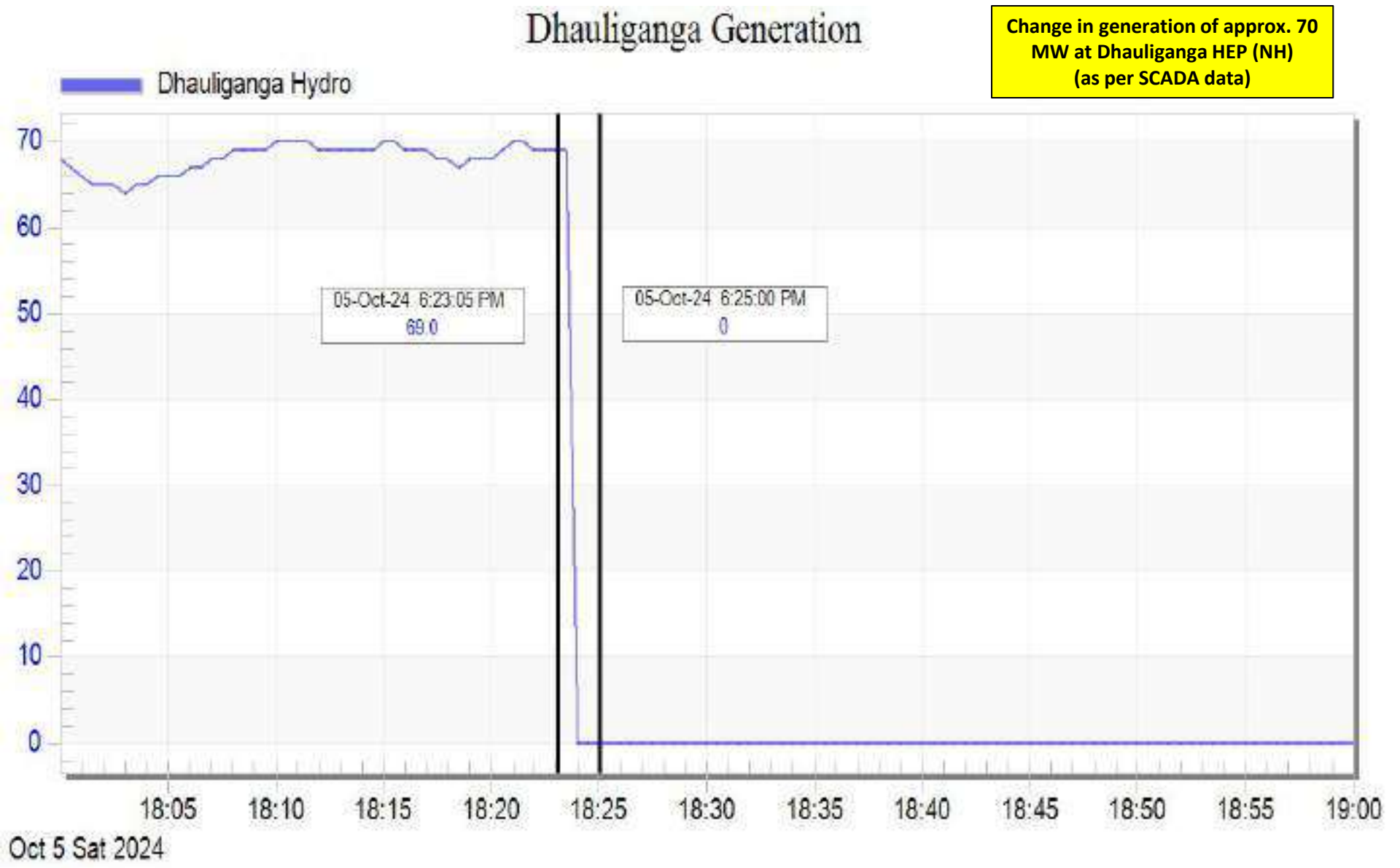
SLD of 220kV Dhauliganga(NH) before the event



SLD of 220kV Dhauliganga(NH) after the event

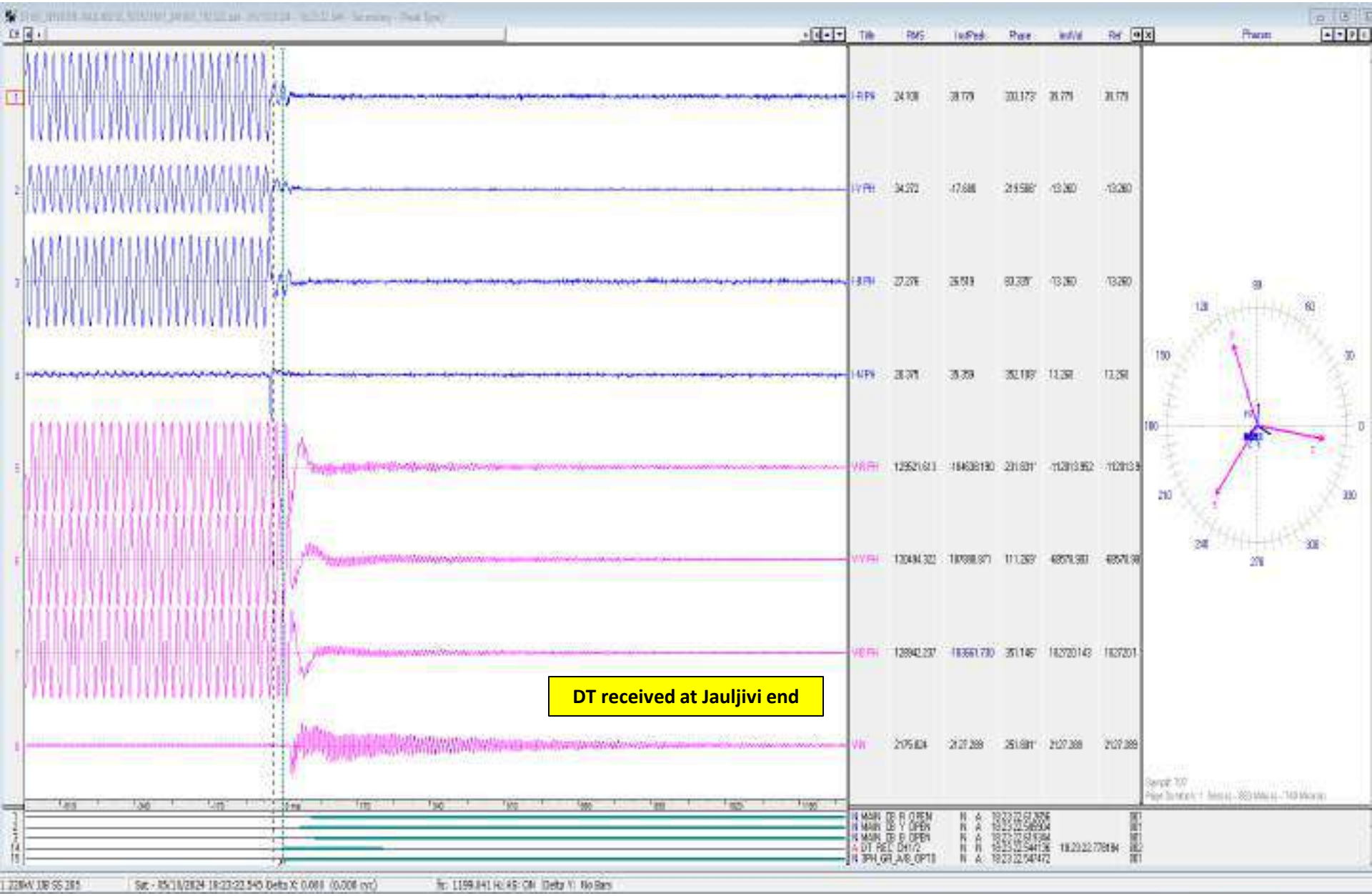


Dhauliganga generation during the event

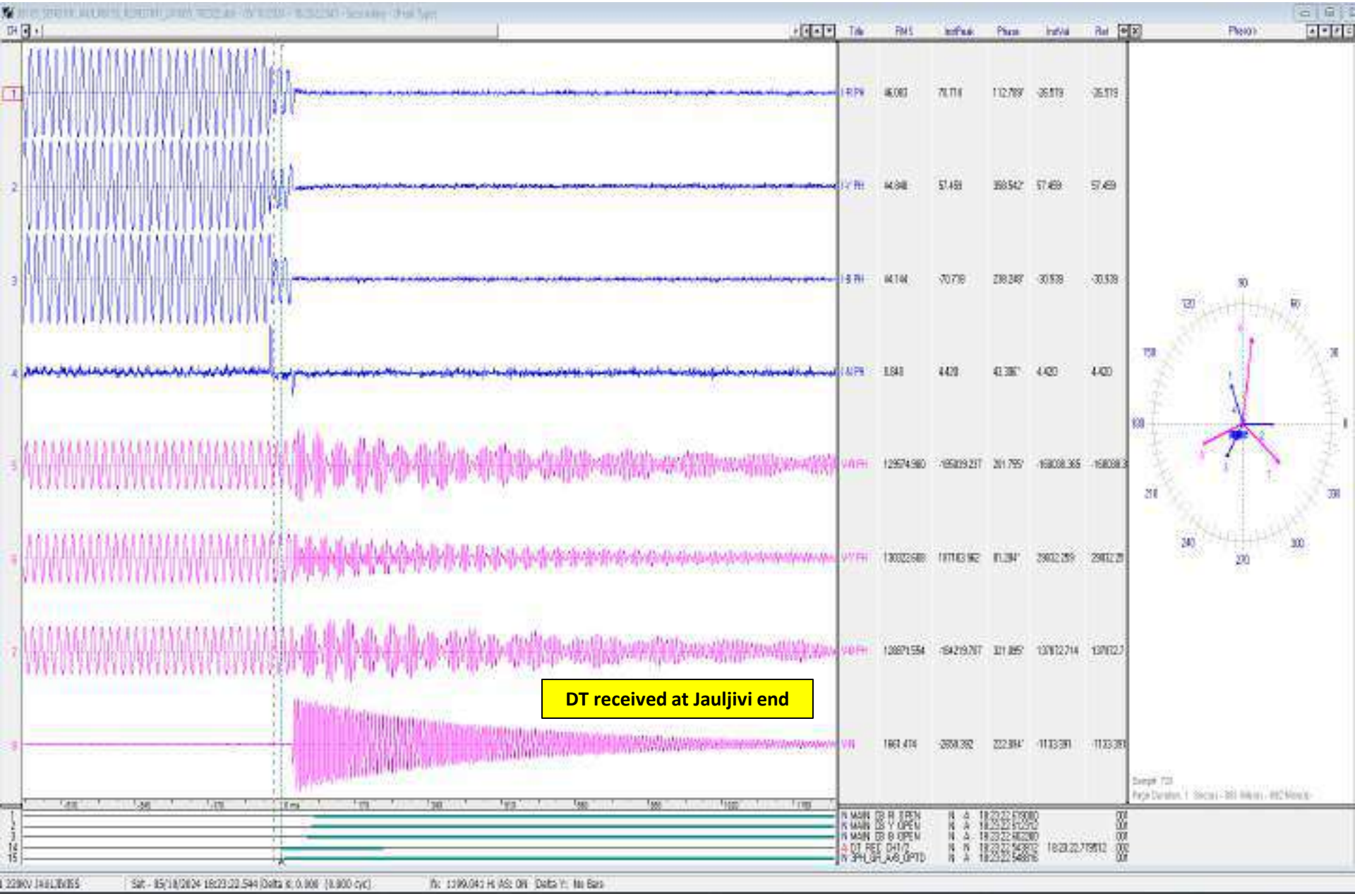


Change in generation of approx. 70 MW at Dhauliganga HEP (NH) (as per SCADA data)

DR of 220 KV Jauljivi (PG) (end)-Dhauliganga(NH) (PG) Ckt-1



DR of 220 KV Jauljivi (PG) (end)-Dhauliganga(NH) (PG) Ckt-2



PMU Plot of frequency at Bareilly(PG)

18:23hrs/05-Oct-24

PMU Plot of phase voltage magnitude at Bareilly(PG)

18:23hrs/05-Oct-24

SCADA SOE

Time	Station Name	Voltage	Element Name	Element Type	Element Status	Remark
18:23:52,453	JLJVI_PG	220kV	09DHULI2	Circuit Breaker	Open	Line CB at Jauljivi(PG) end of 220 KV Jauljivi (PG)-Dhauliganga(NH) (PG) Ckt-2 opened
18:23:52,455	JLJVI_PG	220kV	05DHULI1	Circuit Breaker	Open	Line CB at Jauljivi(PG) end of 220 KV Jauljivi (PG)-Dhauliganga(NH) (PG) Ckt-1 opened

Points for Discussion

i) Exact reason of malfunction in software need to be shared.

ii) Is there any such software related issue at other NHPC stations?

iii) DR/EL of all the tripped elements along with tripping report of the event need to be shared.

iv) Remedial action taken report to be shared.

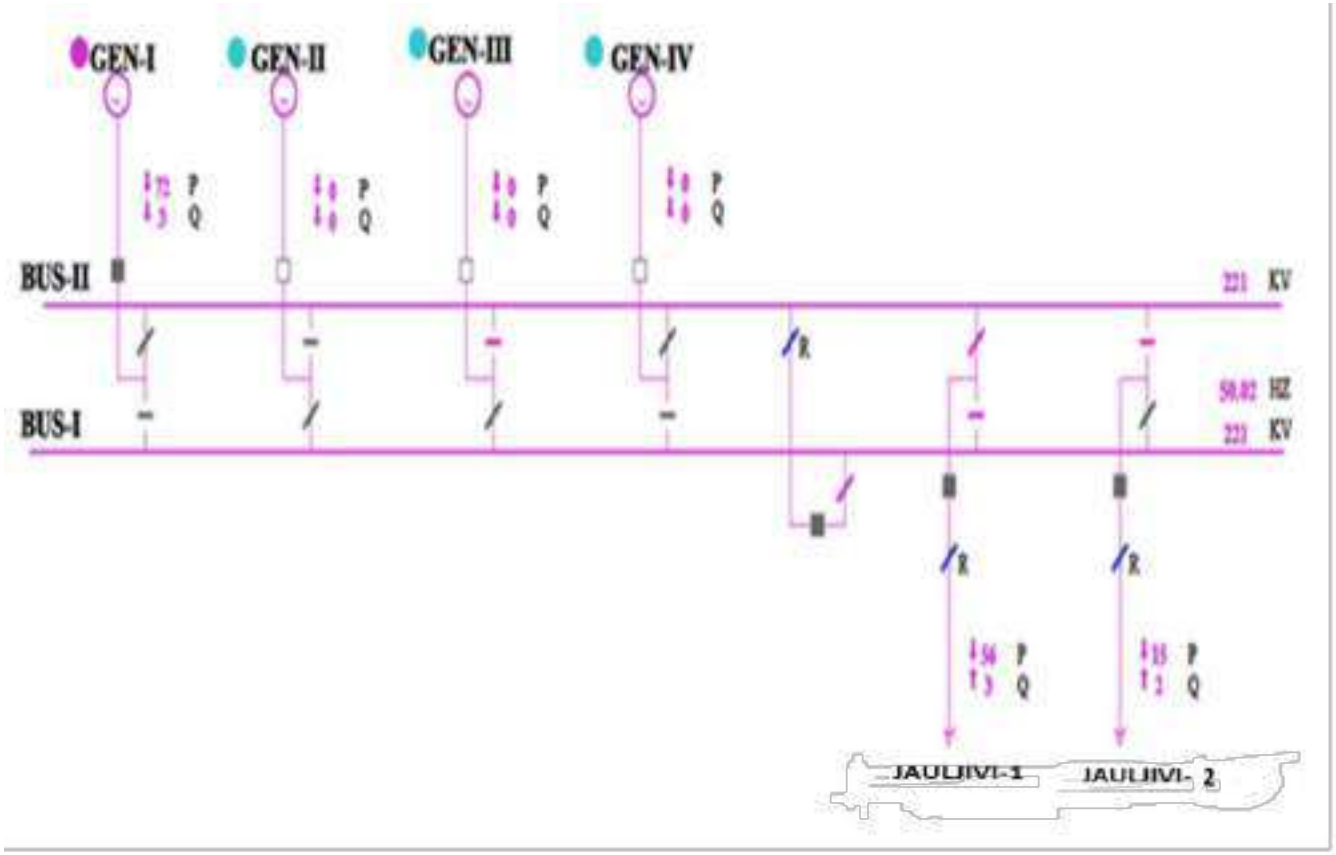
54th
PSC meeting of NRPC

NHPC Limited

Tripping at Point No.-2

Tripping in **Dhauliganga-Jauljivi Line#1 & #2** at 18:23 Hrs on 05.10.2024

SLD of Dhauliganga PS



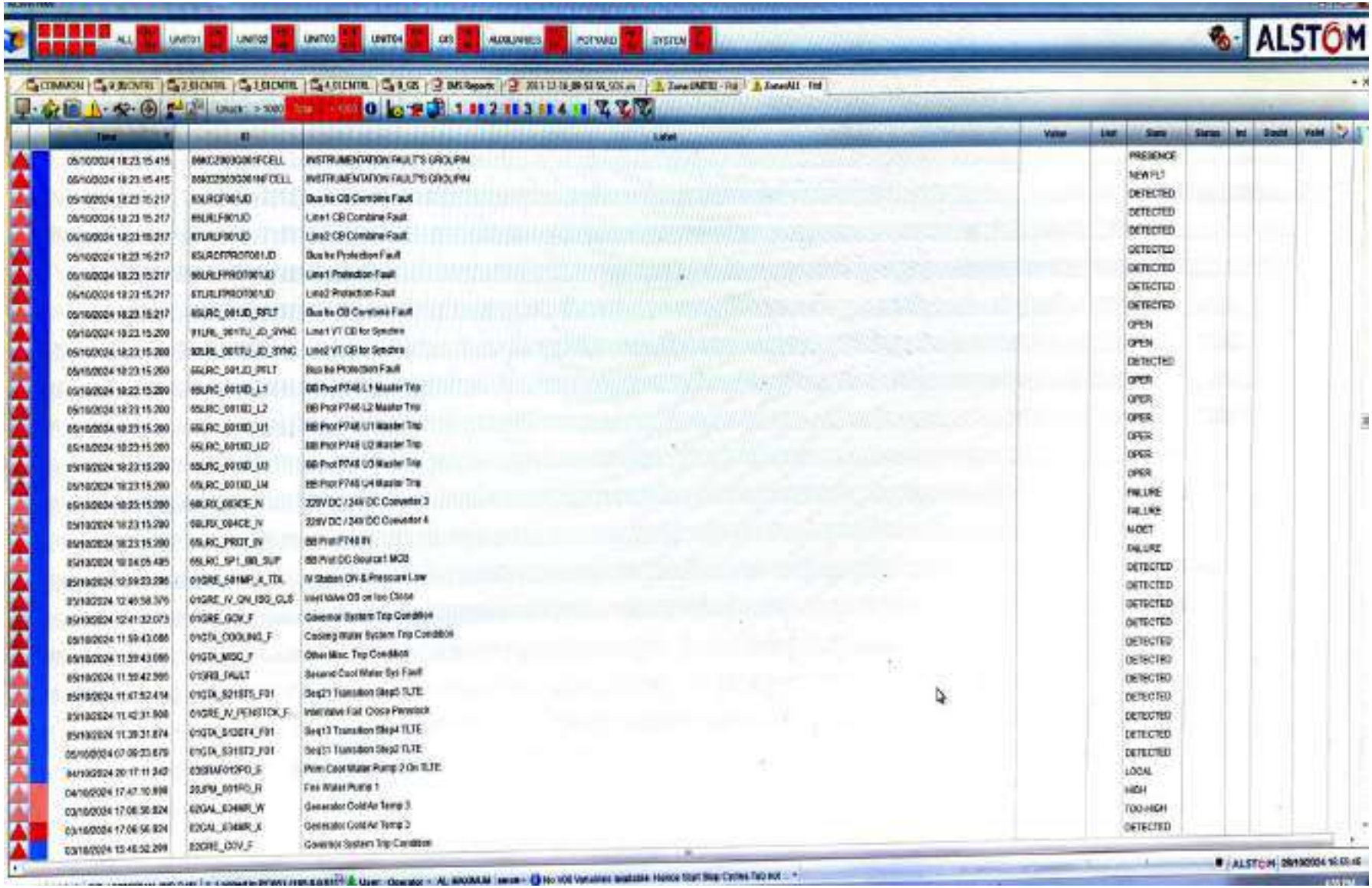
Elements Tripped on 05/10/2024

क्रम सं	यूनिट / लाइन नाम	से		तक		कुल आउटेज समय	आउटेज के कारण	ऊर्जा नुकसान (मेगावाट)
		तारीख	समय	तारीख	समय			
1	Unit#1	5-Oct-24	17:30:00	5-Oct-24	20:15:00	2:45:00	Could not be synchronised due to GIS controller hang.	70
2	Unit#2	5-Oct-24	17:45:00	5-Oct-24	19:13:00	1:28:00	Could not be synchronised due to GIS controller hang.	70
3	Unit#3	5-Oct-24	18:00:00	5-Oct-24	19:12:00	1:12:00	Could not be synchronised due to GIS controller hang.	70
4	Unit#4	5-Oct-24	18:23:00	5-Oct-24	21:30:00	3:07:00	GIS Controller Fault	70
5	220 KV Dhauliganga-Jauljivi Line#1	5-Oct-24	18:23:00	5-Oct-24	21:30:00	3:07:00	GIS Controller Fault	0
6	220 KV Dhauliganga-Jauljivi Line#2	5-Oct-24	18:23:00	5-Oct-24	21:30:00	3:07:00	GIS Controller Fault	0

Detail Analysis

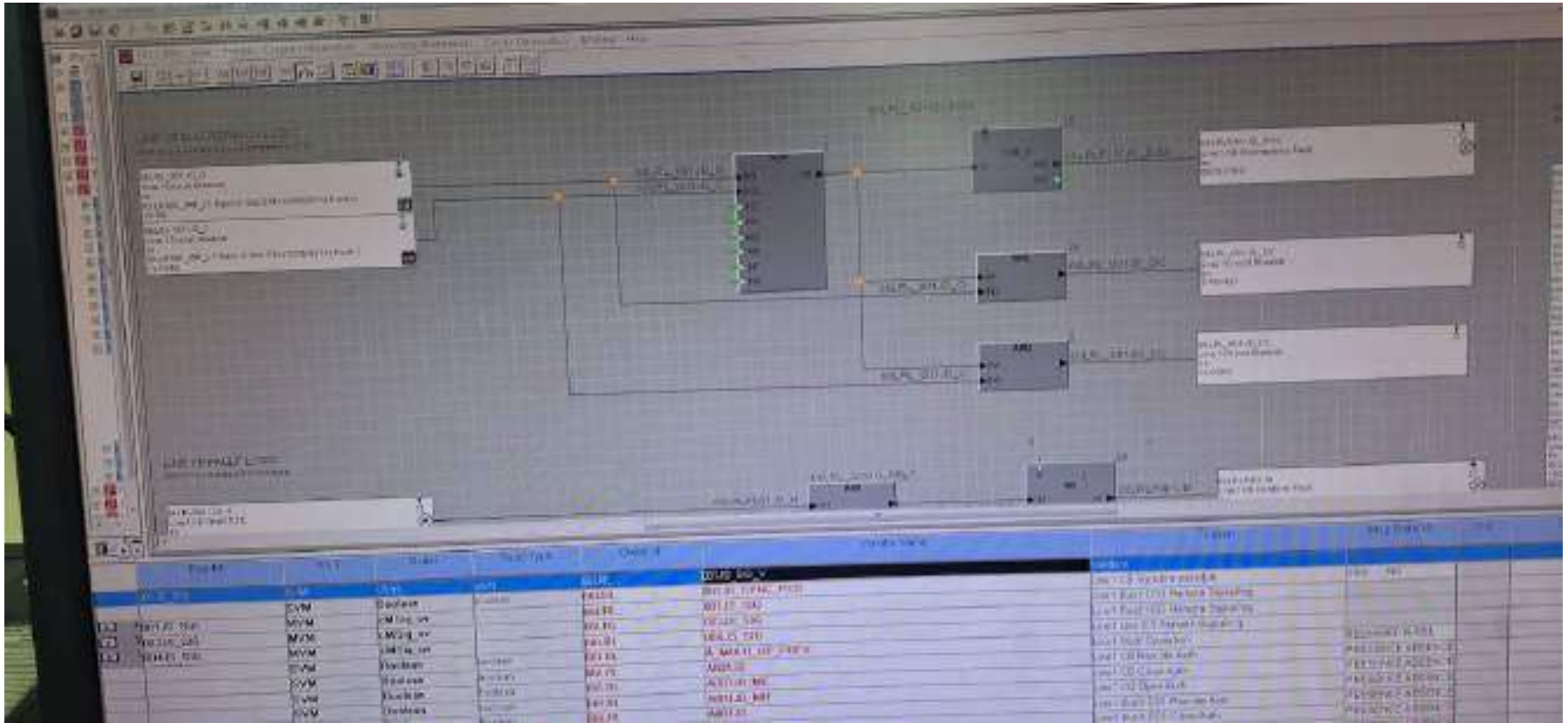
1. Prior to event, one unit i.e. Unit#4 was in running condition. As per schedule, synchronization of other three units i.e. U#1, U#2 & U#3 were tried but could not be synchronised due to hanging up of the GIS controller (missing of feedback signals).
2. Subsequently, the maintenance team tried to reset the GIS controller and during this process trip command was initiated as per existing controller logic from GIS controller to all bays i.e. one running units & two lines. Accordingly, the running unit & Lines were tripped.
3. Due to power off Controller, Line-1,2 and Unit-4 tripped and also initiated the direct trip to remote end.

SCADA Event


ALSTOM
Time
ID
Label
Value
Unit
State
Status
Int
Doubt
Valid
05/10/2024 18:23:15.415 INSTRUMENTATION FAULTS GROUP/N PRESENCE
05/10/2024 18:23:15.415 INSTRUMENTATION FAULTS GROUP/N NEW FLT
05/10/2024 18:23:15.217 Bus bs CB Complete Fault DETECTED
05/10/2024 18:23:15.217 Line1 CB Combine Fault DETECTED
05/10/2024 18:23:15.217 Line2 CB Combine Fault DETECTED
05/10/2024 18:23:15.217 Bus bs Protection Fault DETECTED
05/10/2024 18:23:15.217 Line1 Protection Fault DETECTED
05/10/2024 18:23:15.217 Line2 Protection Fault DETECTED
05/10/2024 18:23:15.217 Bus bs CB Complete Fault DETECTED
05/10/2024 18:23:15.200 Line1 VT CB for Synchro OPEN
05/10/2024 18:23:15.200 Line2 VT CB for Synchro OPEN
05/10/2024 18:23:15.200 Bus bs Protection Fault DETECTED
05/10/2024 18:23:15.200 BB Prot P746 L1 Master Trip OPER
05/10/2024 18:23:15.200 BB Prot P746 L2 Master Trip OPER
05/10/2024 18:23:15.200 BB Prot P746 U1 Master Trip OPER
05/10/2024 18:23:15.200 BB Prot P746 U2 Master Trip OPER
05/10/2024 18:23:15.200 BB Prot P746 U3 Master Trip OPER
05/10/2024 18:23:15.200 BB Prot P746 U4 Master Trip OPER
05/10/2024 18:23:15.200 220V DC / 24V DC Converter 3 FAILURE
05/10/2024 18:23:15.200 220V DC / 24V DC Converter 4 FAILURE
05/10/2024 18:23:15.200 BB Prot P746 IN MDET
05/10/2024 10:04:05.485 BB Prot DC Source1 MCB FAILURE
05/10/2024 12:59:23.286 IV Station ON & Pressure Low DETECTED
05/10/2024 12:46:58.370 Inlet Valve CB on Iso Close DETECTED
05/10/2024 12:41:32.073 Governor System Trip Condition DETECTED
05/10/2024 11:59:43.086 Cooling Water System Trip Condition DETECTED
05/10/2024 11:59:43.086 Other Misc Trip Condition DETECTED
05/10/2024 11:59:42.999 Second Cool Water Sys Fault DETECTED
05/10/2024 11:47:52.414 Seq21 Transition Step5 TLTE DETECTED
05/10/2024 11:42:31.908 Inlet Valve Fail Close Penstock DETECTED
05/10/2024 11:39:31.874 Seq13 Transition Step4 TLTE DETECTED
05/10/2024 07:09:23.879 Seq11 Transition Step2 TLTE DETECTED
04/10/2024 20:17:11.247 Prim Cool Water Pump 2 On TLTE LOCAL
04/10/2024 17:47:10.998 Fire Water Pump 1 HIGH
03/10/2024 17:06:56.824 Generator Cold Air Temp 3 TOO HIGH
03/10/2024 17:06:56.824 Generator Cold Air Temp 2 DETECTED
03/10/2024 15:46:52.299 Governor System Trip Condition

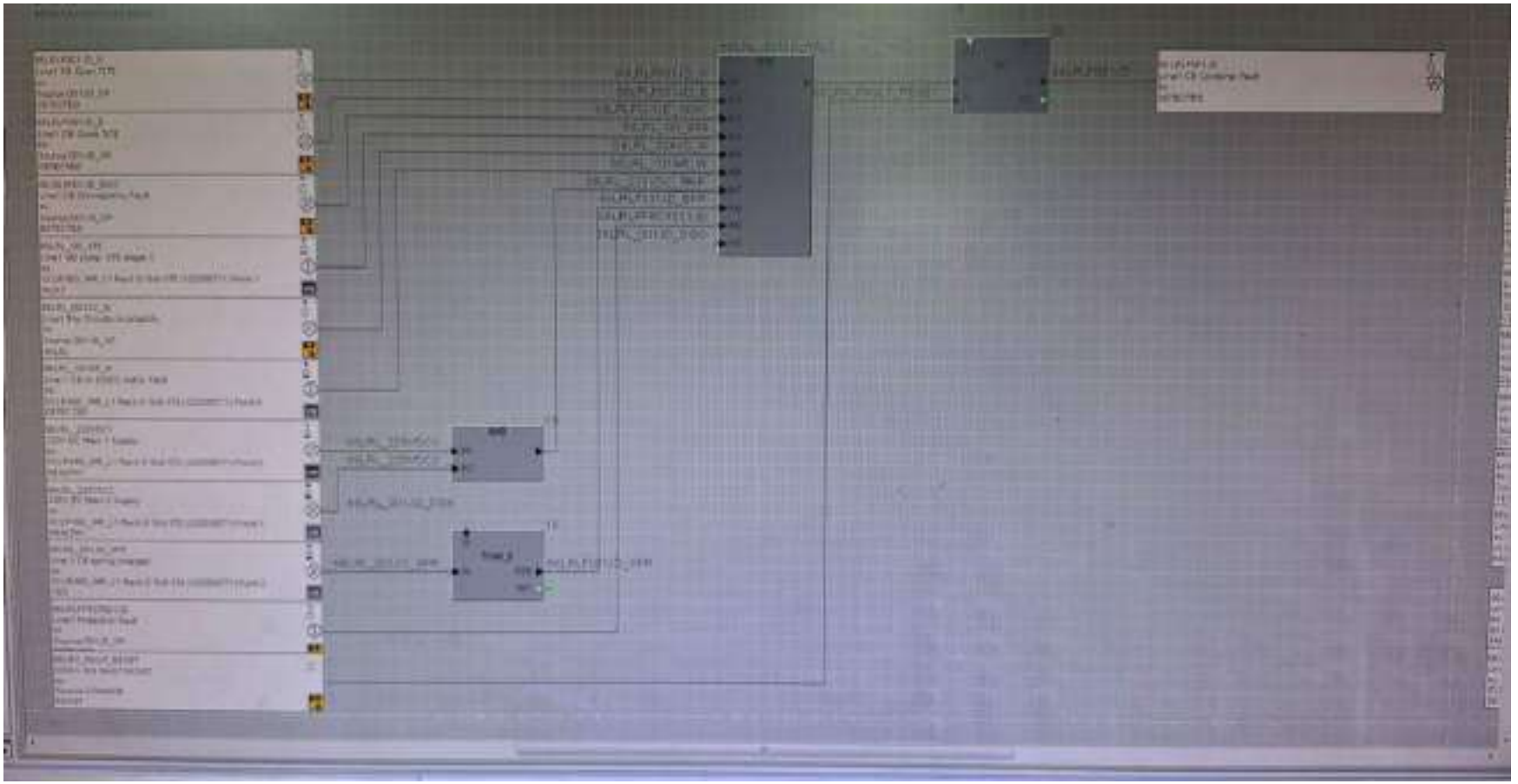
Reason for Trip

1. Due to power off to the controller, CB close status change to -0 and CB open status -0
2. The CB close and open status -0 read as CB discrepancy.



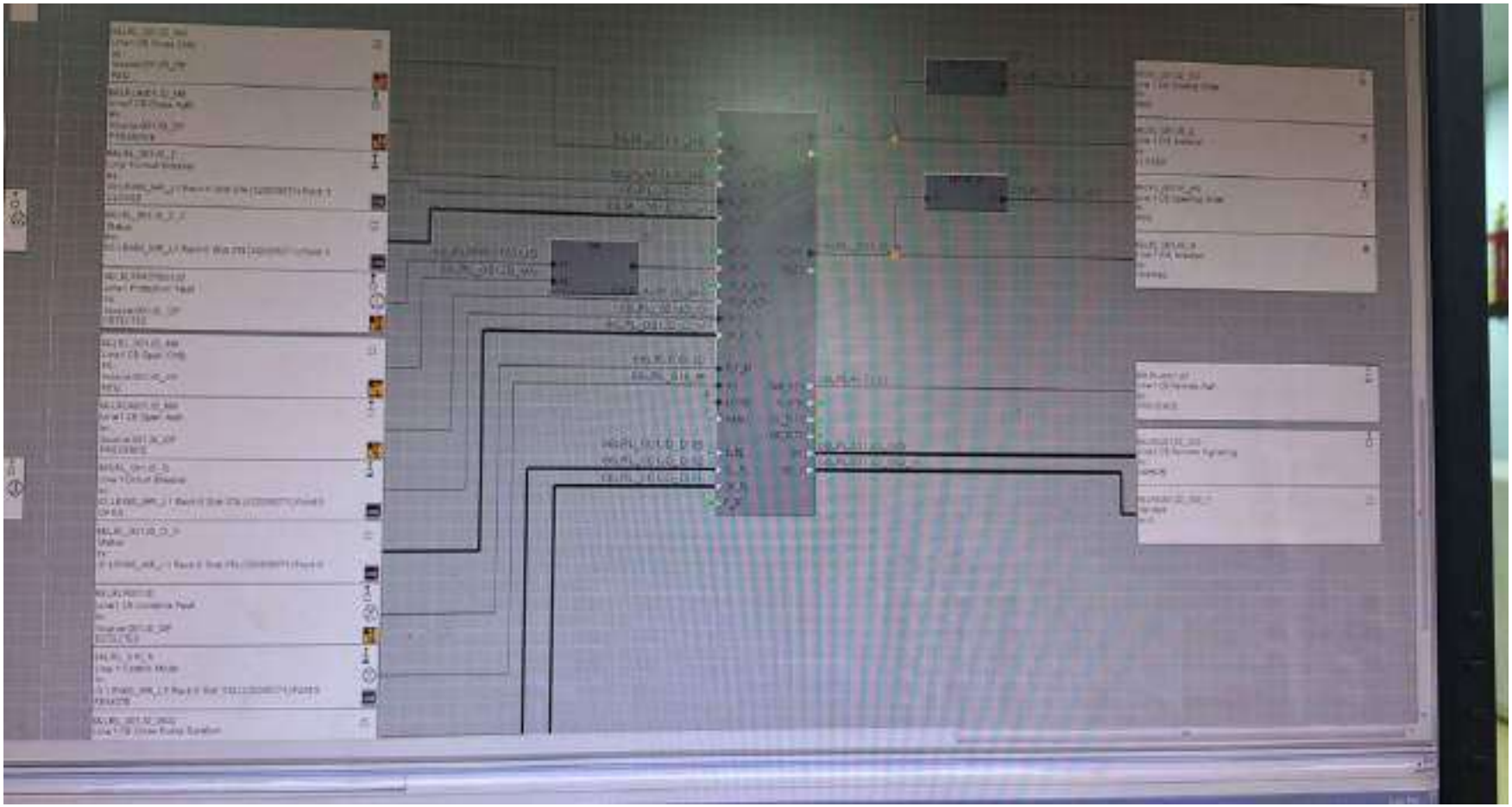
Continued….

1. The CB discrepancy further leads to CB combined Fault



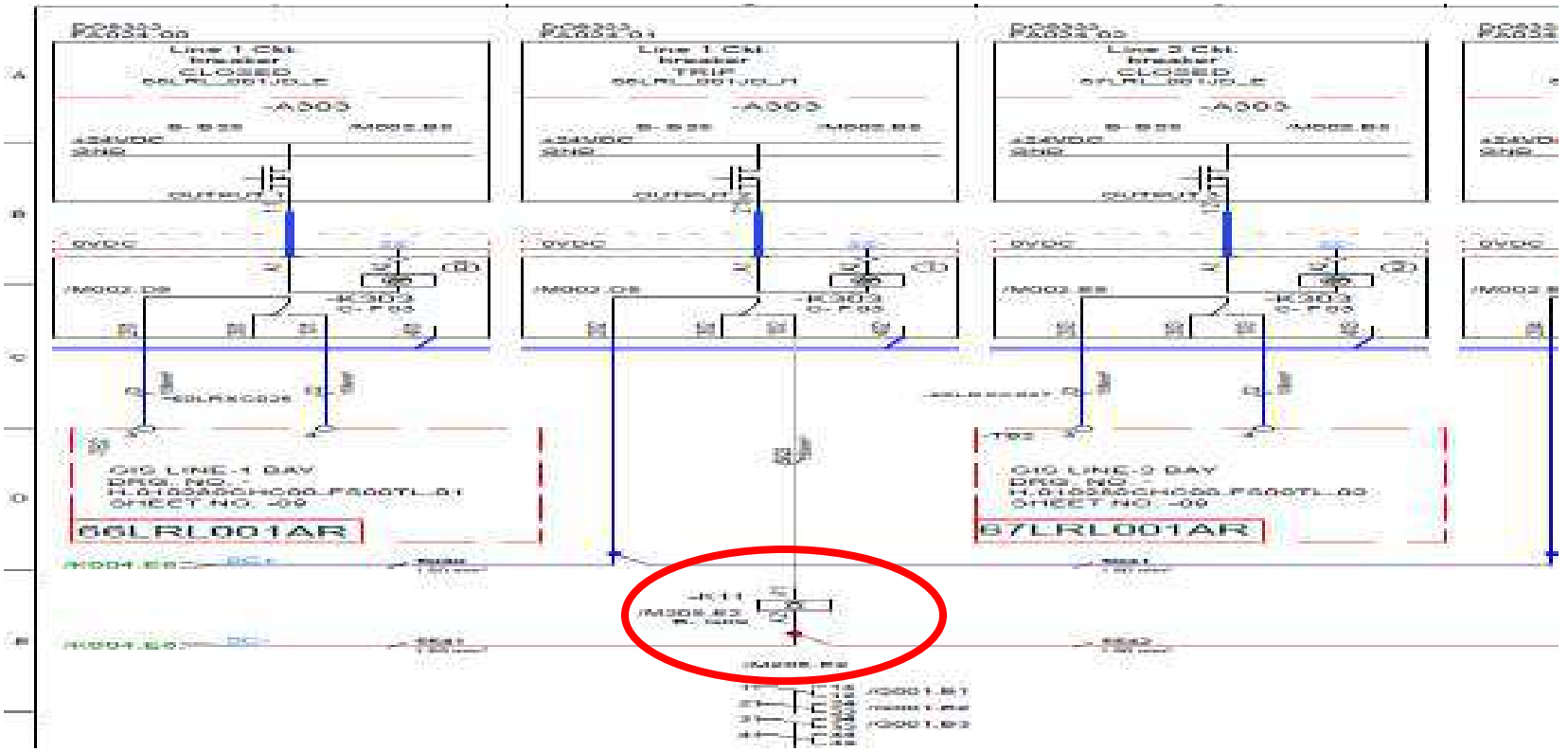
Continued….

1. The CB combined Fault further issued to Trip command.



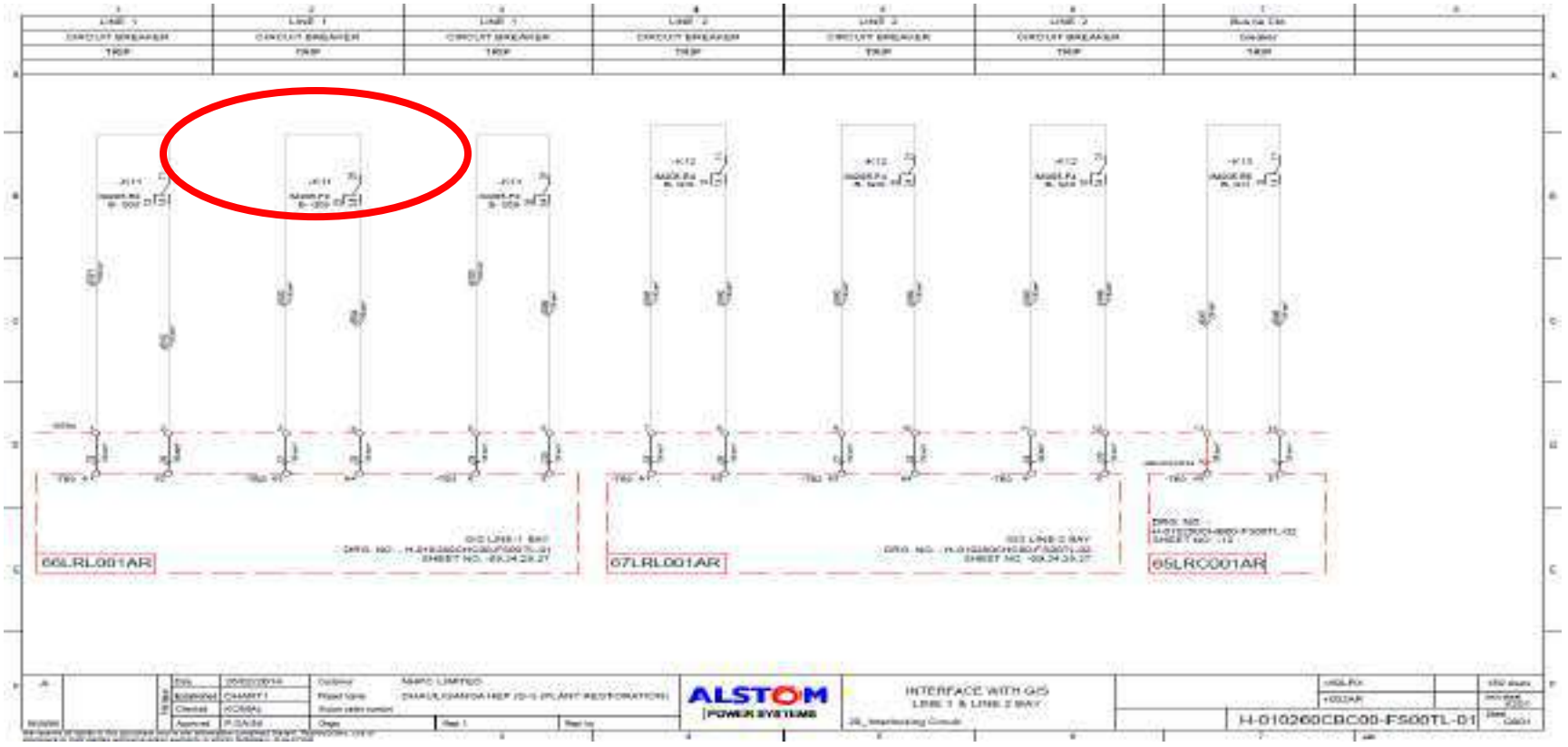
Continued….

- CB Trip command is activated the K11 Relay for tripping of breaker.



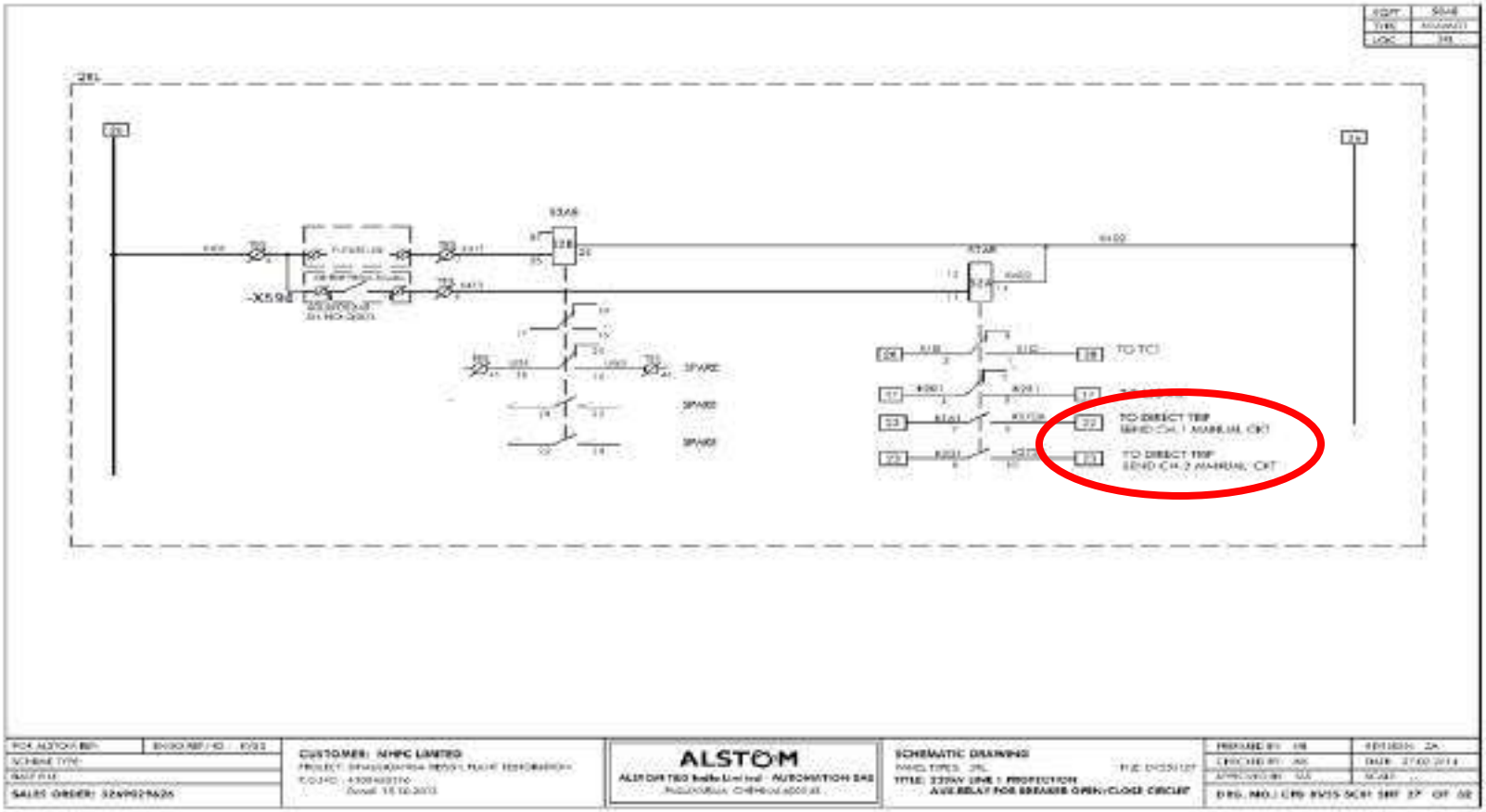
Continued….

- CB Trip command is activated the K11 Relay for tripping of breaker.



Reason for Direct Trip

- CB Trip command is activated the K11 Relay for tripping of breaker.



Thanks

Multiple element tripping event at 400/220KV OBRA-B(UP)

At 11:39 hrs on 09th October, 2024

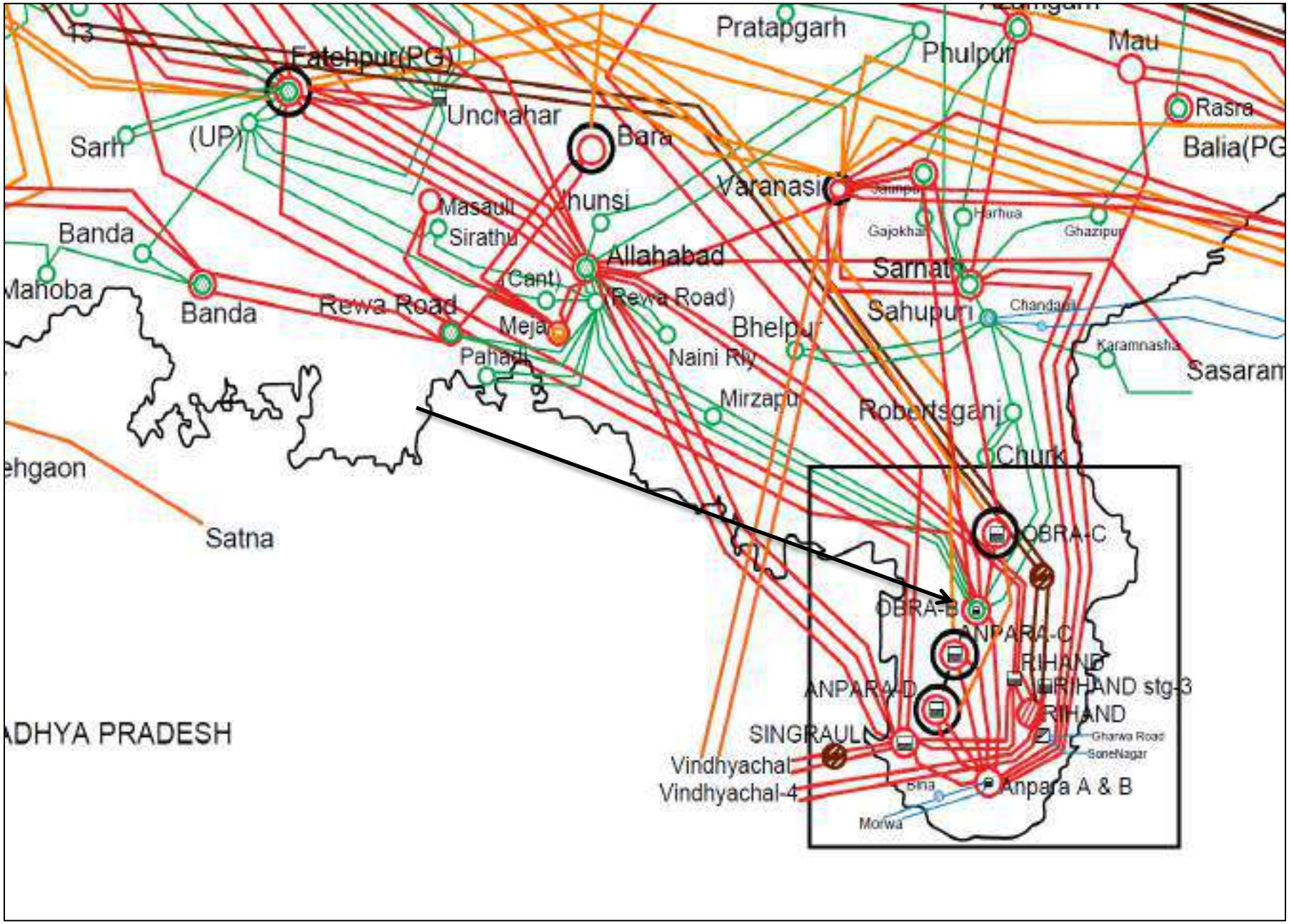
Tripped Elements

S.No.	Name of Element	Tripping Time	Revival Time
1	220kV Obra_A-Sahupuri (UP) ckt	11:39 hrs	
2	220kV Obra_A-Rewa Road (UP) ckt-2		
3	400/220kV 315 MVA ICT 1 at Obra_B(UP)		12:22 hrs
4	400/220kV 240 MVA ICT 3 at Obra_B(UP)		14:41 hrs

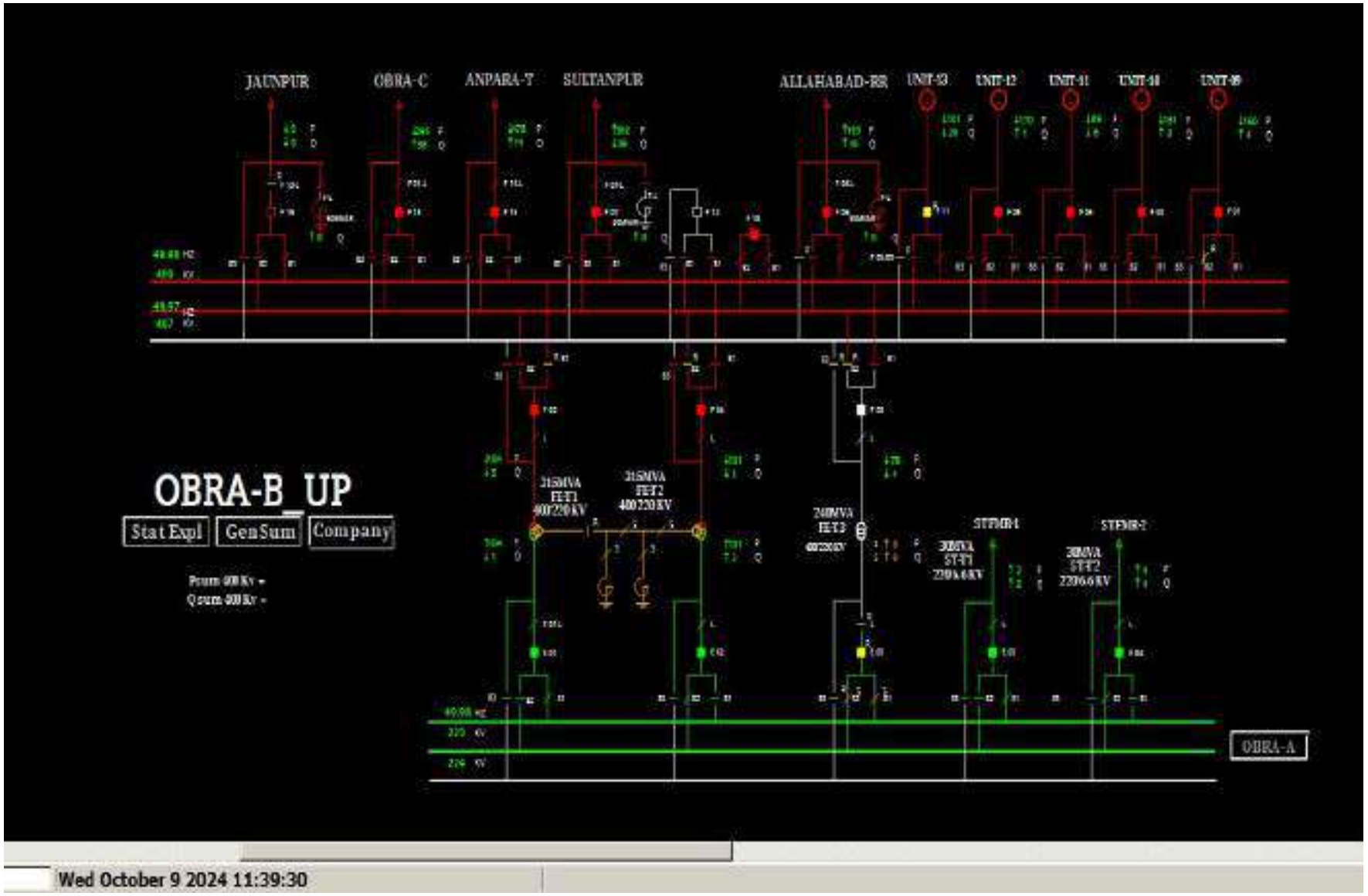
Brief details of the event

- 400/220 KV Obra_B(UP) has 2*315 MVA (ICT-1&2) and one 240MVA ICT (ICT-3). During antecedent condition, 2*315 MVA & 240 MVA ICTs were carrying 104MW (ICT1), 101MW (ICT2) and 78MW (ICT3) respectively.
- During the antecedent condition, 400/220kV 315 MVA ICT-1, 240 MVA ICT-3 at Obra_B, 220kV Obra_A-Allahabad Rewa Road ckt-2 & 220kV Obra_A-Sahupuri ckt were connected to 220kV Bus-1 and rest of the elements were connected to 220kV Bus-2 at Obra_A(UP).
- As reported, at 11:39 hrs, R-Y fault occurred on 220kV Obra_A-Sahupuri ckt. Fault location was 5km from Obra end. Fault was in Z-1 from Obra end and Z-2 from Sahupuri end.
- On this fault, distance protection at both ends operated. CB opened from Sahupuri end in zone-2 (94.9%) however, CB at Obra end failed to open.
- As reported, LBB protection didn't operate (relay is of static type) and fault cleared with the tripping of 220kV Obra_A-Allahabad Rewa Road ckt-2 on Z-4 distance protection operation at Obra_A end and 400/220kV 315 MVA ICT-1, 240 MVA ICT-3 on directional O/C E/F protection operation. 220kV bus coupler CB also opened on over current protection and 220kV Bus-1 became dead.
- After tripping ICT-1 & 3 all the load shifted to ICT-2 and the loading of ICT-2 increased to 240 MW.
- As per PMU at Anpara(UP), R-Y fault with delayed clearance of ~960msec is observed.
- As per SCADA, no generation or load loss was observed in UP control area.

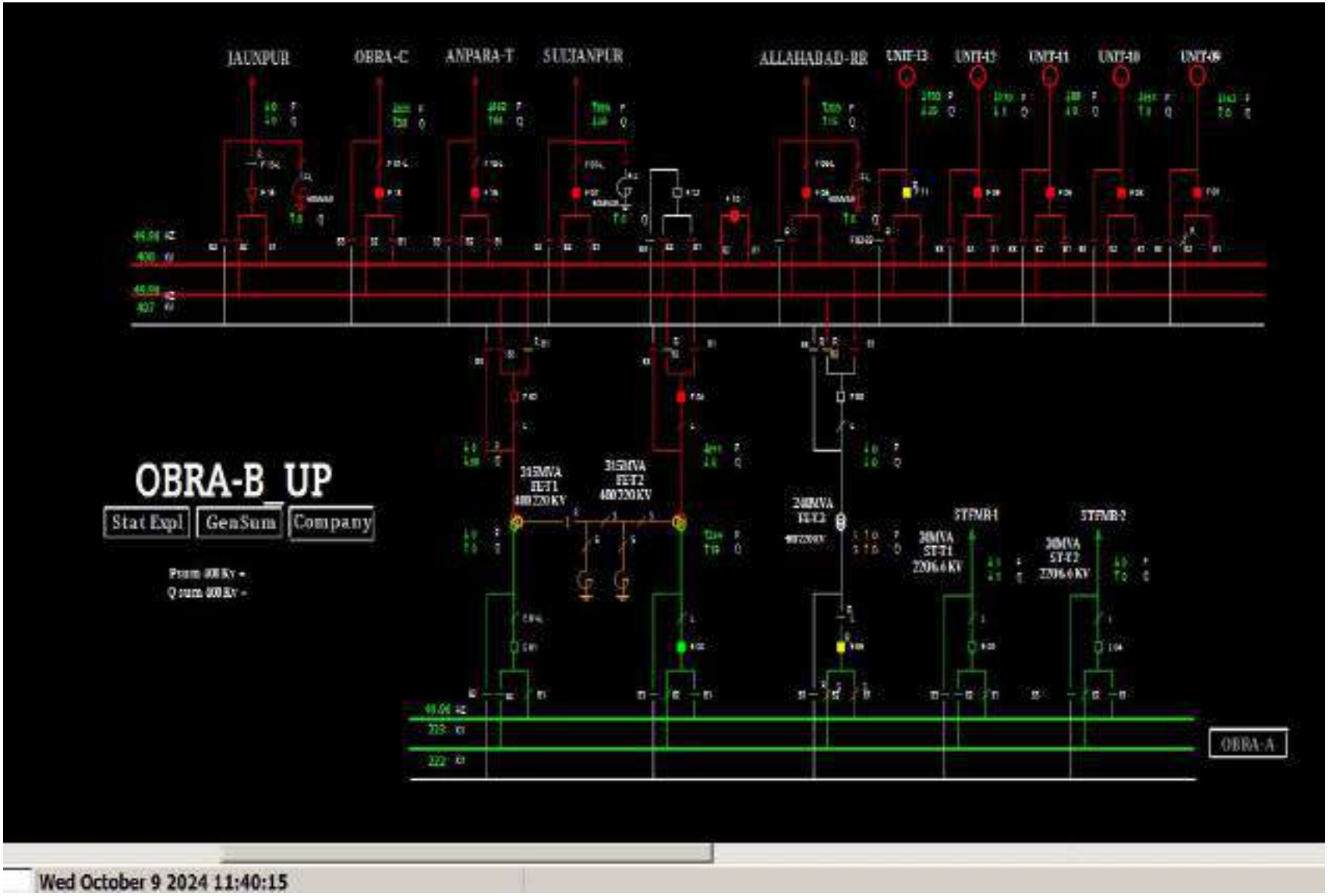
Network Diagram



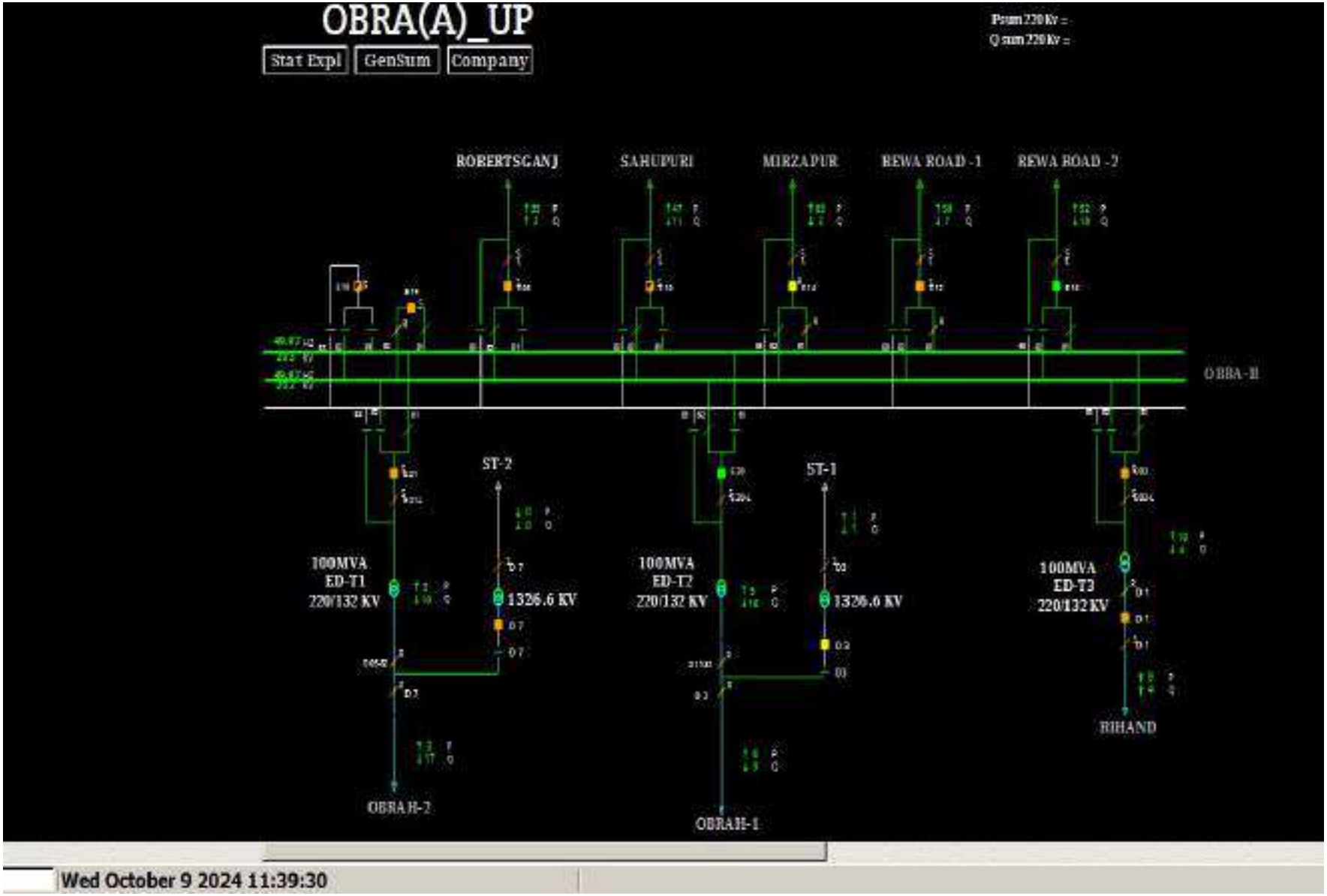
SLD of 400/220kV OBRA-B(UP) before the event



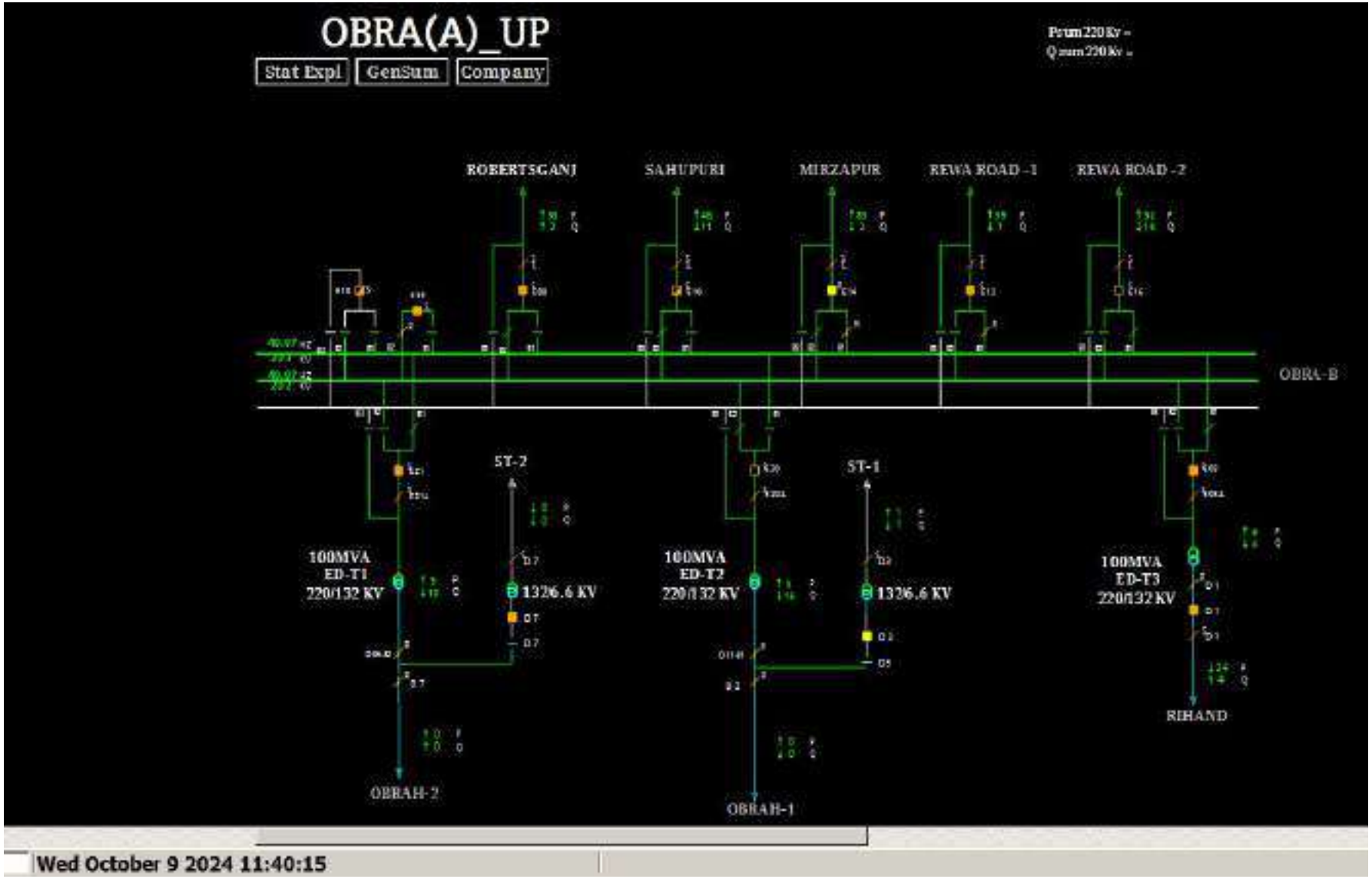
SLD of 400/220kV OBRA-B(UP) after the event



SLD of 220kV OBRA-A(UP) before the event

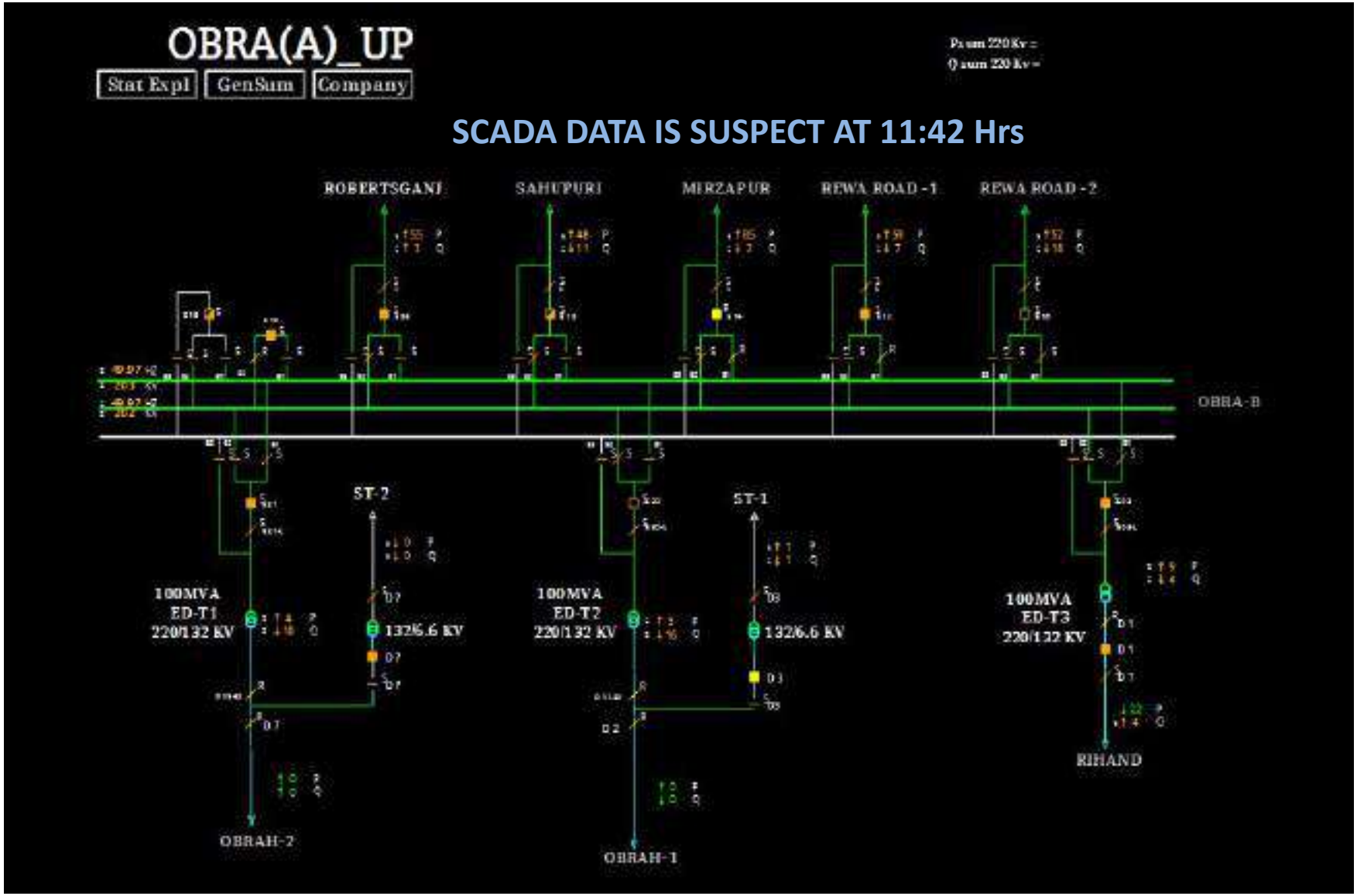


SLD of 220kV OBRA-A(UP) after the event

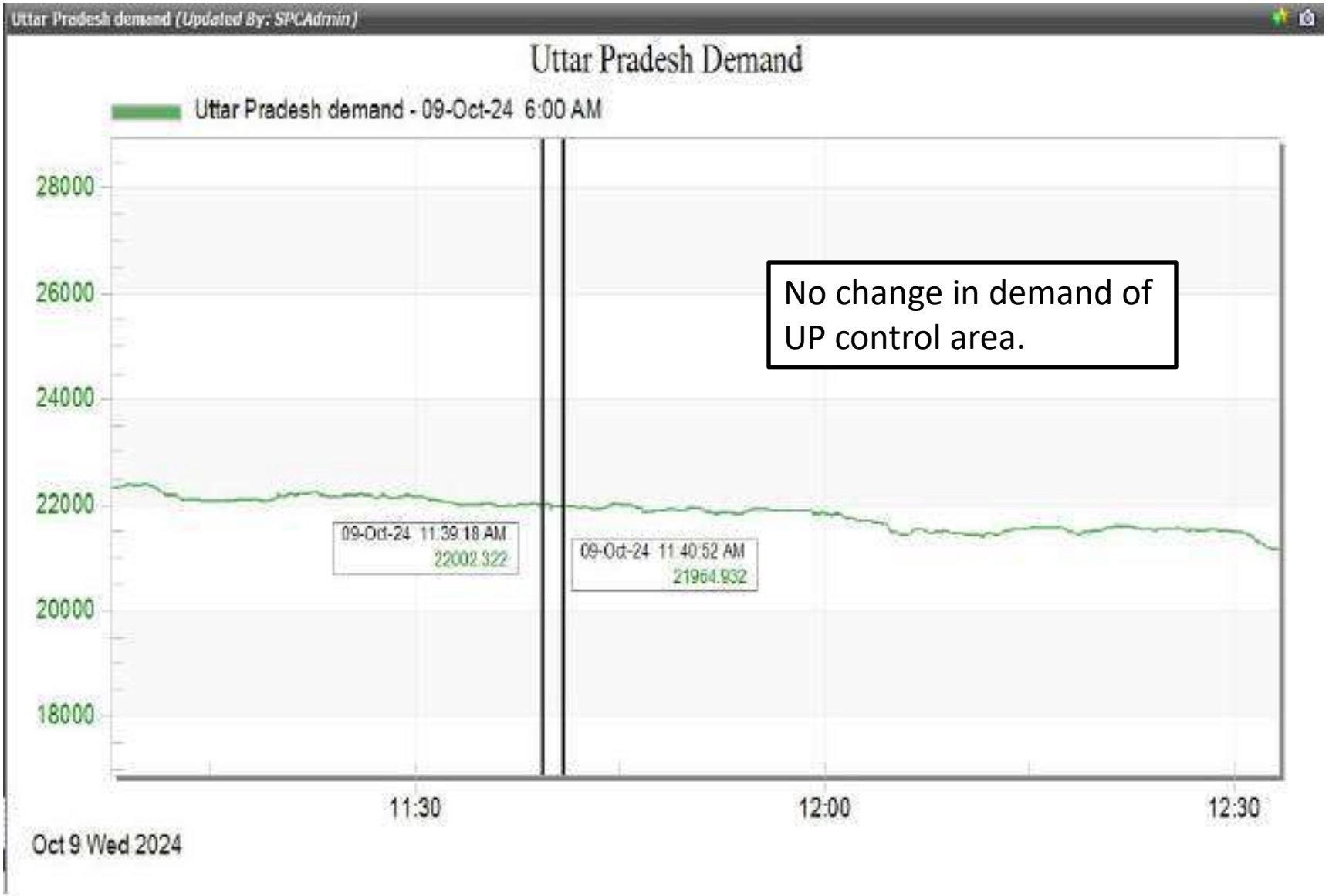


SLD of 220kV OBRA-A(UP) SCADA DATA

09-Oct-2024/11:42 Hrs



Uttar Pradesh Demand during the event



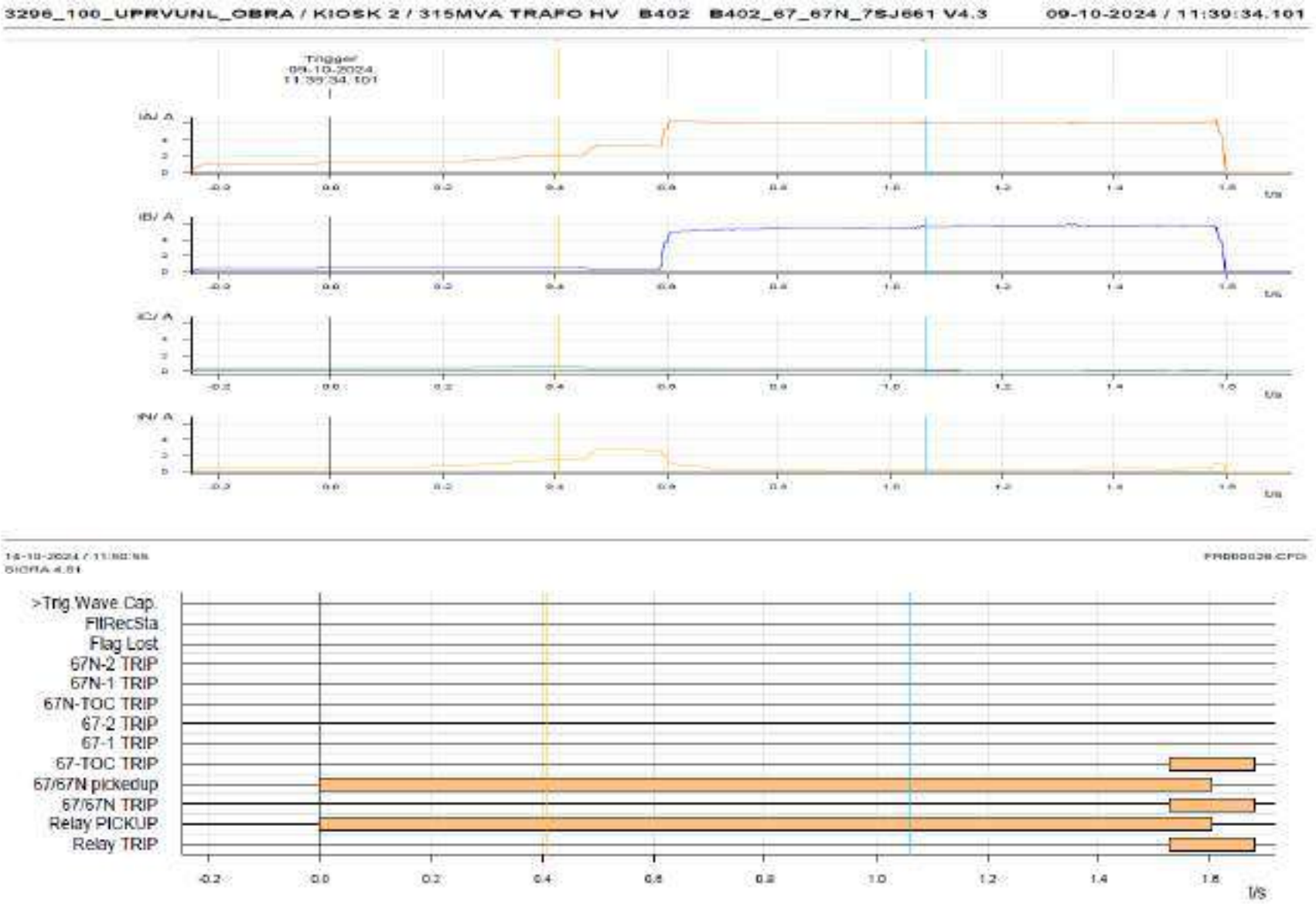
PMU Plot of frequency at Anpara(UP)

11:39 hrs/09-Oct-24

PMU Plot of phase voltage magnitude at Anpara(UP)

11:39 hrs/09-Oct-24

DR of 400/220kV 315 MVA ICT-1 at Obra_B(UP)



R-Y fault, Directional O/C E/F protection operated

EL of 400/220kV 240 MVA ICT-3 at Obra_B(UP)

Directional O/C E/F protection operated

SCADA SOE

Time	Station Name	Voltage	Element Name	Element Type	Element Status	Remarks
11:39:35,010	OBRA_A_UP	220kV	220kV Obra_A-Sahupuri ckt	Line	Open	R-Yfault
11:39:35,190	OBRA_A_UP	220KV	220kV Obra_A-Rewa Road ckt-2	Line	Open	Z-4 distance Protection
11:39:35,690	OBRAB_UP	400kV	ICT1	Transformer	Open	Directional Overcurrent Relay Operated
11:39:37,000	OBRAB_UP	400kV	ICT3	Transformer	Open	Directional Overcurrent Relay Operated

Points for Discussion

i) Exact reason of fault need to be shared.

ii) Why did the LBB of Sahupuri bay at Obra_A not operate? Review of LBB protection need to be done. Also process of replacement of static relay with numerical relay need to be initiated.

iii) DR/EL (.dat/.cfg) of all tripped elements along with detailed tripping report need to be shared from both the ends.

iv) Routine maintenance of breaker and its auxiliary equipments need to be done to ensure their proper operation.

v) Remedial action taken report to be shared.

