

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

दिनांक: 18.11.2024

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 कार्यसूची | Subject: Agenda for 54<sup>rd</sup> 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 जायेगी। उक्त बैठक की कार्यसूची संलग्न है। यह उत्तर क्षेत्रीय विद्युत् समिति की वेबसाइट (http://164.100.60.165/) पर भी उपलब्ध है | कृपया बैठक मे उपस्थिति सुनिश्चित करें।

यह अनुरोध किया जाता है कि प्रतिभागी (प्रत्येक संगठन से दो से अधिक नहीं) मेल में संलग्न एक्सेल शीट लिंक पर निर्धारित प्रारूप में 22.11.2024 तक अपनी यात्रा का विवरण एनआरपीसी सचिवालय को सूचित कर सकते हैं।

The 54<sup>th</sup> meeting of Protection Sub-Committee is scheduled to be held on **25.11.2024** (**10:00 AM**) at **Jodhpur, Rajasthan** being hosted by NHPC Ltd. The agenda for the meeting is attached herewith. The same is also available on NRPC website (http://164.100.60.165/). Kindly make it convenient to attend the same.

It is requested that participants (not more than two from each organization) may intimate their journey details to NRPC Secretariat latest by 22.11.2024 in prescribed format at excel sheet link enclosed in the mail.

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Nodal officer(s) for facilitating meeting are as below:

Signed by Dharmendra Kumar Meena Date: 18-11-2024 18:09:42

डी. के. मीणा अधीक्षण अभियंता (संरक्षण)

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## Agenda for

## 54<sup>th</sup> Meeting of Protection Sub-Committee (PSC) of Northern Regional Power Committee

Date and time of meeting	2	25.11.2024 10.00 Hrs.
Venue	1	Jodhpur, Rajasthan

A.1. Confirmation of minutes of 53<sup>rd</sup> meeting of Protection Sub-Committee

A.1.1 53<sup>rd</sup> 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 required from Forum:**

Forum may approve the minutes of 53<sup>rd</sup> PSC meeting.

- A.2. Status of action taken on decisions of 53<sup>rd</sup> Protection Sub-Committee meeting (agenda NRPC Secretariat)
- A.2.1 Status on decisions of 53<sup>rd</sup> NRPC meeting is attached as **Annexure-I.**

#### Decision required from Forum:

Status of action taken may be discussed in meeting.

## A.3. Submission of protection performance indices to NRPC Secretariat on monthly basis (agenda by NRPC Secretariat)

- A.3.1 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 meeting, it was decided that each utility shall submit the Performance indices of previous month by 7th day of next month.
- A.3.3 Accordingly, the status of the indices reported for the month of October-2024 is attached as **Annexure- II**.
- A.3.4 Based on submitted data by the utilities as on date, the summary of events of October-2024 that caused indices less than unity is also attached as Annexure-III. Most of the concerned utilities have submitted the reason for the same and corrective action taken to resolve the related issue. However, who have not submitted, may send at the earliest.
- A.3.5 Further, it is requested that utilities may submit the performance indices of previous month by 7<sup>th</sup> day of next month element wise along with the reason for indices less than unity and corrective action taken.

## Decision required from Forum:

Members may deliberate on delay in submission of indices by utilities, and action taken in cases where indices are less than one.

## 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 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 48<sup>th</sup>, 49<sup>th</sup>, 50<sup>th</sup>, 51<sup>st</sup>, 52<sup>nd</sup> & 53<sup>rd</sup> PSC meetings, all utilities were requested to submit the annual protection audit plan.
- A.4.3 Some utilities have submitted their annual audit plans for FY 2024-25 (enclosed as **Annexure- IV**) and other remaining may submit annual audit plan at the earliest.

#### Third party protection audit:

- A.4.4 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.4.5 Some utilities have submitted their third-party protection audit plans (enclosed as **Annexure-V**) and other remaining may submit the same at the earliest.
- A.4.6 The utilities may update the status of 3<sup>rd</sup> party protection audit as per the submitted audit plans. Subsequently, the audit reports along with compliance status may be submitted to NRPC Secretariat regularly.
- A.4.7 Most of the utilities have not still submitted the action taken reports against the observations of audits. The same may be expedited.

#### Decision required from Forum:

Utilities may submit annual audit plan for FY 2024-25 & 3<sup>rd</sup> Party Protection audit plan and comply the same timely. Compliance report for the audited substation may be submitted within one month of audit.

- A.5. Annual protection audit plan for FY 2025-26 (agenda by NRPC Secretariat)
- A.5.1 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 31<sup>st</sup> October 2024 in the 53<sup>rd</sup> PSC meeting.
- A.5.3 In view of above, some utilities have submitted their annual audit plans for FY 2025-26 (enclosed as Annexure- VI) and others may submit annual audit plan at the earliest.

#### Decision required from Forum:

Utilities may submit 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 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. After the 53<sup>rd</sup> Protection Sub- Committee meeting, received internal audit reports from THDC, UJVNL, RVUNL, UPRVUNL and PPCL are attached as **Annexure-VII** and received reports of 3<sup>rd</sup> Party audit from LPGCL are attached as **Annexure-VIII**.
- A.6.3 However, compliance of audit recommendations has not been reported to NRPC

Secretariat. UPPTCL has submitted the compliance reports of internal protection audit held in FY 23-24 of its substations and PPCL has submitted the compliance report for internal protection audit done of PPS-I in FY 23-24, attached as **Annexure-IX**.

A.6.4 The concerned utilities may submit the protection audit report (for audited S/s as per submitted plan) and action plan for rectification of deficiencies within a month after issuance of audit report.

#### Decision required from Forum:

Forum may discuss audit report as well as action taken by utilities on recommendations of audit.

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

- A.7.1 In pursuance to the discussion of the 14<sup>th</sup> 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 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 is requested that all stakeholders may note and ensure the compliance of the same.

#### Decision required from Forum:

Members may kindly discuss.

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

A.8.1 Provisional protection clearance during FTC in October 2024 allowed by NRLDC is attached as **Annexure-XI.** 

#### Decision required from Forum:

Concerned Utilities may share agenda for approval of PSC forum and may intimate NRPC Secretariat for update the database.

- 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 In line with the report of Task Force on Automatic under Frequency Load Shedding (AUFLS) and df/dt scheme, NPC Secretariat to communicate the Region wise relief quantum (based on Regional Peak Demand Met during the previous year) by 31<sup>st</sup> of May to RPCs for implementation in the next Financial Year (FY).
- A.9.2 NPC Secretariat 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.9.3 The quantum of load shedding in different stages of AUFLS region-wise is as follows:

Sr. No	_	Frequency (Hz)	Demand Disconn ection (%)		Quantu	m of Loa	nd shed	in MW	
ΑU		Points and antum of R		NR	SR	WR	ER	NER	All Indi a 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 ( i	n MW)	l	19008.5	16069.5	17122.4	6914.3	867.9	59982.7

A.9.4 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.

#### **GUIDELINES FOR IDENTIFICATION OF AUFLS FEEDERS**

- A.9.5 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
  - 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.

### Decision required from Forum:

Members may please discuss and 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 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 has 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

#### Decision required from Forum:

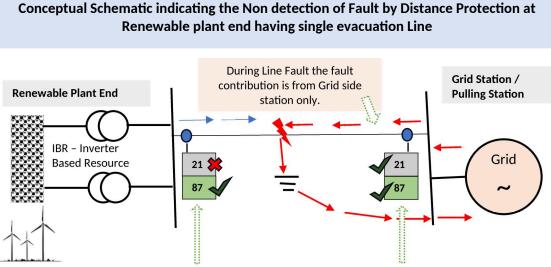
Members may discuss and consider to amend the protection philosophy accordingly.

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

A.11.1 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.

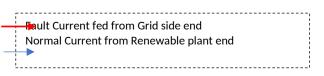
## Review of Distance Protection requirement Philosophy for Renewable plants having one evacuation line. (Point No. 1)

- 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.
  - The Line Differential Protection employed at both ends detect the fault on current differential principle and assures the protection as required.
  - The following conceptual schematic indicates the operation of protection for fault on the single line connected with renewable plant with Grid station



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.



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 is 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 inter-strip signalling, Direct Trip & Auto reclosure 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 philosophy 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 1<sup>st</sup> RE Sub-Committee meeting held on 24.10.2024 wherein all RE members were requested to send their comment on the proposal of AGEL.

#### Decision required from Forum:

Members may discuss and consider to amend the finalized Protection Philosophy/Protocol of Northern Region related to Transmission line.

- 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 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-XII). 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 may affect the life of associated equipment & endangers the stability & security of National grid.
- A.12.4 Further, SJVN has 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 requests 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.

#### Decision required from Forum:

- *i.* Members may discuss the issue and direct POWERGRID to take necessary action for ensuring the healthiness of carrier protection of transmission line circuit Jhakri-Rampur ckt-2.
- ii. Forum may also deliberate on proposal of SJVN regarding upgradation 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 has 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.

#### Decision required from Forum:

Members may kindly discuss.

- 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 As per IEGC 2023, the 1<sup>st</sup> stage of operation of UFR is desired at 49.4Hz. The same is endorsed by 14<sup>th</sup> 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. 1<sup>st</sup> 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 1<sup>st</sup> stage of UFR operation.

#### Decision required from Forum:

Members may kindly discuss.

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

A.15.1 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-XIII**).

- 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.

#### Decision required from Forum:

Forum may propose for adoption of above philosophy by all utility for DR Parameter Standardization.

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

- A.16.1 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 75<sup>th</sup> NRPC meeting, utility has to get final approval of settings in PSC meeting, therefore, UPSLDC has put up the implemented settings (available at NRPC website link <u>http://164.100.60.165/meetings/PCC/PCC54/UPSLDC.rar</u>) for approval of Forum.

#### Decision required from Forum:

Forum may approve the protection settings (available at <u>http://164.100.60.165/meetings/PCC/PCC54/UPSLDC.rar</u>) after deliberation and may suggest changes, if any.

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

- A.17.1 PSTCL vide letter dated 12.11.2024 has 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 75<sup>th</sup> NRPC meeting, utility has to get final approval of settings in PSC meeting, therefore, PSTCL has put up the agenda for Post-facto approval of settings (available at NRPC website link <a href="http://164.100.60.165/meetings/PCC/PCC54/Agenda regarding ICT settings PSTC">http://164.100.60.165/meetings/PCC/PCC54/Agenda regarding ICT settings PSTC</a> <a href="http://164.100.60.165/meetings/PCC/PCC54/Agenda regarding ICT settings">http://164.100.60.165/meetings/PCC/PCC54/Agenda regarding ICT settings PSTC</a> <a href="http://lipid.li

#### Decision required from Forum:

Forum may approve the protection settings (available at <a href="http://164.100.60.165/meetings/PCC/PCC54/Agenda regarding ICT settings PSTC">http://164.100.60.165/meetings/PCC/PCC54/Agenda regarding ICT settings PSTC</a> <a href="http://listings/PCC/PCC54/Agenda">L Nakodar.pdf</a> ) after deliberation and may suggest changes, if any.

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

- A.18.1 HPSLDC vide letter (enclosed as Annexure-XIV) dated 13.11.2024 has 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 As per protection setting procedure finalized in 75<sup>th</sup> NRPC meeting, utility has to get final approval of settings in PSC meeting, therefore, HPSLDC has 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 required from Forum:

Forum may approve the protection settings (available at <u>http://164.100.60.165/meetings/PCC/PCC54/HPSLDC.rar</u>) after deliberation and may suggest changes, if any.

## 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 are requested to share the status of remedial actions taken. List of points to be discussed in 54<sup>th</sup> PSC meeting is attached as Annexure-XV. Constituents can email the details via mail to NRLDC and NRPC.

#### Decision required from Forum:

Members may like to discuss.

## 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-XVI.**
- A.20.2 Maximum delayed clearance of fault observed in event of multiple elements tripping at 220/132kV Pampore (PDD JK) on 16<sup>th</sup> 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).
- A.20.3 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.20.4 Remedial actions taken by constituents to avoid such multiple elements tripping may be shared.
- A.20.5 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.

A.20.6 Members may 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.

#### Decision required from Forum:

Members may like to discuss.

# 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.	Element Name	No. of	Utility/SLDC
NO.		forced	
		outages	
1	400 KV Muradnagar_2-Mathura (UP) Ckt-1	7	UP
2	220 KV RAPS_B(NP)-Sakatpura(RS) (RS)	5	NPCIL/Raj
	Ckt-1	5	Ni Ole/Raj
3	220 KV Saharanpur(PG)-Shamli(UP) (UP)	5	PG/UP
	Ckt-1	5	1 0/01
4	220 KV Nanauta(UP)-Saharanpur(PG) (UP)	3	PG/UP
r	Ckt-1		
5	220 KV Sarsawan(UP)-Khodri(UK) (UP) Ckt-1	3	UP/Utt

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

- A.21.3 It may be noted that frequent tripping of such elements affects the reliability and security of the grid. Hence, utilities are requested to analyse the root cause of the tripping and share the 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.21.4 The list of major tripping events occurred during October 2024 is attached as **Annexure-XVIII**. Concerned constituents/utilities are requested to share the detailed analysis of the tripping elements along with status of remedial action taken/to be taken.
- A.21.5 Utilities are requested to prepare detailed analysis report and present the event details during 54<sup>th</sup> PSC meeting. Events involving more than one utility may be jointly prepared and presented.

### Decision required from Forum:

Members may like to discuss.

## 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-XIX. 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.
- A.22.2 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.

## Decision required from Forum:

Members may please note and advise the concerned for taking corrective action to avoid such tripping as well as timely submission of the information.

- 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 During FTC process, cases of non-availability of station event logger and nonstandardisation 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 was done during pervious PSC meetings. Details were received from UP, Uttarakhand only. Details received is attached as **Annexure-XX**.
- A.23.7 In view of above, all the constituents are 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-XX**.

#### **Decision required from Forum:**

Members may like to discuss.

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

- A.24.1 On 17<sup>th</sup> 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 51<sup>st</sup> 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 12<sup>th</sup> 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-XXI**.
- 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 During 53<sup>rd</sup> 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. Desired remedial actions need to be expedited.
- 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. Therefore, ADANI is requested to apprise the forum about the present status of remedial actions.

#### Decision required from Forum:

Members may like to discuss.

## 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 XXII.**
- 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 are 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 needs to be done to ensure its uniformity and to avoid undesired operation and load loss.
- A.25.6 Respective control shall also need 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 required from Forum:

Members may like to discuss.

- 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 21<sup>st</sup> 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	Eve nt Date	Time (In hrs.)	Event Description	Starti ng Frequ ency (in Hz)	Nadir Frequ ency (in Hz)	End Frequ ency (in Hz)	Δf	NR FRP during the event
1	21- Oct- 24	16:4 9 hrs	As reported, at 16:49 hrs (solar hours) on 21st October, 2024, generation loss event of around 1114 MW occurred 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."
- A.26.4 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.26.5 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.26.6 FRP values as considered (as per NRLDC HDR data) for the events of October, 2024 is as follows:

<b>S</b> .		
J.	Control Area	Event Date
No	Control Area	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
	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
	Dadri (G)	No Gen
26	AD Hydro (H)	No Gen
	Bairasiul (H)	0.00
	Bhakra (H)	0.03
29	Budhil (H)	No Gen
30	Chamera-1 (H)	No Gen
31	Chamera-2 (H)	-2.44
	Chamera-3 (H)	No Gen
33	Dehar (H)	-0.50
	Dhauliganga (H)	5.37
	Dulhasti (H)	35.28
	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.26.7 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 received is as follows:

SI. No.	Entity	Capacity(MW)	Governor Mode (FGMO as per IEGC 2023) Yes or No	Droop settin g (%)	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 Implementati on
5	Rihand-2 (TH)	2*500	Yes	5.0	Under Implementati on
6	Rihand-3 (TH)	2*500	Yes	5.0	Under Implementati on
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)			

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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.26.8 Constituents are requested to share the details at the earliest.
- A.26.9 Memebers are 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.26.10 Members are also requested to reconcile the FRP values as considered for the events of September, 2024.
- A.26.11 On 03<sup>rd</sup> September 2024, NRLDC has conducted an online workshop on Frequency Response Performance of Generators and States of Northern Region. Members

from SLDCs, ISGS & State generating stations attended the worlshop. Approx. 185 participants were connected in the meeting. NRLDC presented and explained IEGC clauses related to Governor response FRC/ FRO methodology for computation of FRC/FRO/FRP, methodology for computation of Beta (average monhtly FRP value for incentive related claculation).

A.26.12 NRLDC highlighted non compliance / unsatisfactory data submission status and requested all the members for timley computation of FRC/FRP and analysi of governor response of their trespective control area.

#### Decision required from Forum:

Members may like to discuss.

- 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.

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

black-start facility at generating stations. Further, NRLDC shall coordinate with the ISGS and states to conduct the mock black start exercise of subsystems.

- A.27.3 Therefore, regional entity generating stations and SLDCs are 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-XXIII. Constituents are 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.27.4 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.
- A.27.5 Members are requested to share the tentative schedule of mock black start exercise of generating stations in their respective control area. SLDCs are 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.

### Decision required from Forum:

Members may like to discuss.

# 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 <u>https://nrldc.in/download/nr-sps-2024/?</u> 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 are 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-XXIV.** 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. Other concerned members also requested to share the updated at the earliest.
- A.28.6 Members are requested to share the tentative schedule of mock testing of SPS implemented on their control area and share the report of the same.

#### Decision required from Forum:

Members may like to discuss.

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

- 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-Testingfor-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 73<sup>rd</sup> NRPC meeting held on 21<sup>st</sup> 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 18<sup>th</sup> October 2024 issued from NLDC in this regard is also attached as **Annexure-XXV**. Sample testing format is also attached as **Annexure-XXV**.
- A.29.10 Generators and HVDC/FACT owners may furnish the Testing schedule for 2024-25 at the earliest.

### Decision required from Forum:

Members may like to discuss.

- A.30. Excessive SPS Tripping of 2x315 MVA, 400/220kV ICT's at STPS Suratgarh (agenda by Rajasthan SLDC)
- A.30.1 The agenda was discussed in the 52<sup>nd</sup> 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-I Contingency".
  - 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.
  - 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. 3<sup>rd</sup> and 4<sup>th</sup> 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. 01<sup>st</sup> & 02<sup>nd</sup> is 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.

#### Decision required from Forum:

Members may like to discuss.

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

- A.31.1 UPSLDC vide letter dated 14.11.2024 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-XXVI).
- A.31.2 Further, as per discussion held in 53<sup>rd</sup> PSC meeting, Forum asked to review the logic.
- A.31.3 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 the annexure-XXVI).
- A.31.4 In view of this, UPSLDC has 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.

### Decision required from Forum:

Members may discuss and approve the 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 mentioned 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).
- A.32.2 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. To prevent major outages, the following actions are 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.32.3 These actions are necessary to prevent major breakdowns of the ICTs and GIS switchgear and to avoid prolonged line outages, thereby enhancing grid security.

## Decision required from Forum:

Members may discuss and consider to approve the above proposals of POWERGRID accordingly.

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

- A.33.1 In the 14<sup>th</sup> 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 15<sup>th</sup> NPC meeting (held on 14.11.2024) wherein Chairperson NPC directed to form the standing PSAG group to analyse the any major 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 is proposed that a PSAG may be constituted for Northern Region.

### Decision required from Forum

Members may deliberate.