INCIDENT OF 220KV OBRA BTPS ON DATED 09 OCTOBER 2024

PRESENTED BY
SWAPNIL YADAV
AE, EMD-I, BTPS, OBRA

Tripping of 220KV Obra-Sahupuri Line with 220KV BUS-I and associated elements.

- **Date & Time of event**: 09.10.2024 at 11:39 hrs
- **Sub-Station affected**: 220KV, 5x200MW OBRA BTPS
- **Date & Time of restoration**: As per below table

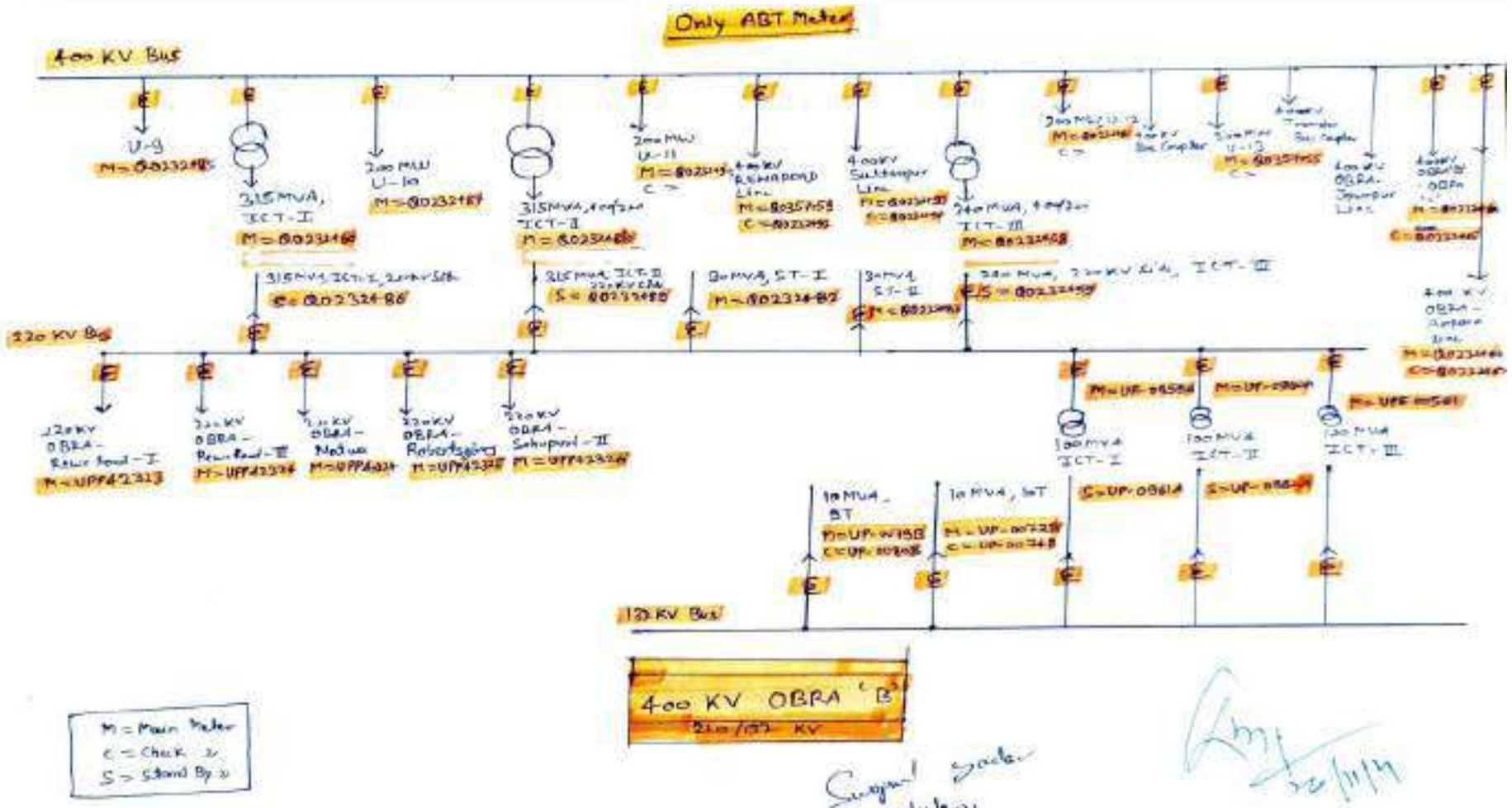
S.NO	NAME OF ELEMENT	LOAD IN MW (Before The Incident)	TRIPPING DATE	TRIPPING TIME	RESTORATION DATE	RESTORATION TIME
1	240 MVA, 400/220KV ICT-III	84 MW	09.10.2024	11:39:34:056	09.10.2024	14:41
2	30 MVA, 220/6.9KV ST-II	1.9 MW	09.10.2024	11:39:34:443	09.10.2024	11:47
3	30 MVA, 220/6.9KV ST-I	3.87 MW	09.10.2024	11:39:34:448	09.10.2024	11:54
4	315 MVA, 400/220KV ICT-I	106 MW	09.10.2024	11:39:35:650	09.10.2024	12:21
5	220 KV Obra- Sahupuri	45 MW	09.10.2024	11:39:34	09.10.2024	15:59
6	220 KV Obra- Rewa Road -III	59 MW	09.10.2024	12:39:34	09.10.2024	13:11
7	220KV Bus-Coupler	N/A	09.10.2024	13:39:34	09.10.2024	11:52
8	100 MVA ICT–II	-12 MW	09.10.2024	14:39:34	09.10.2024	12:52
9	100 MVA ICT–I	-11 MW	09.10.2024	15:39:34	09.10.2024	13:00

ELEMENT STATUS JUST BEFORE TRIPPING OF 220 KV BTPS

2 Main & 1 Transfer Bus Scheme Used in 220KV OBRA BTPS which is distributed in following manner just before tripping.

- **220 KV BUS-I:-** 220 KV Obra Allahabad-III, 100 MVA ICT-I, 100 MVA ICT-III, 315 MVA 400/220 KV ICT-I , 240 MVA 400/220 KV ICT-II, 30 MVA ST-I.
- **220 KV BUS-II:-** 100 MVA ICT-II, 100 MVA ICT-III, 30 MVA ST-II, 315 MVA 400/220 KV ICT-II.
- **220KV BUS-I & II**: Coupled through Bus Coupler.

SLD OF 400/220KV OBRA BTPS

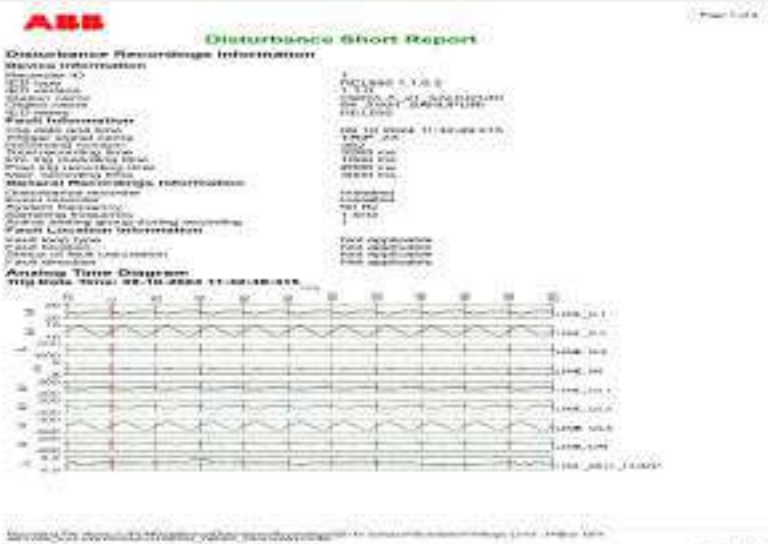


DETAIL OF INCIDENT

- Z-I R,Y phase Fault occurred at 220 KV Obra-Sahupuri Ckt at about 5 Km from obra end. Relay detected the fault and initiated tripping, but breaker had not tripped and line tripped only from sahupuri end at Z2 protection.
- Due to above fault following elements tripped followed by 220KV Bus-Coupler which cause dead of 220KV Bus-I with aforesaid flags.

S.NO	NAME OF ELEMENT	FLAGS END 1 (INCLUDING A/R)	FLAGS END 2 (INCLUDING A/R)
1	240 MVA, 400/220KV ICT-III	Dir. E/F Protection-R,Y, B Phase operated..	
2	30 MVA, 220/6.9KV ST-II	Dir. E/F Protection-R,Y, B Phase operated..	
3	30 MVA, 220/6.9KV ST-I	Dir. E/F Protection-R,Y, B Phase operated..	
4	315 MVA, 400/220KV ICT-I	Dir. E/F Protection-R,Y, B Phase operated..	
5	220 KV Obra- Sahupuri	Gen.Trip, OC/EF , Z1, Z2, Z3 trip, RY B ph trip, PSB, AR Block	R,Y ph P.U.,Z-2 trip A/R block, 86A,86B Distance -93 Km Il1- 1.02 KA. Il2- 1.21 KA, Il3- 0.31 KA
6	220 KV Obra- Rewa Road -III	RY B ph trip , Z4 trip Distance= (-)5.626km Fault duration-479.9 ms.	Zone-2, E/F Fault duration 491.4 ms.86A,86B
7	220KV BUS COUPLER	Current cut off	
8	100 MVA ICT–II	Tripped from obra hydro end	OC, EF, AR1
9	100 MVA ICT –I	Tripped from obra hydro end	OC, EF, AR1

DR OF EVENT



ABB

Disturbance Short Report

Disturbance Recordings Information

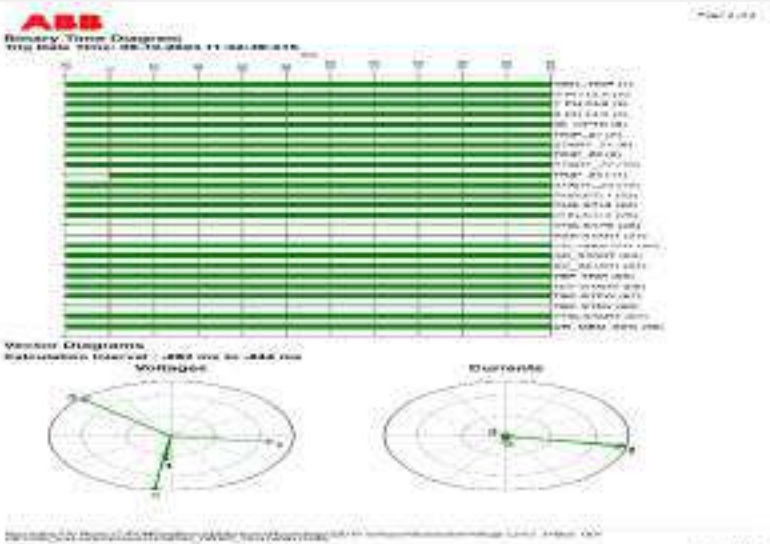
Device Information

Fault Information

Natural Recordings Information

Fault Location Information

Analog Time Diagram



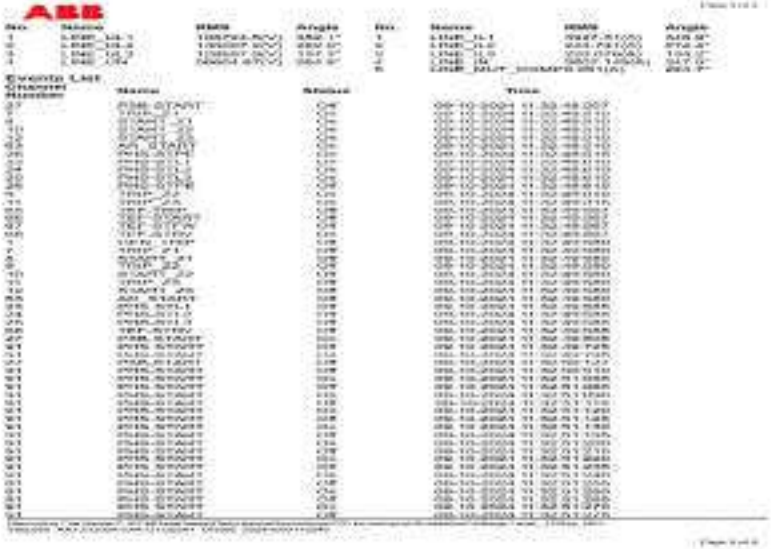
ABB

Binary Time Diagram

Vector Diagrams

Voltages

Currents



ABB

No.	Name	RMS	Angle	No.	Name	RMS	Angle
0	LINE_UL1	10(750.5(V)	352.1°	3	LINE_IL1	0(47.5(10)	325.9°
1	LINE_UL2	10(600(V)	232.0°	4	LINE_IL2	0(0.5(10)	272.3°
2	LINE_UL3	10(600(V)	112.0°	5	LINE_IL3	0(0.5(10)	152.3°
	LINE_UL4	0(0.0(V)	0.0°	6	LINE_IN	0(0.5(10)	32.3°
					LINE_DIFF_IL1(IL2)(IL3)		0.0°

Events List

Channel	Name	Status	Time
Number			
37	FUNC START	ON	08-10-2021 11:32:48.007
7	TRIP_L1	ON	08-10-2021 11:32:48.010
10	START_L1	ON	08-10-2021 11:32:48.010
11	START_L2	ON	08-10-2021 11:32:48.010
12	START_L3	ON	08-10-2021 11:32:48.010
34	AR_START	ON	08-10-2021 11:32:48.010
35	PROTECTED	ON	08-10-2021 11:32:48.010
36	PROT_DTR	ON	08-10-2021 11:32:48.010
37	PROT_DTR	ON	08-10-2021 11:32:48.010
38	PROT_DTR	ON	08-10-2021 11:32:48.010
4	TRIP_L1	ON	08-10-2021 11:32:48.010
5	TRIP_L2	ON	08-10-2021 11:32:48.010
60	REF_TRIP	ON	08-10-2021 11:32:48.010
61	REF_START	ON	08-10-2021 11:32:48.010
62	REF_DTR	ON	08-10-2021 11:32:48.010
63	REF_DTR	ON	08-10-2021 11:32:48.010
1	UNIT TRIP	ON	08-10-2021 11:32:48.010
2	TRIP_L1	ON	08-10-2021 11:32:48.010
3	START_L1	ON	08-10-2021 11:32:48.010
8	TRIP_L2	ON	08-10-2021 11:32:48.010
9	START_L2	ON	08-10-2021 11:32:48.010
13	TRIP_L3	ON	08-10-2021 11:32:48.010
14	START_L3	ON	08-10-2021 11:32:48.010
33	AR_START	ON	08-10-2021 11:32:48.010
39	PROT_STL1	ON	08-10-2021 11:32:48.010
40	PROT_STL2	ON	08-10-2021 11:32:48.010
41	PROT_STL3	ON	08-10-2021 11:32:48.010
42	TRIP_STL1	ON	08-10-2021 11:32:48.010
43	TRIP_STL2	ON	08-10-2021 11:32:48.010
44	TRIP_STL3	ON	08-10-2021 11:32:48.010
45	TRIP_STL1	ON	08-10-2021 11:32:48.010
46	TRIP_STL2	ON	08-10-2021 11:32:48.010
47	TRIP_STL3	ON	08-10-2021 11:32:48.010
48	PROT_START	ON	08-10-2021 11:32:48.010
49	PROT_START	ON	08-10-2021 11:32:48.010
50	PROT_START	ON	08-10-2021 11:32:48.010
51	PROT_START	ON	08-10-2021 11:32:48.010
52	PROT_START	ON	08-10-2021 11:32:48.010
53	PROT_START	ON	08-10-2021 11:32:48.010
54	PROT_START	ON	08-10-2021 11:32:48.010
55	PROT_START	ON	08-10-2021 11:32:48.010
56	PROT_START	ON	08-10-2021 11:32:48.010
57	PROT_START	ON	08-10-2021 11:32:48.010
58	PROT_START	ON	08-10-2021 11:32:48.010
59	PROT_START	ON	08-10-2021 11:32:48.010
64	PROT_START	ON	08-10-2021 11:32:48.010
65	PROT_START	ON	08-10-2021 11:32:48.010
66	PROT_START	ON	08-10-2021 11:32:48.010
67	PROT_START	ON	08-10-2021 11:32:48.010
68	PROT_START	ON	08-10-2021 11:32:48.010
69	PROT_START	ON	08-10-2021 11:32:48.010
70	PROT_START	ON	08-10-2021 11:32:48.010
71	PROT_START	ON	08-10-2021 11:32:48.010
72	PROT_START	ON	08-10-2021 11:32:48.010
73	PROT_START	ON	08-10-2021 11:32:48.010
74	PROT_START	ON	08-10-2021 11:32:48.010
75	PROT_START	ON	08-10-2021 11:32:48.010
76	PROT_START	ON	08-10-2021 11:32:48.010
77	PROT_START	ON	08-10-2021 11:32:48.010
78	PROT_START	ON	08-10-2021 11:32:48.010
79	PROT_START	ON	08-10-2021 11:32:48.010
80	PROT_START	ON	08-10-2021 11:32:48.010
81	PROT_START	ON	08-10-2021 11:32:48.010


ABB

Cause of Tripping

- **Reason for delayed clearance of fault:** Due to not opening of 220KV Obra Sahupuri line CB. After checking in this bay, Circuit breaker SF6 gas pressure lockout relay coil fount defective. Due to this tripping not occurred by both trip circuit.
- **Bus-Bar / LBB Protection:-** Currently in 220KV Switchyard electromagnetic bus bar protection installed without LBB protection function. Due to this individual elements tripped on reverse zone protection or O/C protection.
- **Tripping of 220KV line:** 220KV Obra Rewa Road Line-III tripped on Z-4 protection.
- **Tripping of 315, 240, 100 MVA ICT & 30MVA ST:** All ICT and Station Supply tripped on O/C protection.

HISTORY OF 220KV CIRCUIT BREAKER and 220kv Bus Bar Protection

- **220KV CB:-** In 220KV Obra-Sahupuri Line Hitachi make SF6 breaker Circuit Breaker has been installed. Above breaker was commissioned and charged in year 1993 and continuously in service without any major failure.

- **220 kv Bus bar Protection:-** English Electric make electromagnetic bus bar protection has been installed in 220KV system which was almost 60 year old and in continues service till now.

REMEDIAL MEASURE TAKEN

- **Circuit Breaker :-** Overhauling of 220kV hitachi make SF6 circuit breaker of 220KV OBRA- Sahupuri line proposed in FY 24-25.

- **Bus Bar Protection:-** Case for replacement of 220KV Bus Bar electromagnetic protection relay with Numerical Bus bar protection relay with LBB feature is under pipeline.

THANKYOU

Multiple element tripping event at 220 kV Obra-A(UP), 132 kV Obra HEP(UP), and 132 kV Rihand HEP (UP)

At 17:04 hrs on 09th October, 2024

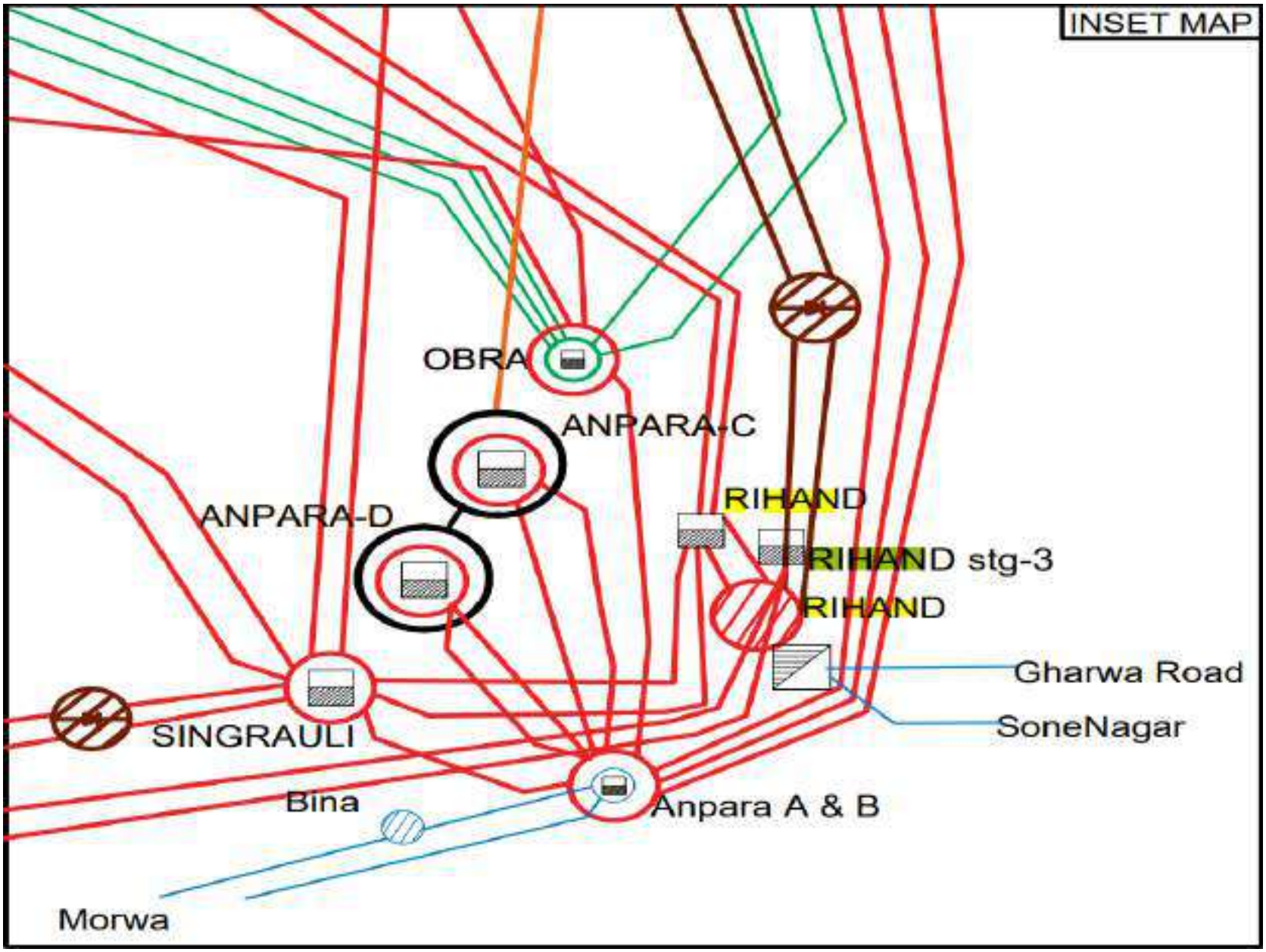
Tripped Elements

S.No.	Name of Element	Tripping Time	Revival Time
1	33 MW Unit-1 at Obra HEP (UP)	17:04 hrs	18:55 hrs
2	33 MW Unit-2 at Obra HEP (UP)		18:40 hrs
3	33 MW Unit-3 at Obra HEP (UP)		19:45 hrs
4	50 MW Unit-1 at Rihand HEP (UP)		18:45 hrs
5	50 MW Unit-2 at Rihand HEP (UP)		18:30 hrs
6	50 MW Unit-4 at Rihand HEP (UP)		18:40 hrs
7	220/132kV 100 MVA ICT-1 at Obra-A (UP)		17:49 hrs
8	220/132kV 100 MVA ICT-2 at Obra-A (UP)		17:49 hrs
9	220/132kV 100 MVA ICT-3 at Obra-A (UP)		17:43 hrs

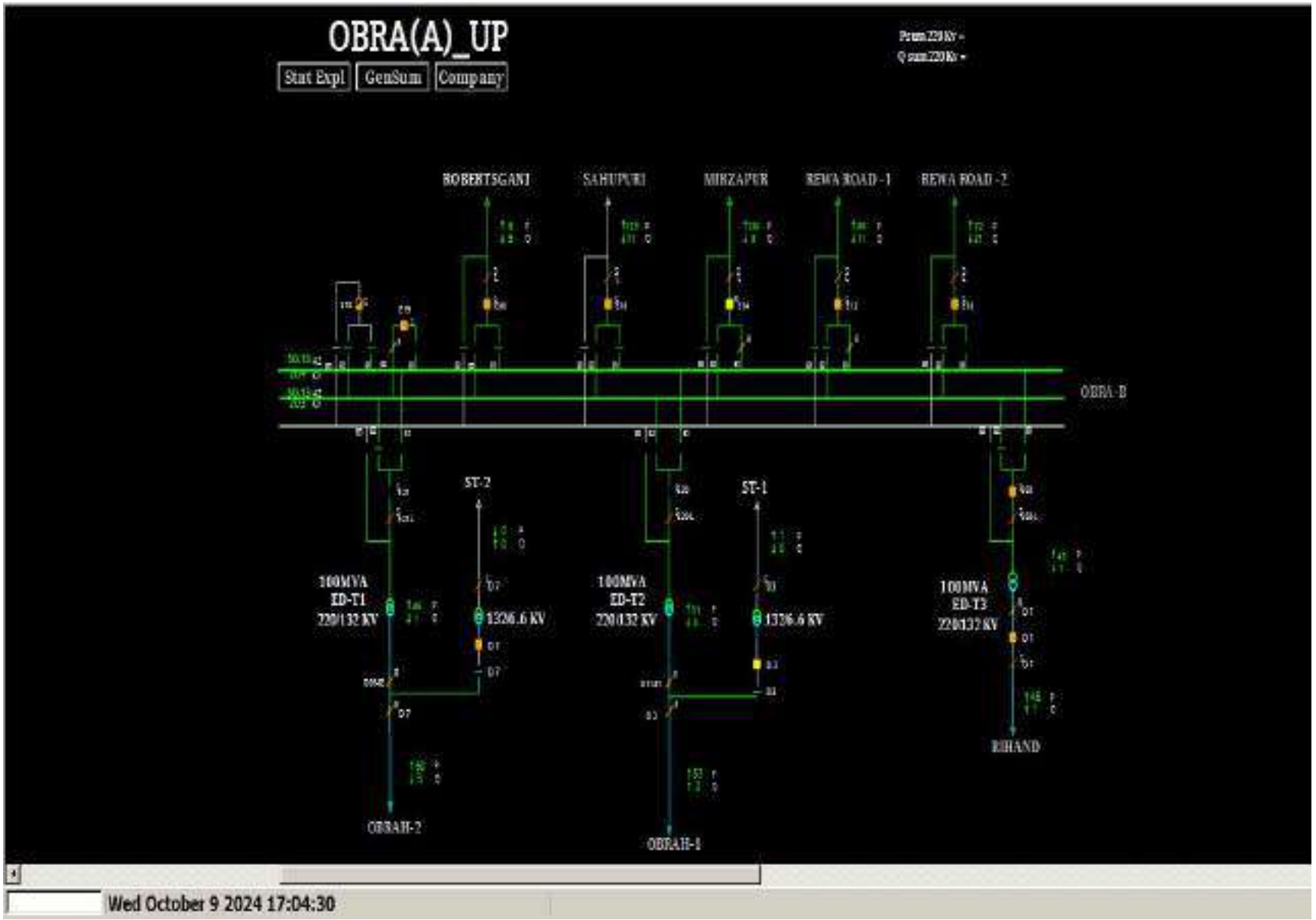
Brief details of the event

- Obra-A has 3, 220/132 KV, 100MVA transformers which were carrying approx. 46MW, 51MW and 45MW during antecedent condition.
- As reported, during inclement weather conditions, 220/132kV 100 MVA ICT-1 & ICT-2 tripped on B-N earth fault protection at Obra-A(UP) which led to complete shifting of load on 220/132kV 100 MVA ICT-3 at Obra-A (UP).
- As a result of overloading of the 3rd transformer, ICT-3 also tripped on O/C protection at 17:04hrs.
- At the same time 17:04hrs, 03 Units at Obra Hydro and 03 Units at Rihand HEP (connected at Bus-2) also tripped leading to a total generation loss of approx. 215 MW.
- Considering the above incident, Rihand manually tripped Obra-A, Obra H1, Obra H2 and Gharwad lines from perspective of safety.
- As per SCADA, change in demand of approx. 100MW is observed in UP control area.

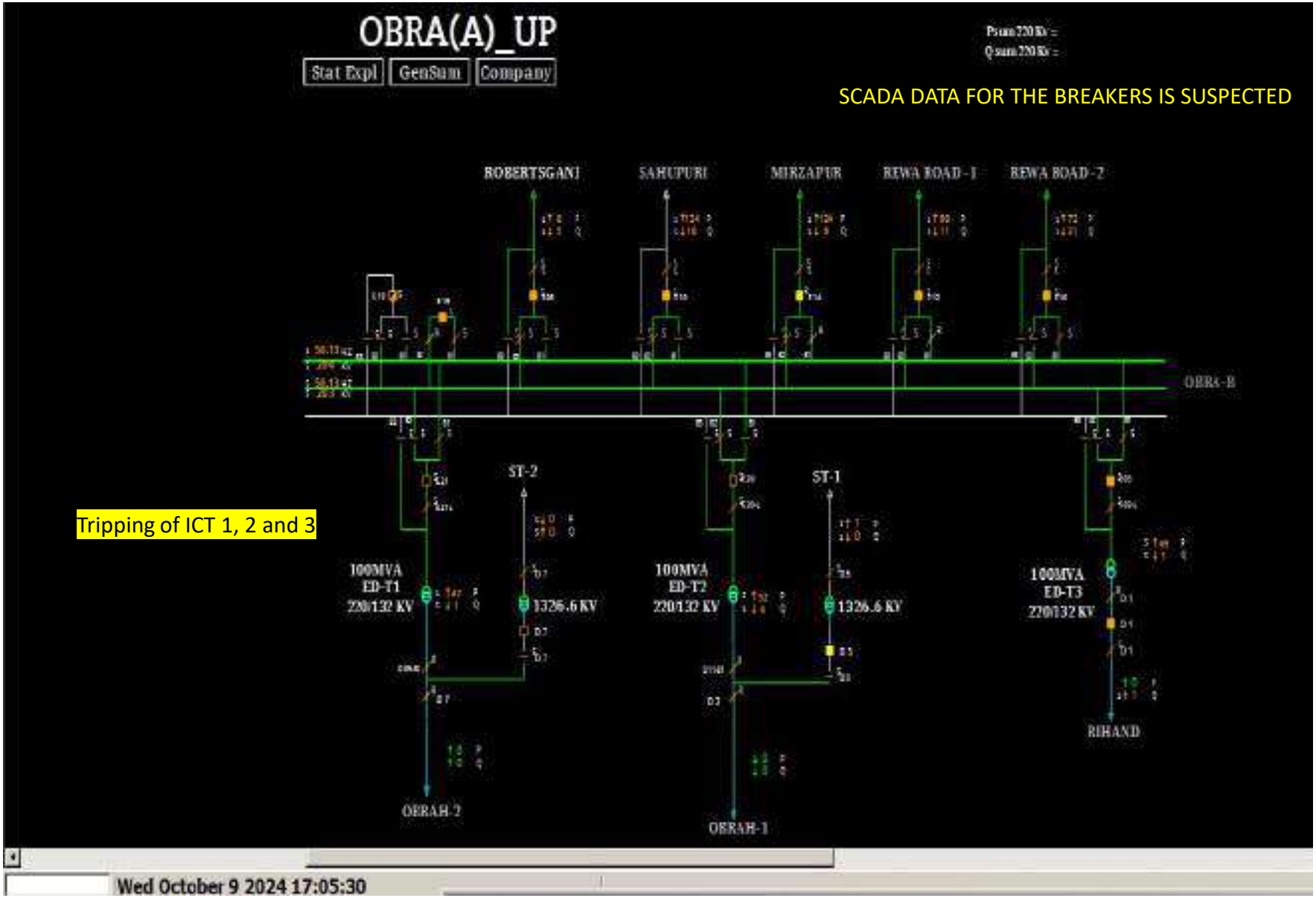
Network Diagram



SLD of 220KV OBRA-A before the event

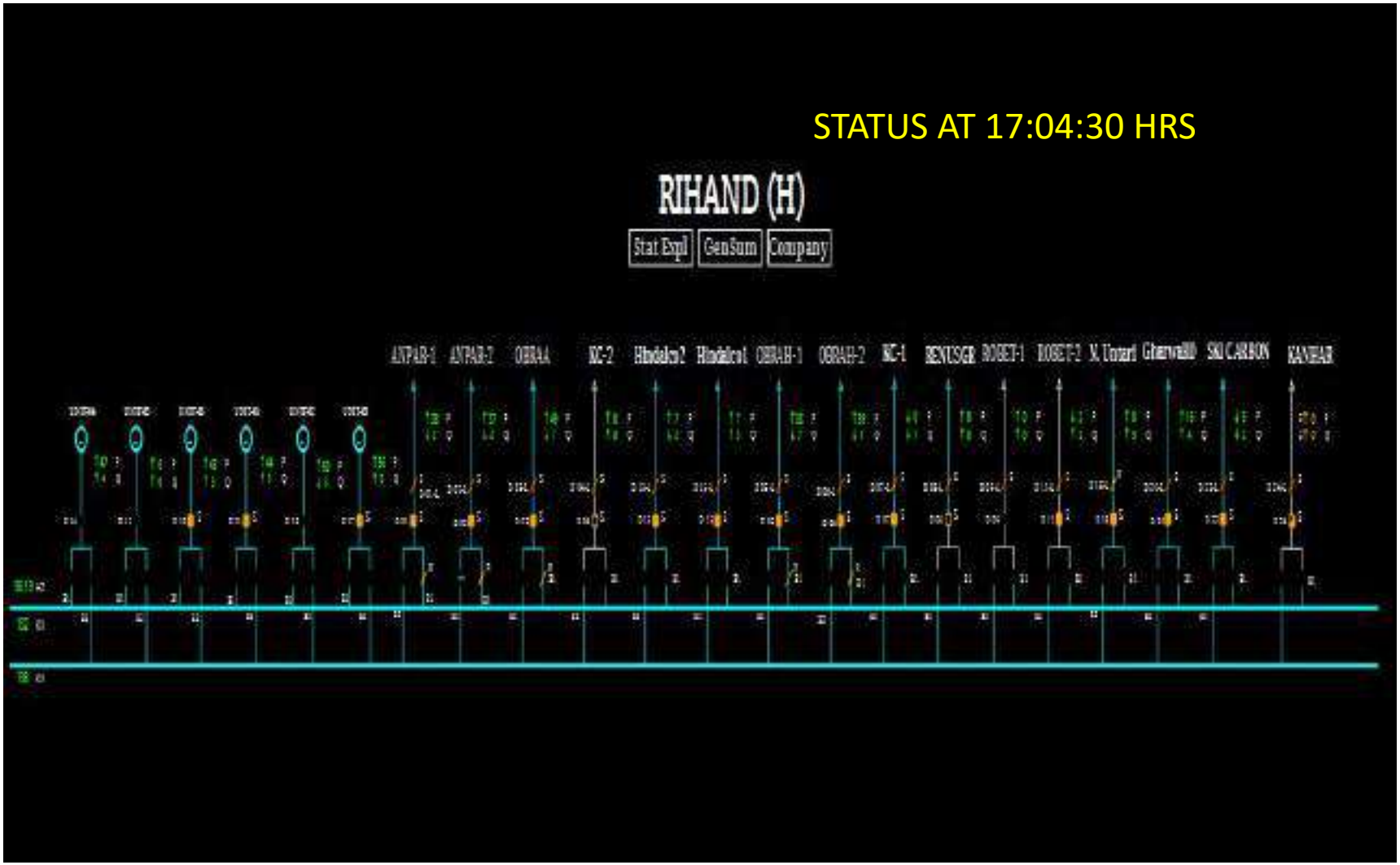


SLD of 220KV OBRA-A after the event

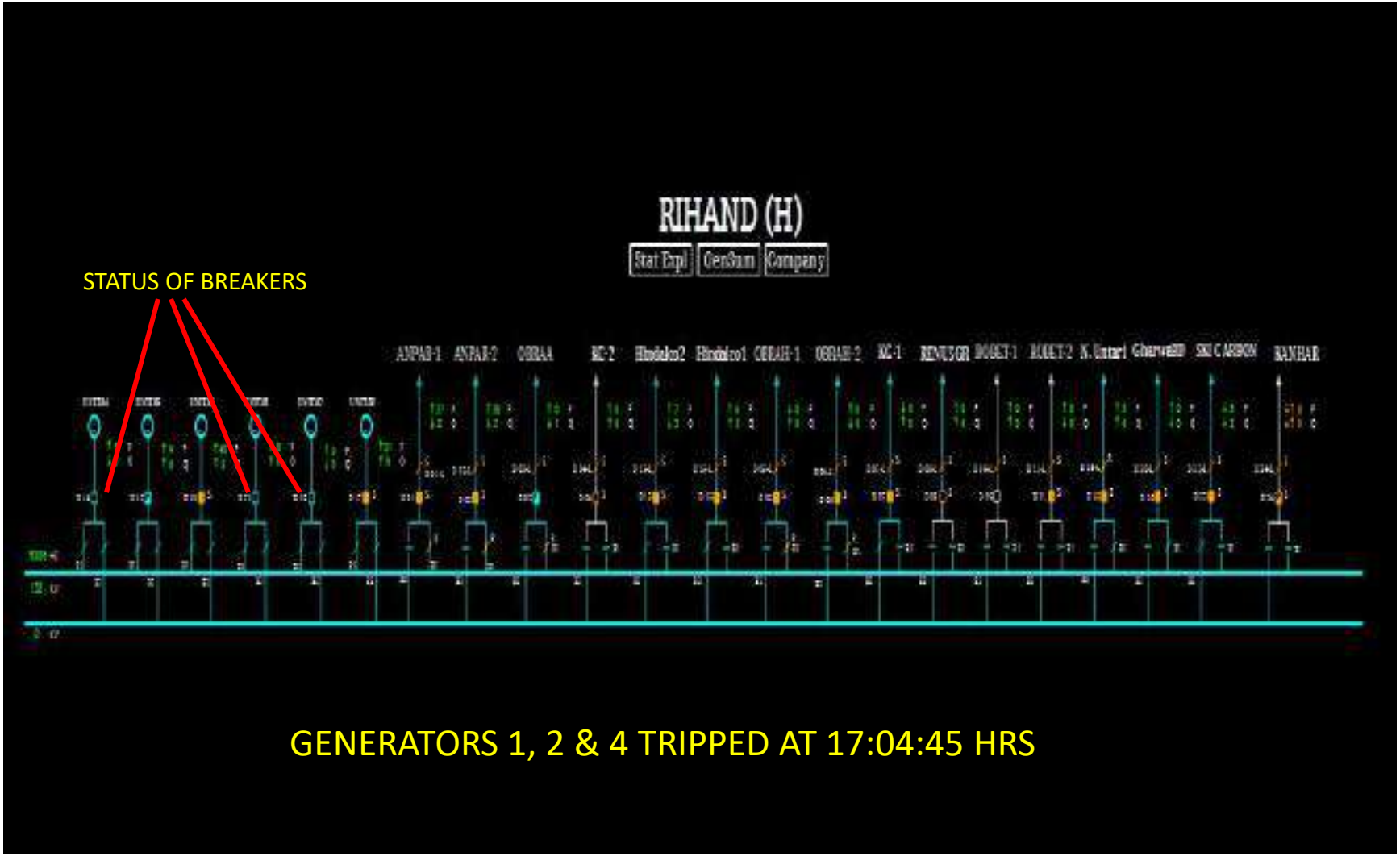


Tripping of ICT 1, 2 and 3

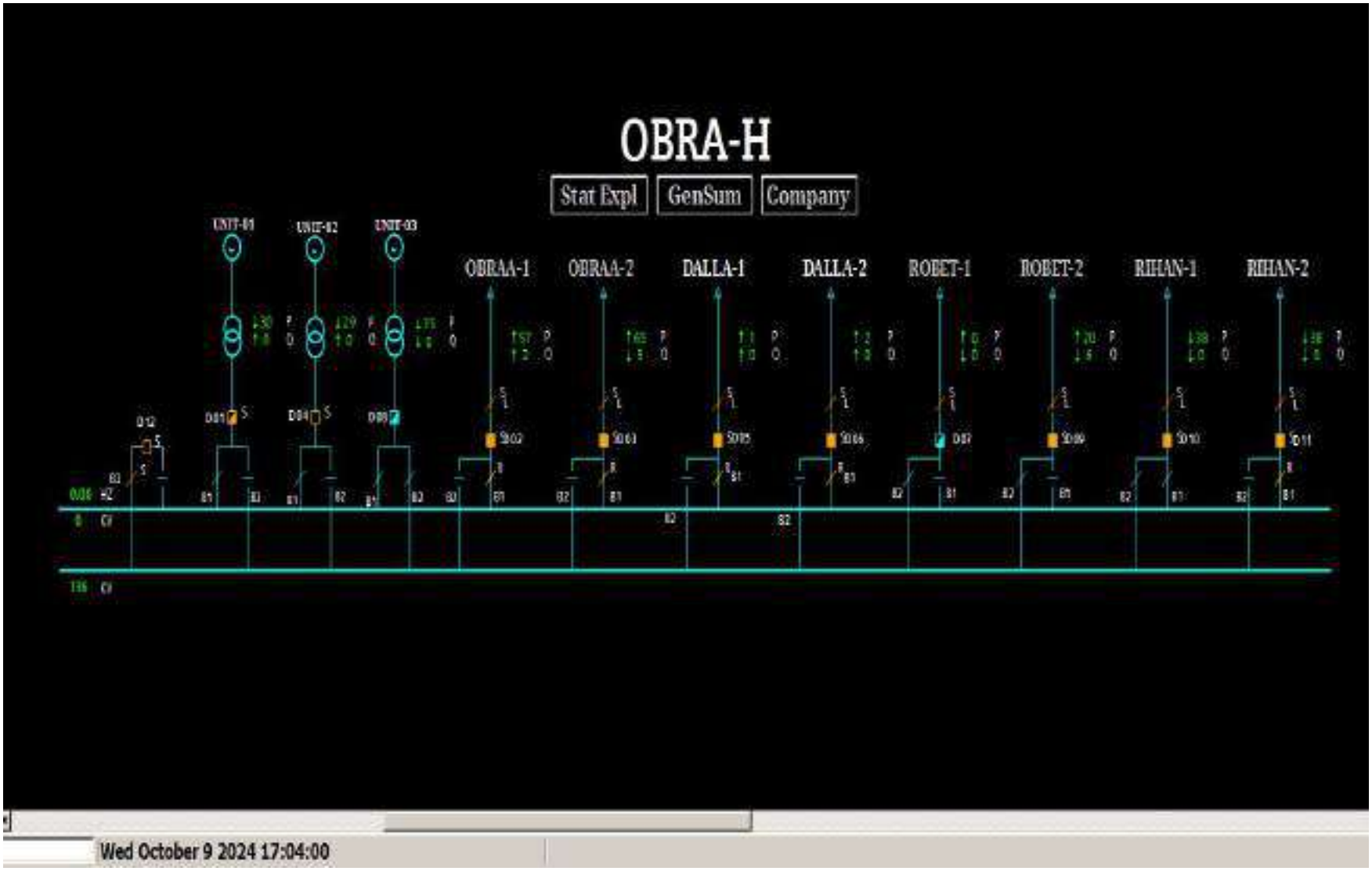
SLD of 220KV RIHAND HEP Before The Event



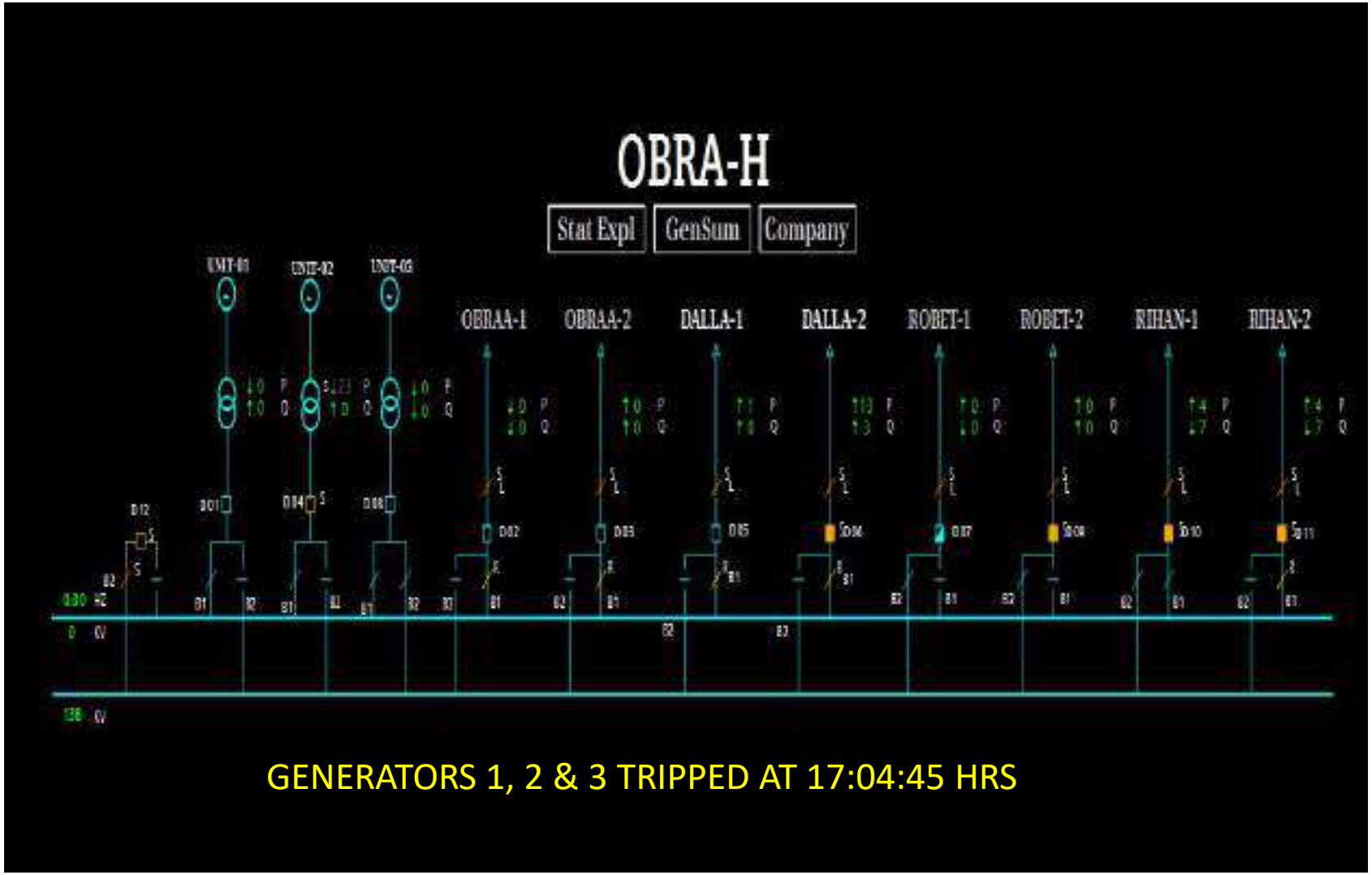
SLD of 220KV RIHAND HEP After The Event



SLD of 132KV OBRA HEP Before The Event

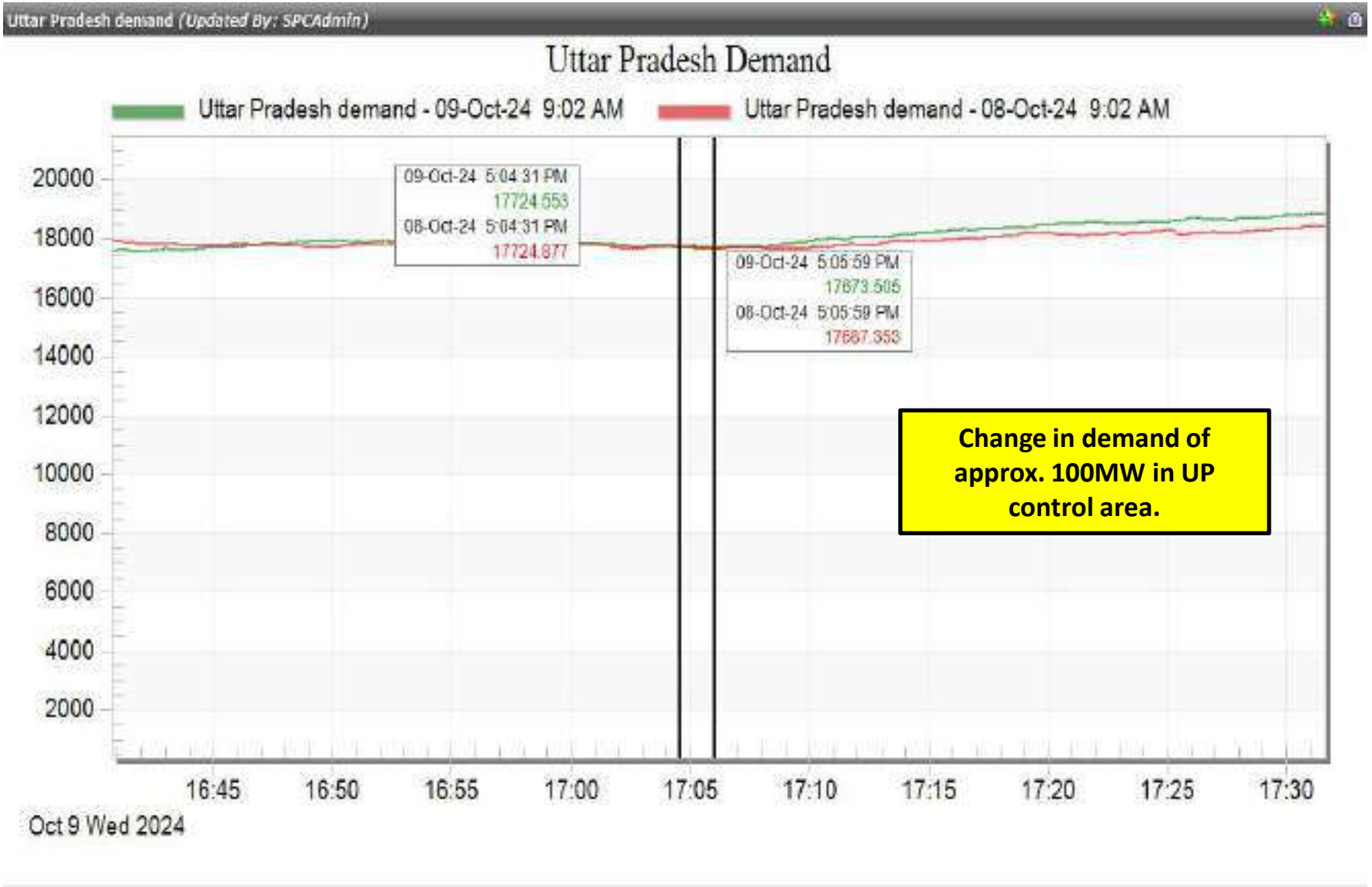


SLD of 132KV OBRA HEP After The Event



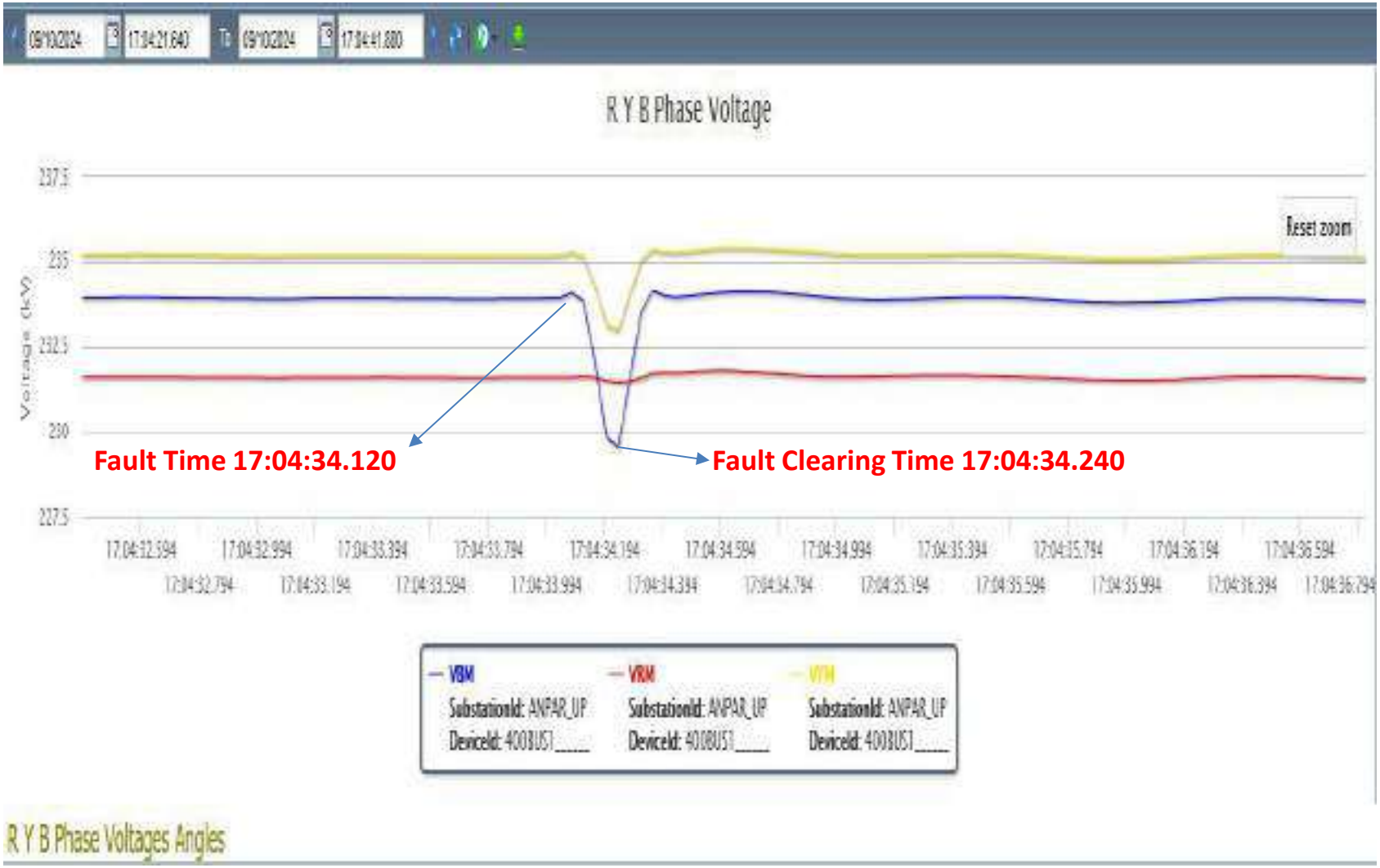
GENERATORS 1, 2 & 3 TRIPPED AT 17:04:45 HRS

Uttar Pradesh Demand during the event



PMU Plot of phase voltage magnitude at Anpara (UP)

17:04 hrs/09-Oct-24



PMU Plot of Frequency at Anpara (UP)

17:04 hrs/09-Oct-24

SCADA SOE

Time	Station Name	Voltage Level	Element Name	Element Type	Element Status	Remarks
17:04:34,461	Obra-A	220KV	ICT - 1	ICT	Open	Tripped on Bphase to Earth Fault
17:04:34,461	Obra-A	220KV	ICT - 2	ICT	Open	Tripped on Bphase to Earth Fault
17:04:34,461	Obra-A	220KV	ICT - 3	ICT	Open	Tripped on Overcurrent Protection
17:04:42,993	Obra_HEP	132KV	Unit 1	Generator	Open	Tripped With ICTs at Obra - A
17:04:42,993	Obra_HEP	132KV	Unit 2	Generator	Open	Tripped With ICTs at Obra - A
17:04:42,993	Obra_HEP	132KV	Unit 3	Generator	Open	Tripped With ICTs at Obra - A
17:04:42,993	Rihand_HEP	132KV	Unit 2	Generator	Open	Tripped With ICTs at Obra - A
17:04:52,18	Rihand_HEP	132KV	Unit 1	Generator	Open	Tripped With ICTs at Obra - A
17:04:56,205	Rihand_HEP	132KV	Unit 4	Generator	Open	Tripped With ICTs at Obra - A

Points for Discussion

i) SCADA data of 220/132KV Obra-A substation is unavailable after the tripping. Availability of SCADA data needs to be ensured.

ii) DR/EL for each tripped element & tripping report need to be shared from both the ends.

iii) Sequence of tripping also need to be shared.

iv) Remedial actions taken and reports need to be shared

Rihand Power Station, Pipri (6X50MW)
Hydel Obra Power Station,Obra (3X33MW)
UPRVUNL

Tripping Date -09.10.2024,17:04 hrs

Tripping at RPS, Pipri:- 03 Nos. Machine and 132 KV Pipri Obra Thermal (ICT3)

Tripping at HOPS, Obra:- 03 Nos. Machine,132KV Obra-Thermal Ist & IInd feeder, 132Kv Obra-Dalla Ist feeder

Tripping of Machines and 132KV Obra-Thermal Ist , IInd &IIIrd feeder at RPS, Pipri and HOPS, Obra due to fault on 132KV Obra-Dalla Ist feeder

- **Date & Time of event**: 09.10.2024 at 17:04 hrs
- **Power House affected**: Rihand Hydro Power Station, Pipri & Hydel Obra Power Station, Obra Sonebhara.
- **Date & Time of restoration**: ICT-1st ,ICT-2nd & ICT-3rd On 09.10.2024 at *17:50 hrs, 17:49 hrs & 17:43 hrs* respectively where as & 132KV Obra-Dalla Ist feeder was charged on dated 10.10.2024 at 13:50 hrs .

Tripping of Machines and ICT 3rd Feeder at RPS, Pipri due to fault on 220/132 KV ICT-1st and ICT-2nd at Obra Thermal feeder.

- **Date & Time of event**: 09.10.2024 at 17:04 hrs
- **Power House affected**: Rihand Hydro Power Station ,Pipri.
- **Date & Time of restoration**: ICT-1st ,ICT-2nd & ICT-3rd On 09.10.2024 at *17:49 hrs,17:49hrs & 17:43 hrs.* respectively.

Antecedents condition

- In antecedents condition unit no. 1, 2 &3 of Obra Hydro Power Station was running on load @30,30 & 28 MW respectively.
- 220/132 KV 100MVA ICT -1st & 2nd feeder exporting 28 & 30MW power respectively at Obra Hydro Power Station end.
- 132 KV Obra Dalla Ist feeder exporting 15 MW power at Obra Hydro Power Station end.
- Unit no. 1, 2 & 4 of RPS Pipri was running on load @45,50 & 45 MW respectively.
- While 132KV Pipri Obra Thermal line (220/132 KV 100MVA ICT-3rd) at Rihand Hydro Power Station carrying 45MW.

Power Distribution/Flow on dated 09/10/2024 at 17:00 Hrs at 132 KV Hydel Obra Power Station

- There are only single bus running at a time.
- Pre-fault Load on feeders of respective Bus at Hydel Obra are as following:-
- 132 KV Thermal Ist:-28 MW
- 132 KV Thermal IInd:- 30 MW
- 132 KV Pipri Ist :- 25 MW
- 132 KV Pipri IInd :-25 MW
- 132 KV Dalla Ist :-15 MW
- 132 KV Dalla IInd:-15MW
- 132 KV Robertsganj Ist :- Shutdown
- 132KV Robertsganj Iind :- 46 MW
- 132 KV Railway TSS :- 4 MW

Power Distribution/Flow on Dt 09/10/2024 at 17:00 Hrs at 132 KV Rihand S/S

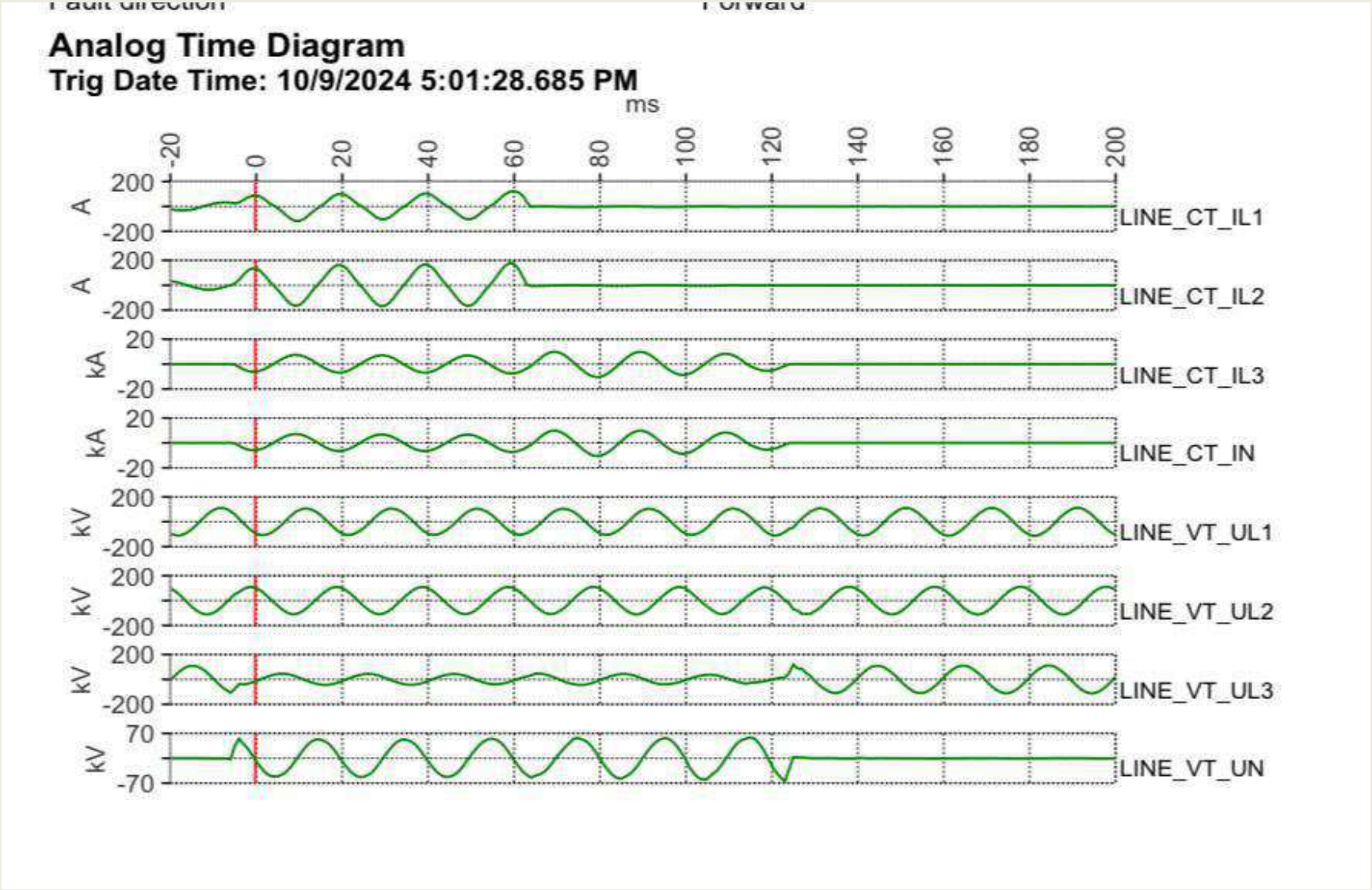
There were Two Bus running (132 KV Main Bus and 132 KV Reserve Bus),

Pre-fault Load on feeders of respective Bus at Rihand are as following:

- 132KV Main Bus
- 132 KV Anpara 1st –34MW
- 132 KV Anpara 2nd –34MW
- 132 KV Hindalco 1st – 06MW
- 132 KV Hindalco 2nd – 06MW
- 132 KV Hi tech carbon– 05MW
- 132/33 KV 63 MVA T/F 62Amps
- M/C No.3 -50MW
- M/C No.6 -45MW

- 132KV Reserve Bus(Fault occurs on this bus)
- 132 KV Obra Hydel 1st – 36MW
- 132 KV Obra Hydel 2nd – 36MW
- 132 KV Obra Thermal(ICT 3rd) – 45MW
- 132 KV Grasim 1st -01MW
- 132 KV Robertsganj 1st- (tripped at 16:41 hrs)
- 132 KV TSS Renukoot–05MW
- 132 KV Garhwa –18MW
- 132 KV Nagaruatri – 00MW
- M/C No.1- 45MW
- M/C No.2- 50MW
- M/C No.4- 45MW

DR of 132 KV Obra Dalla Ist Ckt

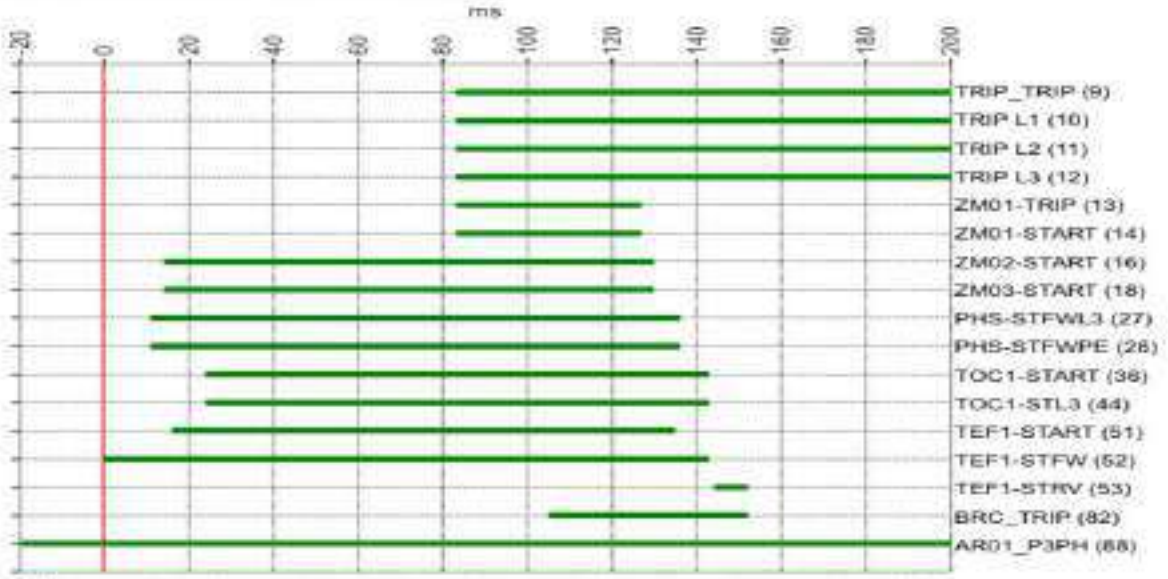


DR of 132 KV Obra Dalla Ist Ckt

ABB

Binary Time Diagram

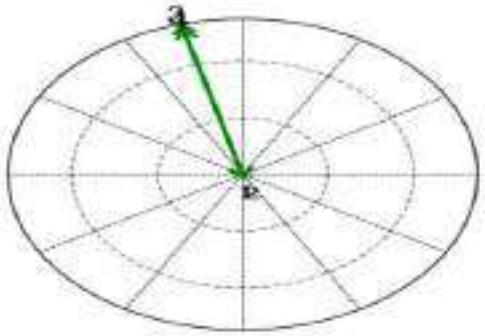
Trig Date Time: 10/9/2024 5:01:28.685 PM



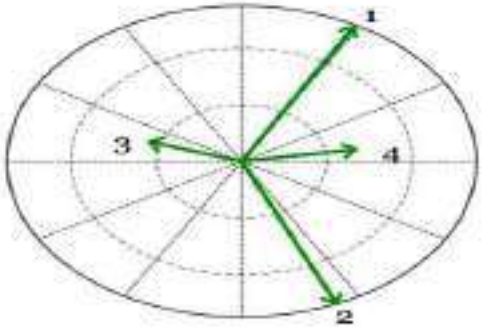
Vector Diagrams

Calculation Time Period : 0 ms to 19 ms

Currents



Voltages

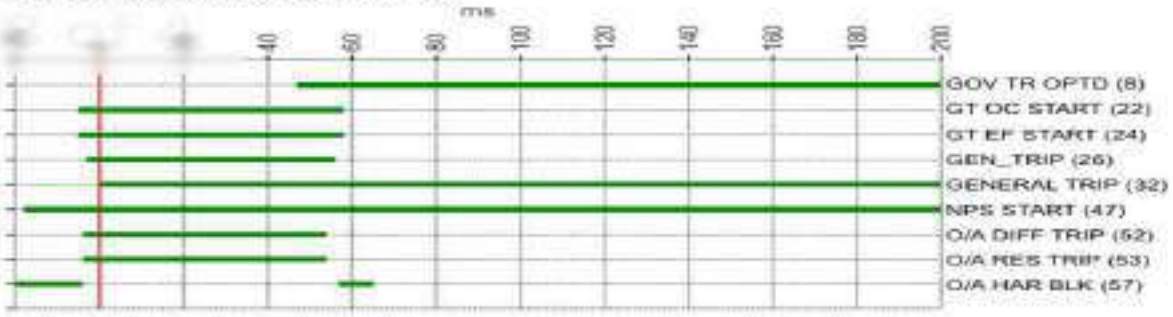


DR of 132 KV HOPS,Obra Unit no. 1

DR of 132 KV HOPS,Obra Unit no. 1

Binary Time Diagram

Trig Date Time: 10/0/2024 5:04:11.884 PM



Recording File Name:C:\PCMDataBases\DisturbanceRecordings\mc1\Substation\Voltage Level_J1\Bay_Q01\REG670_AA1J1Q02A1\AA1J1Q02A1_20241009_10_9_10c