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#### Members of Protection Sub-Committee (FY 24-25)

S. No.	NRPC Member Organization	s of Protection Sub-Committee (FY 2 Designation	Email-ID
1	Member (GO&D), CEA	Director, NPC Division	skdotancea@nic.in
2	Member (PS), CEA	Chief Engineer, PSPA-I Division	i.sharan@nic.in
3	CTUIL	Sr.GM	schakraborty@powergrid.in
4	PGCIL	GM	gunjan.agrawal@powergrid.in
5	NLDC*	Executive Director	scsaxena@arid-india.in
6	NRLDC	CGM(SO)	somara.lakra@grid-india.in
7	NTPC	GM(OS-NR)	dmandal@ntpc.co.in
8	BBMB	Director (P&C)	dirpc@bbmb.nic.in
9	THDC*	Chief General Manager (EM-Design)	rrsemwal@thdc.co.in
10	SJVN	General Manager	sjvn.cso@sjvn.nic.in
11	NHPC	General Manager (O&M)	hod-om-co@nhpc.nic.in
12	NPCIL*	Director (Finance), SO/F, TSU(E&I)	df@npcil.co.in rajeshsharma@npcil.co.in
13	Delhi SLDC	General Manager	gmsldc@delhisldc.org
14	Haryana SLDC	Chief Engineer (SO&C)	cesocomml@hvpn.org.in
15	Rajasthan SLDC	Chief Engineer (LD)	<u>ce.ld@rvpn.co.in</u>
16	Uttar Pradesh SLDC	Superintending Engineer (R&A)	sera@upsldc.org
17	Uttarakhand SLDC	Chief Engineer	anupam_singh@ptcul.org
18	Punjab SLDC	Chief Engineer	ce-sldc@punjabsldc.org
19	Himachal Pradesh SLDC	Chief Engineer	cehpsldc@gmail.com
20	DTL	AGM-Protection	bharatgujardtl@gmail.com
21	HVPNL	Chief Engineer (TS)	cetspkl@hvpn.org.in
22	RRVPNL	CE (M&P)	ce.mps@rvpn.co.in
23	UPPTCL*	Managing Director	md@upptcl.org
24	PTCUL	SE(T&C)	setandchld@gmail.com
25	PSTCL	Chief Engineer (P&M)	ce-pm@pstcl.org
26	HPPTCL*	Managing Director	md.tcl@hpmail.in
27	IPGCL	DGM (Protection)	arif.ipgcl@gmail.com
28	HPGCL	SE/M&T RGTPP	semt.rgtpp@hpgcl.org.in
29	RRVUNL*	CMD	cmd@rrvun.com
30		Chief Engineer, (L-2)	ce.ppmm@uprvunl.org
31	UJVNL*	Managing Director	mdujvnl@ujvnl.com
32	HPPCL*	Managing Director	md@hppcl.in
33	PSPCL UHBVN	Chief Engineer/GHTP	ce-ghtp@pspcl.in
34	Jodhpur Vidyut Vitran Nigam Ltd.	Managing Director	md@uhbvn.org.in
35	Paschimanchal Vidyut Vitaran Nigam Ltd.	Managing Director	MD.JDVVNL@RAJASTHAN.GOV.IN md@pvvnl.org
36	, ,	Managing Director	
37	UPCL* HPSEB*	Managing Director	md@upcl.org
38	Prayagraj Power Generation Co. Ltd.*	Managing Director Head (Commercial & Regulatory), DGM -	md@hpseb.in sanjay.bhargava@tatapower.com,
39	Aravali Power Company Pvt. Ltd*	Elect CEO	dhananjay.singh@ppgcl.co.in brahmaijg@ntpc.co.in
40			
41	Apraava Energy Private Limited*	GM-Electrical	navin.chaturvedi@apraava.com
42	Talwandi Sabo Power Ltd. *	COO	Vibhav.Agarwal@vedanta.co.in
43	Nabha Power Limited*		sk.narang@larsentoubro.com
44	MEIL Anpara Energy Ltd Rosa Power Supply Company Ltd	COO & WTD, Executive Director	anandkumar.singh@meilanparapower.com arun.tholia@meilanparapower.com kesarinandan.pandey@relianceada.com
45 46	Lalitpur Power Generation Company Ltd	Head of Maintenance, GM Electrical	alokkumar.ltp@lpgcl.com,
40			aupadhyay.ltp@lpgcl.com
47	MEJA Urja Nigam Ltd.	AGM-EMD	SPSPUNDIR@NTPC.CO.IN
48	Adani Power Rajasthan Limited*	COO, Thermal, O&M	jayadeb.nanda@adani.com
49	JSW Energy Ltd. (KWHEP)*	Head Regulatory & Power Sales	jyotiprakash.panda@jsw.in
50	TATA POWER RENEWABLE*	Zonal Head, NR	dhmahabale@tatapower.com
51	UT of J&K*	Chief Engineer, JKPCL	cejkpcl2@gmail.com
52	UT of Ladakh*	Chief Engineer, LPDD	cepdladakh@gmail.com
53	UT of Chandigarh	Executive Engineer	elop2-chd@nic.in
54	Noida Power Company Limited	Head – Power Purchase	ssrivastava@noidapower.com
55	Fatehgarh Bhadla Transmission Limited	Head-Protection, AESL	Sunil.Raval@adani.com
56	NTPC Vidyut Vyapar Nigam Ltd.	CEO	ceonvvn@ntpc.co.in
57	ReNew Power Private Limited*	CEO	sumant@renew.com
58	NTPC Green Energy Limited*	CEO	rajivgupta@ntpc.co.in
59	Azure Power India Pvt. Limited*	CEO	sunil.gupta@azurepower.com
39		CEO	kishor.nair@avaada.com
60	Avaada Energy Private Limited* Adani Green Energy Limited*	COO	chaitanya.sahoo@adani.com

# Status of action taken on decision 53<sup>rd</sup> PSC meeting

S.N.	Agenda	Decision of 53 <sup>rd</sup> 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.	i) Concerned may submit the reason for not submission of protection performance indices.
		<ul><li>ii) BBMB representative conveyed to submit the protection performance indices shortly.</li><li>iii) Forum also directed</li></ul>	<ul><li>ii) BBMB has not submitted the same as of now.</li><li>iii) UPSLDC may</li></ul>
		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	iv) MEIL Anpara Energy Limited & ADHPL may share the reason for delay in submission of corrective action.

		performance indices less	
		than unity.	
		v) A letter may be sent to	v) A letter dated
		higher authorities of the	08.11.2024 has been
		concerned utilities and	sent to the concerned
		SLDCs to actively	by NRPC Secretariat.
		participate in the	
		Protection Sub-	
		Committee meeting	
A.3	Annual protection audit	PSCPL representative	PSPCL has submitted
	plan for FY 2024-25 and	conveyed that third-	the same for GATP
	third-party protection	party protection audit	and GHTP.
	audit plan (agenda by	plan will be submitted	
	NRPC Secretariat)	with in few days.	
A.5	Observations and	i) CCGT, Bawana	(i) CCGT, Bawana
	Compliance of	was requested to submit	has not submitted the
	recommendations of	the compliance report of	same. May update.
	protection audit (agenda	internal and third-party	
	by NRPC Secretariat)	Protection audits of	(ii) UPSLDC and
		PPS-III.	UPRVUNL have not
		ii) UPSLDC and	submitted the same.
		UPRVUNL were also	May update.
		requested to submit the	
		compliance report of	
		internal and third-party	
		Protection audits.	
A.15	Non operation of auto	Forum directed	POWERGRID vide
	recloser at 220 kV S/S	POWERGRID to	email dated
	Saharanpur (PG) & 220	expedite the functioning	11.11.2024 submitted
		and healthiness of Auto-	that the AR scheme
L			

٨V	s/S	Baghpat	(PG)	Recloser	scheme	at	has I	been th	norou	ughly
age	nda l	by UPSLD	C)	both Subs	tations of 4	400	checl	ked at	both	h the
				kV S/s Sal	naranpur (F	PG)	Saha	ranpur		and
				and 400 k	V S/s Bagh	pat	Bagh	pat Sul	bstat	ions.
				(PG).			Durin	g tes	ting	on
							04.11	.2024,	the	AR
							was	found	to	be
							functi	ioning		
							satisf	actorily	at	both
							locati	ons		after
							modif	fication		of
							scher	mes.		
			0.1	V s/S Baghpat (PG) agenda by UPSLDC)	agenda by UPSLDC) both Subs kV S/s Sal and 400 kV	agenda by UPSLDC) both Substations of 4 kV S/s Saharanpur (F and 400 kV S/s Bagh	agenda by UPSLDC) both Substations of 400 kV S/s Saharanpur (PG) and 400 kV S/s Baghpat	agenda by UPSLDC) both Substations of 400 check kV S/s Saharanpur (PG) Saha and 400 kV S/s Baghpat Bagh (PG). Durin 04.11 was functi satisfi locati modit	agenda by UPSLDC) both Substations of 400 checked at kV S/s Saharanpur (PG) Saharanpur and 400 kV S/s Baghpat Baghpat Sub (PG). During tes 04.11.2024, was found functioning	agenda by UPSLDC) both Substations of 400 kV S/s Saharanpur (PG) and 400 kV S/s Baghpat (PG). Baghpat Substat During testing 04.11.2024, the was found to functioning satisfactorily at locations modification

	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	Not Recevied			
4	THDC	Recevied (Tehri)			
5	SJVN	Recevied (NJHPS, RHPS)			
6	NHPC	Recevied			
7	NPCIL	Recevied (RAP-5&6, RAP-3&4			
8	Delhi SLDC	Not Recevied			
9	Haryana SLDC	Not Recevied			
10	Rajasthan SLDC	Not Recevied			
11	Uttar Pradesh SLDC	Received (WUPPTCL)			
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 Receiied			
24	RRVUNL	Recevied			
25	UPRVUNL	Recevied (DTPS Anpara, Parichha)			
26	UJVNL	Recevied (Dharshu, Tiloth, Khodri, Chibro, Vyasi)			
27	HPPCL	Not Receiied			
28	PSPCL	Recevied (RSD, GHTP, GATP			
29	HPSEBL	Not Recevied			
30	Prayagraj Power Generation Co. Ltd.	Recevied			
31	Aravali Power Company Pvt. Ltd	Recevied			
32	Apraava Energy Private Limited	Receied			
33	Talwandi Sabo Power Ltd.	Received			
34	Nabha Power Limited	Not Received			
35	MEIL Anpara Energy Ltd	Not Received			
36	Rosa Power Supply Company Ltd	Received			
37	Lalitpur Power Generation Company Ltd	Received			
38	MEJA Urja Nigam Ltd.	Not Recevied			
39	Adani Power Rajasthan Limited	Received			
40	JSW Energy Ltd. (KWHEP)	Not Received			
41	AESL	Received (ATIL, ATSCL, BKTL, FBTL, GTL, HPTSL, MTSCL, OCBTL)			
42	Tata Power Renewable Energy Ltd.	Received (TPGEL, TPREL, Tata Power Sourya)			
43	UT of J&K	Not Received			
44	UT of Ladakh	Not Received			
45	UT of Chandigarh				
		Not Recevied			
46	INDIGRID	Recevied			
47	POWERLINK	Not Receied			
48	ADHPL	Recevied			
49	Sekura Energy Limited	Not Recevied			

#### Reasons 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

<u>Reason for unwanted operation</u> – 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 (may update current status)

#### Corrective action taken- Not received from utility.

#### 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

**<u>Reason for unwanted operation</u>** – Tripping due to DC Earth Fault.

Corrective action taken- Not received from utility.

#### 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

**<u>Reason for failure to operate</u>** – DT received at Banda end but Circuit Breaker did not trip.

<u>Corrective action taken</u>- 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

<u>Reason for failure of line to operate</u> – 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 - - Not received from utility.

Corrective action taken- Not received from utility.

#### **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 (may apprise the current status).

#### **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.

<u>Corrective action taken-</u> 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.

#### <mark>SJVN</mark>

**Case-1 Tripping of 68.67 MW generating unit no. 1 of Rampur HPS on 13.10.2024.** Number of unwanted operations = 1

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

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

#### <u>RRVPN</u>

# 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

<u>Corrective Action taken</u> – 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

**<u>Reason of unwanted operation</u>** – 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

**<u>Reason of unwanted operation</u>** – Bus bar isolator status issue in Bus bar protection scheme.

**<u>Corrective Action taken</u>** – 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

**<u>Reason of unwanted operation</u>** – 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

**<u>Reason of unwanted operation</u>** – 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

**<u>Reason of unwanted operation</u>** – Mal-operation of REF relay MIT161.

**Corrective Action taken** – REF relay shall be replaced at the earliest. (may apprise the current status).

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 <u>Reason of unwanted operation</u> – Mal-operation of REF relay.

**<u>Corrective Action taken</u>** – 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 <u>Reason of unwanted operation</u> – 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

**<u>Reason for unwanted operation-</u>** PRV operated due to DC leakage. **<u>Corrective Action taken-</u>** 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- Not received from utility.

#### **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

<u>Reason for unwanted operation</u>-Tripping due to PLCC maloperation at PSTCL end. <u>Corrective Action taken</u>-Not received from utility. (PSTCL may apprise)

#### POWERGRID NR-2 due to Others

Case-1 Tripping of 220KV WAGOORA-PAMPORE-II No. of unwanted operation – 1 <u>Reason for unwanted operation due to other end</u>- Line tripped on operation of distance protection in Z2 caused by 220KV Bus 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.

**<u>Corrective Action taken-</u>** 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) is owned and maintained by BBMB.

<u>Corrective Action taken- Not received from utility.</u> (BBMB may apprise)

Case-3 Tripping of 400KV BHIWANI (BBMB) - RAJPURA (PSTCL) LILO PORTION No. of unwanted operation – 1

<u>Reason for unwanted operation at other end-</u>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.

<u>Corrective Action taken-</u>Not received from utility. (BBMB may apprise)

0.11		Protection Audit Plan for FY 202	-
<b>S. No.</b> 1	NRPC Member PGCIL	Category Central Government owned	Status Received
		Transmission Company	Kecelveu
2	NTPC		Received
3	BBMB	1	Received
4	THDC		Received
5	SJVN	Central Generating Company	Received (Rampur)
6	NHPC	-	Received
7	NPCIL	-	
8	Delhi SLDC		
9	Haryana SLDC	-	
10	Rajasthan SLDC	-	
11	Uttar Pradesh SLDC	SLDC	Vishnuprayag, WUPPTCL
12	Uttarakhand SLDC		
13	Punjab SLDC		
14	Himachal Pradesh SLDC		
15	DTL		Received
16	HVPNL		Received
17	RRVPNL	-	Received
18	UPPTCL	1	Received for Jhansi, Lucknow,
-		State Transmission Utility	Meerut, Gorakhpur, Prayagraj,
			Agra zone)
19	PTCUL	1	Received
20	PSTCL	1	Received
21	HPPTCL	7	Received
22	IPGCL		Received (PPCL-I,III)
23	HPGCL	1	
24	RRVUNL	7	Received
25	UPRVUNL		Received (obra -B, Anpara-B
		State Generating Company	switch yard, Harduganj-C,D,E))
26	UJVNL		Received (Khodri, Chibro,
			Vyasi, Dharasu , Tiloth)
27	HPPCL		
28	PSPCL	State Generating Company & State	Received (Ranjet sagar dam,
		owned Distribution Company	GHTP, GGSSTP, GATP)
29	HPSEBL	Distribution company having	
		Transmission connectivity ownership	
30	Prayagraj Power Generation Co. Ltd.		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	IPP having more than 1000 MW	Received
36	Rosa Power Supply Company Ltd	installed capacity	Received
37	Lalitpur Power Generation Company	-	Received
57	Ltd		
38	MEJA Urja Nigam Ltd.	4	
30	Adani Power Rajasthan Limited	-	Received
40	JSW Energy Ltd. (KWHEP)	4	Received
40	AESL		Received (ATIL -400kV
, T			Mohindergarh S/s, OBTL,
		Other transmission licensee	FBTL, MTSCL, ATSCL,
			HPTSL, BKTL, GTL)
42	Tata Power Renewable Energy Ltd.	1	Recevied (TPGEL, BTPSL)
42	UT of J&K	1	
43	UT of Ladakh	UT of Northern Region	
45	UT of Chandigarh		
46	INDIGRID	1	Received
40	ADHPL	1	Received
48	Sekura Energy Limited	1	
10	estata Enorgy Elinitoa	1	1

S. No.	NRPC Member	Category	Protection Audit Plan Status	Schedule submitted as per utililty	Present Status Comipleted (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	Completed (yeario)
2	NTPC		Received (Tanda)	By 17.07.2025	
3	BBMB				
4	THDC		Received	March 2026-Tehri, F.Y. 2025-26- Koteshwar	
5	SJVN	Central Generating Company	Received	Nov-Dec 2025 for RHPS, Nov 24- March 25 for NJHPS	
6	NHPC		Received	FY-2025-26	
7	NPCIL				
	Delhi SLDC				
	Haryana SLDC				
	Rajasthan SLDC				
	Uttar Pradesh SLDC		Received (Tanda, Tanda Extension)	17.07.2025	
	Uttarakhand SLDC				
	Punjab SLDC				
	Himachal Pradesh SLDC				
	DTL	-			
	HVPNL	-			
	RRVPNL	State Transmission Litility			
	UPPTCL	State Transmission Utility	Descived	Div Jan 2005	
19	PTCUL PSTCL	4	Received	By Jan 2025	
	HPPTCL	4			
	IPGCL				
	HPGCL	-			
	RRVUNL	-			
	UPRVUNL	State Generating Company	Received (Obra-B)	2026-27	
	UJVNL	-		2020 21	
	HPPCL	-			
	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.		Received	Dec-24	
	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	IPP having more than 1000 MW	Received	Dec-24	
36	Rosa Power Supply Company Ltd	installed capacity	Conducted	By 30.09.2024	
37	Lalitpur Power Generation Company Ltd		Conducted	26.03.2024	
	MEJA Urja Nigam Ltd.	1			
39	Adani Power Rajasthan Limited	]	Received (Kawai)	September, 2024	May update current status
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	
42	Tata Power Renewable Energy Ltd.	IPP having less than 1000 MW installed capacity (alphabetical rotaional basis)	Received (GTL)	GTL- Q3 & Q4, FY 2026-27	
43	UT of J&K				
	UT of Ladakh	UT of Northern Region			
	UT of Chandigarh				
	INDIGRID		Received (NRSS 29)	FY 24-25	
47	ADHPL		Received	30.09.2024	May update current status
	Sekura Energy Limited	1			

\* Revised Schedule

		Protection Audit Plan for FY 202	5 -26
S. No.		Category	Status
1	PGCIL	Central Government owned	
		Transmission Company	
2	NTPC		
3	BBMB		
4	THDC	Central Generating Company	
5	SJVN	Central Generating Company	Received (NJHPS)
6	NHPC		
7	NPCIL		
8	Delhi SLDC		
9	Haryana SLDC		
10	Rajasthan SLDC		
11	Uttar Pradesh SLDC		Received (Jaypee
		SLDC	Vishnuprayag,
12	Uttarakhand SLDC		
13	Punjab SLDC		
14	Himachal Pradesh SLDC	1	
15	DTL		
16	HVPNL	1	
17	RRVPNL	1	
18	UPPTCL	State Transmission Utility	Received (All zones)
19	PTCUL		
20	PSTCL	-	
20	HPPTCL	-	Received
22	IPGCL		Received (CCGT-III)
22	HPGCL	-	
23	RRVUNL	-	
24	UPRVUNL	State Generating Company	
25	UJVNL	-	Received (Dhoreeby, Tileth)
		-	Received (Dharashu, Tiloth)
27	HPPCL PSPCL	State Concreting Company & State	Dessived (CLITD, COSSTD
28	PSPCL	State Generating Company & State	Received (GHTP, GGSSTP,
20	HPSEBL	owned Distribution Company Distribution company having	GATP, RSD)
29	HPSEBL		
		Transmission connectivity ownership	
30	Prayagraj Power Generation Co. Ltd.	_	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	IPP having more than 1000 MW	
36	Rosa Power Supply Company Ltd	installed capacity	
37	Lalitpur Power Generation Company	-	Received
5,	Ltd		
38	MEJA Urja Nigam Ltd.		
39	Adani Power Rajasthan Limited		
40	JSW Energy Ltd. (KWHEP)		
40	AESL	Other transmission licensee	
41	Tata Power Renewable Energy Ltd.		
	UT of J&K		1
43		UT of Northern Region	
44	UT of Ladakh		
45	UT of Chandigarh		
46			
47	ADHPL Solvers Engravel imited		
48	Sekura Energy Limited		

#### Status of Internal Protection Audit Plan for FY 2025 -26

#### PROTECTION AUDIT REPORT (SELF CERTIFICATION)

#### A. **GENERAL INFORMATION:**

1.	Name of Utility:	THDC India Limited
<b>2</b> .	Name & Voltage Level of Substation:	Koteshwar HEP & 400 kV
3.	Date of Commissioning:	<b>Mar</b> ' 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

SI. No.	Checks	220 V DC -1	220 V DC-2	48 V DC -1	48 V DC-2
a.	Measured Voltage				
Ī,	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

(A) and a

#### b. Power House

SI, No.	Checks	220 V DC -1	220 V DC-2	24 V DC -1	24 V DC-2
а.	Measured Voltage			<u> </u>	<u> </u>
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 Ceils Per Bank	106	106	13	13
C.	Availability & Healthiness of Charger	02 nos. of Charger & Functional			

#### 2. Protection Relays:

#### a. Bus Bar Protection:

SI. 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
٧.	DR/ EL	Yes
vi.	Remarks (if any)	

#### b. Line Protection:

#### i. <u>Line-1:</u>

SI. 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)

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		(All above are functional)
ív.	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
۷.	Date of Testing	
vi.	Time Synchronization	Relays are currently being tim synchronized manually.
vii.	DR/ EL	Yes
viii,	Remarks (if any)	Main-1/2 Protection is bein upgraded to differential Protectio from distance protection in co ordination with POWERGRID as pe NRPC recommendations. The tim synchronization issue will b resolved with new relays.