Page 2 of 4

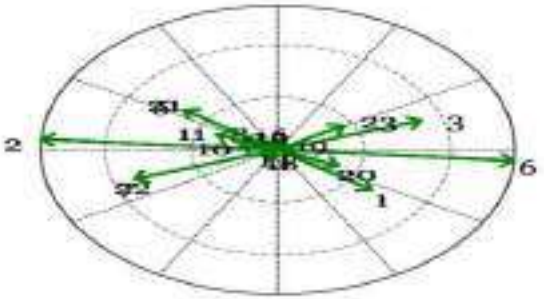
ABB

Page 3 of 4

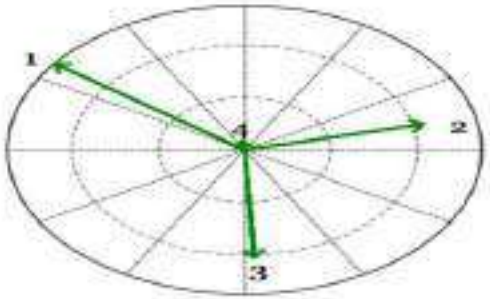
Vector Diagrams

Calculation Time Period : -21 ms to -2 ms

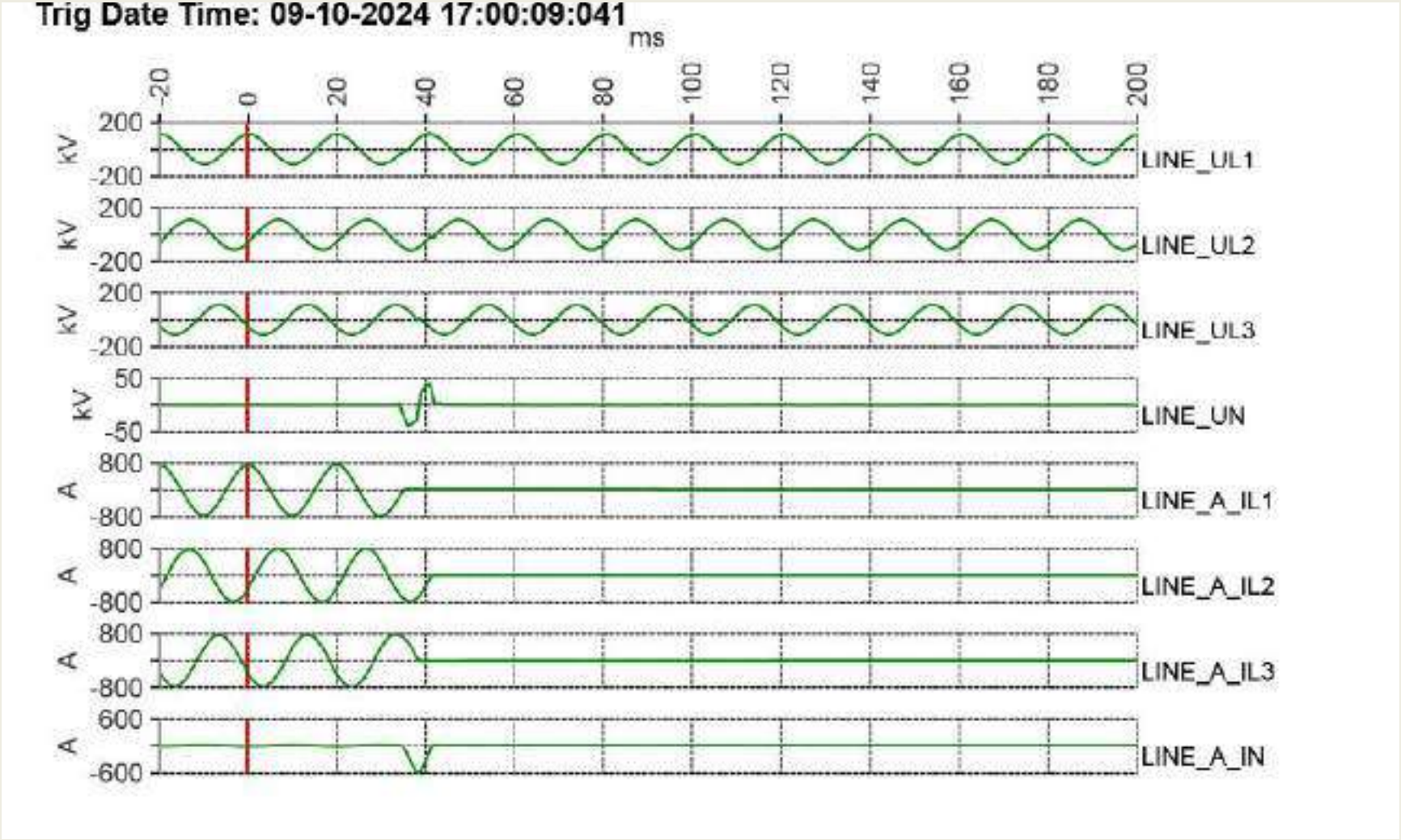
Currents



Voltages



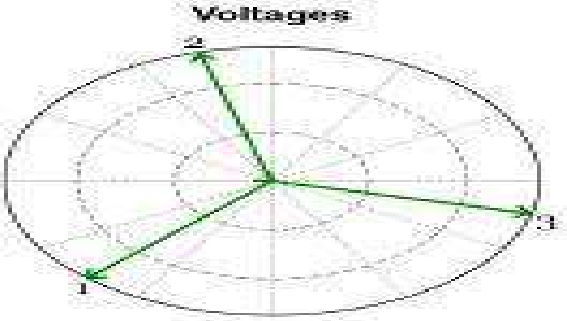
DR 132KV Pipri Obra Thermal Line(ICT-3rd)

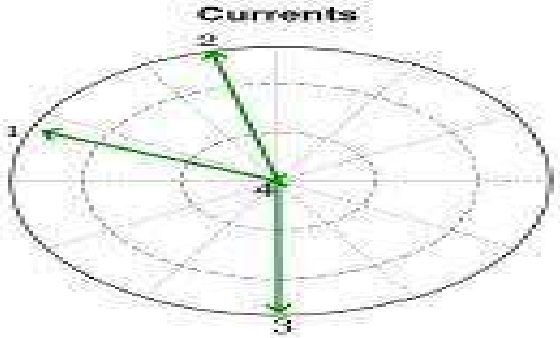


DR 132KV Pipri Obra Thermal Line (ICT-3rd)

Vector Diagrams

Calculation Interval : -47 ms to -29 ms



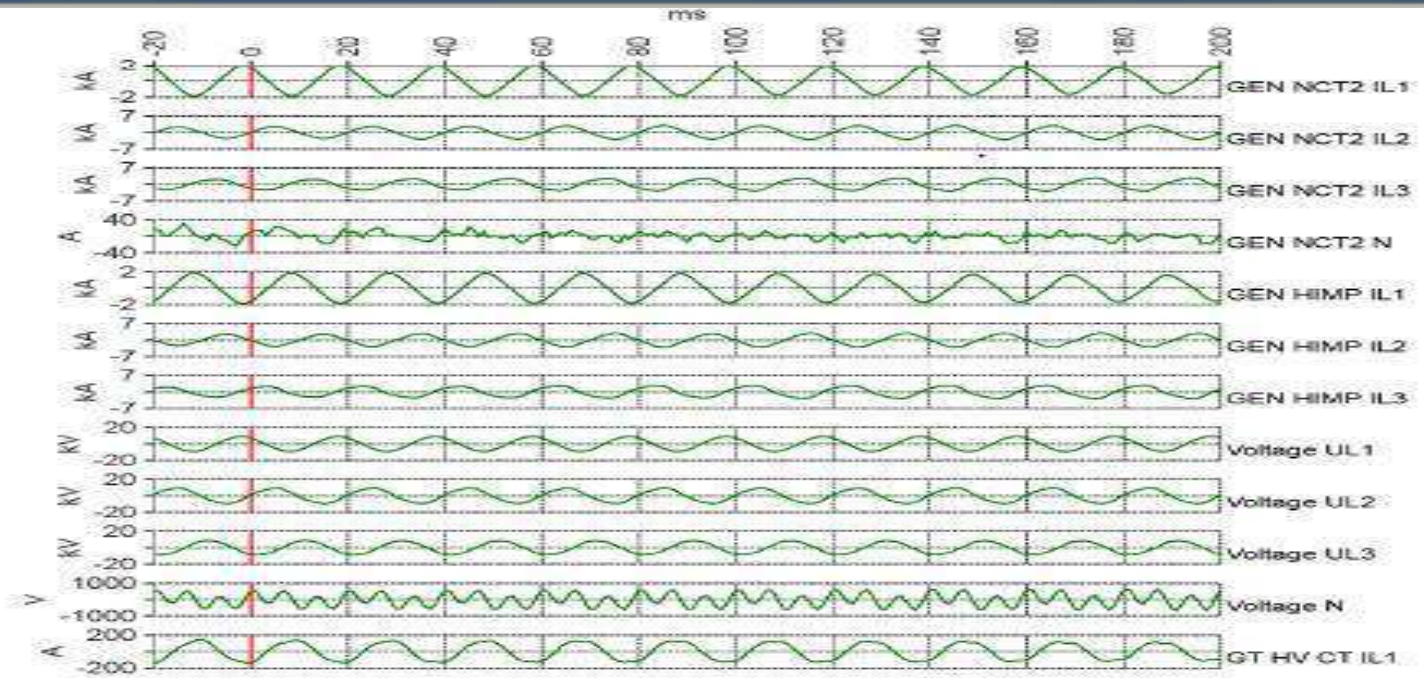


No.	Name	RMS	Angle	No.	Name	RMS	Angle
1	LINE_UL1	78766.27(V)	226.4°	1	LINE_A_IL1	0.044(A)	157.2°
2	LINE_UL2	78689.88(V)	100.8°	2	LINE_A_IL2	0.07(A)	104.4°
3	LINE_UL3	78407.1(V)	346.0°	3	LINE_A_IL3	0.09(A)	270.1°
4	LINE_UN	133.198(V)	316.1°	4	LINE_A_IN	0.058(A)	184.9°

Events List

Channel Number	Name	Status	Time
49	TOC1_TRIP	On	09-10-2024 17:00:09:041
1	TRIP_TRIP	On	09-10-2024 17:00:09:041

DR 132KV Pipri Unit No 2

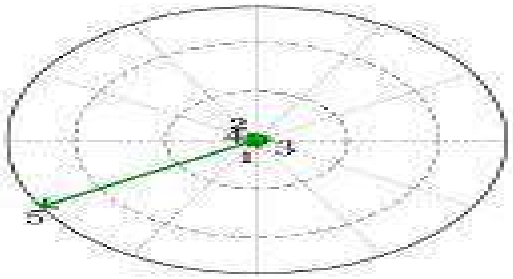


Binary Time Diagram
Trig Date Time: 06-10-2020 11:44:00:953

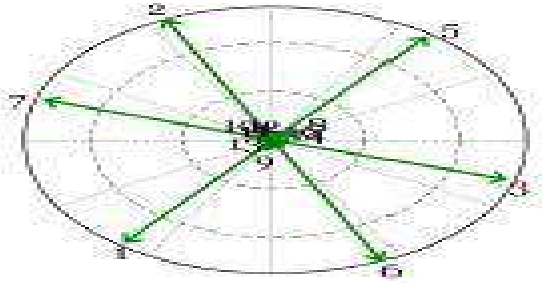
DR 132KV Pipri Unit No 2

Calculation Interval : -949 ms to -931 ms

Voltages



Currents



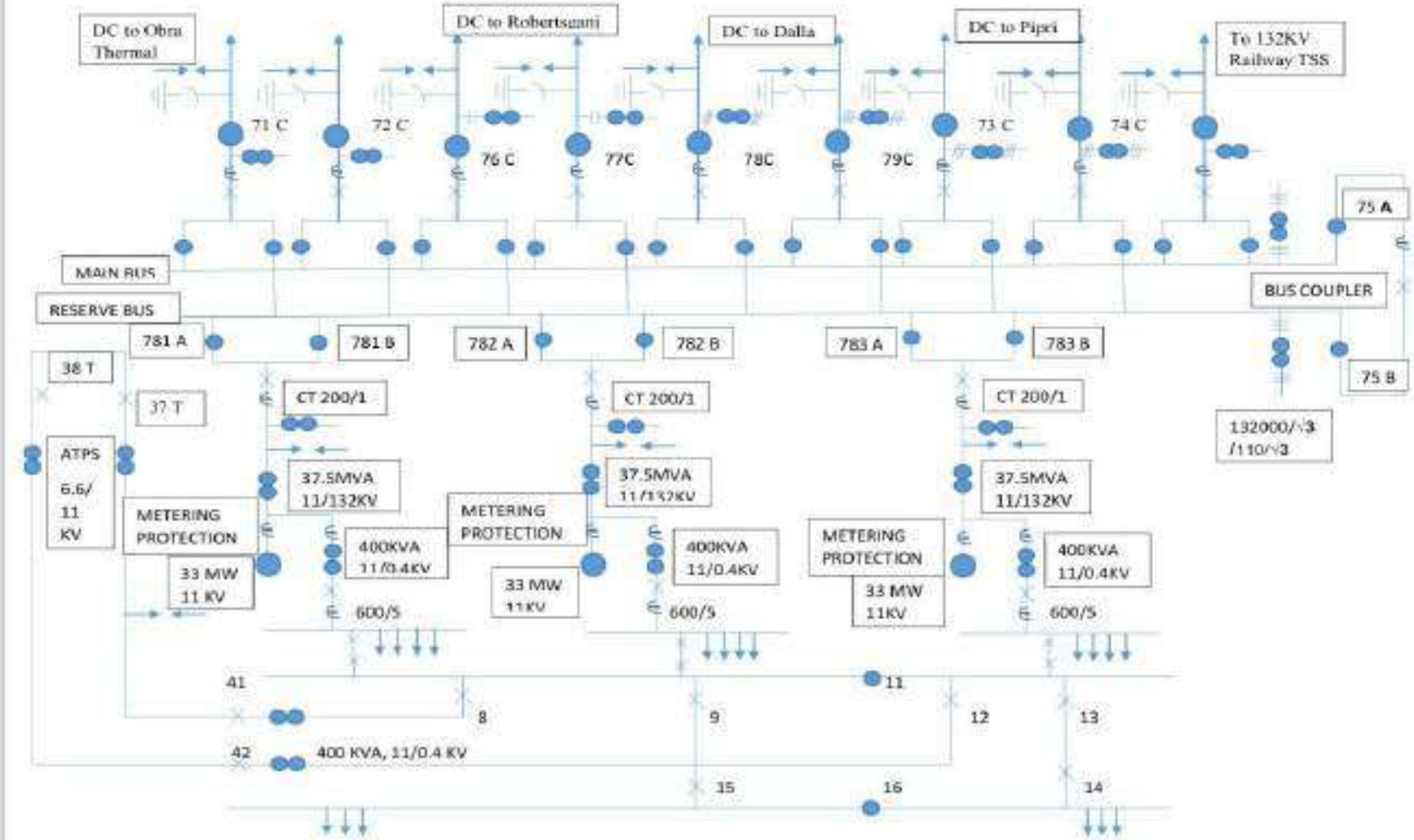
No.	Name	RMS	Angle
1	Voltage UL1	6528.666(V)	240.2°
2	Voltage UL2	6568.964(V)	118.6°
3	Voltage UL3	6257.778(V)	359.9°
4	Voltage N	182.996(V)	140.8°
5	U_ROTOR_EF	124120.0(V)	210.0°

No.	Name	RMS	Angle
1	GEN NCT2 IL1	1276.275(A)	232.3°
2	GEN NCT2 IL2	1661.389(A)	115.4°
3	GEN NCT2 IL3	1565.781(A)	342.1°
4	GEN NCT2 N	10.48(A)	113.5°
5	GEN HIMP IL1	1276.654(A)	52.3°
6	GEN HIMP IL2	1660.152(A)	295.4°
7	GEN HIMP IL3	1570.063(A)	161.8°
8	GT HV CT IL1	97.198(A)	43.7°
9	GT HV CT IL2	86.024(A)	245.4°
10	GT HV CT IL3	195.878(A)	137.3°
11	GT HV CT IN	163.048(A)	132.6°
12	I_ROTOR_EF	27.613(A)	113.6°
13	UAT HV CT IL1	2.708(A)	173.9°
14	UAT HV CT IL2	2.475(A)	36.9°
15	UAT HV CT IL3	1.771(A)	303.0°
16	UAT HV CT IN	0.382(A)	48.7°
17	GT SBEF CT	160.956(A)	133.3°
18	NPS CURRENT	0.0(A)	0.0°

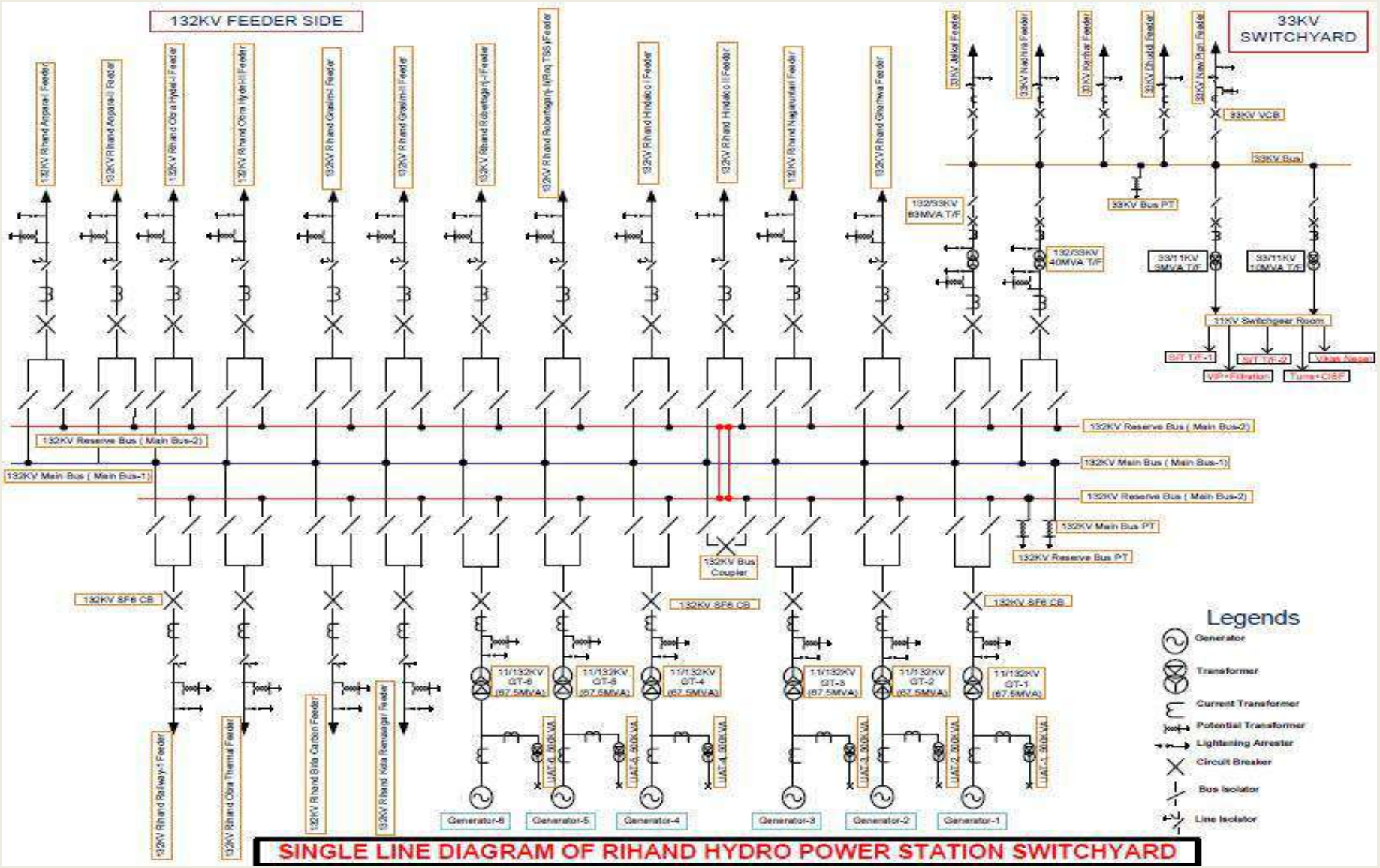
Events List

Channel Number	Name	Status	Time
24	GT EF START	On	06-10-2020 11:44:00:953
22	GT OC START	On	06-10-2020 11:44:01:042
26	GEN_OC1_START	On	06-10-2020 11:44:01:217
28	GEN_OC_ST	On	06-10-2020 11:44:01:217
23	GT EF TRIP	On	06-10-2020 11:44:01:904
32	GENERAL TRIP	On	06-10-2020 11:44:01:969
63	ROTOR EF ST	On	06-10-2020 11:44:02:028
23	GT EF TRIP	Off	06-10-2020 11:44:02:033
24	GT EF START	Off	06-10-2020 11:44:02:033
46	GOVRNR_TRIP	On	06-10-2020 11:44:02:038
22	GT OC START	Off	06-10-2020 11:44:02:042
26	GEN_OC1_START	Off	06-10-2020 11:44:02:042
28	GEN_OC_ST	Off	06-10-2020 11:44:02:042
63	ROTOR EF ST	Off	06-10-2020 11:44:02:044
80	100% STEF ST	On	06-10-2020 11:44:02:066
80	100% STEF ST	Off	06-10-2020 11:44:02:314

Complete SLD of HOPS, Obra



Complete SLD of Rihand Hydro Power Station



Events Description

- On dated 09/10/2024, 17:04 hrs:- **Due to tripping of 132 KV Obra Dalla Ist feeder ,132 KV ICT-1 and ICT-2** Circuit also tripped at both end along with tripping of unit no. 1,2 &3 at HOPS, Obra.
- Due to tripping of ICT -1 &ICT-2 at Obra end ICT-3 also tripped on overloading resulting tripping of unit no 1,2 &4 at RPS,Pipri.
- 132KV Pipri Power House and 132 KV Obra Hydel Power house started to run on locally grid (Islanding). That's why All 132 KV concerned feeders were opened for safety purpose.
- After inspection in Switchyard at both generating end and getting clearance of transmission line from UPPTCL ,supply were **resumed by charging 132 KV grid feeders** at following time-

  At 17:43hrs -132KV Pipri Obra Thermal Ict 3rd feeder

  At 17:49hrs -132KV Pipri Obra Thermal Ict Ist & IInd feeder

  At 17:53hrs -132KV Pipri Obra Hydel 1st and 2nd feeder

Exact location and nature of Fault:-

- Noted that : ICT -1 &ICT-2 oftenly trips with external line fault, it might be due to high set/normal relay setting, unavailability of directional E/F relay or ageing effect of Electromagnetic relays for 132 KV ICT Ist and IInd ckt.(As per report of TNC Obra team).
- Various exercise and settings were done in all relays at Obra Hydel end in supervision of SE(TNC) Allahabad & team to overcome/remove the unwanted tripping. But complete solution was not made only frequency of unnecessary tripping reduced.

Remedial action:-

- Only solution to overcome the mentioned problem is replacement of existing Electromechanical relay with Numerical relay for 132KV ICT Ist & IInd circuit.

- Commissioning of Numerical relay for 132KV ICT Ist & IInd circuit in under process, (procurement of relay has been done and commissioning will be done in upcoming 2-3 months).

THANK YOU.

Multiple element tripping event at 400/220/132kV Muradnagar_2(UP)

At 00:43 hrs on 17th October, 2024

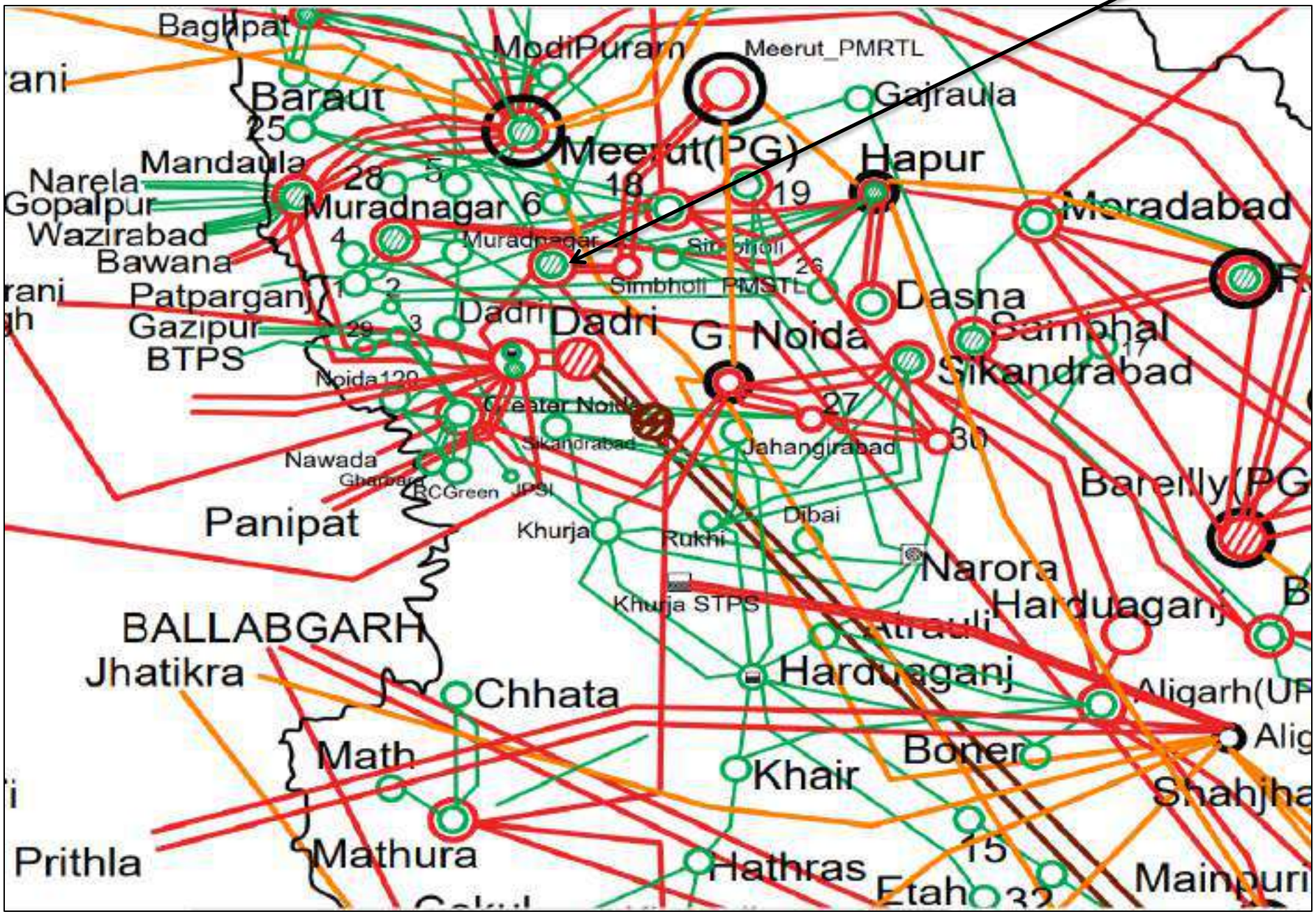
Tripped Elements

S.No.	Name of Element	Tripping Time	Revival Time
1	400kV Muradnagar_2-Mathura (UP) Ckt	00:43 hrs	02:48 hrs
2	400kV Muradnagar_2-Simbholi_PMSTL (UP) Ckt-1		03:05 hrs
3	400kV Muradnagar_2-Simbholi_PMSTL (UP) Ckt-2		03:12 hrs
4	400 KV Dadri(NT)-Muradnagar_2(UP) (PG) Ckt		03:39 hrs

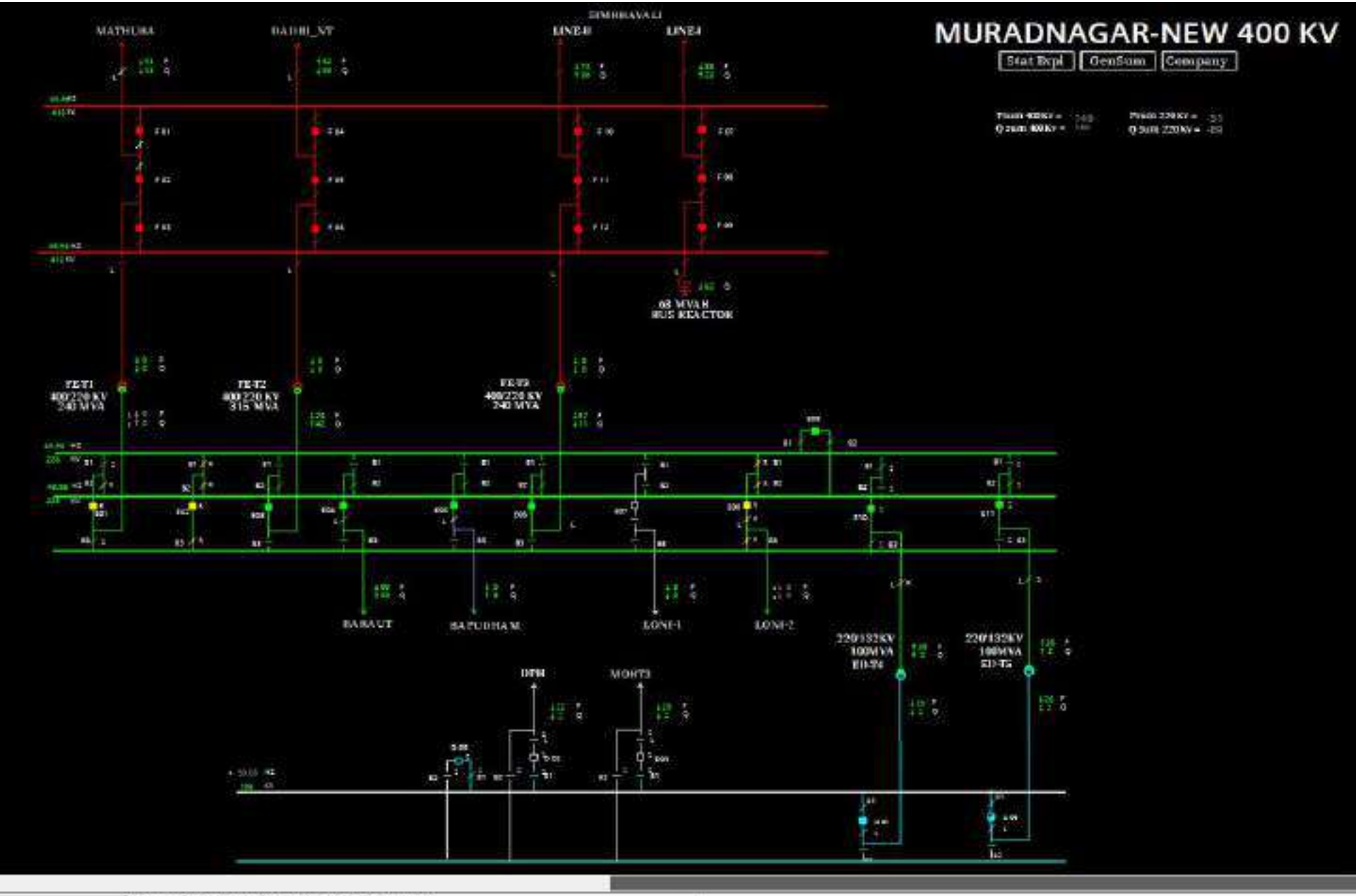
Brief details of the event

- 400/220/132kV Muradnagar-New(UP) has one and half breaker scheme at 400kV level and double main and transfer bus scheme at 220kV level.
- As reported, at 00:43 hrs, 400kV Muradnagar_2-Mathura (UP) Ckt tripped on Y-N phase to earth fault with fault current of 4.065kA from Muradnagar_2 end and fault clearing time of 291 ms; zone-1 distance protection operated (as per DR at Muradnagar_2 end) and DT received at Mathura end (as reported).
- Due to delayed opening of CB at Muradnagar_2 end of 400kV Muradnagar_2-Mathura (UP) Ckt, LBB protection operated and both main and tie CBs at Muradnagar_2 end of 400 KV Dadri(NT)-Muradnagar_2(UP) (PG) Ckt and 400kV Muradnagar_2-Simbholi_PMSTL (UP) Ckt-1 & 2 opened and all the 400kV lines connected at Muradnagar_2 tripped. DT received at remote ends (as reported).
- As informed by SLDC-UP, the logic of LBB operation was wrong in 400kV Muradnagar_2-Simbholi_PMSTL (UP) Ckt-1 & 2: on LBB operation opening command was sent to both main and tie CBs. Reason of opening of tie CB of 400 KV Dadri(NT)-Muradnagar_2(UP) (PG) Ckt is under investigation and yet to be shared.
- As per PMU at Muradnagar1(UP), Y-N phase to earth fault with delayed fault clearing time of 280ms is observed.
- As per SCADA, no change in demand is observed in UP control area.

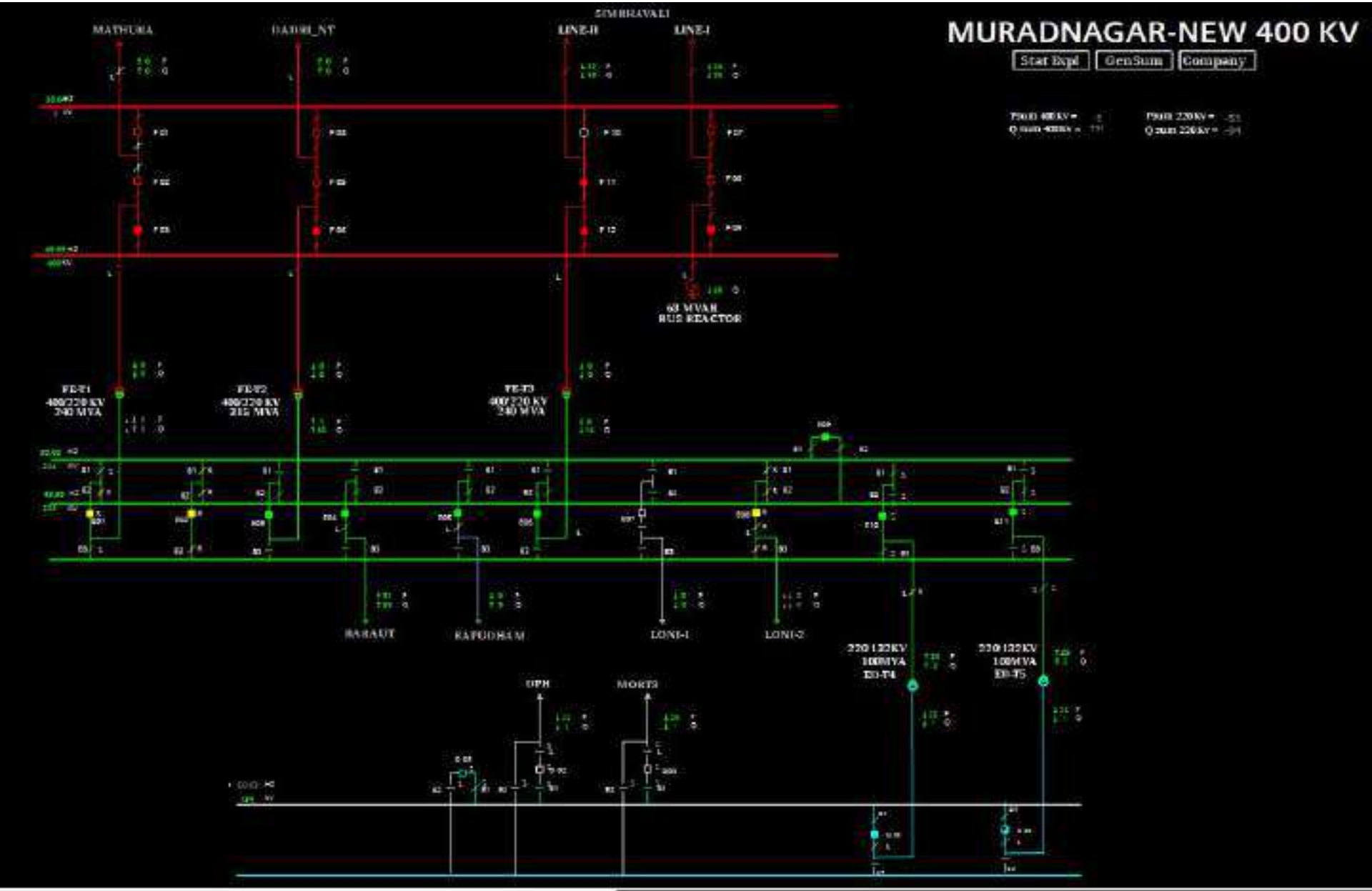
Network Diagram



SLD of 400/220/132kV Muradnagar_2(UP) before the event

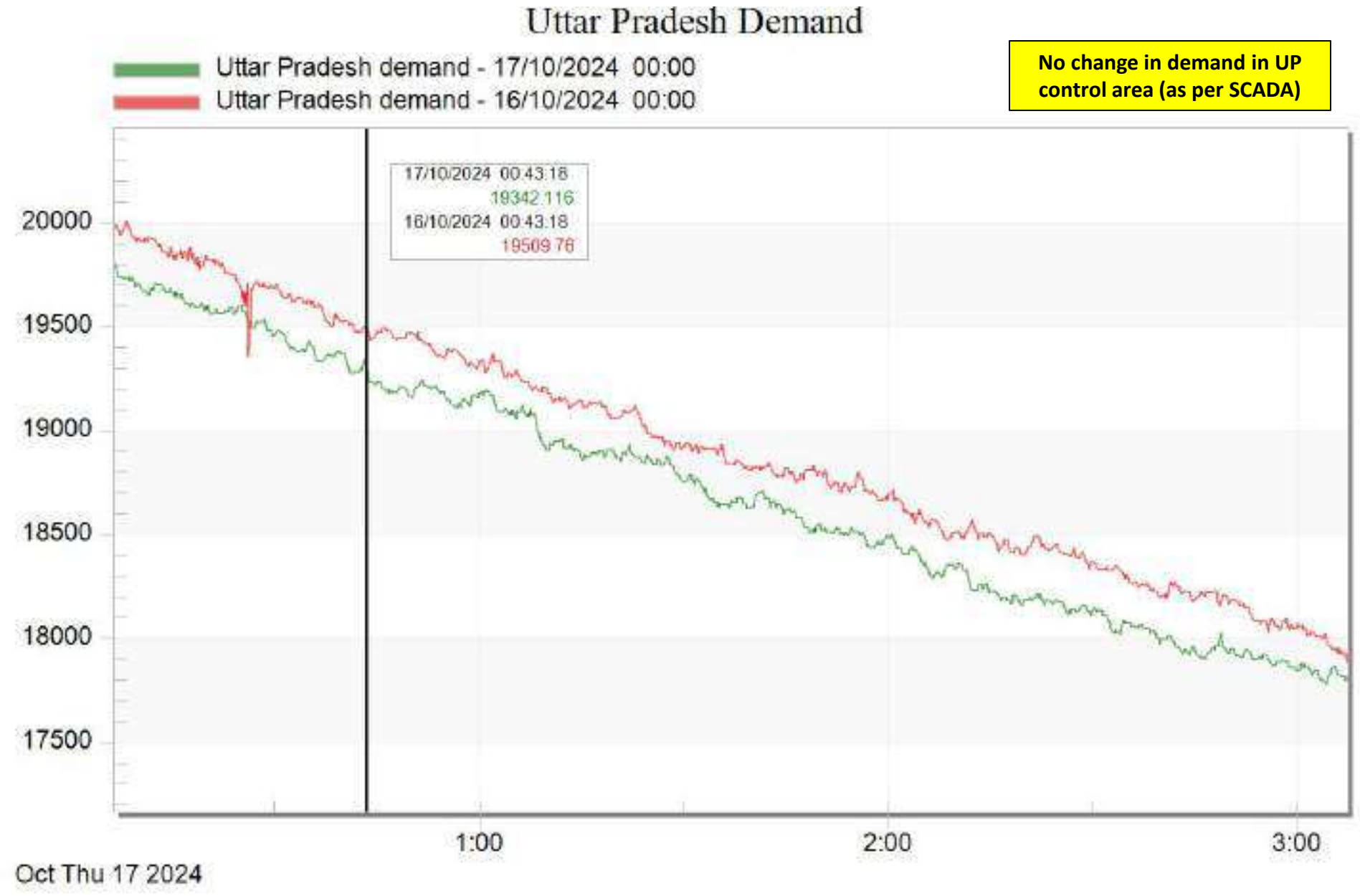


SLD of 400/220/132kV Muradnagar_2(UP) after the event



Thu October 17 2024 00:45:00

Uttar Pradesh Demand during the event



No change in demand in UP control area (as per SCADA)

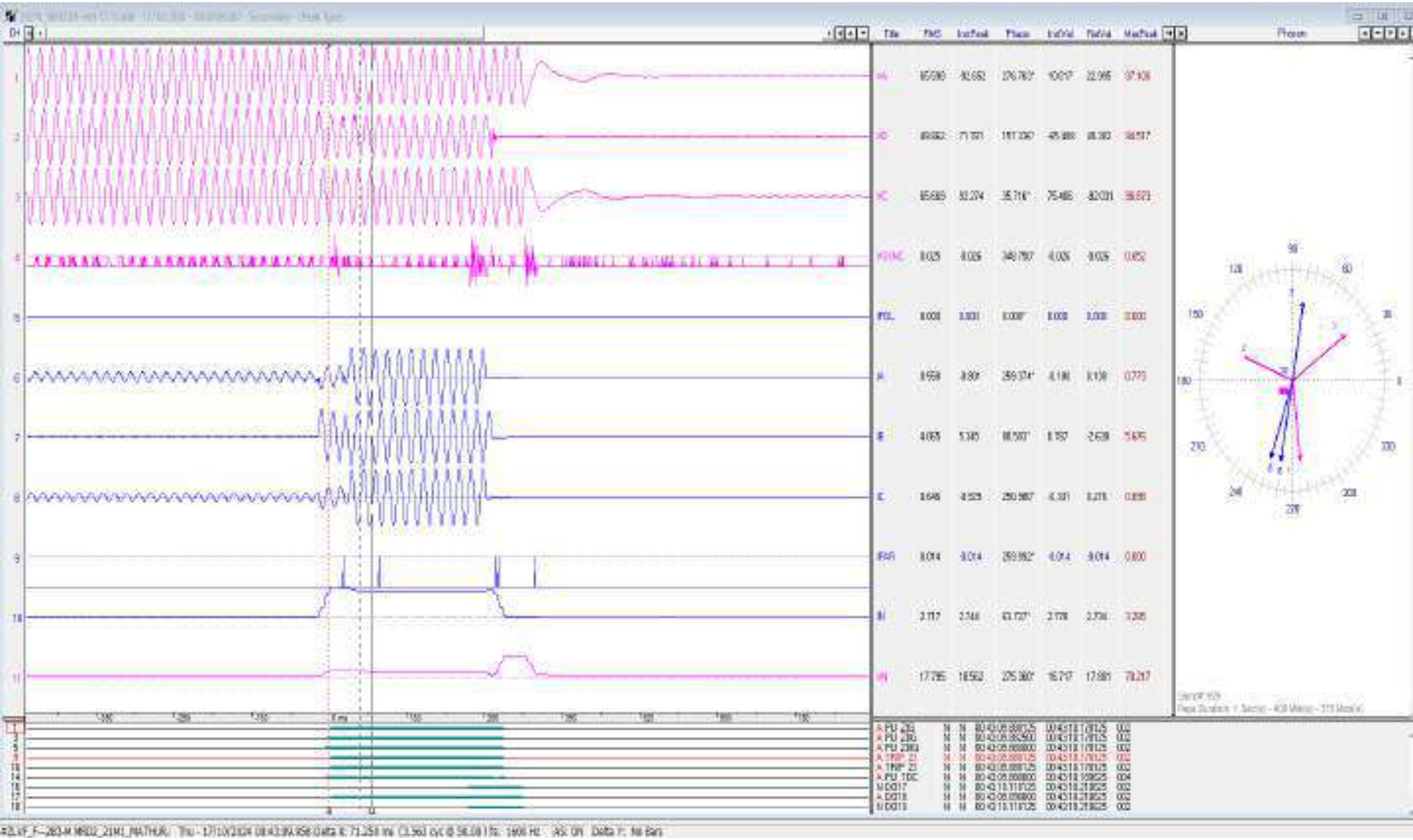
PMU Plot of frequency at Muradnagar1(UP)

00:43 hrs/17-Oct-24

PMU Plot of phase voltage magnitude at Muradnagar1(UP)

00:43 hrs/17-Oct-24

DR of 400kV Muradnagar_2 (end) -Mathura (UP) Ckt



- ✓ Y-N phase to earth fault; Iy=~4.065kA
- ✓ Zone-1 distance protection operated; delayed opening of CB at Muradnagar_2 end
- ✓ Fault clearing time=~291 ms

SCADA SOE

Time	Station Name	Voltage Level	Element Name	Element Type	Element Status	Remarks
00:43:02,426	MTHRA_UP	400KV	09MURN1	Circuit Breaker	Open	Main CB at Mathura(UP) end of 400kV Muradnagar_2-Mathura (UP) Ckt opened
00:43:02,669	SIMBH_UP	400KV	06MUR1N2	Circuit	Open	Main CB at Simbholi_PMSTL end of 400kV Muradnagar_2-Simbholi_PMSTL (UP) Ckt-2 opened
00:43:02,807	SIMBH_UP	400KV	02BRMUR	Circuit	Open	Tie CB at Simbholi_PMSTL end of 400kV Muradnagar_2-Simbholi_PMSTL (UP) Ckt-1 opened
00:43:02,823	SIMBH_UP	400KV	05T1MUR	Circuit	Open	Tie CB at Simbholi_PMSTL end of 400kV Muradnagar_2-Simbholi_PMSTL (UP) Ckt-2 opened
00:43:02,854	SIMBH_UP	400KV	01MUR1N1	Circuit	Open	Main CB at Simbholi_PMSTL end of 400kV Muradnagar_2-Simbholi_PMSTL (UP) Ckt-1 opened
00:43:03,161	MURN2_UP	400KV	08BRSIM1	Circuit	Open	Tie CB at Muradnagar_2(UP) end of 400kV Muradnagar_2-Simbholi_PMSTL (UP) Ckt-1 opened
00:43:03,161	MURN2_UP	400KV	05T2DTHM	Circuit	Open	Tie CB at Muradnagar_2(UP) end of 400 KV Dadri(NT)-Muradnagar_2(UP) (PG) Ckt opened
00:43:03,161	MURN2_UP	400KV	02T1MTHR	Circuit	Open	Tie CB at Muradnagar_2(UP) end of 400kV Muradnagar_2-Mathura (UP) Ckt opened
00:43:03,161	MURN2_UP	400KV	01MTHRA	Circuit	Open	Main CB at Muradnagar_2(UP) end of 400kV Muradnagar_2-Mathura (UP) Ckt opened
00:43:03,161	MURN2_UP	400KV	04DTHM	Circuit	Open	Main CB at Muradnagar_2(UP) end of 400 KV Dadri(NT)-Muradnagar_2(UP) (PG) Ckt opened
00:43:03,540	MURN2_UP	400KV	10SIMBV2	Circuit	disturbe	
00:43:03,540	MURN2_UP	400KV	07SIMBV1	Circuit	Open	Main CB at Muradnagar_2(UP) end of 400kV Muradnagar_2-Simbholi_PMSTL (UP) Ckt-1 opened
00:43:03,832	MURN2_UP	400KV	10SIMBV2	Circuit	Open	Main CB at Muradnagar_2(UP) end of 400kV Muradnagar_2-Simbholi_PMSTL (UP) Ckt-2 opened
00:43:12,748	DTHM_NT	400kV	11MURPA1	Circuit	disturbe	
00:43:12,748	DTHM_NT	400kV	10MURN1	Circuit	disturbe	

Points for Discussion

i) Reason for delayed fault clearance need to be shared.

ii) Reason of opening of tie CB of 400 KV Dadri(NT)-Muradnagar_2(UP) (PG) Ckt on LBB operation need to be shared.

iii) DR/EL (.dat/.cfg file) of all the tripped elements along with detailed tripping report need to be shared from both the ends.

iv) Remedial action taken report to be shared.

U.P. POWER TRANSMISSION CORPORATION LIMITED

UPPTCL

400kV SUB-STATION MURADNAGAR-II, UPPTCL

17.10.2024, 00:42

400 kV DADRI, SIMBHAOLI-I, SIMBHAOLI-II LINE TRIPPED DUE TO LBB OPERATION AFTER FAULT ON 400KV MATHURA - MURADNAGAR-II LINE

400 kV SUB STATION MURADNAGAR-II : 400 kV DADRI, SIMBHAOLI-I, SIMBHAOLI-II LINE TRIPPED DUE TO LBB OPERATION AFTER FAULT ON 400KV MATHURA - MURADNAGAR-II LINE ON 17.10.2024.

- **Date & Time of event**: 17.10.2024 at 00:42 hrs.
- **Sub-Station affected**: 400 kV SUB STATION MURADNAGAR-II
- **Date & Time of restoration**: 400 kV MATHURA, DADRI, SIMBHAOLI-I, SIMBHAOLI-II LINE On 17.10.2024 at 02:47 hrs, 03:39 hrs, 03:05 hrs & 03:12 hrs. respectively.

Antecedent conditions

LOADING OF LINES BEFORE THE INCIDENT WAS AS FOLLOWING:

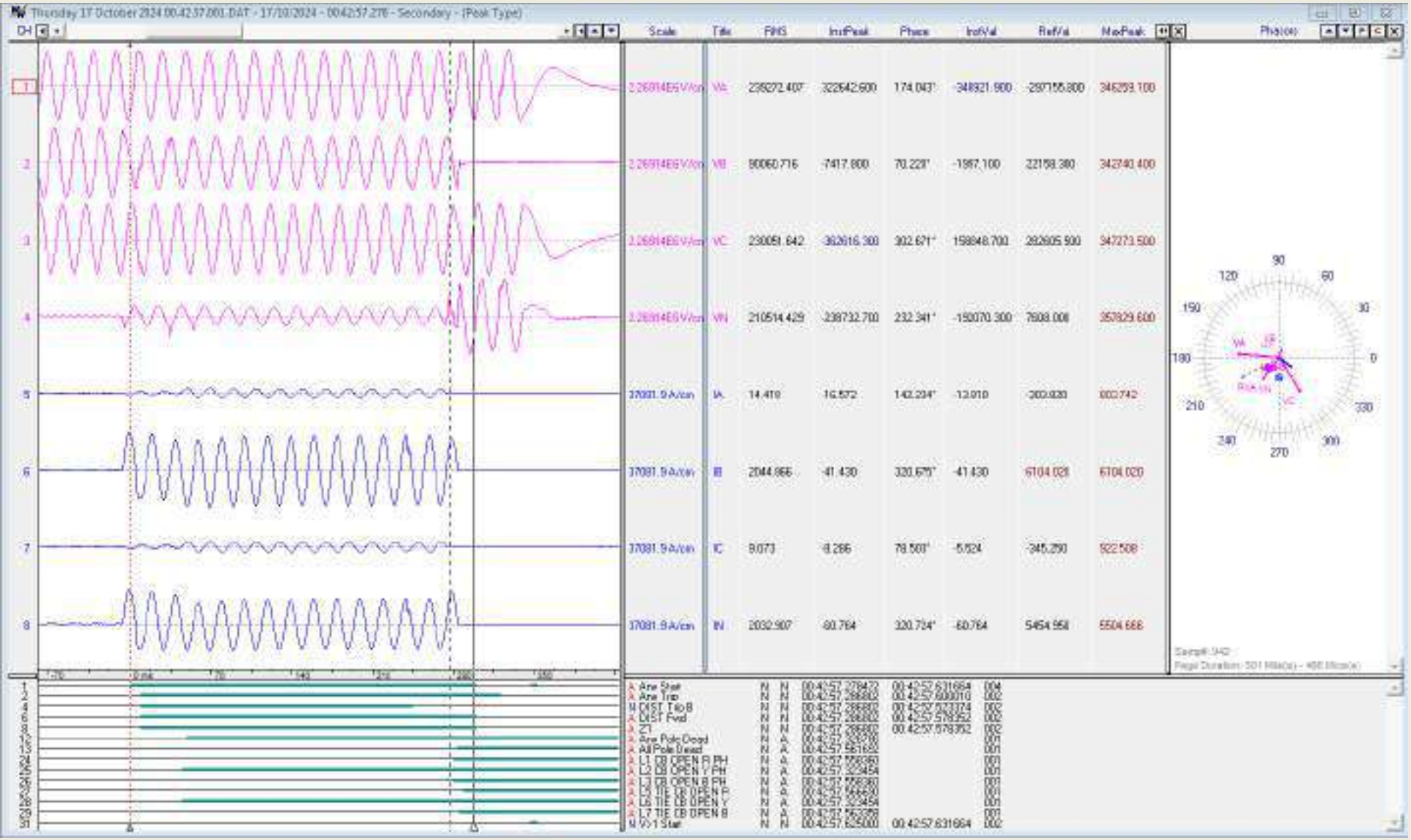
- 400 kV MATHURA LINE 53MW (I)
- 400kV DADRI LINE 81MW (E)
- 400kV SIMBHAOLI LINE-I 76MW (I)
- 400kV SIMBHAOLI LINE-II 76MW (I)

Report

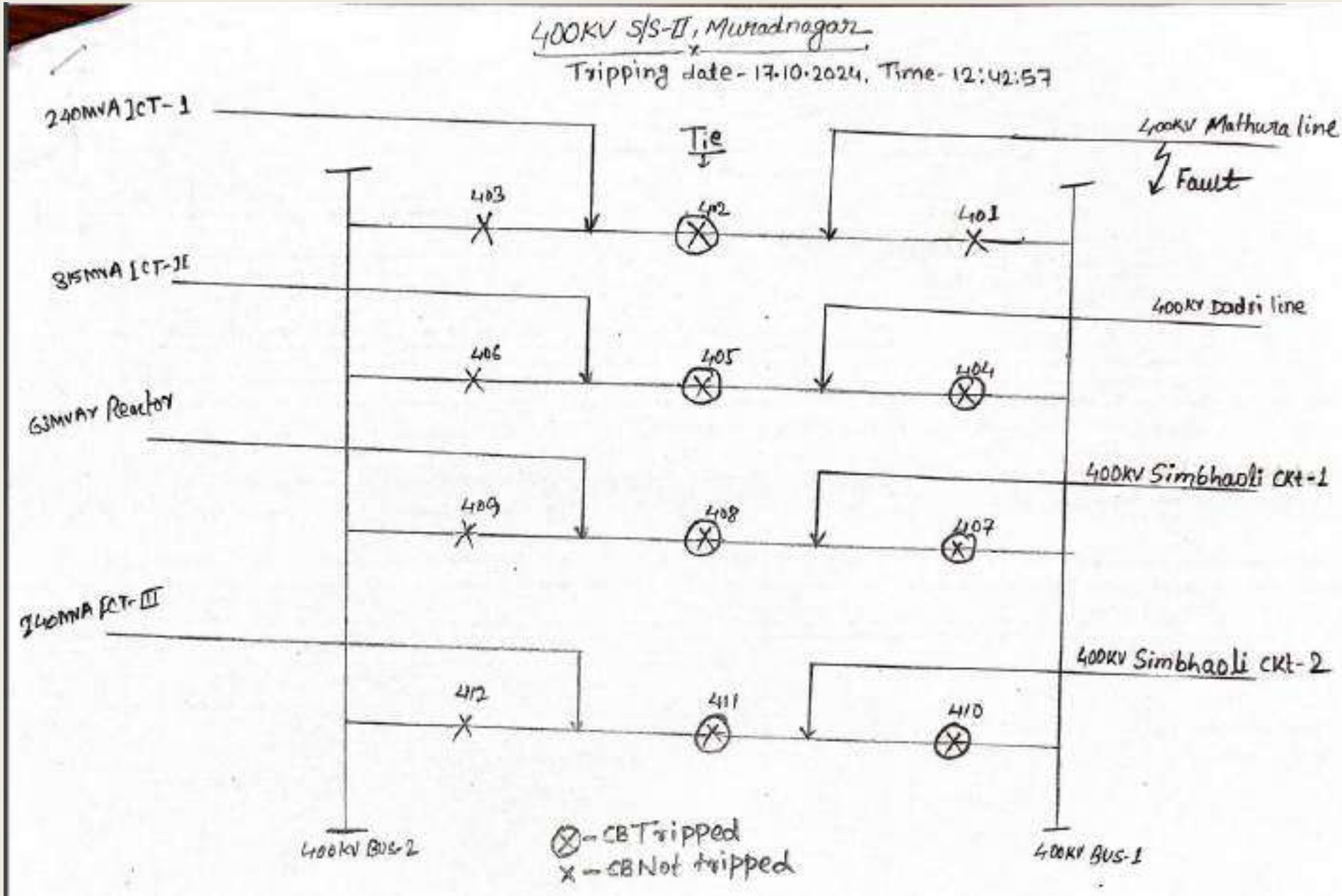
UTTAR PRADESH POWER TRANSMISSION CORP. LIMITED
ELECTRICITY TEST AND COMMISSIONING CIRCLE MEERUT

Sl. No.	Tripping Date/Time	Closing Date/Time	Name of Substation	C.B.No./ Direction	Type Of Protection Scheme	FLAGS OBSERVED				Analysis
						This End		Other End		
						Relay Flags	Fault locator with Percentage	Relay Flags	Fault locator with Percentage	
1	2	3	4	5	6	7	8	9	10	11
1	17.10.2024 00:42:57	17.10.2024 02:47	400KV Muradnagar -II	T -401 & 402 MATHURA	ZIV MICOM	M1- Y Phase, Zone-1, CS, CR, 86A, DT Send Ir=0.20A , Iy=3.66KA , Ib =0.23A ,In =3.27KA Vr=66.23V, Vy=50.44V,Vb=66.49V, Vn=19.07V M2- Y Phase, Zone-1, CS, 86B, Ir=193.2A , Iy = 3.73KA , Ib =230.6A , Vr=240.4KV, Vy=183.1KV,Vb=242KV BCU - A/R LOCKOUT	89.57 56% 92.50 58%	M1- Y Phase, Zone-1, CS, CR, DT Received M2- Y Phase, Zone-1 ,CS, CR, Carrier Aided trip.	50.3 50.02	During analysis it has been observed that breaker 401 of 400kv Muradnagar-mathura line failed to open. 1.) Fault occurred at 400 kv muradnagar-2-Mathura line at 00:42:57 hrs on dated 17.10.2024 in zone-1. 2.) Relay issued trip command to main CB 401 of Mathura line but breaker could not trip instantaneously. 3.) Breaker no 401 open after 290ms whereas LBB operation time is 200ms. 4.) Therefore LBB Protection Main-1 and Main-2 operated and all Bays connected to Bus-1 got tripped. 5.) Details of tripped Bays- i.) 400 KV Mathura Line Main CB-401 and Tie CB-402. ii.) 400 KV Dadri Line Main CB-404 and Tie CB-405. iii.) 400 KV Simbhaoli Ckt-1 Line Main CB-407 and Tie CB-408. iv.) 400 KV Simbhaoli Ckt-2 Line Main CB-410 and Tie CB-411.
2	17.10.2024 00:43:01	17.10.2024 03:39	400KV Muradnagar -II	T- 404 & 405 Dadri	ZIV MICOM	Main CB- 86A & 86B, DT Send Tie CB- 86A & 86B	-	DT Received	-	
3	17.10.2024 00:43:08	17.10.2024 03:05	400KV Muradnagar -II	T- 407 & 408 Simbhaoli Ckt-1	ZIV MICOM	Main CB- 86A & 86B, DT Send Tie CB- 86A & 86B	-	DT Received	-	
4	17.10.2024 00:43:12	17.10.2024 03:12	400KV Muradnagar -II	T- 410 & 411 Simbhaoli Ckt-2	ZIV MICOM	Main CB- 86A & 86B, DT Send Tie CB- 86A & 86B	-	DT Received	-	
5	17.10.2024 00:42:57	17.10.2024 02:47	400KV Muradnagar -II	400 KV BUS BAR-1 Unit-1 & Unit-2	ZIV	M-1 - Bus-1 Unit-1, 87 Trip, Bus-1 Breaker Fail (CB-401 Muradnagar-2-Mathura Line) M-2 - Bus-1 Unit-2, 87 Trip, Bus-1 Breaker Fail (CB-401 Muradnagar-2-Mathura Line)	-		-	

DR 400KV MATHURA - MURADNAGAR-II LINE



SLD


400KV S/S-II, Muradnagar
Tripping date - 17.10.2024, Time - 12:42:57
240MVA ICT-I
315MVA ICT-II
63MVAr Reactor
240MVA ICT-III
Tie
400KV Mathura line
Fault
400KV Dadri line
400KV Simbhaoli CKt-1
400KV Simbhaoli CKt-2
403
402
401
406
405
404
409
408
407
412
411
410
400KV BUS-2
400KV BUS-1
⊗ - CB Tripped
× - CB Not tripped

Event Description

1.) Fault occurred on 400kV Muradnagar-II -Mathura line at 00:42:57 hrs on 17.10.2024 in zone-1, Y-Phase having fault current Iy=3.66KA.

2.) Relay issued trip command to Main CB 401 & Tie CB 402 of Mathura line but Main CB 401 failed to trip resulting LBB operation.

3) Due to LBB operation only Tie CB should have operated, but due to some configuration error other Tie CBs (405,408 and 411) also tripped.

4.) Details of tripped Bays-

i.) 400 kV Mathura Line Main CB-401 and Tie CB-402.
ii.) 400 kV Dadri Line Main CB-404 and Tie CB-405.
iii.) 400 kV Simbhaoli Ckt-1 Line Main CB-407 and Tie CB-408.
iv.) 400 kV Simbhaoli Ckt-2 Line Main CB-410 and Tie CB-411.

Remedial Measures Taken

- Auto Reclose testing of 400 kV Muradnagar-2-Mathura Line has been done on dated 19.10.2024 and all results were found in order.

- Time Testing of CB-401 has been done after servicing of CB mechanism on 18.10.2024.

- On analyzing busbar protection we found that Protection Logics are different in different PUs, the same shall be corrected after thorough review of busbar scheme.

THANK YOU.

Multiple element tripping event at 400/220kV Aligarh(UP)

At 12:08 hrs on 23rd October, 2024

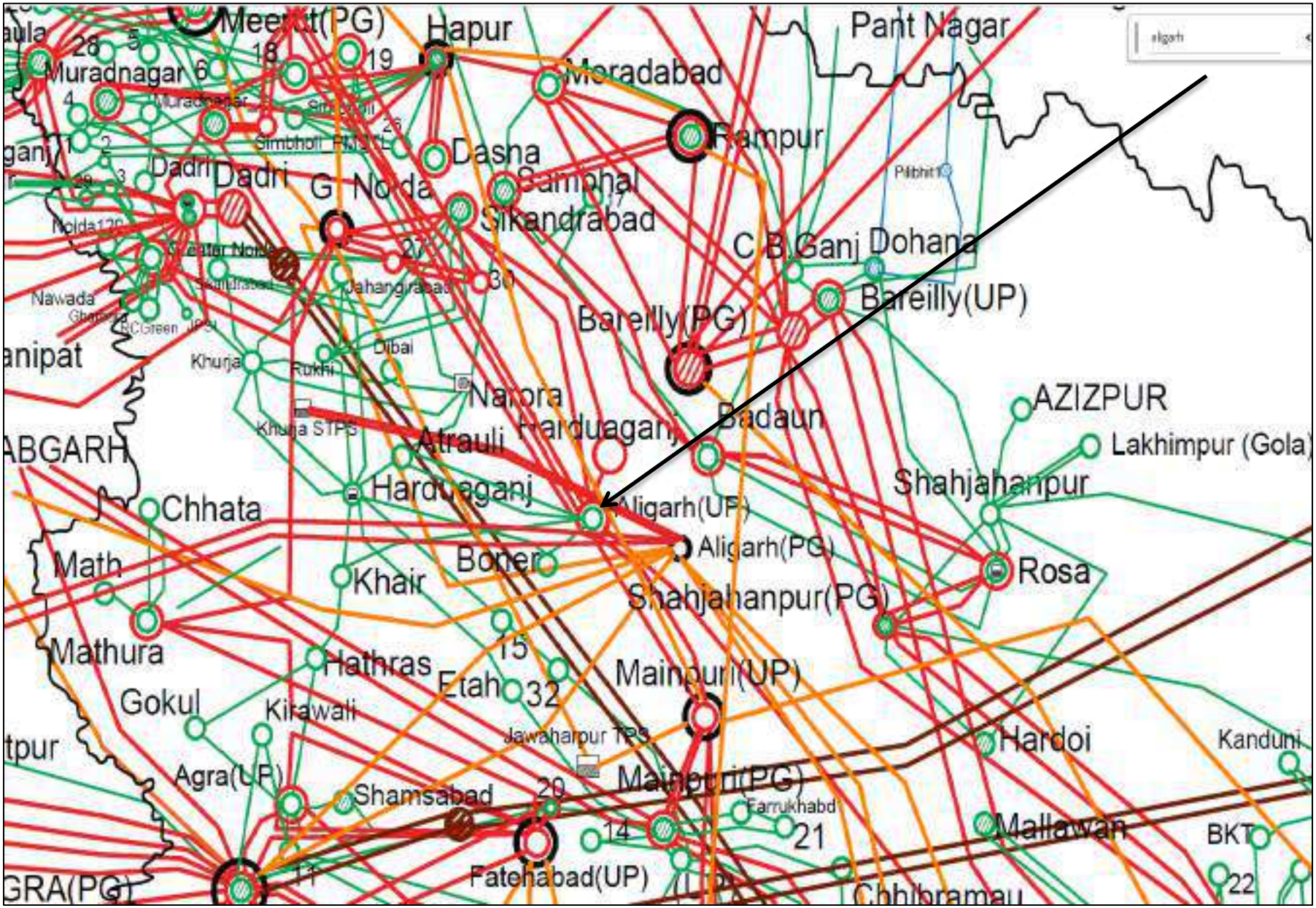
Tripped Elements

S.No.	Name of Element	Tripping Time	Revival Time
1	400KV Bus 1 at Aligarh(UP)	12:08 hrs	12:52 hrs
2	400 KV Panki-Aligarh (UP) Ckt		20:15 hrs
3	400 KV Aligarh-Sikandrabad (UP) Ckt		14:09 hrs
4	400 KV Aligarh-Mainpuri (UP) Ckt-1		13:46 hrs
5	400 KV Aligarh-Shamli (UP) Ckt-2		13:48 hrs

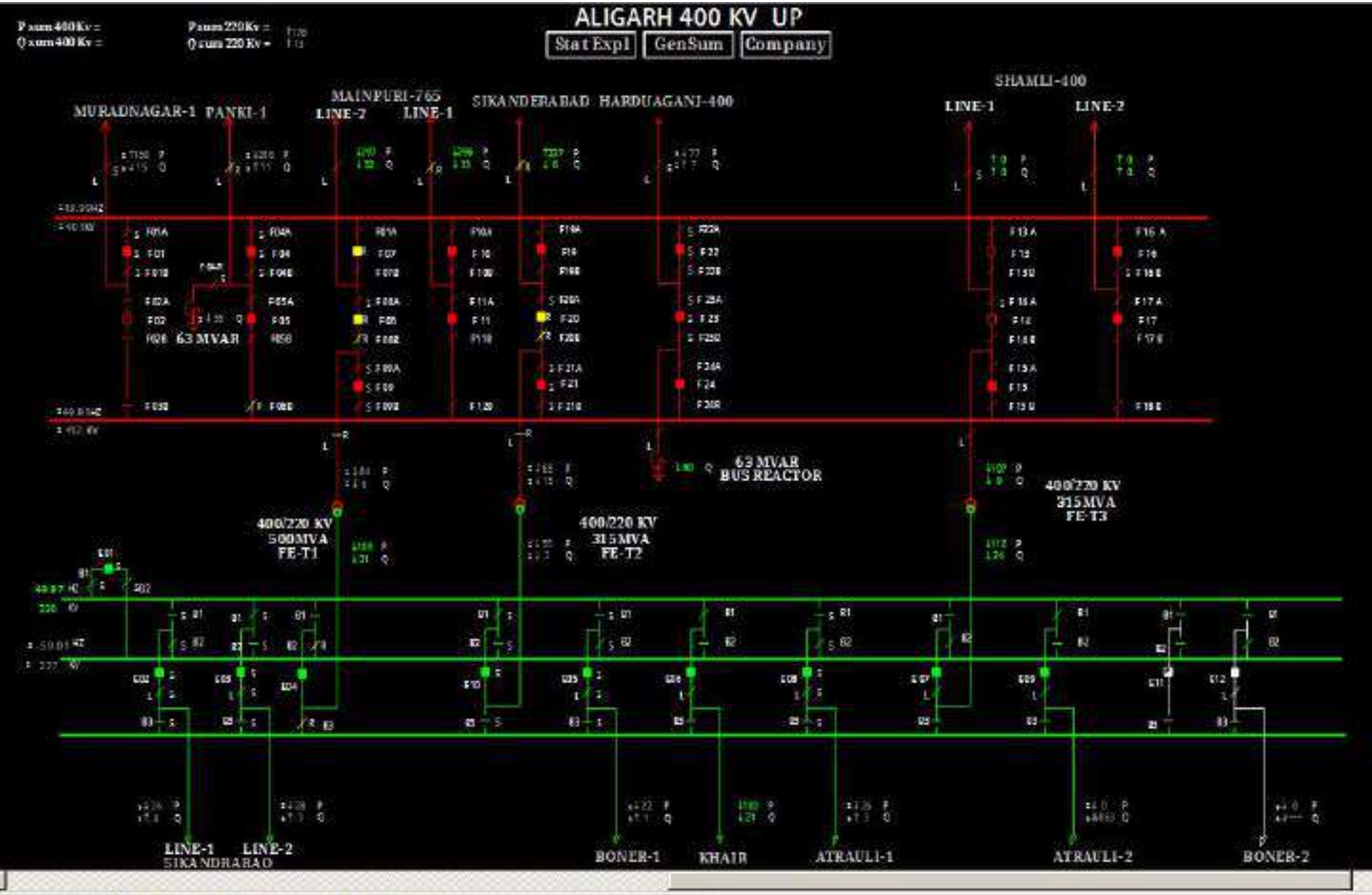
Brief details of the event

- 400/220kV Aligarh(UP) has one and half breaker scheme at 400kV level and double main and transfer bus scheme at 220kV level.
- As reported, at 12:08 hrs, differential protection of line reactor of 400 KV Panki-Aligarh (UP) Ckt operated (exact reason of differential protection operation of line reactor of 400 KV Panki-Aligarh (UP) Ckt yet to be shared).
- During the same time, Bus bar protection operated at 400kV Bus-1 at Aligarh(UP) also operated (exact reason of bus bar operation of 400kV Bus-1 at Aligarh(UP) yet to be shared).
- Due to this, all the elements connected to 400kV Bus-1 at Aligarh(UP) tripped and Bus-1 became dead (exact reason of opening of tie CBs of 400 KV lines connected to Bus-1 at Aligarh(UP) yet to be shared).
- As per PMU at Aligarh(PG), no fault is observed in the system.
- As per SCADA, no change in demand is observed in UP control area.

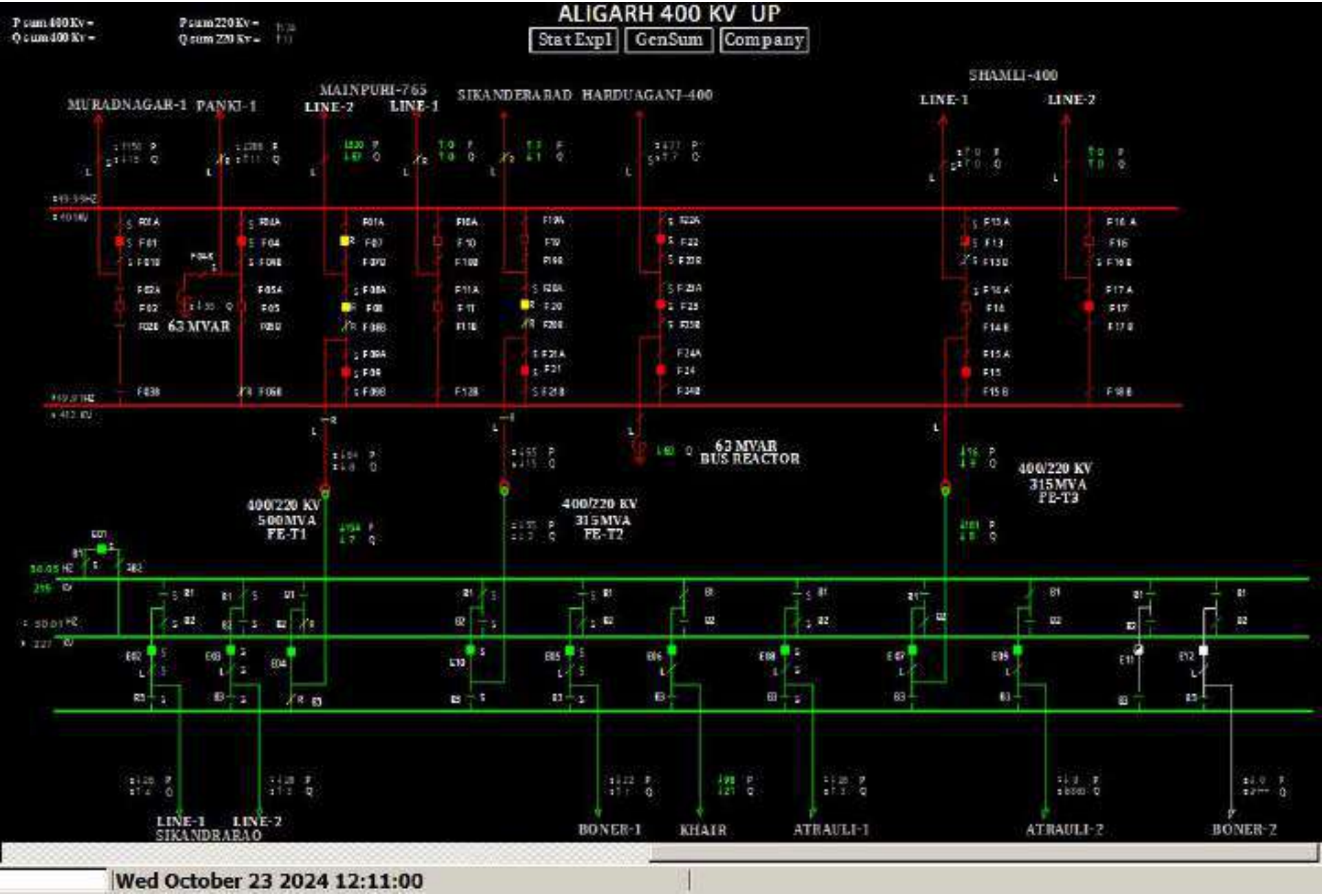
Network Diagram



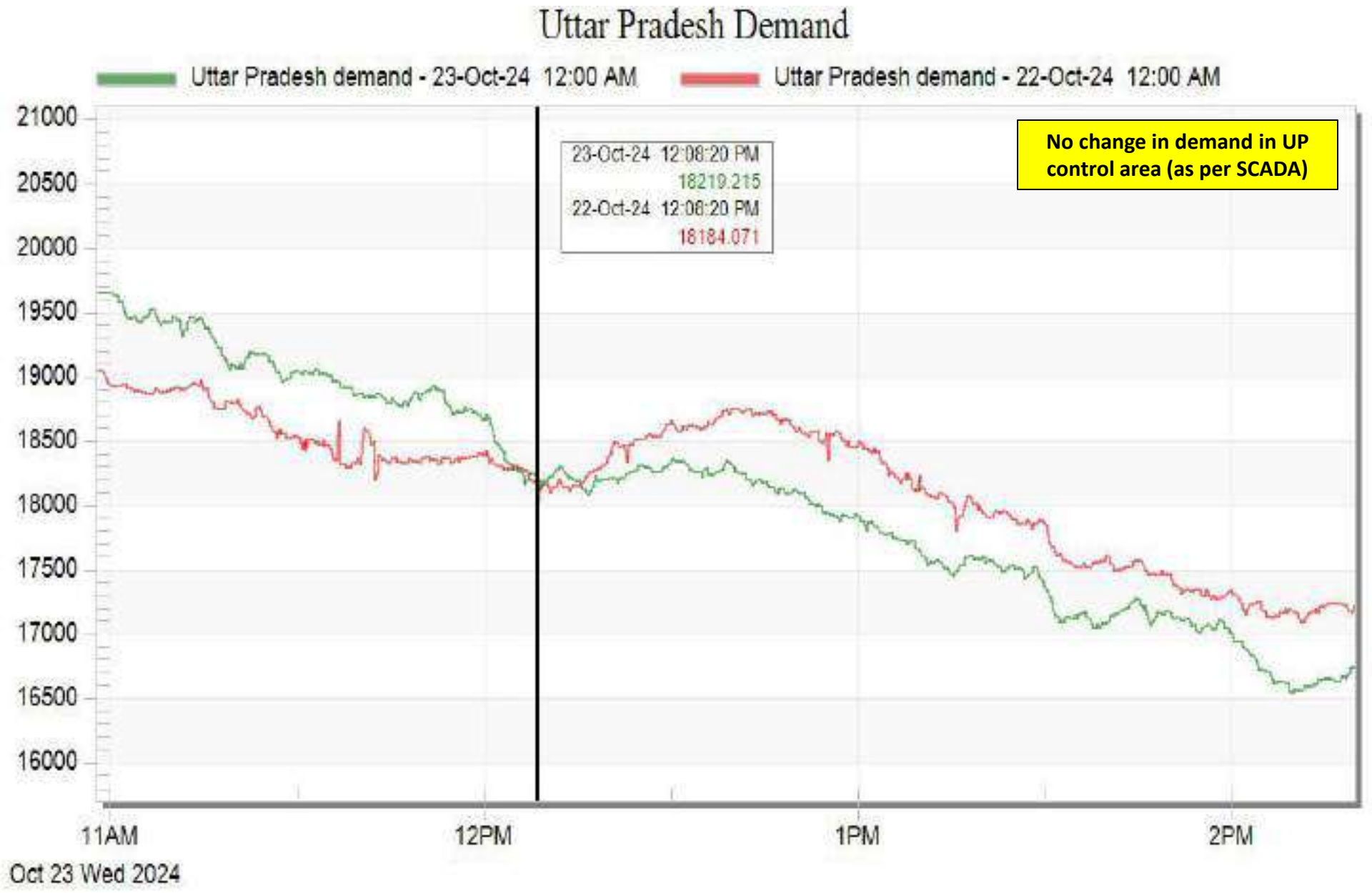
SLD of 400/220kV Aligarh(UP) before the event



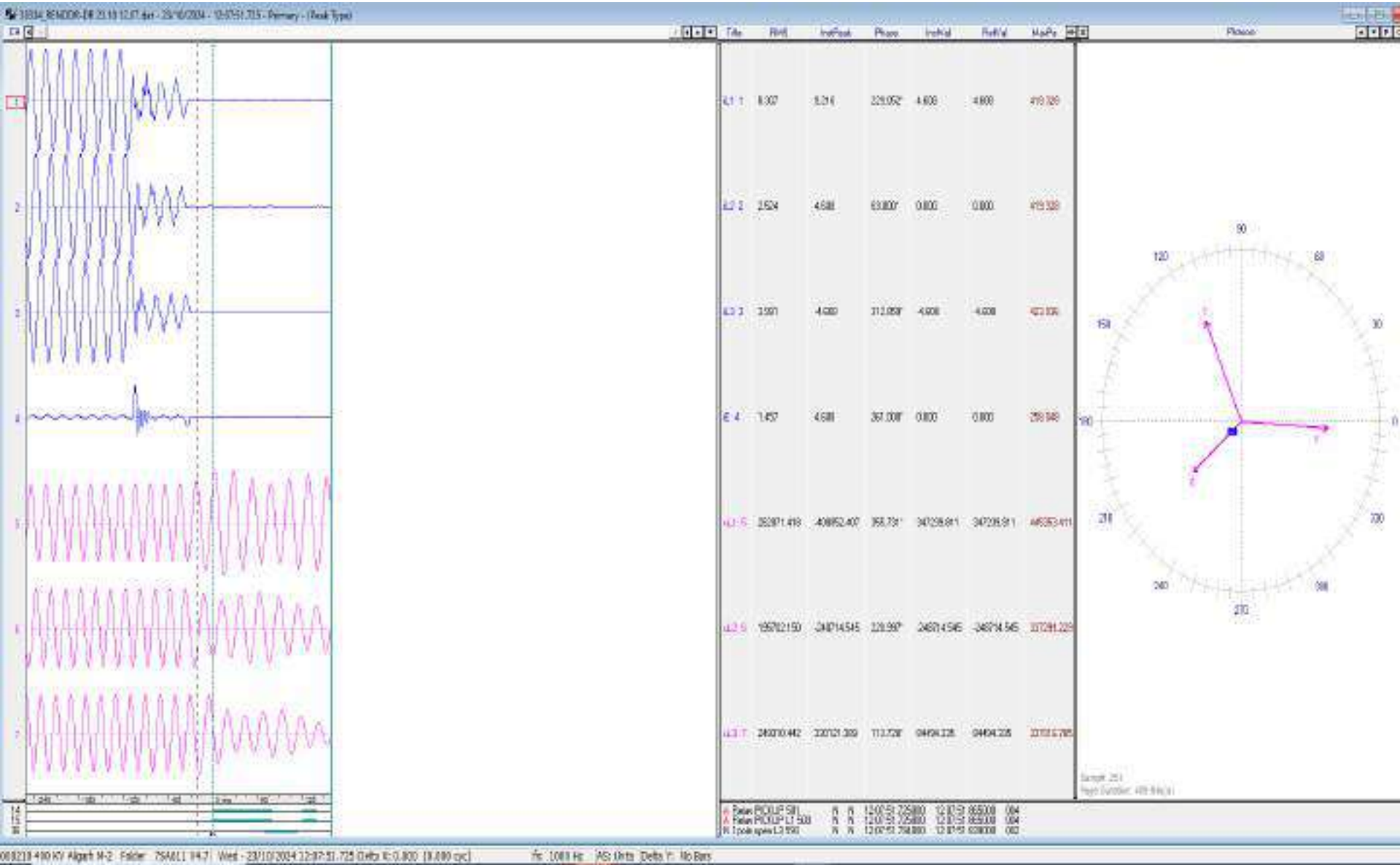
SLD of 400/220kV Aligarh(UP) after the event



Uttar Pradesh Demand during the event

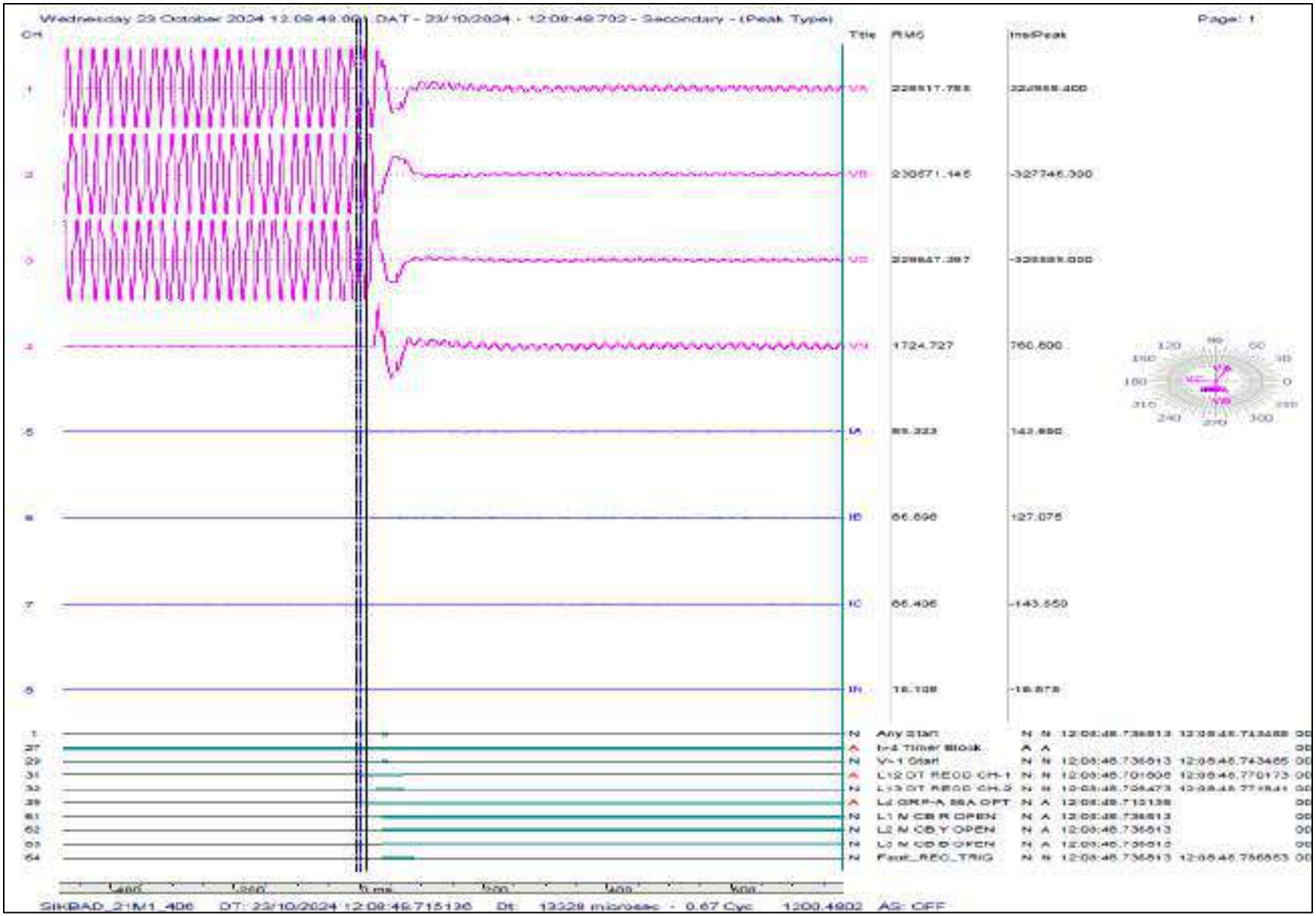


DR of 400 KV Panki-Aligarh (end) (UP) Ckt



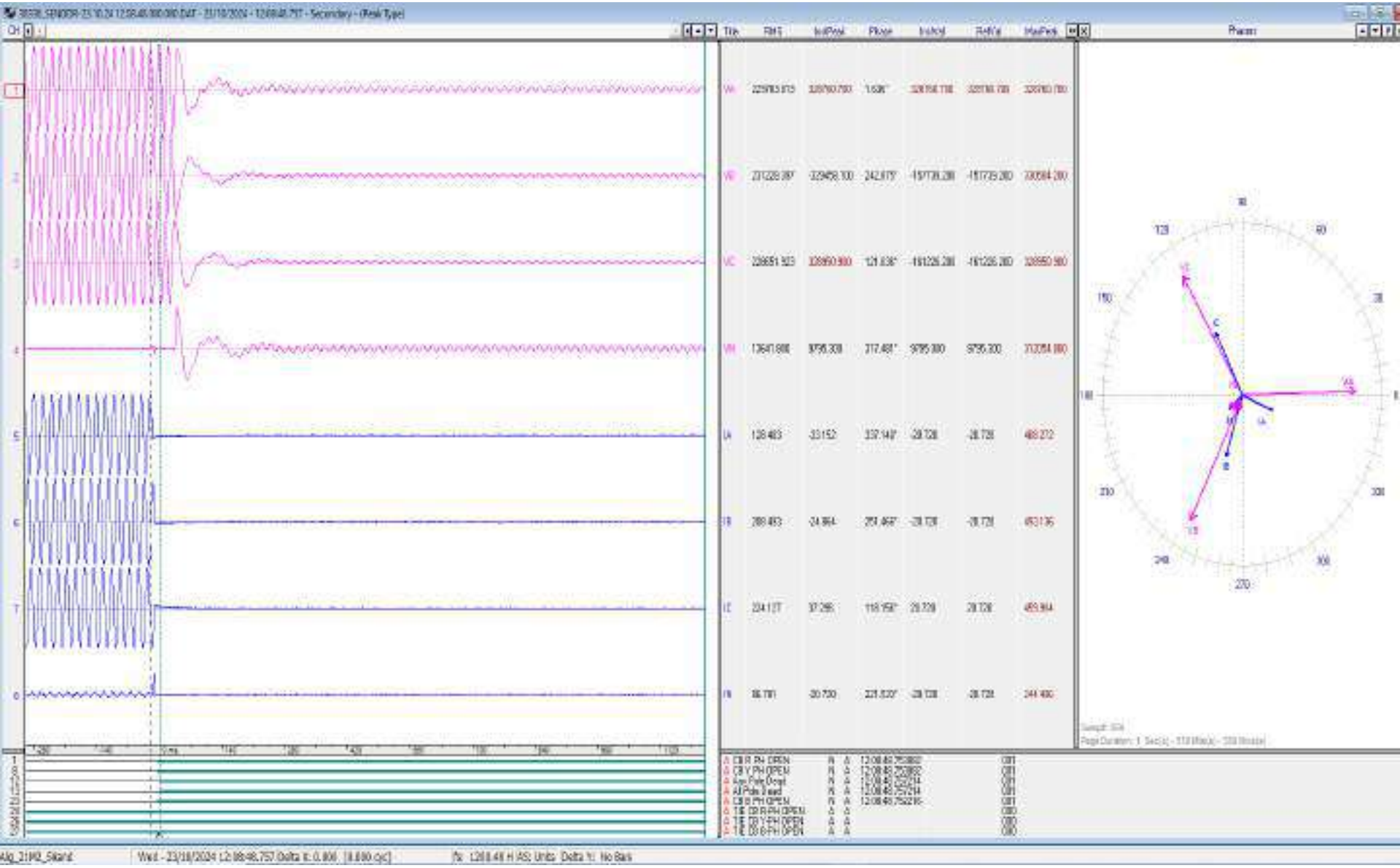
- ✓ No fault observed

DR of 400 KV Aligarh-Sikandrabad (end) (UP) Ckt



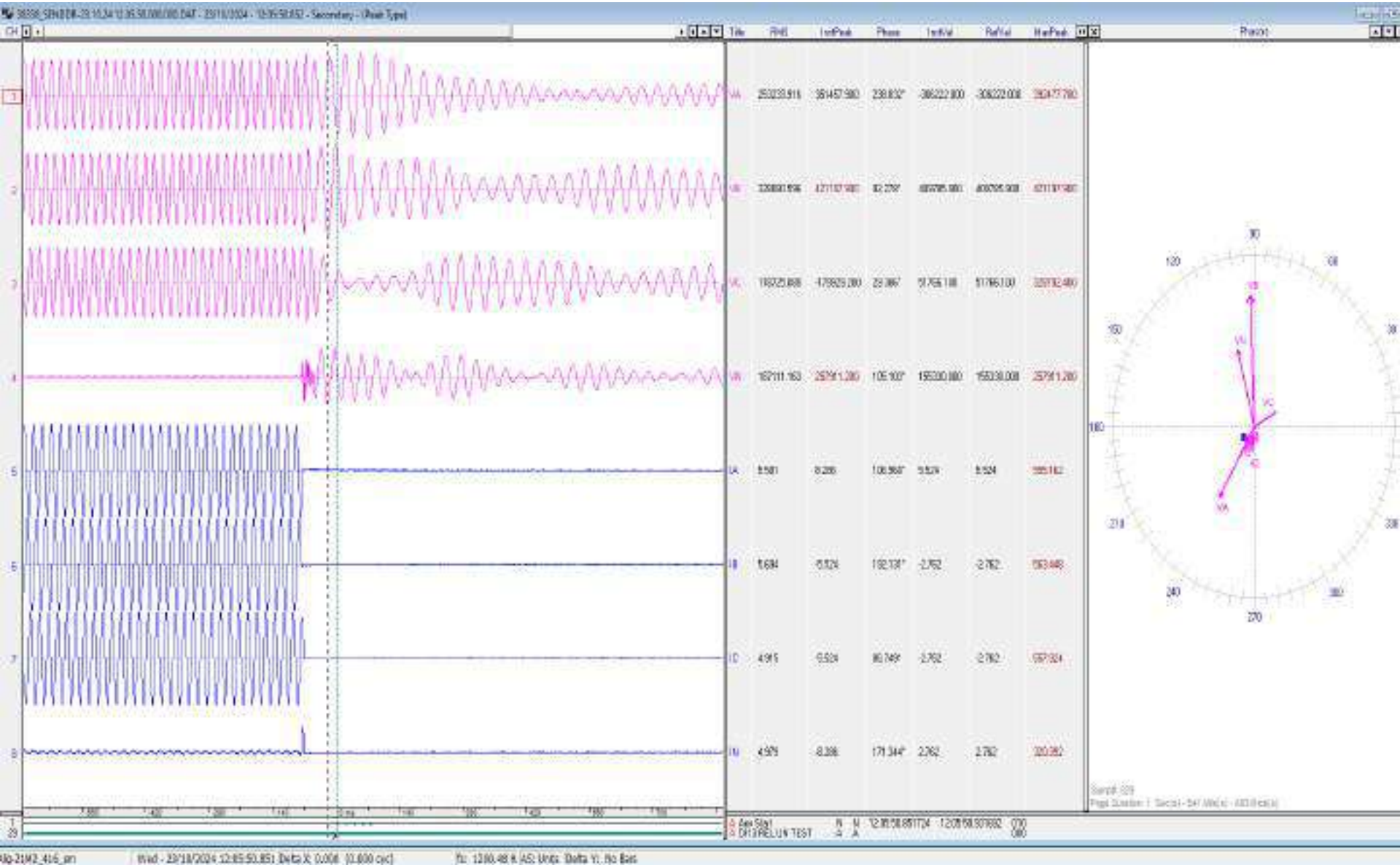
✓ DT received at Sikandrabad

DR of 400 KV Aligarh (end)-Sikandrabad (UP) Ckt



- ✓ No fault observed

DR of 400 KV Aligarh (end)-Shamli (UP) Ckt-2



- ✓ No fault observed

PMU Plot of frequency at Aligarh(PG)

12:08 hrs/23-Oct-24

PMU Plot of phase voltage magnitude at Aligarh(PG)

12:08 hrs/23-Oct-24

SCADA SOE

Time	Station Name	Voltage Level	Element Name	Element Type	Element Status	Remarks
12:08:25,858	ALIGR_UP	400kV	13SHMLI1	Circuit Breaker	disturbe	
12:08:48,765	ALIGR_UP	400kV	10MANP71	Circuit Breaker	Open	Main CB at Aligarh(UP) end of 400 KV Aligarh-Mainpuri (UP) Ckt-1 opened
12:08:48,772	PANK1_UP	400kV	10ALIGR	Circuit Breaker	Open	Line CB at Panki(UP) end of 400 KV Panki-Aligarh (UP) Ckt opened
12:08:48,784	ALIGR_UP	400kV	05TIE	Circuit Breaker	Open	Tie CB at Aligarh(UP) end of 400 KV Aligarh-Mainpuri (UP) Ckt-1 opened
12:08:48,785	ALIGR_UP	400kV	19SIKND1	Circuit Breaker	Open	Main CB at Aligarh(UP) end of 400 KV Aligarh-Sikandrabad (UP) Ckt opened
12:08:48,786	SHML4_UP	400kV	02ALIGR2	Circuit Breaker	Open	Line CB at Shamli(UP) end of 400 KV Aligarh-Shamli (UP) Ckt-2 opened
12:08:48,800	ALIGR_UP	400kV	16SHMLI2	Circuit Breaker	disturbe	
12:08:48,820	ALIGR_UP	400kV	16SHMLI2	Circuit Breaker	Open	Main CB at Aligarh(UP) end of 400 KV Aligarh-Shamli (UP) Ckt-2 opened
12:08:49,000	ALIGR_UP	400kV	11TIE	Circuit Breaker	Open	Tie CB at Aligarh(UP) end of 400 KV Panki-Aligarh (UP) Ckt opened
12:10:29,733	SIKND_UP	400kV	06ALIGR1	Circuit Breaker	Open	Line CB at Sikandrabad(UP) end of 400 KV Aligarh-Sikandrabad (UP) Ckt opened

Points for Discussion

i) Exact reason of differential protection operation of line reactor of 400 KV Panki-Aligarh (UP) Ckt need to be shared.

ii) Exact reason of bus bar operation of 400kV Bus-1 at Aligarh(UP) need to be shared.

iii) Reason of opening of tie CBs of 400 KV lines connected to Bus-1 at Aligarh(UP) need to be shared.

iv) DR/EL (.dat/.cfg file) of all the tripped elements along with detailed tripping report need to be shared from both the ends.

v) Remedial action taken report to be shared.

400kV Sub-Station Aligarh, UPPTCL

23.10.2024, 12:08 hrs.

400kV Busbar Protection (Zone-I) operated resulted into Tripping of 400kV Panki line, Sikandrabad line, Mainpuri-I line ,Shamli-II line

400 KV S/S Aligarh : 400KV Bus Bar Protection(Zone-I) operated resulting tripping of 400KV Panki line, Sikandrabad line, Mainpuri-I line ,Shamli-II line

- **Date & Time of event**: 23.10.2024 at 12:08 hrs
- **Sub-Station affected**: 400kV S/S Aligarh
- **Date & Time of restoration**:

400KV Bus-I	12:52hrs, 23.10.2024
400KV Mainpuri-I(407)	13:46hrs, 23.10.2024
400KV Shamli-II(416)	13:48hrs, 23.10.2024
400KV Sikandrabad(419)	14:09hrs, 23.10.2024
400KV Panki(404)	20:15hrs, 23.10.2024

Antecedent conditions

- Before tripping load on different elements was as follows:
- FEEDER BAY NO LOAD

400kV Mainpuri-I (407) 296MW

400kV Shamli-II (415) 257MW

400kV Sikandrabad (419) 223MW

400kV Panki (404) 203MW

400kV Muradnagar (401) shutdown

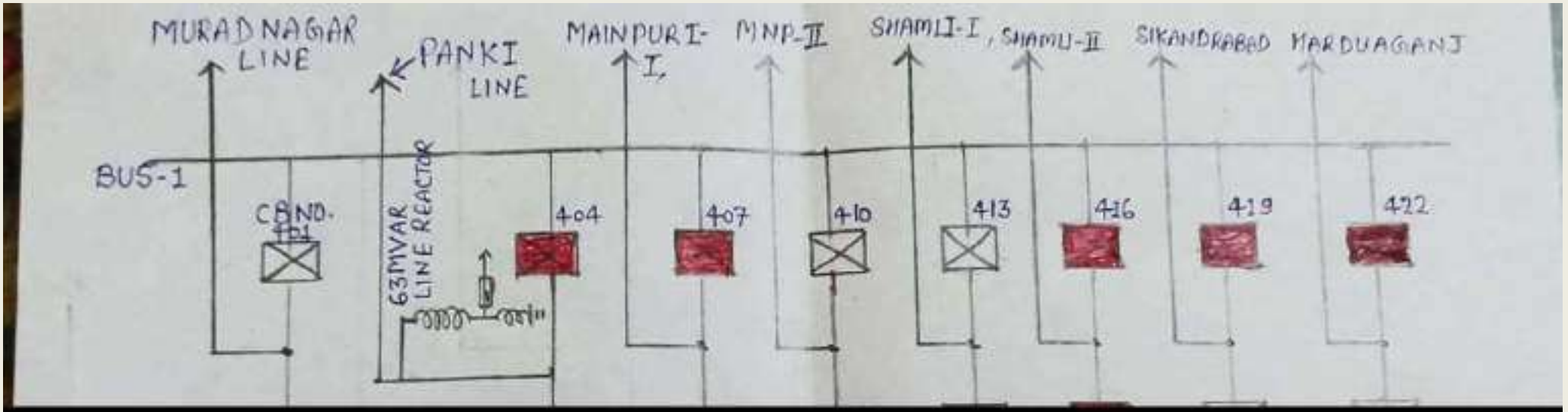
400kV Shamli –I (413) Already tripped at 11:50hrs

Tripping Report

ELECTRICITY TEST & COMMISSIONING CIRCLE, AGRA (DIV-T&C)

FAULT ANALYSIS STATEMENT OF PROTECTIVE GEARS 400 KV FOR THE M/O-OCTOBER 2024 (DIV AligarhT&C)

S. No.	NAME OF SUBSTATION	TRIPPING	CLOSING	FEEDER NAME	TYPE OF Relay	ALIGARH END FLAG	Fault Distance, Fault Reach	TRIP VALUES		F/T ANALYSIS
		DT/TIME	DT/TIME		Manth End			KVolts	Amp	
1	400 kv SubStation Aligarh	23.10.2024 12:08Hrs.	23.10.2024 12:52Hrs.	400kv Bus Bar-1	ZIV	Bus Bar operated	-	-	-	There are differences between configuration logic, scheme and hard wiring of PU1 and PU2 instatlled at 400kV Shamli-1 and Shamli-2 line. As per the events recorded in Busbar(CU) unit-1,Busbar unit-1 operated by the bay no. 413(400kV Shamli-1line).
2	400 kv SubStation Aligarh	23.10.2024 12:08Hrs.	23.10.2024 13:48Hrs.	400kv SHAMLI-2 Line	ZIV/micom	Bus Bar operated	-	-	-	
3	400 kv SubStation Aligarh	23.10.2024 12:08Hrs.	23.10.2024 13:46Hrs.	400kv Mainpuri-1 Line	ZIV/micom	Bus Bar operated	-	-	-	
4	400 kv SubStation Aligarh	23.10.2024 12:08Hrs.	23.10.2024 14:09Hrs.	400kv Sikandrabad Line	ZIV/micom	Bus Bar operated	-	-	-	
5	400 kv SubStation Aligarh	23.10.2024 12:08Hrs.	23.10.2024 20:15Hrs.	400kv panki Line with reactor	ZIV/micom	Bus Bar operated	-	-	-	


MURADNAGAR LINE
PANKI LINE
MAINPURI-I,
MNP-II
SHAMLI-I
SHAMLI-II
SIKANDRABAD
HARDUAGANJ
BUS-1
CB
63MVAR LINE REACTOR
404
407
410
413
416
419
422

Event Description

On 23/10/2024 at 12:08 hrs Busbar (Zone I) protection operated at 400kV Sub-station Aligarh resulting tripping of following elements:

(1) 400kV Panki line with reactor

(2) 400kV Shamli line II

(3) 400kV Mainpuri line I

(4) 400kV Sikandrabad line.

Also, C phase LED indication appeared on differential relay of Panki line reactor at the time of incident.

Bay no. 413 (400kV Shamli-1 line) was already in tripped condition since 11:50 hrs on 23.10.2024.

As per the analysis of events recorded in Busbar (CU) relay of Zone-I, it was observed that the communication between PU1 of Shamli -I line (Bay 13 in Bus Bar prot) and CU was getting lost and established multiple times before the incident.

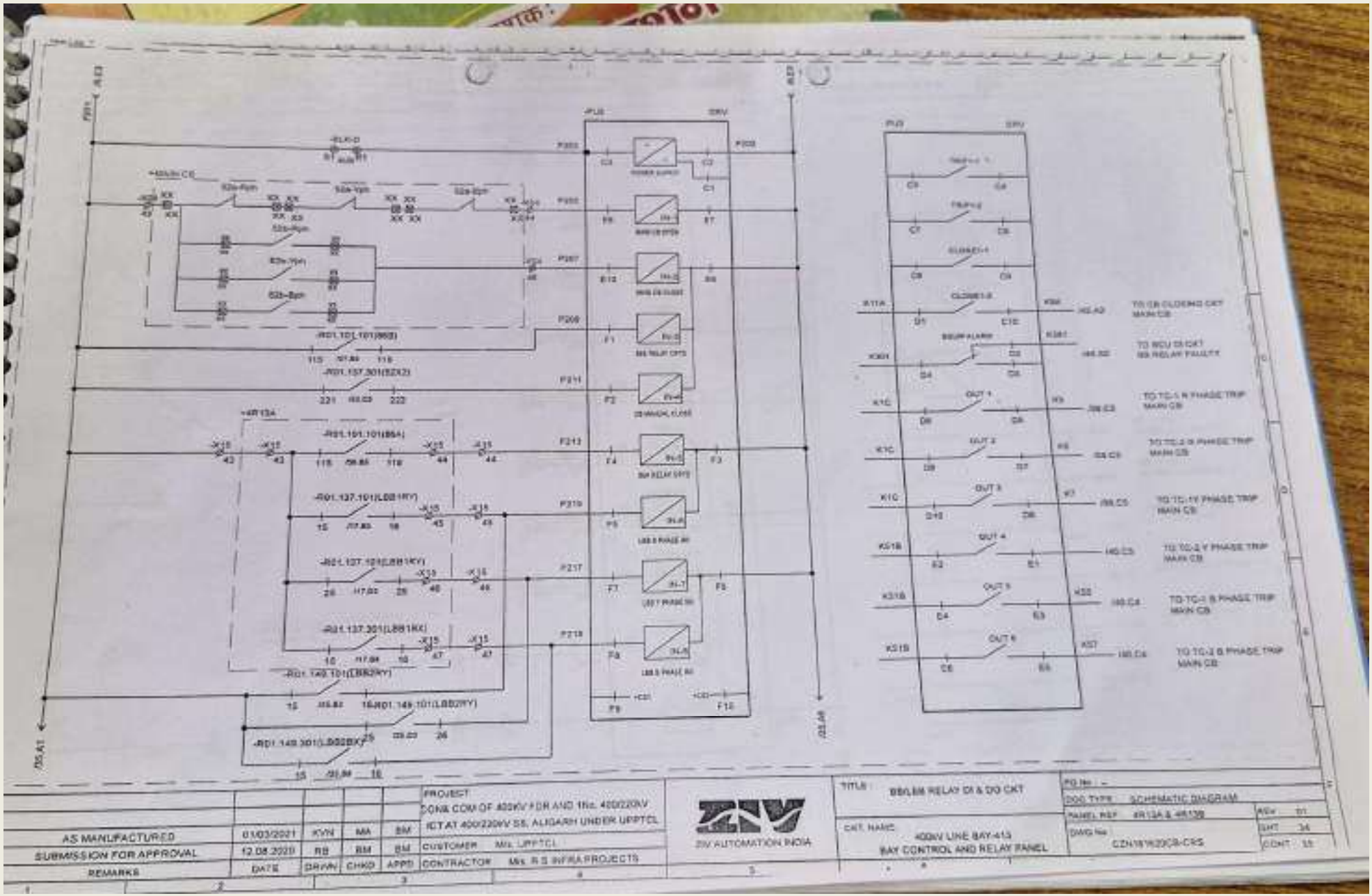
Similarly, Bay 13 was getting connected and disconnected from Bus 1 multiple times. Status of connection of same bay also toggled from Bus 1 to Bus 2 which shows some topology error.

Due to these errors, Busbar Zone 1 protection operated erratically at 12:08:48:706 hrs.

Recently 400kV Shamli I and Shamli II circuits were energised. Notable differences between the wiring and configuration logics were observed on thorough inspection of these bays.

However, no abnormality was observed in the switchyard, which suggests that this event originated from Shamli bay -13(413). This seems to be a case of malfunction of busbar relay due to errors in configuration and logic.

Discrepancy between Drawing and Configuration logics



EVENTS OF 400 KV BUSBAR RELAY UNIT-1

Events
10/22/2024-10:48:43.470**Event:** Oscillography trigger
10/22/2024-15:09:20.596**Event:** Oscillography trigger
10/22/2024-15:10:43.579**Event:** Oscillography trigger
10/22/2024-15:17:21.056**Event:** Oscillography trigger
10/22/2024-17:11:35.911**Event:** Oscillography trigger
10/22/2024-18:16:11.764**Event:** Oscillography trigger
10/22/2024-18:20:22.783**Event:** Oscillography trigger
10/22/2024-18:21:42.520**Event:** Oscillography trigger
10/22/2024-18:28:51.894**Event:** Oscillography trigger
10/22/2024-22:40:15.240**Event:** Oscillography trigger
10/22/2024-22:50:29.599**Event:** Oscillography trigger
10/22/2024-22:56:57.937**Event:** Oscillography trigger
10/22/2024-23:01:16.804**Event:** Oscillography trigger
10/22/2024-23:01:36.288**Event:** Oscillography trigger
10/23/2024-00:45:44.048**Event:** Oscillography trigger
10/23/2024-00:45:44.866**Event:** Oscillography trigger
10/23/2024-02:11:27.645**Event:** Oscillography trigger
10/23/2024-06:09:51.412**Event:** Oscillography trigger
10/23/2024-07:39:26.745**Event:** Oscillography trigger
10/23/2024-10:18:22.372**Event:** Oscillography trigger
10/23/2024-11:50:50.760**Event:** Bay #13 Status Contact Input IN-7 Activated
10/23/2024-11:50:50.760**Event:** Bay #13 Status Contact Input IN-8 Activated
10/23/2024-11:50:50.760**Event:** Bay #14 Status Contact Input IN-11 Activated
10/23/2024-11:50:50.760**Event:** Bay #14 Status Contact Input IN-3 Activated
10/23/2024-11:50:50.761**Event:** Oscillography trigger
10/23/2024-11:50:50.762**Event:** Bay #14 Status Contact Input IN-10 Activated
10/23/2024-11:50:50.762**Event:** Bay #14 Status Contact Input IN-9 Activated
10/23/2024-11:50:50.763**Event:** Bay #13 Status Contact Input IN-3 Activated
10/23/2024-11:50:50.763**Event:** Bay #13 Status Contact Input IN-4 Activated
10/23/2024-11:50:50.763**Event:** Bay #13 Status Contact Input IN-6 Activated
10/23/2024-11:50:50.769**Event:** Bay #14 Status Contact Input IN-9 Deactivated
10/23/2024-11:50:50.774**Event:** Bay #14 Status Contact Input IN-9 Activated
10/23/2024-11:50:50.777**Event:** Bay #14 Status Contact Input IN-2 Deactivated
10/23/2024-11:50:50.781**Event:** Bay #13 Status Contact Input IN-2 Deactivated

10/23/2024-11:50:50.789**Event:** Bay #13 Status Contact Input IN-1 Activated
10/23/2024-11:50:51.005**Event:** Bay #13 Status Contact Input IN-6 Deactivated
10/23/2024-11:50:51.005**Event:** Bay #13 Status Contact Input IN-7 Deactivated
10/23/2024-11:50:51.006**Event:** Bay #14 Status Contact Input IN-10 Deactivated
10/23/2024-11:50:51.006**Event:** Bay #14 Status Contact Input IN-11 Deactivated
10/23/2024-11:50:51.006**Event:** Bay #14 Status Contact Input IN-9 Deactivated
10/23/2024-11:50:51.007**Event:** Bay #13 Status Contact Input IN-8 Deactivated
10/23/2024-12:04:33.183**Event:** Bay #13 Status Contact Input IN-3 Deactivated
10/23/2024-12:04:37.037**Event:** Bay #13 Status Contact Input IN-4 Deactivated
10/23/2024-12:07:57.492**Event:** Bay #13 Status Contact Input IN-1 Deactivated
10/23/2024-12:07:57.492**Event:** Bay #13 Status Contact Input IN-10 Deactivated
10/23/2024-12:07:58.345**Event:** Bay 13 Disconnected from Bus 1
10/23/2024-12:07:58.346**Event:** Bus 1 Diff. Trip Block Activated
10/23/2024-12:07:58.346**Event:** Bus 2 Diff. Trip Block Activated
10/23/2024-12:07:58.346**Event:** Bus 3 Diff. Trip Block Activated
10/23/2024-12:07:58.346**Event:** Bus 4 Diff. Trip Block Activated
10/23/2024-12:07:58.346**Event:** Bus 5 Diff. Trip Block Activated
10/23/2024-12:07:58.346**Event:** Oscillography trigger
10/23/2024-12:07:58.365**Event:** Communication Lost with Bay IED #13
10/23/2024-12:08:05.401**Event:** Bus 1 Diff. Trip Block Deactivated
10/23/2024-12:08:05.401**Event:** Bus 2 Diff. Trip Block Deactivated
10/23/2024-12:08:05.401**Event:** Bus 3 Diff. Trip Block Deactivated
10/23/2024-12:08:05.401**Event:** Bus 4 Diff. Trip Block Deactivated
10/23/2024-12:08:05.401**Event:** Bus 5 Diff. Trip Block Deactivated
10/23/2024-12:08:05.401**Event:** Communication Established with Bay IED #13
10/23/2024-12:08:05.496**Event:** Bay #13 Power Up
10/23/2024-12:08:05.496**Event:** Bay #13 Status Contact Input IN-1 Activated
10/23/2024-12:08:05.496**Event:** Bay #13 Status Contact Input IN-10 Activated
10/23/2024-12:08:05.496**Event:** Bus 1 Diff. Trip Block Activated
10/23/2024-12:08:05.496**Event:** Bus 2 Diff. Trip Block Activated
10/23/2024-12:08:05.496**Event:** Bus 3 Diff. Trip Block Activated
10/23/2024-12:08:05.496**Event:** Bus 4 Diff. Trip Block Activated
10/23/2024-12:08:05.496**Event:** Bus 5 Diff. Trip Block Activated
10/23/2024-12:08:05.500**Event:** Bay 13 Connected to Bus 1
10/23/2024-12:08:05.500**Event:** Bus 2 Diff. Trip Block Deactivated
10/23/2024-12:08:05.500**Event:** Bus 3 Diff. Trip Block Deactivated
10/23/2024-12:08:05.500**Event:** Bus 4 Diff. Trip Block Deactivated
10/23/2024-12:08:05.500**Event:** Bus 5 Diff. Trip Block Deactivated
10/23/2024-12:08:05.501**Event:** Oscillography trigger
10/23/2024-12:08:06.051**Event:** Bus 1 Diff. Trip Block Deactivated

10/23/2024-12:08:47.854**Event:** Bay #13 Status Contact Input IN-1 Deactivated
10/23/2024-12:08:47.855**Event:** Bay #13 Status Contact Input IN-10 Deactivated
10/23/2024-12:08:48.706**Event:** Bay #13 Unknown 52 Status Activated
10/23/2024-12:08:48.706**Event:** Bay #13 Unknown 89 Status Activated
10/23/2024-12:08:48.706**Event:** Bay 13 Connected to Bus 2
10/23/2024-12:08:48.706**Event:** Bus 1 Diff. Trip Block Activated
10/23/2024-12:08:48.706**Event:** Bus 1 Trip Activated
10/23/2024-12:08:48.706**Event:** Bus 2 Diff. Trip Block Activated
10/23/2024-12:08:48.706**Event:** Bus 3 Diff. Trip Block Activated
10/23/2024-12:08:48.706**Event:** Bus 4 Diff. Trip Block Activated
10/23/2024-12:08:48.706**Event:** Bus 5 Diff. Trip Block Activated
10/23/2024-12:08:48.706**Event:** Lockout
10/23/2024-12:08:48.706**Event:** Oscillography trigger
10/23/2024-12:08:48.708**Event:** Bay #13 Status Contact Input IN-1 Activated
10/23/2024-12:08:48.708**Event:** Bay #13 Unknown 52 Status Deactivated
10/23/2024-12:08:48.708**Event:** Bay #13 Unknown 89 Status Deactivated
10/23/2024-12:08:48.708**Event:** Bay #18 Trip Activated
10/23/2024-12:08:48.708**Event:** Bus 1 Diff. Trip Block Deactivated
10/23/2024-12:08:48.708**Event:** Bus 1 Trip Deactivated
10/23/2024-12:08:48.708**Event:** Bus 2 Diff. Trip Block Deactivated
10/23/2024-12:08:48.708**Event:** Bus 3 Diff. Trip Block Deactivated
10/23/2024-12:08:48.708**Event:** Bus 4 Diff. Trip Block Deactivated
10/23/2024-12:08:48.708**Event:** Bus 5 Diff. Trip Block Deactivated
10/23/2024-12:08:48.709**Event:** Bay #13 Status Contact Input IN-10 Activated
10/23/2024-12:08:48.709**Event:** Bay #15 Trip Activated
10/23/2024-12:08:48.709**Event:** Bay #16 Trip Activated
10/23/2024-12:08:48.709**Event:** Bay 13 Disconnected from Bus 2
10/23/2024-12:08:48.713**Event:** Bay 13 Disconnected from Bus 1
10/23/2024-12:08:48.713**Event:** Bus 1 Diff. Trip Block Activated
10/23/2024-12:08:48.713**Event:** Bus 2 Diff. Trip Block Activated
10/23/2024-12:08:48.713**Event:** Bus 3 Diff. Trip Block Activated
10/23/2024-12:08:48.713**Event:** Bus 4 Diff. Trip Block Activated
10/23/2024-12:08:48.713**Event:** Bus 5 Diff. Trip Block Activated
10/23/2024-12:08:48.733**Event:** Communication Lost with Bay IED #13
10/23/2024-12:08:48.736**Event:** Bay #17 Status Contact Input IN-3 Activated
10/23/2024-12:08:48.736**Event:** Bay #18 Status Contact Input IN-3 Activated
10/23/2024-12:08:48.751**Event:** Bay #16 Status Contact Input IN-2 Deactivated
10/23/2024-12:08:48.755**Event:** Bay #16 Status Contact Input IN-3 Activated
10/23/2024-12:08:48.755**Event:** Bay #16 Status Contact Input IN-4 Activated

10/23/2024-12:08:48.770**Event:** Bay #18 Trip Deactivated
10/23/2024-12:08:48.771**Event:** Bay #16 Trip Deactivated
10/23/2024-12:08:53.190**Event:** Bus 1 Diff. Trip Block Deactivated
10/23/2024-12:08:53.190**Event:** Bus 2 Diff. Trip Block Deactivated
10/23/2024-12:08:53.190**Event:** Bus 3 Diff. Trip Block Deactivated
10/23/2024-12:08:53.190**Event:** Bus 4 Diff. Trip Block Deactivated
10/23/2024-12:08:53.190**Event:** Bus 5 Diff. Trip Block Deactivated
10/23/2024-12:08:53.190**Event:** Communication Established with Bay IED #13
10/23/2024-12:08:53.286**Event:** Bay #13 Power Up
10/23/2024-12:08:53.286**Event:** Bay #13 Status Contact Input IN-1 Activated
10/23/2024-12:08:53.286**Event:** Bay #13 Status Contact Input IN-10 Activated
10/23/2024-12:08:53.286**Event:** Bus 1 Diff. Trip Block Activated
10/23/2024-12:08:53.286**Event:** Bus 2 Diff. Trip Block Activated
10/23/2024-12:08:53.286**Event:** Bus 3 Diff. Trip Block Activated
10/23/2024-12:08:53.286**Event:** Bus 4 Diff. Trip Block Activated
10/23/2024-12:08:53.286**Event:** Bus 5 Diff. Trip Block Activated
10/23/2024-12:08:53.289**Event:** Bay 13 Connected to Bus 1
10/23/2024-12:08:53.289**Event:** Bus 2 Diff. Trip Block Deactivated
10/23/2024-12:08:53.289**Event:** Bus 3 Diff. Trip Block Deactivated
10/23/2024-12:08:53.289**Event:** Bus 4 Diff. Trip Block Deactivated
10/23/2024-12:08:53.289**Event:** Bus 5 Diff. Trip Block Deactivated
10/23/2024-12:08:53.289**Event:** Oscillography trigger
10/23/2024-12:08:53.849**Event:** Bus 1 Diff. Trip Block Deactivated
10/23/2024-12:09:28.378**Event:** Bay #14 Status Contact Input IN-3 Deactivated
10/23/2024-12:16:00.381**Event:** Local Mode (keypad and display)
10/23/2024-12:18:46.192**Event:** Bus 1 Diff. Trip Block Activated
10/23/2024-12:18:46.192**Event:** Bus 1 Trip Blocking by BF or DI
10/23/2024-12:18:46.192**Event:** Bus 2 Diff. Trip Block Activated
10/23/2024-12:18:46.192**Event:** Bus 2 Trip Blocking by BF or DI
10/23/2024-12:21:08.405**Event:** Local Mode (keypad and display)
10/23/2024-12:35:32.270**Event:** Oscillography trigger
10/23/2024-12:41:15.220**Event:** Local Mode (keypad and display)
10/23/2024-12:41:40.229**Event:** Local Mode (keypad and display)
10/23/2024-12:49:00.555**Event:** Local Mode (keypad and display)
10/23/2024-12:55:10.308**Event:** Oscillography trigger
10/23/2024-13:45:55.220**Event:** Oscillography trigger
10/23/2024-13:49:27.449**Event:** Bay #16 Status Contact Input IN-4 Deactivated
10/23/2024-13:49:30.869**Event:** Bay #16 Status Contact Input IN-3 Deactivated
10/23/2024-13:49:36.912**Event:** Bay #17 Status Contact Input IN-3 Deactivated

Remedial Measures Taken

1. Panki line 63MVR reactor stability test results were found satisfactory and the bay was charged subsequently.
2. Executive engineer 400kV substation division Aligarh issued a letter on 11.11.2024 to the firm (ZIV) for checking and correction of busbar logic and associated wiring.
3. Till the time the problem in busbar relay is rectified, busbar protection is kept in blocked state and zone 4 reach and time settings of all lines are revised accordingly.

THANK YOU.

Multiple element tripping event at 400/220kV Kashipur(Utt)

At 10:57 hrs on 10th October, 2024

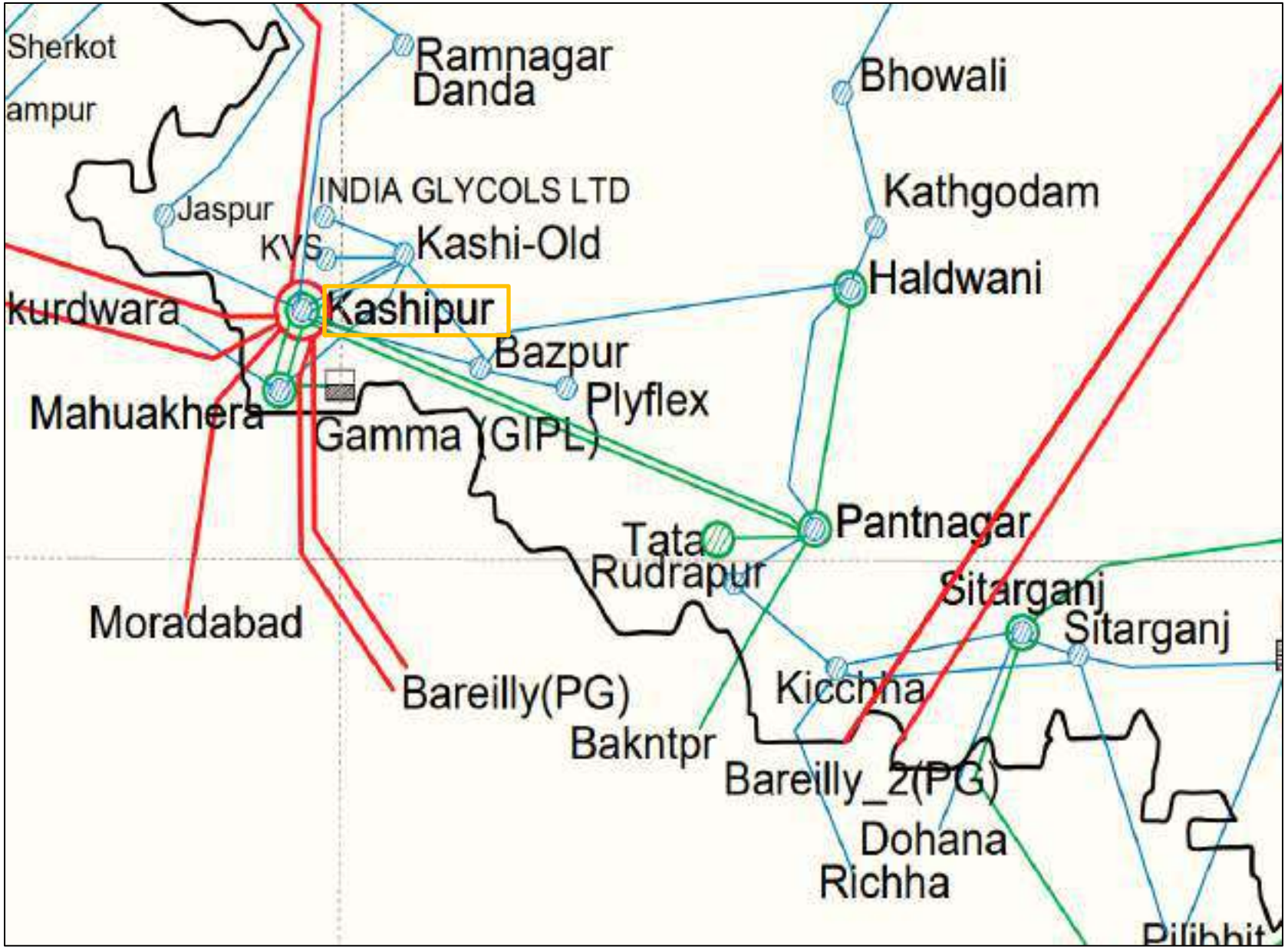
Tripped Elements

S.No.	Name of Element	Tripping Time	Revival Time
1	400/220kV 315 MVA ICT-1 at Kashipur(UK)	10:56 hrs	11:22 hrs
2	400/220kV 315 MVA ICT-2 at Kashipur(UK)		11:17 hrs
3	220/132kV 160 MVA ICT-3 at Kashipur(UK)		11:36 hrs
4	220kV Jafarpur-Kashipur (UK) Ckt		11:31 hrs
5	220kV Pantnagar – Kashipur (UK) Ckt		11:32 hrs
6	132kV Kahipur – Jaspur (UK) Ckt		11:26 hrs

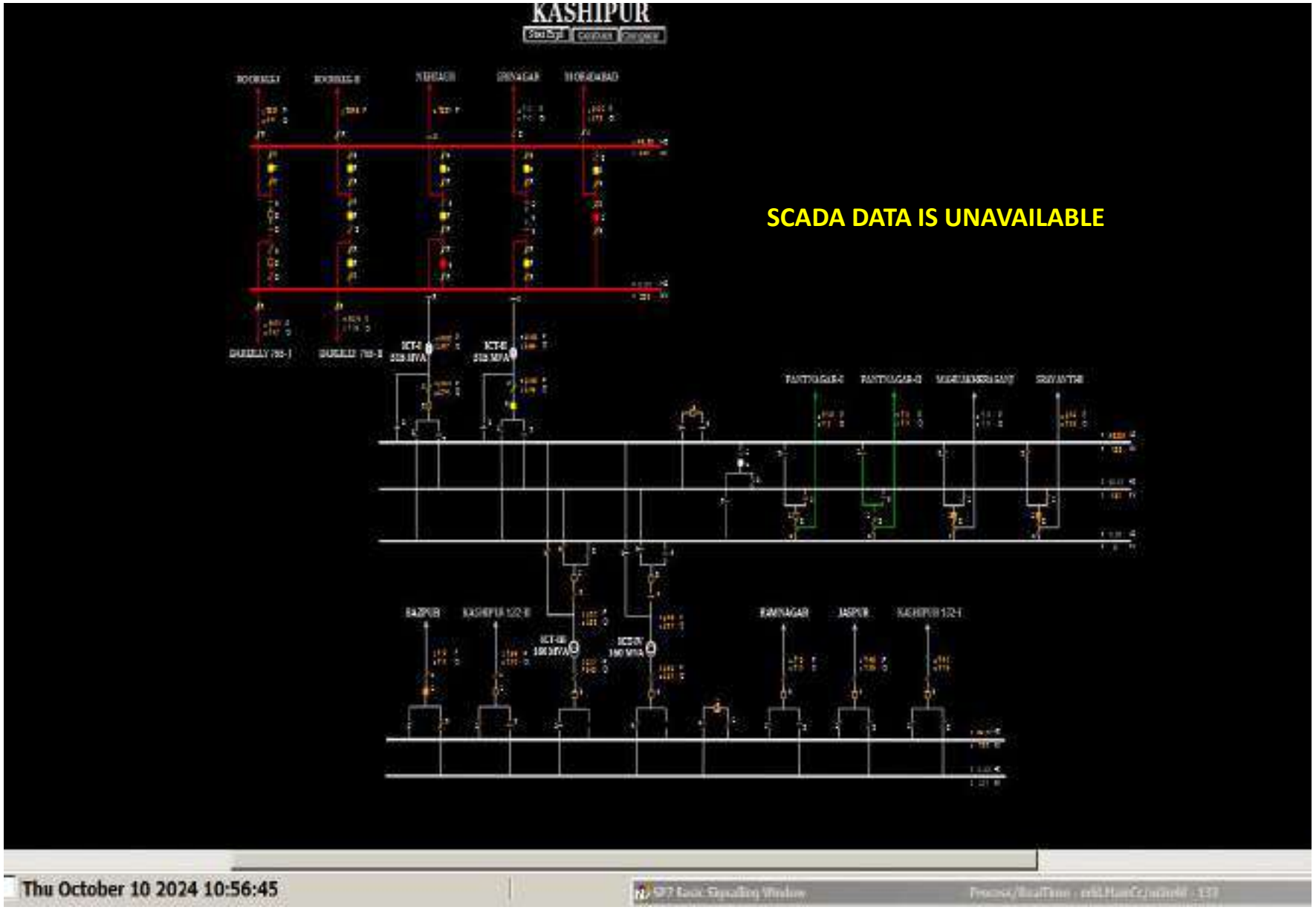
Brief details of the event

- 400/220/132kV Kashipur has 2*315 400/220kV and 2*160MVA 220/132kV ICTs.
- As reported, at 10:56:13.086, 400/220kV 315MVA ICT-2 tripped due to Restricted Earth Fault (REF) protection operation.
- With the tripping of 315MVA ICT-1 at Kashipur, case-2 of SPS for transformers at 400KV Kashipur (PTCUL) substation operated. As a result of the SPS present in Kashipur sub-station, the following lines also tripped
    a. 220kV Jafarpur-Kashipur (UK) Ckt
    b. 220kV Pantnagar – Kashipur (UK) Ckt
    c. 132kV Kahipur – Jaspur (UK) Ckt
- Even after tripping of the aforementioned lines, loading of 315MVA ICT-1 didn't reduce and further increased to ~339MVA. As reported, load of 220kV Kamalwaganja was being fed from 220kV Pantnagar and 132kV Bajpur. After tripping of 220kV Kashipur-Pantnagar ckt, load of Kamalwaganja which was feeding through Kashipur-Pantnagar shifted to Bajpur source. Due to this, loading of 315MVA ICT-3 didn't reduce after SPS operation.
- Further, at 10:56:24.522, 400/220kV 315MVA ICT-1 tripped on Over Current Protection operation. However, from the DR of ICT-1, loading of ICT-1 before tripping was ~107%.
- Further, 220/132kV 160 MVA ICT-3 also tripped at Kashipur. As reported, no flag was observed for the said tripping.
- As per PMU at Roorkee(PG), no fault in system is observed.
- As per SCADA, a change in demand of approx. 247MW is observed in Uttarakhand control area.

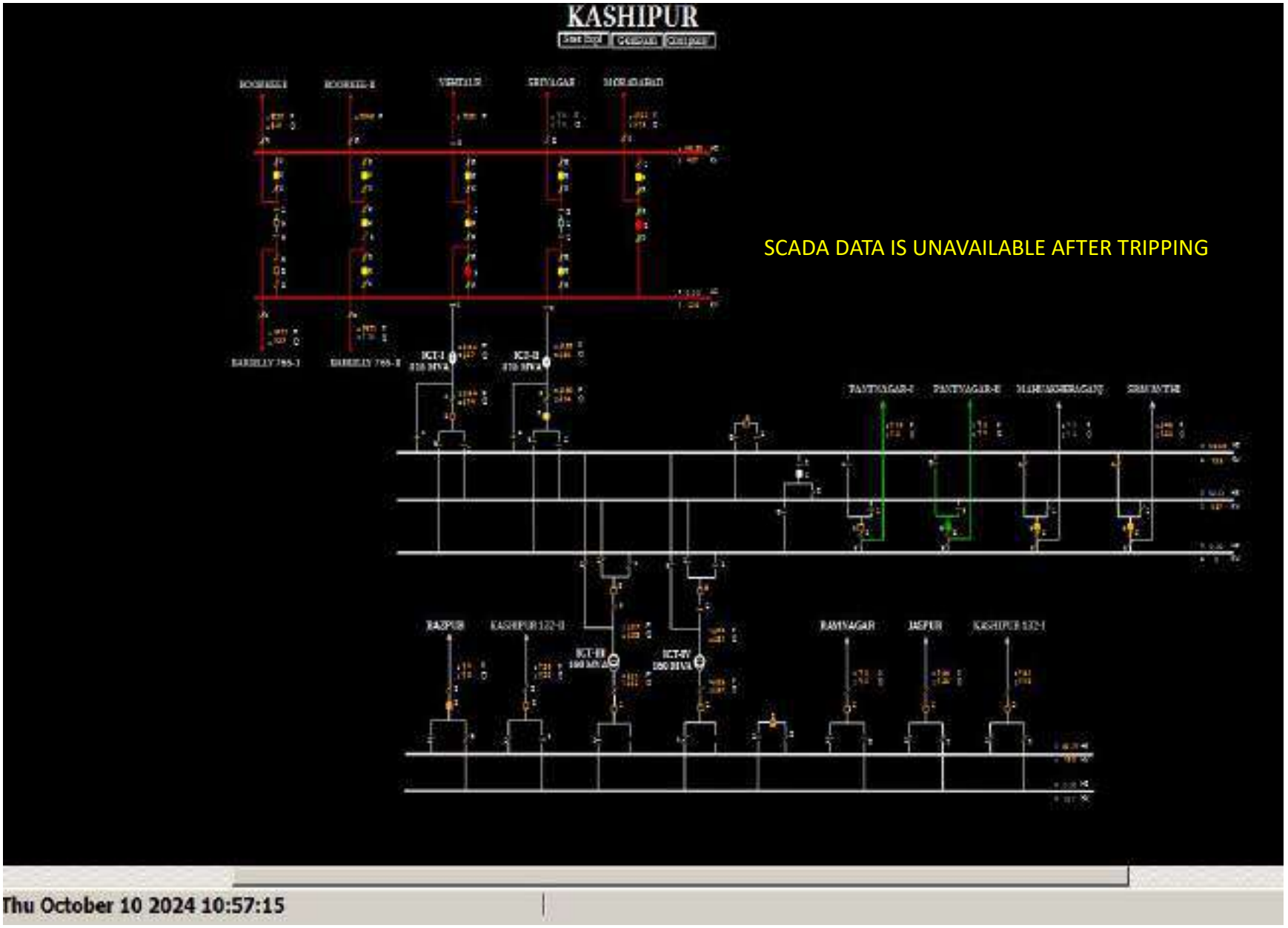
Network Diagram



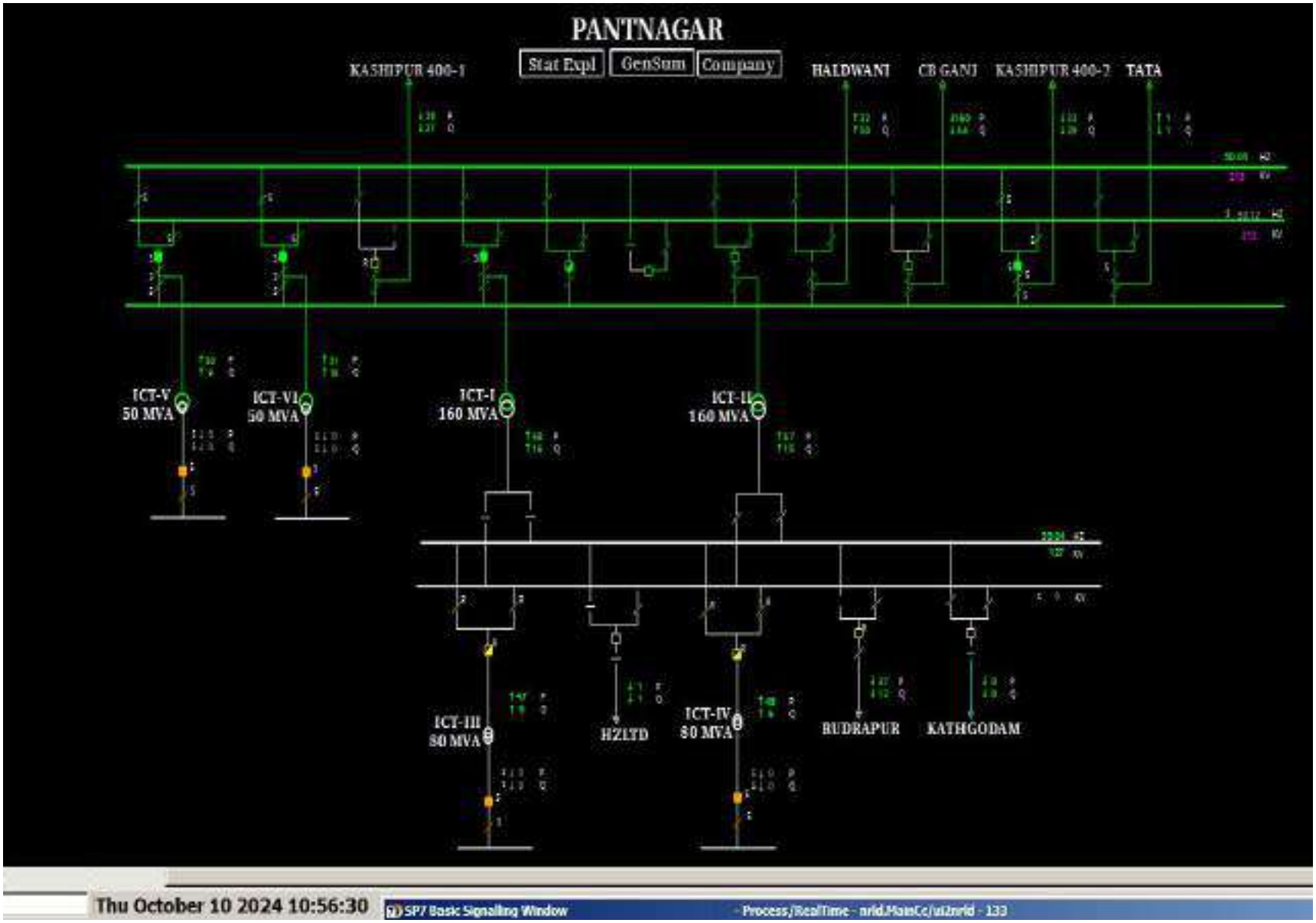
SLD of 400/220kV Kashipur(UK) before the event



SLD of 400/220kV Kashipur(UK) after the event

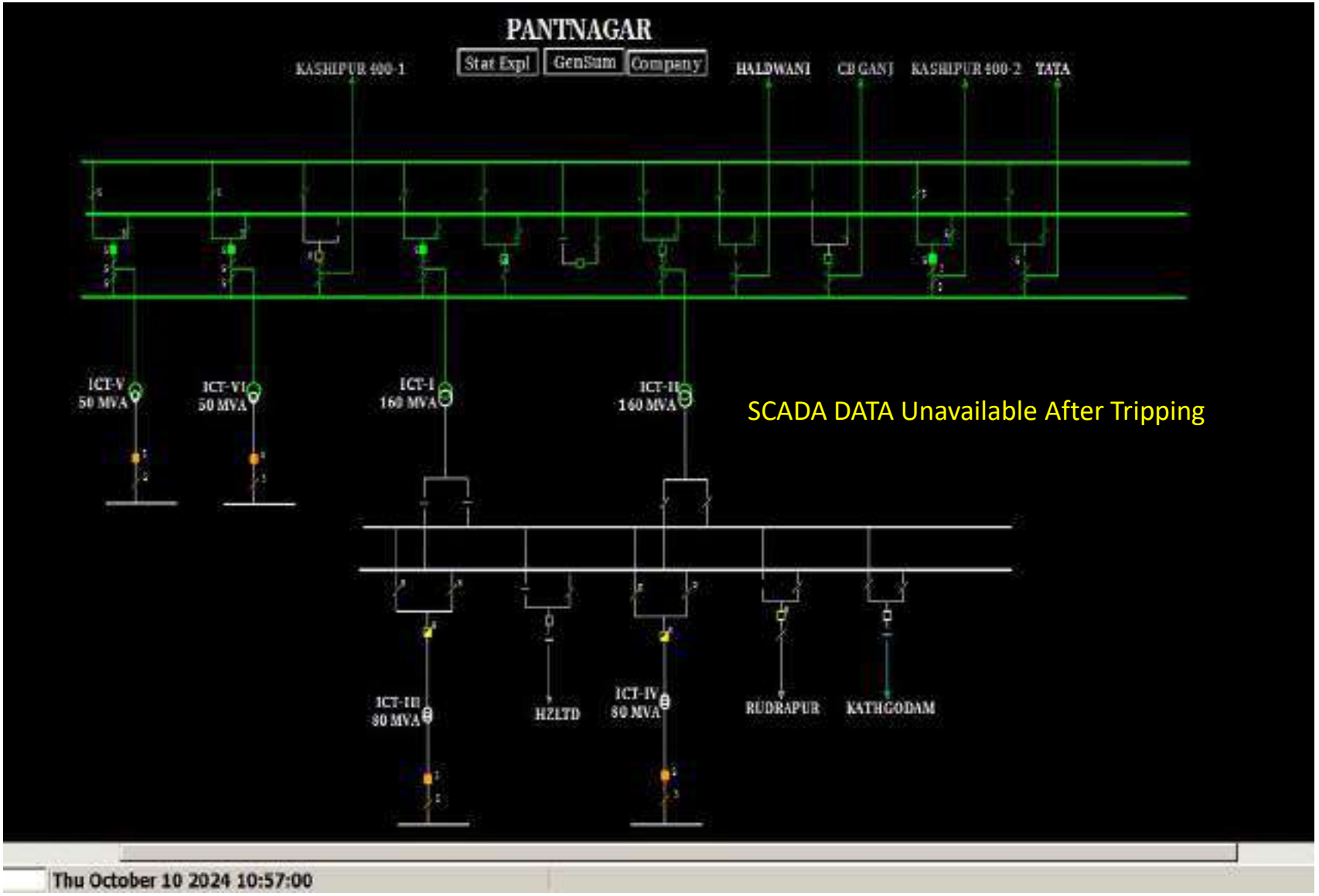


SLD of 220kV PANTNAGAR(UK) before the event

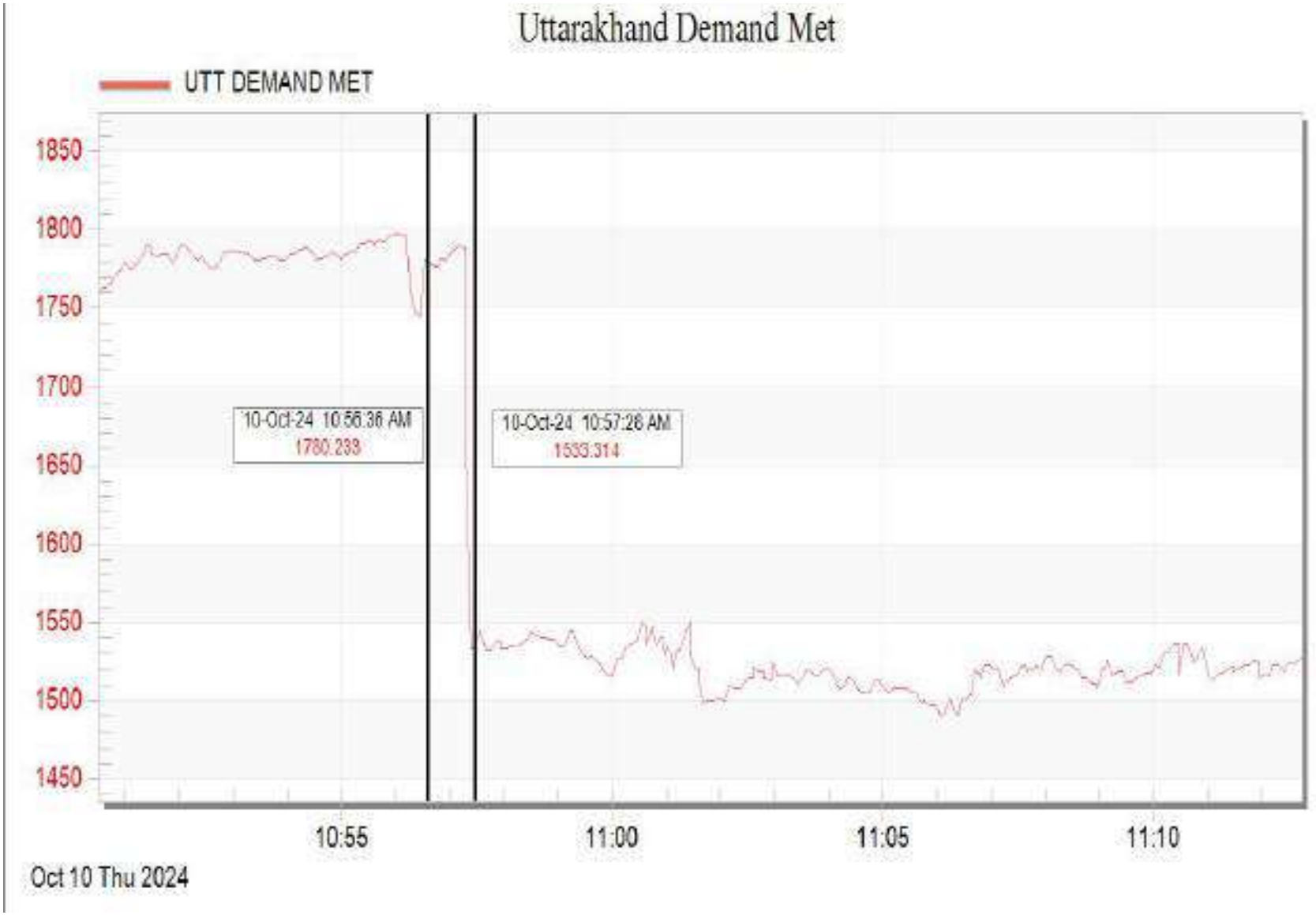


SLD of 220kV PANTNAGAR(UK) After the event

10-Oct-2024/10:57 Hrs



Uttarakhand Demand during the event



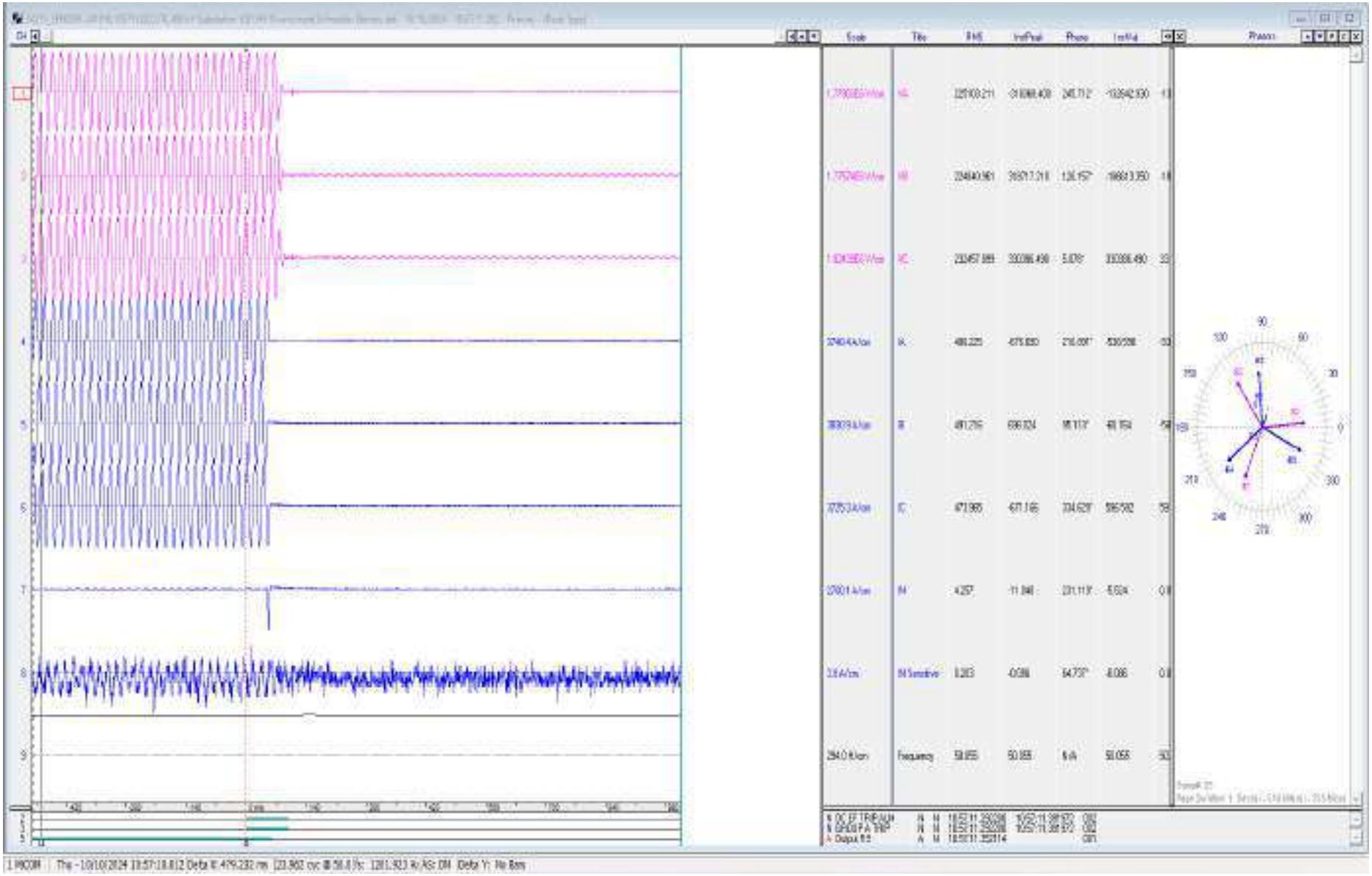
PMU Plot of frequency at Roorkee(UK)

10:57 hrs/10-Oct-24

PMU Plot of phase voltage magnitude at Roorkee(UK)

10:57 hrs/10-Oct-24

DR of 400/220kV 315 MVA ICT-1 at Kashipur(Utt)



O/C E/F protection operated. Phase currents were in the range of ~490A.

Points for Discussion

i) Exact reason of REF protection operation in 400/220kV 315 MVA ICT-2 need to be analysed and shared.

ii) From the DR of ICT-1, loading of ICT before tripping was ~107%. As per NRPC protection philosophy, pick up setting of ICT O/C protection shouldn't be less than 110%. O/C protection setting of ICTs at Kashipur need to be shared and reviewed.

iii) SCADA data of 400/220/132kV Kashipur (UK) S/s was not available during event time. The same needs to be ensured.

iv) SPS system needs to be revised to take care of 132KV Bazpur- Kamalwaganja loading factor.

v) Exact reason of tripping of 220/132kV 160 MVA ICT-3 need to be shared.

vi) DR, EL & tripping report need to be shared from both the ends.

vii) Remedial action taken report to be shared.