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

SI. No.	Checks	Status
İ.	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)
iv.	Functional (Yes/No)	(All above are functional) Yes
	Zone & Time Settings (Z-1/2/3/4)	Yes (As per settings provided by

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		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
ν.	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:

SI. No.	Checks	Status
i.	Buchholz/ PRV trip	Yes
íl.	OTI/ WTI trip	Yes
iii.	Differential Protection	······
	Make and Model	SIEMENS SIPROTEC 7UT612 (Functional)
	2 <sup>nd</sup> Harmonic Block	Yes
<b>.</b>	Event Logger/ DR	Yes
iv.	Restricted Earth Fault Protection	
	Make and Model	SIEMENS SIPROTEC 7SJ8032 (Functional)
	Event Logger/ DR	Yes
٧.	Back up Over Current Protection	

(Pai volg

	Make and Model	SIEMENS SIPROTEC 7SD610
	Event Logger/ DR	(Functional) Yes
vi.	Local Breaker Back up	
	Make and Model	AREVA (MICOM P123)
	Current/ Time Setting	(Functional) 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
X.	Remarks (if any)	Unit # 4- 03.11.24 to 23.11.24

# d. Generator Protection:

	Checks	Status
i.	Generator Protection	
	Make and Model	SIEMENS SIPROTEC 7UM622
	Event Logger/ DR	(Functional) Yes
ii.	Excitation Transformer	
	Make and Model	SIEMENS SIPROTEC 7SJ610
	Event Logger/ DR	<u>(Functional)</u> Yes
ifi.	UAT Protection	
	Make and Model	SIEMENS SIPROTEC 7SJ610
	Event Logger/ DR	(Functional) Yes
iv.	SST Protection	
	Make and Model	SIEMENS SIPROTEC 7UT610
-	Event Logger/ DR	(Functional) 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
viii.	Remarks (if any)	Unit # 4- 03.11.24 to 23.11.24

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## e. Reactor Protection:

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

# 3. CIRCUIT BREAKER TESTING:

SI. 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. <u>DG SET :</u>

	Si. No.	Detail/ rating Status
	1.	DG-1/ 1010 kVA Functional
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2.	DG-2/ 1010 kVA	Functional

#### 5. TESTING OF PROTECTION RELAYS:

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SI. 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

DGM (O&M)

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), तिलोय वियुत गृह, उत्तरकाशी-249193 (उत्तराखण्ड), दूरमाय - (01374) 222250, फिस - (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: <u>seo-nrpc@nic.in</u>, <u>nrltcso2@grid-india.in</u>, 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  $\mathfrak{A}$ 

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

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

पंजीकृत कार्यालयः "उज्जवल" महारानी बाग, जी.एम.एस.रोड़, देहरादून-248006 (उत्तराखण्ड) दूरभाष-0135-2763808 फैक्स 0135-2763508 Regd. Office: "Ujjwal" Maharani Bagh, G.M.S. Road, Dehradun-248006 (Uttarakhand) Phone - 0135-2763808 Fax - 0135-2763508 Website: <u>www.ujvnl.com</u>

## 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 Subs	tation : 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)	: 3
8. Audit Team UJVNL :	16 Proveen Chauvasign EE (Gen) Executive Encline Anton 2 Es Anaat & Gausen Andri Kiens 3 Ex Despak Kumas 4 AE (test) 1 2

# B) Capacitive Voltage Transformer (CVT)

ĕ	Location of CVT		220kV Feeder No. 82 (Line -02)	32 (Line -02)	
a. (	a. CVT ratio :		(220000/v3)/(110/v3)	V3)	
р. I	b. Date of last Testing		29.11.2020		
с. Г	c. Date of comissioning:		19.12.2020		
d. 5	d. Serial no.		2CV4840	2CV4841	2CV4842
e e	e. Serviceble/Non-serviceble				
		Phase Core	Core i	Core ii	Core iii
	Ratio Adopted		2000.00	2000.00	2000.00
	Ratio Measured	æ	2000.80	2000.80	2000.80
	Error Calculated		-0.04%	-0.04%	-0.04%
	Ratio Adopted		2000.00	2000.00	2000.00
:=	Ratio Measured	7	2000.80	2000.80	2000.80
	Error Calculated		-0.04%	-0.04%	-0.04%
	Ratio Adopted		2000.00	2000.00	2000.00
≣	<b>Ratio Measured</b>	в	2000.80	2000.80	2000.80
	Error Calculated		-0.04%	-0.04%	-0.04%

	Locatio	a. CVT ratio	b. Date	c. Date	d. Serial no.	e. Serv			ļ			:=				
Error Calculated	Location of CVT	ratio :	b. Date of last Testing	c. Date of comissioning:	d no.	e. Serviceble/Non-serviceble		Ratio Adopted	<b>Ratio Measured</b>	Error Calculated	Ratio Adopted	Ratio Measured	Error Calculated	Ratio Adopted	<b>Ratio Measured</b>	
							Phase Core i		æ			≻			8	
-0.04%	Unit- 01	(220000/v3)/(110/v3)	20.02.2020	14.04.2020	2CV4838		Core i	2000.00	1998.40	+0.08%	2000.00	1998.40	+0.08%	2000.00	1997.60	/0C1 0T
-0.04%		3)			2CV4834		Core ii	2000.00	1998.40	+0.08%	2000.00	1999.20	+0.04%	2000.00	1997.60	70 1 207
-0.04%					2CV4847		Core iii	2000.00	2003.20	-0.16%	2000.00	2004.00	-0.20%	2000.00	2002.40	-0.17%

Prent:

			a-0								_
ne -02)	2CV4845	Core iii	2000.00	2000.80	-0.04%	2000.00	2000.80	-0.04%	2000.00	2000.80	-0.04%
220kV Feeder No. 84 (Line -02) (220000/v3)/(110/v3) 15.01.2020	2CV4844	Core ii	2000.00	2000.80	-0.04%	2000.00	2000.80	-0.04%	2000.00	2000.80	-0.04%
220kV Feeder No. 84 ( (220000/v3)/(110/v3) 15.01.2020	2CV4836	Core ì	2000.00	2000.80	-0.04%	2000.00	2000.80	-0.04%	2000.00	2000.80	-0.04%
	<u>.</u>	Phase		٣			≻			8	
Location of CVT a. CVT ratio : b. Date of last Testing	d. Serial no.	e. Serviceble/Non-serviceble	Ratio Adopted	Ratio Measured	Error Calculated	Ratio Adopted	<b>Ratio Measured</b>	Error Calculated	Ratio Adopted	<b>Ratio Measured</b>	Error Calculated
b. D. C. b. D. C.	- Gr	۵ ۵		·			:=			≣	

	3)			2CV4837		Core iii	0 2000.00	0 2014.00
	3)/(110/V3			2CV4839		Core ii	2000.00	2006.00
Unit-02	(220000/v3)/(110/v3)	25.04.2022	05.09.2022	2CV4843		Phase Core i	2000.00	2018-00
					le	Phase		~
Location of CVT	a. CVT ratio :	b. Date of last Testing	c. Date of comissioning:	d. Serial no.	e. Serviceble/Non-serviceble		Ratio Adopted	Ratio Measured
ö	a. C	р. П	С 3	d. S	e. S	1		

		Phase Core i	Core i	Core ii	Core iii
	Ratio Adopted		2000.00	2000.00	2000.00
	Ratio Measured	æ	2018.00	2006.00	2014.00
	Error Calculated		-0.89%	-0.30%	-0.70%
	Ratio Adopted		2000.00	2000.00	2000.00
ŧ.	<b>Ratio Measured</b>	~	2000.00	2006.00	2014.00
	Error Calculated		00.00%	-0.30%	-0.70%
	Ratio Adopted		2000.00	2000.00	2000.00
1	Ratio Measured	۵	2000.00	1994.00	2002.00
	Error Calculated		00.00%	+0.30%	-0.09%
				C	V
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# B) Capacitive Voltage Transformer (CVT)

	///3)			2CV4850 2CV4851		Core ii Core iii	0.00 2000.00 2000.00	2000.80 2000.80	-0.04% -0.04%	0.00 2000.00 2000.00	2000.80 2000.80	-0.04% -0.04%	2000.00 2000.00	2000.80 2000.80	-0.04% -0.04%
Unit-03	(220000/v3)/(110/v3)	19.03.2021	03.07.2021	2CV4848		Core i	2000.00	2000.80	-0.04%	2000.00	2000.80	-0.04%	2000.00	2000.80	-0.04%
						Phase Core i		۲			7			8	
Location of CVT	a. CVT ratio :	b. Date of last Testing	c. Date of comissioning:	d. Serial no.	e. Serviceble/Non-serviceble		Ratio Adopted	Ratio Measured	Error Calculated	Ratio Adopted	Ratio Measured	Error Calculated	Ratio Adopted	Ratio Measured	Error Calculated
- ö	a. C	р. С	c. D	d. S	e. S			•			:=			≣	

F		E
2	••	1
Location of CVT	a. CT ratio	

b. Date of last Testing
c. Date of comissioning:
d. Serial no.
e. Serviceble/Non-serviceble

OCVT 8182/1/3/19 OCVT 8182/1/1/19 220kV BUS-B CV I (220000/V3)/(110/V3) 15.02.2020 16.02.2020 0CVT 8182/1/2/19 0

		Phase Core	Core i	Core ii	Core iii	_
	Ratio Adopted		2000.00	2000.00	2000.00	_
-	Ratio Measured	۲	2018.00	2006.00	2014.00	
	Error Calculated		-0.89%	-0.30%	-0.70%	_
	Ratio Adopted		2000.00	2000.00	2000.00	_
:=	Ratio Measured	7	1998.40	1999.20	2004.00	_
	Error Calculated		+0.08%	+0.04%	-0.20%	-
	Ratio Adopted		2000.00	2000.00	2000.00	_
≣	Ratio Measured	æ	2000.80	2000.80	2000.80	_
	Error Calculated		-0.04%	-0.04%	-0.04%	_

Onen!

20.05.2023           2CV4846           2CV4846           2000.00           R         2000.00           R         2001.40           -0.07%         -0.03%           B         1993.82           A         2000.00           β         -0.23%           -0.13%         -0.31%	L L L L L L L L L	Location of CVT a. CVT ratio : b. Date of last Testing		220kV BUS-A CVT (220000/V3)/(110/V3) 24.03.2023	4 CVT /(110/V3)	
Phase Core i Cor	j j	zare or comissioning: Serial no.		28.03.2023 2CV4846	S- 46867	S- 46866
Ratio AdoptedPhaseCore iC.Ratio Adopted2000.00Ratio MeasuredRError Calculated-0.07%Ratio Adopted2000.00Ratio Adopted2000.00Ratio MeasuredYError Calculated-0.23%Ratio Adopted-0.23%Ratio Adopted-0.33%Error Calculated-0.33%Ratio MeasuredBIgg3.82Error Calculated-0.31%	e S	serviceble/Non-serviceb	ole			
Ratio Adopted2000.00Ratio MeasuredR2001.40Error Calculated-0.07%-0.07%Ratio AdoptedY2000.00Ratio MeasuredY2004.60Error Calculated-0.23%-0.23%Ratio AdoptedB1993.82Error CalculatedB1993.82Error CalculatedR-0.31%			Phase	Core i	Core ii	Core iii
Ratio MeasuredR2001.40Error Calculated-0.07%Ratio Adopted2000.00Ratio MeasuredYError Calculated-0.23%Ratio Adopted-0.23%Ratio Adopted1993.82Ratio MeasuredBRatio Measured1993.82Error Calculated+0.31%		Ratio Adopted		2000.00	2000.00	2000.00
Error Calculated-0.07%Ratio Adopted2000.00Ratio MeasuredYError Calculated-0.23%Ratio Adopted-0.23%Ratio MeasuredBIgg3.82Error Calculated-0.31%	•	Ratio Measured	œ	2001.40	1997.20	2002.00
Ratio Adopted2000.00Ratio MeasuredY2004.60Error Calculated-0.23%Ratio Adopted2000.00Ratio MeasuredB1993.82Error Calculated+0.31%		Error Calculated		-0.07%	+0.14%	-0.1%
Ratio MeasuredY2004.60Error Calculated-0.23%Ratio Adopted2000.00Ratio MeasuredBError Calculated+0.31%		Ratio Adopted		2000.00	2000.00	
Error Calculated-0.23%Ratio Adopted2000.00Ratio MeasuredBError Calculated+0.31%	:=	Ratio Measured	۲	2004.60	2001.00	
Ratio Adopted2000.00Ratio MeasuredB1993.82Error Calculated+0.31%		Error Calculated		-0.23%	-0.05%	
Ratio Measured B 1993.82 Error Calculated +0.31%		Ratio Adopted		2000.00	2000.00	
+0.31%	≣	Ratio Measured	۵	1993.82	1995.21	
		Error Calculated		+0.31%	+0.24%	

Ъ,	a. CT ratio : b. Date of last Testing					
ц С	c. Date of comissioning:					
d. S	d. Serial no.					
e. S	e. Serviceble/Non-serviceble	le				i î
		Phase	Core i	Core ii	Core iii	
	Ratio Adopted				Å	
•	Ratio Measured	æ				
	Error Calculated					_
	Ratio Adopted					
:=	Ratio Measured	~				
	Error Calculated					_
	Ratio Adopted					
≣	Ratio Measured	æ				_
	Error Calculated					
	Steepel amend			B		
	ACC	Altery	Executiv	Executive Engineer (Gen.) Tiloth Power House	en.)	

# **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

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Line
3)

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

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Mechanical protection tripping and Annunciation healthiness.

Generating Transformer 38.5MVA:

-3

SI. No.	MECHANICAL	SETTI	NGS		Tr. R2	
	PROTECTION	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

SI. No.	MECHANICAL	SETTI	NGS		Tr. R2	
	PROTECTION	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

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AE (Test) (EEG), TPM

#### Mechanical protection tripping and Annunciation healthiness.

#### Distribution Transformer 25MVA-02

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SI. No.	MECHANICAL	SETT	NGS	Tr. R2				
	PROTECTION	Alarm	Trip	Alarm	Тгір	Healthiness		
1.	ΟΤΙ	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		
	Onent Action)	*	ieep@ema	L IE (Test)		EE(GI), TPM		

#### **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)

TPH

SCADA pc must be updated to latest version of windows.

	Bus bar relay (220kV	7)	
	Main	Backup	
Make and Model of Bus Bar relay	REB 650	REB 670	
) Whether stability checks done or not			
i) Date of last Testing	5/1/2023	5/1/2023	
y) Date of comissioning	5/1/2023	5/1/2023	
) Serial no.	11820092	11820091	
i) Serviceble/Non-serviceble	Serviceble	Serviceble	

					Subs	tation Protec	tion and Mon	itoring Equip	oments					
SI. 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 comissioning	Serviceble/ Non- serviceble
i)	765													
ii)	400													
iii)	220													
iv)	132										12			
						14					0	/		

AELEM)

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Executive Engineer (Gen.) Tiloth Power House Uttarkashi

Tiloth Power House Uttarkashi	Executive Segineer (Gen.)
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	_	Transmission	Line Protection	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 [1820042	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 -1 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 -JI Make- ABB Make- ABB	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 Sichon	
Date of comissioning	5/6/2023	5/6/2023	5/6/2023	
Serviceble/ Non-serviceble	Serviceble	Serviceble	Serviceble	
PK (Make & Model) Functional (Yes/No)	Yes	Yes	Yes	
Time Synch.Unit (Make & Model)	Make- Masibus Modle- MC-1(GPS)			
Time Synch.Unit (serial no.) Functional (Yes/No)	Serial No 19092245 Yes			
Date of last Testing	10/6/2022			
Serviceble/ Non-serviceble	Serviceble	Serviceble		
		DAG	AL' Example L' Examinant Genil	

			Trar	sformer Prote	ection		
SL. NO.	1		3	4	5	6	
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
Differential Proection (Make & Model)	Make- ANDRITZ Modle- HIPASE -P (870A-DIFF4SYS3PH)	Make- ANDRITZ Modle- HIPASE -P (870A-DIFF4SYS3PH)	Make- ANDRITZ Modle- HIPASE -P (870A-DIFF4SYS3PH)	Make- ANDRITZ Modle- HIPASE -P (87T-DIFF4SYS3PH)	Make- ANDRITZ Modle- HIPASE -P (87T-DIFF4SYS3PH)	Make- ABB Modle- REF615	Make- ABB REF615
no.)	Serial No Main Relay - GGP002- 01711B040 Backup Relay- GGP002- 01711B038		Serial No Main Relay - GGP002- 01711B03 Backup Relay- GGP002- 01711B	Main Relay - GGP002- 01711B043 Backup Relay-	Serial No Main Relay - GGP002- 02807B001 Backup Relay- GGP002- 01711B041	Serial No IVYV91276219	Serial No 1
Functional (Yes/No)	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/
Date of comissioning	4/14/2020	9/5/2022	7/3/2022	9/14/2022	12/7/2022	9/26/2022	9/
Serviceble/ Non-serviceble	Serviceble	Serviceble	Serviceble	Serviceble	Serviceble	Serviceble	Se
REF Protection (Make & Model)	Make- ABB Modle- REF615	Make- ABB Modle- REF615	Make- ABB Modle- REF615	Make- ANDRITZ Modle- HIPASE -P		Make- ABB Modle- REF615	Make- ABB REF615
REF Protection (Serial no.)	Serial No Main Relay - IVYV91276212 Backup Relay- 1VYV91276220	Serial No Main Relay - IVYV91276081 Backup Relay- IVYV91276211	Serial No Main Relay - 1VYV91276213 Backup Relay- 1VYV91276080	01711B043 Backup Relay-	Serial No Main Relay - GGP002- 02807B001 Backup Relay- GGP002- 01711B041	Serial No 1VYV91276219	Serial No 1
Functional (Yes/No)	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	
Date of comissioning	4/14/2020	9/5/2022	7/3/2022	9/14/2022	12/7/2022	9/26/2022	
Serviceble/ Non-serviceble	Serviceble	Serviceble	Serviceble	Serviceble	Serviceble	Serviceble	S
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 REF615
Back-Up Overcurrent Protection (Serial no.)	Serial No Main Relay - 1VYV91276212 Backup Relay- 1VYV91276220	Serial No Main Relay - IVYV91276081 Backup Relay- IVYV91276211	Serial No Main Relay - IVYV91276213 Backup Relay- IVYV91276080	017118043	Serial No Main Relay - GGP002- 02807B001 Backup Relay- GGP002- 01711B041	Serial No 1VYV91276219	Serial No 1
Functional (Yes/No)	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	
Date of comissioning	4/14/2020	9/5/2022	7/3/2022	9/14/2022	12/7/2022	9/26/2022	
Serviceble/ Non-serviceble	Serviceble	Serviceble	Serviceble	Serviceble	Serviceble	Serviceble	S
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 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 - IVYV91276213 Backup Relay- 1VYV91276080		Serial No Main Relay - GGP002- 02807B001 Backup Relay- GGP002- 01711B041	Serial No 1VYV91276219	Serial No 1
Functional (Yes/No)	Yes	Yes	Yes	Yes	Yes	Yes	
			Chen	VELEM)		Steepe Cem	AE (Test)

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T (3.15 MVA) No.2	
- ABB Modle-	
515	
I No 1VYV91276216	
INO IVIV912/0210	
_	
Yes	
9/26/2022	
9/26/2022	
Serviceble	
- ABB Modle-	
515	
l No 1VYV91276216	
Yes	
9/26/2022 9/26/2022	
Serviceble	
- ABB Modle-	
515	
l No 1VYV91276216	
Yes	
9/26/2022 9/26/2022	
9/20/2022	
Serviceble	
- ABB Modle-	
515	
I No 1VYV91276216	
	0
Yes	the
Exceed	the Regineer (Gen.)
	i Mamerico schi



Date of Testing	4/14/2020	9/5/2022	7/3/2021	9/14/2022	12/7/2022	9/26/2022	9/26/2022	1
Date of comissioning	4/14/2020	9/5/2022	7/3/2022	9/14/2022	12/7/2022	9/26/2022	9/26/2022	3
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	1 2 2 4 8 T
Other Protection					-			
LA Rating HV Side	66kV*3	66kV*3	66kV*3	66kV*3	66kV*3	36 KV	36 KV	1 A A
LA Rating LV side	12kV	l2kV	12kV	36 KV	36 KV	9kV	9kV	
SL. NO.			2	3	4	5	6	7
ICT/GT/ST		GT-01	GT-02	GT-03	ST-01	ST-02	ST-03	ST-04
Vector Grou		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%
	HV	230	230	230	220	220	33	33
Rated Voltage (kV)	IV				-			
	LV	11	11	11	33	33	. 11	11
	HV	38.5	38.5	38.5	25	25	3.15	3.15
MVA Capacity	IV	5				5.1 Y		
(Maximum Rating)	LV	38.5	38.5	38.5	25	25	3.15	3.15
	HV	400/200/1	400/200/1	400/200/1	400/200/1-1-1-1-1-1	400/200/1-1-1-1-1-1	200/100/1-1	200/100/1-1
CT Ratio	IV					-		2
	LV	0			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 Posi	tions	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
voltage at (m % of rated voltage)	Maximum tap	241.50	241.50	241.50	253	253	12.65	12.65
Nominal Ta Position	p	3	3	- 3	5	9b	. 1	a 1 a 4
	Lead Resistance							
REF Protection	RCT (Ohms)	< 2 ohm	< 2 ohm	<2 ohm	< 2 ohm	< 2 ohm	< 2 ohm	< 2 ohm
Stabilizing Resistance for REF (Ohn	ns)	1	21006-					



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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			
¢	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		