Multiple element tripping event at 400/220kV Obra-B(UP)

At 12:52 hrs on 25th October, 2024

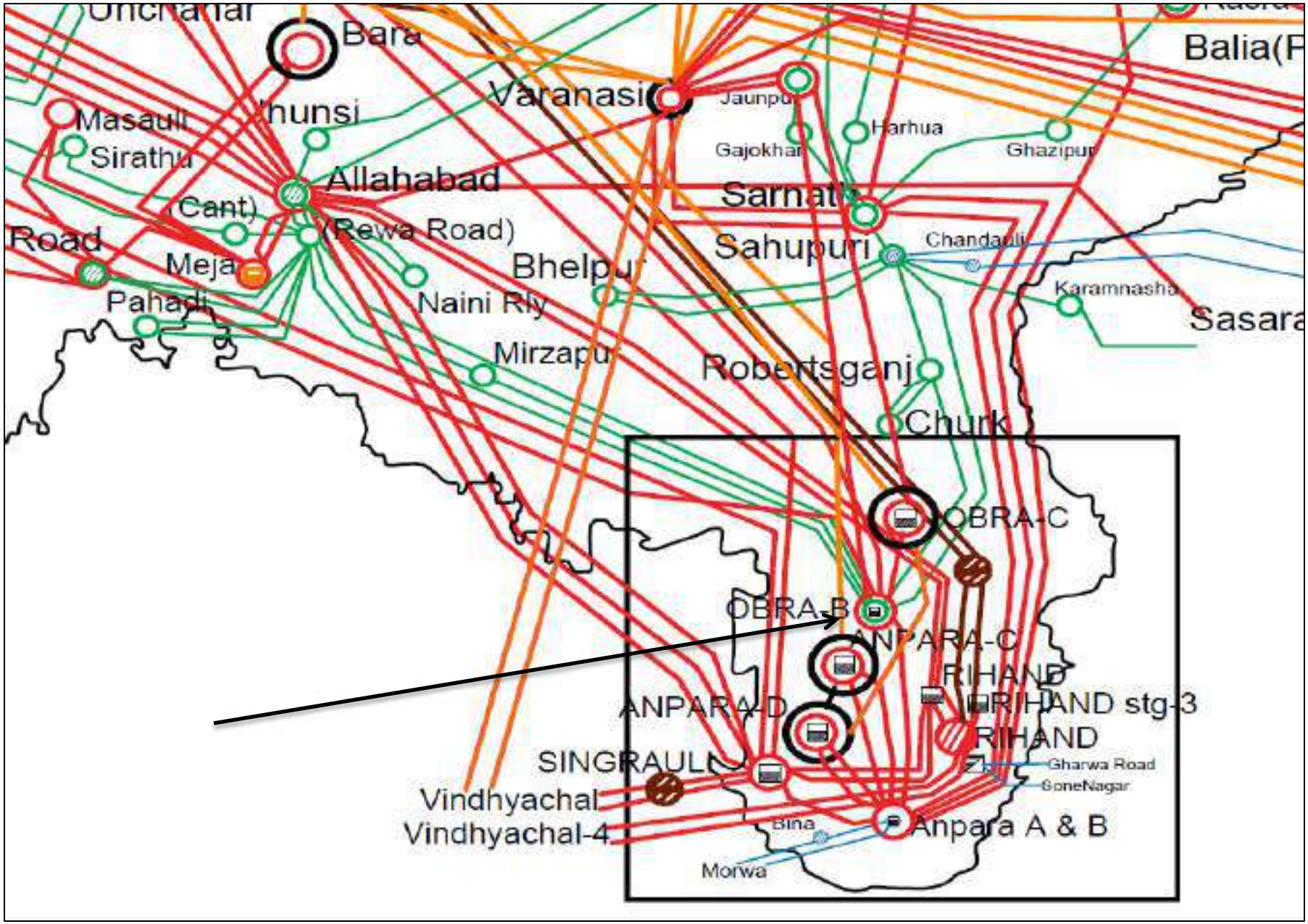
Tripped Elements

S.No.	Name of Element	Tripping Time	Revival Time
1	400KV Bus 1 at Obra-B(UP)	12:52 hrs	14:06 hrs
2	400/220 kV 315 MVA ICT 1 at Obra_B(UP)		18:22 hrs
3	400 KV Obra_B-Rewa Road (UP) Ckt-1		17:30 hrs
4	200 MW Obra TPS - UNIT 09		
5	200 MW Obra TPS - UNIT 11		
6	200 MW Obra TPS - UNIT 13		02:38 hrs on 26th Oct'24

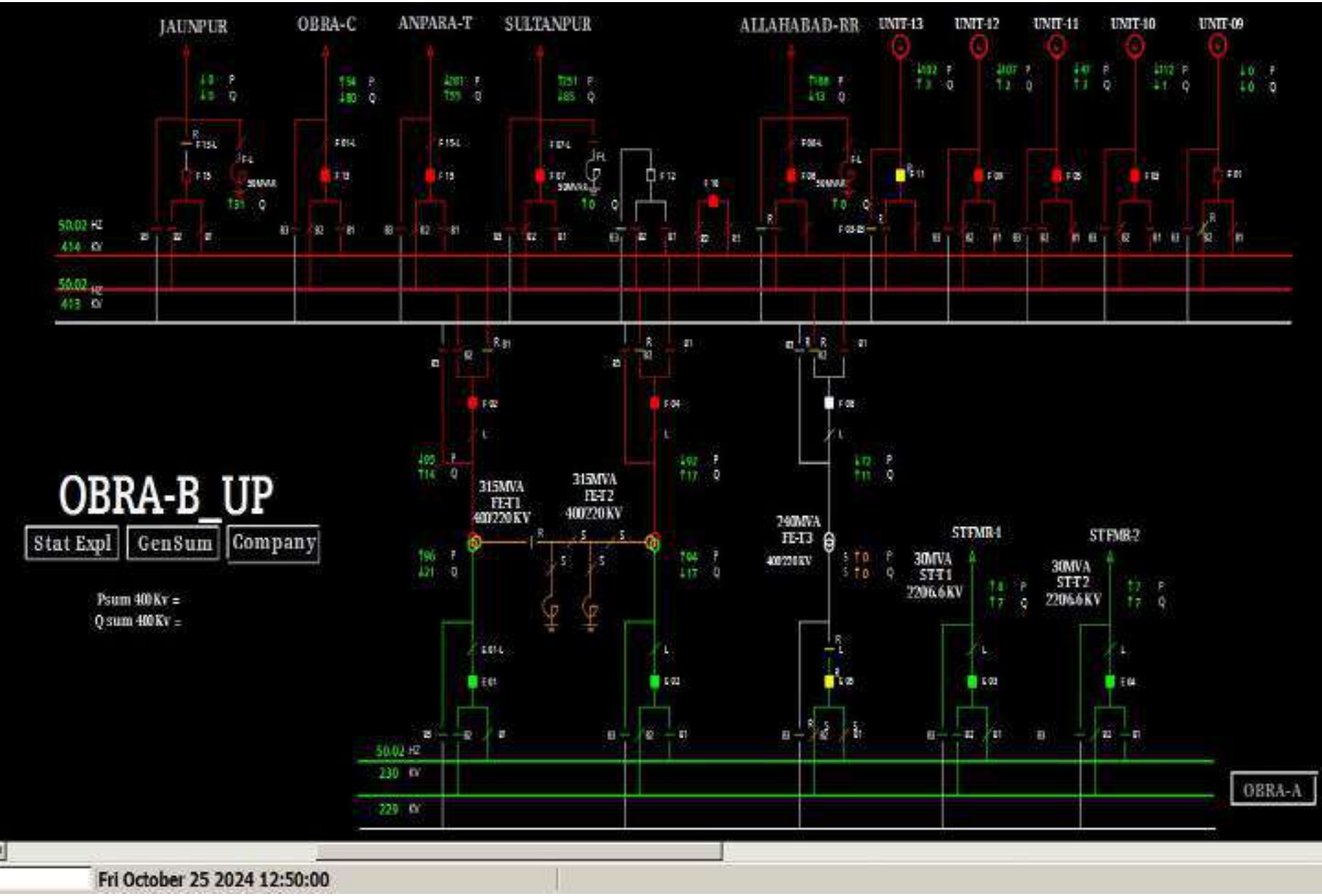
Brief details of the event

- 400/220kV Obra-B(UP) has double main and transfer bus scheme at both 400kV and 220kV level.
- During antecedent condition, 200 MW Obra TPS - UNIT 11 and 13 were generating approx. 48 MW and 102 MW respectively. 200 MW Obra TPS - UNIT 09 was under tripped condition since 09:57 hrs on 25th Oct'24. 400/220 kV 315 MVA ICT 1 at Obra_B(UP), 400 KV Obra_B-Rewa Road (UP) Ckt-1 and 200 MW Obra TPS - UNIT 09, 11 & 13 were connected to 400KV Bus 1 at Obra-B(UP) and rest of the elements were connected to 400KV Bus 2 at Obra-B(UP).
- As reported, at 12:52 hrs, while synchronizing 200 MW Obra TPS - UNIT 09, busbar differential protection operated at 400KV Bus 1 at Obra-B(UP) (exact reason of busbar protection operation yet to be shared).
- Due to busbar protection operation, all the elements connected to 400kV Bus-1 at Obra-B(UP) tripped and Bus-1 became dead.
- As per PMU at Anpara-TH(UP), B-N phase to earth fault is observed with fault clearing time of 120 ms.
- As per SCADA, no change in demand is observed in UP control area. However, generation loss of approx. 150 MW occurred at Obra-B(UP).
- As reported by Obra-B, after investigation it was found that interrupter unit of CB at 400kV side of 200 MW Obra TPS - UNIT 09 was damaged. This CGL make SF_6 type CB which was commissioned on 30th Nov'23 and was continuously in service since 16th Feb'24, is under warranty period. CGL service engineer was called for detailed analysis regarding the same as primarily it seems that there is some manufacturing defect of CB.

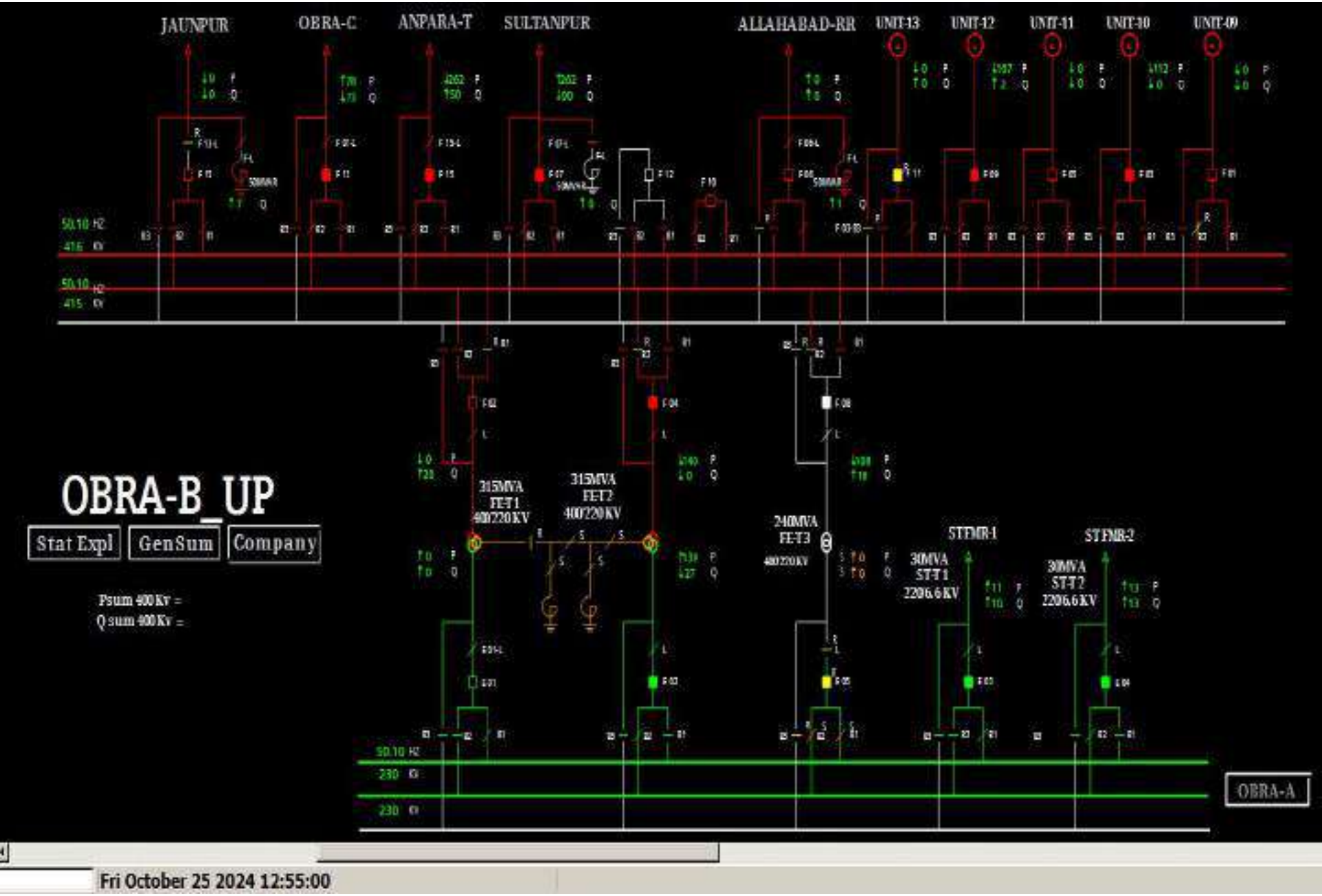
Network Diagram



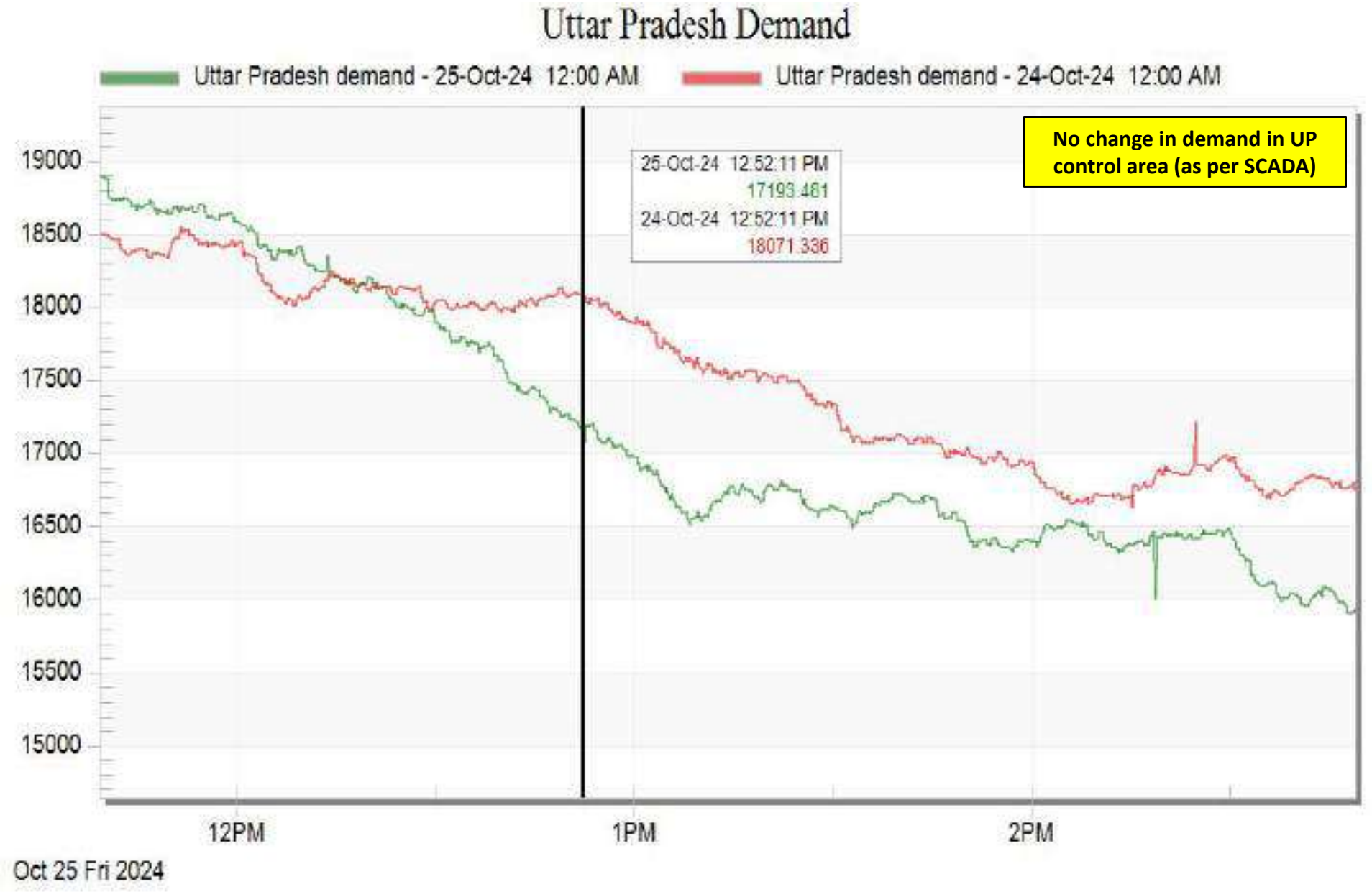
SLD of 400/220kV Obra-B(UP) before the event



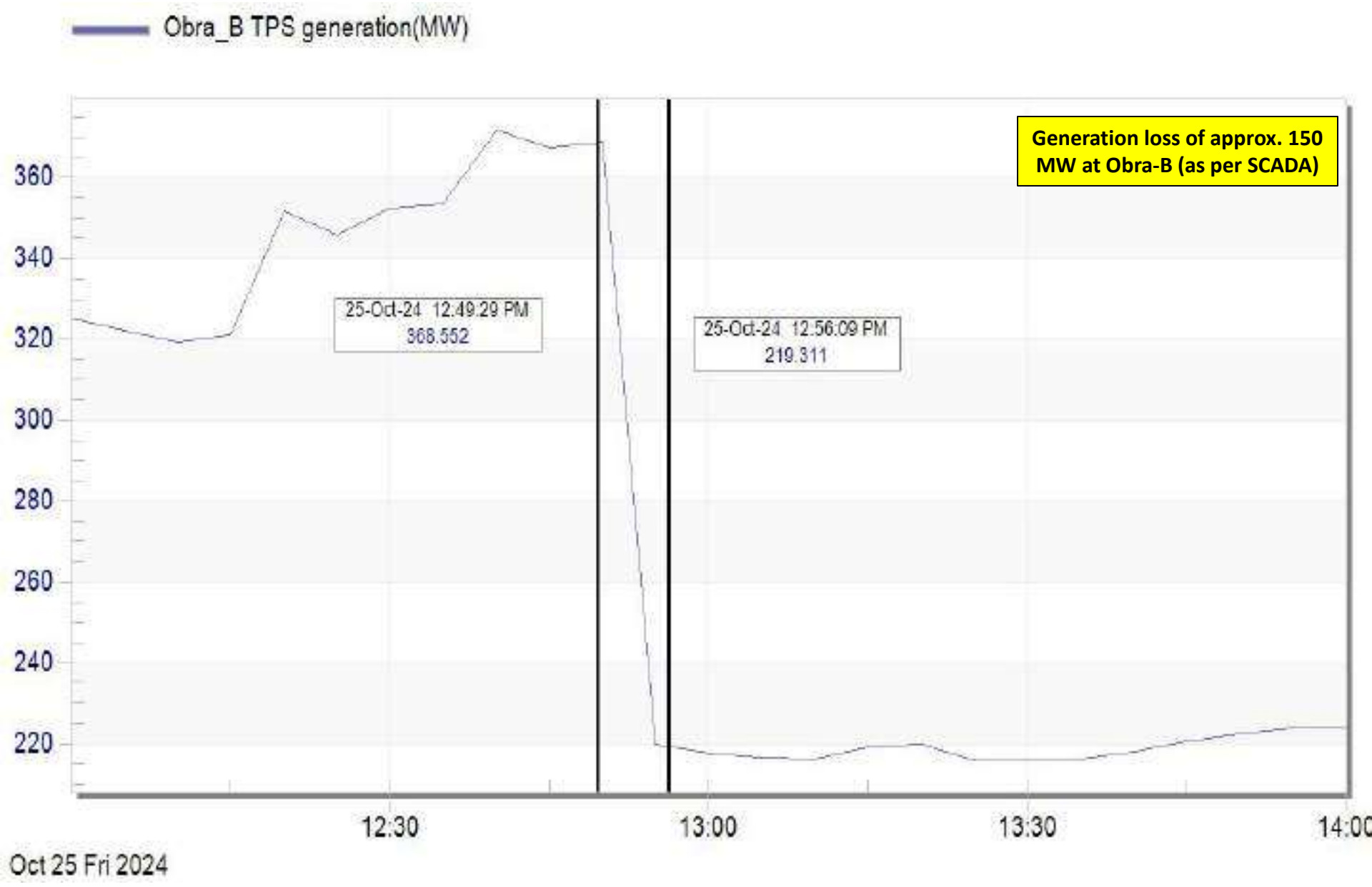
SLD of 400/220kV Obra-B(UP) after the event



Uttar Pradesh Demand during the event



Obra-B generation during the event



Station Event Logger Details at Obra-B(UP)

	Date	Time	Message Group	Wincc Message Text	Value	Cause	Additional cause
87	25/10/2024	12.41.55.895	OBRA SS:400KV:413_JAUNPUR LINE#21_1	DIST ZONE-1 PICKUP	CLEARED	spontaneous	no error
88	25/10/2024	12.41.55.895	OBRA SS:400KV:413_JAUNPUR LINE#21_1	DIST ZONE-1 B-PH OPTD	CLEARED	spontaneous	no error
89	25/10/2024	12.41.55.895	OBRA SS:400KV:413_JAUNPUR LINE#21_1	DIST ZONE-1 Y-PH OPTD	CLEARED	spontaneous	no error
90	25/10/2024	12.41.55.895	OBRA SS:400KV:413_JAUNPUR LINE#21_1	DIST ZONE-1 R-PH OPTD	CLEARED	spontaneous	no error
91	25/10/2024	12.41.55.895	OBRA SS:400KV:413_JAUNPUR LINE#21_1	DIST ZONE-1 OPTD	CLEARED	spontaneous	no error
92	25/10/2024	12.52.00.940	OBRA SS:400KV:410_BC:86_51N	GENERAL PICKUP	RAISED	spontaneous	no error
93	25/10/2024	12.52.00.940	OBRA SS:400KV:410_BC:86_51N	DMT B/F STAGE-1 PICKUP	RAISED	spontaneous	no error
94	25/10/2024	12.52.00.940	OBRA SS:400KV:410_BC:86_51N	DMT GENERAL PICKUP	RAISED	spontaneous	no error
95	25/10/2024	12.52.00.948	OBRA SS:400KV:410_BC:86_51N	IDMT B/F PICKUP	RAISED	spontaneous	no error
96	25/10/2024	12.52.00.952	OBRA SS:220KV:204_ST-I:64T	GENERAL PICKUP	RAISED	spontaneous	no error
97	25/10/2024	12.52.00.952	OBRA SS:220KV:204_ST-I:64T	GENERAL PICKUP	RAISED	spontaneous	no error
98	25/10/2024	12.52.00.956	OBRA SS:220KV:203_ST-I:64T	DMT GENERAL PICKUP	RAISED	spontaneous	no error
99	25/10/2024	12.52.00.956	OBRA SS:220KV:203_ST-I:64T	GENERAL PICKUP	RAISED	spontaneous	no error
100	25/10/2024	12.52.01.010	OBRA SS:400KV:401_UNIT-II:BCU	86.1_86.2_86.3_86.4_86.5 RELAY OPTD	RAISED	spontaneous	no error
101	25/10/2024	12.52.01.024	OBRA SS:400KV:400:MCU1	B401 3-PH LBB INITIATION	RAISED	spontaneous	no error
102	25/10/2024	12.52.01.028	OBRA SS:400KV:400:MCU2	B401 3-PH LBB INITIATION	RAISED	spontaneous	no error
103	25/10/2024	12.52.01.129	OBRA SS:400KV:400:MCU2	Trip repeat Bay Unit @01 phase L1	RAISED	spontaneous	no error
104	25/10/2024	12.52.01.130	OBRA SS:400KV:400:MCU2	Total: TRIP phsC	RAISED	spontaneous	no error
105	25/10/2024	12.52.01.130	OBRA SS:400KV:400:MCU2	Total: TRIP phsB	RAISED	spontaneous	no error
106	25/10/2024	12.52.01.130	OBRA SS:400KV:400:MCU2	Total: TRIP phsA	RAISED	spontaneous	no error
107	25/10/2024	12.52.01.130	OBRA SS:400KV:400:MCU2	Trip repeat Bay Unit @01 phase L3	RAISED	spontaneous	no error
108	25/10/2024	12.52.01.130	OBRA SS:400KV:400:MCU2	Trip repeat Bay Unit @01 phase L2	RAISED	spontaneous	no error
109	25/10/2024	12.52.01.135	SICAM GW: IEC 61850 ClientInterface:MCU	Trip repeat Bay Unit @01 phase L3	RAISED	spontaneous	no error
110	25/10/2024	12.52.01.135	OBRA SS:400KV:400:MCU1	Trip repeat Bay Unit @01 phase L3	RAISED	spontaneous	no error
111	25/10/2024	12.52.01.135	OBRA SS:400KV:400:MCU1	Trip repeat Bay Unit @01 phase L2	RAISED	spontaneous	no error
112	25/10/2024	12.52.01.196	OBRA SS:220KV:203_ST-I:64T	DMT GENERAL PICKUP	CLEARED	spontaneous	no error
113	25/10/2024	12.52.01.196	OBRA SS:220KV:203_ST-I:64T	GENERAL PICKUP	CLEARED	spontaneous	no error
114	25/10/2024	12.52.01.222	OBRA SS:220KV:204_ST-I:64T	GENERAL PICKUP	CLEARED	spontaneous	no error
115	25/10/2024	12.52.01.222	OBRA SS:220KV:204_ST-I:64T	GENERAL PICKUP	CLEARED	spontaneous	no error
116	25/10/2024	12.52.01.252	OBRA SS:400KV:400:MCU2	BF TRIP T1	RAISED	spontaneous	no error
117	25/10/2024	12.52.01.252	OBRA SS:400KV:400:MCU2	DIFF TRIP	RAISED	spontaneous	no error
118	25/10/2024	12.52.01.252	OBRA SS:400KV:400:MCU2	Trip command BF for BB1 phase L3	RAISED	spontaneous	no error
119	25/10/2024	12.52.01.252	OBRA SS:400KV:400:MCU2	Trip command BF for BB1 phase L2	RAISED	spontaneous	no error
120	25/10/2024	12.52.01.252	OBRA SS:400KV:400:MCU2	Trip command BF for BB1 phase L1	RAISED	spontaneous	no error
121	25/10/2024	12.52.01.252	OBRA SS:400KV:400:MCU2	Trip commans for BB1 (group alarm)	RAISED	spontaneous	no error
122	25/10/2024	12.52.01.268	OBRA SS:400KV:400:MCU1	GENERAL OPTD	RAISED	spontaneous	no error
123	25/10/2024	12.52.01.268	OBRA SS:400KV:400:MCU1	Trip commans for BB1 (group alarm)	RAISED	spontaneous	no error
124	25/10/2024	12.52.01.268	OBRA SS:400KV:400:MCU1	Trip command BF for BB1 phase L3	RAISED	spontaneous	no error
125	25/10/2024	12.52.01.268	OBRA SS:400KV:400:MCU1	Trip command BF for BB1 phase L2	RAISED	spontaneous	no error
126	25/10/2024	12.52.01.268	OBRA SS:400KV:400:MCU1	Trip command BF for BB1 phase L1	RAISED	spontaneous	no error
127	25/10/2024	12.52.01.284	OBRA SS:400KV:405_REWA_ROAD LINE_REC	96 TRIP RELAY OPTD	RAISED	spontaneous	no error
128	25/10/2024	12.52.01.288	OBRA SS:400KV:411_UNIT-II:BCU	96 TRIP RELAY OPTD	RAISED	spontaneous	no error
129	25/10/2024	12.52.01.288	OBRA SS:400KV:405_UNIT-II:BCU	96 TRIP RELAY OPTD	RAISED	spontaneous	no error

Busbar differential operated at 400KV Bus 1 at Obra-B(UP)

PMU Plot of frequency at Anpara-TH(UP)

12:52 hrs/25-Oct-24

PMU Plot of phase voltage magnitude at Anpara-TH(UP)

12:52 hrs/25-Oct-24

SCADA SOE

Time	Station Name	Voltage Level	Element Name	Element Type	Element Status	Remarks
12:52:01,310	OBRAB_UP	400kV	05U11	Circuit Breaker	Open	CB at 400kV side of 200 MW Obra TPS - UNIT 11 opened
12:52:01,315	OBRAB_UP	400kV	02T1	Circuit Breaker	Open	CB at 400kV side of 400/220 kV 315 MVA ICT 1 at Obra_B(UP) opened
12:52:01,317	OBRAB_UP	400kV	10MBC	Circuit Breaker	Open	Main Bus Coupler CB at 400kV Obra_B(UP) opened
12:52:01,330	OBRAB_UP	400kV	07ALHA1	Circuit Breaker	Open	Line CB at Obra_B(UP) end of 400 KV Obra_B-Rewa Road (UP) Ckt opened
12:52:01,361	OBRAB_UP	220kV	01T1	Circuit Breaker	Open	CB at 220kV side of 400/220 kV 315 MVA ICT 1 at Obra_B(UP) opened
12:52:01,363	JAUNP_UP	400kV	04OBRAB	Circuit Breaker	Open	Main CB at Jaunpur(UP) end of 400kV Obra_B-Jaunpur (UP) Ckt opened
12:52:01,502	JAUNP_UP	400kV	05OBRT1	Circuit Breaker	Open	Tie CB at Jaunpur(UP) end of 400kV Obra_B-Jaunpur (UP) Ckt opened

Points for Discussion

i) Exact reason of bus bar operation of 400kV Bus-1 at Obra-B(UP) need to be shared.

ii) DR/EL (.dat/.cfg file) of all the tripped elements along with detailed tripping report need to be shared from both the ends.

iii) Remedial action taken report to be shared.

INCIDENT OF 400KV OBRA BTPS ON DATED 25 OCTOBER 2024

PRESENTED BY

SWAPNIL YADAV

AE, EMD-I, BTPS, OBRA

Failure of 400KV Circuit Breaker of Unit-09 which causes tripping of 400KV BUS-I and associated elements.

- **Date & Time of event**: 25.10.2024 at 12:52 hrs
- **Sub-Station affected**: 400/220KV, 5x200MW OBRA BTPS
- **Date & Time of restoration**: As per below table

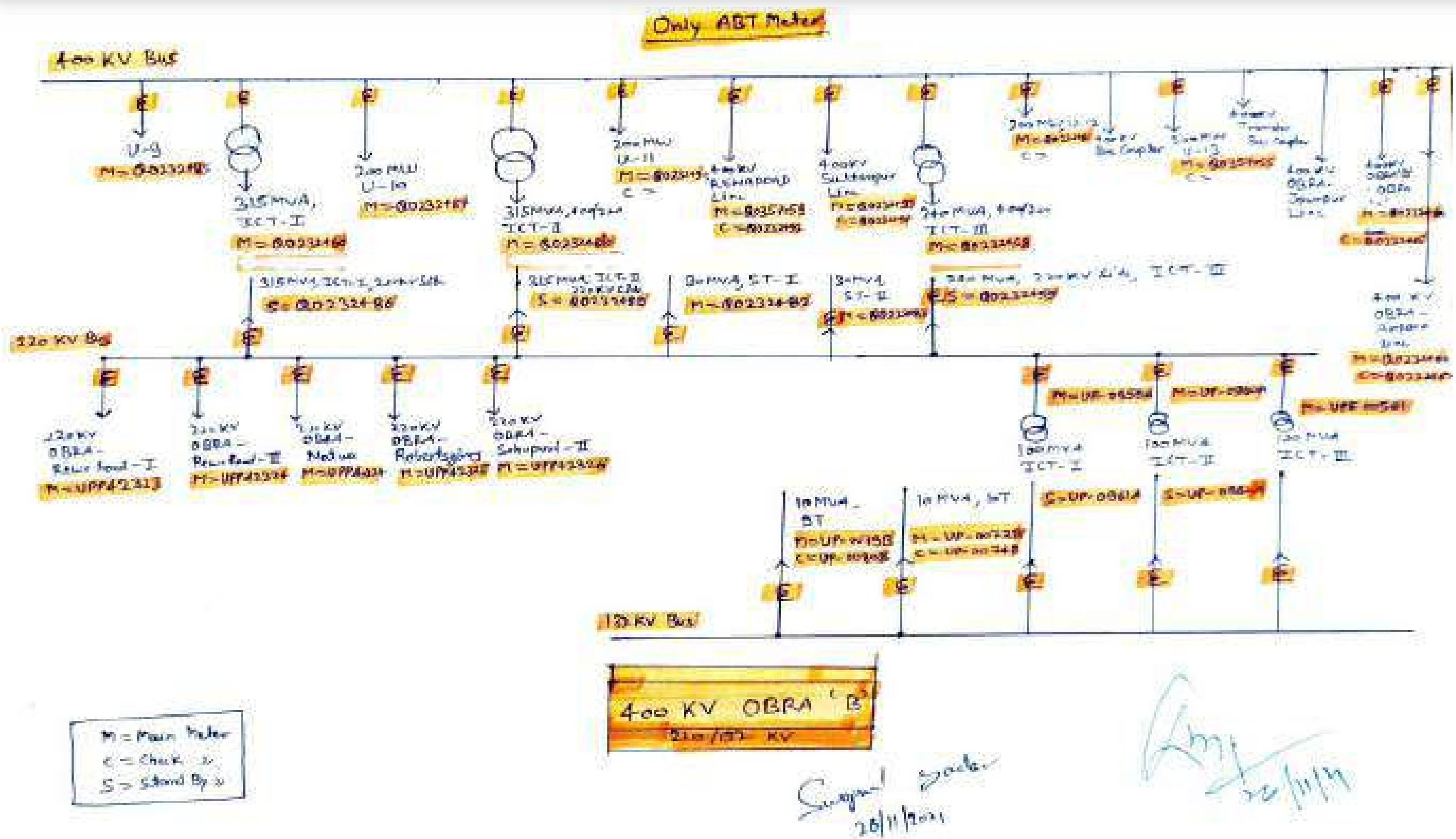
S.NO	NAME OF ELEMENT	LOAD IN MW (Before The Incident)	TRIPPING DATE	TRIPPING TIME	RESTORATION DATE	RESTORATION TIME
1	200MW UNIT-09	0 MW	25.10.2024	12.52:01,010	29.10.2024	01:08
2	315 MVA, 400/220KV ICT-I	88 MW	25.10.2024	12.52:01,288	25.10.2024	18:22
3	400 KV Obra- Rewa Road	190 MW	25.10.2024	12.52:01,286	25.10.2024	17:30
4	400 KV BUS-I	N/A	25.10.2024	12.52:01,289	25.10.2024	14:06
5	200 MW UNIT-13	102 MW	25.10.2024	12.52:01,288	26.10.2024	02:38
6	200 MW UNIT-11	49 MW	25.10.2024	12.52:01,288	27.10.2024	08:36
7	400KV BUS COUPLER	63 MW	25.10.2024	12.52:01,289	25.10.2024	14:06

ELEMENT STATUS OF 400KV BTPS JUST BEFORE TRIPPING

2 Main & 1 Transfer Bus Scheme Used in 400/220KV OBRA BTPS which is distributed in following manner just before tripping.

- **400 KV BUS-I:-** 200MW Unit-9, 315MVA 400/220/33kV ICT-I, 400kV Obra- Rewa Road line, 200MW Unit-13, 200MW Unit-11.
- **400 KV BUS-II:-** 315MVA 400/220/33V ICT-II, 240MVA 400/220/33 kV ICT-III, 400kV Obra- Sultanpur line, 400kV Obra-Anpara Line, 200MW Unit-10, 200MW Unit-12, 400 kV OBRA'B'-OBRA'C' Line.
- **400kV BUS-I & II**: Coupled through 400 KV Bus Coupler.

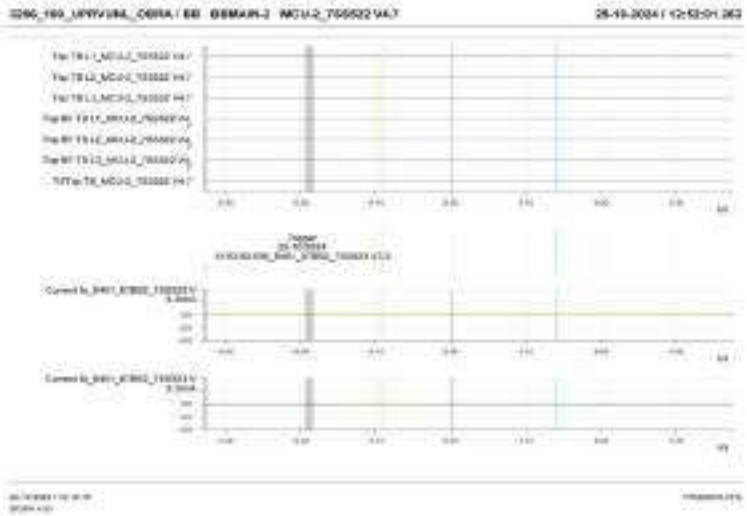
SLD OF 400 /220 KV BTPS

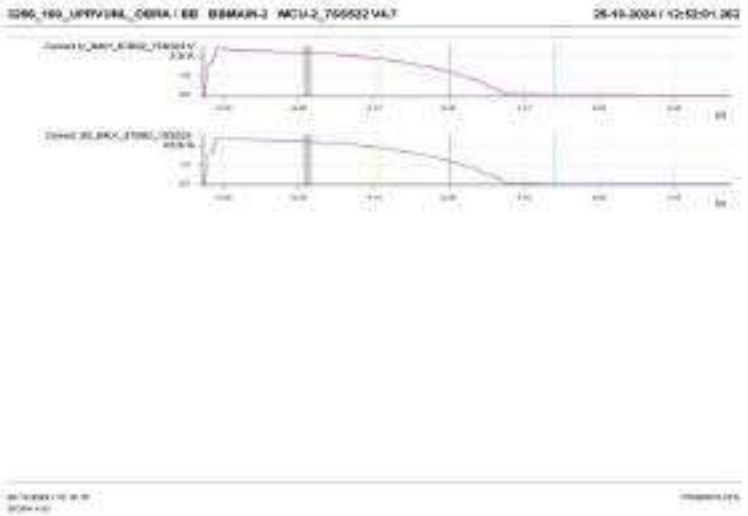


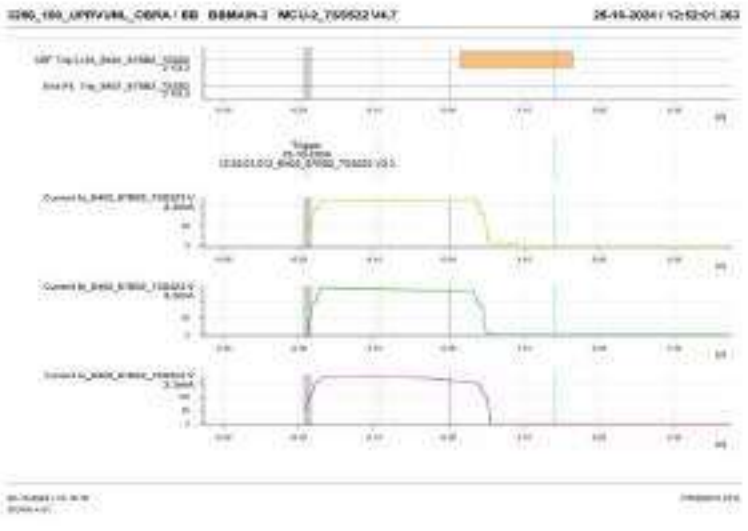
DETAIL OF INCIDENT

- On dated 25.10.2024 unit is running normally at 122MW through 400kv Bus-I and tripped at 09:56:58,931 hrs on turbine MOT level low protection, while unit is light up and going to synchronised, at 12:52:00 hrs when field circuit breaker of excitation system put in ON position, (till time main breaker is in OFF position) current of B PHASE is increasing.
- Due to above B phase current of whole system connected to this bus also increased, as per relay data of 400KV bus-coupler current increased 170 A to 1900 A.
- During this incident GT Backup O/C protection operated which caused operation of lockout relay of unit#9 at 12:52:01,010 hrs and initiated LBB protection of this bay.
- As per LBB relay, B phase current in this bay continuously flowing which causes reattempt of tripping of this breaker after 120ms (at 12:52:01,129 hrs) by LBB protection, but it is already in OPEN position.
- Finally, LBB protection operated at 12:52:01,288 hrs and all elements of 400KV BUS-I tripped including 400KV bus coupler. Breaker interrupter unit of this breaker (towards 400KV BUS) damaged and all porcelain part scattered in beside bay also.

LBB RELAY DR OF INCIDENT







HISTORY OF Unit#9 400KV CIRCUIT BREAKER

- In 200 MW, Unit#09 CG Power make 400KV SF6 Circuit Breaker has been installed. Above breaker was commissioned on 30.11.2023, successfully charged since 16.02.2024 and continuously in service.

REMEDIAL MEASURE FOR 400kV CIRCUIT BREAKER

- Damaged B Pole replaced with available new spare pole at site. After replacement of this pole remaining two pole tested in following manner for assurance of not repeating this incident in.

  Mechanical 50 operation, before and after CRM test. IR test, Dew point, timing test also performed as per standard.

- CG Power (OEM) requested for analysis of root cause and submit their detail report.

THANKYOU

Multiple element tripping event at 220/132kV Dausa(RS)

At 15:32 hrs on 21st October, 2024

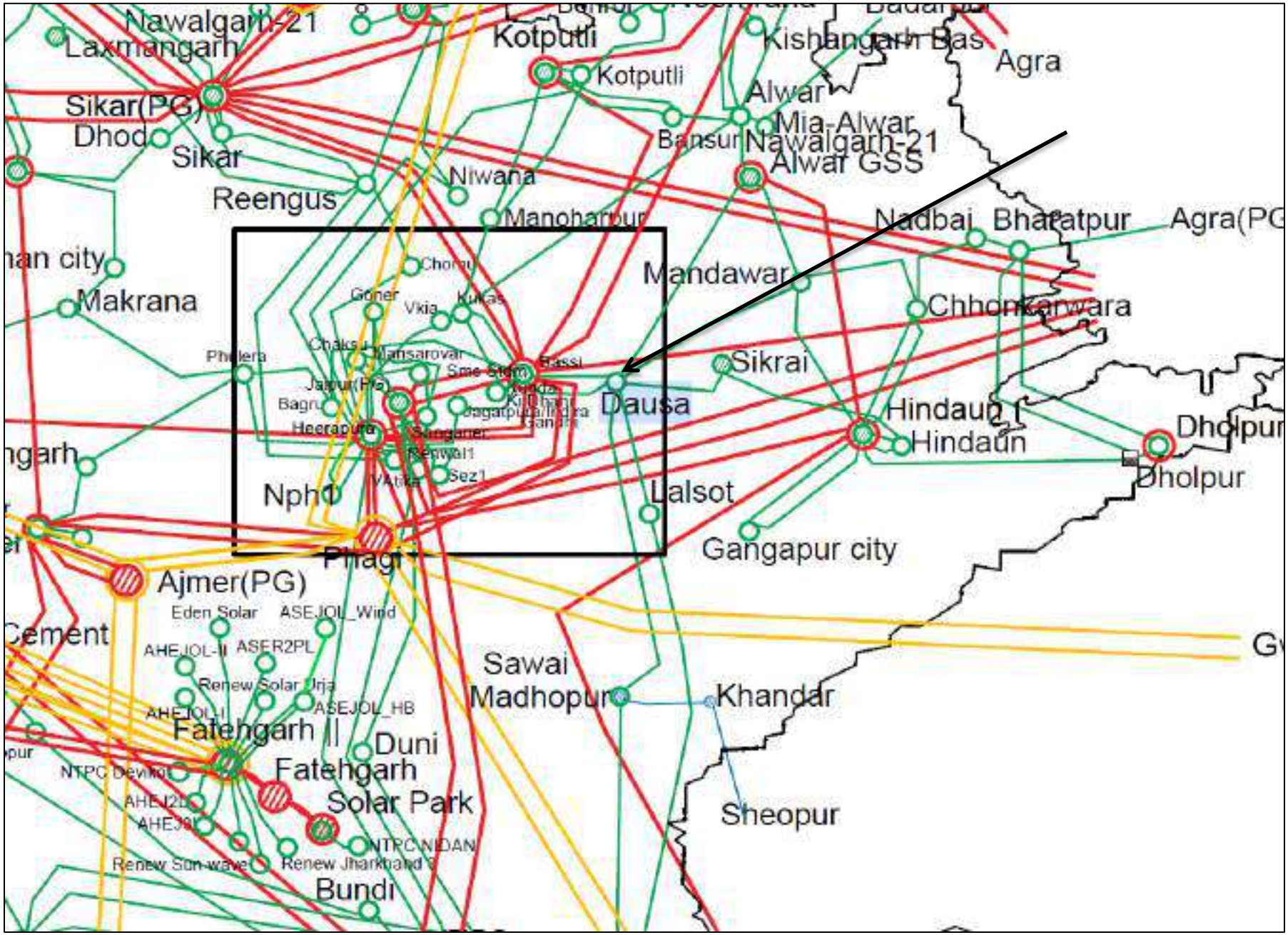
Tripped Elements

S.No.	Name of Element	Tripping Time	Revival Time
1	220 KV Lalsote(RS)-Dausa(RS) (PG) Ckt	15:32 hrs	18:04 hrs
2	220 KV Sawaimadhopur(RS)-Dausa(RS) (PG) Ckt		18:13 hrs
3	220 KV Bassi(PG)-Dausa(RS) (PG) Ckt-1		17:57 hrs
4	220 KV Bassi(PG)-Dausa(RS) (PG) Ckt-2		17:57 hrs
5	220 KV Mandawar(RS)-Dausa(RS) Ckt		18:06 hrs
6	220 KV Sikrai(RS)-Dausa(RS) Ckt		16:08 hrs
7	220/132kV 160MVA ICT-1 at Dausa(RS)		18:00 hrs
8	220/132kV 100MVA ICT-2 at Dausa(RS)		17:57 hrs

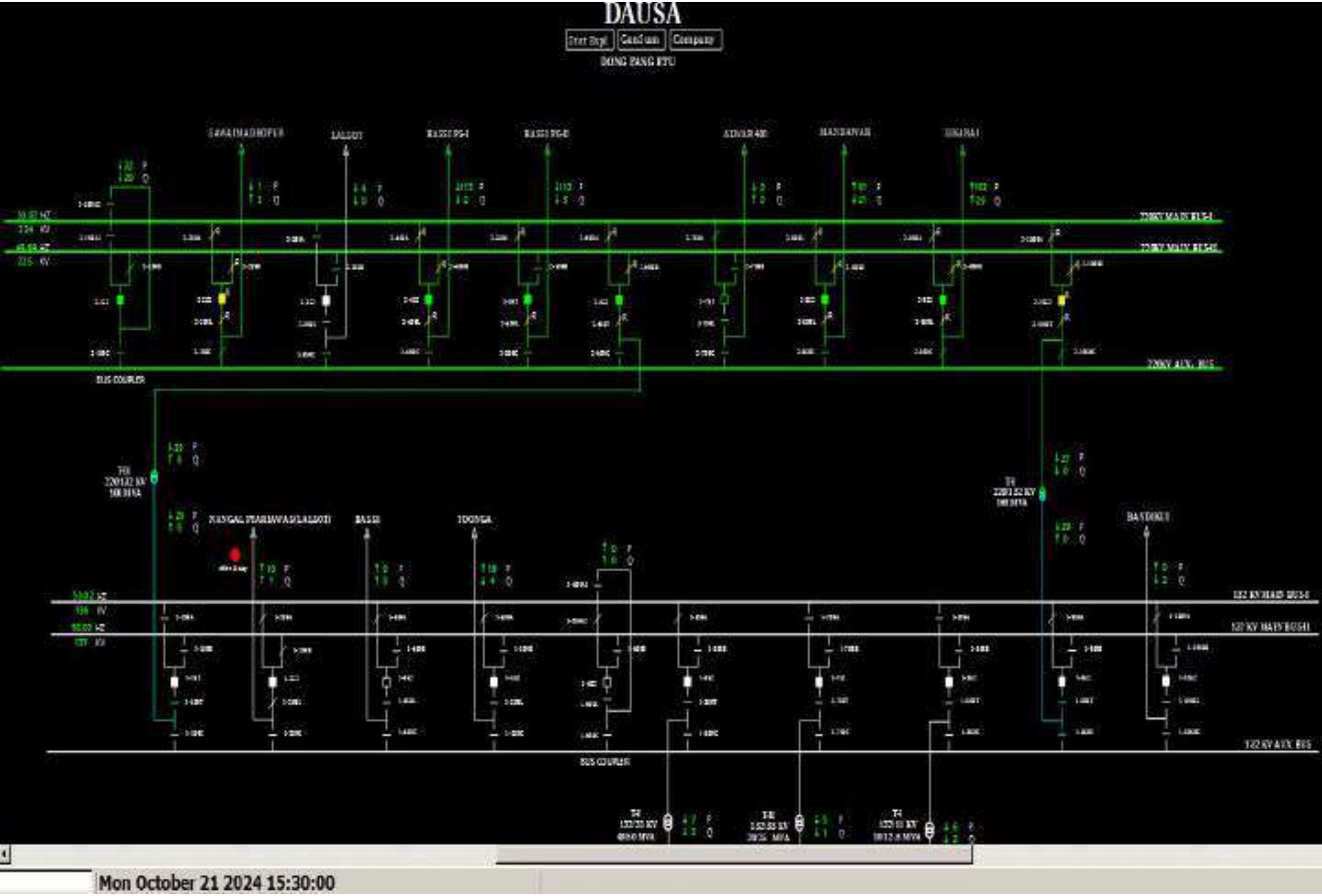
Brief details of the event

- 220/132kV Dausa(RS) has double main and transfer bus scheme at 220kV level.
- During antecedent condition, 220 kV Alwar(RS)-Dausa(RS) Ckt was not in service.
- As reported, at 15:32 hrs, R-phase CVT of Main-Bus-I flashover occurred due to reptile climbing on structure at Dausa end and bus fault created. Bus bar protection at Dusa(RS) was not operational during the event and due to delay in opening of bus coupler (bus coupler opening delay setting was 110ms), fault was also sensed by Main Bus-II.
- Due to this bus fault, all the 220kV lines connected to Bus-I & II at Dausa(RS) sensed the fault in zone-4 and fault cleared from Dausa(RS) end in zone-4 (zone-4 delay setting was 160ms). But in 220 KV Lalsote(RS)-Dausa(RS) (PG) Ckt and 220 KV Bassi(PG)-Dausa(RS) (PG) Ckt-2, CB didn't open from Dausa(RS) end and finally fault cleared in zone-2 from remote end.
- During the same time, 220/132kV 160MVA ICT-1 and 100MVA ICT-2 at Dausa(RS) also tripped on over-current protection operation (exact reason yet to be shared).
- As all the elements connected to both the 220kV buses tripped and there was no source of supply at 132kV level, complete blackout occurred at 220/132kV Dausa(RS) S/s.
- As per DR at Lalsote end of 220 KV Lalsote(RS)-Dausa(RS) (PG) Ckt, R-N phase to earth fault occurred with fault current of 1.729kA from Lalsote end and fault sensed in zone-2 at Lalsote end.
- As per PMU at Bassi(PG), R-N phase to earth fault converted to R-B-N double phase to earth fault with delayed fault clearing time of 560ms is observed.
- As per SCADA, change in demand of approx. 170 MW is observed in Rajasthan control area.

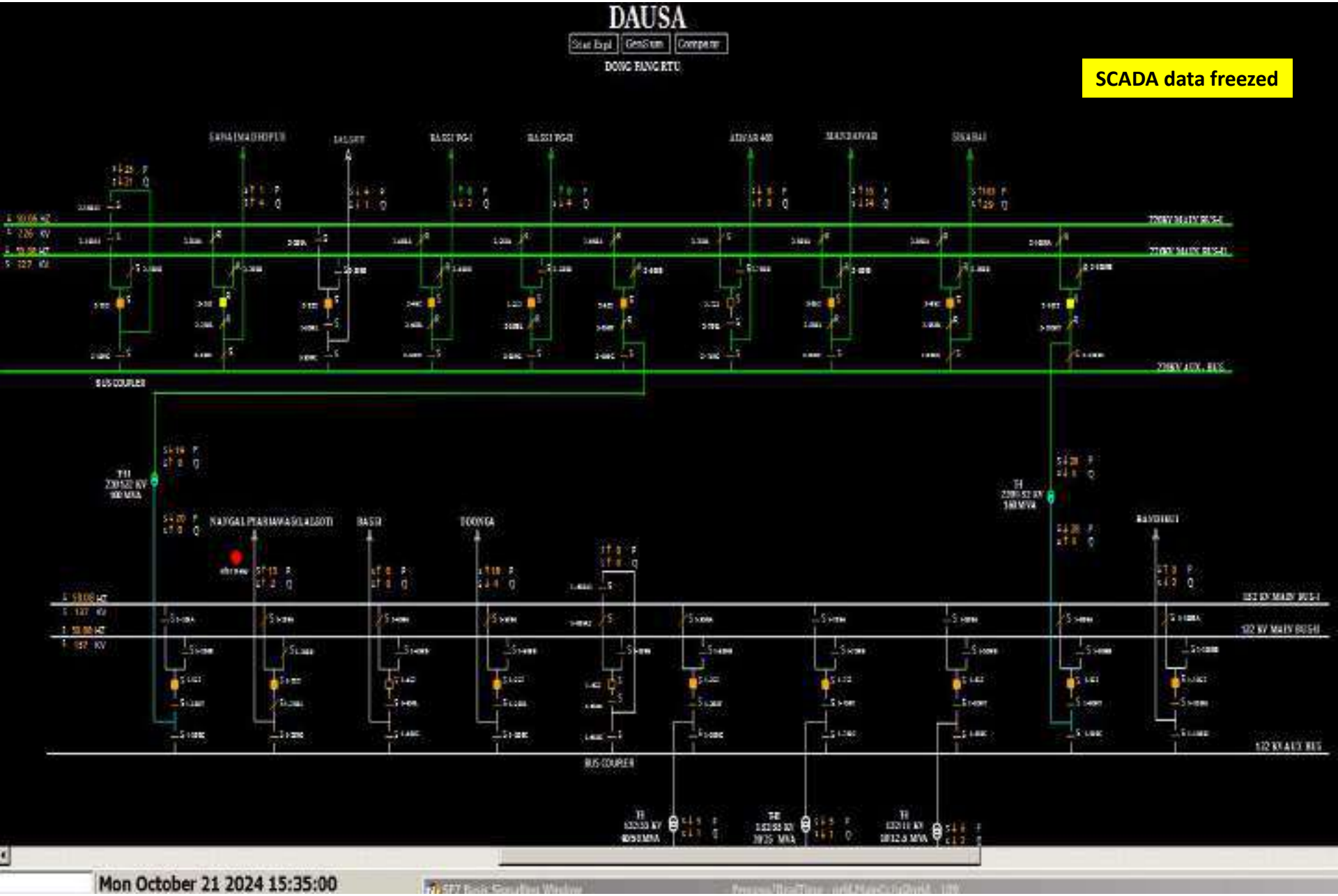
Network Diagram



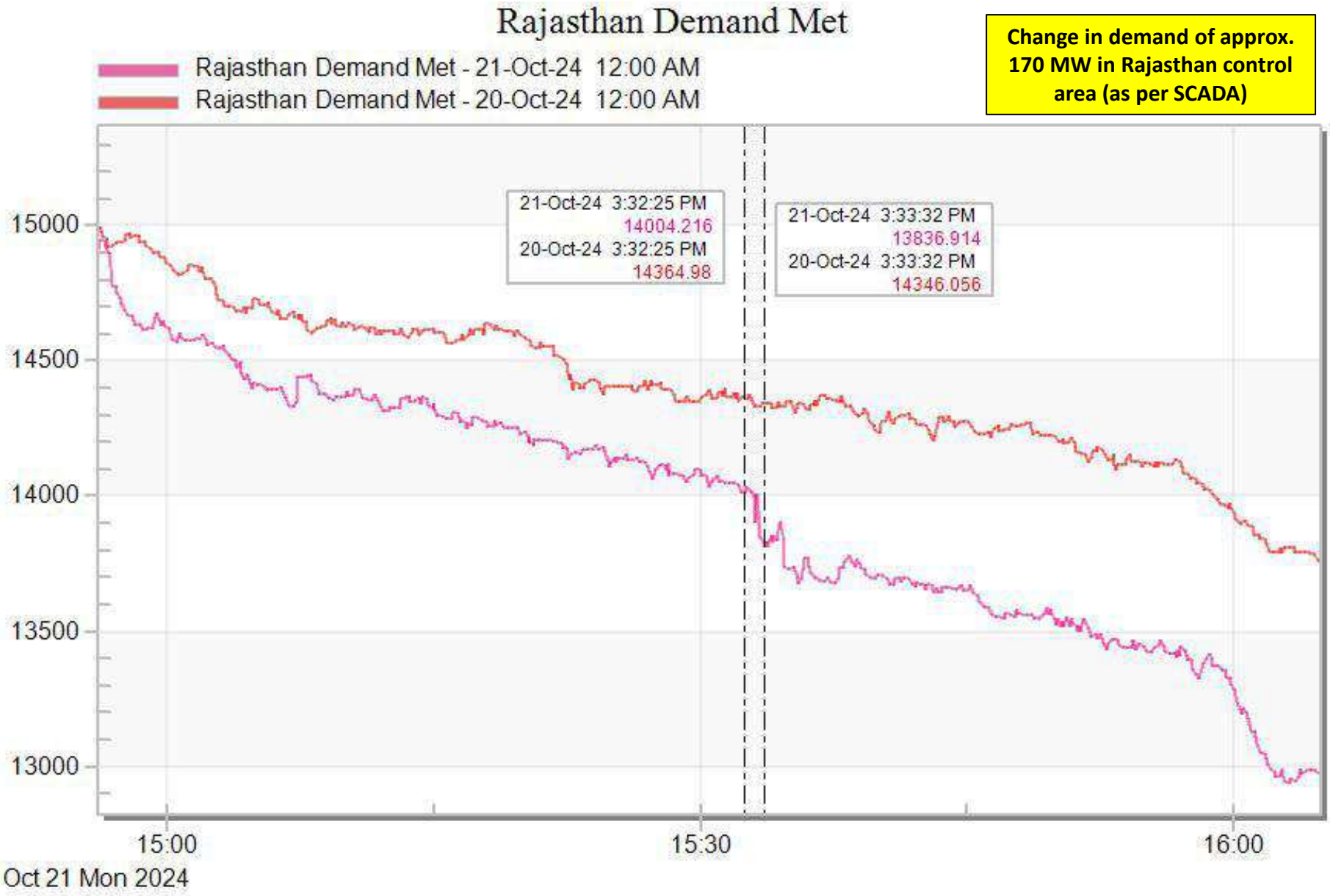
SLD of 220/132/33kV Dausa(RS) before the event



SLD of 220/132/33kV Dausa(RS) after the event

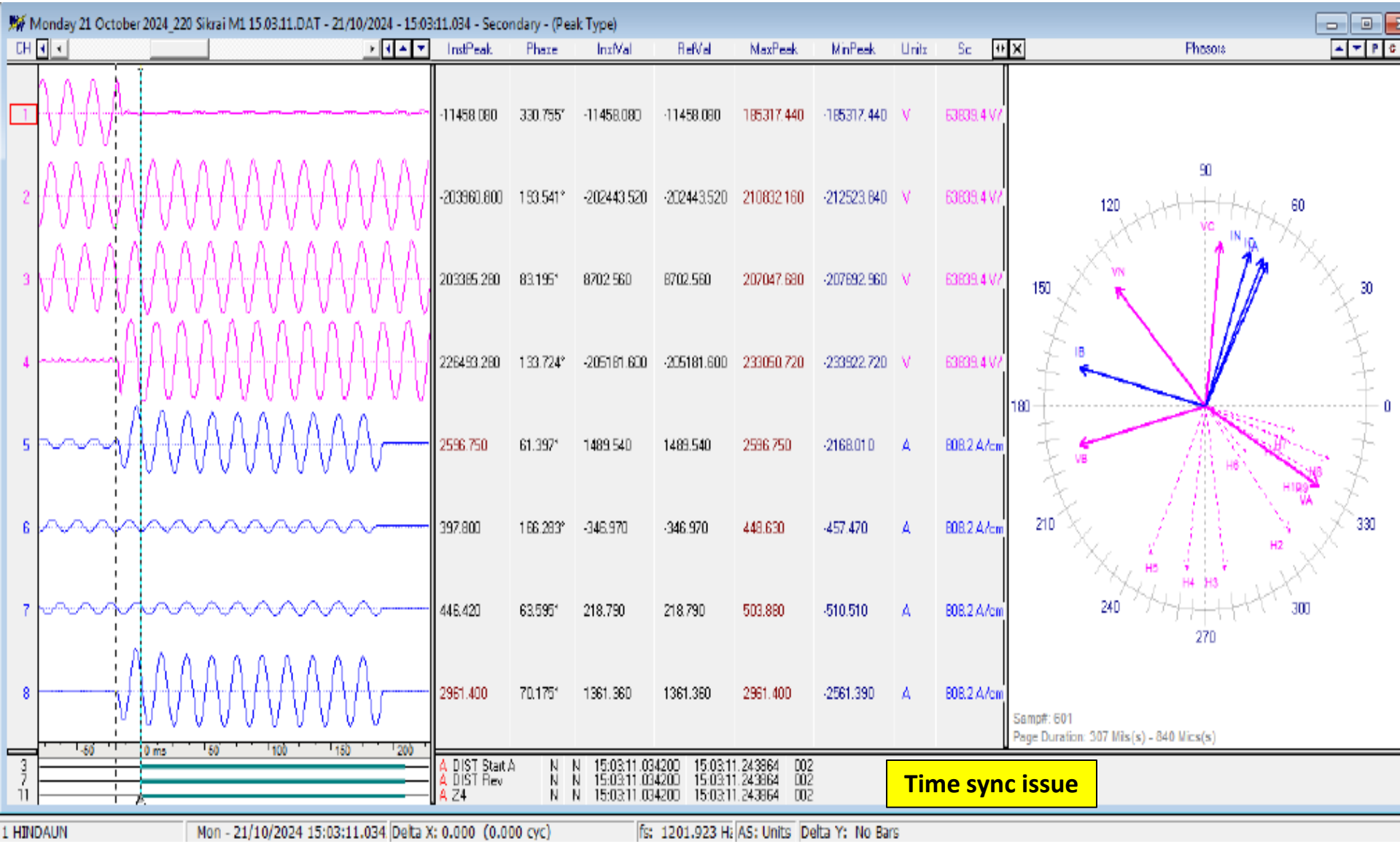


Uttar Pradesh Demand during the event



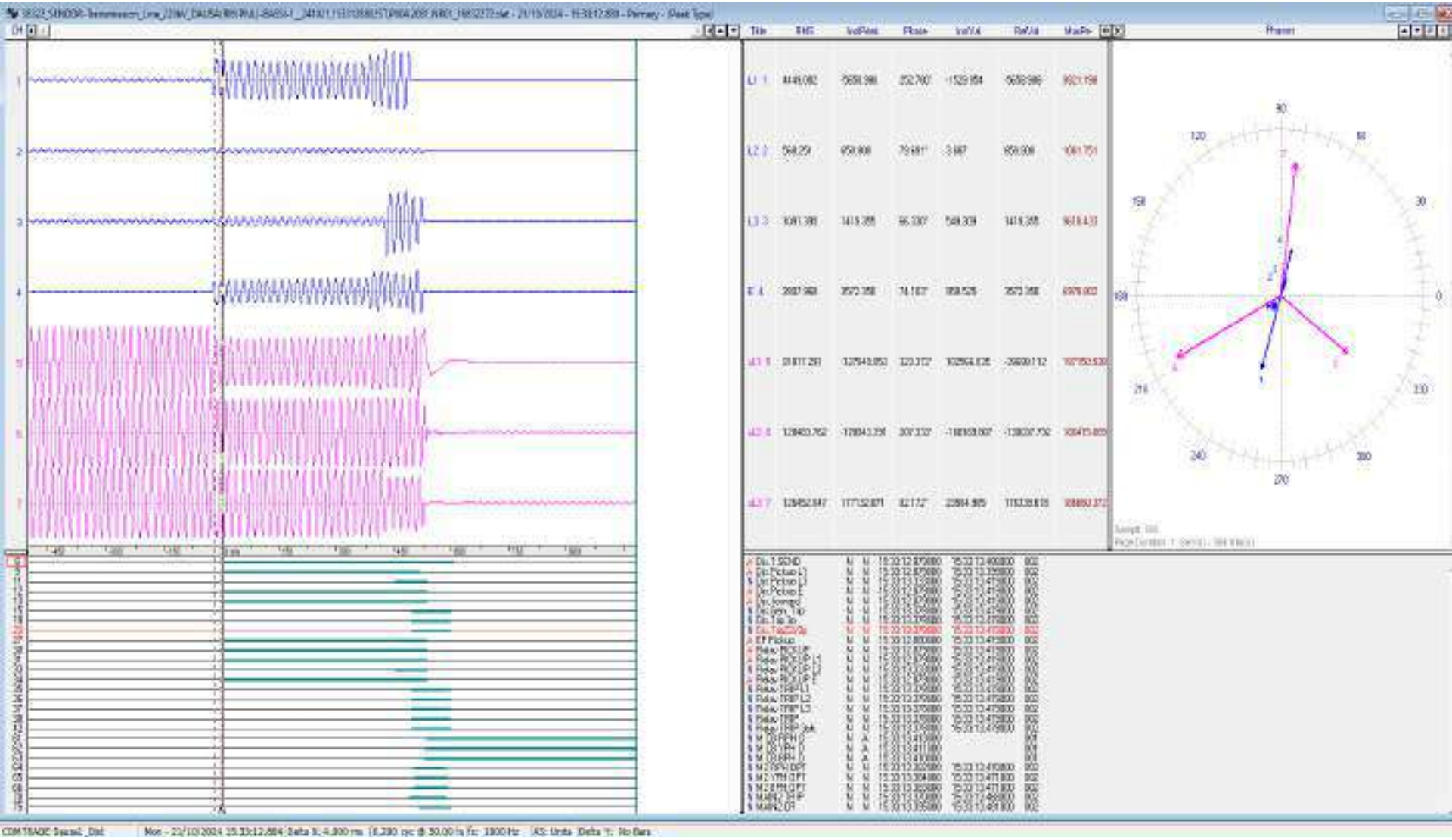
Change in demand of approx. 170 MW in Rajasthan control area (as per SCADA)

DR of 220 KV Bassi(PG)-Dausa(RS) (end) (PG) Ckt-1



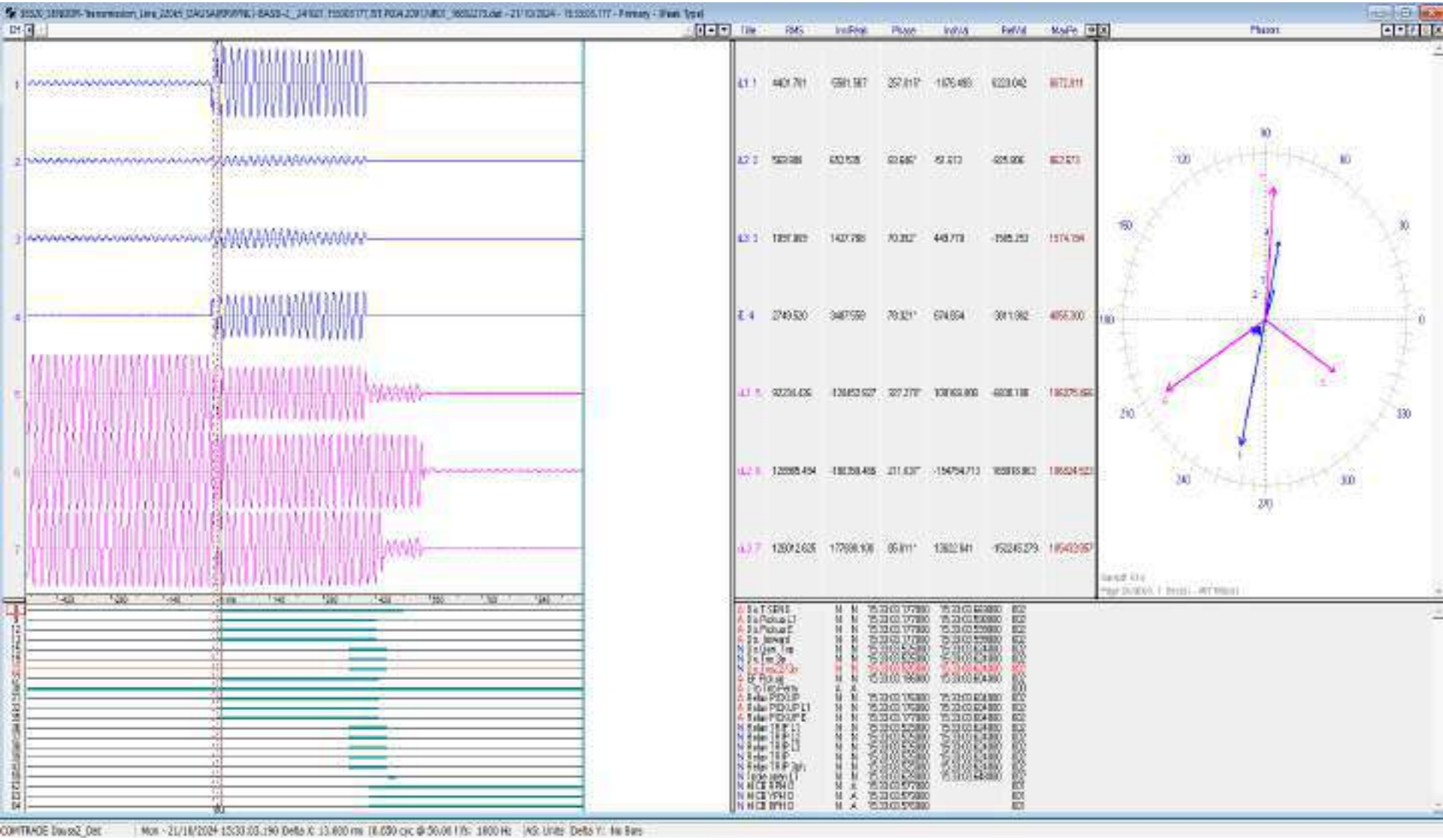
- ✓ R-N Phase to earth fault; Ir=~2.597kA
- ✓ Fault sensed in zone-4 at Dausa end

DR of 220 KV Bassi(PG) (end)-Dausa(RS) (PG) Ckt-1



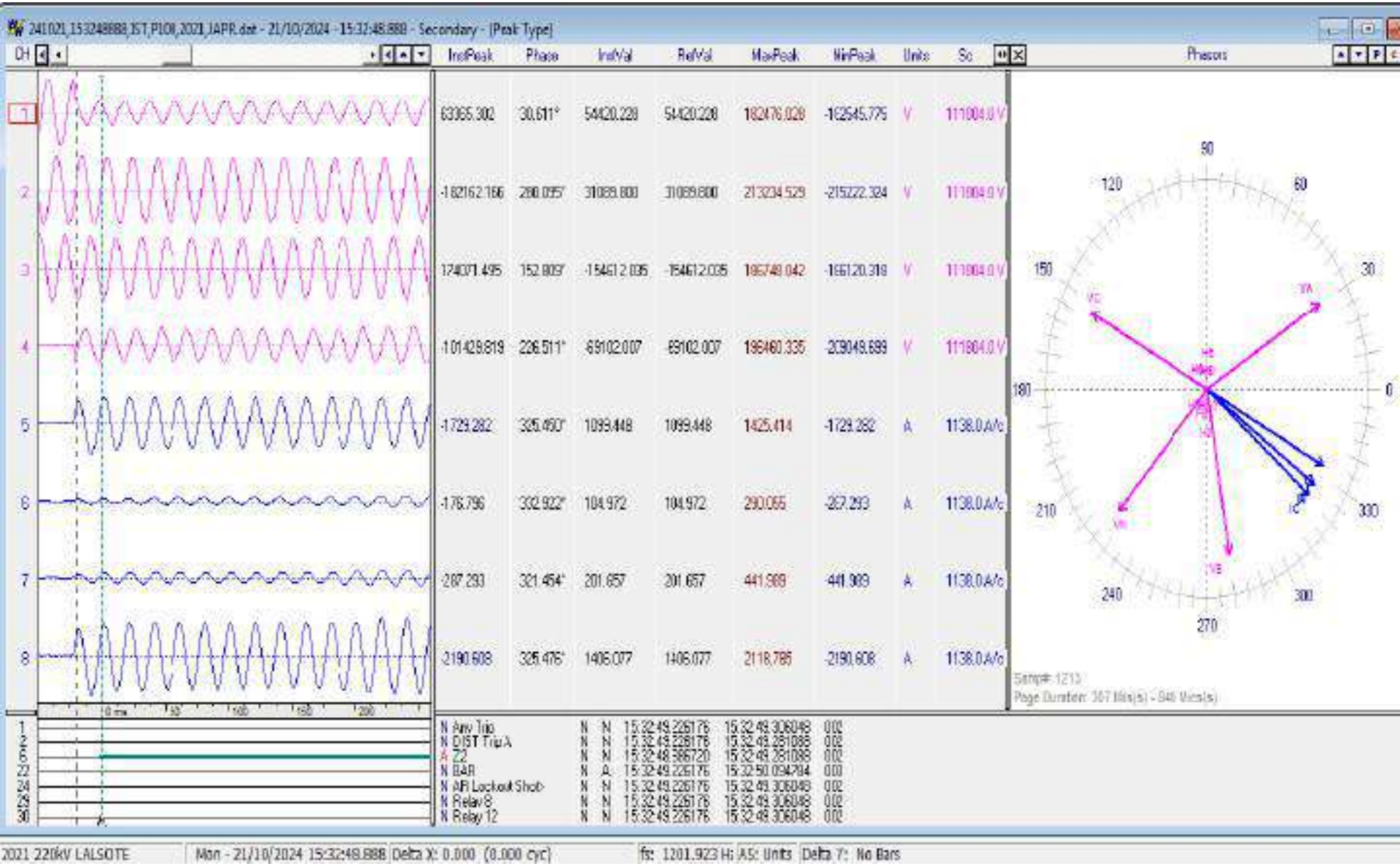
- ✓ R-N fault with Ir=~4.45kA converted to R-B-N fault with Ir=~6.57kA, Ib=~6.91kA
- ✓ Fault clearing time=~530ms
- ✓ Fault sensed in zone-2 at Bassi end

DR of 220 KV Bassi(PG) (end)-Dausa(RS) (PG) Ckt-2



- ✓ R-N fault; Fault current, Ir=~4.402kA
- ✓ Fault clearing time=~390ms
- ✓ Fault sensed in zone-2 at Bassi end

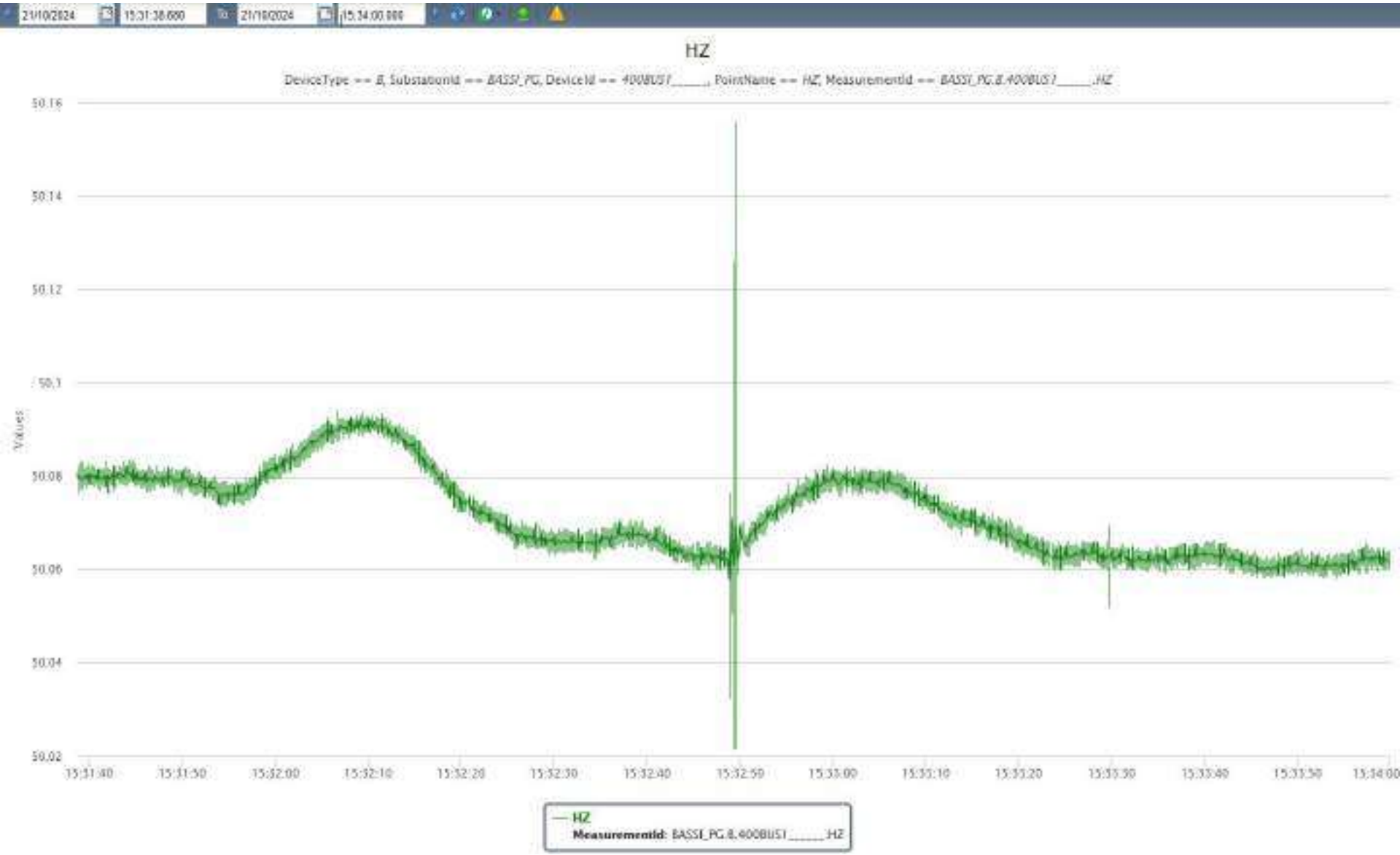
DR of 220 KV Lalsote(RS) (end)-Dausa(RS) (PG) Ckt-1



- ✓ R-N Phase to earth fault; Ir=~1.729kA
- ✓ Fault sensed in zone-2 at Lalsote end

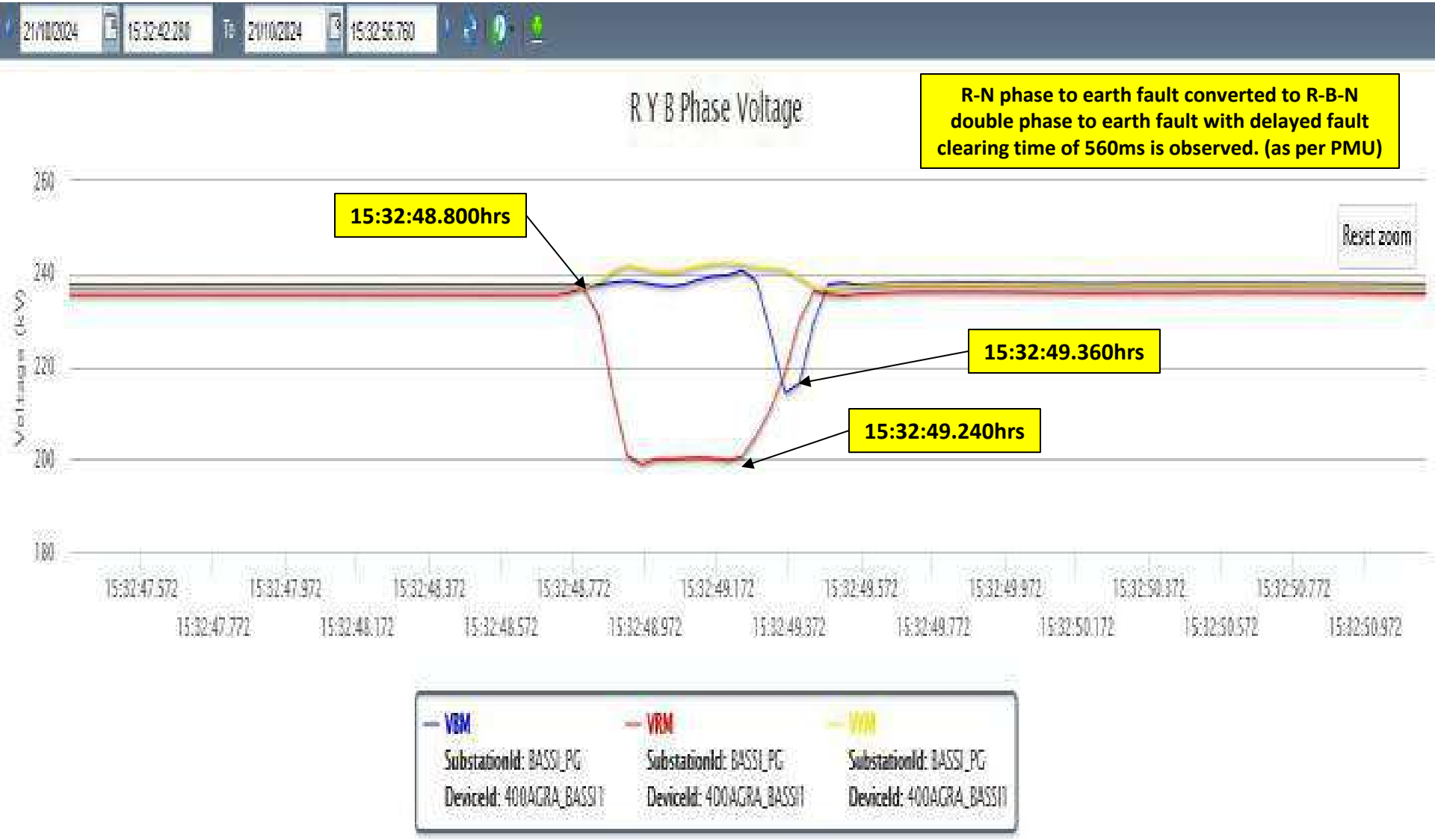
PMU Plot of frequency at Bassi(PG)

15:32 hrs/21-Oct-24



PMU Plot of phase voltage magnitude at Bassi(PG)

15:32 hrs/21-Oct-24



SCADA SOE

Time	Station Name	Voltage Level	Element Name	Element Type	Element Status	Remarks
15:32:49,362	BASSI_PG	220kV	09DAUSA2	Circuit Breaker	disturbe	
15:32:49,433	BASSI_PG	220kV	08DAUSA1	Circuit Breaker	Open	Main CB at Bassi(PG) end of 220 KV Bassi(PG)-Dausa(RS) (PG) Ckt-1 opened

Points for Discussion

i) Why was bus bar protection at Dausa(RS) not operational during the event?

ii) Reason for delay in bus coupler CB opening need to be shared.

iii) Why line CB at Dausa(RS) end of 220 KV Lalsote(RS)-Dausa(RS) (PG) Ckt and 220 KV Bassi(PG)-Dausa(RS) (PG) Ckt-2 didn't trip in zone-4?

iv) Exact reason of tripping of 220/132kV 160MVA ICT-1 and 100MVA ICT-2 at Dausa(RS) need to be shared.

v) SCADA data at 220/132kV Dausa(RS) freezed after the event. Availability and healthiness of the same need to be ensured.

vi) DR/EL (.dat/.cfg file) of all the tripped elements along with detailed tripping report need to be shared from Rajasthan end (Same DR submitted for all the circuits for Dausa end; clarification needed)

vii) Remedial action taken report to be shared.