			1			Circuit Dieakei							
		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	0	pening	g Time	(ms)	Serviceble/ Non-serviceble
<b>)</b> [	765 kV System												
1	765 kv Bay 1												
2	765 kv Bay 2												
3	765 kv Bay 3								2				
4	765 kv Bay 4												
5	765 kv Bay 5												
6	765 kv Bay 6												
) 4	100 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												
1	220 kV System	1											
	220 kv Bay 1 Unit-01	ABB make and LTB245E1	17500563	Available	02 trip/01 close coil		06 11 2022	2000	T1	16.8	16.2	16.2	Serviceable
<b>ٔ</b> ا			11,200202	Available	oz trip/ of close con	Not Available	06.11.2023	2009	T2	17.4	16.6	16.6	Serviceable
1										16.2	16.2	16.2	Serviceable
2 2	220 kv Bay 2 Unit-02	ABB make and LTB245E1	17500562	Available	02 trip/ 01 close coil	Not Available	07.11.2023	2009		16.4		15.6	
+													Serviceable
;   2	220 kv Bay 3 Unit-03	ABB make and LTB245E1	17500561	Available	02 trip/ 01 close coil	Not Available	08.11.2023	2009	_	16.4	16.4	16.2	Serviceable
+			-							16.4	16	16.2	Serviceable
2	20 kv Bay 4 Line-01	ABB make and LTB245E1	17500566	Available	02 trip/ 01 close coil	Not Available	01.05.2023	2009		16.9	16.2	16.7	Serviceable
									Τ2	17	16.5	16.9	Serviceable
	220 kv Bay 5 Line-02	ABB make and LTB245E5	17500565	Available	02 trip/01 close coil	Not Available	30.04.2024	2009	<b>T</b> 1	16.8	16.4	16.3	Serviceable
		7.00 make and 21024323	17500505	Available	oz cipy oz ciose con	NOL AVAIIADIE	30.04.2024	2009	T2	16.7	16.5	16.1	Serviceable
	220 kv Bay 6 -B/C	APP make and LTP34551	17500564	Augilahla	02 min ( 01 alass soil	Mark Assettable	00.04.0000		T1	16	16.5	16.5	Serviceable
1	20 KV Day 0-D/C	ABB make and LTB245E1	17500564	Available	02 trip/ 01 close coil	Not Available	22.06.2022	2009	_	16	16	16	Serviceable
										16	16.5		
1	20 kv Bay 7- 25MVA-01	ABB make and LTB245E1	17500567	Available	02 trip/ 01 close coil	Not Available	23.06.2022	2009	<u> </u>	16.5		16	Serviceable
+										16.2			Serviceable
3 2	20 kv Bay 8- 25MVA-02	Alstom make and GL314	150033	Available	02 trip/ 01 close coil	Not Available	25.03.2023	2006		16.6	16.4	16.6 16.6	Serviceable
1	32 kV System								12	10.0	10.0	10.0	Serviceable
1	132 kv Bay 1											<u> </u>	
2	132 ky Bay 2							· · · · · · · · · · · · · · · · · · ·			<u> </u>		
3	132 kv Bay 3											<u> </u>	
4	132 kv Bay 4											<u> </u>	
5	132 kv Bay 5										<u> </u>		
	132 kv Bay 6		in the									<u> </u>	AEt



•	Remarks (if any)
-	
-	
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-	
	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.
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_	
2	Executive Engineer (Gen_) Tiloth Power House Uttarkashi

Xeate
≥393V @ 200/1A & ≥786V @ 400/1A
+0.51%
198.7
400/1
401.67 199.17 199.17 199.17
+0.21% +0.21%
+
400/1 200/1
401.67 401.67
Core IV Core V
19-25929
400/1
-0.70% -0.80%
402.8 403.2
+0.10% +0.20%
398.8 399.2
-0.50% -0.50%
ð.
804 804
Core IV Core V
OC 8523/02/05/19
TWO BUS (ONE CHARGED BUS AND ONE STAND-BY BUS)



iv)	iii)	ii) i)	5.Location c a. CT ratio b. Date of la c. Date of cc d. Serial no. e. Servicebl	۷)	iv)	II)	ij	J	A) Current 1.Location o a. CT ratio b. Date of la c. Date of co d. Serial no. e. Servicebl
Knee Point Voltage	Ratio Adopted Ratio Measured Error Calculated	Ratio Adopted Ratio Measured Error Calculated Ratio Adopted Ratio Measured Error Calculated	5.Location of CT : a. CT ratio : b. Date of last Testing c. Date of comissioning: d. Serial no. e. Serviceble/Non-serviceble	Knee Point Voltage	Ratio Adopted Ratio Adopted Error Calculated	Ratio Adopted Ratio Adopted Error Calculated	Ratio Adopted Ratio Measured Error Calculated	Ratio Adopted Ratio Measured Error Calculated	A) Current Transformer(CT) 1.Location of CT : a. CT ratio : b. Date of last Testing c. Date of comissioning: d. Serial no. e. Serviceble/Non-serviceble
Vk in Volt	ω	Y R	rviceble	Vk in Volt Ne	z	æ	~	₽	ing:
olt			2 0	Phase 2/ Neutra			+++++++++++++++++++++++++++++++++++++++	+ + + + + + + + - + + - + + - + + + + + + + + + + +	
-	100/1 200/1 100.8 200.8 -0.79% -0.39%	Core I 100/1 200/1 100.9 200.3 -0.15% 100/1 200/1 100.3 -0.30% -0.15%	Unit-02 Switchys 2110310	≥393V @ 200/1A & ≥786V @ 400/1A ≥393V @ 200/1A & ≥786V @ 400/1A	200/1 400/1 200 397.37 0.00% +0.65%	200/1 400/1 200 400 0.00% 0.00%	200/1 400/1 205.46 -1.36% 0.00%	Core 1 200/1 400/1 204.41 402.17 -2.20% -0.54%	TF No 03 HV
>200/100V	100/1 200/1 100.7 200.6 -0.69% -0.30%	Core II 100/1 200/1 100.3 200.9 -0.30% -0.45% 100/1 200/1 100.3 200.3 -0.30% -0.15%	Unit-02 Switchyard CT (220kV) 200/100/1-1 28.04.2022 05.09.2022 2110310 2110308	≥393V @ 200/1A & ≥786V @ 400/1A ≥393V @ 200/1A & ≥786V @ 400/1A	200/1 400/1 202.38 397.37 -1.19% +0.65%	200/1 400/1 203.73 401.12 -1.86% -0.56%	200/1 400/1 205.19 402.03 -1.29% -0.50%	Core II 200/1 400/1 203.85 400 -1.92% 0.00%	GTF No 03 HV (220kV) Bushing 400/200/1-1-1-1-1-1 14.06.2021 03.07.2021 27203249 27
		the sector of th	2110307	≥393V @ 200/1A & ≥786V @ 400/1A	200/1 400/1 200 397.37 	200/1 400/1 202.85 400 -1.42% 0.00%	200/1 400/1 205.46 402.03 -1.36% -0.50%	Core III 200/1 400/1 204.98 397 -2.49% +0.75%	A
		AE (Test)		≥393V @ 200/1A & ≥786V @ 400/1A	200/1 400/1 200 397.37 -0.00% +0.65%	200/1 400/1 202.56 403.4 -1.28% -0.85%	200/1 400/1 204,92 401.01 -1.23% -0.25%	200/1 200/1 400/1 203.85 404.37 -1.92% -1.09%	- 27203229
						200/1 400/1 198.32 400 +0.84% 0.00%	200/1 400/1 204.66 401.01 -1.16% -0.25%	200/1 400/1 204.41 404.37 -2.20% -1.09%	Corre V
						200/1 400/1 198.32 401.12 +0.84% -0.56%	200/1 400/1 203.6 -0.90% 0.00%	200/1 400/1 204.41 402.17 -2.20% -0.54%	Core VI
		*				200/1 400/1 198.87 401.12 +0.56% -0.56%	200/1 400/1 204.66 402.03 -1.16% -0.50%	200/1 400/1 203.85 402.17 -1.92% -0.54%	

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iv)		iii)			ii)			ij			d. Servicebl	b. Date	9.Location a. CT ratio	iv)			iii)					ij					Ð				d. Serial no. e. Servicebl	c. Date	b. Dat	A) Curren 7.Location
Knee Point Voltage	Error Calculated	Ratio Measured	Ratio Adopted	Error Calculated	Ratio Measured	Ratio Adopted	Error Calculated	Ratio Measured	Ratio Adopted		Serviceble/Non-serviceble	<ul><li>b. Date of last Testing</li><li>c. Date of comissioning:</li></ul>	9.Location of CT a. CT ratio :	Knee Point Voltage	Calculated	Error	Measured	Adopted	Ratio	Calculated	Error	Katio	Adopted	Ratio	Calculated	Firm	Ratio	Adopted	Ratio		Serviceble/Non-serviceble	Date of comissioning:	b. Date of last Testing	A) Current Transformer(CT) 7.Location of CT :
Vk in Volt		в			Y			R			rviceble	ng:		Vk in Volt			œ					γ					R				rviceble	ng:	90	rmer(CT) :
452V	-0.05%	400.2	400/1	-0.02%	400.1	400/1	-0.02%	400.08	400/1	Core I	OC 8523/4/1/19		220kV Bus Coupler CT 400/1	1074V @ 400/1A	-0.99%	-0.50%	404.04	201.01	200/1	-0.19	-0.70%	400.8	400/1	200/1	-0.40%	-0.70%	201.41	400/1	200/1	Core I				220kV/33kV 25
452V	+0.08%	399.67	400/1	-0.03%	400.14	400/1	+0.08%	399.67	400/1	Core II	OC 8523/1/3/19	24.03.2023 28.03.2023	400/1-1-1	1	-0.80%	-0.60%	403.23	201.21	200/1	00.00%	-0.0079	400	400/1	200/1	-0.40%	-0.00%	202.02	400/1	200/1	Core II	OC 8523/6/1/19	22.09.2022	08.08.2022	220kV/33kV 25MVA T/F-01 HV CT
I.	-0.03%	400.14	400/1	-0.05%	400.23	400/1	-0.02%	400.1	400/1	Core III	OC 8523/1/2/19			1	-0.89%	-0.90%	403.63	201.82	200/1	+0.30%	-0.50%	398.8	400/1	200/1	-0.29%	~0 < 0%	201.01	400/1	200/1	Core III	OC 8523/3/6/19			<u>-</u> -
AGIO.	(Pro Orl)							R	X .oX					1	-0.80%	-0.19%	403.23	200.4	200/1	+0.39%	-0.09%	398.41	400/1	200/1	-0.19	-0.00%	201.82	400/1	200/1	Core IV	OC 8523/3/4/19			
	_							D	weepfament (Test)					1074V @ 400/1	-0.99%	-0.50%	404.04	201.01	200/1	+0.10%	-0.60%	399.6	400/1	200/1	-0.49%	-0.70%	201.41	400/1	200/1	Core V				
Tiloth Power House Uttarkashi	Szecutive Enginee	D							A					511V @ 400/1A	-0.59%	-0.60%	402.41	201.21	200/1	+0.20%	-0.70%	399.2	400/1	200/1	-0.59	-0.99%	202.02	400/1	200/1	Core VI				
f ouse	r (Gen.)	Y												511V @ 400/1A	-0.99%	-0.79%	404.04	201.61	200/1	-0.09%	-0.70%	400.4	400/1	200/1	-0.59%	~0.99%	202.02	400/1	200/1	Core VII	1			

1

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

	3	5			(۷)					,	IJ					(II	;					ij			1.7	e. Ser	d. Ser	c. Dat	a, CT ratio	4.Loc	ાં				ii)					ii)						;	
	Voltage	Knee Point	Calculated	Error	Measured	Ratio	Ratio	Calculated	Error	Measured	Ratio	Adopted	Ratio	Calculated	Error	Measured	Ratio	Adopted	Ratio	Calculated	Error	Measured	Adopted	Ratio		e. Serviceble/Non-serviceble	d. Serial no.	<ul> <li>c. Date of comissioning;</li> </ul>	a, CT ratio : h Date of last Testing	4.Location of CT	Voltage	Vana Daint	Calculated	Measured	Ratio	Adopted	Ratio	Calculated	Error	Measured	Adopted	Adopted	Calculated	Error	Measured	Ratio	Ratio
	Volt Neutr al	Phase Vk in			Z	2					₽					Y						R				rviceble	1	16 11. 0.	9	••	Vk in Volt				B					Y					~	,	
	≥393V @ 200/1A & ≥786V @ 400/1A	≥393V @ 200/1A & ≥786V @ 400/1A	+0.51%	+0.51%	397.95	198.97	200/1	0.00%	0.00%	400.08	200.01	400/1	200/1	0.00%	-1.36%	400.09	205.45	400/1	200/1	-0.54%	-2.20%	204.3	200/5	200/1	Core 1					GTF No (	2	@ VACO	+0.10%	7,997	399.6	1/008	400/1	+0.20%	+0.10%	798.4	9 001 1/008	400/1	+0.10%	+0.10%	799.2	399.6	400/1
	≥393V @ 200/1A & ≥786V @ 400/1A	≥393V @ 200/1A & ≥786V @ 400/1A	+0.51%	+0.51%	397.95	198.97	200/1	-0.56%	-1.86%	401.09	203.74	400/1	200/1	-0.50%	-1.029%	402.03	205.15	400/1	200/1	0.00%	-1.92%	400 00	202 8	200/1	Core II		27213238	05.09.2022	21.04.2022	02 HV (220kV) Bushing	924V @ 800/1		+0.10%	7.66/.	399.2	800/1	400/1	+0,10%	+0.10%	799.2	9 001	400/1	+0.10%	+0.10%	799.2	399.6	400/1
(2)		≥393V @ 200/1A & ≥786V @ 400/1A	+0.51%	+0.51%	397.95	198.97	200/1	0.00%	-1.42%	400.91	202.86	400/1	200/1	-0.50%	-1.36%	402.01	205.43	400/1	200/1	+0.75%	-2.49%	204.91	204 01	200/1	Core III		27213246			t i A	ł		+0 10%	/99.2	399.6	800/1	400/1	+0.10%	+0.10%	799.2	9 005	400/1	+0.10%	+0.10%	799.2	399.6	400/1
PARICAN)	al -	≥393V @ 200/1A & ≥786V @ 400/1A	+0.51%	+0.51%	397.95	198.97	200/1	-0.85%	-1.28%	403.3	202.58	400/1	200/1	-0.25%	-1.23%	401	204.93	400/1	200/1	-1.09%	-1.92%	404 27	2001	200/1	Core IV		27213244				-		+0.10%	7,100/	399.6	800/1	400/1	+0.10%	+0.10%	799.2	9 001	400/1 800/1	+0.20%	+0.10%	798.4	399.6	400/1
			I		1		]	0.00%	+0.84%	400.08	198.34	400/1	200/1	-0.25%	-1.16%	401.06	204.65	400/1	200/1	-1.09%	-2.20%	404.4	204.4	200/1	Core V						400/1	@ VIIS	+0.20%	198.4	399.6	800/1	400/1	+0.20%	+0.20%	798.4	1008	400/1	+0.10%	+0.10%	799.2	399.6	400/1
			I	l	1			-0.56%	+0.84%	401.01	198.32	400/1	200/1	0.00%	-0.90%	400.09	203.68	400/1	200/1	-0.54%	-2.20%	204.40	20/1 / 15	200/1	Core VI						400/1	SIIV @	+0.20%	198.4	399.2	800/1	400/1	+0.20%	+0.20%	798.4	2 008	400/1	+0.20%	+0.10%	798.4	399.6	400/1
	Kernelie			-	-			-0.56%	+0.56%	401.16	198.84	400/1	200/1	-0.50%	-1.16%	402.01	204.61	400/1	200/1	-0.54%	-1.92%	403.00	2013 65	200/1	Core VII																						
	Kennedherman A.E. Texto Executive Thore	8 u						5					11.			2																															

tive Engineer (Gen.) oth Power House Uttarkashi

		e. Servic	d. Serial no.	c. Date c	b. Date c	a. CT ratio :	2.Location of CT	4.Wheth	2. Date (	
Patio		eble/Non-	no.	c. Date of comissioning:	b. Date of last Testing	:0	on of CT	er SLD Co	Of First Co	
		e. Serviceble/Non-serviceble		oning:	ling		••	4. Whether SLD Collected or Not ?	2. Date Of First Commissioning	
400/1	Core I						220kV Feede		_	
400/1	Core II		OC 8523/2/4/19	22.02.2020	20.02.2020	800/400/1-1-1-1-1 A	220kV Feeder No. 84 (Line-02)	COLLECTED	1984, RMU CO COMPLETED)	
400/1	Core III		OC 8523/2/4/19 OC 8523/2/6/19 OC 8523/2/1/1			-1 A	Ŭ		1984 , RMU COMPLETED ON 2022 (RMU OF COMPLETED)	
400/1	Core IV		OC 8523/2/1/19							
400/1	Core V								3RD UNIT	
400/1	Core VI									

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6.Location of CT :
a. CT ratio :
b. Date of last Testing
c. Date of comissioning:
d. Serial no. e. Serviceble/Non-serviceble ₿ Ē ÷ J Knee Point Voltage Calculated Ratio Adopted Ratio Measured Ratio Adopted Ratio Measured Error Calculated Error Calculated Ratio Adopted Ratio Measured Error Vk in Volt Unit-03 Switchyard CT (220kV) 200/100/1-1 25.03.2021 03.07.2021 2110306 2110305 Β  $\prec$ R Core I 100/1 200/1 100.18 200.2 +0.18% +0.20% +0.20% +0.30% +0.30% +0.23% +0.46% >200/100V 100.16 200.32 +0.16% +0.32% 100/1 200/1 200.14 200.24 +0.24% +0.24% 100/1 200/1 100.17 200.34 +0.34% Core II 100/1 200/1

2110302

	-0.10%	+0.10%	-	Calculated	-
	-0,10%	+0.10%		Error	
	200.2	199.8	C	Measured	1.11
	100.1	99.9	æ	Ratio	111
	200/1	200/1		Adopted	
	100/1	100/1		Ratio	
	+0.40%	+0.10%		Calculated	1
	-0.10%	+0.10%		Error	
	199.2	199.8		Measured	, n j
	100.1	99.9	<	Ratio	ÿ
	200/1	200/1		Adopted	
	100/1	100/1		Ratio	~
	+0.20%	-0.10%		Calculated	
	+0.10%	+0.10%		Error	
	199.6	200.2	7	Measured	(1
	99.9	99.9	Ð	Ratio	;;
	200/1	200/1		Adopted	
2	100/1	100/1		Ratio	
	Core II	Core I			
	×		rviceble	e. Serviceble/Non-serviceble	e. Serv
2110309	2110303	2110304		al no.	d. Serial no
•	14.04.2020		ing:	c. Date of comissioning:	c. Date
	20.02.2020		010	<ul> <li>b. Date of last Testing</li> </ul>	b. Date
	200/100/1-1			atio :	a. CT ratio
IKV)	Unit-01 Switchyard CT (220kV)	Unit-01 Swi		2.Location of CT	2.Loca

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Knee Point Voltage

Vk in Volt

>200/100V

8.Location a. CT ratio b. Date of la c. Date of o d. Serial no.	<ul> <li>8.Location of CT :</li> <li>a. CT ratio :</li> <li>b. Date of last Testing</li> <li>c. Date of comissioning:</li> <li>d. Serial no.</li> </ul>	. 0; 	220kV/33kV	220kV/33kV 25MVA T/F-02 HV CT 400/200/1-1-1-1-1-1 30.11.2022 09.12.2022 OC 8523/3/2/19 OC 8:	<b>HV CT</b>  -1-1 OC 8523/3/5/19	OC 8523/3/3/19			
e. serv		AIG8016	Core I	Core II	Core III	Core IV	Core V	Core VI	Core VII
	Ratio		200/1	200/1	200/1	200/1	200/1	200/1	200/1
	Adopted		400/1	400/1	400/1	400/1	400/1	400/1	400/1
ע	Ratio	q	200.002	199.735	199.538	198.728	200.036	200.087	200.079
ų	Measured	7	399.945	400.123	399.368	398.604	400.127	400.031	400.127
	Error		-0.0009%	+0.1324%	+0.2308%	+0.636%	-0.0179%	-0.0436%	-0.0395%
	Calculated		+0.0138%	-0.0308%	+0.1581%	+0.349%	-0.0318%	-0.0077%	-0.0318%
	Ratio		200/1	200/1	200/1	200/1	200/1	200/1	200/1
	Adopted		400/1	400/1	400/1	400/1	400/1	400/1	400/1
9	Ratio	<	200	199.77	199.3	198.68	200.04	199.78	200.09
	Measured	I	400.05	399.85	400	398.81	399.84	399.76	400.23
	Error		00.00%	+0,12%	+0.35%	+0.66%	-0.0200%	+0.11%	%50.0-
	Calculated		-0.012%	+0.04%	00.00%	+0.30%	+0.04%	+0.06%	~90.0-
	Ratio		200/1	200/1	200/1	200/1	200/1	200/1	200/1
	Adopted		400/1	400/1	400/1	400/1	400/1	400/1	400/1
ij	Ratio	R	200.04	200.1	199.12	198.77	200.07	200.08	200.1
,,	Measured	ţ	400.02	399.74	399.45	398.84	400.04	400.03	400.01
	Error		-0.02%	-0.13%	+0.45%	+0.62%	-0.04%	-0.04%	-0.06%
	Calculated		-0.01%	+0.07%	+0.14%	+0.29%	-0.01%	-0.01%	-0.001%
iv)	Knee Point Voltage	Vk in Volt	1074V @ 400/1A	l	Ι.	I	1074V @ 400/1	511V @ 400/1A	511V @ 400/1A
10.Loca	10.Location of CT								

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

iv)		iii)		1		ų	9					5				
Knee Point Vk in Voltage Volt	Error Calculated	Ratio Measured	Ratio Adopted	Calculated	Error	Measured	Ratio	Adopted	Data	Calculated	Error	Measured	Ratio	Adopted	Ratio	
Vk in Volt		в				-	<					;	₽			
																Core I
																Core II
į.																Core III
																Core IV
																Core V
											9					
																Core VI

# Note : I

Rows	Knee Point Vk in Voltage Volt	Adopted Ratio Measured Error Error	Calculated Ratio
to	Vk in Volt	в	
be a			
added			
/deletec			
d as requi	ž		
Rows to be added /deleted as required for no.			21
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  $\sqrt{\text{mark}}$  in the appropriate box )