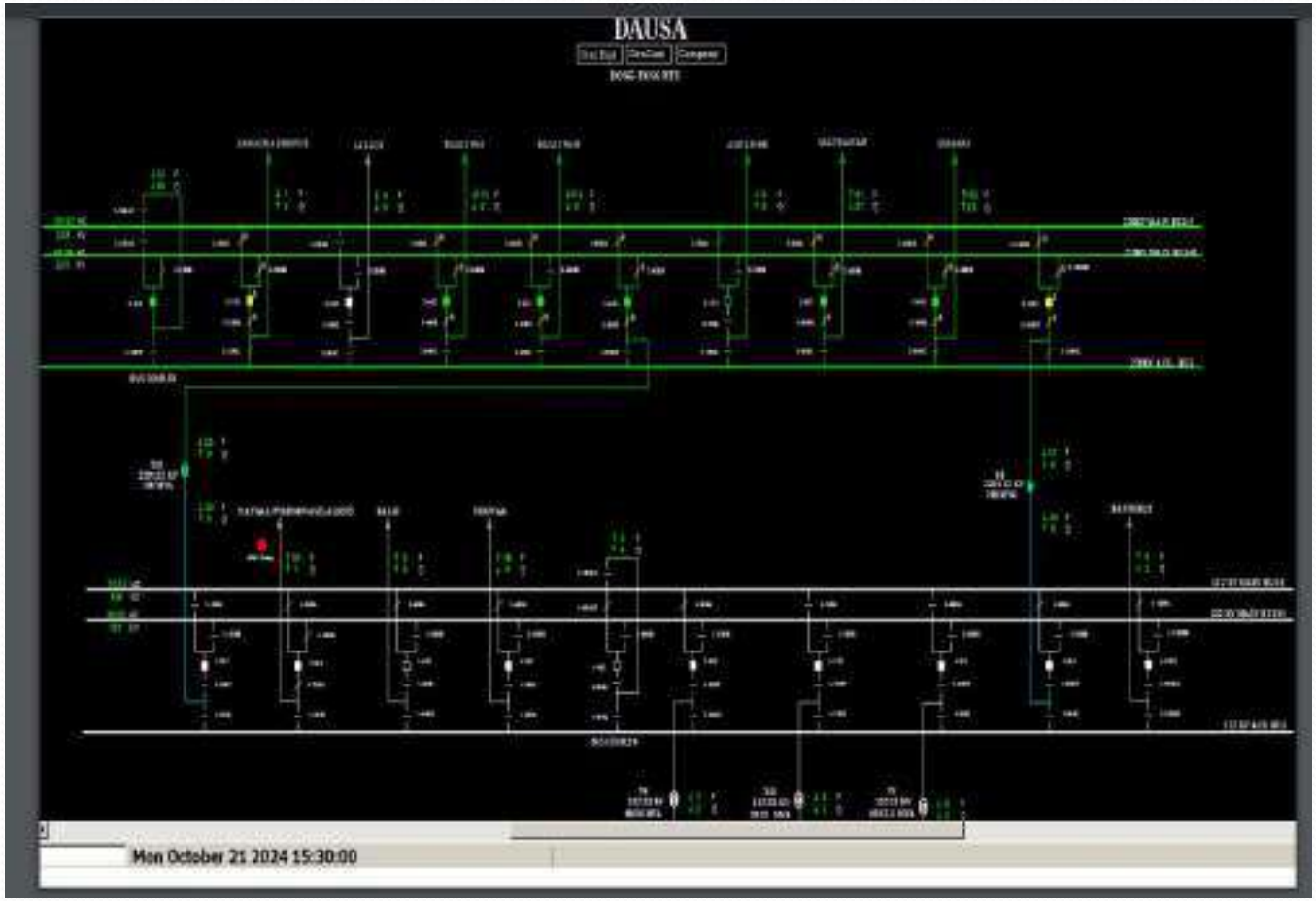
RAJASTHAN RAJYA VIDHYUT PRASARAN NIGAM LIMITED

MULTIPLE TRIPPINGS AT
220 KV GSS DAUSA ON DATED 21.10.2024

Brief Detail about Tripping

- At around 15:35 Hrs on dated 21.10.2024 a *reptile climbed* over the R phase CVT of 220 kV Main bus I at 220 kV GSS Dausa due to which a flashover occurred causing tripping of all Lines and Transformers at 220 kV GSS Dausa.

SLD of DAUSA



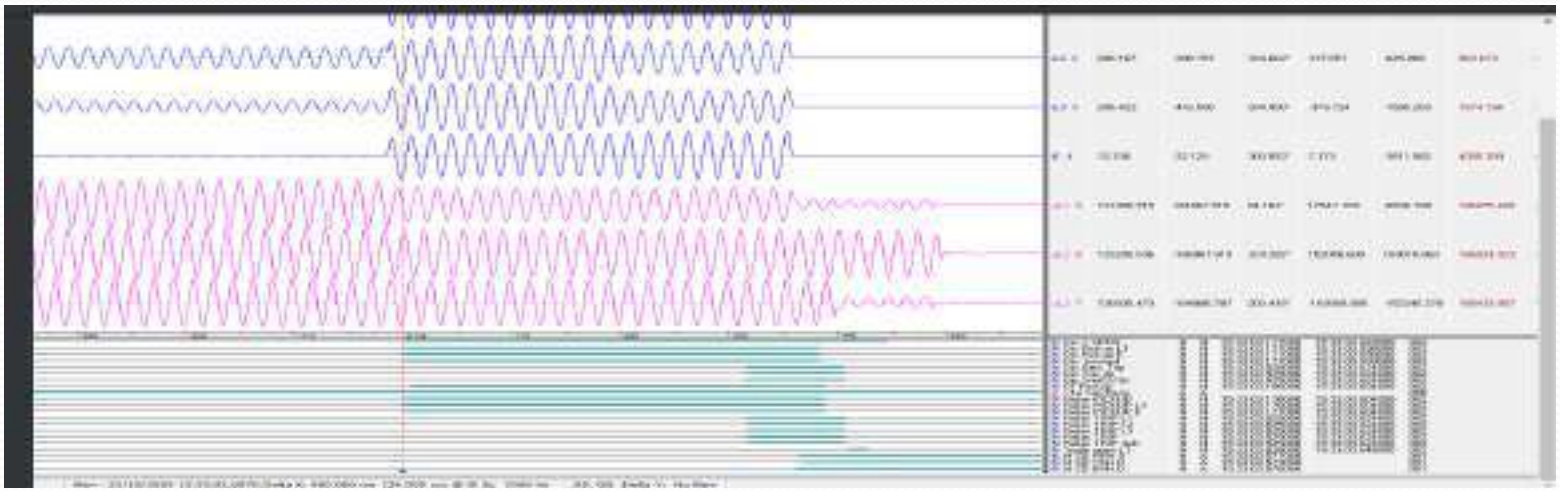
The details of tripped Elements are:-

S.No	Name of Element	Outage Time	Revival Time	India cation (End 1 – End 2)
1	220 kV Lalsot- Dausa	15:32	18:04	ZII-
2	220 kV SWM- Dausa	15:32	18:13	ZII-
3	220 kV Bassi(PG)- Dausa I	15:32	17:57	ZII-
4	220 KV Bassi(PG)- Dausa II	15:32	17:57	ZII-
5	220 kV Mundawar- Dausa	15:32	18:06	No tripping
6	220 KV Sikrai- Dausa	15:32	16:08	No Ind - Rph , z4
7	220/132 kV 160 MVA ICT I	15.32	18:00	Not tripped
8	220/132 kV 160 MVA ICT II	15.32	17:57	Not tripped
9	220 kV B/C	15.32		E/F
10	220 kV Alwar	15.32		Not tripped

Preliminary Observation

- At the time of event *Bus - Bar Protection* was out of circuit due to Isolator Status problem.
- CB of 220 kV Bus - Coupler did not operate on E/F relay due to DC control cable problem causing operation of line's & Equipment connected at Main Bus II.
- Main 1 of 5 Nos. 220 kV lines have Q.Mho relays which are old and static and not reliable the other Main 2 relays are Numerical but due to VT fail indication did not operate. Q-mho relay installed at Dausa end has default time of Z4 is 1 sec.

- 220 kV Lalsot, SWM, Bassi I & II did not operate at Dausa end. All feeders tripped on ZII from other end. Mandawar and Alwar fed radially and Sikrai Line operated in Z 4. Alwar feeder was charged only. However the CB at Bassi(PG)II operated with delay clearance of about 500 ms from Bassi end.
- DR of Dausa- Bassi(PG) II at Bassi end .



- Both the 220/132 kV Transformer did not trip, wrongly reported.
- DR/EL shared on portal.

REMEDIAL MEASURE

- Process of retrofitting of numerical relays by replacing Q.Mho relays are under process.
- Bus – Bar protection is in service.
- Relay setting at Bassi (PG) II has been revised by PGCIL .

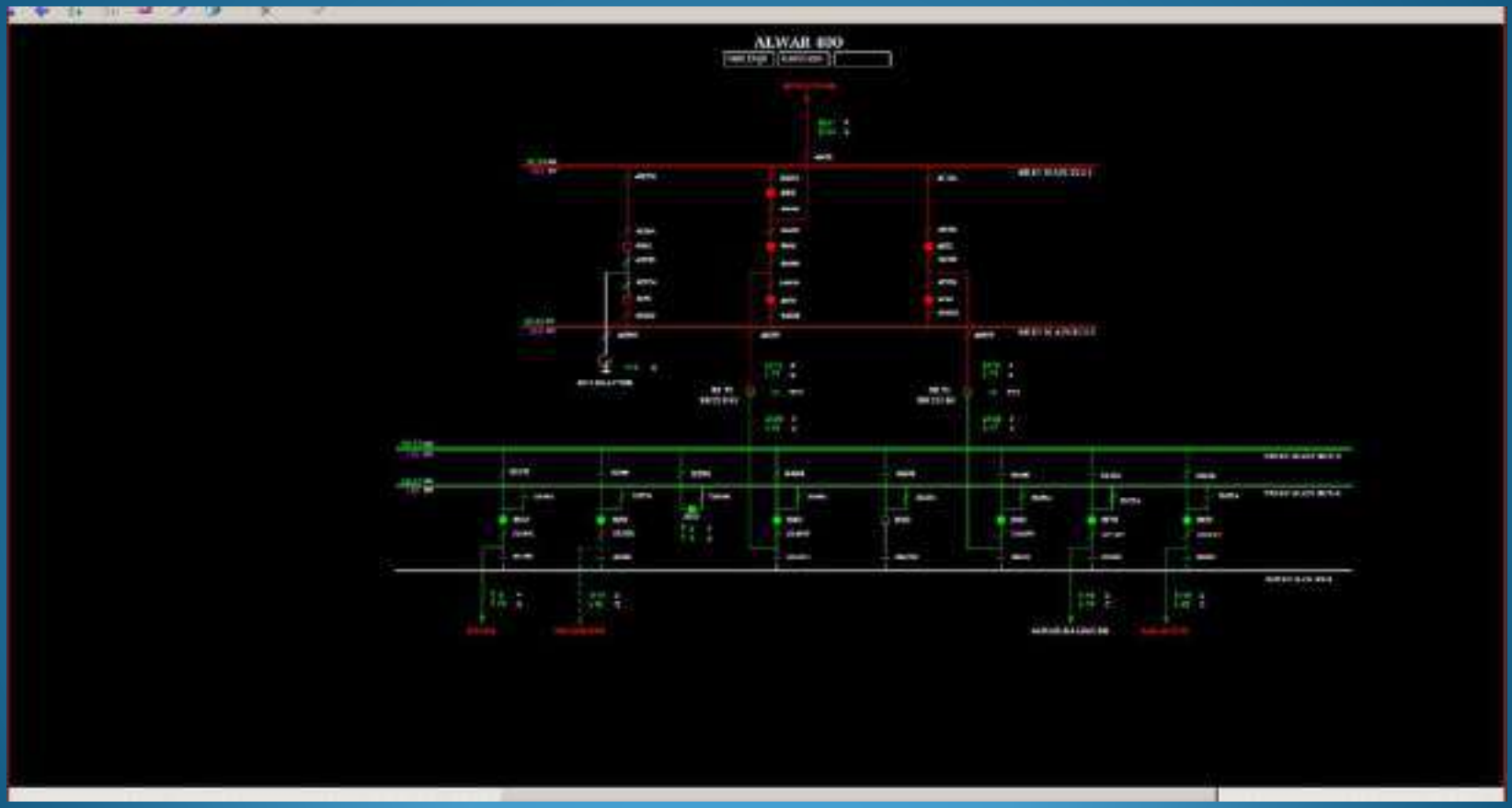
RAJASTHAN RAJYA VIDHYUT PRASARAN NIGAM LIMITED

MULTIPLE TRIPPINGS AT 220 KV GSS ALWAR ON DATED 30.10.2024

Brief detail about the tripping

On dated 30.10.2024 at 14;15 Hrs, 400 KV Alwar(ATIL)-Hindaun(RS) ckt. tripped with ph-ph Z1 indication from Hindaun. The distance recorded by the relay is 4.176 Km with fault current 5.780 kA. During patrolling of line, NO visible fault observed.

SLD OF 400 KV GSS ALWAR



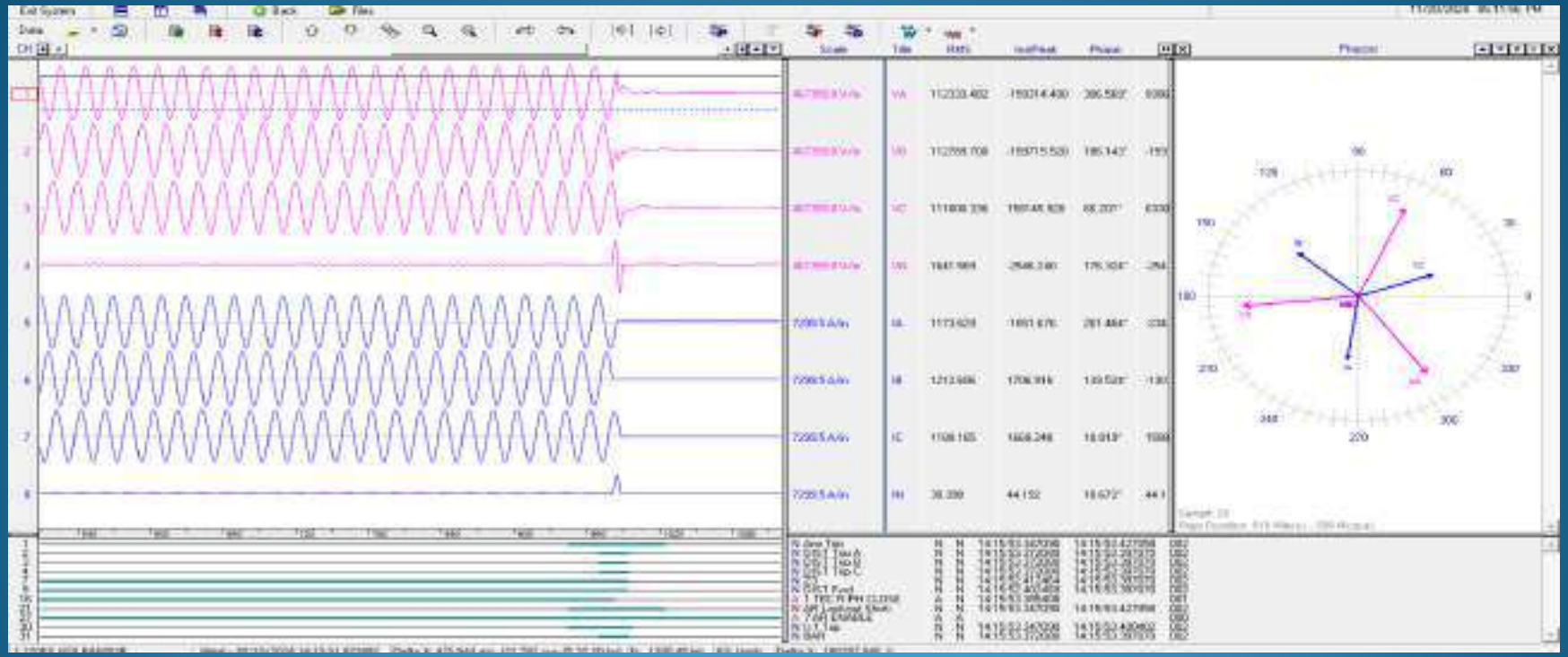
The detail of tripped Elements are:-

S. No	Name of Line	Outage Time	Revival Time	Indication (End1- End 2)
1	400 kV Alwar -Hindaun	14:15	16:33	AB, Z2, 98.5 KM – AB ,Z1, 87 KM
2	220 kv GSS Kukas- Alwar	14:15	14:38	Z-4, ABC- No tripping
3	220 kV Alwar _ Bansur	14:15	14:53	N o tripping – Z3, ABC,1.72KA

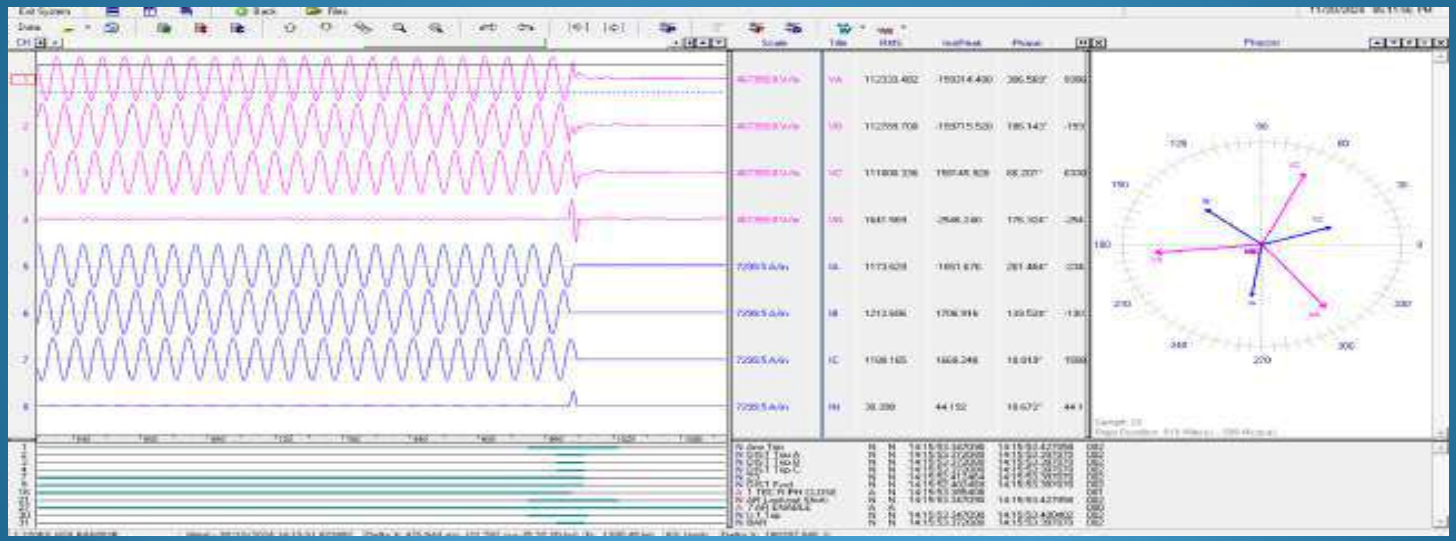
Preliminary Observation

- 220 KV KUKAS – ALWAR ckt. Tripped on **Z4(forward)**[EPAC relay] from KUKAS end. The current recorded in all the three phases is 1.25KA. This was basically an overloading condition but due to wrong reach setting of Z4, the relay operated in Z4 (Forward). This setting has been revised and corrected
- The relay is of static type so no DR/EL available at kukas end

- As per PMU fault has been cleared within 80 ms , as the fault cleared in Z1 from Hindaun end which may be due to delay operation of CB.
- DR of 400 kV Alwar – Hindaun at Hindaun is as below:-



After the above event, 220 KV ALWAR – BANSUR line also tripped on I> (Overloading), as this was the only source remained to feed 220KV Alwar S/S and it adjoining substations.



REMEDIAL MEASURE

- This case is of 400KV single source outage on fault and overloading of remaining lines.
- Z4(Forward) setting at 220 KV S/S KUKAS and Z3 Setting at 220 KV BANSUR were found on much higher side. Both the settings has been corrected

Multiple element tripping event at 220/132kV Ziankote(J&K)

At 10:03 hrs on 11th October, 2024

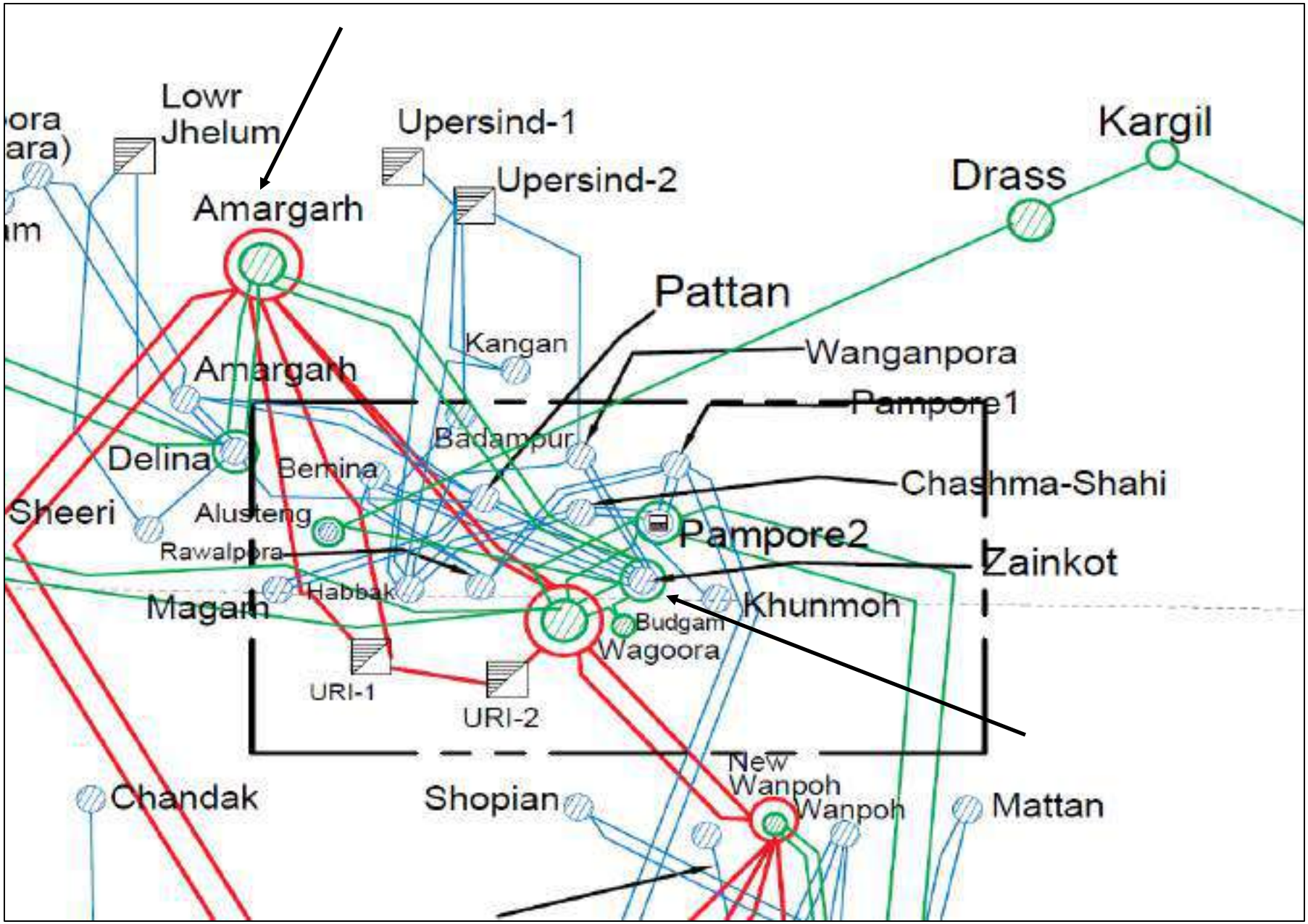
Tripped Elements

S.No.	Name of Element	Tripping Time	Revival Time
1	220 KV Amargarh (INDIGRID)-Ziankote(JK) (PDD JK) Ckt-1	10:03 hrs	12:02 hrs
2	220 KV Amargarh (INDIGRID)-Ziankote(JK) (PDD JK) Ckt-2		11:09 hrs

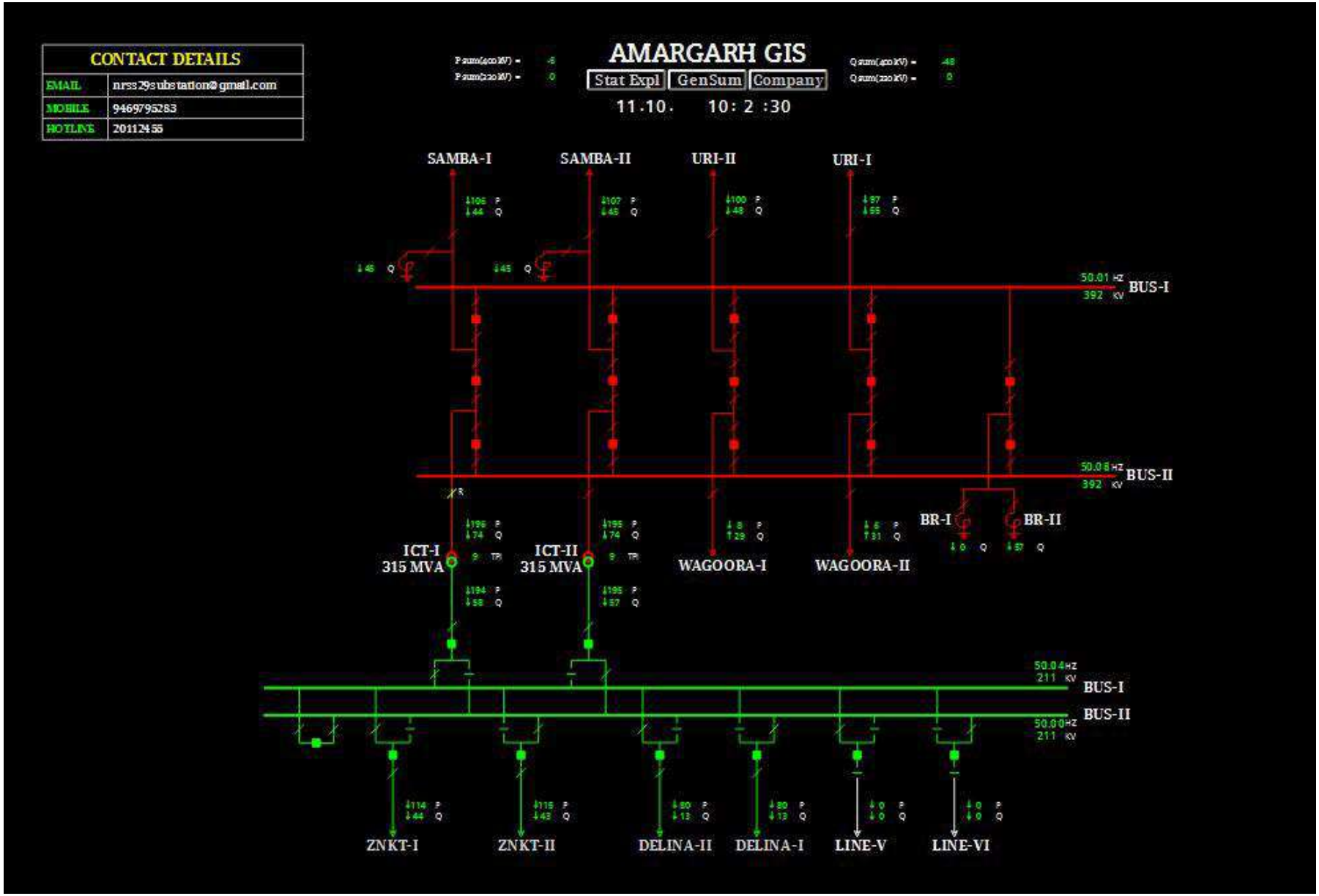
Brief details of the event

- 220/132kV Ziankote S/s have two bus at 220kV side i.e., main bus & reserve bus. 220kV Amargarh-Ziankote ckt-1&2 are on the same tower (D/C tower) and line length is ~21.4km.
- During antecedent condition, 220kV Amargarh(INDIGRID) –Ziankote(JK) D/C was carrying 114 MW each and feeding Ziankote load.
- As reported, at 10:03 hrs, 220 KV Amargarh(INDIGRID)-Ziankote(JK) (PDD JK) D/C tripped from both ends on Y-B phase to phase fault. During patrolling it was found that the fault had occurred between Tower no. 76 and 77, as some locals were cutting trees in the vicinity of line and branches of tree had fallen on the line.
- As per PMU at Amargarh(PG), Y-B phase to phase fault which cleared within 80 msec is observed.
- As per SCADA, change in demand of approx. 175MW is observed in J&K control area.

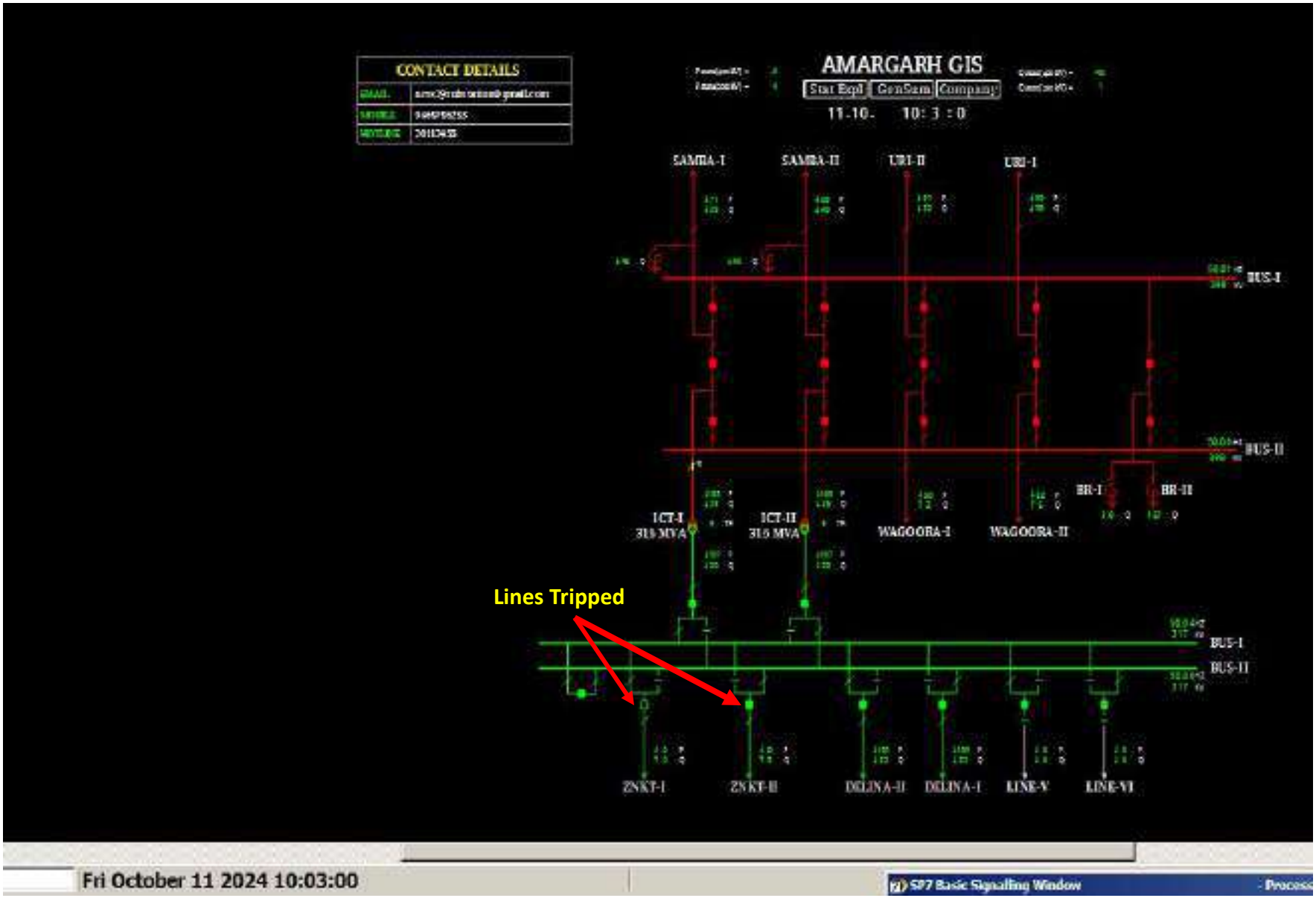
Network Diagram



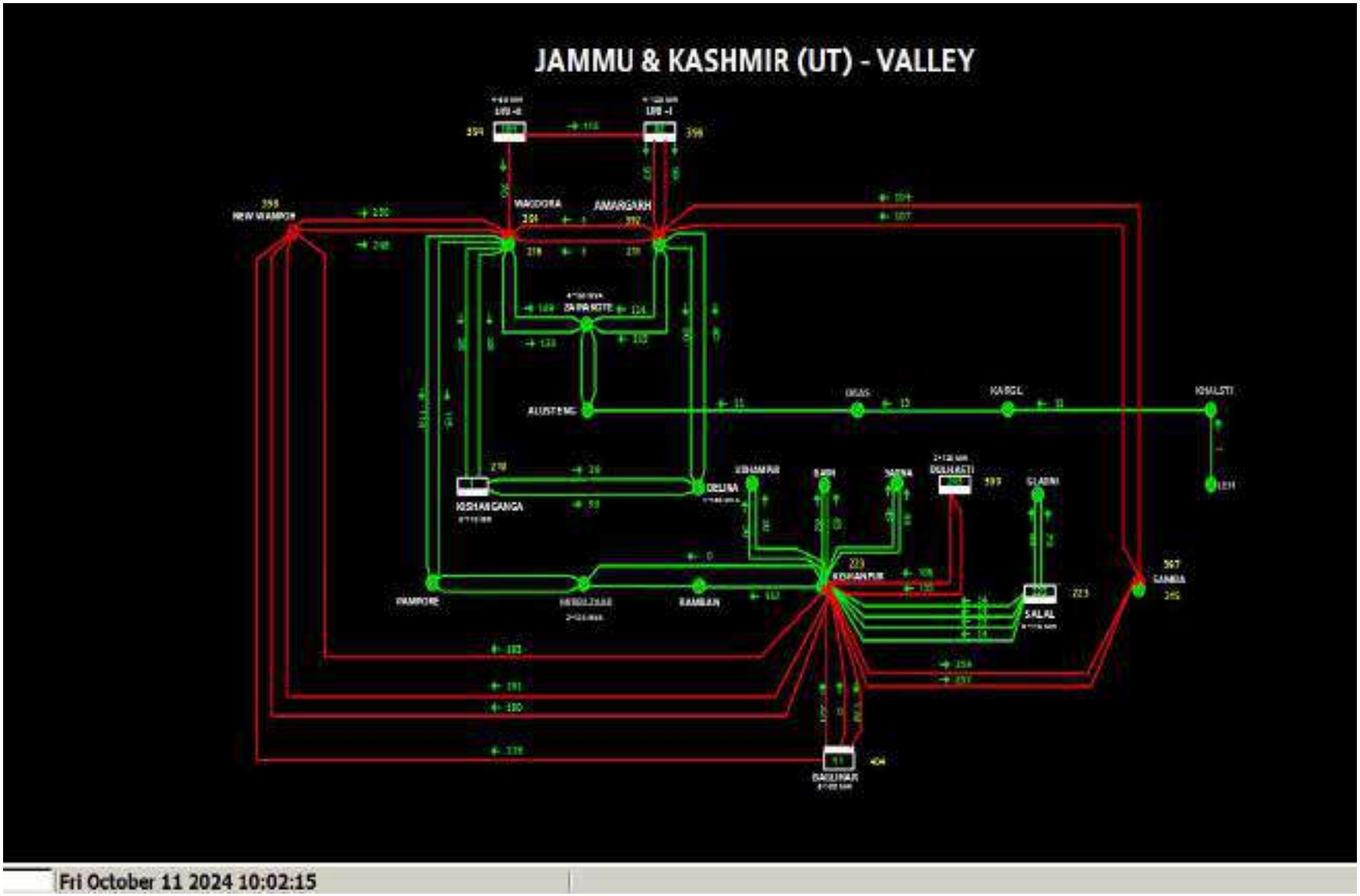
SLD of 400/220kV Amargarh(INDIGRID) before the event



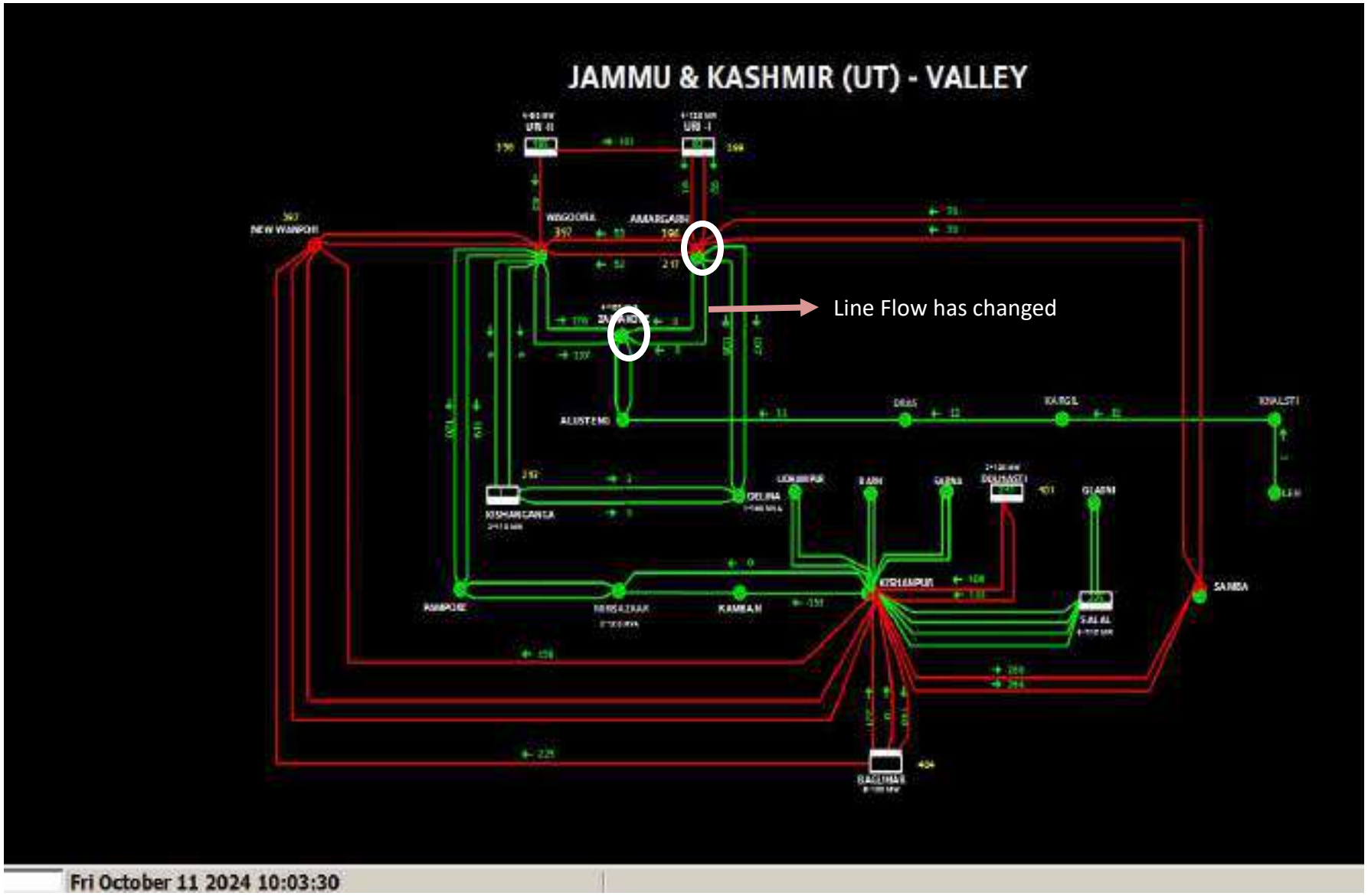
SLD of 400/220kV Amargarh(INDIGRID) after the event



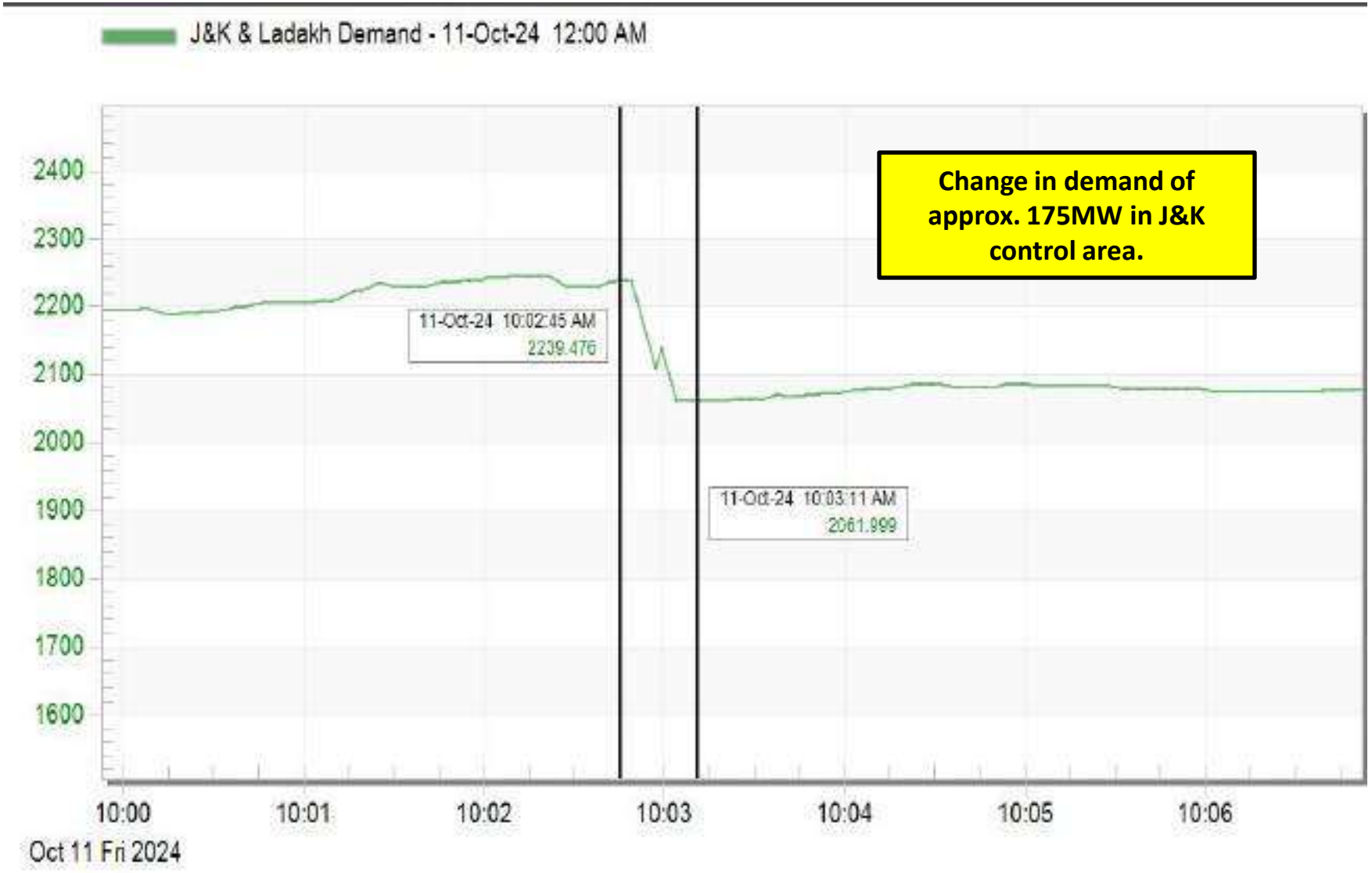
Network of J&K valley before the event



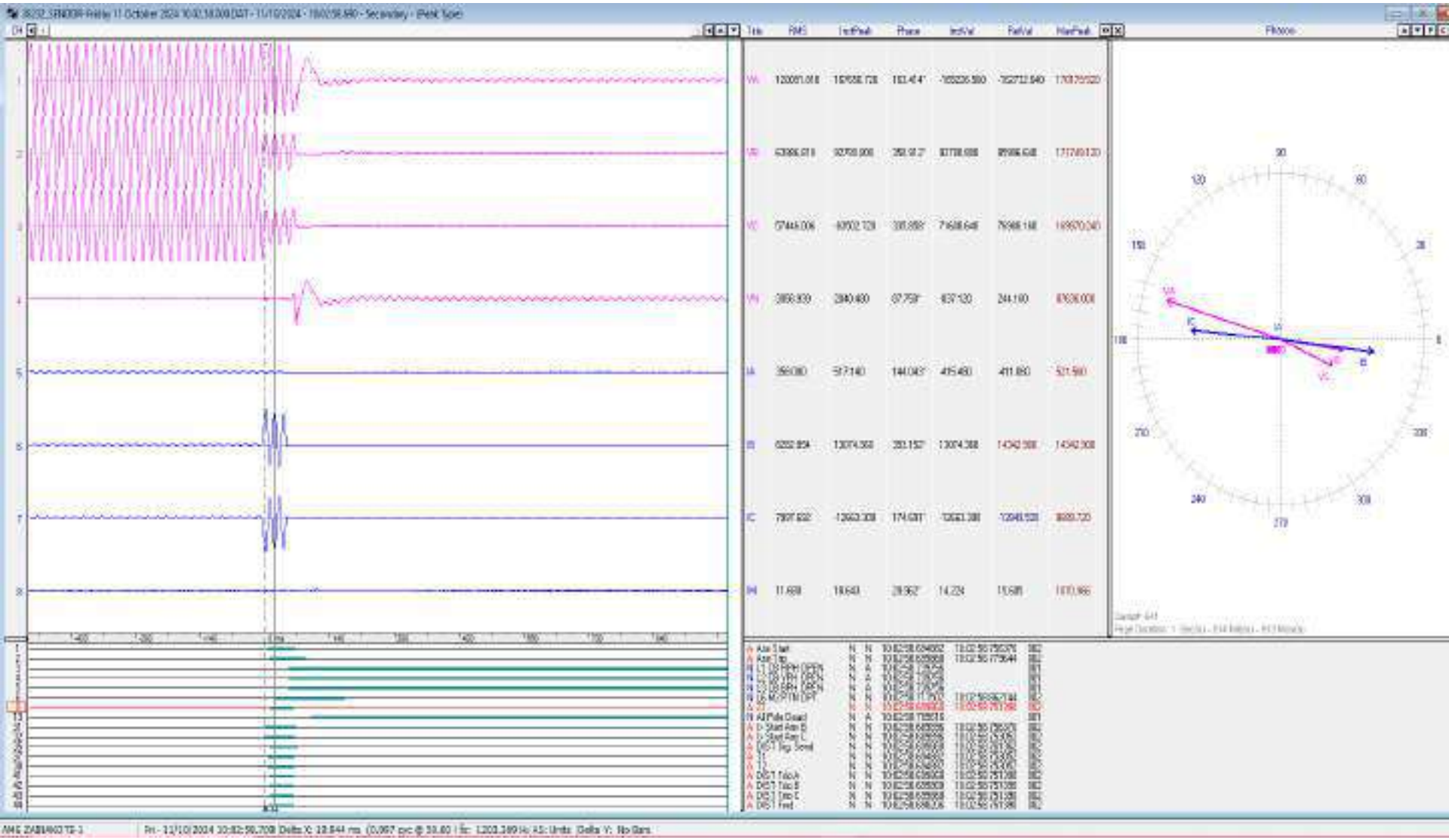
Network of J&K valley after the event



J&K demand during the event

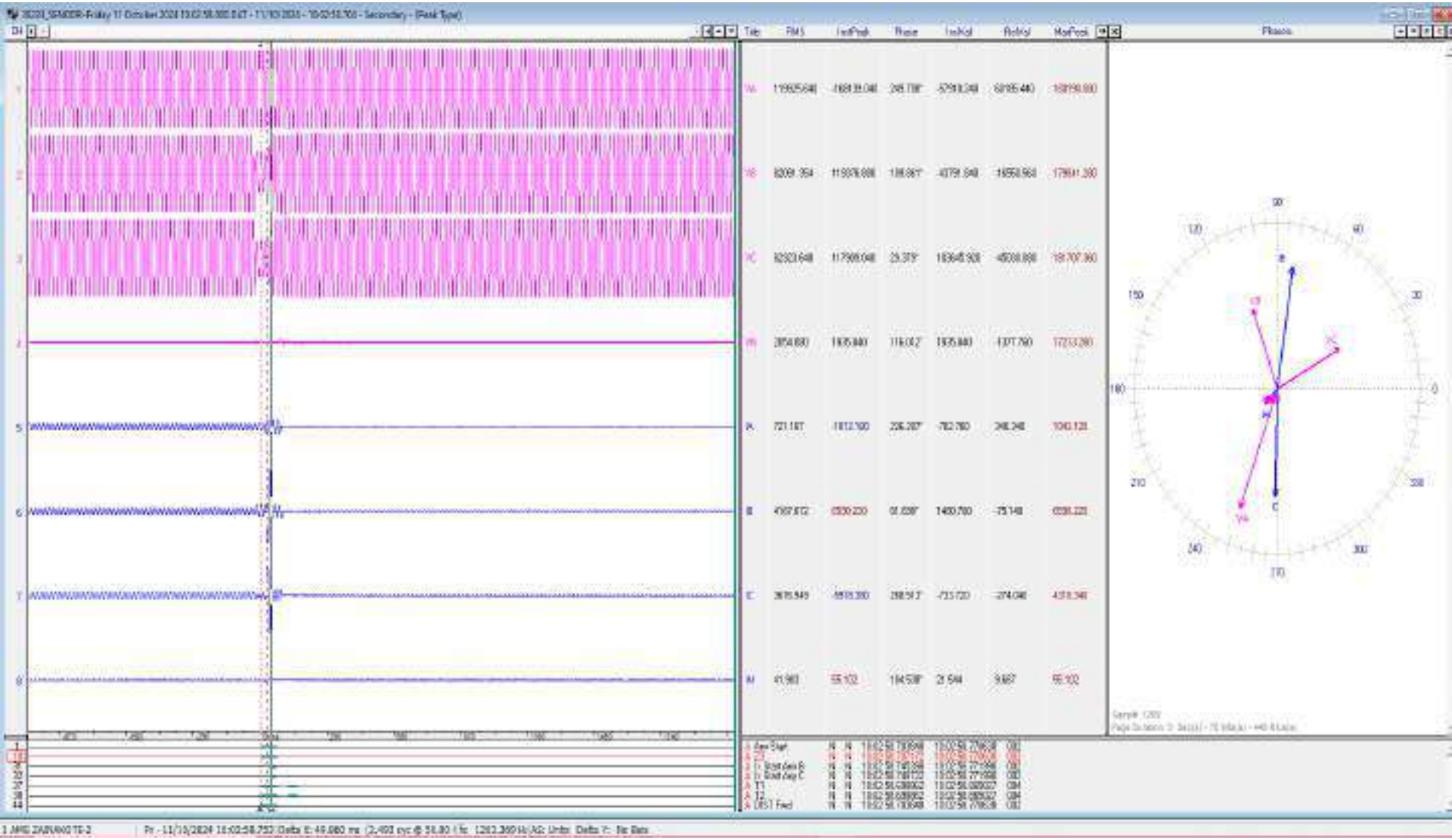


DR of 220 KV Amargarh(INDIGRID) (end)-Ziankote(JK) (PDD JK) Ckt-1



- ✓ Y-B phase to phase fault; Iy=~8.283kA, Ib=~7.998kA
- ✓ Fault clearing time=~50ms
- ✓ Fault sensed in zone-1 at Amargarh end

DR of 220 KV Amargarh(INDIGRID) (end)-Ziankote(JK) (PDD JK) Ckt-2



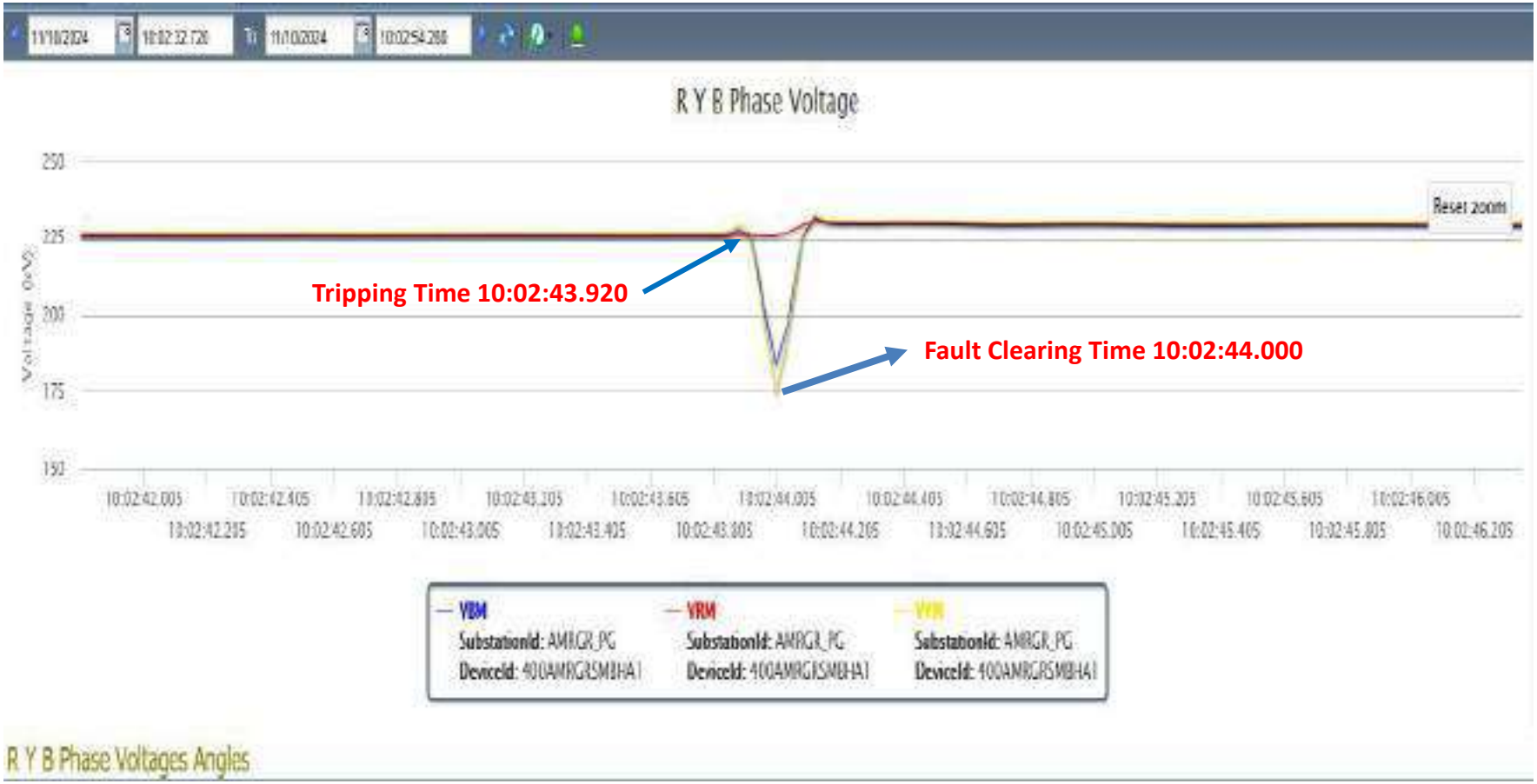
- ✓ Y-B phase to phase fault; Iy=~4.188kA, Ib=~3.677kA
- ✓ Fault clearing time=~50ms
- ✓ Fault sensed in zone-3 at Amargarh end

PMU Plot of frequency at Amargarh(INDIGRID)

10:03hrs/11-Oct-24

PMU Plot of phase voltage magnitude at Amargarh(INDIGRID)

10:03hrs/11-Oct-24



SCADA SOE

Time	Station Name	Voltage Level	Element Name	Element Type	Element Status	Remarks
10:02:43,920	Amargarh	220kV	Amargarh Ziankote Ckt 1	Circuit	Open	Y-B phase to phase fault
10:02:43,920	Amargarh	220kV	Amargarh Ziankote Ckt 2	Circuit	Open	Y-B phase to phase fault

Points for Discussion

i) SCADA data of 220/132kV Ziankote(JK) S/s is not available. Availability and healthiness of the same need to be ensured.

ii) DR, EL & tripping report need to be shared from both the ends.

iii) Remedial action taken report to be shared.

Multiple element tripping event at 220/132kV Pampore(PDD JK)

At 13:45 hrs on 16th October, 2024

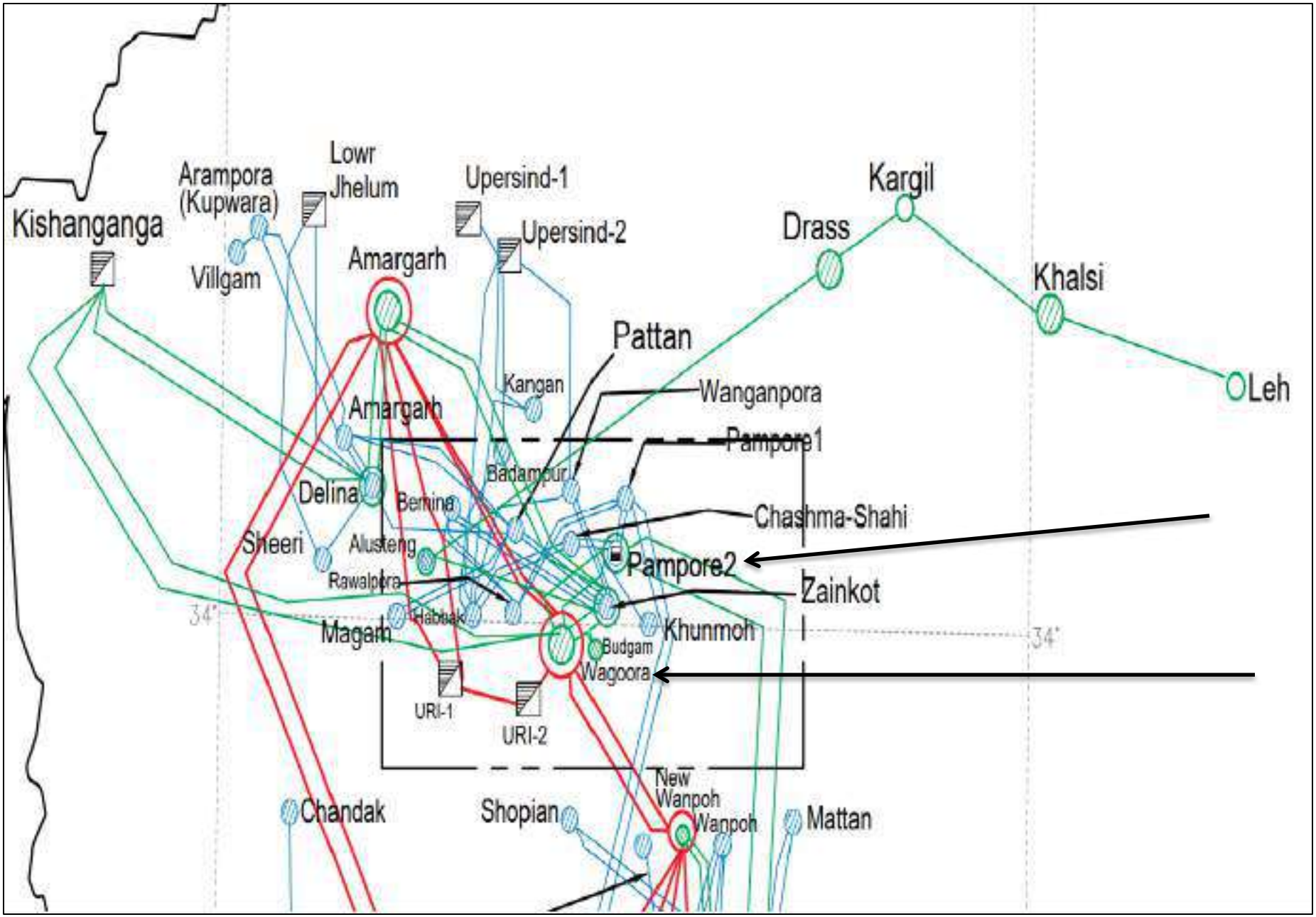
Tripped Elements

S.No.	Name of Element	Tripping Time	Revival Time
1	220 KV Wagoora(PG)-Pampore(PDD) (PG) Ckt-1	13:45 hrs	13:49 hrs
2	220 KV Wagoora(PG)-Pampore(PDD) (PG) Ckt-2		13:50 hrs

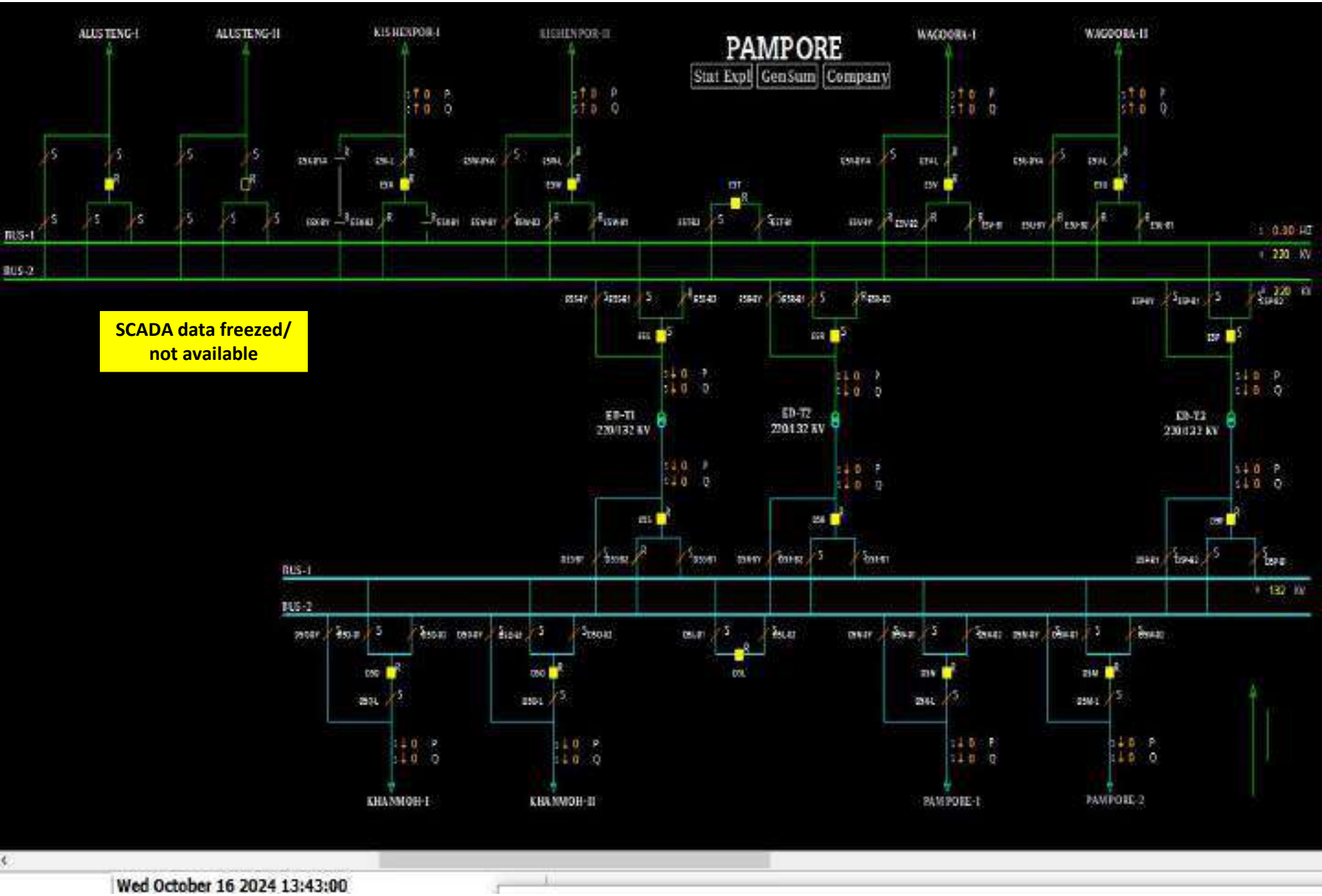
Brief details of the event

- 220/132kV Pampore(PDD) has single main and transfer Bus arrangement at 220kV side.
- During antecedent condition, power flow from Wagoora(PG) S/s to Pampore(PDD) S/s was approx. 140 MW (70 MW each) through 220 KV Wagoora(PG)-Pampore(PDD) (PG) D/C.
- As reported, at 13:45 hrs, Y-phase disc ruptured in 220kV main Bus at Pampore.
- Due to this, 220kV Wagoora(PG)-Pampore(PDD) (PG) Ckt-1 tripped from Pampore end on Y-N phase to earth fault (exact location of fault and nature of protection operated yet to be shared).
- During the same time, 220kV Wagoora(PG)-Pampore(PDD) (PG) Ckt-2 also tripped from Wagoora end sensing the fault in zone-2 with fault distance of 11.91km from Wagoora end.
- As per PMU at Amargarh(INDIGRID), Y-N phase to earth fault converted to Y-B-N double phase to earth fault with delayed fault clearing time of 1000ms is observed.
- As per SCADA, change in demand of approx. 350 MW is observed in J&K control area.