<u>A.</u> T	ransmission 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	<b>₽</b> 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-I! Distance protection, Zone-I is set cover 80% of the protected line section	YES 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	YE\$	🗌 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	
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)	YE\$	
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.	VES	□ NO
10.	In case of short lines, is manufacturers recommendation considered in respect of resistive setting vis a vis reactance setting to avoid overreach.	YE\$	□ 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. $\rightarrow 460$ Sec.	C 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 600 w 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?	<b>YES</b>	□ NO
14.	Is reverse looking Zone-4 time delay set as Zone-2 time delay?	YES	<b>₽</b> NO

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16.       17.       18.       19.       20.       21.	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 Whether VT fuse fail detection function has been correctly set to block the distance function operation on VT fuse failure 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? 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? In case of Cables, is unit protection provided as Main-I & Main-II protection with distance as back-up. Are the line parameters used for setting the relay verified by field testing 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:	<ul> <li>✓ YES</li> </ul>	<ul> <li>NO</li> </ul>
16.       17.       18.       19.       20.       21.	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 Whether VT fuse fail detection function has been correctly set to block the distance function operation on VT fuse failure 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? 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? In case of Cables, is unit protection provided as Main-I & Main-II protection with distance as back-up. Are the line parameters used for setting the relay verified by field testing Is Two stages Over-Voltage protection provided for 765 & 400kV Lines? Do you apply grading in over-voltage setting for lines at one station.	<ul> <li>YES</li> </ul>	<ul> <li></li></ul>
16.       17.       18.       19.       20.       21.	initiation of line SOTF from CB closing has been interlocked with the other CB Whether VT fuse fail detection function has been correctly set to block the distance function operation on VT fuse failure 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? 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? In case of Cables, is unit protection provided as Main-I & Main-II protection with distance as back-up. Are the line parameters used for setting the relay verified by field testing Is Two stages Over-Voltage protection provided for 765 & 400kV Lines? Do you apply grading in over-voltage setting for lines at one station.	<ul> <li>✓ YES</li> </ul>	NO NO NO NO NO
17. 18. 19. 20.	to block the distance function operation on VT fuse failure 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? 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? In case of Cables, is unit protection provided as Main-I & Main-II protection with distance as back-up. Are the line parameters used for setting the relay verified by field testing Is Two stages Over-Voltage protection provided for 765 & 400kV Lines? Do you apply grading in over-voltage setting for lines at one station.	<ul> <li>✓ YES</li> <li>✓ YES</li> <li>✓ YES</li> <li>✓ YES</li> <li>✓ YES</li> </ul>	□ NO □ NO □ NO □ NO
18. 19. 20.	relay or built-in function of Main relay) for protection against high resistive earth faults? 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? In case of Cables, is unit protection provided as Main-I & Main-II protection with distance as back-up. Are the line parameters used for setting the relay verified by field testing Is Two stages Over-Voltage protection provided for 765 & 400kV Lines? Do you apply grading in over-voltage setting for lines at one station.	YES	
18. 19. 20.	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? In case of Cables, is unit protection provided as Main-I & Main-II protection with distance as back-up. Are the line parameters used for setting the relay verified by field testing Is Two stages Over-Voltage protection provided for 765 & 400kV Lines? Do you apply grading in over-voltage setting for lines at one station.	VES	
19. 20.	In case of Cables, is unit protection provided as Main-I & Main-II protection with distance as back-up. Are the line parameters used for setting the relay verified by field testing Is Two stages Over-Voltage protection provided for 765 & 400kV Lines? Do you apply grading in over-voltage setting for lines at one station.	YES	
<b>21.</b>	field testing Is Two stages Over-Voltage protection provided for 765 & 400kV Lines? Do you apply grading in over-voltage setting for lines at one station.	YES	
	400kV Lines? Do you apply grading in over-voltage setting for lines at one station.		NO
	reduce specify the setting values adopted for.		₽NO
	Stage-I : (typical value - 106 to 112 % , delay : 4-7 Sec) Stage-II: (typical value - 140 to 150%, delay: 0 to 100msec.)		
	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)–	PYES 	□ NO
	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	Tes	□ NO
24.	provide the detail with justification thereof. Is the Current reversal guard logic for POR scheme provided on Double circuit lines?	☐ YES	🗌 NO
ł	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	PNO
<b>26.</b>	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	<b>₽</b> NO
	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.)	l= V= Angle: S=	
28. ÷	<ul> <li>a) What are the Zones blocked on Power swing block function:</li> <li>b) Setting for Unblock timer: (typical 02 second)</li> </ul>	Z1 / Z2 / Time:	Z3 / Z4
	c) Out of Step trip enabled		
i	Whether the location of Out of step relay has been identified on the basis of power system simulation studies	YES	

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30.	a) Is Disturbance recorder and Fault locator provided on all line feeder ?	YES	□ NO
	b) Whether standalone or built in Main relay	Standalon	e / built-in
	c) Whether DR is having automatic fault record download facility to a central PC	☐ YES	NO
	<ul> <li>d) Whether DR is time synchronised with the GPS based time synchronising equipment</li> </ul>	YES	🗌 NO
	e) Whether DR analog channels contain line phase & neutral current and line phase & neutral voltage.	☑ YES	
	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.	<b>YES</b>	□ 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. 2.	Do you use Group A and Group B protections connected to separate DC sources for power transformers Do you follow CBIP guideline (274 & 296) for protection	YES VYES		
	setting of transformer			
3.	Do you use duplicated PRD and Bucholtz initiating contact for power transformers at 765kV and 400kV levels	YES	<b>⊡</b> 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)	Group	NO 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.	T YES	□ NO	
6.	Is Restricted earth fault (REF) protection used a high impedance type	YES		
7.	Are Main protection relays provided for transformers are of numerical design.	VES YES		
8.	<ul> <li>a) Are directional over current &amp; earth fault relays provided as back-up protection of Transformer are of numerical design.</li> <li>b) Do the back up cattle fault relays have bacmapic</li> </ul>	YES YES		
	<ul> <li>b) Do the back-up earth fault relays have harmonic restrain feature</li> </ul>	-		
9.	Is Fire protection system (HVW type) provided for power transformer and functioning	VES YES		
10.	<ul> <li>a) Is the Disturbance recorder provided for Transformer feeder</li> <li>b) Whether standalone or built in Main relay</li> </ul>	YES Standalon	□ NO e/built-in	
	<ul> <li>c) Whether DR is having automatic fault record download facility to a central PC</li> </ul>	□ YES	NO	
	<ul> <li>d) Whether DR is time synchronised with the GPS time synchronising equipment</li> </ul>	YES		A
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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?	PYES	□ NO
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# C. Shunt Reactors

1.	Do you use Group A and Group B protections connected to separate DC sources for reactors	☐ YES	
2.	Do you follow CBIP guideline (274 and 296) for protection setting of reactors	YES	
3.	Do you use duplicated PRD and Bucholtz initiating contact for Reactors at 765kV and 400kV levels	YES	
4.	Do you classify Reactor protections as below in groups: Group A Group B • Biased differential relay R.E.F Protection	YES	
	<ul> <li>PRD , WTI</li> <li>Back up impedance protection</li> <li>Buchholz Protection, OTI</li> <li>Direction O/C &amp; E/F relay</li> </ul>	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.	U 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	
8	Is Fire protection system (HVW type) provided for Reactor and functioning	☐ YES	
9	a) Is the Disturbance recorder and Fault locator provided on all the Shunt Reactors used in 765 kV, 400 kV	☐ YES	
	substations?	Standalo	ne/built-in
	<ul> <li>b) Whether standalone or built in Main relay</li> <li>c) Whether DR is having automatic fault record download facility to a central PC</li> </ul>	☐ YES	
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	<b>YES</b>	
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	VES YES	□ NO
4	In an existing substation if CTs are of different ratios, is biased type bus protection provided.	☐ YES	PNO
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	PNO

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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	YES	
	on all line feeders of 765, 400 & 220kV substations?	Standalone	Huilt in
	b) Whether standalone or built in Main relay		
	c) Whether DR is having automatic fault record download	YES	NO
	facility to a central PC		
	<ul> <li>d) Whether Central PC for DR , EL are powered by Inverter (fed from station DC)</li> </ul>	YES	🗌 NO
2.	Whether DR is having the following main signals for lines:	YES	
	Analogue signals:		
	From CT: IA, IB, IC, IN		
	<ul> <li>From VT: VAN, VBN, VCN</li> </ul>		
	From Aux. VT: V0		
	Digital Signals		
	Main 1 Carrier receive		
	Main 1 Trip		
	<ul> <li>Line O/V Stage I / Stage II</li> </ul>		
	Reactor Fault Trip		
	<ul> <li>Stub Protection Operated.</li> </ul>		
	Main II Trip		
	Main II Carrier Receive		
	Direct Trip CH I / II		
	<ul> <li>CB I Status (PH-R, Y &amp; B)</li> </ul>		
	CB II Status (PH R, Y & B)		
	<ul> <li>Bus bar trip</li> </ul>		
	<ul> <li>Main / Tie CB LBB Operated</li> </ul>		
	<ul> <li>Main / Tie Auto-reclose operated.</li> </ul>		
	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		
3.	Whether substation (765, 400, 220kV) is having Event	YES	
	logger facility (standalone or built-in-SAS)		
4.	Whether GPS based time synchronizing equipment is	YES	

# F. Circuit Breakers

1.	Is breaker fail protection (LBB / BFR) provided for all the Circuit Breakers at 220kV, 400kV & 765kV rating	YES		0
3.			□ 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?	PYES	
6.	Is LBB relay provided with separate DC circuit independent from Group-A and Group-B Protections?	YES	<b>₽</b> NO
7.	Is the LBB initiation provided with initiating contact independent of CB trip relay contact?	TYES	-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	U-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 buckhoiz operation?	VES 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	
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)?	T YES	<b>YNO</b>
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

<b></b>					
1,	a)	Do you use PLCC for tele-protection of distance relays at 765, 400 & 220kV feeders			
	b)	Specify type of coupling	(Ph-Ph / Ph	G/ Inter-ckt)	
	c)	Whether redundant PLCC channels provided for 400 & 765kV lines	☐ YES	UNO	
	d) e)	Specify number of PLCC channels per circuit : Whether dependability & security of each tele- protection channel measured & record kept ?	(One YES		
	1		· · · · · · · · · · · · · · · · · · ·		1

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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?	☐ YES	GNO
	b)	Whether dedicated fibre is being used for Main-I / Main-II relay or multiplexed channel are being used.	Dedica multip	

# H. Station DC supply systems

1	Do you have two separate independent DC system (220V or 110V)	YES	
	(Source-A and Source-B)		
2.	Do you have two independent DC system (48V) for PLCC (source-A and source-B)	Tes	<b>MNO</b>
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	
5.	<ul> <li>Whether Bay wise distribution of DC supply done in the following way:</li> <li>a) Protection</li> <li>b) CB functions</li> <li>c) Isolator / earth switch functions</li> <li>d) Annunciation / Indications</li> <li>e) Monitoring functions</li> </ul>	YES	□ NO
6	<ul> <li>Whether following has been ensured in the cabling:</li> <li>a) Separate cables are used for AC &amp; DC circuits</li> <li>b) Separate cables are used for DC-I &amp; DC-II circuits</li> <li>c) Separate cables are used for different cores of CT and CVT outputs to enhance reliability &amp; security</li> </ul>	YES	□ NO
7	Is guidelines prescribed in CBIP manual 274 & 296 followed in general	YES	

### I. PERFORMANCE INDICES

1.	Is there a system of periodically measuring Dependability & Security of Protection system (as given in CBIP manual 296) and recorded	LYES	∐ 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	
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	

# J. ADDITIONAL CHECKS FOR SERIES COMPENSATED LINES

1.	What is the operating principle of Main protect	ction employed	Distance
			Line Current diff.
	trapa Power Kest	apat	Plan
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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	
4.	Are POR tele-protection scheme employed for distance relays	
5.	Position of Line VT provided on series compensated line	<ul> <li>Between Capacitor and line</li> <li>Between Capacitor and Bus</li> </ul>
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?	<ul> <li>Phase locked voltage memory</li> <li>Intentional time delay Other, specify:</li> </ul>
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
15.	Whether measures taken for under/overreach problems at sub- harmonic oscillations?	adjacent lines
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?	

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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

2024 C.P. Meena

S.E. (Gen.Mtc.) CTPP, Chhabra, RVUNL

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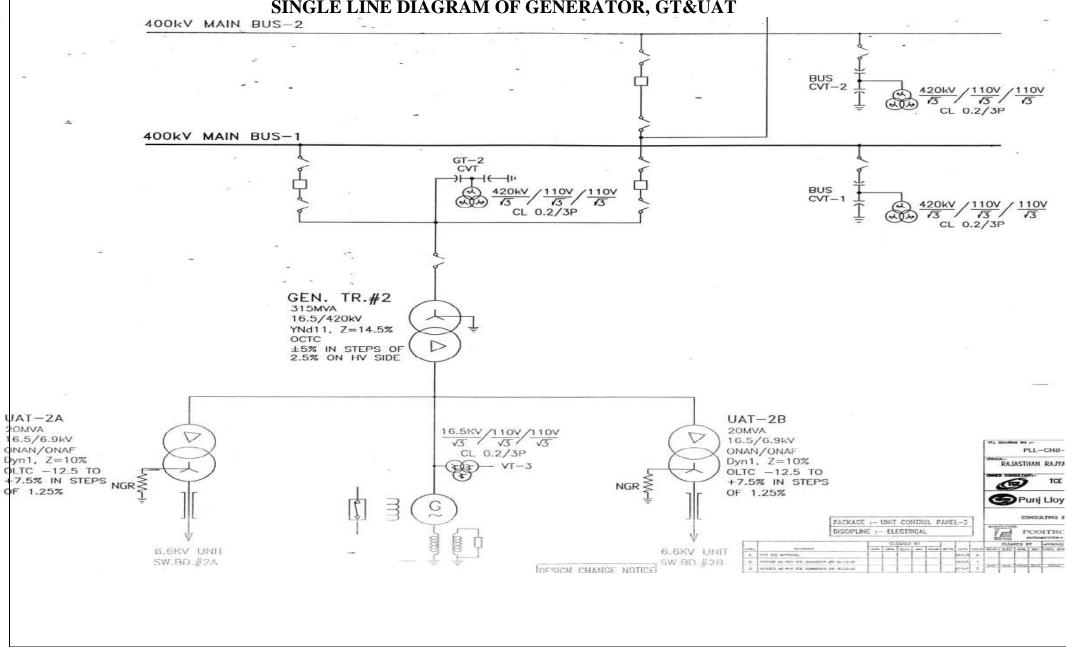
# **LIST OF ABBREVIATION**

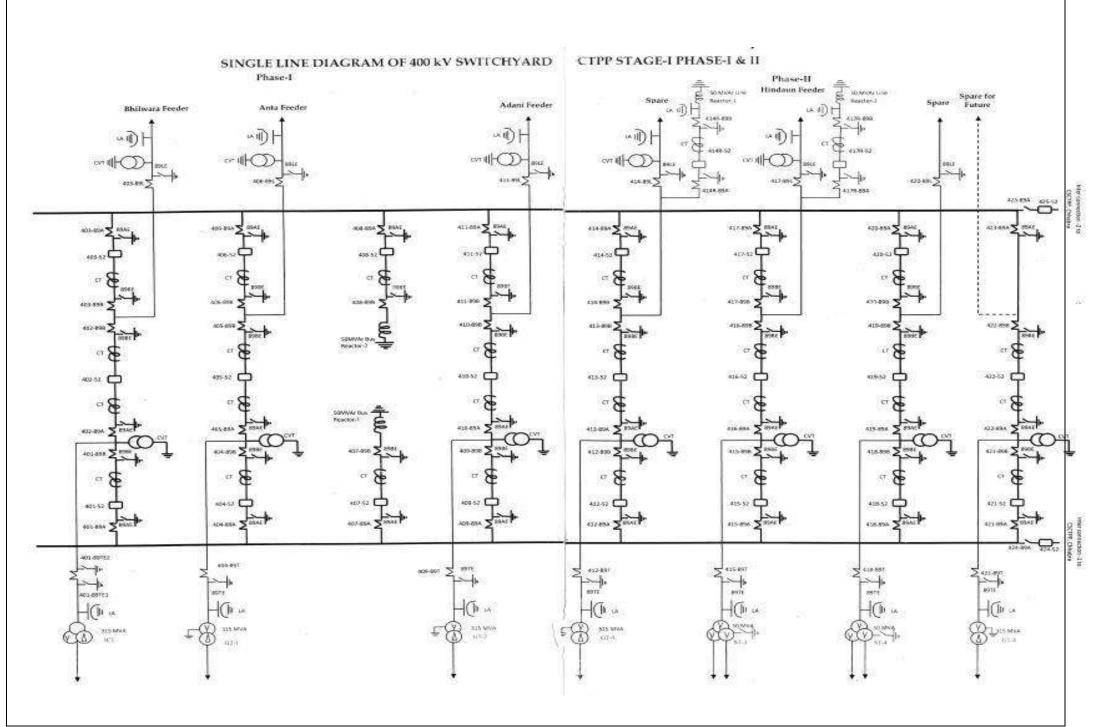
	RRVUNL	Rajasthan	Rajya	Vidyut	Utpadan	Nigam	Limited
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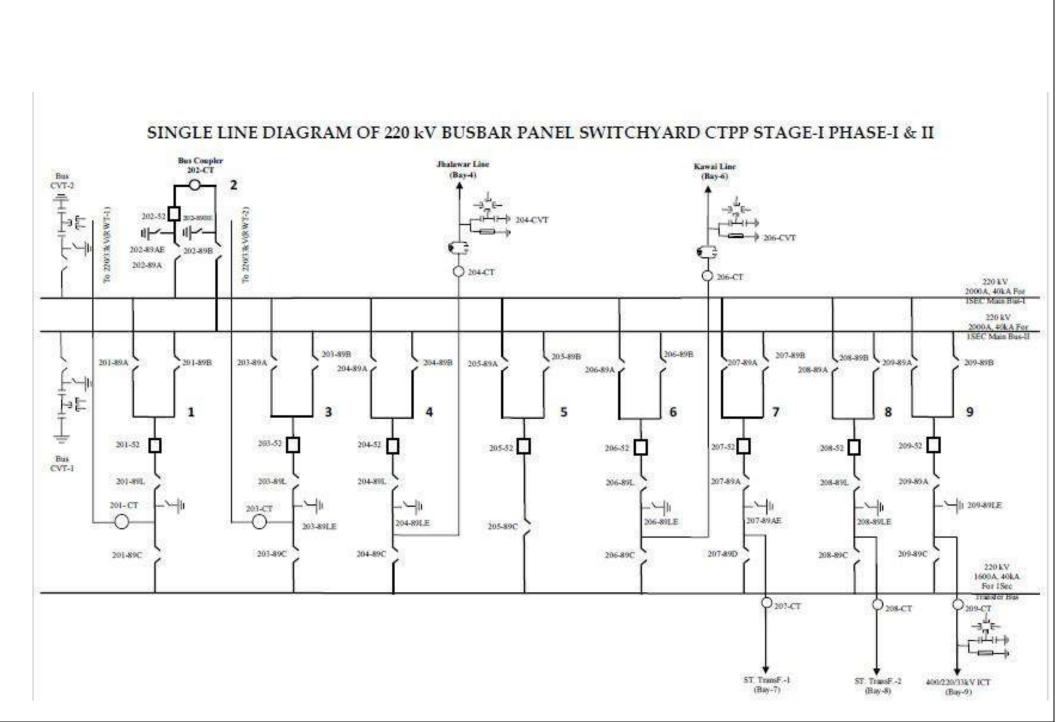
- CTPP Chhabra Thermal Power Plant
- GT Generator Transformer
- UAT Unit Auxiliary Transformer
- ST Station Transformer
- ICT Interconnecting Transformer
- CT Current Transformer
- CVT Capacitive Voltage Transformer

1.1

SINGLE LINE DIAGRAM OF GENERATOR, GT&UAT







# **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	<ul> <li>[1] 220 V DC-I System (1&amp;2)</li> <li>[2] 220 V DC-II System (1&amp;2)</li> <li>[3] 220 V DC-I System (3&amp;4)</li> <li>[4] 220 V DC-II System (3&amp;4)</li> <li>[5] 48 V DC-I System</li> <li>[6] 48 V DC-II System</li> <li>[7] 220 V DC-I System (Unit 1to 4)</li> <li>[8] 220 V DC-II System (Unit 1to 4)</li> </ul>		

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: <u>Relays used for Transmission Line Protection:</u>

Sl. No.	I. 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:** <u>Relays used for Transformer Protection:</u>

Sl. Primary Protection		Back Up protection				
No.	Transformer	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: <u>Relays used for Reactor Protection:</u>

Sl. No.	Reactor	Primary Protection Differential Protection	Backup 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: <u>Relays used for Bus bar Protection:</u>

Sl. No.	Voltage level	Make	Model
1	220kV	SIEMENS	7885220
2	4001-37	SIEMENS	7885220
2	2 400kV	SIEMENS	7885220