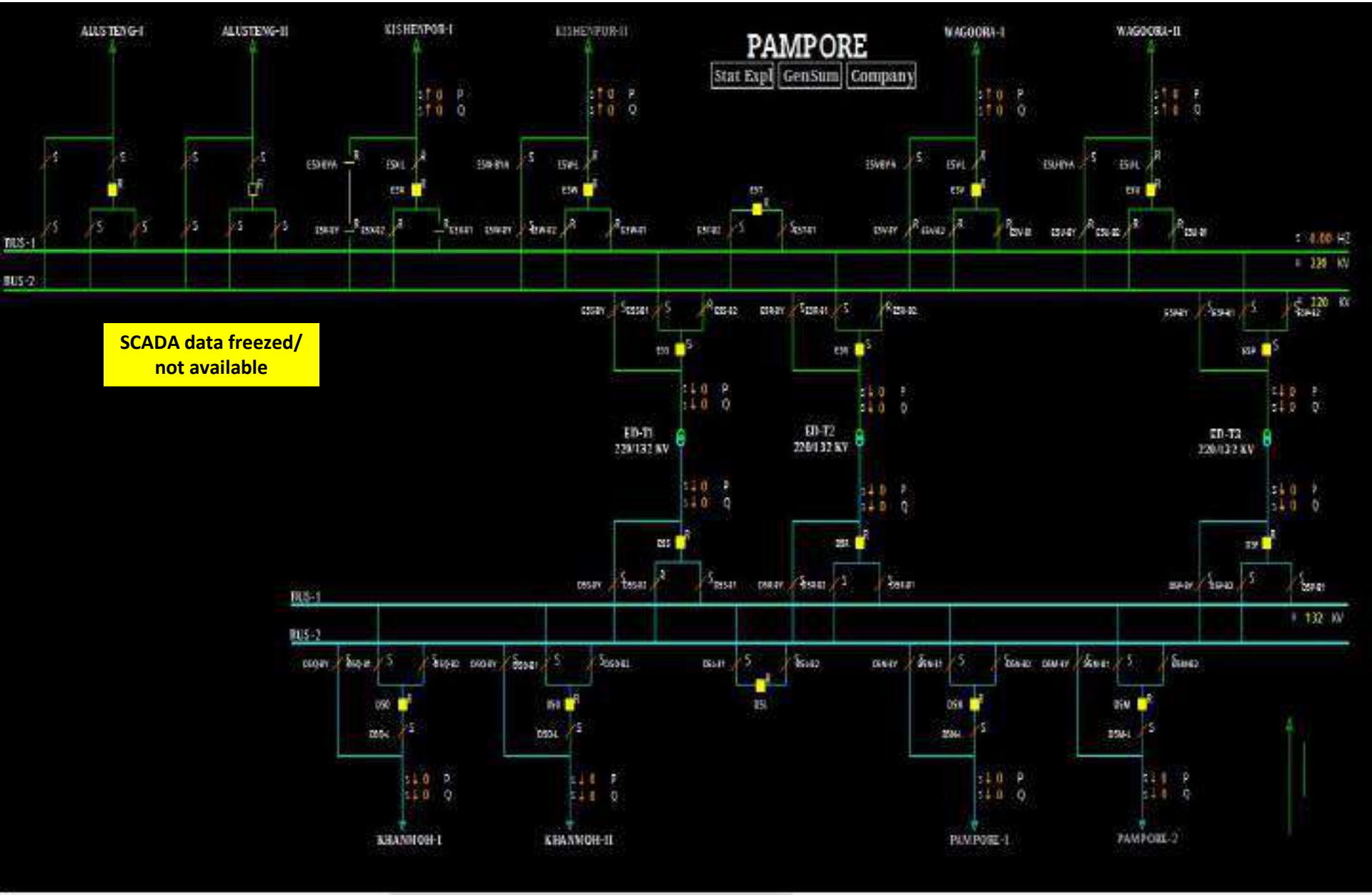
Network Diagram



SLD of 220/132kV Pampore(JK) before the event

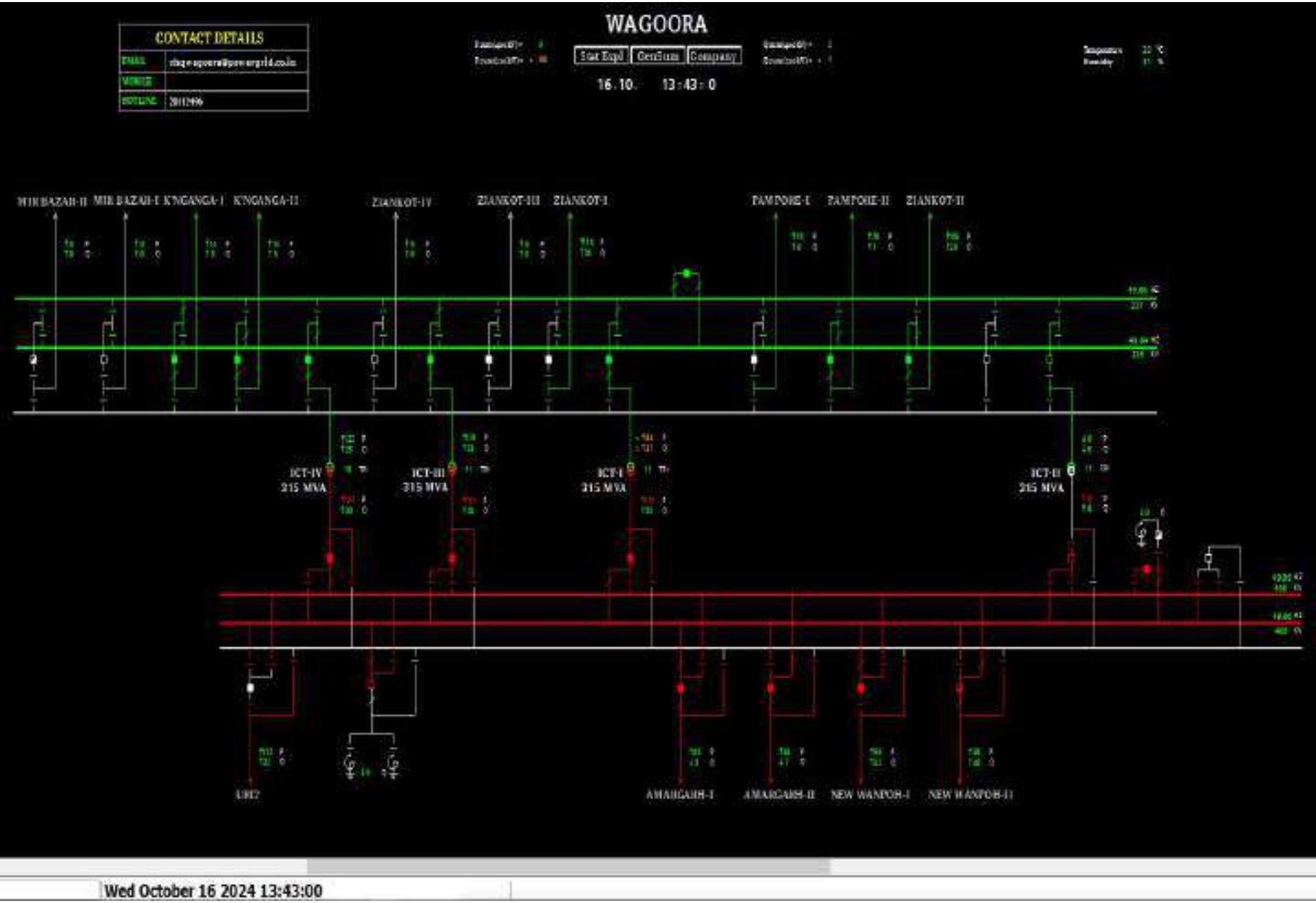


SLD of 220/132kV Pampore(JK) after the event

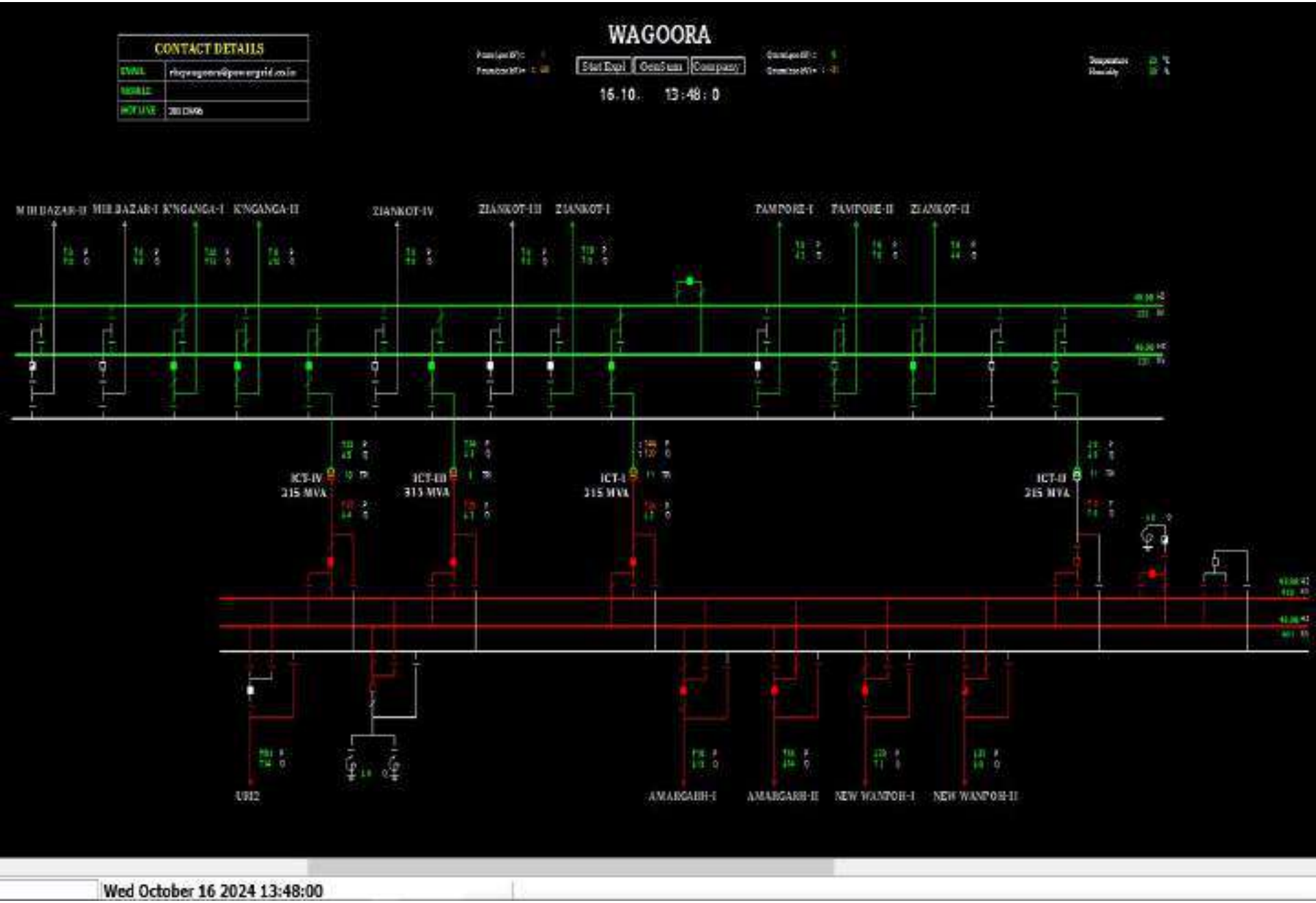


Wed October 16 2024 13:48:00

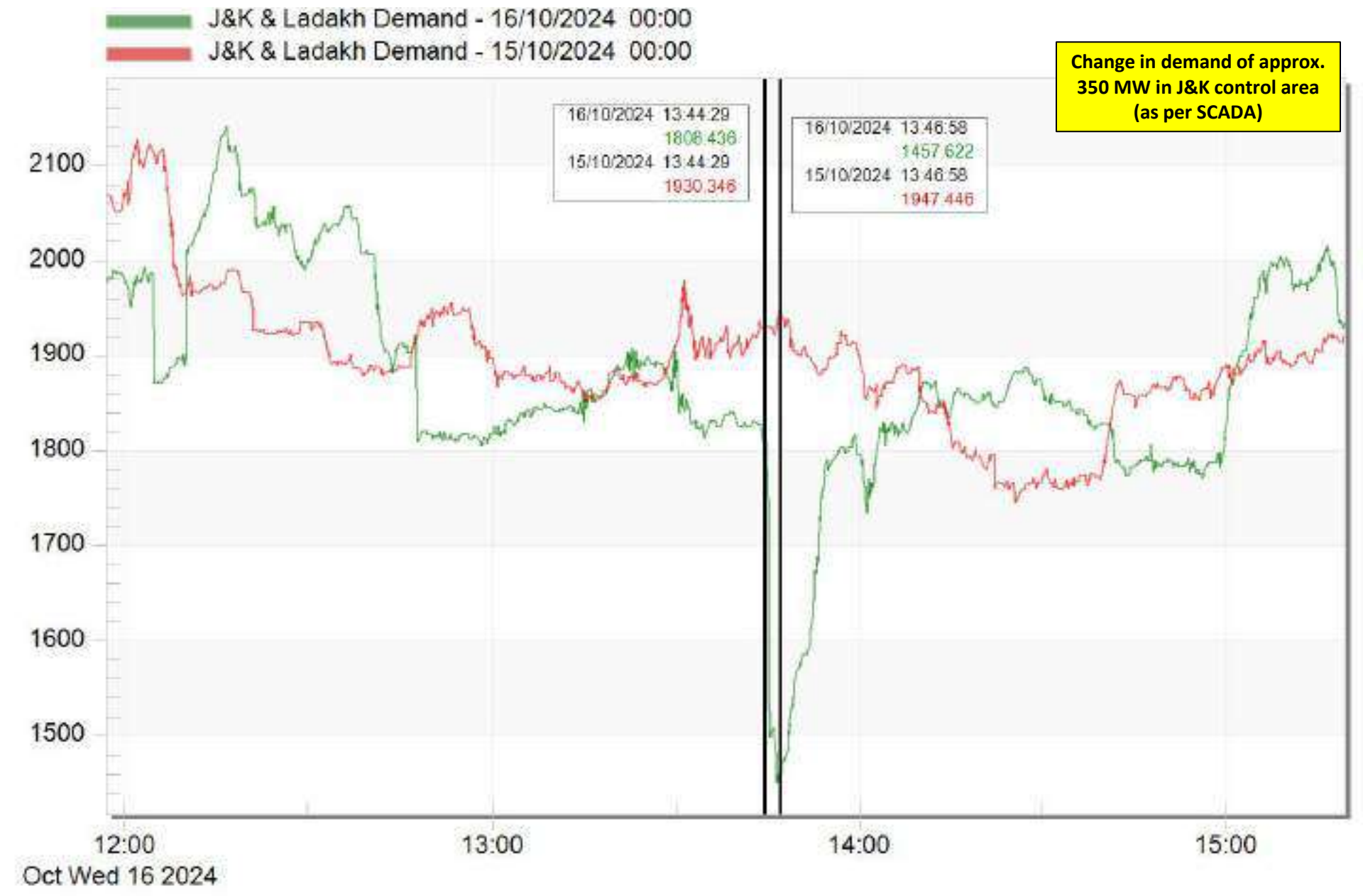
SLD of 400/220kV Wagoora(PG) before the event



SLD of 400/220kV Wagoora(PG) after the event

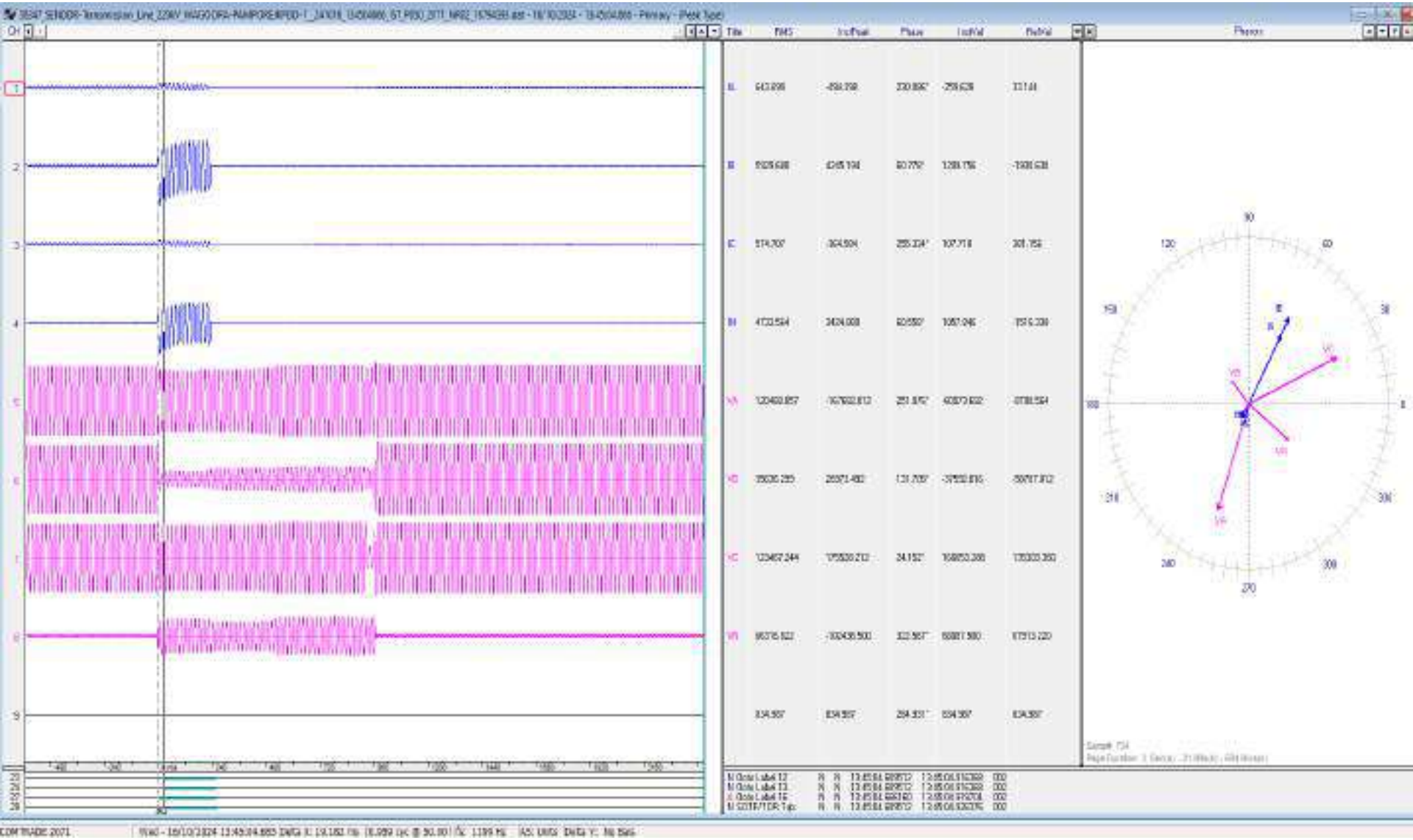


J&K Demand during the event



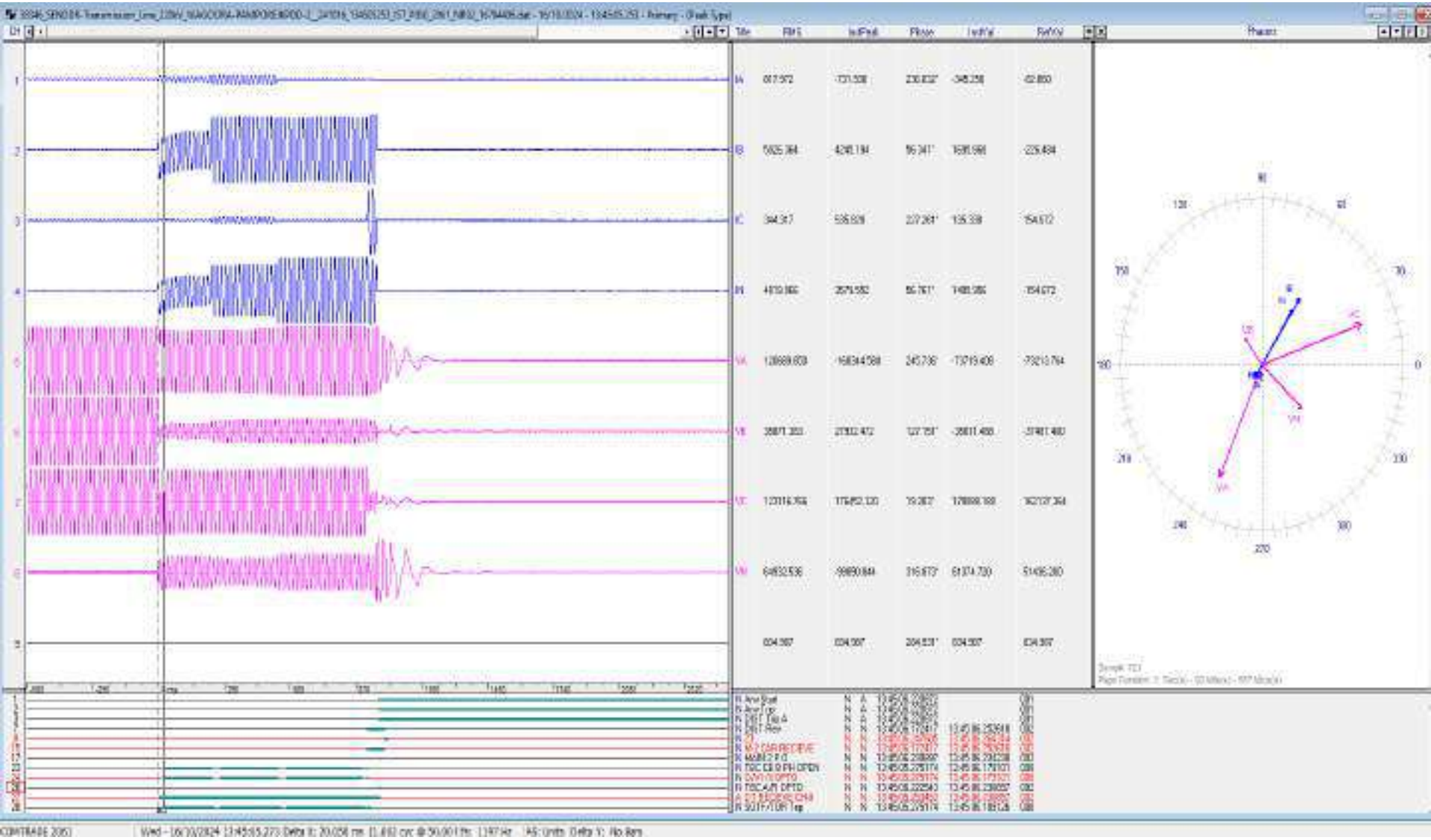
Change in demand of approx. 350 MW in J&K control area (as per SCADA)

DR of 220 KV Wagoora(PG) (end)-Pampore(PDD) (PG) Ckt-1



- ✓ Y-N fault; fault current=~5.93kA
- ✓ Fault clearing time=~235ms
- ✓ Line didn't trip from Wagoora end

DR of 220 KV Wagoora(PG) (end)-Pampore(PDD) (PG) Ckt-2



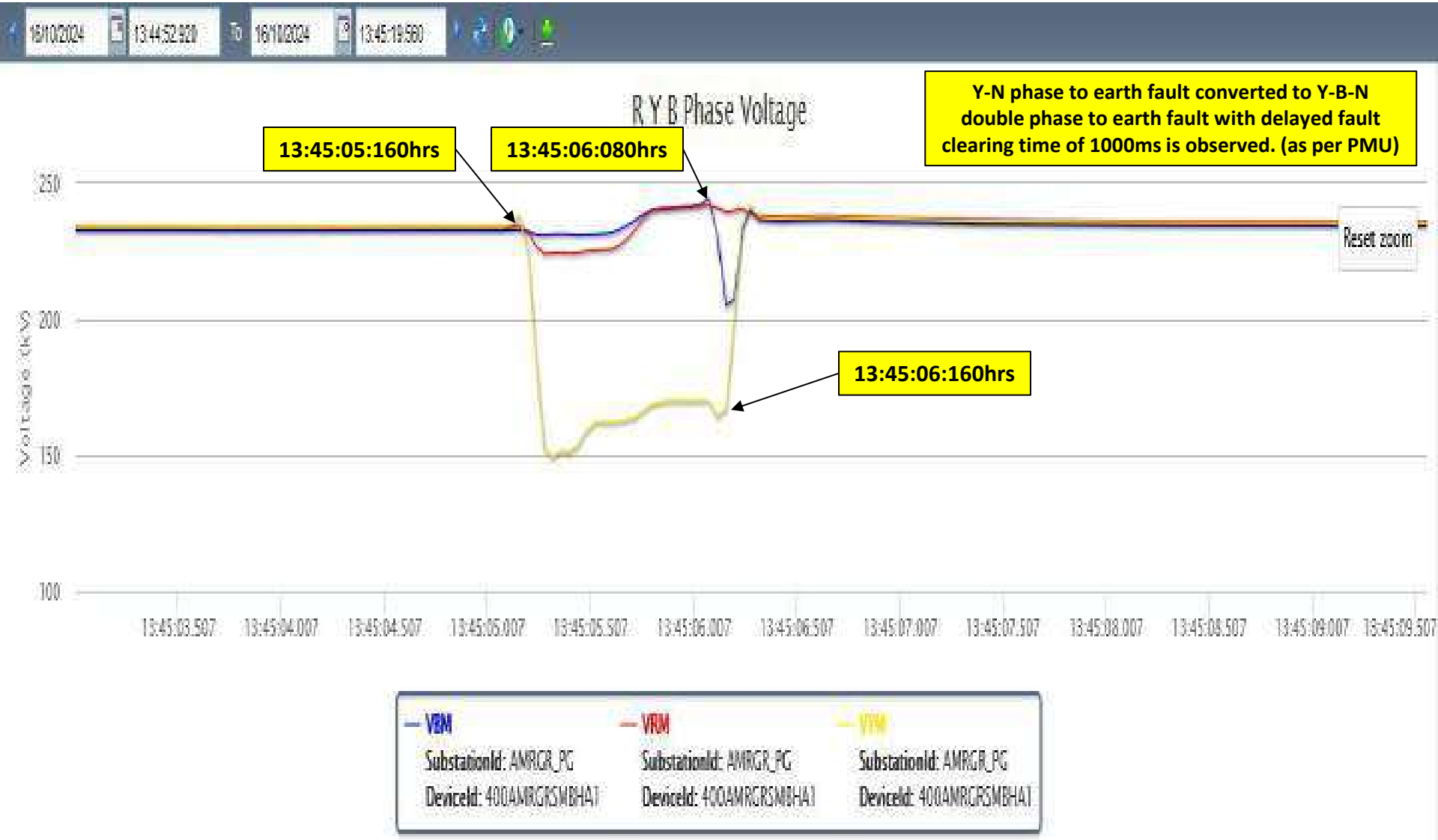
- ✓ Y-N fault with fault current=~5.93kA converted to Y-B-N fault with Iy=~8.64kA, Ib=~8.28kA
- ✓ Fault clearing time=~970ms
- ✓ Carrier received in Main-II; DT received in Ch-II

PMU Plot of frequency at Amargarh(INDIGRID)

13:45 hrs/16-Oct-24

PMU Plot of phase voltage magnitude at Amargarh(INDIGRID)

13:45 hrs/16-Oct-24



Points for Discussion

i) Exact location of fault and nature of protection operated need to be shared.

ii) Reason for delayed clearance of fault need to be shared.

iii) SCADA data was not available for 220/132kV Pampore(PDD JK) S/s during the event. Tripping is also not recorded in SCADA SOE. Availability and healthiness of SCADA data need to be ensured.

iv) DR/EL (.dat/.cfg file) along with tripping report of the tripped elements need to be shared from J&K end.

v) Remedial action taken report need to be shared.

S. No.	Name of Transmission Element Tripped	Owner/ Utility	Outage		Brief Reason (As reported)
			Date	Time	
1	220 KV Modak(RS)-Bhanpura(MP) (MPSEB) Ckt-1	MPSEB	07-Oct-24	04:57	Phase to earth fault R-N
2	132 KV Rihand(UP)-Garwa(JS) (UP) Ckt-1	UPPTCL	12-Oct-24	04:28	Phase to earth fault B-N
3	400 KV Allahabad-Sasaram (PG) Ckt-1	POWERGRID	20-Oct-24	13:05	Phase to earth fault B-N
4	132 KV Rihand(UP)-Garwa(JS) (UP) Ckt-1	UPPTCL	22-Oct-24	02:08	Phase to earth fault Y-N
5	800 KV HVDC Kurukshetra(PG) Pole-1	POWERGRID	23-Oct-24	23:14	Blocked due to CAT-1 protection operated at Champa and Block command received at Kurukshetra from Champa end.
6	220 KV Auraiya(NT)-Mehgaon(MP) (MPSEB) Ckt-1	POWERGRID	27-Oct-24	06:12	Phase to earth fault R-N

 # Fault Clearance time has been computed using PMU Data from nearest node available and/or DR provided by respective utilities (*Annexure-* ***II)***

****Yes, if written Preliminary report furnished by constituent(s)***

R-Y-B phase sequencing (Red, Yellow, Blue) is used in the list content.All information is as per Northern Region unless specified.

^^ tripping seems to be in order as per PMU data, reported information. However, further details may be awaited.

Reporting of Violation of Regulation for various issues for above tripping

1	Fault Clearance time(>100ms for 400kV and >160ms for 220kV)	1. CEA Grid Standard-3.e 2. CEA Transmission Planning Criteria
2	DR/EL Not provided in 24hrs	1. IEGC 37.2(c) 2. CEA Grid Standard 15.3
3	FIR Not Furnished	1. IEGC 37.2(b) 2. CEA Grid Standard 12.2 (Applicable for SLDC, ALDC only)
4	Protection System Mal/Non Operation	1. CEA Technical Standard of Electrical Plants and Electric Lines: 43.4.A 2. CEA (Technical
5	A/R non operation	1. CEA Technical Standard of Electrical Plants and Electric Lines: 43.4.C 2. CEA Technical

Annex-V

Annexure-XXIII

Status of Recording Instruments (220kV & above stations)						
Sr. No	**Station Name**	**Voltage Level**	**Disturbance Recorder/Station Event logger healthy (Yes or No)**	**Standardisation (Yes or No)**	**Time Sync (Yes or No)**	**Remarks**

Format for Station Event logger/SAS status

S. No.	Name of Division	Name of the station	Voltage Level (in kV)	Availability of station event logger	Healthiness of Event Logger	Is event logger time synchronised with GPS (Yes/No)	Date of commissioining / rectification of station event logger (in case of non-existence or unhelathy EL)	Status of Action being taken	
								Tenetative date for commissioning/healthiness	Any other remarks
1	T&CD, Shahjahanpur	220KV S/S Shahjahanpur	220KV	No	No	No	No	No	No
		220KV S/S Azizpur	220KV	YES	YES	YES			
		220KV S/S Hardoi	220KV	No	No	No	No	No	No
		220KV S/S Mallawa	220KV	YES	YES	YES			
		220 KV SITAPUR	220KV	No	No	No	No	No	No
		220 KV KANDUNI	220 KV	YES	YES	NO			
		220 KV NIGHASAN	220KV	YES	YES	NO			
		220 KV GOLA	220KV	YES	YES	YES			
2	T&CD, Gonda	220 KV GONDA	220/132/33 KV	NOT AVAILABLE					
		220 KV BALRAMPUR	220/132/33 KV	NOT AVAILABLE					
		220KV BAHRAICH	220/132/33 KV	NOT AVAILABLE					
3	T&CD, Sarojini Nagar	765kV Unnao	765kV	No	-	-	-	31.08.2024	-
		400kV Unnao	400kV	Yes	Healthy	No	31.05.2024	-	-
		400kV Sarojini Nagar	400kV	Yes	Unhealthy	-	31.05.2024	-	-
		220kV Sarojini Nagar	220kV	No	-	-	-	31.08.2024	-
		220kV/33kV Dahi Chauki Unnao	220kV	Yes	Healthy	Yes	-	-	-
4	T&CD, Sultanpur	400kV S/S Sultanpur	400/220kV	Yes	Unhealthy	No	May-15	31.07.2024	Hard Disc of Event Logger Industrial PC (Advantech make) crashed and ELB relay defective in Event Logger Panel. It is requested to Executive Engineer, Electy 400kV S/S Division, Sultanpur for an early repair/replacement of defective elements of Event Logger.
		220kV S/S Sultanpur	220kV	NO	Not Available	Not Available	Not Available	–	–
		220kV S/S Amethi	220kV	YES	Healthy	yes	04.04.2018	–	SAS Based Event Logger
		220kV S/S Bachhrawan	220kV	YES	Healthy	yes	26.05.2018	–	SAS Based Event Logger
		220kV S/S New Tanda	220kV	NO	Not Available	Not Available	Not Available	–	–
		220kV S/S Sohawal	220kV	NO	Not Available	Not Available	Not Available	–	–
		220kV S/S GIS Ayodhya	220kV	NO	Not Available	Not Available	Not Available	–	–
5	T&CD, Bareilly	400KV S/S BAREILLY	400KV	YES	YES	YES	-	-	All elements not connected due to exhausted capacity
			220KV	YES	YES	YES	-	-	
		220KV S/S DOHNA	220KV	No	N/A	N/A	-	-	-
		220 KV PILIBHIT	220KV	SAS	YES	NO	-	-	-
		220 KV AMARIYA	220 KV	SAS	YES	YES			
		220 KV Badaun	220 KV	Not Installed					
		220 KV Dataganj	220 KV	SAS	Yes	Yes			
		220 KV C B ganj	220 KV	Not Installed					
		220 KV Faridpur	220 KV	SAS	No				
6	T&CD, Lucknow	220KV Hardoi Rd	220KV	NO	-	-	-	-	
		220KV GIS Kanpur Rd	220KV	Yes	Yes	Yes	-	-	
		220KV Bijnor Rd.	220KV	Yes	Yes	Yes	-	-	
		220 KV SS CHINHAT	220 KV	NO	NA	NA			
		220 KV SS C G CITY	220 KV	NOT WORKING	Unhealthy	NA			
		220 KV SS K ROAD	220 KV	YES	Healthy	SYNC			
		220 KV SS BKT	220 KV	YES	Healthy	SYNC			
		220 KV SS GOMTI NAGAR	220 KV	NO	NA	NA			
		220 KV SS SATRIKH ROAD	220 KV	YES	Healthy	SYNC			
		220 KV SS BARABANKI	220 KV	YES	Healthy	SYNC			

DETAILS OF TIME SYNCHRONISATION OF RELAY WITH GPS CLOCK AT 765/400/220 KV SUBSTATION

SNO.	Name of Division	NAME OF S/S	DETAILS OF GPS CLOCK: AVAILABLE	DETAILS OF GPS CLOCK: WHETHER WORKING IF AVAILABLE	DETAILS OF GPS CLOCK: WHETHER GPS CLOCK HAS SUFFICIENT NO OF PORTS SNTP, RS 85 ETC	DETAILS OF TRANSMISSION LINE: SNO.	NAME OF TRANSMISSION LINE	MAIN 1	MAIN 2	LBB	DETAILS OF ICTS: SNO.	NAME OF ICT	DIFFERENTIAL PROTECTION	HV SIDE BACK UP PROTECTION	LV SIDE BACK UP PROTECTION	REF PROTECTION	OVERFLUX RELAY	WHETHER BUS BAR PLROTECTION IS TIME SYNCHRONISED: HV SIDE	LV SIDE	WHETHER EVENT LOGGER IS TIME SYNCHRONISED	WHETHER DR IS TIME SYNCHRONISED	WHETHER SPS SCHEME IS GPS SYNCHRONISED	Action being taken and tentative date of synchronization
1	T&CD, Shahjahanpur	220KV S/S Shahjahanpur	GPS CLOCK IS AVAILABLE	GPS CLOCK IS NOT WORKING	GPS CLOCK HAS SUFFICIENT NO OF PORTS	1	220 KV RPSCL ROSA -I	NOT SYNC	NOT SYNC	NOT SYNC	1	160 MVA ICT -I	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT APPLICABLE	NOT SYNC	NOT APPLICABLE	
						2	220 KV RPSCL ROSA -II	NOT SYNC	NOT SYNC	NOT SYNC	2	160 MVA ICT -II	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC				
						3	220 KV Faridpur	NOT SYNC	NOT SYNC	NOT SYNC	3	200 MVA ICT	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC				
						4	220 KV Hardoi line	NOT SYNC	NOT SYNC	NOT SYNC													
						5	220 KV Gola line	NOT SYNC	NOT SYNC	NOT SYNC													
						6	220 KV Azizpur line	NOT SYNC	NOT SYNC	NOT SYNC													
		220KV S/S Hardoi	GPS CLOCK IS AVAILABLE	GPS CLOCK IS WORKING	GPS CLOCK HAS SUFFICIENT NO OF PORTS	1	220 KV Shahjahanpur line	NOT SYNC	NOT SYNC	NOT SYNC	1	160 MVA ICT -I	SYNC	SYNC	SYNC	SYNC	SYNC	SYNC	SYNC	NOT APPLICABLE	NOT SYNC	NOT APPLICABLE	
						2	220KV Mallawan line	SYNC	NOT SYNC	NOT SYNC	2	160 MVA ICT -II	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC				
		220 KV S/S SITAPUR	GPS CLOCK IS NOT AVAILABLE	---------------------	------------	1	220 KV BKT LINE	NOT SYNC	NOT SYNC	NOT SYNC		200 MVA TXR	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE	
						2	220 KV SPN PGCIL LINE	NOT SYNC	NOT SYNC	NOT SYNC		160 MVA TXR	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC				
						3	220 KV KANDUNI LINE	NOT SYNC	NOT SYNC	NOT SYNC		100 MVA TXR	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC				
		220 KV S/S KANDUNI	GPS CLOCK IS AVAILABLE	GPS CLOCK IS WORKING	GPS CLOCK HAS SUFFICIENT NO OF PORTS	1	220 KV SITAPUR LINE	NOT SYNC	NOT SYNC	NOT SYNC		200 MVA TXR	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC				
						2	220 KV NIGHASHAN LINE	NOT SYNC	NOT SYNC	NOT SYNC													
						3	220 KV PGCIL LKO 1 LINE	NOT SYNC	NOT SYNC	NOT SYNC													
						4	220 KV PGCIL LKO 2 LINE	NOT SYNC	NOT SYNC	NOT SYNC													
		220 KV SS NIGHASAN	GPS CLOCK IS NOT AVILABLE	---------------------	--------------	1	220 KV GOLA LINE	NOT SYNC	NOT SYNC	NOT SYNC	1	160 MVA TXR	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT APPLICABLE	
						2	220 KV KANDUNI LINE	NOT SYNC	NOT SYNC	NOT SYNC	2	100 MVA TXR 1	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC		
											3	100 MVA TXR 2	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC		
2	T&CD, Gonda	220/132 KV Gonda	GPS CLOCK IS AVAILABLE	GPS CLOCK IS WORKING	GPS CLOCK HAS SUFFICIENT NO OF PORTS	1	220 KV PGCIL LINE	NOT SYNC	NOT SYNC	NOT SYNC	1	220/132 KV 200 MVA ICT -I	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT APPLICABLE	NOT SYNC	NOT APPLICABLE	
						2	220 KV INTERCONNECRTOR	NOT SYNC	NOT SYNC	NOT SYNC	2	220/132 KV 200 MVA ICT -II	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC				
						3	220 kv BASTI(400)-I	NOT SYNC	NOT SYNC	NOT SYNC													
						4	220 kv BASTI(400)-II	NOT SYNC	NOT SYNC	NOT SYNC													
		220/132 KV Bahraich	GPS CLOCK IS AVAILABLE	GPS CLOCK IS Not WORKING	GPS CLOCK HAS SUFFICIENT NO OF PORTS	1	220 KV PGCIL LINE	NOT SYNC	NOT SYNC	NOT SYNC	1	220/132 KV 160 MVA ICT -I	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT APPLICABLE	NOT SYNC	NOT APPLICABLE	
						2	220 kv Balrampur Line	NOT SYNC	NOT SYNC	NOT SYNC	2	220/132 KV 160 MVA ICT -II	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC				
											3	220/132 KV 100 MVA ICT	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC				
3	T&CD, Sarojini Nagar	765 KV UNNAO	GPS CLOCK IS NOT AVAILABLE	NOT APPLICABLE	NOT APPLICABLE	1	765 KV UNNAO-ANPARA C LINE	SYNC BY SNTP	SYNC BY SNTP	SYNC BY SNTP	1	765/400 KV 1000 MVA ICT -I	SYNC BY SNTP	SYNC BY SNTP	SYNC BY SNTP	SYNC BY SNTP	SYNC BY SNTP	SYNC BY SNTP	SYNC BY SNTP	NOT APPLICABLE	SYNC BY SNTP	NOT APPLICABLE	
						2	765 KV UNNAO-OBRA C LINE	SYNC BY SNTP	SYNC BY SNTP	SYNC BY SNTP	2	765/400 KV 1000 MVA ICT -II	SYNC BY SNTP	SYNC BY SNTP	SYNC BY SNTP	SYNC BY SNTP	SYNC BY SNTP	SYNC BY SNTP	SYNC BY SNTP				
											3	765/400 KV 1000 MVA ICT -III	SYNC BY SNTP	SYNC BY SNTP	SYNC BY SNTP	SYNC BY SNTP	SYNC BY SNTP	SYNC BY SNTP	SYNC BY SNTP				
											4	3X63 MVAR BUS REACTOR	SYNC BY SNTP	SYNC BY SNTP	SYNC BY SNTP	SYNC BY SNTP	SYNC BY SNTP	SYNC BY SNTP	SYNC BY SNTP				
		400/220 KV UNNAO	GPS CLOCK IS AVAILABLE	GPS CLOCK IS WORKING	GPS CLOCK DOES NOT HAVE SUFFICIENT NO OF PORTS	1	400 KV UNNAO JEHTA 1 LINE	SYNC	SYNC	NOT SYNC	1	400/220 KV 500 MVA ICT -2	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	EVENT LOGGER HAS TIME SYNCHRONISATION CONNECTION DONE, BUT IS NOT SHOWING CORRECT TIME(APPROXIMATELY THREE MINUTE ADVANCE)
						2	400 KV UNNAO JEHTA 2 LINE	SYNC	NOT SYNC	NOT SYNC	2	400/220 KV 315 MVA ICT -2	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC				
						3	400 KV UNNAO MOHANLALGANJ LINE	SYNC	NOT SYNC	NOT SYNC	3	400/220 KV 315 MVA ICT -3	SYNC	SYNC	SYNC	SYNC	SYNC	NOT SYNC	NOT SYNC				
						4	400 KV UNNAO BAREILLY 1 LINE	SYNC	NOT SYNC	NOT SYNC													
						5	400 KV UNNAO BAREILLY 2 LINE	SYNC	NOT SYNC	NOT SYNC													
						6	400kV UNNAO- PANKI LINE	SYNC	NOT SYNC	NOT SYNC													
						7	400 KV UNNAO AGRA LINE	SYNC	NOT SYNC	NOT SYNC													
		220/132 KV UNNAO	GPS CLOCK IS NOT AVAILABLE	NOT APPLICABLE	NOT APPLICABLE	1	220 KV UNNAO-PHOOL BAGH-1 LINE	NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE	1	220/132 KV 160 MVA ICT -I	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT APPLICABLE	GPS CLOCK IS NOT AVAILABLE	GPS CLOCK IS NOT AVAILABLE	GPS CLOCK IS NOT AVAILABLE	NO EVENT LOGGER IS INSTALLED
						2	220 KV UNNAO-PHOOL BAGH-2 LINE	NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE	2	220/132 KV 160 MVA ICT -II	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT APPLICABLE				
						3	220 KV UNNAO- BITHOOR LINE	NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE	3	220/132 KV 160 MVA ICT -III	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT APPLICABLE				
						4	220 KV UNNAO- RPH LINE	NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE													
						5	220 KV UNNAO- GIS KANPUR ROAD LINE	NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE													
						6	220 KV UNNAO- AJGAIN TSS LINE	NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE													
						7	220 KV UNNAO- DAHI CHOWKI LINE	NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE													
		400KV Sarojini Nagar Lucknow	GPS Clock is Available	Working	GPS Clock has not Sufficient No. of Ports	1	400 KV Singrauli Line	-	-	Non Numerical Relay	Reactor Back Up Impedance Not Sync	1	400/220 KV 500 MVA ICT -I	Not Sync	Not Sync	Not Sync	Not Sync	Not Sync	-	Non Numerical Relay	-	Unhealthy	-
						2	400 KV Bareilly Line	-	-	Non Numerical Relay	-	2	220/132 KV 200 MVA ICT -I	Not Sync	Not Sync	Not Sync	Not Sync	Not Sync	-				
						-	-	-	-	-	-	3	80MVAr Bus Reactor	Not Sync	-	-	Not Sync	-	Back Up Impedance				
		220/132/33 KV SAROJINI NAGAR	GPS CLOCK IS AVAILABLE	GPS Clock is Working DATE : Wrong Time : Ok	GPS CLOCK HAS NOT SUFFICIENT NO OF PORTS	1	220KV Gomati Nagar	Not Sync	Not Sync (Bakup Relay)	-		1	220/132 KV 200 MVA ICT -I	-	Not Sync	Not Sync	Not Sync		Not Sync	Not Sync	-	Not Available	-
						2	220KV Hardoi Road	Not Sync	Not Sync (Bakup Relay)	-		2	220/132 KV 200 MVA ICT -2	-	Not Sync	Not Sync	Electro Mechanical Relay		Not Sync				
						3	220KV Dahi Chauki	Not Sync	Not Sync (Bakup Relay)	-		3	220/132 KV 200 MVA ICT -3	-	Not Sync	Not Sync	Not Sync		Not Sync				
						4	220KV Kanpur Road	Not Sync	Not Sync (Bakup Relay)														
						5	220KV Bijnaur	-	Not Sync														
4	T&CD, Sultanpur	400kV S/S Sultanpur	GPS CLOCK IS AVAILABLE	GPS CLOCK IS WORKING	GPS CLOCK HAS SUFFICIENT NO OF PORTS	1	400kV NTPC Tanda line	SYNC	SYNC	SYNC	1	400/220kV, 315MVA ICT-I	SYNC	SYNC	SYNC	SYNC	SYNC	SYNC	SYNC	NOT SYNCHRONISED (DEFECTIVE)	SYNC	NOT SYNCHRONISED (DEFECTIVE)	
						2	400kV Obra line	SYNC	SYNC	SYNC	2	400/220kV, 240MVA ICT-II	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	
						3	400kV PGCIL Mohanlalganj line	SYNC	SYNC	SYNC	3	400/220kV, 315MVA ICT-III	SYNC	SYNC	SYNC	SYNC	SYNC	SYNC	SYNC	NOT SYNCHRONISED (DEFECTIVE)	SYNC	NOT SYNCHRONISED (DEFECTIVE)	
						4	220kV Amethi line	SYNC	SYNC	SYNC	4	400/220kV, 315MVA ICT-IV	SYNC	SYNC	SYNC	SYNC	SYNC	SYNC	SYNC	NOT SYNCHRONISED (DEFECTIVE)	SYNC	NOT SYNCHRONISED (DEFECTIVE)	
						5	220kV Sangipur line	SYNC	SYNC	SYNC													
		220KV S/S Sultanpur	GPS CLOCK IS AVAILABLE	GPS CLOCK IS WORKING	GPS CLOCK HAS NOT SUFFICIENT NO. OF PORTS	1	220 KV PRATAPGARH LINE	SYNC	SYNC	NA	1	220/132kV, 160 MVA ICT -I	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT APPLICABLE	PARTIAL SYNC	SPS SYSTEM DEFECTIVE	
						2	220 KV SOHAWAL LINE	SYNC	SYNC	NA	2	220/132kV, 160 MVA ICT -III	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC				
						3	220 KV NEW TANDA LINE	SYNC	NOT SYNC	NA	3	220/132kV, 200 MVA ICT -II	SYNC	NOT SYNC	NOT SYNC	SYNC	SYNC	NOT SYNC	NOT SYNC				
						4	220 KV NTPC TANDA LINE	SYNC	NOT SYNC	NA													
		220KV S/S BACHRAWAN	GPS CLOCK IS AVAILABLE	GPS CLOCK IS WORKING	YES	1	220 KV BIJNAUR ROAD	SYNC	SYNC	SYNC	1	220/132kV, 160 MVA ICT -I	SYNC	SYNC	SYNC	SYNC	SYNC	SYNC	SYNC	YES	YES	SPS SYSTEM NA	
						2	220KV PGCIL RAIBARELI	SYNC	SYNC	SYNC	2	220/132kV. 160 MVA ICT -II	SYNC	SYNC	SYNC	SYNC	SYNC	SYNC	SYNC				
		220 KV S/S AMETHI	GPS SYSTEM IS AVAILABLE	GPS SYSTEM IS AVAILABLE	YES	1	220 KV SANGIPUR	SYNC	SYNC	SYNC	1	220/132kV, 160 MVA ICT -I	SYNC	SYNC	SYNC	SYNC	SYNC	SYNC	SYNC	YES	YES	SPS SYSTEM NA	
						2	220 KV SULTANPUR	SYNC	SYNC	SYNC	2	220/132kV, 160 MVA ICT -II	SYNC	SYNC	SYNC	SYNC	SYNC	SYNC	SYNC				
						3	220 KV RAIBARELI(SIRSIRA) CKT1	SYNC	SYNC	SYNC													
							220 KV RAIBARELI(SIRSIRA) CKT2	SYNC	SYNC	SYNC													
		220 KV S/S GIS AYODHYA	GPS CLOCK IS AVAILABLE	GPS CLOCK IS WORKING	GPS CLOCK HAS SUFFICIENT NO OF PORTS	1	220 KV NEW TANDA LINE	SYNC	SYNC	SYNC	1	220/132kV, 160 MVA ICT -I	SYNC	SYNC	SYNC	SYNC	SYNC	SYNC	SYNC	SYNC	Inbuilt in relay SYNC	SYNC	
						2	220 KV PGCIL LINE	SYNC	SYNC	SYNC	2	220/132kV, 160 MVA ICT -II	SYNC	SYNC	SYNC	SYNC	SYNC	SYNC	SYNC				
		220 KV S/S SOHAWAL	GPS CLOCK IS AVAILABLE	GPS CLOCK IS WORKING	GPS CLOCK HAS SUFFICIENT NO OF PORTS	1	220 KV SULTANPUR LINE	NOT SYNC	NOT SYNC	NOT SYNC	1	220/132kV, 160 MVA ICT -I	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	Inbuilt in relay SYNC	NOT SYNC	
						2	220 KV GONDA LINE	NOT SYNC	NOT SYNC	NOT SYNC	2	220/132kV, 160 MVA ICT -II	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC				
						3	220 KV PGCIL LINE-1	NOT SYNC	NOT SYNC	NOT SYNC													
						4	220 KV PGCIL LINE-2	NOT SYNC	NOT SYNC	NOT SYNC													
		220 KV S/S NEW TANDA	GPS CLOCK IS AVAILABLE	GPS CLOCK IS NOT WORKING	GPS CLOCK HAS SUFFICIENT NO OF PORTS	1	220 KV SULTANPUR LINE	NOT SYNC	NA	NA	1	220/132kV, 160 MVA ICT -I	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	
						2	220 KV GIS AYODHYA LINE	NOT SYNC	NA	NA	2	220/132kV, 160 MVA ICT -II	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC				
						3	220 KV PGCIL LINE	NOT SYNC	NA	NA	3	220/132kV, 160 MVA ICT -III	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC				
						4	220 KV NTPC LINE-1	NOT SYNC	NA	NA													
						5	220 KV NTPC LINE-2	NOT SYNC	NOT SYNC	NA													
						6	220 KV NTPC LINE-3	NOT SYNC	NOT SYNC	NA													
5	T&CD, Bareilly	400/220 KV Bareilly	GPS CLOCK IS AVAILABLE	GPS CLOCK IS WORKING	GPS CLOCK DOES NOT HAVE SUFFICIENT NO OF PORTS	1	400 KV UNNAO-1 LINE	SYNC	SYNC	Non Numerical Relay	1	400/220 KV 315 MVA ICT -1	Non Numerical Relay	Non Numerical Relay	Non Numerical Relay	Non Numerical Relay	Non Numerical Relay	Non Numerical Relay	Non Numerical Relay	SYNC	-	Not available	EVENT LOGGER HAS TIME SYNCHRONISATION CONNECTION DONE BUT CAPACITY IS EXHAUSTED(ALL BAYS ARE NOT CONNECTED IN EL)
						2	400 KV UNNAO-2 LINE	SYNC	SYNC	Non Numerical Relay	2	400/220 KV 315 MVA ICT -2	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC				
						3	400 KV PGCIL BAREILLY 1 LINE	SYNC	SYNC	Non Numerical Relay	3	400/220 KV 315 MVA ICT -3	SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC				
						4	400 KV PGCIL BAREILLY 2 LINE	SYNC	SYNC	Non Numerical Relay	4	80 MVAr Bus Reactor	Non Numerical Relay	Non Numerical Relay	-	Non Numerical Relay	-	-	-				
						5	220 KV DOHNA-1	SYNC	SYNC	SYNC													
						6	220 KV DOHNA-2	SYNC	SYNC	SYNC													
						7	220 KV CB GANJ-1	SYNC	Non Numerical Relay	Non Numerical Relay													
						8	220 KV CB GANJ-2	SYNC	SYNC	SYNC													
						9	220 KV PILIBHIT-1	NOT SYNC	NOT SYNC	NOT SYNC													
						10	220 KV PILIBHIT-2	SYNC	Non Numerical Relay	Non Numerical Relay													
						11	220 KV AMARIYA-1	SYNC	SYNC	SYNC													
						12	220 KV AMARIYA-2	SYNC	SYNC	SYNC													
						13	220 KV PANTNAGAR	SYNC	Non Numerical Relay	Non Numerical Relay													
						14	220 KV FARIDPUR	SYNC	SYNC	SYNC													
		220/132 KV PILIBHIT	GPS CLOCK IS DEFECTIVE	NOT APPLICABLE	NOT APPLICABLE	1	220 KV BAREILLY-1	NOT SYNC	NOT SYNC	NOT SYNC	1	220/132 KV 160 MVA ICT -I	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	N/A	-	Not available	SAS S/S
						2	220 KV BAREILLY-2	NOT SYNC	NOT SYNC	NOT SYNC	2	220/132 KV 160 MVA ICT -II	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC				
		220/132 KV AMARIYA	GPS Clock is Available	Working	YES	1	220 KV BAREILLY-1	SYNC	SYNC	SYNC	1	220/132 100 MVA T/F-1	SYNC	SYNC	SYNC	SYNC	SYNC	SYNC	SYNC	N/A	-	Not Available	SAS S/S
						2	220 KV BAREILLY-2	SYNC	SYNC	SYNC	2	220/132 100 MVA T/F-2	SYNC	SYNC	SYNC	SYNC	SYNC	SYNC	SYNC				
		220/132/33 KV DOHNA	GPS CLOCK IS AVAILABLE	Working	GPS CLOCK HAS NOT SUFFICIENT NO OF PORTS	1	220 KV BAREILLY-1	Not Sync	Not Sync	Not Sync	1	220/132 160 MVA T/F-1	Not Sync	Not Sync	Not Sync	Not Sync	Not Sync	Not Sync	Not Sync	N/A	-	Not Available	EVENT LOGGER NOT INSTALLED
						2	220 KV BAREILLY-2	Not Sync	Not Sync	Not Sync	2	220/132 160 MVA T/F-2	Not Sync	Not Sync	Not Sync	Not Sync	Not Sync	Not Sync	Not Sync				
						3	220KV CB GANJ	Not Sync	Not Sync	Not Sync													
						4	220KV ROZA	Not Sync	Not Sync	Not Sync													
		220KV S/S Badaun	GPS CLOCK IS NOT AVAILABLE	---------------------	-----------	1	220 KV C.B Ganj(OCBTL-1)	NOT SYNC	NOT SYNC	NOT SYNC	1	200MVA T/F I	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT APPLICABLE	NOT SYNC	NOT APPLICABLE	
						2	220 KV Roza PH-I	NOT SYNC	NOT SYNC	NOT SYNC	2	200MVA T/F II	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC				
						3	220 KV Roza PH-II	NOT SYNC	NOT SYNC	NOT SYNC													
						4	220 KV Sambhal/ chandosi (OCBTL-2)	NOT SYNC	NOT SYNC	NOT SYNC													
		220KV S/S CBGanj	GPS CLOCK IS AVAILABLE	GPS CLOCK IS NOT WORKING	GPS CLOCK HAS NOT SUFFICIENT NO OF PORTS	1	220 Kv 400 Kv BLY	NOT SYNC	NOT SYNC	NOT SYNC	1	200 MVAT/FI	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT APPLICABLE	NOT SYNC	NOT APPLICABLE	
						2	220 Kv 400 Kv BLY (New)	NOT SYNC	NOT SYNC	NOT SYNC	2	200 MVAT/FII	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC				
						3	220 Kv Dohna	NOT SYNC	NOT SYNC	NOT SYNC													
						4	220 Kv Tanakpur	SYNC	SYNC	SYNC													
						5	220 Kv Sitarganj	SYNC	SYNC	SYNC													
						6	220 Kv Rampur	NOT SYNC	NOT SYNC	NOT SYNC													
						7	220 KV OCBTL	NOT SYNC	NOT SYNC	NOT SYNC													
						8	220 Kv Roza (New)	NOT SYNC	NOT SYNC	NOT SYNC													
		220 KV S/S Faridpur	GPS CLOCK IS AVAILABLE	GPS CLOCK IS NOT WORKING	GPS CLOCK HAS SUFFICIENT NO OF PORTS	1	220KV Bareilly (400)	NOT SYNC	NOT SYNC	NOT SYNC		100MVA T/F -I	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE	
						2	220KV Shahjahanpur	NOT SYNC	NOT SYNC	NOT SYNC													
		220 KV S/S Dataganj	GPS CLOCK IS AVAILABLE	GPS CLOCK IS WORKING	GPS CLOCK HAS SUFFICIENT NO OF PORTS	1	220KV Badaun	SYNC	SYNC	SYNC		160 MVA T/F-I	SYNC	SYNC	SYNC	SYNC	SYNC	SYNC	SYNC	SYNC	SYNC	NOT APPLICABLE	
						2	220KV Roza	SYNC	SYNC	SYNC		160 MVA T/F-II	SYNC	SYNC	SYNC	SYNC	SYNC	SYNC	SYNC				
						3	220KV OCBTL-I	SYNC	SYNC	SYNC													
						4	220KV OCBTL-II	SYNC	SYNC	SYNC													
6	T&CD, Lucknow	400kV GIS JEHTA	AVAILABLE	WORKING	YES	1	400KV JEHTA(400)- UNNAO CKT-1	SYNC	SYNC	SYNC	SYNC	400/220KV 500 MVA ICT-1	SYNC	SYNC	SYNC	SYNC	SYNC	SYNC	SYNC	YES	YES	NA	
							400KV JEHTA(400)- UNNAO CKT-2	SYNC	SYNC	SYNC	SYNC	400/220KV 500 MVA ICT-2	SYNC	SYNC	SYNC	SYNC	SYNC	SYNC	SYNC				
							400KV JEHTA(400) - KURSI ROAD CKT-1	SYNC	SYNC	SYNC	SYNC	220/132KV 200 MVA ICT-1	SYNC	SYNC	SYNC	SYNC	SYNC	SYNC	SYNC				
							400KV JEHTA(400) - KURSI ROAD CKT-2	SYNC	SYNC	SYNC	SYNC	220/132KV 200 MVA ICT-2	SYNC	SYNC	SYNC	SYNC	SYNC	SYNC	SYNC				
							220KV JEHTA(400) - HARDOI ROAD CKT-1	SYNC	SYNC	SYNC	SYNC												
							220KV JEHTA(400) - HARDOI ROAD CKT-2	SYNC	SYNC	SYNC	SYNC												
							220KV JEHTA(400) - MALLAWAN CKT-1	SYNC	SYNC	SYNC	SYNC												
							220KV JEHTA(400) - MALLAWAN CKT-2	SYNC	SYNC	SYNC	SYNC												
		220KV Hardoi Rd	Yes	No	No	1	220KV Jehta I	Not Sync	Not Sync	Not Sync	1	200MVA TF I	Not Sync	Not Sync	Not Sync	Not Sync	Not Sync	HV Side		NA	NA	NA	Has been informed to SDO regarding this, Process is going on as informed.
						2	220KV Jehta II	Not Sync	Not Sync	Not Sync	2	200MVA TF II	Not Sync	Not Sync	Not Sync	Not Sync	Not Sync	HV Side					
						3	220KV Sarojininagar	Not Sync	Not Sync	Not Sync								HV Side					
						4	220KV Kursi Rd.	Not Sync.	Not Sync.	Not Sync.								HV Side					
		220KV Kanpur Rd	Yes	Yes	Yes	1	220KV Sarojininagar	Sync	Sync	Sync	1	60 MVA TF I	Sync	Sync	Sync	Sync	Sync	HV Side		YES	YES	YES	
						2	220KV Unnao	Sync	Sync	Sync	2	60 MVA TF II	Sync	Sync	Sync	Sync	Sync	HV Side					
											3	60 MVA TF III	Sync.	Sync.	Sync.	Sync.	Sync.	HV Side					
		220KV Bijnor Rd.	Yes	Yes	Yes	1	220KV Sarojininagar	Sync	Sync	Sync	1	160MVA TF I	Sync	Sync	Sync	Sync	Sync	HV Side		YES	YES	YES	
						2	220KV Baccharawan	Sync.	Sync.	Sync.	2	160MVA TF II	Sync.	Sync.	Sync.	Sync.	Sync.	HV Side					
		220 KV CHINHAT	AVAILABLE	NOT WORKING	yes	1	220 KV SATRIKH LINE	NOT SYNC	NOT SYNC		1	220/132 KV 200 MVA T/F-I(BHEL)	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NO	NO	NO	
						2	220 KV GOMTINAGAR	NOT SYNC	NOT SYNC		2	220/132 KV 200 MVA T/F-II(ADITYA)	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC				
						3	220 KV PGCIL LKO	NOT SYNC	NOT SYNC														
						4	220 KV KURSI ROAD	NOT SYNC	NOT SYNC														
						5	220 KV LMRC-I	NOT SYNC	NOT SYNC														
						6	220 KV LMRC-II	NOT SYNC	NOT SYNC														
		220 KV GOMTI NAGAR	AVAILABLE	NOT WORKING	YES	1	220 KV CHINHAT	NOT SYNC	NOT SYNC		1	220/33 KV 60 MVA T/F -I	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NO	NO	NO	
											2	220/33 KV 60 MVA T/F -II	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC				
											3	220/33 KV 60 MVA T/F -III	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC				
						2	220 KV SAROJINI NAGAR	NOT SYNC	NOT SYNC		4	220/33 KV 60 MVA T/F -IV	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC				
		220 KV SATRIKH	AVAILABLE	WORKING	YES	1	220 KV CG CITY LINE	SYNC	SYNC		1	220/33 KV 60 MVA T/F -I (TA)	SYNC	SYNC	SYNC	SYNC	SYNC	SYNC	SYNC	YES	YES	YES	
						2	220 KV CHINHAT LINE	SYNC	SYNC		2	220/33 KV 60 MVA T/F -II (BBL)	SYNC	SYNC	SYNC	SYNC	SYNC	SYNC	SYNC				
						3	220 KV Barabanki CKT-I	SYNC	SYNC														
						4	220 KV Barabanki CKT-II	SYNC	SYNC														
		220 KV C.G.CITY	AVAILABLE	NOT WORKING	YES	1	220 KV PGCIL -Raibareilly LINE	NOT SYNC	NOT SYNC		1	220/33 KV 60 MVA T/F -I	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NO	NO	NO	
						2	220 KV SATRIKH ROAD LINE	NOT SYNC	NOT SYNC		2	220/33 KV 60 MVA T/F -II	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC				
		220 KV BKT	AVAILABLE	NOT WORKING	YES	1	220 KV PGCIL LINE	NOT SYNC	NOT SYNC		1	220/33 KV 60 MVA T/F -I	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NO	NO	NO	
						2	220 KV SITAPUR LINE	NOT SYNC	NOT SYNC		2	220/33 KV 60 MVA T/F -II	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC				
		220 KV KURSI ROAD	AVAILABLE	NOT WORKING	YES	1	220 KV CHINHAT	NOT SYNC	NOT SYNC		1	200 MVA T/F-I	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NO	NO	NO	
						2	220 KV HARDOI ROAD	NOT SYNC	NOT SYNC		2	100MVA T/F	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC				
						3	220 KV PGCIL CKT-I	NOT SYNC	NOT SYNC		3	160 MVA T/F	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC				
											4												
						4	220 KV PGCIL CKT-II	NOT SYNC	NOT SYNC		5												
		220 KV BARABANKI	AVAILABLE	NOT WORKING	YES	1	220 KV PGCIL CKT-I	NOT SYNC	NOT SYNC		1	220/132 KV 160 MVA T/F -I(BBL)	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NO	NO	NO	
						2	220 KV PGCIL CKT-II	NOT SYNC	NOT SYNC		2	220/132 KV 160 MVA T/F -II(BBL)	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC	NOT SYNC				
						3	220 KV SATRIKH ROAD LINE -I	NOT SYNC	NOT SYNC		3												
						4	221 KV SATRIKH ROAD LINE -II	NOT SYNC	NOT SYNC		4												

ELECTRICITY TEST & COMMISSIONING CIRCLE, MEERUT						
TRANSMISSION WEST ZONE UPPTCL,MEERUT						
Status of recording instruments(220kV and above stations) Annexure-XVII Date: 18.9.24						
Sr.No	**Station Name**	**Voltage Level**	**Disturbance recorder/station event logger healthy (Yes or No)**	**Standardisation (Yes or No)**	**Time synch (Yes or No)**	**Remarks**
1	220 kV SS CHANDPUR	220 kV	DR and event logger are inbuilt in relays.(Yes) No centralised event logger is available.	Yes	Yes	
2	220 kV SS NEHTAUR	220 kV	DR and event logger are inbuilt in relays.(Yes) No centralised event logger is available.	Yes	Yes	
3	220 kV Amroha	220 kV	DR and event logger are inbuilt in relays.(Yes) No centralised event logger is available.	Yes	Yes	
4	220 kV Gajraula	220 kV	DR and event logger are inbuilt in relays.(Yes) No centralised event logger is available.	Yes	No	GPS clock is not working.
5	400kV S/S Moradabad	400kV	DR Inbuilt in Relay/Centralised Event Logger Available (Yes)	Yes	Yes	Relays are partially time Synchronized.
6	220kV S/S Sambhal	220kV	DR and event logger are inbuilt in relays.(Yes) No centralised event logger is available.	Yes	No	GPS clock is not working.
7	220kV S/S Chandausi	220kV	DR and event logger are inbuilt in relays.(Yes) No centralised event logger is available.	Yes	Yes	
8	220kV S/S Moradabad	220kV	DR and event logger are inbuilt in relays.(Yes) No centralised event logger is available.	Yes	Yes	Partially Relays are time Synchronized
9	220 kV SS Rampur	220 kV	DR and event logger are inbuilt in relays.(Yes) No centralised event logger is available.	Yes	Yes	

10	220kV Nara S/S MZN	220 kV	DR and event logger are inbuilt in relays.(Yes) No centralised event logger is available.	Yes	No	GPS clock unhealthy.
11	220kV BadhaiKalan S/S MZN	220 kV	DR and event logger are inbuilt in relays.(Yes) No centralised event logger is available.	Yes	Yes	
12	220kV Khatauli S/S MZN	220 kV	DR and event logger are inbuilt in relays.(Yes) No centralised event logger is available.	Yes	No	
13	220kV Jansath S/S MZN	220 kV	DR and event logger are inbuilt in relays.(Yes) No centralised event logger is available.	Yes	No	Communication cable laying pending.
14	400 kV S/S GIS Shamli	400 kV	DR is inbuilt in relays.(Yes). Centralised event logger is part of SAS.	Yes	Yes	
15	220 kV S/S Shamli	220 kV	DR and event logger are inbuilt in relays.(Yes) No centralised event logger is available.	Yes	No	GPS Clock not available
16	400 kV S/S MUZAFFARNAGAR	400 kV	DR is inbuilt in relays.(Yes) Centralised event logger is available.	Yes	Yes	
17	220 kV Saharanpur	220kV	DR and event logger are inbuilt in relays.(Yes) No centralised event logger is available.	Yes	No	
18	220 kV Behat	220kV	DR is inbuilt in relays.(Yes). Centralised event logger is part of SAS.	No	No	
19	220kV Sarsawa	220kV	DR is inbuilt in relays.(Yes). Centralised event logger is part of SAS.	Yes	No	
20	220 kV Nanauta	220 kV	DR and event logger are inbuilt in relays.(Yes) No centralised event logger is available.	Yes	No	GPS Clock not available
21	220 kV Deoband	220 kV	DR is inbuilt in relays.(Yes). Centralised event logger is part of SAS.	Yes	Yes	
22	220kV S/S SEC 62	220kV	DR and event logger are inbuilt in relays.(Yes) No centralised event logger is available.	Yes	No	GPS clock is defective
23	220kV S/S DADRI	220kV	DR and event logger are inbuilt in relays.(Yes) No centralised event logger is available.	Yes	No	GPS clock to relay wiring pending
24	220kV S/S RC GREEN	220kV	DR is inbuilt in relays.(Yes). Centralised event logger is part of SAS.	Yes	No	SAS unhealthy

25	220kV S/S JALPURA	220kV	DR is inbuilt in relays.(Yes). Centralised event logger is part of SAS.	Yes	Yes	
26	220kV S/S KP5	220kV	DR is inbuilt in relays.(Yes). Centralised event logger is part of SAS.	Yes	Yes	
27	220kV S/S JEWAR	220kV	DR is inbuilt in relays.(Yes). Centralised event logger is part of SAS.	Yes	Yes	
28	220kV S/S METRO DEPOT	220kV	DR is inbuilt in relays.(Yes). Centralised event logger is part of SAS.	Yes	Yes	
29	220kV S/S SEC 20	220kV	DR and event logger are inbuilt in relays.(Yes) No centralised event logger is available.	Yes	No	GPS clock to relay wiring pending
30	220kV S/S SEC 129	220kV	DR and event logger are inbuilt in relays.(Yes) No centralised event logger is available.	Yes	No	GPS clock is defective
31	220kV S/S BOTANICAL GARDEN	220kV	DR is inbuilt in relays.(Yes). Centralised event logger is part of SAS.	Yes	Yes	
32	400kV SEC 123	400kV	DR is inbuilt in relays.(Yes). Centralised event logger is part of SAS.	Yes	Yes	
33	400kV SEC 148	400kV	DR is inbuilt in relays.(Yes). Centralised event logger is part of SAS.	Yes	Yes	
34	220kV S/S SIKANDRABAD	220kV	DR and event logger are inbuilt in relays.(Yes) No centralised event logger is available.	Yes	No	GPS clock is defective
35	220kV S/S RUKHI	220kV	DR is inbuilt in relays.(Yes). Centralised event logger is part of SAS.	Yes	Yes	
36	400kV S/S GR NOIDA	400kV	DR inbuilt in relay.(Yes)/ Station Event Logger available	Yes	Yes	Few numerical relays (CSC211) do Not have the inbuilt time sync provision
37	220kV GIS S/S IITGNL	220kV	DR is inbuilt in relays.(Yes). Centralised event logger is part of SAS.	Yes	Yes	SAS Healthy
38	220kV S/S YEIDA SEC-18	220kV	DR is inbuilt in relays.(Yes). Centralised event logger is part of SAS.	Yes	No	GPS clock not available
39	220kV S/S YEIDA SEC-24	220kV	DR is inbuilt in relays.(Yes). Centralised event logger is part of SAS.	Yes	No	GPS clock not available

40	220 kV HYBRID S/S HAPUR	220kV	DR is inbuilt in relays.(Yes). Centralised event logger is part of SAS.	Yes	Yes	
41	220 kV S/S SIMBHAOLI	220kV	DR and event logger are inbuilt in relays.(Yes) No centralised event logger is available.	Yes	No	GPS clock is defective
42	220kV S/S KHURJA	220kV	DR and event logger are inbuilt in relays.(Yes) No centralised event logger is available.	Yes	No	GPS clock not available
43	220kV S/S JAHANGIRABAD	220kV	DR and event logger are inbuilt in relays.(Yes) No centralised event logger is available.	Yes	No	GPS clock is defective
44	220kV S/S DEBAI	220kV	DR is inbuilt in relays.(Yes). Centralised event logger is part of SAS.	Yes	Yes	
45	Shatabdinagar	220kV	DR and event logger are inbuilt in relays.(Yes) No centralised event logger is available.	Yes (Partial)	Yes	--------
46	Partapur (Jagriti Vihar)	220kV	DR is inbuilt in relays.(Yes). Centralised event logger is part of SAS.	Yes (Partial)	Yes	--------
47	Modipuram	220kV	DR and event logger are inbuilt in relays.(Yes) No centralised event logger is available.	Yes	No	GPS Clock is not Healthy
48	Modipuram-2	220kV	DR is inbuilt in relays.(Yes). Centralised event logger is part of SAS.	Yes	No	GPS Clock is not Healthy
49	Charla	220kV	DR and event logger are inbuilt in relays.(Yes) No centralised event logger is available.	Yes	No	GPS Clock is not Healthy
50	Baraut	220kV	DR and event logger are inbuilt in relays.(Yes) No centralised event logger is available.	Yes	Partially Synchronised	--------
51	Baghpat	220kV	DR and event logger are inbuilt in relays.(Yes) No centralised event logger is available.	Yes	Partially Synchronised	--------
52	Nirpura	220kV	DR and event logger are inbuilt in relays.(Yes) No centralised event logger is available.	Yes	No	GPS Clock is not Healthy

Note:- No station event logger is available in any of the conventional 220kV Sub-stations under Transmission west zone Meerut UPPTCL.

Status of recording instruments (220 kV & above station of PTCUL)

SR NO	Station name	Voltage level	Disturbance recorder /Station event logger healthy (Yes or No)	Standardisation (Yes or No)	Time sync (Yes or No)	Remarks
1	400KV S/s Kashipur	400 kV	Inbuilt in Numerical Relays	YES	YES	
2	400KV RISHIKESH	400 kV	Inbuilt in Numerical Relays	YES	YES	
3	400KV SRINAGAR	400 kV	Inbuilt in Numerical Relays	YES	YES	
4	220KV S/s Mahuakheraganj	220 kV	Inbuilt in Numerical Relays	YES	YES	
5	220KV S/s Pantnagar	220 kV	Inbuilt in Numerical Relays	YES	NO	
6	220KV S/s Jafarpur	220 kV	Inbuilt in Numerical Relays	YES	NO	
7	220KV S/s Kamaluaganja	220 kV	Inbuilt in Numerical Relays	YES	NO	
8	220KV Jhajra	220 kV	Inbuilt in Numerical Relays	YES	YES	
9	220KV Rishikesh	220 kV	Inbuilt in Numerical Relays	YES	YES	
10	220KV IIP Harrawala	220 kV	Inbuilt in Numerical Relays	YES	YES	
11	220KV Chamba	220 kV	Inbuilt in Numerical Relays	YES	YES	
12	220KV SIDCUL, Haridwar	220 kV	Inbuilt in Numerical Relays	YES	NO	
13	220KV Pirankaliyar	220 kV	Inbuilt in Numerical Relays	YES	YES	
14	220KV Roorkee	220 kV	Inbuilt in Numerical Relays	YES	NO	

Annexure-XXIV

RE: Mock testing of SPS of 500kV HVDC Mundra-Mahindergarh link

Thu 8/29/2024 7:29 PM

To:NRLDC SO 2 <nrldcso2@grid-india.in>; CPCC1 <rtamc.nr1@powergrid.in>;

Cc:seo-nrpc <seo-nrpc@nic.in>; Somara Lakra (सोमारा लाकरा) <somara.lakra@grid-india.in>; Mahavir Prasad Singh (महावीर प्रसाद सिंह) <mahavir@grid-india.in>; Arunkumar P <Arunkumar.P@adani.com>; Sugata Bhattacharya (सुगाता भट्टाचार्या) <sugata@grid-india.in>; Deepak Kumar <deepak.kr@grid-india.in>; AMIT SHARMA <amsharma@grid-india.in>; Bikas Kumar Jha (बिकास कुमार झा) <bikaskjha@grid-india.in>; Manas Ranjan Chand (मानस रंजन चंद) <manas@grid-india.in>; Aman Gautam (अमन गौतम) <amangautam@grid-india.in>; Gnanaguru . <Gnanaguru.1@adani.com>; Sumeet Sharma <Sumeet.Sharma@adani.com>; Naman Vyas <Namany.Vyas@adani.com>; Milan Popat <Milan.Popat@adani.com>; Nihar Raj <nihar.raj@adani.com>; Abhishek Kukreja <Abhishek.Kukreja@adani.com>;

5 attachments (9 MB)

Counter (2).jpg; Counter.jpg; TPS (2).jpg; TPS.jpg; 220KV Alwar ss.jpg;

Dear Sir,

Please find the attached Photos. on 28-08-2024, a representative from M/s. Commtel Networks visited the Mahendragarh site and confirmed the healthiness of the SDH and TPS, along with their associated cards.

All SPS System equipment are functioning properly. The 15 TPS installed in the remote substation.

The details and status of TPS and Counter at Mahendragarh End.

S.No	TPS	TPS Status	Counter	Counter Status
1	PG Hissar	ON	17	OKAY
2	Bhiwani	ON	17	OKAY
3	Dadari	ON	17	OKAY
4	Alwar	ON	-	OFF
5	Bhilwara	ON	12	OKAY
6	Merta	ON	14	OKAY
7	Ratangarh	ON	-	OFF
8	Gobinugarg	ON	-	OFF
9	Malerkotla	ON	-	OFF
10	Laton Kalan	ON	6	OKAY
11	Mandula	ON	12	OKAY
12	Bamnauli	ON	-	OFF
13	Shamli	ON	-	OFF
14	Bahadurgarh	ON	10	OKAY

15	Dhanonda	ON	-	OFF

There alarms on the system are due to the following reasons.

1. Equipment Failure/ card failure/ power failure at Remote Sites.
2. Cable connectivity break between the remote System and cable coming from Field.
3. E1 connectivity outage at remote Sites.