# **1.3.5:** <u>Relays used for Generator Protection:</u>

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	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	ADJACE	NT 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 L	INE DATA (from rem	note 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-CT	PP, 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	P	ROTECTED LINE DA	TA
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 SH	ORTEST 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 SHOR	TEST 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	<b>RVUNL-CTPP, Chhabra</b>		
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 SHOI	RTEST LINE DATA (fro	om 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		GEST LINE DATA (fro	m 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 LIN	E 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 SI	HORTEST LINE D	ATA (from remote bus)
9.1	Name of the substation to which the shortest adjacent line is connected		Atru 220kV
9.2			
1	Line Length of shortest adjacent line	Km	11.53
9.3	Line Length of shortest adjacent line         Positive seq. RESISTANCE of         shortest adjacent line	Km Ohms/Km	11.53 0.1363
	Positive seq. RESISTANCE of		
9.3	Positive seq. RESISTANCE of shortest adjacent line Positive seq. REACTANCE of	Ohms/Km	0.1363

	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. <u>Transmission line protective relay Settings Review:</u>

Line Name	BHILWARA 400KV LINE				
Main I/II	Main-I SEIMENS&7SA522		Main-II		
Relay			SEIMENS&7SA612		
Description/Parameter	Existing setting	Reviewed setting	Existing setting	Reviewed setting	
Line angle	85	84.93	85	84.93	
Zero seq. compensation factor ( <b>Rg/Rl</b> ) 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 ( <b>Rg/Rl</b> ) for >Z1	1.48	1.48	1.48	1.48	
Zero seq. compensation factor ( <b>Xg/Xl</b> ) 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	
1-1Phase, 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	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

Γ4-1Phase,delay for single phase faults	1	1	1	1
T4 multi-ph, delay for multi phase faults	1	1	1	1
	Powe	er 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
	Grou	nd Over Current		
Pickup	0.2	0.2	0.2	0.2
Time delay	1.25	1.25	1.25	1.25
	Over V	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	A	NTA 400KV LINE		
Main I/II	Μ	ain-I		Main-II
Relay	SEIMENS&7SA522		SEIMENS&7SA61	12
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	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				
	Powe	er 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
	Grou	nd Over Current		
Pickup	0.2	0.2	0.2	0.2
Time delay	1.25	1.25	1.25	1.25
	Over V	<b>Voltage Protection</b>	l	
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	AL	DANI 400KV LINI	E	
Main I/II	Ma	ain-I		Main-II
Relay	SEIMENS&78	SA522	SEIMENS&7SA61	2
Description/Parameter	Existing setting	Reviewed setting	Existing setting	Reviewed setting
Line angle	85	84.93	85	84.93
Zero seq. compensation factor ( <b>Rg/Rl</b> ) 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 ( <b>Rg/Rl</b> ) 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
	Ро	wer Swing Setting	çs	
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
	Gr	ound Over Curre	nt	
Pickup	0.2	0.2	0.2	0.2
Time delay	1.25	1.25	1.25	1.25
	Ove	r Voltage Protect	ion	
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
Au	tomatic 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 M	НО	
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	
Тре	0.00	0.00	
OpModePP	ON	ON	
ZPP	81.325	80.78	
ZAngPP	85	85	
ZRevPP	81.325	80.78	
Трр	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		
Тре	0.50	0.50		
OpModePP	ON	ON		
ZPP	121.98	121.17		
ZAngPP	85	85		
ZRevPP	121.98	121.17		
Трр	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		
Тре	1.00	1.00		
OpModePP	ON	ON		
ZPP	185.981	197.69		
ZAngPP	85	85		
ZRevPP	185.981	197.69		
Трр	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
Трр	1	1.00
	Residual over current	
IN1>	20	20
T1Min	1.1	1.1
K1	0.48	0.48
Automat	ic Switch Onto Fault Logic (OFF)	
Ib	-	2000
UB	-	400
IPh<	-	20
UPh<	-	70
tDuration	-	0.02
tSOTF	-	0.2

tDLD	-	0.2
AutoInit	-	ON
Ove	r Voltage protection	
Operation Step 1	ON	ON
U1>	110	110
T1	5	5
U2>	150	150
T2	0.1	0.1

Line Name	AKL	ERA 220KV LINE			
Main I/II	Ma	ain-I	Main-II		
Relay	SEIMENS&7SA	A522	SEIMENS&7SA6	12	
Description/Parameter	Existing setting	Reviewed setting	Existing setting	Reviewed setting	
Line angle	80	79.42	80	79.42	
Zero seq. compensation factor ( <b>Rg/Rl</b> ) 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 ( <b>Rg/Rl</b> ) for >Z1	0.64	0.65	0.64	0.65	
Zero seq. compensation factor ( <b>Xg/Xl</b> ) for >Z1	0.78 0.78		0.78	0.78	
	ZONI	E 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	
	ZONI	E 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	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
	SOT	<u>.</u>	·	
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	KAV	VAI 220KV LINE			
Main I/II	Ma	in-I	Main-II		
Relay	SEIMENS&7SA	522	SEIMENS&7SA6	512	
Description/Parameter	Existing setting	Reviewed setting	Existing setting	Reviewed setting	
Line angle	80	78.79	80	78.79	
Zero seq. compensation factor ( <b>Rg/Rl</b> ) 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 ( <b>Rg/Rl</b> ) 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	
	ZONI	E 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	
	ZONI	E 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 S	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 Cu	irrent		
Pickup	0.2	0.2	0.2	0.2
Time delay	0.5	0.5	0.5	0.5
	<b>Over Voltage Pro</b>	tection		
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				Transforme	r		
	Substation Name								
	Transforme	r 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							•	<b>i</b>
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	А	1000/1			1000/1	1000/1	300/1	1000/1
6.3	LV CT Ratio	А	1000/1			2000/1	2000/1	2500/1	2500/1
7	Differential Relay		L	L	1			1	1
7.1	Make		SIEMENS			SIEMENS	ABB	SIEMENS	ABB
7.2	Model		7UT613			7UT613	RET650	7UT613	RET670
8	<b>REF Provided</b>	Yes/No	Yes	Yes	Yes			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	NO	NO	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 $\Omega$	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

0 Rs	tab Range (Ω)	Ohms	NA	300.0	825.0			892.0	370
							I		
Т	ransformer Nam	e	ICT	GT-1&2	GT-3&4	UAT-1A/1E & 2A/2B	UAT- 3A/3B& 4A/4B	ST 1&2	ST 38
9	Over fluxing Protection provided	Yes/No	Yes	No	No	No	No	Yes	Yes
9.1				Over	fluxing Protection	n Relay			
9.2	Make		SIEMENS					SIEMENS	ABB
9.3	Model		7UT613					7UT613	RET67
10	HV Back-up Protection Provided	Yes/No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
10.1				H	 V Back-up Protec Relay	tion			
10.2	Make		SIEMENS	SIEMENS	ABB	SIEMENS	ABB	SIEMENS	ABB
10.3	Model		7SJ621	7SJ611	ABB RET670	7SJ611	RET650	7SJ611	RET67
10.4	HV Back-up Protection CTs Ratio	A/A	1000/1	1000/1	1000/1	1000/1	1000/1	300/1	1000/2

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
	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 <u>Transformers Protection Relay Setting Review:</u>

SI No	DDOTECTION		1	ICT	
Sl. No.		PROTECTION			Reviewed
		Rela	y Make & Model	SIEME	NS 7UT613
			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
1	Differential	Differential Biased	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
		Rela	y Make & Model	SIEME	NS 7UT613
	Over Fluxing		U/f > Pickup	1.15	1.15
2		T U/f >> Time delay		Infinity	Infinity
			U/f > Pickup	1.40	1.40
		ΤU	/f >>Time delay	5 sec	5 sec

2	3 HV Over Current	Relay Make & Model	SIEME	ENS 7SJ621	
5		Pickup Current	0.6	0.6	
		TSM(s)	0.3	0.3	
		Relay Make & Model	SIEMI	ENS 7SJ621	
4	LV Overcurrent	Pickup Current	1.10	1.10	
		TSM(s)	0.3	0.3	
		Relay Make & Model	SIEMENS 7SJ621		
5	HV Earth fault	PSM(A)	0.1	0.1	
		TSM(s)	0.35	0.35	
		Relay Make & Model	SIEMI	ENS 7SJ621	
6	LV Earth fault	PSM(A)	0.18	0.18	
	-	TSM(s)	0.35	0.35	

Sl. No.	PROTECTION		GT 1	&2	
51. 190.	reletion			Existing	Reviewed
		Rela	y Make & Model	SIEME	NS 7UT635
			Pickup value of diff. current	0.15	0.15
			T I-DIFF> Time delay	0.00	0.00
1	Over All		Pickup value of High set trip	12.00	12.00
1	Differential	Biased	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
		Relay Make & Model		SIEMENS 7UM62	
		U/f > Pickup		1.10	1.10
2	<b>Over Fluxing</b>	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	Overen ment	Relay	y Make & Model	SIEME	NS 7SJ61
3	Overcurrent	P	ickup 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
		Relay Make & Model	SIEMENS 7SJ61	
4	Stand by Earth	PSM(A)	0.25A	0.25A
	fault	TMS(s)	0.7	0.7
		Curve	NI	NI
		Relay Make & Model	SIEME	ENS 7SJ61
5	REF	PSM(A)	0.1A	0.1A
		Time delay	0.7	0.7

Sl. No.	PROTECTION			GT 3&4	
				Existing	Reviewed
		Relay	y Make & Model	ABB RI	ET670
			Pickup value of diff. current	0.20	0.20
			T I-DIFF> Time delay	0.00	0.00
1	Over All		Pickup value of unrestrained trip	6.00	6.00
	Differential	Biased	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 <sup>nd</sup> Harmonic	15%	15%
			5 <sup>th</sup> Harmonic	25%	25%
		Relay	y Make & Model	ABB RET670 & SIEMENS 7UM62	
2	Over Fluxing	U/f > Pickup		1.10	1.10
	0	T U/f >> Time delay		1 sec	1 sec
		J	U/f > Pickup	1.40	1.40
		T U/	f > >Time delay	0.10 sec	0.10 sec

3	3 <b>Over Current</b>	Relay Make & Model	ABB RET670	
5	over current	Pickup Current	120%Ib	120%Ib
		TMS(s)	0.25	0.25
		Curve	NI	NI
		High set Pickup current	1176A	1176A
		Time delay00 s		0 sec
			sec	

		Relay Make & Model	ABB RET670	
4	Stand by Earth	PSM(A)	25%Ib	25%Ib
	fault	TMS(s)	0.7	0.7
		Curve	NI	NI
		Relay Make & Model	ABB I	RET670
5	REF	Alarm value	8V	8V
		Time delay	5.0 sec	5.0 sec
		Trip value 66V 66		66V
		Time delay	0 sec	0 sec

Sl. No.	PROTECTION		UAT 1	&2	
SI. INU.		IROIECTION			Reviewed
		Relay	Make & Model	SIEME	NS 7UT612
			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
1	Differential	Biased	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 <sup>nd</sup> Harmonic	15%	15%
			5 <sup>th</sup> Harmonic	25%	25%
3	Over Current	Relay	Make & Model	SIEMENS 7SJ61	
5	over Current	Pic	kup Current	0.57A	0.57A
			TMS(s)	0.6	0.6
			Curve	NI	NI
		High s Curren	et Pickup nt	11A	11A
		Т	Time delay	0 sec	0 sec

		Relay Make & Model	SIEMENS 7SJ61	
4	Stand by Earth	PSM(A)	0.2A	0.2A
	fault	TMS(s)	0.6	0.6
		Curve	NI	NI

Sl. No.	PROTECTION		UAT 3&4		
51. 190.					Reviewed
		Relay	y Make & Model	ABB RE	ET650
			Pickup value of diff. current	0.12Ib	0.12Ib
			T I-DIFF> Time delay	0.00	0.00
1			Pickup value of unrestrained trip	8.00 Ib	8.00 Ib
1	Differential	Biased	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		15%	15%
		Harmonic Blocking	2 <sup>nd</sup> Harmonic 5 <sup>th</sup> Harmonic		
			5 <sup>th</sup> Harmonic	25%	25%
2	Overcurrent	Rela	y Make & Model	ABB RET650	
2	Overcurrent	P	ickup Current	1.30Ib	1.30Ib
			TMS(s)	0.25	0.25
			Curve	NI	NI
		H	igh set Pickup current	18.28Ib	18.28Ib

		Time delay	0 sec	0 sec	
		Relay Make & Model AB		B REF615	
		Pickup Current	0.84In	0.84In	
		TMS(s)	0.25	0.25	
		Curve	NI	NI	
		Relay Make & Model	ABB	RET650	
3	Stand by Earth	PSM(A)	5%Ib	5%Ib	
	fault	TMS(s)	2.7	2.7	
		Curve	EI	EI	
		Relay Make & Model	ABB	RET650	
4	Residual Over	PSM(A)	5%Ib	5%Ib	
	Current	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	

		DDOTECTION		ST	1&2
Sl. No.		PROTECTION			Reviewed
		Relay N	Iake & Model	SIEMEN	S 7UT613
			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
1	Differential	Biased	T I-DIFF>>Time delay	0.00	0.00
		Dased	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
		Relay Make & Model		SIEMENS 7UT613	
		U/f > Pickup		1.10	1.10
2	Over Fluxing	T U/f >	>> Time delay	5 sec	5 sec
		U/1	f > Pickup	1.40	1.40
		T U/f >>Time delay		1 sec	1 sec
		Relay N	Iake & Model	SIEMEN	S 7SJ611
3	SEF Protection	I>:	>> Pickup	35	35
		T I>>>	> Time delay	0	0

		I>> Pickup	3.72	3.72	
	-	T I>> Time delay	0	0	
		Relay Make & Model	SIEMEN	S 7SJ621	
4	HV Earth fault	PSM(A)	0.25	0.25	
		TSM(s)	0.45	0.45	
		Relay Make & Model	SIEMENS 7SJ621		
5	LV1 Earth fault	PSM(A)	0.2	0.2	
		TSM(s)	0.55	0.55	
		Relay Make & Model	SIEMEN	S 7SJ621	
6	LV2 Earth fault	PSM(A)	0.2	0.2	
		TSM(s)	0.55	0.55	

CL N-	n	DOTECTION			ST 3&	4	
Sl. No.	PI	ROTECTION		Existing		Reviewed	
					ABB&RE	Г670	
		Kelay M	Relay Make & Model		main2	main1	main2
			IDiffAlarm	0.2	0.2	0.2	0.2
1	Differential	Biased	tAlarmDelay	10	10	10	10
		Blased	IdMin	0.3	0.5	0.3	0.5
			IdUnre	8	12	8	12
	Over Fluxing	Relay Make & Model		ABB&RET670 main1/2			
		V/Hz>>		170		1	70
2		V/Hz>		110		1	10
		AlaramLevel		100		100	
		tAlarm		5		5	
		Relay M	ake & Model	Al	BB&RET67	) main1/2	
		]	N1>	10		]	10
			T1	1.5		1	.5
3	Residual over current	IN1 Mult		1.0	)	1.0	
		K1	(TSM)	0.3		0.3	
	-	T1 min		0		0	

		Relay Make & Model	ABB&RET670 main1/2		
4	HV Overcurrent	I1>	1.2	1.2	
		T1	0	0	
		Relay Make & Model	Relay Make & Model ABB&RET670 main		
5	LV Overcurrent	I1>	1.2	1.2	
		T1	0	0	
		Relay Make & Model	ABB REF615		
7	LV Earth fault	Start value	0.15	0.15	
		Time multiplier	0.55	0.55	

## 5.1. Reactor protection Data:

## 5.1.1. <u>Reactor Protection Relay Setting Review:</u>

Sl. No.		PROTECTION	BAY - 407 BAY - 408	Bus Reactor Bus Reactor		
			Existing	Reviewed		
		Relay Make & Model	SIEMENS	&7SJ611		
		I > Pickup	0.46	0.46		
1	Earth fault Overcurrent	T I > Time delay	0.50	0.50		
		IE > Pickup	0.11	0.11		
		T IE > Time delay	0.50	0.50		
	High impedance diff protection R phase	Relay Make & Model	SIEMENS	&7SJ611		
2		1Phase o/c I >Pickup Current	0.03	0.03		
	P	T 1Phase o/c I >Pickup time delay	0.1	0.1		
		Relay Make & Model	SIEMENS&7SJ611			
3	High impedance diff protection Y phase	1Phase o/c I >Pickup Current	0.03	0.03		
	P	T 1Phase o/c I >Pickup time delay	0.1	0.1		
		Relay Make & Model	SIEMENS	&7SJ611		
4	High impedance diff protection B phase	1Phase o/c I >Pickup Current	0.03	0.03		
		T 1Phase o/c I >Pickup time delay	0.1	0.1		

		Relay Make & Model	SIEMENS&7SA522		
		R(Z1) resistance for ph-ph faults	33.80	33.80	
5		X(Z1), Reactance	386.6	386.6	
5	Impedance protection	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			4R Line Reactor 7R Line Reactor
				Existing	Reviewed
		Relay Mal	ke & Model	ABB&RET67	70 MAIN 1
			U>Alarm	2	
1	High Impedance	High impedance	tAlarm	5	
	Differential	Differential	U>Trip	5	- Stable
			Series resistor	250	
		Relay Make & Model		ABB&RET670 MAIN 1	
2	Phase Over Current	Pickup	Current	1.3	1.3
		TS	M(s)	1	1
		Relay Make & Model		ABB&RET670 MAIN 2	
		X1		2115	2115
		R1		0.6	0.6
		Σ	κο	1904	1904
3	Impedance protection	ŀ	80	0.54	0.54
		RI	FPP	75	75
		RI	FPE	125	125
		Т	PP	1	1
		TPE		1	1

## 6.1. Bus-bar protection data

# 6.1.1. Bus bar Protection (400kV) Relay Setting Review

Sl. No.			400	0kV	220kV	
		PROTECTION	Existing	Reviewed	Existing	Reviewed
		Relay Make & Model	SIEMEN	IS 7SS522	SIEMEN	S 7SS522
		Stabilising factor-BZ	0.6	0.6	0.6	0.6
1	Bus bar protection	Diff current threshold-BZ	0.8	0.8	1.10	1.10
	<b>b</b>	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	SIEMEN	IS 7SS522	SIEMEN	S 7SS522
2		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	<b>Rated Apparent Power</b>	MVA	294.1 MVA	294.1 MVA
4	<b>Rated Active Power</b>	MW	250	250
5	Rated Generating Voltage	kV	16.5 kV	16.5 kV
6	Rated current	А	10290.83	10290.83
7	<b>Rated Power factor</b>		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

S.No.	Protection	Setting	Genera	ator-1&2		Genera	ator-3&4	
			Mai	n-1&2	Mai	in-1	N	Iain-2
			Existing	Reviewed	Existing	Reviewed	Existing	Reviewed
		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
1	Generator	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
1	Differential Protection	87-2 T I-DIFF>>	0.00 sec	0.00 sec	0.00 sec	0.00 sec	0.00 sec	0.00 sec
	Trotection	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
		40 Susceptance Intersect Characteristic1	0.55	0.55	NA	NA	0.55	0.55
	2 Loss of Excitation	40 Inclination Angle of Characteristic 1	80 °	80 °	NA	NA	80 °	80 °
2		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 °

### 7.1.2 <u>Generator Protection Relay Setting Review Unit -1to 4:</u>

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

		Impedance Zone Z2	2.23 Ohm	2.23 Ohm	NA	NA	2.23 Ohm	2.23 Ohm
3	Back up Impedance	Impedance Zone Z2 Time Delay	2.00 sec	2.00 sec	NA	NA	2.00 sec	2.00 sec
	Protection	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
		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
4	Pole Slip Protection	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		32R P> Reverse Pickup	-0.50%	-0.50%	-0.60%	-0.50%	-0.50%	-0.50%
5	Reverse	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
	Power Protection	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	32F P-forw.< Supervision Pickup	0.50%	0.50%	0.60%	0.50%	0.50%	0.50%
	Power Protection	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
		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
7	Negative sequence	46 Permissible Negative Sequence Time K	6.7 sec	6.7 sec	NA	NA	6.7 sec	6.7 sec
	current Protection	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
		49 K-Factor	0.86	0.86	NA	NA	0.86	0.86
	Thermal	49 Time Constant	580 sec	580 sec	NA	NA	580 sec	580 sec
8	over load	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
	100% Stator Earth fault	Pickup Value of Alarm Stage Rsgf<	70.0 Ohm	70.0 Ohm	NA	NA	70.0 Ohm (Unit-3) 210Ohm (Unit-4)	70.0 Ohm (Unit-3) 210Ohm (Unit-4)
9	Protection (20 Hz Injection method)	Pickup Value of Tripping Stage Rsgf<<	20.0 Ohm	20.0 Ohm	NA	NA	20.0 Ohm (Unit-3) 60.0 Ohm (Unit-4)	20.0 Ohm (Unit-3) 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%	Beta	NA	NA	2	2	NA	NA
	Stator Earth fault	UN3rdH<	NA	NA	2% of UB/1.732	2% of UB/1.732	NA	NA
	Protection (3rdHarmo nic	UT3BlkLevel	NA	NA	1% of UB/1.732	1% of UB/1.732	NA	NA
	method)	t3rdH	NA	NA	1.0 sec	1.0 sec	NA	NA
10	95% Stator Earth fault	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
	Protection (59N/67GN)	59N/67GN Time Delay	0.70 sec	0.70 sec	0.70 sec	0.70 sec	0.70 sec	0.70 sec
	Over	59-1 Pickup	121.0 V	121.0 V	121.0 V	121.0 V	121.0 V	121.0 V
11	Voltage	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
	Under	81-1 Alarm Pickup	48.20 Hz	48.20 Hz	48.20 Hz	48.20 Hz	48.20 Hz	48.20 Hz
12	Frequency	81-1 Time Delay	5.00 sec	5.00 sec	4.00 sec	4.00 sec	5.00 sec	5.00 sec
	Protections	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
	Over	81-3 Alarm Pickup	51.50 Hz	51.50 Hz	51.50 Hz	51.50 Hz	51.50 Hz	51.50 Hz
13	Frequency	81-3 Time delay	1.00 sec	1.00 sec	1.00 sec	1.00 sec	1.00 sec	1.00 sec
	Protections	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
	Over	24-1 V/f Pickup	1.10	1.10	1.05	1.10	1.10	1.10
14	Excitation	24-1 V/f Time Delay	1.00 sec	1.00 sec	5.00 sec	1.00 sec	1.00 sec	1.00 sec
	Protection	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	50/27 I Stage Pickup	4.5 A	4.5 A	NA	NA	2.5 A	2.5 A
	Machine Protection	50/27 Release Threshold V1<	77.0 V	77.0 V	NA	NA	77.0 V	77.0 V
	Trotection	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	64R-1 Pickup	80.0 kOhm	80.0 kOhm	NA	NA	80.0 kOhm	80.0 kOhm
	protection 1-3Hz	64R-2 Pickup	10.0 kOhm	10.0 kOhm	NA	NA	10.0 kOhm	10.0 kOhm
	method	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	64-1 Ground Displacement	20.0 V	20.0 V	16.5 V	16.5 V	NA	NA
	Fault	Voltage						
	Protection	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:

3&4	Sw		Switch	Description	Sl. No.
DC2	DC1	DC2	DC1		
240 V	240 V	240 V	240 V	Voltage	1
127	127	130	213	1) Positive to earth	
114	114	111	28	2)Negative to earth	
	240 V 127	240 V 130	240 V 213	1) Positive to earth	

		Unit#1		Unit#2	
Sl. No.	Description	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
		Unit#3		Unit#4	
Sl. No.					
	Description	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:

- 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.
- 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 o	of Substation	:	'D' Thermal Powe	er Station, A	Anpara,	Sonebhao	dra.	
Voltage	e Level	:	765/400kV					
Generation Capacity : 2X500MW								
Sl. No	Protectio	n Sc	heme	Status **		Rei	marks	
51.110	Trotectio	n se	neme	Status	765KV	765KV	400KV	400KV
1.	Main I-Distance Prote	octio	n	Yes/No	Line-1 Yes	Line-2 Yes	Line-1 Yes	Line-2 Yes
<u>1.</u> 2.	Main II-Distance Prot			Yes/No	Yes	Yes	Yes	Yes
2.	comparison protection line differential protection	n or	phase segregated	105/110	1 05	1 05	1 05	105
3.	Directional instantane minimum time (IDMT relay	eous	definite	Yes/No	Yes	Yes	Yes	Yes
4.	Directional IDMT ove fault back up protection		rrent and earth	Yes/No	Yes	Yes	Yes	Yes
5.	Two stages over volta	ge p	rotection	Yes/No	Yes	Yes	Yes	Yes
6.	Auto Reclosing			Yes/No	Yes	Yes	Yes	Yes
7.	Carrier aided inter-tr feature	ippi	ng/blocking.	Yes/No	Yes	Yes	Yes	Yes
8.	Are Power Line Carri (PLCC) equipment wi Coupler complete for line protection and da Provided?	ith P spee	rotection ech transmission,	Yes/No	N/A	Yes	N/A	N/A
9.	Are 100% back up Co Channels provided for line compensating equ	r tra 1ipm	nsmission line &	Yes/No	N/A	Yes	N/A	N/A
10.	Disturbance Recorder			Yes/No	Yes	Yes	Yes	Yes
11.	Distance to Fault Loca	ator		Yes/No	Yes	Yes	Yes	Yes
12.	Event Logger: i) Stand Alone ii) Part of S/S or s automation				ii)	ii)	ii)	ii)
13.	Are Time Synchronizi complete with antenna processing equipment receive synchronizing Positioning System (G synchronization of ever recorder and SCADA	a, all s etc puls PS) ent l	l cables, c. provided to se through Global compatible for? ogger, disturbance	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		N/A	Yes	N/A	N/A
	one speech plus data channel provided for	Yes/No				
	each direction?					
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	Z1/Z2/	Z2, Z3,	Z2, Z3,	Z1/Z2/	Z1/Z2
	on Power swing block	Z3/Z4	Z4	Z4	Z3/Z4	Z3/Z4
	function:					
	(b) Unblock time setting (typical 02sec)			02 sec		
	(c) Out of step trip enabled	Yes/No	No	No	No	No
19.	SPS Protection	Yes/No	N/A	Yes	N/A	N/A
20.	Any other Protection					

\*\* Check the availability & functional healthiness.

Note:

- a) SI 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) SI 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

Differential Protection Over Fluxing	Yes/No Yes/No	Yes Yes
2	Yes/No	Yes
Restricted Earth Fault	Yes/No	Yes
Backup directional over current and earth		
fault protection (HV & LV side) or impedance protection	Yes/No	Yes
Buchholz	Yes/No	Yes
Winding Temperature Indicator (WTI)	Yes/No	Yes
Oil Temperature Indicator (OTI)	Yes/No	Yes
Magnetic Oil Gauge (MOG) with low oil level alarm	Yes/No	Yes
Oil Surge Relay (OSR) for On Load Tap	Yes/No	GT-N/A, ST/ICT-Yes
	Yes/No	Yes
Surge Arrester (SA) on both primary and secondary sides of transformers located	Yes/No	Yes
	Yes/No	Yes, in ICT
Overload alarm	Yes/No	Yes
Cooling		ST-ONAF GT, ICT-ODAF
Disturbance Recorder	Yes/No	Yes
Any other protection		
	Fault protection (HV & LV side) or mpedance protectionBuchholzBuchholzWinding Temperature Indicator (WTI)Dil Temperature Indicator (OTI)Magnetic Oil Gauge (MOG) with low oil level alarmDil Surge Relay (OSR) for On Load Tap Changer (OLTC)Pressure Relieve Device (PRD)Surge Arrester (SA) on both primary and secondary sides of transformers located putdoors and connected to overhead lines.Tertiary winding protectionOverload alarmCoolingDisturbance Recorder	Fault protection (HV & LV side) or mpedance protectionYes/NoBuchholzYes/NoBuchholzYes/NoWinding Temperature Indicator (WTI)Yes/NoDil Temperature Indicator (OTI)Yes/NoMagnetic Oil Gauge (MOG) with low oil level alarmYes/NoDil Surge Relay (OSR) for On Load Tap Changer (OLTC)Yes/NoPressure Relieve Device (PRD)Yes/NoSurge Arrester (SA) on both primary and secondary sides of transformers located Dutdoors and connected to overhead lines.Yes/NoTertiary winding protectionYes/NoDiverload alarmYes/NoDisturbance RecorderYes/No

\*\* Check the availability & functional healthiness. Note:

#### a) SI 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)	Yes/No	Yes
	and earth fault (E/F) protection)		
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		Yes
	settings?	Yes/No	
5.	DC supply:		
	i) 48V	Yes/No	
	ii) 110V	Yes/No	Yes
	iii) 220V	Yes/No	
6.	Availability of Battery Charger		
	i) 48V	Yes/No	
	ii) 110V	Yes/No	Yes
	iii) 220V	Yes/No	
7.	DG set	Yes/No	Yes
8.	Auxiliary Supply	Yes/No	Yes
	Average trippings per month		
9.	Special Protection Scheme (SPS)	Yes/No	Yes
10.	Under Frequency Relay(UFR):		
	i) Stage I	Yes/No	No
	ii) Stage II	Yes/No	No
	iii) Stage III	Yes/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	Yes/No	Yes
	does not overload the remaining ICTs or the		
	underlying transmission system		
14.	SCADA:		
	i) Voice	Yes/No	Yes
	ii) Data	Yes/No	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	400KV
Transfer bus	

# 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				
SLNO	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	<u>Transmission Unit</u> 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			
	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	I System is working satisfactorily.			

# 2.4 Relays used for transmission line, Transformer, Bus bar, and Reactor:

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	-

Relay used for Transmission Line Protection:-

Relays used for Transformer Protection:

			Group-A	Grou	Group-B			
Sl. No.	Transformer Details	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		

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		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:

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# 2.6.1 Review of 765KV Anpara D-Lanco Line settings:

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Name of	Transmission Li	ne						
Main I	ABB REL-670		Existing	Reviewed	Existing	Reviewed	Evictina	Reviewed
Settings	Existing Settings	Reviewed Settings	Existing Settings	Settings	Existing Settings	Settings	Existing Settings	Settings
Distance Protection	Zon	e 1	Zo	ne 2	Zo	ne 3	Zo	ne 4
Direction	Forward	Forward	Forward	Forward	Forward	Forward	Reverse	Reverse
X1PP/PE ( $\Omega$ )	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 $(\Omega)$	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	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	I P-921			
Name of Line	Anpara-D l	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			

Name of Tran	smission Lir	ne						
Main I	ABB REL-670							
Setting	Existing Settings	Reviewed Settings	Existing Settings	Reviewed Settings	Existing Settings	Reviewed Settings	Existing Settings	Reviewed Settings
<b>Distance Protection</b>	Zo	one 1	Zo	one 2	Zo	ne 3	Zo	ne 4
Direction	Forward	Forward	Forward	Forward	Forward	Forward	Reverse	Reverse
X1PP/PE $(\Omega)$	97.264	97.264	179.924	179.924	238.268	238.268	24.316	24.316
R1PP/PE ( $\Omega$ )	3.886	3.886	7.189	7.189	9.521	9.521	0.972	0.972
X0PE $(\Omega)$	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	Zo	one 1	Zo	one 2	Zo	Zone 3		ne 4
Direction	Forward	Forward	Forward	Forward	Forward	Forward	Reverse	Reverse
Resistive reach-phase ( $\Omega$ )	17.24	17.24	21.59	21.59	26.99	26.99	26.99	26.99
Resistive reach-ground $(\Omega)$	23.30	23.30	28.79	28.79	35.98	35.98	35.98	35.98
Impedance -phase resistive reach $(\Omega)$	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

# 2.6.2 Review of 765KV Anpara D-Obra-C Line settings:

# 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		2000
6.4	Rct	Ohms	-
6.5 7	Imag @ Vk/2 or Vk/4	mA	60
7	CT data for LBB Ratio	A/A	3000/1
7.1	Class	A/A	PS
7.2	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

	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		<b>F</b> · /·		<b></b>		<b>F</b> · /·	
Settings	Existing Settings	Reviewed Settings	Existing Settings	Reviewed Settings	Existing Settings	Reviewed Settings	Existing Settings	Reviewed Settings
<b>Distance Protection</b>	Zone 1		Zo	ne 2	Zo	ne 3	Zo	ne 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 $(\Omega)$	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 $(\Omega)$	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)				
7	<b>REF Protection</b>		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 ( $\Omega$ )	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	G	T-6	G	T-7	S	T-1	S	T-2				
Relay make	MICO	OM P-633	MICO	M P-633	MICO	M P-633	MICO	M P-633	MICO	M P-633				
Differential Protection	Existing settings	Reviewed Settings	Existing settings	Reviewed Settings	Existing settings	Reviewed Settings	Existing settings	Reviewed Settings	Existing settings	Reviewed Settings	τ	Jnit	C	T 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		HV- 1000/1
Diff I>>	8	8	10	10	10	10	10	10	10	10	A	Iref	ICT	LV- 1600/1
Diff I>>>	12	12	12	12	12	12	12	12	12	12	A	Iref	GT-	HV- 800/1
slope 1	20	20	20	20	20	20	20	20	20	20		%	6	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		HV- 600/1
Time delay	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000		sec	ST-1	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		HV- 600/1
Time delay	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000		sec	ST-2	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		utral CT atios
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		
			1										
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 Relay		CT M P-643		Г-б <b>М Р-643</b>		T-7 M P-643		T-1 M P-643		T-2 M P-643				
make Differential Protection	Existing	Reviewe d Settings	Existing	Reviewe d Settings	Existing settings	Reviewed Settings	Existing settings	Reviewed Settings	Existin g settings	Reviewed Settings	τ	Jnit	C	T Ratio
IS1	0.15	0.15	0.15	0.15	0.15	0.15	0.2	0.2	0.2	0.2	A	ref		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		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		%		2000010
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-	HV- 800/1
Time delay	120	120	120	120	120	120	120	120	120	120	v	//Hz	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		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		HV- 600/1
Time delay	30	30	_	_	_	_	4	4	4	4	v	/Hz	ST-2	LV- 2500/1
V/f	3.080	3.080	-	-	-	-	-	-	-	-		/Hz		2000/1
Time delay	4	4	-	-	-	-	-	-	-	-		/Hz		
V/f	3.300	3.300	-	-	-	-	-	-	-	-	V	/Hz		

Time delay	1	1	-	-	-	-	-	-	-	-	V/Hz		
												. ,	
REF Protection													utral CT atios
Pickup (mA)	0.2	0.2	0.2	0.2	0.2	0.2							
K1(%)	105	105	105	105	105	105	-	-	-	-	А	GT- 6	600/1
K2(%)	105	105	105	105	105	105	-	-	-	-	ohm	GT- 7	600/1
Over curre Earth fault p													
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													

					1				r	T		 
function	-	-	IEC S Inverse	IEC S Inverse	-	-	-	-	-	-		
Pickup(A)	-	-	1	1	-	-	-	-	-	-		
Time delay(S)	-	-	1.5	1.5	-	-	-	-	-	-		
	I.	200	G	<b>P</b> (		<b></b>		<u> </u>		2	<u> </u>	
Back up	10	CT	G	Г-6	G	T-7	S	T-1	S T	-2		 
Relay make		И-Р-141	MICON	M-P-141	MICO	M-P-141	MICO	M-P-141	MICOM	-P-141		
HV side Ove and Eartl protect	h fault											
Over Current	Existing settings	Reviewe d Settings	Existing settings	Reviewe d Settings	Existing settings	Reviewe d 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	Reviewe d Settings	Existing settings	Reviewe d Settings	Existing settings	Reviewe d 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 Ove and Earth protect	h fault											
Over Current	Existing settings	Reviewe d Settings	Existing settings	Reviewe d Settings	Existing settings	Reviewe d 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	Reviewe d Settings	Existing settings	Reviewe d Settings	Existing settings	Reviewe d Settings	Existing settings	Reviewed Settings	Existing settings	Reviewed Settings		
Pick up (A)	-	-	-	-	-	-	-	-	_	-		
Time Delay (Sec)	-	-	-	-	-	-	-	-	-	-		

					1									1
TEE2	line+GT Bı	1para –C -6+765kV 1s-1	Bus Reactor+' line+765kV			us -2+GT- ÈE-F		ICT765kV 55kV Bus-2		00kV -LV+ST- 00KVBUS-1				
Relay make	MICO	M P-633	MICOM	P-633	MICO	M P-633	MICO	OM P-633	MI	COM P-633				
Differential Protection	Existin g settings	Reviewe d Settings	Existing settings	Reviewe d Settings	Existin g settings	Reviewe d Settings	Existing settings	Reviewed Settings	Existing settings	Reviewed Settings	U	NIT	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	2+400	LINE-1+ST KVBUS-2	C line+7		1+ST-2 LI	V Bus 2+400kV NE-1	2+400 1+	tV Line- NV BUS- -ST-1		BUS-2+TEE- J+ST-2				
Relay make	MICO	OM P-633	MICON	M P-633		M P-633	MICO	<u>OM P-633</u>		COM P-633				
Differential Protection	Existing settings		Existing	Reviewe d Settings	Existin g settings	Reviewe d Settings	Existing settings	Reviewed Settings	Existin g settings	Reviewed Settings	U	NIT		
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		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	line+G	Anpara –C T-6+765kV Bus-1	Obra-C li	ctor+765 ne+765kV s- 2		us -2+GT- ïEE-F		ICT765kV 55kV Bus-2	ICT-400kV -LV+ST- 2+400KVBUS-1					
	MICO	OM P-122	MICON	M P-122	MICO	M P-122	MICO	OM P-122	MI	COM P-122				
Relay make			1		Entertin	Reviewe			Existin					
Relay make Over Current Protection	Existing settings		Existing	Reviewe d Settings	Existin g settings	d Settings	Existing settings	Reviewed Settings	g settings	Reviewed Settings	U	NIT		

Time Delay	0	0	0	0	0	0	0	0	0	0	sec		
TEE1	400kV LIN 2+400KV		-	line+765Bus 1 2+4		Bus 1+ST- V LINE-1		ine-2+400kV -1+ST-1	400kV B	SUS-2+TEE-J+ST-2			
Relay make	MICON	1 P-122	MICOM P-122 MICOM P-1		M P-122	MICO	OM P-122	MI	COM P-122				
Over Current Protection	Existing settings	Reviewe d Settings	Existing settings	Reviewe d Settings	Existin g settings	Reviewe d Settings	Existing settings	Reviewed Settings	Existin g settings	Reviewed Settings	UN	IT	
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:

				BUS REACTOR		
SI No.	Description			Adopted Settings	Recommended Settings	
1	Μ	ake		ALSTOM		
2	Capacity(MVAR) Voltage Level (KV)			189		
3				765		
4	% Impedance			3092.70		
5	MAIN			MAIN-I	MAIN-I	
		Relay Model &make		MICOM P-632		
		Adopted CT	HV	600/1	600/1	
		Ratio	LV	600/1	600/1	
		Biased	M1 (%)	20	20	
6	Differential		M2 (%)	80	80	
		Diascu	Is/Id min	0.10	0.10	
	MAIN			MAIN-II	MAIN-II	
		Relay Model &make Pick up (A)		MICOM P-141	MICOM P-141	
7	Over			0.10	0.1	
	current		delay(Sec)	0	0	
		Relay M	lodel &make			
		CT Ratio	HV	600/1	600/1	
			LV	600/1	600/1	
		Settings				
	Back Up Over Current		Pick up (A)	0.28	0.28	
o		Over current	Time delay(Sec)	0.5	0.5	
8		Earth fault	Pick up (A)	0.13	0.13	
			Time delay(Sec)	1	1	
	Relay Model & make				-	
		CT RATIO	HV	-	-	
	REF		LV	-	-	
			NEUTRAL	-	-	
		Setting	Pick up (A)	-	-	
9			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
		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
1	765 kV BUS-1	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
		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
2	765 kV BUS-2	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
		Dead Zone	Pick up I=2010 A Time delay=1 sec	Pick up I=2010 A Time delay=1 sec	-	-
3	400 kV BUS-1	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			Pick up I=2010 A Time delay=1 sec	-	-
		Over Current				Pick up I=3480 A Time delay=0.35 sec
		Differential	-		K1=0%	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 O	DF 765 kV SWITCH YARD 110 V (2	Battery Banks) IN CRB-1
Bank	Bank-1	Bank-2
Make	HBL	HBL
Туре	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
Туре	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

DC BATTER SYSTEM	OF 765 kV SWITCH YARD 110 V	(2 Battery Banks) IN CRB-3
Bank	Bank-1	Bank-2
Make	HBL	HBL
Туре	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-3 Review of 110 V battery bank for CRB-3

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
Туре	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 o	of Transmission Lin	e						
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	e 1	Zo	ne 2	Z	one 3	Z	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
RIPP/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

Nan	ne of Transmission	n 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	Ι	Zon	ie 2	Zor	ne 3	Zo	ne 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
RIPP/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	e I	Zo	ne 2	Zo	ne 3	Z	one 4
Direction	Forward	Forward	Forward	Forward	Forward	Forward	Reverse	Reverse
Resistive reach- phase (O)	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	V Anpara D-Anp	oara 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 Po	wer Corporation Lim	ited	
			Report of	Internal Protection At		
A:	General information					
I) N	ame of Utility					Date ;- 25.10.2024
II)	Voltage Level of Sub-Station	Pragati Po	wer Station -	IV) Type of Bus-Sw	itching Scheme	
ĺ		22	0 KV	V) Name & Organis	ation of Audit Team	Double Main Bus Scheme
						Sh. Yogender Aggarwal,
						Manager (T), Electrical, PPS-
ill) i	Date of Commissioning					j, Sh. Manoj Goyal,
		) N	1/A	VI) Name of Represe	entative from Utility whose Audit is being	Dv. Manager (T) Protection
_				carried out		Sudhir Kumar
3: 0	heck List for Protection Audit			· · · · · · · · · · · · · · · · · · ·	۹ 	Dy. G.M.(T) Protection, PPS-I
. N	Check	Availability	I Francisco I Fran			
	}	i stematinty	Functional/Non	Type of Relay*	Setting as found in the field	
			Functural /	(Numerical/Static		Remarks
			Enable/Disable			
_				Electromechanic		
1	D C System of GT#1		· · · · · · · · · · · · · · · · · · ·	<u>al)</u>		
	Nos. of independent DC source	00.41				
	Potential between +ve & earth	02 Nos. 125V DC	Functional			
	I(Source-I)V	1F-D;		·		· · · · · · · · · · · · · · · · · · ·
	Potential between -ve & earth	125V DCDB			62.1	
	(Source-I)V	1F-D;				
	Potential between +ve & earth	125V DCDB 1F-E;			66.5	
	(Source-II)V	125V DCDB				
	Potential between -ve & earth				57.8	
	(Source-II) V	1F-E;				
		125V DCDB			66.7	
2	D C System of GT#2	<u>┽┈╼━┈</u>				·····
	Nos. of independent DC source	02 Nos. 125V DC				
	Potential between +ye & earth	1F-F;	Functional			
	(Source-I)V	125V DCDB			62.9	· <u> </u>
	(00d/08-1)V				02.9	]
			-		1	
	Potential between -ve & earth	<u>UNIT#1</u>				
					66.8	

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Pragati Power Station-I IPGCL-PPCL New Delhi of they.