Our team, with support from Commtel Networks, visited the nearest TPS installed at the 220/132 kV Alwar Substation to check its healthiness. However, during the inspection, the panel was found to be de-energized, necessitating an end-to-end test. (Photo Attached) Similarly, each substation needs to be ensured the healthiness of the TPS by respective Substation owner.

We request you to please confirm the healthiness of the Sr no 1 and 2 .

Thanks and Regards,

Kalicharan Sahu
(O&M) HVDC & EHV Substations,
Adani Energy Solutions Limited
| ±500kV HVDC Mahendragarh Terminal Sub Station I
Village-Kheri- Aghiyar, Taluka- Kanina, Mahendragarh 123 029, Haryana, India
Mob +91 9764006167| Off +91 1285 277326

From: NRLDC SO 2 <nrldcso2@grid-india.in>
Sent: Tuesday, August 27, 2024 10:07 AM
To: SLDC Punjab <se-sldcprojects@pstcl.org>; PC PSTCL SLDC PUNJAB <pcpstcl@gmail.com>; Haryana <sldcharyanacr@gmail.com>; Delhi <sldcmintoroad@gmail.com>; UP <sera@upsldc.org>; Rajasthan <SE.LDRVPNL@RVPN.CO.IN>; ce.ld@rvpn.co.in; CPCC1 <rtamc.nr1@powergrid.in>; neerajk@powergrid.in; setncmrt@upptcl.org; bharatlalgujar@gmail.com; akashdeep3433786@gmail.com; xenemtcbhpp2@bbmb.nic.in; PC Control Room <pccont@bbmb.nic.in>; se.prot.engg@rvpn.co.in; Arunkumar P <Arunkumar.P@adani.com>; Kali Charan Sahu <Kalicharan.Sahu@adani.com>; rajbir-walia79@yahoo.com; ase-sldcop@pstcl.org; sesldcop@hvpn.org.in; cepso@upsldc.org; se-sldcop <se-sldcop@pstcl.org>; SICHVDC Controlroom <SICHVDC.Controlroom@adani.com>
Cc: seo-nrpc <seo-nrpc@nic.in>; somara.lakra <somara.lakra@grid-india.in>; Mahavir Prasad Singh (महावीर प्रसाद सिंह) <mahavir@grid-india.in>; Sugata Bhattacharya (सुगाता भट्टाचार्या) <sugata@grid-india.in>; deepak.kr <deepak.kr@grid-india.in>; AMIT SHARMA <amsharma@grid-india.in>; bikaskjha <bikaskjha@grid-india.in>; Manas Ranjan Chand (मानस रंजन चंद) <manas@grid-india.in>; Aman Gautam (अमन गौतम) <amangautam@grid-india.in>
Subject: Re: Mock testing of SPS of 500kV HVDC Mundra-Mahindergarh link

Sir,

उत्तर प्रदेश राज्य भार प्रेषण केन्द्र लि०
यू०पी०एस०एल०डी०सी०परिसर, विभूति
खण्ड II,गोमती नगर, लखनऊ–226010
ई मेल : sera@upsldc.org

U.P. State Load Despatch Centre Ltd.
UPSLDC Complex, Vibhuti Khand II
Gomti Nagar, Lucknow- 226010
E-mail: sera@upsldc.org

No: - 2661 /SE(R&A)/EE-II/SPS Dated:- 07/08/ 2024

General Manager, NRLDC18-A,
SJSS Marg, Katwaria Sarai,
New Delhi – 110016

Subject- Regarding SPS of HVDC Mundra-Mahendargarh line

Kindly refer to SE (ETC) Muzaffarnagar letter no/062/E.T.C./MZN/400 kV S/S Shamli dated 05.05.2024. (copy enclosed) regarding feeder wise load of Shamli area. As per the letter, at present complete load relief (i.e. 300MW) may not be provided by 220 kV Shamli, so that alternatively feeder and load details of 400 kV Shamli has also been provided. Also it is informed that at present SPS system at 220 kV Shamli is not healthy which is being maintained by PGCIL.

It is therefore requested to kindly instruct the concerned to incorporate 132 kV feeders of 220 kV Shamli & 400 kV Shamli in SPS of HVDC Mundra-Mahendargarh line so that appropriated load relief may be provided from UP Control area and take necessary action regarding healthiness of SPS system

Sangeet

(Sangeeta)
Superintending Engineer (R&A)

No: - /SE(R&A)/EE-II/SPS Dated: - 2024

Copy forwarded to following via e-mail for kind information and necessary action:-

1. Director, UPSLDC, Vibhuti Khand – II, Gomti Nagar, Lucknow.
2. Director (Operation), UPPTCL, 11th Floor, Shakti Bhawan Extn., Lucknow.
3. Chief Engineer (PSO), Vibhuti Khand – II, Gomti Nagar, Lucknow.
4. Chief Engineer (Trans. West),PareshanBhawan, 130D, Hydel Colony, Victoria Park, Meerut 250001.
5. SE (Operations), 18 – A SJSS Marg, Katwaria Sarai, New Delhi, 110016.

(Sangeeta)
Superintending Engineer (R&A)

कार्यालय
अधीक्षण अभियन्ता
विद्युत पारेषण मण्डल
उ०प्र०पावर ट्रांसमिशन कारपोरेशन लि०
132 के०वी० भोपारोड उपकेन्द्र
मुजफ्फरनगर-251001

OFFICE OF THE
SUPERINTENDING ENGINEER
Electricity Transmission Circle
U.P. Power Transmission Corporation Ltd.
132 KV Bhopa Road Sub-station
Muzaffarnagar-251001

दूरभाष [0131-2608038
Ph.[0131-2608038
E-mail : seetcmzn@upptcl.org, seetcmzn@gmail.com

संख्या / No. 1062 /E.T.C./MZN/400 KV S/S Shamli दिनांक / DATED 05/08/24

Subject: - Regarding SPS of HVDC Mundra-Mahendargarh.

Superintending Engineer (R & A)
U.P State Load Despatch Centre Ltd.
UPSLDC Complex, Vibhuti Khand-II
Gomti Nagar, Lucknow.
Email. sera@upsldc.org

Please refer to your office letter no. 2187 dt. 01.07.2024, forwarded to this office by SE (T&C), Meerut vide endorsement no. 2237/CE(TW)/MT/SPS dt. 23.07.2024 vide which it has been requested to provide details of 132 KV feeders for planned relief to HVDC Mundra-Mahendargarh SPS.

In this reference, it is to apprise that following is the details of 132 KV feeders being fed from 220 KV Sub-Station Shamli.

S.No.	Name of feeder	Connected Load (MVA)	Maximum Load (MW)	Average Load (MW)
1	132 KV Lalukheri	63+63	72	47
2	132 KV Jhinjhana	63+40+40	80	52
3	132 KV Kairana-I/II	63+63	41	27
4	132 KV Jasala	63+40	58	38
	Total		251	164

1. Following Case wise Trippings of 132 KV Feeders at 220 KV Sub-Station, Shamli for tripping of HVDC Mundra-Mahendergarh Line may be used.

(A) In Maximum Load Condition:-

S. No.	State.L.S quantum	Name of feeding substation	Feeder/line/ equipment	MW	Case-1 50 MW	Case-2 100 MW	Case-3 200MW	Case-4 300 MW
1	Uttar Pradesh Case-1 =50 MW Case-2 =100 MW Case-3 =200 MW Case-4 300 MW	220 KV Subsatatio n, Shamli	132 KV Jasala	58	1	1	1	1
2			132 KV Kairana-I	20.5		1		1
3			132 KV Kairana-II	20.5	-	1		1
4			132 KV Lalukheri	72	-	-	1	1
5			132 KV Jinjhana	80	-		1	1
			Total Relief	251	58	99	210	251

(B) In Average Load Condition :-

S. No.	State.L.S quantum	Name of feeding substation	Feeder/line/ equipment	MW	Case-1 50 MW	Case-2 100 MW	Case-3 200MW	Case-4 300 MW
1	Uttar Pradesh Case-1 =50 MW Case-2 =100 MW Case-3 =200 MW Case-4 =300 MW	220 KV Subsatatio n, Shamli	132 KV Jasala	38	1		1	1
2			132 KV Kairana-I	13.5	1		1	1
3			132 KV Kairana-II	13.5	-		1	1
4			132 KV Lalukheri	47	-	1	1	1
5			132 KV Jinjhana	52	-	1	1	1
			Total Relief	164	51.5	99	164	164

Alternatively HVDC Mundra-Mahendargarh SPS may be shifted to 400 KV Sub-Station Shamli, details of 132 KV feeders from 400 KV Sub-Station Shamli with its Maximum and Average load is as follows :

S.No.	Name of feeder	Connected Load (MVA)	Maximum Load (MW)	Average Load (MW)
1	132 KV Budhana	63+40	82	53
2	132 KV Kharad	63+40	78	51
3	132 KV Jalalpur	40+40	41	27
4	132 KV Thanabhawan	63+63+40	74	48
5	132 KV Kaniyan	40+40	35	23
	Total		310	202

2. Following Case wise Trippings of 132 KV Feeders at 400 KV Sub-Station, Shamli for tripping of HVDC Mundra-Mahendergarh Line is hereby recommended

(A). In Maximum Load Condition :-

S. No.	State.L.S quantum	Name of feeding substation	Feeder/line/ equipment	MW	Case-1 50 MW	Case-2 100 MW	Case-3 200MW	Case-4 300 MW
1	Uttar Pradesh Case-1 =50 MW Case-2 =100 MW Case-3 =200 MW Case-4 =300 MW	400 KV Subsatatio n, Shamli	132 KV Budhana	82	-	-	1	1
2			132 KV Kharad	78	-	-	1	1
3			132 KV Jalalpur	41	1	-	1	1
4			132 KV Thanabhawan	74	-	1	-	1
5			132 KV Kaniyan	35	1	1	-	1
			Total Relief	310	76	109	201	310

(B). In Average Load Condition :-

S. No.	State.L.S quantum	Name of feeding substation	Feeder/line/ equipment	MW	Case-1 50 MW	Case-2 100 MW	Case-3 200MW	Case-4 300 MW
1	Uttar Pradesh Case-1 =50 MW Case-2 =100 MW Case-3 =200 MW Case-4 =300 MW	400 KV Subsatatio n, Shamli	132 KV Budhana	53	-	1	1	1
2			132 KV Kharad	51	1	1	1	1
3			132 KV Jalalpur	27	-	-	1	1
4			132 KV Thanabhawan	48	-	-	1	1
5			132 KV Kaniyan	23	-		1	1
			Total Relief	202	51	104	202	202

Submitted for information and necessary action

(Nikhil Kumar)
Superintending Engineer

संख्या / No. /E.T.C./MZN/ दिनांक / DATED

Copy forwarded to the following for information and necessary action :

1. Chief Engineer (TW) UPPTCL Meerut.
2. Superintending Engineer, Electricity (T&C) Circle, UPPTCL Meerut.
3. Executive Engineer Electricity Transmission Division, Shamli

(Nikhil Kumar)
Superintending Engineer

कार्यालय
अधीक्षण अभियन्ता
विद्युत परीक्षण एवं परिचालन मण्डल
उ0प्र0 पावर ट्रांसमिशन कारपोरेशन लि0
प्रथम तल पारेषण भवन, 130–डी, विक्टोरिया पार्क
मेरठ– 250 003
मोबाइल: 9412749817

OFFICE OF THE
SUPERINTENDING ENGINEER
Electricity Test & Commissioning Circle
U.P. POWER TRANSMISSION CORPORATION LTD.
1st Floor Pareshan Bhawan, 130-D, Victoria Park,
Meerut 250 003
Mobile: 9412749817

No. 82 / ETCC-MT / Dated- 30/05/24

Sub :- SPS related to HVDC Mundra-Mahendargarh.

Superintending Engineer (R&A) (By e-mail)
UPSLDC Vibhuti Khand ,
Gomti Nagar,
Lucknow.

In reference to the above cited subject, UPSLDC via email on 22.05.2024 informed that on 17.05.2024 at 16:20 hrs, Case-3 of SPS related to HVDC Mundra - Mahendergarh operated. As per action in case-3 operation of this line SPS, 200MW load relief at 220kV Shamli (UP) is desired. However, no load relief at 220kV Shamli was observed at given date and time. It is to bring in your notice that due to commissioning of 400kV Shamli S/s entire power flow scenario has been changed. Current situation is summarized as below.

At 220kV Shamli S/s feeders shown in the list	Planned load relief (MW)	Current situation
Thana Bhawan -1	25	The only line cateting Thana Bhawan has been made LILO at 132kV Jalalpur. Now Jalalpur is fed from 220kV Shamli S/s while load of Thana Bhawan is fed from 400kV Shamli S/s.
Thana Bhawan -2	25	
Jasala-1	25	Only one line exists.
Jasala-2	25	
Kharad-1	50	Only one line exists which is normally kept open at Kharad and load of Kharad is normally fed from 400kV Shamli S/s.
Kharad-2	50	
Baraut-1	150 (case-4)	No such line exist at 220kV Shamli S/s.
Baraut-2	150 (case-4)	

In view of the above facts, entire load relief strategy needs to be reviewed and redesigned for SPS. On 17.05.2024 at 16:20 hrs, no tripping observed at 220kV S/S Shamli as SPS system is unhealthy, which is being maintained by M/s PGCIL.

Hence it is requested to you to kindly coordinate with M/s PGCIL for modification of the scheme and rectification of the fault in SPS.

(Pramod Kumar Mishra)
Superintending Engineer

No. 82 /ETCC-MT/ Dated/– 30/05/24

Copy forwarded to the following for information & necessary action:-

1. Chief Engineer (TW), UPPTCL Victoria Park, Meerut.
2. Executive Engineer, Electricity Test & Commissioning Div., Muzaffarnagar.

(Pramod Kumar Mishra)
Superintending Engineer

SK/SENew/NewEngLetter01

Rajasthan Details

Revised updated feeder details (radial) along with expected average Load Relief

S.No.	Name of Sub- Station	Feeder name as per existing detail	Revised name of Existing Feeder /Line/Equipment	Average Load relief (MW)	Remark
1	220 kV GSS Alwar	132 kV GSS Mundawar	132 kV GSS Pinan	25	
		132 kv GSS Bansoor	132 kV GSS Telco	45	
		132 kV GSS Ramgarh	132 kV GSS Ramgarh	65	
		132 kV GSS Malakhera	132 kV GSS Malakhera	50	
		132 kV Alwar (LOCAL)	132 kV GSS Alwar (LOCAL)	120	
2	220 kV GSS Ratangarh	132 kV Sardar Sher			Generally Feed from 220 kV Halasar
3	220 kV GSSV Bhilwara	132 kV GSS Gangapur	132 kv GSS Karoi	15	
		132 kV GSS Danta	132 kV GSS Danta	30	
		132 kV GSS Devgarh	132 kV GSS Bankali	18	
		132 kV GSS Kareda			
4	400 kV GSS Merta	132 kV GSS Kuchera	132 kV GSS Dhawa	25	
		132 kV GSS Lamba	132 kV GSS Lamba jatan	55	
		132 kV GSS Gotan			

Email **Control Room CONTROL ROOM SLDC**

Re: Review of SPS installed for 500kV HVDC Mundra - Mahindergarh.

From : Executive Engineer TS Rewari <xentsrwr@hvpn.org.in> Thu, Aug 29, 2024 01:20 PM

Subject : Re: Review of SPS installed for 500kV HVDC Mundra - Mahindergarh.

To : Control Room CONTROL ROOM SLDC <controlroomsldc@hvpn.org.in>

Cc : SE TS GGN <setsggn@hvpn.org.in>, Executive Engineer Executive Engineer <xen400kvdhanoda@hvpn.org.in>, Substation Engineer <sse220kvlulaahir@hvpn.org.in>

In continuation of trailing email and discussion held today telephonically, it is gathered that desired load relief shall not get as load of 220 kV Lula Ahir shall be fed through 220 kV Dadri-Lula Ahir line being synchronized. Therefore, it is proposed that in the existing scheme SPS, the tripping of 220 kV D/C Lula Ahir line at 400 kV Dhanonda end may be removed and tripping of all incomers (2 no. 132 kV Incomers of 100 MVA 220/132 kV TFs and one no. 33 kV incomer of 100 MVA 220/33 kV TF) at 220 kV Lula Ahir substation may be added.

The maximum load (for FY 2023-24) on three no. 100 MVA TFs installed at 220 kV Lula Ahir is 53.46 MVA, 86.26 MVA and 87.02 MVA

The average load on three no. 100 MVA TFs installed at 220 kV Lula Ahir is 50 MVA, 70 MVA and 70 MVA

From: "Executive Engineer TS Rewari" <xentsrwr@hvpn.org.in>
To: "Control Room CONTROL ROOM SLDC" <controlroomsldc@hvpn.org.in>
Cc: "SE TS GGN" <setsggn@hvpn.org.in>, "Executive Engineer Executive Engineer" <xen400kvdhanoda@hvpn.org.in>, "Substation Engineer" <sse220kvnarnaul@hvpn.org.in>
Sent: Wednesday, August 28, 2024 12:46:13 PM
Subject: Re: Review of SPS installed for 500kV HVDC Mundra - Mahindergarh.

In reference of trailing email it is submitted that 220 kV Lula Ahir is connected with 400 kV Dhanonda through 220kV D/C line and with 220 kV Dadri through 220kV S/C line and with 220 kV Rewari with 220kV S/C line.
In general circuits of 400 kV Dhanonda and 220 kV Dadri runs in synchronization. The maximum load (for FY 2023-24) on three no. 100 MVA TFs installed at 220 kV Lula Ahir is 53.46 MVA, 86.26 MVA and 87.02 MVA. It is further added that in general 220 kV Dadri takes load from 220 kV Lula Ahir substation and thus act as sink.

In case of operation of SPS at 400 kV Dhanonda, the desired load relief as mentioned in trailing email (90+95 MW) can be achieved through existing scheme (by outage of three no. 100 MVA TFs and 220 kV Dadri (acting as sink)).

Regards
XEN/TS Division
HVPNL Rewari.

From: "Control Room CONTROL ROOM SLDC" <controlroomsldc@hvpn.org.in>
To: "Executive Engineer TS Rewari" <xentsrwr@hvpn.org.in>, "Executive Engineer TS Rohtak" <xentsrtk@hvpn.org.in>, "Executive Engineer Ts Bhiwani" <xentsbhw@hvpn.org.in>, "Executive Engineer Executive Engineer" <xen400kvdhanoda@hvpn.org.in>, xendhanonda@gmail.com
Cc: "Chief Engineer SO Commercial" <cesocomml@hvpn.org.in>, "Chief Engineer TS Panchkula" <cetspkl@hvpn.org.in>, "Chief Engineer TS Hisar" <cetshsr@hvpn.org.in>, "Superintending Engineer SLDC OP" <sesldcop@hvpn.org.in>, "SE TS Rohtak" <setsrtk@hvpn.org.in>, "SE TS GGN" <setsggn@hvpn.org.in>, "Superintending Engineer TS Hisar" <setshsr@hvpn.org.in>, "Superintending Engineer MP CC Dhulkote" <sempccdkt@hvpn.org.in>, "Superintending Engineer MP CC Delhi" <sempccdelhi@hvpn.org.in>, "Executive Engineer MP Rohtak" <xenmpccrtk@hvpn.org.in>, "XEN MP Hisar" <xenmpcchsr@hvpn.org.in>, "XEN MP CC" <xenmpccggn@hvpn.org.in>
Sent: Wednesday, August 21, 2024 11:57:59 AM
Subject: Review of SPS installed for 500kV HVDC Mundra - Mahindergarh.

Sir,

Please see the attachments.

--
Regards,
SCE (पाली प्रभारी अभियंता)/SLDC Control room,
HVPNL Panipat
Contact No- 9053090722,9053090721,0180-2664095

Fwd: Review of SPS installed for 500kV HVDC Mundra - Mahindergarh.

Control Room CONTROL ROOM SLDC <controlroomsldc@hvpn.org.in>

Fri 8/30/2024 12:44 PM

To:NRLDC SO 2 <nrldcso2@grid-india.in>; NRLDC SO-II <nrldcso2@gmail.com>; Deepak Kumar <deepak.kr@grid-india.in>;

Cc:Superintending Engineer SLDC OP <sesldcop@hvpn.org.in>;

2 attachments (209 KB)

Email SPS Rewari.pdf; Regarding SPS Bhiwani.pdf;

Sir,

In reference to the SPS installed for 500kV HVDC Munda - Mahindergarh link the information received from TS wing (copy attached) is as under:

1. At 400kV Dhanonda through Lula Ahir substation:- It is proposed that in the existing scheme SPS, the tripping of 220 kV D/C Lula Ahir line at 400 kV Dhanonda end may be removed and tripping of all incomers (2 no. 132 kV Incomers of 100 MVA 220/132 kV TFs and one no. 33 kV incomer of 100 MVA 220/33 kV TF) at 220 kV Lula Ahir substation may be added. The maximum load (for FY 2023-24) on three no. 100 MVA TFs installed at 220 kV Lula Ahir is 53.46 MVA, 86.26 MVA and 87.02 MVA. The average load on three no. 100 MVA TFs installed at 220 kV Lula Ahir is 50 MVA, 70 MVA and 70 MVA.

2. At 400/220kV Bhiwani BBMB: It is proposed that in the existing scheme SPS, the tripping of 220 kV Bapora (Bhiwani HVPNL) D/C line at Bhiwani BBMB end may be removed and tripping of all incomers (2 no. 132 kV Incomers of 100 MVA 220/132 kV T-1 & T-2 TFs) at 220 kV Bapora (Bhiwani HVPNL) substation may be added. The maximum load on two no. 100 MVA TFs installed at 220kV Bhiwani HVPNL is 80 MW and 85 MW respectively. The average load on two no. 100 MVA TFs installed at 220kV Bhiwani HVPNL is 70 MW and 70 MW respectively.

3. At 132kV Charkhi Dadri: It is proposed that in the existing scheme SPS, the tripping of 132kV Kalanaur line at Dadri BBMB end may be removed and tripping of 132kV Haluwas & 132kV Dadri old at Dadri BBMB may be added. The maximum load on 132kV Haluwas & 132kV Dadri old line is 45 MW and 50 MW respectively. The average load on 132kV Haluwas & 132kV Dadri old line is 40 MW and 40 MW respectively.

Rest information kept unchanged. It is also added here that the fiber connectivity is also available on all the above substations.
It is also pertinent to mention here that 700 MW load relief is expected from Haryana. Rest of the states have been allotted with a relative less amount of relief as compared to Haryana for 500kV HVDC Mundra - Mahendargarh link. The Haryana share from APL Mundra has also been reduced now. In view of the above, the expected load relief from the NR states is required to be reviewed accordingly. The same was also pointed out by this office during the online meeting held on dated 20.08.2024.

This is for information & further necessary action please.

From: "Executive Engineer TS Rewari" <xentsrwr@hvpn.org.in>
To: "Control Room CONTROL ROOM SLDC" <controlroomsldc@hvpn.org.in>
Cc: "SE TS GGN" <setsggn@hvpn.org.in>, "Executive Engineer Executive Engineer" <xen400kvdhanoda@hvpn.org.in>, "Substation Engineer" <sse220kvlulaahir@hvpn.org.in>
Sent: Thursday, August 29, 2024 1:20:08 PM
Subject: Re: Review of SPS installed for 500kV HVDC Mundra - Mahindergarh.

In continuation of trailing email and discussion held today telephonically, it is gathered that desired load relief shall not get as load of 220 kV Lula Ahir shall be fed through 220 kV Dadri-Lula Ahir line being synchronized. Therefore, it is proposed that in the existing scheme SPS, the tripping of 220 kV D/C Lula Ahir line at 400 kV Dhanonda end may be removed and tripping of all incomers (2 no. 132 kV Incomers of 100 MVA 220/132 kV TFs and one no. 33 kV incomer of 100 MVA 220/33 kV TF) at 220 kV Lula Ahir substation may be added.

The maximum load (for FY 2023-24) on three no. 100 MVA TFs installed at 220 kV Lula Ahir is 53.46 MVA, 86.26 MVA and 87.02 MVA
The average load on three no. 100 MVA TFs installed at 220 kV Lula Ahir is 50 MVA, 70 MVA and 70 MVA

From: "Executive Engineer TS Rewari" <xentsrwr@hvpn.org.in>
To: "Control Room CONTROL ROOM SLDC" <controlroomsldc@hvpn.org.in>
Cc: "SE TS GGN" <setsggn@hvpn.org.in>, "Executive Engineer Executive Engineer" <xen400kvdhanoda@hvpn.org.in>, "Substation Engineer" <sse220kvnarnaul@hvpn.org.in>
Sent: Wednesday, August 28, 2024 12:46:13 PM
Subject: Re: Review of SPS installed for 500kV HVDC Mundra - Mahindergarh.

In reference of trailing email it is submitted that 220 kV Lula Ahir is connected with 400 kV Dhanonda through 220kV D/C line and with 220 kV Dadri through 220kV S/C line and with 220 kV Rewari with 220kV S/C line.
In general circuits of 400 kV Dhanonda and 220 kV Dadri runs in synchronization. The maximum load (for FY 2023-24) on three no. 100 MVA TFs installed at 220 kV Lula Ahir is 53.46 MVA, 86.26 MVA and 87.02 MVA. It is further added that in general 220 kV Dadri takes load from 220 kV Lula Ahir substation and thus act as sink.

In case of operation of SPS at 400 kV Dhanonda, the desired load relief as mentioned in trailing email (90+95 MW) can be achieved through existing scheme (by outage of three no. 100 MVA TFs and 220 kV Dadri (acting as sink)).

Regards
XEN/TS Division
HVPNL Rewari.

From: "Control Room CONTROL ROOM SLDC" <controlroomsldc@hvpn.org.in>
To: "Executive Engineer TS Rewari" <xentsrwr@hvpn.org.in>, "Executive Engineer TS Rohtak" <xentsrtk@hvpn.org.in>, "Executive Engineer Ts Bhiwani" <xentsbhw@hvpn.org.in>, "Executive Engineer Executive Engineer" <xen400kvdhanoda@hvpn.org.in>, xendhanonda@gmail.com
Cc: "Chief Engineer SO Commercial" <cesocomml@hvpn.org.in>, "Chief Engineer TS Panchkula" <cetspkl@hvpn.org.in>, "Chief Engineer TS Hisar" <cetshsr@hvpn.org.in>, "Superintending Engineer SLDC OP" <sesldcop@hvpn.org.in>, "SE TS Rohtak" <setsrtk@hvpn.org.in>, "SE TS GGN" <setsggn@hvpn.org.in>, "Superintending Engineer TS Hisar" <setshsr@hvpn.org.in>, "Superintending Engineer MP CC Dhulkote" <sempccdkt@hvpn.org.in>, "Superintending Engineer MP CC Delhi" <sempccdelhi@hvpn.org.in>, "Executive Engineer MP Rohtak" <xenmpccrtk@hvpn.org.in>, "XEN MP Hisar" <xenmpcchsr@hvpn.org.in>, "XEN MP CC" <xenmpccggn@hvpn.org.in>
Sent: Wednesday, August 21, 2024 11:57:59 AM
Subject: Review of SPS installed for 500kV HVDC Mundra - Mahindergarh.

Sir,

Please see the attachments.

--
Regards,
SCE (पाली प्रभारी अभियंता)/SLDC Control room,
HVPNL Panipat
Contact No- 9053090722,9053090721,0180-2664095

--
Regards,
SCE (पाली प्रभारी अभियंता)/SLDC Control room,
HVPNL Panipat
Contact No- 9053090722,9053090721,0180-2664095

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HARYANA VIDYUT PRASARAN NIGAM LIMITED

Regd. Office: Shakti Bhawan, Plot No. C-4, Sector-6, Panchkula, 134109.
Corporate Identity Number: U40101HR1997SGC033683
Website: www.hvpn.org.in, E-mail - xentsbhw@hvpn.org.in
Phone No: 01664-242797(O)

To

The Executive Engineer,
LDPC, HVPNL,
Panipat.

Memo No.Ch-116/OMBE-7 Dated: 29.08.2024

Subject: SPS scheme at HVPNL substations for getting load relief due to tripping of 500Kv HVDC Mundra – Mahendargarh

Please refer to this O/Memo No. 108/OMBE-7 dated 27.08.2024 and O/Email dated 09.08.2024 on the subject cited matter.

In this continuation to above, the details of SPS under TS division, HVPNL, Bhiwani is as under:

S No.	Name of feeding S/Stn	Feeder/Line/Equipment	SPS Installed	Max. Load	Load Relief (Avg Load)	Remarks
1	220KV S/Stn Bhiwani	132KV IA Bhiwani Line	UFR	50MW	40 MW	SPS (UFR)Installed and healthy
2	220KV S/Stn Bhiwani	132KV Bhiwani Ckt 2	UFR	50MW	40 MW	SPS (UFR)Installed and healthy
3	220KV S/Stn Bhiwani	132KV Tosham	UFR	-	-	SPS (UFR) Installed and healthy but line is running on No load as 2nd source to 132KV Tosham
4	220KV S/Stn Bhiwani	132KV Incomer of Transformer 100MVA Transformer T2	-	85MW	70 MW	SPS may be provided for load relief as mentioned on subject above.
5	220KV S/Stn Bhiwani	132KV Incomer of 100MVA Transformer T1	-	80MW	70 MW	SPS may be provided for load relief as mentioned on subject above.
6	132kV substation Dadri-2	132kV Dadri-kalanaur ckt	Yes		Nil	SPS Installed and healthy but line is running on No load as 2nd source to 132KV Kalanaur
7	132kV substation Dadri-2	132kV Dadri-Makrani ckt	Yes		Nil	SPS Installed and healthy but line is running on No load as 2nd source to 132KV Makrani
8	132kV substation Dadri-2	132kV Dadri-Haluwas ckt	-	45MW	40MW	SPS may be provided for load relief as mentioned on subject above.
9	132kV substation Dadri-2	132kV Dadri-Dadri old	-	50MW	40MW	SPS may be provided for load relief as mentioned on subject above.

This is for kind information and necessary action please.

Executive Engineer,
Transmission System Division,
HVPNL, Bhiwani

CC to:

1. SE/TS Circle, HVPNL, Hisar for kind information, please.

Delhi Details

Re: Mock testing of SPS of 500kV HVDC Mundra-Mahindergarh link

SLDC, DELHI <sldcmintoroad@gmail.com>

Wed 8/28/2024 3:48 PM

To:NRLDC SO 2 <nrldcso2@grid-india.in>;

Cc:sinha.surendra <sinha.surendra@yahoo.com>; dgmsodelhisldc@gmail.com <dgmsodelhisldc@gmail.com>; Manager (T) SO <managersogd@gmail.com>;

In reference to trailing mail, the maximum load on 220kV feeders covered under SPS of 500kV HVDC Mundra-Mahindergarh link are as under:

S. No.	Name of the Element	MW
1	220 KV BAMNAULI-PAPANKALAN-I CKT.-I	120
2	220 KV BAMNAULI-PAPANKALAN-I CKT.-II	120
3	220 KV MANDAULA- GOPALPUR CKT.-I	212
4	220 KV MANDAULA- GOPALPUR CKT.-II	214

Regards,
SLDC Delhi

On Tue, Aug 27, 2024 at 10:07 AM NRLDC SO 2 <nrldcso2@grid-india.in> wrote:

> Sir,
>
> In reference of the trailing mail, it is to be mentioned that inputs have received from Rajasthan only. Members agreed to shared the details by 22nd August 2024, however no further details received from Haryana, Punjab, Delhi, UP & ADANI.
>
> Kindly share the details as discussed during the meeting held on 20th August 2024, so that further remedial actions can be initiated on the basis of those details.
>
> सादर धन्यवाद/ Thanks & Regards
> प्रणाली संचालन-II/ System Operation-II
> उ॰क्षे॰भा॰प्रे॰के॰/ NRLDC
> ग्रिड कंट्रोलर ऑफ इंडिया लिमिटेड/ Grid Controller of India Limited
> Formerly known as
> पोसोको / POSOCO

Punjab Details

	Name of S/S	66kV Feeders	Average Demand(Amp.)	Maximum Demand(Amp.)
Punjab Control Area	220/66kV Gobindgarh	66kV Talwara-19(ADANI SPS)	375	430
		66kV Talwara-2(ADANI SPS)	375	430
	220/66kV Lalton kalan	66kV Gill road-1(DADRI SPS)	543	610
		66kV Gill Road-2(DADRI SPS)	518	692
		66kV Dugri(DADRI SPS)	325	450
	220/66kV Malerkotla	66kV Malerkotla(ADANI SPS)	213	403
		66kV Amargarh(ADANI SPS)	238	405
		66kV Malaud ckt 1(DTPC SPS)	257	356

Note: 66kV Malaud at 220kV S/S Malerkotla was bifurcated into two circuits in the month of July 2024.

Nodal officers details

Control Area	Station Name	Nodal Person (SPS, communication system)	Contact details	Email Id
Rajasthan	220/132kV Alwar	Sh. Vijaypal Yadav XEN (Prot.) Ms. Pooja Verma AEN (Comm)	9413361407 9413375366	xen.prot.alwar@rvpn.co.in aen.comm.alwar@rvpn.co.in
	220/132kV Ratangarh	Sh. Mukesh Somra AEN (MPT&S) , Sh. Dharmender Singh (Comm.)	9414061442 9413383246	aen.mpt&s.rtg@rvpn.co.in aen.comm.ratangarh@rvpn.co.in
	220/132kV Bhilwara	Sh. Madhusudan Sharma, AEN (SLDC-comm Sh. Suresh Garg, XEN (MPT&S)	9413383176 9414061424	aen.subsldc.bhl@rvpn.co.in xen.mpts.bhl@rvpn.co.in
	220/132kV Merta	Mukesh Kumar (AEN Prot.) Mahip Singh (Aen) Comm)	7734806466 9413362995	aen.prot.mertacity@RVPN.CO.IN aen.comm.merta@RVPN.CO.IN
BBMB	400/220kV Bhiwani(BBMB)			
POWERGRID	400/220kV Hissar(PG)			
	Bhiwani(PG)			
	400/220kV Bahadurgarh(PG)			
Haryana	400/220kV Dhanonda	Gautam / SSE, 400kV Dhanonda	9313472669	dhanonda400kv@gmail.com
	220kV Lulahir	Er. Subhash Chander	9416373135	sse220kvlulaahir@hvpn.org.in
	220kV Rewari	Er. Kavinder Yadav	9315315649	sse220kvrwr@hvpn.org.in
	132kV Charkhi Dadri	Vivek Sangwan	9034459489	sse132kvdadri@hvpn.org.in
Punjab	220/66kV Gobindgarh	Er. Harwinder Singh	96461-18184	ae-220kvg1-mgg@pstcl.org
	220/66kV Laltokalan	Er. Supinder Singh	96461-24495	sse-pm-lalton@pstcl.org
	220/66kV Malerkotla	Er. Sanju Bala	96461-64007	sse-pm-mlrk@pstcl.org
UP	Shamli	Er. Krishna Nand	9412756631	eeetdshamli@upptcl.org,
	400kV Muradnagar	Er. D.S. Sengar	9412748666	ee400mrd2@upptcl.org
Delhi	400/220kV Bamnauli			
	400/220kV Mandola			

Annexure-XXV

Summary of df/dt operation during May-June 2024

Date	Time	Load throw-off quantum (State-wise)						Total Load throw-off quantum	Remarks
		Delhi	Punjab	Haryana	Rajasthan	UP	Uttarakhand		
25-05-2024	12:46	82	1375	0	140	172	0	1769	as reported by SLDCs
27-05-2024	14:36	280	0	540	0	140	100	1060	as per SCADA data at NRLDC, SLDCs have not confirmed yet
01-06-2024	13:26	0	440	0	0	100	0	540	as per SCADA data at NRLDC, SLDC-Punjab have confirmed
01-06-2024	13:44	270	580	120	0	220	0	1190	SLDC-Punjab & UP have confirmed
03-06-2024	05:28	0	300	0	0	0	0	300	as reported by SLDC-Punjab
04-06-2024	12:35	0	400	0	0	0	0	400	as per SCADA data at NRLDC, SLDC-Punjab have confirmed
09-06-2024	11:21	0	435	0	0	0	0	435	as per SCADA data at NRLDC, SLDC-Punjab have not confirmed yet
19-06-2024	12:42	0	723	0	107	220	0	1050	as reported by SLDCs
23-06-2024	09:11	0	880	0	0	0	0	0	as reported by SLDC-Punjab

Mock trial run/black start schedule plan for 2024-25						Remarks
S.No.	Name of Generatiing Station	Fuel Type	Compliance to 34.3 of IEGC for mock trial runs (Last date on which mock drill carried out)	Tentaive schedule plan for mock trial run		
				Black start exercise of generating unit (dead bus charging)	Mock black start of subsytem (black start of generating unit / island operation / synchronidation)	
NTPC						
1	Dadri GPS	Gas	16-Dec-23	31-Oct-24	NA	
2	Anta GPS	Gas	29-Feb-24			
3	Auraiya GPS	Gas		09-07-2024	09-07-2024	
4	Faridabad GPS	Gas				
5	Koldam HEP	Hydro	14-Mar-24	12-03-2025	12-03-2025	
NHPC						
6	Bairasuil	Hydro	30-Nov-22	2nd week of November	2nd week of November	
7	Salal Stage-I	Hydro	02-Nov-18	3rd week of October	3rd week of October	
8	Salal Stage-II	Hydro		3rd week of October	3rd week of October	
9	Tanakpur HPS	Hydro		4th week of December	4th week of December	
10	Chamera HPS-I	Hydro	02-Dec-22	1st week of December	1st week of December	
11	Chamera HPS-II	Hydro	02-Dec-22	1st week of December	1st week of December	
12	Chamera HPS-III	Hydro	04-Dec-17	1st week of December	1st week of December	
13	URI-I	Hydro	20-Dec-16	1st week of December	1st week of December	
14	URI-II	Hydro	20-Dec-16	1st week of December	1st week of December	
15	Dhauliganga	Hydro	28-Dec-21	4th week of December	4th week of December	
16	Dulhasti	Hydro		4th week of November	4th week of November	
17	Sewa-II	Hydro	29-May-22	3rd week of November	3rd week of November	
18	Parbati-3	Hydro	22-Dec-20	4th week of December	4th week of December	
19	Kishanganga	Hydro		4th week of October	4th week of October	
SJVNL						
20	Nathpa-Jhakri	Hydro	09-Dec-22	20.11.2024	20.11.2024	
21	Rampur	Hydro	09-Dec-22	20.11.2024	20.11.2024	
THDC						
22	Tehri	Hydro	07-11-23	06-11-24	06-11-24	
23	Koteshwar	Hydro	14-Mar-24	Dec-24	Dec-24	
BBMB						
24	Bhakra (L)	Hydro	31-Dec-22			
25	Bhakra (**R**)	Hydro	26-Dec-22			
26	Ganguwal	Hydro				
27	Kotla	Hydro				
28	Dehar	Hydro				
29	Pong	Hydro	08-Jun-14			
*: Rampur can be black started only after starting of Nathpa Jhakri units due to Tandem operation						
IPPGCL(Indraprashta power generating Corporation Ltd.)/ Delhi Gencos						
30	I.P. Gas Turbine (IPGCL G.T.)	Gas	20-Feb-19	10-04-2024	10-04-2024	Conducted
31	Pragati Gas Turbine (PPCL)	Gas				
32	Bawana GT	Gas				
33	Rithala(TPPDL)	Gas				Not in operation
Haryana						
34	Western Yamuna Canal (WYC-I & II)	Hydro				
Himachal Pradesh						
35	Bhabha	Hydro				
36	Bassi	Hydro				
37	Ghanvi	Hydro				
38	Giri	Hydro				
39	Larji	Hydro				
40	Phojal	Hydro				
41	Sainj HEP	Hydro				
42	Swara Kuddu HEP	Hydro				
43	Bajoli Holi HEP	Hydro				
Malana Power Company Ltd.						

Mock trial run/black start schedule plan for 2024-25						Remarks
S.No	Name of Generatiing	Fuel	Compliance to 34.3 of IEGC for mock trial runs (Last date on	Tentaive schedule plan for mock trial run		
44	Malana-I	Hydro	12-Mar-24			
Everest Power Company Ltd.						
45	Malana-II	Hydro	03-Jan-19			
AD Hydro Power Ltd.						
46	AD Hydro	Hydro	27-Jan-23	**24-02-2025**	**24-02-2025**	
JSW						
47	Karcham Wangtoo	Hydro	29-Dec-21			It is submitted that we shall perform black start Mock trial test after completion of M4 and M5 of GIS overhauling. In the meantime, Karcham Wangtoo HEP can carry out black start exercise of generating unit only at this point (dead bus charging).
48	Baspa	Hydro				
Greenco						
49	Budhil	Hydro				inability to carry out Mock Black start exercise keeping in view the Unit safety being installed capacity low and issue of Governing system. The Governing system of Budhil HEP is of M/S Dong Fong China make and we are not ge□ng any support from OEM a□er COVID-19.. The planning for changing the governing system is in Process.
50	Sorang HEP	Hydro				
Jammu & Kashmir						
51	Baghlihar-I	Hydro				
52	Baghlihar-II	Hydro				
53	Lower Jhelum	Hydro	20-Dec-16			
54	Upper Sindh	Hydro	20-Dec-16			
Punjab						
55	Jogendernagar/ Shanan	Hydro				
56	UBDC	Hydro				
57	Mukerian	Hydro				
58	Anandpur Sahib (APS)	Hydro				
59	Ranjit Sagar (Thein Dam)	Hydro		04-05-2024	04-05-2024	
Rajasthan						
60	Ramgarh GT Extn.	Gas				
61	Dholpur CCPP	Gas				
62	Rana Pratap Sagar (RPS)	Hydro	16-Jan-11			
63	Jawahar Sagar	Hydro				
64	Mahi Bajaj Sagar I	Hydro	21-Jul-15			
65	Mahi Bajaj Sagar II	Hydro	24-Mar-16			
Uttar Pradesh						
66	Rihand (H) or Pipri	Hydro	16-Feb-24			
67	Obra(H)	Hydro	16-Feb-24			
68	Khara	Hydro				
69	Matatila	Hydro				
GVK						
70	Alaknanda HEP	Hydro				
Jaiprakash power Venture Ltd.						
71	Vishnu Prayag IPP	Hydro				
Uttrakhand						
72	Ramganga	Hydro				
73	Chibro	Hydro				
74	Dhalipur	Hydro				
75	Khodri	Hydro				
76	Khatima	Hydro				
77	Chilla	Hydro				
78	Maneri Bhali-I	Hydro				
79	Maneri Bhali-II	Hydro				
80	Vyasi HEP	Hydro				
81	Dhakrani HEP	Hydro				
82	Kulhal HEP	Hydro				
83	Gamma GPS	Gas				
84	Sravanti GPS	Gas	NA	NA	NA	
L&T						

Mock trial run/black start schedule plan for 2024-25						Remarks
S.No	Name of Generatiing	Fuel	Compliance to 34.3 of IEGC for mock trial runs (Last date on	Tentaive schedule plan for mock trial run		
85	Singoli Bhatwari	Hydro	Not done yet	03rd Dec 2024	03rd Dec 2024	Consent did not given for mock drill by SLDC Dehradun due to constraint of partial power evacuation

Annexure-XXVII

Sr. No.	Scheme Name	State Control Area	Date of review of SPS	Last date on which Mock testing carried out	Tentaitve schedule of SPS Mock testing during 2024-25	Remarks
1	SPS for WR-NR corridor - 765kV Agra-Gwalior D/C	POWERGRID		12-03-2024		
2	SPS for contingency due to tripping of HVDC Mundra-Mahendergarh	ADANI				
3	SPS for high capacity 400 kV Muzaffarpur-Gorakhpur D/C Inter-regional tie-line related contingency	POWERGRID				
4	SPS for 1500 MW HVDC Rihand-Dadri Bipole related contingency	POWERGRID				
5	System Protection Scheme (SPS) for HVDC Balia-Bhiwadi Bipole	POWERGRID				
6	SPS for contingency due to tripping of multiple lines at Dadri(NTPC)	NTPC				
7	SPS for reliable evacuation of power from NJPS, Rampur, Sawra Kuddu, Baspa Sorang and Karcham Wangtoo HEP	SJVN/HPPTCL/JSW				
8	SPS for Reliable Evacuation of Ropar Generation	Punjab				
9	SPS for Reliable Evacuation of Rosa Generation	Uttar Pradesh		07-05-2022	counducted on 20-04-2024	
10	SPS for contingency due to tripping of evacuating lines from Narora Atomic Power Station	NAPS				
11	SPS for evacuation of Kawai TPS, Kalisindh TPS generation complex	Rajasthan				
12	SPS for evacuation of Anpara Generation Complex	Uttar Pradesh		06-07-2020		
13	SPS for evacuation of Lalitpur TPS Generation	Uttar Pradesh		14-07-2018	counducted on 21.05.2024	
14	SPS for Reliable Evacuation of Bara TPS Generation	Uttar Pradesh				
15	SPS for Lahal Generation	Himachal Pradesh		08-07-2020		
16	SPS for Transformers at Ballabhgarh (PG) substation	POWERGRID				
17	SPS for Transformers at Maharanibagh (PG) substation	POWERGRID				
18	SPS for Transformers at Mandola (PG) substation	POWERGRID				
19	SPS for Transformers at Bamnauli (DTL) Substation	Delhi				
20	SPS for Transformers at Moradabad (UPPTCL) Substation	Uttar Pradesh			counducted on 20-04-2024	
21	SPS for Transformers at Muradnagar (UPPTCL) Substation	Uttar Pradesh		07-02-2023	counducted on 20-04-2024	
22	SPS for Transformers at Muzaffarnagar(UPPTCL) Substation	Uttar Pradesh			counducted on 20-04-2024	
23	SPS for Transformers at Greater Noida(UPPTCL) Substation	Uttar Pradesh			SPS Unhealthy	
24	SPS for Transformers at Agra (UPPTCL) Substation	Uttar Pradesh		12-07-2023		
25	SPS for Transformers at 400kV Sarojininagar (UPPTCL) Substation	Uttar Pradesh		17-05-2023		
26	SPS for Transformers at 220kV Sarojininagar (UPPTCL) Substation	Uttar Pradesh		18-05-2022		
27	SPS for Transformers at 400kV Unnao (UPPTCL) Substation	Uttar Pradesh		19-05-2023	SPS Unhealthy	
28	SPS for Transformers at 220kV Unnao (UPPTCL) Substation	Uttar Pradesh				
29	SPS for Transformers at 400kV Sultanpur (UPPTCL) Substation	Uttar Pradesh			SPS Unhealthy	
30	SPS for Transformers at 400kV Bareilly (UPPTCL) Substation	Uttar Pradesh				
31	SPS for Transformers at 400kV Azamgarh (UPPTCL) Substation	Uttar Pradesh		14-05-2023	counducted on 06-05-2024	
32	SPS for Transformers at 400kV Mau (UPPTCL) Substation	Uttar Pradesh		17-01-2019	counducted on 27-04-2024	
33	SPS for Transformers at 400kV Gorakhpur (UPPTCL) Substation	Uttar Pradesh		14-05-2023	counducted on 27-04-2024	
34	SPS for Transformers at 400kV Sarnath (UPPTCL) Substation	Uttar Pradesh		19-05-2023	counducted on 23-05-2024	
35	SPS for Transformer at 400kV Rajpura (PSTCL) Substation	Punjab				
36	SPS for Transformers at 400kV Mundka (DTL) Substation	Delhi		19-06-2023		
37	SPS for Transformers at 400kV Deepalpur (JKTPL) Substation	Haryana				
38	SPS for Transformers at 400kV Ajmer (RVPN) Substation	Rajasthan				
39	SPS for Transformers at 400kV Merta (RVPN) Substation	Rajasthan				
40	SPS for Transformers at 400kV Chittorgarh (RVPN) Substation	Rajasthan				
41	SPS for Transformers at 400kV Jodhpur (RVPN) Substation	Rajasthan				
42	SPS for Transformers at 400kV Bhadla (RVPN) Substation	Rajasthan				
43	SPS for Transformers at 400kV Ratangarh (RVPN) Substation	Rajasthan				
44	SPS for Transformers at 400kV Nehtaur(UPPTCL) Substation	Uttar Pradesh		05-07-2022		
45	SPS for Transformers at Obra TPS	Uttar Pradesh			counducted on 20-05-2024	
46	SPS for Transformers at 400KV Kashipur (PTCUL) substation	Uttarakhand		03-09-2023	Septemeber 2024	
47	SPS for Transformers at 400KV Fatehgarh Solar Park (AREPRL)	ADANI				
48	SPS to relive transmission congestion in RE complex (Bhadla2)	POWERGRID				
49	SPS for Transformers at 400kV Bikaner (RVPN) Substation	Rajasthan				
50	SPS for Transformers at 400kV Bawana (DTL) Substation	Delhi		06-09-2023		
51	SPS for Transformers at 400kV Bhilwara (RVPN) Substation	Rajasthan				
52	SPS for Transformers at 400kV Hinduan (RVPN) Substation	Rajasthan				
53	SPS for Transformers at 400kV Suratgarh (RVPN) Substation	Rajasthan				

Sr. No.	Scheme Name	State Control Area	Date of review of SPS	Last date on which Mock testing carried out	Tentaitve schedule of SPS Mock testing during 2024-25	Remarks
1	SPS for WR-NR corridor - 765kV Agra-Gwalior D/C	POWERGRID		12-03-2024		
2	SPS for contingency due to tripping of HVDC Mundra-Mahendergarh	ADANI				
3	SPS for high capacity 400 kV Muzaffarpur-Gorakhpur D/C Inter-regional tie-line related contingency	POWERGRID				
4	SPS for 1500 MW HVDC Rihand-Dadri Bipole related contingency	POWERGRID				
5	System Protection Scheme (SPS) for HVDC Balia-Bhiwadi Bipole	POWERGRID				
6	SPS for contingency due to tripping of multiple lines at Dadri(NTPC)	NTPC				
7	SPS for reliable evacuation of power from NJPS, Rampur, Sawra Kuddu, Baspa Sorang and Karcham Wangtoo HEP	SJVN/HPPTCL/JSW				
8	SPS for Reliable Evacuation of Ropar Generation	Punjab				
9	SPS for Reliable Evacuation of Rosa Generation	Uttar Pradesh		07-05-2022	counducted on 20-04-2024	
10	SPS for contingency due to tripping of evacuating lines from Narora Atomic Power Station	NAPS				
11	SPS for evacuation of Kawai TPS, Kalisindh TPS generation complex	Rajasthan				
12	SPS for evacuation of Anpara Generation Complex	Uttar Pradesh		06-07-2020		
13	SPS for evacuation of Lalitpur TPS Generation	Uttar Pradesh		14-07-2018	counducted on 21.05.2024	
14	SPS for Reliable Evacuation of Bara TPS Generation	Uttar Pradesh				
15	SPS for Lahal Generation	Himachal Pradesh		08-07-2020		
16	SPS for Transformers at Ballabhgarh (PG) substation	POWERGRID				
17	SPS for Transformers at Maharanibagh (PG) substation	POWERGRID				
18	SPS for Transformers at Mandola (PG) substation	POWERGRID				
19	SPS for Transformers at Bamnauli (DTL) Substation	Delhi				
20	SPS for Transformers at Moradabad (UPPTCL) Substation	Uttar Pradesh			counducted on 20-04-2024	
21	SPS for Transformers at Muradnagar (UPPTCL) Substation	Uttar Pradesh		07-02-2023	counducted on 20-04-2024	
22	SPS for Transformers at Muzaffarnagar(UPPTCL) Substation	Uttar Pradesh			counducted on 20-04-2024	
23	SPS for Transformers at Greater Noida(UPPTCL) Substation	Uttar Pradesh			SPS Unhealthy	
24	SPS for Transformers at Agra (UPPTCL) Substation	Uttar Pradesh		12-07-2023		
25	SPS for Transformers at 400kV Sarojininagar (UPPTCL) Substation	Uttar Pradesh		17-05-2023		
26	SPS for Transformers at 220kV Sarojininagar (UPPTCL) Substation	Uttar Pradesh		18-05-2022		
27	SPS for Transformers at 400kV Unnao (UPPTCL) Substation	Uttar Pradesh		19-05-2023	SPS Unhealthy	
28	SPS for Transformers at 220kV Unnao (UPPTCL) Substation	Uttar Pradesh				
29	SPS for Transformers at 400kV Sultanpur (UPPTCL) Substation	Uttar Pradesh			SPS Unhealthy	
30	SPS for Transformers at 400kV Bareilly (UPPTCL) Substation	Uttar Pradesh				
31	SPS for Transformers at 400kV Azamgarh (UPPTCL) Substation	Uttar Pradesh		14-05-2023	counducted on 06-05-2024	
32	SPS for Transformers at 400kV Mau (UPPTCL) Substation	Uttar Pradesh		17-01-2019	counducted on 27-04-2024	
33	SPS for Transformers at 400kV Gorakhpur (UPPTCL) Substation	Uttar Pradesh		14-05-2023	counducted on 27-04-2024	
34	SPS for Transformers at 400kV Sarnath (UPPTCL) Substation	Uttar Pradesh		19-05-2023	counducted on 23-05-2024	
35	SPS for Transformer at 400kV Rajpura (PSTCL) Substation	Punjab				
36	SPS for Transformers at 400kV Mundka (DTL) Substation	Delhi		19-06-2023		
37	SPS for Transformers at 400kV Deepalpur (JKTPL) Substation	Haryana				
38	SPS for Transformers at 400kV Ajmer (RVPN) Substation	Rajasthan			Condcuted on 10.09.2024	
39	SPS for Transformers at 400kV Merta (RVPN) Substation	Rajasthan			Condcuted on 12.09.2024	
40	SPS for Transformers at 400kV Chittorgarh (RVPN) Substation	Rajasthan			Condcuted on 31.08.2024 & 05.09.2024	
41	SPS for Transformers at 400kV Jodhpur (RVPN) Substation	Rajasthan			Condcuted on 24.09.2024	
42	SPS for Transformers at 400kV Bhadla (RVPN) Substation	Rajasthan			Condcuted on 27.09.2024	
43	SPS for Transformers at 400kV Ratangarh (RVPN) Substation	Rajasthan			Condcuted on 20.09.2024	
44	SPS for Transformers at 400kV Nehtaur(UPPTCL) Substation	Uttar Pradesh		05-07-2022		
45	SPS for Transformers at Obra TPS	Uttar Pradesh			counducted on 20-05-2024	
46	SPS for Transformers at 400KV Kashipur (PTCUL) substation	Uttarakhand		03-09-2023	Septemeber 2024	
47	SPS for Transformers at 400KV Fatehgarh Solar Park (AREPRL)	ADANI				
48	SPS to relive transmission congestion in RE complex (Bhadla2)	POWERGRID				
49	SPS for Transformers at 400kV Bikaner (RVPN) Substation	Rajasthan			Condcuted on 26.09.2024	
50	SPS for Transformers at 400kV Bawana (DTL) Substation	Delhi		06-09-2023		
51	SPS for Transformers at 400kV Bhilwara (RVPN) Substation	Rajasthan			Condcuted on 09.07.2024 & 10.07.2024	
52	SPS for Transformers at 400kV Hinduan (RVPN) Substation	Rajasthan			Condcuted on 26.09.2024	
53	SPS for Transformers at 400kV Suratgarh (RVPN) Substation	Rajasthan				During frequent actual operation of SPS scheme. All alarm & tripping status found OK

Annexure-XXIX

Grid Controller of India Ltd.
National Load Despatch Centre

Inter Office Memo

Date: 18th Oct 2024

From: Chief General Manager (I/C), NLDC

To: Executive Director (NRLDC/ WRLDC / SRLDC / ERLDC / NERLDC)

Sub: Periodic testing of power system elements as per IEGC 2023 – Reg.

महोदय,

As per IEGC 2023, tests of power system elements are to be carried out on a periodic basis for ascertaining the correctness of mathematical models used for simulation studies as well as ensuring desired performance during any event in the system. The element wise details of the tests to be conducted are provided at **Annexure-I.**

These tests shall be performed once every **five (5) years** or whenever major retrofitting is done. If any adverse performance is observed during any grid event, then the tests shall be carried out even earlier, if so advised by SLDC or RLDC or NLDC or RPC. The equipment owners shall submit a testing plan for the next year to the concerned RPC by **31st October** to ensure proper coordination during testing as per the schedule.

In this regard, all RLDCs are requested to kindly take up the agenda for testing of power system elements in respective RPCs so as to ensure submission of the testing plan by 31st Oct 2024.

A meeting among RLDCs and NLDC to harmonize other modalities such as model data and test report submission etc. will be convened shortly.

18/10/24

(S Usha)

Annexure-I: TESTS REQUIRED FOR POWER SYSTEM ELEMENTS

Power System Elements	Tests	Applicability
Synchronous Generator	(1) Real and Reactive Power Capability assessment. (2) Assessment of Reactive Power Control Capability as per CEA Technical Standards for Connectivity (3) Model Validation and verification test for the complete Generator and Excitation System model including PSS. (4) Model Validation and verification of Turbine/Governor and Load Control or Active Power/ Frequency Control Functions. (5) Testing of Governor performance and Automatic Generation Control.	Individual Unit of rating 100MW and above for Coal/lignite, 50MW and above gas turbine and 25 MW and above for Hydro.
Non synchronous Generator (Solar/Wind)	(1) Real and Reactive Power Capability for Generator (2) Power Plant Controller Function Test (3) Frequency Response Test (4) Active Power Set Point change test. (5) Reactive Power (Voltage / Power Factor / Q) Set Point change test	Applicable as per CEA Technical Standards for Connectivity.
HVDC/FACTS Devices	(1) Reactive Power Controller (RPC) Capability for HVDC/FACTS (2) Filter bank adequacy assessment based on present grid condition, in consultation with NLDC. (3) Validation of response by FACTS devices as per settings.	To all ISTS HVDC as well as Intra-State HVDC/FACTS, as applicable

S. No.	Name of Plant	Unit	Installed Capacity	MVA Rating	Make of Units	COD	GT Details			Mode of Fuel Transport (Pit Head/Non Pit-head)	Name of Utility	Sector	Control Area	Type	Real and Reactive Power Capability assessment.			Assessment of Reactive Power Control Capability as per CEA Technical Standards for connectivity			Model Validation and verification test for the complete Generator and Excitation System model including PSS.			Model Validation and verification of Turbine/Governor and Load Control or Active Power/frequency Control Functions.			Testing of Governor performance and Automatic Generation Control			Revised Simulation Models	
							Voltage Ratio	GT MVA Capacity	Tap Ratio of GT (Present Tap/Total Taps)						Last tested on (dd/mm/yyyy)	Whether due?	Tentative Schedule date	Last tested on (dd/mm/yyyy)	Whether due?	Tentative Schedule date	Last tested on (dd/mm/yyyy)	Whether due?	Tentative Schedule date	Last tested on (dd/mm/yyyy)	Whether due?	Tentative Schedule date	Last tested on (dd/mm/yyyy)	Whether due?	Tentative Schedule date	Whether Revised Models Submitted?	Remarks

S. No.	Name of Plant	Unit	Installed Capacity	MVA Rating	Make of Units	COD	GT Details			Type (Pondage /RoR etc.)	Name of Utility	Sector	Control Area	Real and Reactive Power Capability assessment.			Assessment of Reactive Power Control Capability as per CEA Technical Standards for connectivity			Model Validation and verification test for the complete Generator and Excitation System model including PSS.			Model Validation and verification of Turbine/Governor and Load Control or Active Power/frequency Control Functions.			Testing of Governor performance and Automatic Generation Control			Revised Simulation Models		
							Voltage Ratio	GT MVA Capacity	Tap Ratio of GT (Present Tap/Total Taps)					Last tested on (dd/mm/yyyy)	Whether due?	Tentative Schedule date	Last tested on (dd/mm/yyyy)	Whether due?	Tentative Schedule date	Last tested on (dd/mm/yyyy)	Whether due?	Tentative Schedule date	Last tested on (dd/mm/yyyy)	Whether due?	Tentative Schedule date	Last tested on (dd/mm/yyyy)	Whether due?	Tentative Schedule date	Whether Revised Models Submitted?	Remarks	

S. No.	Name of Plant	Unit	Installed Capacity	MVA Rating	Make of Units	COD	GT Details			Type	Name of Utility	Sector	Control Area	Type	Real and Reactive Power Capability assessment.			Assessment of Reactive Power Control Capability as per CEA Technical Standards for connectivity			Model Validation and verification test for the complete Generator and Excitation System model including PSS.			Model Validation and verification of Turbine/Governor and Load Control or Active Power/frequency Control Functions.			Testing of Governor performance and Automatic Generation Control			Revised Simulation Models		
							Voltage Ratio	GT MVA Capacity	Tap Ratio of GT (Present Tap/Total Taps)						Last tested on (dd/mm/yyyy)	Whether due?	Tentative Schedule date	Last tested on (dd/mm/yyyy)	Whether due?	Tentative Schedule date	Last tested on (dd/mm/yyyy)	Whether due?	Tentative Schedule date	Last tested on (dd/mm/yyy)	Whether due?	Tentative Schedule date	Last tested on (dd/mm/yyyy)	Whether due?	Tentative Schedule date	Whether Revised Models Submitted?	Remarks	

S. No.	Name of Plant	Unit	Installed Capacity	MVA Rating	Make of Units	COD	GT Details			Name of Utility	Sector	Control Area	Type	Real and Reactive Power Capability assessment.			Assessment of Reactive Power Control Capability as per CEA Technical Standards for connectivity			Model Validation and verification test for the complete Generator and Excitation System model including PSS.			Model Validation and verification of Turbine/Governor and Load Control or Active Power/frequency Control Functions.			Testing of Governor performance and Automatic Generation Control			Revised Simulation Models	
							Voltage Ratio	GT MVA Capacity	Tap Ratio of GT (Present Tap/Total Taps)					Last tested on (dd/mm/yyyy)	Whether due?	Tentative Schedule date	Last tested on (dd/mm/yyyy)	Whether due?	Tentative Schedule date	Last tested on (dd/mm/yyyy)	Whether due?	Tentative Schedule date	Last tested on (dd/mm/yyy)	Whether due?	Tentative Schedule date	Last tested on (dd/mm/yyyy)	Whether due?	Tentative Schedule date	Whether Revised Models Submitted?	Remarks

S. No.	Name of Plant	Pooling Station Name	Installed Capacity	Type (Solar/Wind)	COD	Owner

Sector	Control Area	Inverter/ WTG Make	Inverter/W TG Model	PPC Make	Real and Reactive Power Capability for Generator			Power Plant Controller Function Test			Frequency Response Test			Active Power Set Point change test			Reactive Power (Voltage / Power Factor / Q) Set Point change test			Revised Simulation Models	
					Last tested on (dd/mm/yyyy)	Whether due?	Tentative Schedule date	Last tested on (dd/mm/yyyy)	Whether due?	Tentative Schedule date	Last tested on (dd/mm/yyyy)	Whether due?	Tentative Schedule date	Last tested on (dd/mm/yyyy)	Whether due?	Tentative Schedule date	Last tested on (dd/mm/yyyy)	Whether due?	Tentative Schedule date	Whether Revised Models Submitted?	Remarks

S.No	Station	Statcom	Capacity (MVAR)	Owner	Make	Reactive Power Controller (RPC) Capability for HVDC/FACTS			Filter bank adequacy assessment based on present grid condition, in consultation with NLDC			Validation of response by FACTS devices as per settings.			Revised Simulation Models	
						Last tested on (dd/mm/yyyy)	Whether due?	Tentative Schedule date	Last tested on (dd/mm/yyyy)	Whether due?	Tentative Schedule date	Last tested on (dd/mm/yyyy)	Whether due?	Tentative Schedule date	Whether Revised Models Submitted?	Remarks

S.No	End 1	End 2	Line No.	Compensator Location	Make	Fixed Compensation	Variable Compensation Positive	Variable Compensation Negative	Agency	Reactive Power Controller (RPC) Capability for HVDC/FACTS			Filter bank adequacy assessment based on present grid condition, in consultation with NLDC			Validation of response by FACTS devices as per settings.			Revised Simulation Models	
										Last tested on (dd/mm/yyyy)	Whether due?	Tentative Schedule date	Last tested on (dd/mm/yyyy)	Whether due?	Tentative Schedule date	Last tested on (dd/mm/yyyy)	Whether due?	Tentative Schedule date	Whether Revised Models Submitted?	Remarks

S.No	End 1	End 2	Line No.	End	Capacity	Make	Reactive Power Controller (RPC) Capability for HVDC/FACTS			Filter bank adequacy assessment based on present grid condition, in consultation with NLDC			Validation of response by FACTS devices as per settings.			Revised Simulation Models	
							Last tested on (dd/mm/yyyy)	Whether due?	Tentative Schedule date	Last tested on (dd/mm/yyyy)	Whether due?	Tentative Schedule date	Last tested on (dd/mm/yyyy)	Whether due?	Tentative Schedule date	Whether Revised Models Submitted?	Remarks
1	Jabalpur	Itarsi	4	Itarsi	50MVAR			Due			Due			Due			

Annexure-XXX

उत्तर प्रदेश राज्य भार प्रेषण केन्द्र लि०
यू0पी0एस0एल0डी0सी0 परिसर, विभूति
खण्ड– II, गोमती नगर, लखनऊ–226010
ई मेल : sera@upsldc.org

U.P. State Load Despatch Centre Ltd.
UPSLDC Complex, Vibhuti Khand – II
Gomti Nagar, Lucknow- 226010
E-mail:sera@upsldc.org

No: 3990 /CE(PSO)/SE(R&A)/EE-II/ Date: 14-11- 2024

SE (Operations), 18 – A SJSS Marg,

Katwaria Sarai, New Delhi,

110016. (seo-nrpc@nic.in)

Subject: Agenda for 54th PSC meeting-Regarding revision in logic of Anpara SPS

A grid disturbance occurred on 23.09.2024 at 765 kV S/S Unnao and SPS operated at Anpara C & D TPS. During detailed analysis of the incident, Anpara 'C' informed that they have given 3 sec time delay in unit tripping logic of condition (iv) of SPS logic (copy enclosed). As per discussion held in 53rd PSC meeting of NRPC, New Delhi, NRPC asked to review the logic UPSLDC organized a meeting on 23.10.2024 to review the logic. Executive Engineer, ETD-II, Varanasi informed that 400 kV Anpara-Obra B line can sustain 1100 MW load for a short duration (Minutes of the meeting enclosed).

In view of this it is proposed to provide 3 sec time delay in the unit tripping of condition (iv) of approved logic. It is to mention that by providing 3 sec time delay, unit tripping may be avoided in case line loading exceeds 1000 MW momentarily.

It is therefore, requested to kindly include the agenda in 54th PSC meeting scheduled on 25.11.2024.

Encl: As above.

14.11.24

(Arshad Jamal Siddiqui)
Chief Engineer (PSO)

ok
M Rasing

No: 3990/CE(PSO)/SE(R&A)/EE-II/ Date: 14-11- 2024

Copy forwarded to following (via e-mail) for information and necessary action:-

1. Director, UPSLDC, Vibhuti Khand-II, Gomti Nagar, Lucknow.
2. Director (Operation), UPPTCL, 11th Floor, Shakti Bhawan Extn., Lucknow.
3. Director (Technical), UPRVUNL, 8th Floor, Shakti Bhawan Extension, Lucknow.

4. Chief Engineer (Trans. South - East), U.P. Power Transmission Corporation Ltd., 57, George Town, Prayagraj - 211003.
5. Chief General Manager, Anpara, Thermal Power Station, Anpara, Sonbhadra.
6. M/s Lanco-Anpara Power Ltd., Gate No: 3, Anpara, Sonebhadra, District, Uttar Pradesh-231225.

14.11.24

(Arshad Jamal Siddiqui)
Chief Engineer (PSO)

ok.
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Rising

Revision of SPS for Anpara Complex		
	Present Logic for SPS	**Proposed logic of SPS**
Contingency related to overloading of 400 kV Obra C-Obra B line	i. If 900<P1<1100- Automatic backdown at Obra C till P 1, becomes less than 900.	**No Change**
	ii. If P1>1100- Tripping of one Unit at Obra C.	
Contingency related to overloading of 400 kV Anpara-Obra B line	iii. If 900<P2<1000- Automatic backdown at Anpara C AND Anpara D till P2 , becomes less than 900	**No Change**
	iv. If 1000<P2<1100- Tripping of one unit at Anpara C or D and automatic backdown of Generation of remaining Unit of Anpara C AND Anpara D till P2 , becomes less than 900	**iv. If 1000<P2<1100- Tripping of one unit with 3 second time dealy at Anpara C or D and automatic backdown of Generation of remaining Unit of Anpara C AND Anpara D till P2 , becomes less than 900**
	v. If P2>1100- Tripping of two units at Anpara C TPS AND Anpara DTPS and automatic backdown of Generation of remaining Unit of Anpara C AND Anpara D till P2 , becomes less than 900	**No Change**
Where P1= Loading of 400 kV Obra C-Obra B line P2 = Loading of 400 kV Anpara-Obra B line		

उत्तर प्रदेश राज्य भार प्रेषण केन्द्र लि०
यू०पी०एस०एल०डी०सी० परिसर, विभूति
खण्ड - II, गोमती नगर, लखनऊ–226010
ई–मेल : sera@upsldc.org

U.P. State Load Despatch Centre Ltd.
UPSLDC Complex, Vibhuti Khand – II
Gomti Nagar, Lucknow- 226010
E-mail:sera@upsldc.org

No: 3703 /SE(R&A)/EE-II/Meeting Dated: 26-10 2024

To,

As per distribution list (Via E-mail)

Subject: Record of proceedings to review of System Protection Scheme (SPS) installed at generating stations.

A meeting regarding review of System Protection Scheme (SPS) installed at generating stations was held on 23.10.2023 vide letter no. 3478/CE(PSO)/SE(R&A)/EE-II dated 14.10.2024. Copy of record of proceedings is enclosed for further necessary action.

Encl: As above.

(Ram Sharan Singh)
Superintending Engineer (R&A)

No: /SE(R&A)/EE-II/Meeting Dated: - 2024

Copy forwarded to following via e-mail for kind information:-

1. Director (SLDC), UPSLDC, Vibhuti Khand – II, Gomti Nagar, Lucknow.
2. Director (Operation), UPPTCL, 11th Floor, Shakti Bhawan Extn., Lucknow.
3. Director (Technical), UPRVUNL, 8th Floor, Shakti Bhawan Extension, Lucknow.
4. Chief Engineer (PSO), UPSLDC, Vibhuti Khand – II, Gomti Nagar, Lucknow.
5. Superintending Engineer (System Control), UPSLDC, Vibhuti Khand – II, Gomti Nagar, Lucknow.

(Ram Sharan Singh)
Superintending Engineer (R&A)

Distribution List

1. Chief Engineer, (Trans South west), U.P. Power Transmission Corporation Ltd., 64, Khambha, By pass Road, Agra -282007.
2. Chief Engineer (Trans. South - East), U.P. Power Transmission Corporation Ltd., 57, George Town, Prayagraj - 211003.
3. Chief General Manager, (Obra) Thermal Power Station, Obra, Sonbhadra Pin code-231219.
4. Chief General Manager, Anpara, Thermal Power Station, Anpara, Sonbhadra.
5. CGM (SEUPPTCL), Lavana Cyber Height, Ist Floor, Office No.-116, Vibhuti Khand, Gomti Nagar, Lucknow.
6. General Manager, Meja Thermal Power Plant Meja Tehsil, Prayagraj.
7. M/s Lalitpur Power Generating Company Ltd., TC-13, Vibhuti Khand, Near JSV Hyundai Service Centre, Gomti Nagar, Lucknow-226010.
8. President, M/s Prayagraj Thermal Power Plant, Village-Khansemra, PO- Lohgara, Tehsil-Bara, Distt.-Allahabad-212107.
9. M/s Rosa Power Supply, Company Limited, 520, F – Block, 5th Floor, Kasmanda House, 02 Park Road, Hazratganj,Lucknow–226001.
10. M/s Lanco-Anpara Power Ltd., Gate No: 3, Anpara, Sonebhadra, District, Uttar Pradesh-231225.

Record Proceedings of review meeting for System Protection Scheme (SPS) installed at generating stations

A meeting to review System Protection Scheme (SPS) installed at generating stations was held on 23.10.2024 vide letter no. 3478/CE(PSO)/SE(R&A)/EE-II dated 14.10.2024 via video conferencing. Following officers participated in the meeting:

1. Er. Ram Sharan Singh, Superintending Engineer, (R&A), UPSLDC.
2. Er. Prithvee Raj Singh, Superintending Engineer, ETC Mirzapur, UPPTCL.
3. Er. Mithilesh Kumar Gupta, Superintending Engineer, ETC Gazipur, UPPTCL.
4. Er. Rahul Sharma, Executive Engineer, ETD-II Varanasi, UPPTCL.
5. Er. Manoj Yadav, Executive Engineer, Anpara D.
6. Er. Manoj Prasad, Executive Engineer, Anpara B.
7. Er. V.K. Bhaskar, Executive Engineer, Fatehabad.
8. Er. Bhanu Pratap Sharma, Assistant Engineer (R&A), UPSLDC.
9. Shri Sujeet Singh, AGM, Anpara C-Lanco.
10. Shri Abhinanyu Updadhyay, Head (Electrical), LPGCL.
11. Shri Amit Patil, Head (EMD), PPGCL, Bara.
12. Shri Vikas Goyal, Rosa Thermal Power Station.
13. Shri Prashant, SEUPPTCL.
14. Shri Ashish Kumar Singh, SEUPPTCL.

Discussion regarding following SPS and decision taken thereof is given below:-

SPS for Anpara Complex:-

1. Executive Engineer (Anpara D) informed that during event on 23.09.24, SPS at Anpara-D did not operate due to technical issue in software because of which load reduction was done manually. Mock testing of SPS logic for overloading of 400 kV Anpara-Obra B line was done on 19.10.2024 and SPS is in healthy condition now.
2. As per SPS logic, when loading of 400kV Anpara-Obra B line is >1000MW & <1100MW, one unit of Anpara C or Anpara D is to be tripped instantaneously which did not happen during event of 23.09.24. Representative of Anpara-C informed that a time delay of 3 sec is implemented in the software at Anpara-C for tripping of unit in this case to avoid spurious tripping of unit.

3. EE ETD-II Varanasi informed that 400kV Anpara-Obra B line can sustain 1100MW load for a short duration.
4. It was decided that logics in the software are to be implemented for instantaneous tripping of units without any time delay, in case loading of 400 kV Anpara-Obra B line is >1000MW until NRPC approves the logic for short duration time delay for tripping of units in case line loading is up to 1100MW.
5. Superintending Engineer (ETC Gazipur) informed that for implementation of System Protection Scheme for overloading of 400 kV Obra C- Obra B line, budgetary offer from M/s Synergy System Solution will be received by 27th October, 2024.

SPS at Lalitpur TPS:-

1. Representative of M/s LPGCL informed that mock test of SPS was done on 21.05.2024 & it is in healthy condition.
2. In view of new network connectivity of 765kV Fatehabad with Ghatampur, a separate meeting for review of logics for SPS at Lalitpur TPS will be held in 2nd week of November 2024.

SPS at Bara TPS:-

1. Representative of Bara TPS informed that logics for SPS at Bara TPS are not implemented yet.
2. UPSLDC instructed Bara TPS to implement approved SPS logics & perform mock testing of SPS logics and submit reports to SLDC by end of November, 2024.

SPS at Rosa TPS:-

1. Representative of ROSA TPS informed that mock test of SPS was done on 20.04.2024 and SPS is in healthy condition and SPS has not operated after its installation in 2017.
2. A separate meeting to review requirement of SPS at Rosa TPS to be scheduled in November 2024.

UPSLDC instructed all the generating stations that SPS logics are to be disabled only after prior approval from UPSLDC (by taking code from control room of SLDC) except in emergency cases same to be communicated to SLDC within 10 minutes.

(Ram Sharan Singh)
Superintending engineer (R&A)