	Potential between +ve & earth					
	(Source-II)V	2F-C;				
	·····	125V DCDB	1		F	32.5
	Potential between -ve & earth	<u>UNIT#2</u>		1		×2.0
	(Source-II)V	2F-C;				1
		125V DCDB	1	J		
		<u>UNIT#2</u>			6	6.6
3	DCS					
-			<del></del>			
_	Nos. of independent DC source	02 Non 40511				
	Potential between the & earth	02 Nos. 125V DC	Functiona			
	(Source-I)V	3F-E;		┉╸᠊᠊┥╴╴╸╼╸┈		
		125V DCDB				
	Potential between -ve & earth	<u>UNIT#1</u>	1		• • •	1.6
	(Source-I)V	3F-E;		<b></b>		
	(000100-1)V	125V DCDB	1	1 -		
	Petertiat	UNIT#1	1		66	.1
	Potential between +ve & earth	3F-D;				1
	(Source-II)V					
_		125V DCDB			61.	8
	Potential between -ve & earth	<u>UNIT#1</u>		Ì		3
	(Source-II)V	3F-D		╺╼┤╾╶╾╴		1
_		125V DCDB				
	E	UNIT#1			66.	2
	Event logger panel	Yes				
	Event Logger Time Synchronised				In built in Numerical Protection Relay	
_	Disturbed	Yes				
	Disturbance Recorder	Yes	·······			+
	DR Time Synchronised		Functional		for the state in the	
	Transformer Protection Panel	Yes			In built in Numerical Protection Relay	
Į	GTGT #4 (44 4 bp tot			- <del>  </del>		<b></b> /
	GTGT #1 (114 MVA)	ļ				
	Tripping by Buchholz Relay ( Alar					
1	Differential Protection	Yes	Functional			1 1
1	and received	Yes		- <del> </del>	Alarm as well as Trip	
1	]		Functional	Numerical /		
Ť			- ancaona	ALSTOM/MICOM	Is2 = 1.5,SLOPE 2-0.8 I/In	
1	2 <sup>nd</sup> Harmonic Block (Setting)	Yes				
1		100	Functional	Numerical/	2 <sup>nd</sup> - 20%, 5 <sup>th</sup> - 20%	1
╆		1		ALSTOM/ MICOM	2 - 20%, 5" - 20%	
15	vent Logger Operation			P643		
ļF	REF Protection	Yes	Functional			1
		Yes		Numprisell	In built in Numerical Protection Relay	
1	1	1			200mA, time - 0 Sec.	
F	Vent Logon On the			PLEAT OWNICOM 1		
-	vent Logger Operation	Yes		P643	· · · · · · · · · · · · · · · · · · ·	1
			Functional		In built in Numerica in	L L
		<b>4</b>		<u></u>	In built in Numerical Protection Relay	
		11.	Er. SUDHIR	KIMAD		
		() r 1 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	y, General Manade	r (T) Protoction	) نب ()	They are
		TTISM	- Fragair Power	Station		25 6 / 1.
			IPGCL-PPCL, N	Vew Dethi	×,-	

Back up Over Current	No*	······································			
Event Logger Operation	Yes				
Earth Fault Protection		Functional			
	Yes	Functional	Numerical/ ALSTOM/MICON	100mA, time - 2 Sec	
Event Logger Operation			P643		
Over Flux Protection	Yes	Functional			
	Yes		Numerical/	In built in Numerical Protection Relay V/Hz >1 alarm - 2.310 V/Hz.,time-5 sec	
Event Logger Operation		Functional	P643	(A) 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	
Local Breaker Back up (GCB)	Yes	Functional			
	Yes	Functional	Numerical/ ALSTOM/ MICOM	In built in Numerical- Protection Relay I< = 250mA , 200 mSec.	
Transformer Protection Panel GTGT #2 (114 MVA)		+	P141		
Tripping by Buchholz Relay ( Alar			1	1	
Differential Protection		Functional		A1	
	Yes	Functional	Inumerical/	Alarm as well as Trip Is1 = 0.1, SLOPE 1-0.2l/In,	
nd Harmonic Block (Setting)			P643	ls2 = 1.5,SLOPE 2-0.8 l/ln	
vent Logger Operation	Yes	Functional			
EF Protection	Yes	Functional	f	2 <sup>nd</sup> - 20%, 5 <sup>th</sup> - 20%	
	Yes			In built in Numerical Protection Relay 200mA, time - 0 Sec.	
vent Logger Operation	Yes		P643		
ack up Over Current		Functional		n huilt in al	
/ent Logger Operation	<u>No*</u>			n built in Numerical Protection Relay	
arth Fault Protection	Yes	Functional			<u> </u>
_	Yes	Functional	Numerical/ 1 ALSTOM/MICOM	00mA, time - 2 Sec	
ent Logger Operation	Yes		P643		
er Flux Protection	Yes	Functional	Ir	built in Numerical Protection Relay	
ent Logger Operation		Functional / / F	LSTOM/ MICOM (A 643 m	NZ >1 ararm - 2.310 V/Hz.,time-5 sec N V/Hz >1 Trip- 2.420 V/Hz ,time-250 sec V/Hz >2 - 2.660 V/Hz , time-0	
operation	Yes	Functional		r,	
	Jan Jan	24 SUDHIR KUMAR 24 SUDHIR KUMAR 24 EI. SUDHIR Manager Sat 24 EI. Sudhanager Sat 29 Eaneral Manager Ner 29 Eaneral Norder Ner 20 Eaneral Ne	Totection Dami Undertaking)	built in Numeridal Protection Relay	25/10/24 m(T)

Local Breaker Back up (GCB)	Yes	Functional	Numerical/	I< = 250mA , 200 mSec.	
Transformer Protection Panel			ALSTOM/ MICO P141	M	
5/GT (146 MVA)					
Tripping by Buchholz Relay ( Alar	Yes	Functional			
Differential Protection	Yes	Functional		Alarm as well as Trip	
2 <sup>nd</sup> Harmonic Block (Setting)		Functional	Numerical/	Is1 = 0.1, SLOPE 1 - 0.2///p	
	Yes	Functional	GE/MICOMP643 Numerical/	$\mu s_2 = 1.5$ , SLOPE 2-0.8 $\mu m$	
Event Logger Operation	Yes		GE/MICOMP643	2 <sup>nd</sup> - 20%, 5 <sup>th</sup> - 20%	
REF Protection	Yes	Functional		In built in Numerical D	
Event Logger Operation			Numerical/	In built in Numerical Protection Relay 100mA, time - 0 Sec.	
Back up Over Current	Yes	Functional	GE/MICOM P642		
Event Logger Operation	No*		+	In built in Numerical Protection Relay	
Earth Fault Protection	Yes	Functional	<u>+</u>		
	Yes	Functional	Numerical/	100mA, time - 2 Sec	
Event Logger Operation	Yes	Functional	GE//MICOMP643		
	Yes		Numerical/	In built in Numerical Protection Relay	
			GE/M/COMP643	(A) V/Hz >1 Trip- 2.420 V/Hz time-400	
vent Logger Operation	Yes		1	WFIZ >2 - 2,660 V/Hz time_0 1	
ocal Breaker Back up (GCB)	Yes	Functional		n built in Numerical Protection Relay	
			Numerical/ GE/MICOM P141	< = 250mA , 200 mSec.	

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Er. SUDHIR KUMAR Dy. General Manager (T) Protection Pragati Power Station-I IPGCL-PPCL, New Delhi (Govt. of NCT of Delhi Undertaking)

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# INDRAPRASTHA POWER GENERATION CO. LTD.

&



# PRAGATI POWER CORPORATION LIMITED

(A Govt. of NCT of Delhi Undertaking) Website - <u>http://www.ipgcl-ppcl.gov.in/</u>

# 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.

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 890000052 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: <u>http://www.cpri.res.in</u>

**JUNE 2024** 



## POWER SYSTEMS DIVISION CENTRAL POWER RESEARCH INSTITUTE Sir. C.V. RAMAN ROAD P.B.No.8066, BANGALORE 560080 Website: <u>https://cpri.res.in</u>

Ref.File No.: 2/9/PSD/CPRI/LPGCL/2023-24

Dated. 21-06-2024

/T)*41	Third Party Protection audit at 765kV & 220kV Switchyard Lalitpur		
Title			
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 890000052, Dated 08-02-2024		
CPRI report No:	2/9/PSD/RT105/2024		
Name(s) of investigator(s) from CPRI	<ol> <li>Mr. Ramesh Patil, Engineering Officer</li> <li>Mr. Suraj D Naik, Project Engineer</li> <li>Mr. Manoj Kumar S, Project Engineer</li> </ol>		
Name of Lalitpur Power Generation Company Limited officers, associated in providing support to CPRI	<ol> <li>Mr. R.N Bedi, Head Maintenance (President)</li> <li>Mr. Vikas Kumar Sharma,Electrical (HOD)</li> <li>Mr. Abhimanyu Upadhyay,Electrical (GM)</li> <li>Mr. Mukesh Pokharna, Electrical BTG (GM)</li> <li>Mr.Manivannan V, Electrical (Senior Manager)</li> </ol>		
Report contains	Number of pages : 65Annexure-1 : 985		
Report prepared by:	Report Approved by:		
Mr.Ramesh Patil Engineering Officer Power Systems Division, CPRI	Dr. J. Sreedevi Additional Director & HoD Power Systems Division, CPRI		
Signature:	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. 890000052 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	

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Page 1 of 2

 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	<b>Positive to Earth</b>	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
<b>48 V</b> /	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 Elation 1. Ramesh jat:1 Engg officer.

&. Suzaj. D' Neule, Porged Engmen ou / 04/2024

M/s LPGCL 1. VIKAS SHARMA VID 2. Umawing /2024 CV.MANINANNAN)

Page 2 of 2

# 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:

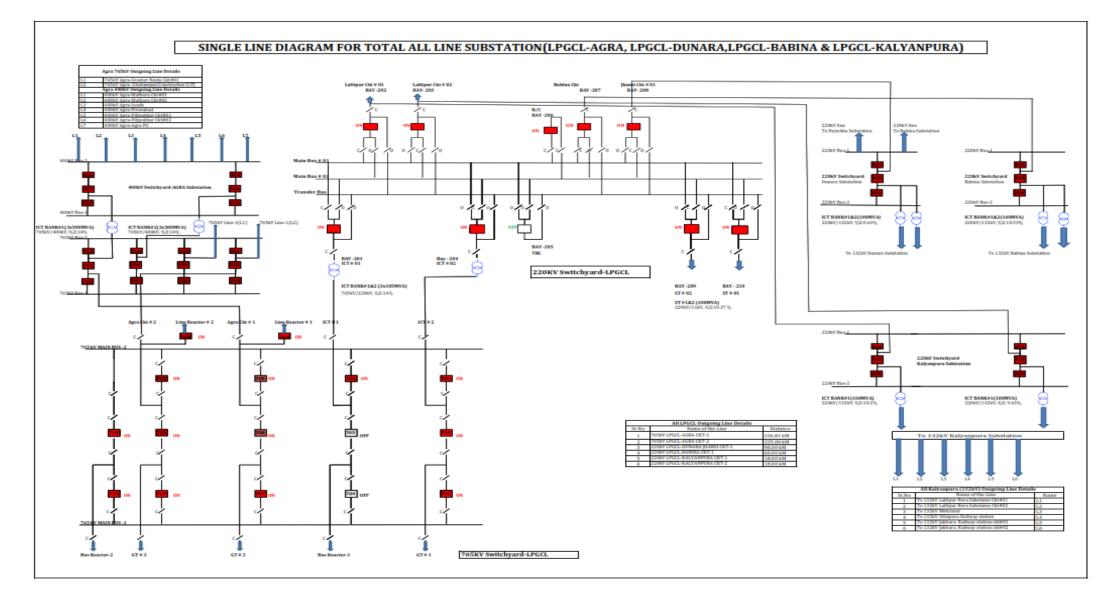
- The distance protection Main-I and Main II ,of all Zone's impedance reach setting for 765KV Lalitpur-Agra/Fathehabad Ckt#01 & Ckt #02 lines are requires some minor revisions.
- The distance protection Main-I ,Zone 1 impedance reach setting for 220KV Lalitpur-Dunara Ckt#01 lines are properly set and some minor revisions are required in Zone 2 Zone 3 and Zone 5 impedance reach settings.
- 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.
- The distance protection Main-I of all Zones impedance reach setting for 220KV Lalitpur-Babina Ckt#01 lines require some minor revisions.
- 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.

- 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.
- 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 LALITPURDATE OF AUDIT BY CPRI TEAM : 26-03-2024SI. NoTitleDetails1Name Of Grid Substation765KV &220KV SWITCHYARD LALITPU2Highest Voltage Level765KV &220KV SWITCHYARD LALITPU2Highest Voltage Level765KV &220KV SWITCHYARD LALITPU2Highest Voltage Level765KV Feeder & Four 220 kV Feeder3Year Of Installation20144No of Transformers, Make and Capacity2*315 MVA6Busbar Arrangement765kV - One and Half Scheme 220kV - Double Main Bus with Transfer Scl7Present Busbar Switching StatusCommissioned8Busbar ProtectionCommissioned9Relay System StatusIn Service10DC Supply Capacity And AdequacyBattery is adequate for the station load.11DC Supply Capacity And AdequacyBattery is adequate for the station load.13GPS Receiver Make & Synchronization Of Relay StatusRelays are synchronised14Synchronization Of Relay Status15Common Event Logger In-built feature in numerical relay is used	
Sl. NoTitleDetails1Name Of Grid Substation765KV &220KV SWITCHYARD LALITPU2Highest Voltage Level765 kV3Year Of Installation20144No Of FeedersTwo 765kV Feeder & Four 220 kV Feeder5No of Transformers, Make and Capacity2*315 MVA6Busbar Arrangement765kV - One and Half Scheme 220kV - Double Main Bus with Transfer Sch7Present Busbar Switching StatusCommissioned8Busbar ProtectionCommissioned9Relay System StatusIn Service10DC Supply System[1] 220/110 V DC-1 [2] 220/110 V DC-2 [3] 48 V DC-211DC Supply Capacity And AdequacyBattery is adequate for the station load.12DC System Earth Fault StatusHealthy condition.13GPS Receiver Make & ModelSANDS and MASIBUS14Synchronization Of Relay StatusRelays are synchronised	
2Highest Voltage Level765 kV3Year Of Installation20144No Of FeedersTwo 765kV Feeder & Four 220 kV Feeder5No of Transformers, Make and Capacity2*315 MVA6Busbar Arrangement765kV - One and Half Scheme 220kV - Double Main Bus with Transfer Scl7Present Busbar Switching StatusCommissioned8Busbar ProtectionCommissioned9Relay System StatusIn Service10DC Supply System[1] 220/110 V DC-1 [2] 220/110 V DC-2 [3] 48 V DC-1 [4] 48 V DC-211DC Supply Capacity And AdequacyBattery is adequate for the station load.12DC System Earth Fault StatusHealthy condition.13GPS Receiver Make & ModelSANDS and MASIBUS14Synchronization Of Relay StatusRelays are synchronised	
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         20kV - Double Main Bus with Transfer Scl       720kV - Double Main Bus with Transfer Scl         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         [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 & SANDS and MASIBUS         14       Synchronization Of Relay Status       Relays are synchronised         15       Common Event Logger       In-built feature in numerical relay is used	1eme
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         20kV - Double Main Bus with Transfer Scl       7         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-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       Synchronization Of Relay Status       Relays are synchronised	<u>1eme</u>
5No of Transformers, Make and Capacity2*315 MVA6Busbar Arrangement765kV - One and Half Scheme 220kV - Double Main Bus with Transfer Scl 220kV - Double Main Bus with Transfer Scl7Present Busbar Switching StatusCommissioned8Busbar ProtectionCommissioned9Relay System StatusIn Service10DC Supply System[1] 220/110 V DC-1 [2] 220/110 V DC-2 [3] 48 V DC-1 [4] 48 V DC-211DC Supply Capacity And AdequacyBattery is adequate for the station load.12DC System Earth Fault StatusHealthy condition.13GPS Receiver Make & ModelSANDS and MASIBUS14Synchronization Of Relay StatusRelays are synchronised	1eme
5       and Capacity       2*313 MVA         6       Busbar Arrangement       765kV - One and Half 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	ieme
6Busbar Arrangement220kV - Double Main Bus with Transfer Scl7Present Busbar Switching StatusCommissioned8Busbar ProtectionCommissioned9Relay System StatusIn Service10DC Supply System[1] 220/110 V DC-1 [2] 220/110 V DC-2 [3] 48 V DC-1 [4] 48 V DC-211DC Supply Capacity And AdequacyBattery is adequate for the station load.12DC System Earth Fault StatusHealthy condition.13GPS Receiver Make & ModelSANDS and MASIBUS14Synchronization Of Relay StatusRelays are synchronised15Common Event LoggerIn-built feature in numerical relay is used	
7       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       Synchronization Of Relay Status       Relays are synchronised         15       Common Event Logger       In-built feature in numerical relay is used	
9Relay System StatusIn Service10DC Supply System[1] 220/110 V DC-1 [2] 220/110 V DC-2 [3] 48 V DC-211DC Supply Capacity And AdequacyBattery is adequate for the station load.12DC System Earth Fault StatusHealthy condition.13GPS Receiver Make & ModelSANDS and MASIBUS14Synchronization Of Relay StatusRelays are synchronised15Common Event LoggerIn-built feature in numerical relay is used	
10DC Supply System[1] 220/110 V DC-1 [2] 220/110 V DC-2 [3] 48 V DC-211DC Supply Capacity And AdequacyBattery is adequate for the station load.12DC System Earth Fault StatusHealthy condition.13GPS Receiver Make & ModelSANDS and MASIBUS14GPS Clock Receiver & StatusRelays are synchronised15Common Event LoggerIn-built feature in numerical relay is used	
10DC Supply System[2] 220/110 V DC-2[3] 48 V DC-1[4] 48 V DC-2[1]DC Supply Capacity And AdequacyBattery is adequate for the station load.12DC System Earth Fault StatusHealthy condition.13GPS Receiver Make & ModelSANDS and MASIBUS14GPS Clock Receiver & StatusRelays are synchronised15Common Event LoggerIn-built feature in numerical relay is used	
II       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       In-built feature in numerical relay is used	
12       Status       Heatury condition.         13       GPS Receiver Make & Model       SANDS and MASIBUS         14       GPS Clock Receiver & Synchronization Of Relay Status       Relays are synchronised         15       Common Event Logger       In-built feature in numerical relay is used	
I3     Model     SANDS and MASIBUS       GPS Clock Receiver &     14     Synchronization Of Relay Status     Relays are synchronised       15     Common Event Logger     In-built feature in numerical relay is used	
14Synchronization Of Relay StatusRelays are synchronised15Common Event LoggerIn-built feature in numerical relay is used	
$\mathbf{n}_{\mathbf{n}}$	
Status In-ount readire in numerical relay is used	
16 Line Disturbance Recorder In-built feature in numerical relay is used	
17   Fault Locator in Line   Provided	
Breaker Failure Relay     Provided       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 Nur Protection IEDs shall be tested once in 3 or 4 as per the best practices.	

### **Protection audit teams at site:**

### **LPGCL Team Members:**

- 1 Mr. R.N Bedi
- 2 Mr. Vikas Kumar Sharma
- **3** Mr. Abhimanyu Upadhyay
- 4 Mr. Mukesh Pokharna
- 5 Mr. Manivannan V
- 6 Mr. R.N Bedi

### **CPRI Team Members:**

- 1 Mr. Ramesh Patil
- 2 Mr. Suraj D Naik
- 3 Mr Manoj Kumar S

Head Maintenance (President) Electrical (HOD) Electrical (G.M) Electrical BTG (GM) Electrical (Senior Manager) Head Maintenance (President)

Engineering Officer Project Engineer 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:**

SI.	Transformer		Primary Protection		Back Up protection	
No.			Differential Protection	Over fluxing protection	Back up over current	Back Up REF
1	I	CT 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		SCHNEIDER-P643	SCHNEIDER-P645	-	SCHNEIDER-P141
6	GT #02	765 Side	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

SI.	. 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.	Description	Units	Value
No.			
	Station Name	765kV &220kV SWITCHYARD LALITPUR	
1		765kv Lalitpur-Agra/Fatehabad Ckt#01	
1	Line Reference		
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	PROTECTE	D LINE DAT	ГА
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 L	INE 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	Ohms/Km	0.7671
	shortest adjacent line		
9	ADJACENT LONGEST LI	NE DATA (f	from remote bus)
9.1	Name of the substation to which the		765 KV Fatehabad-
7.1	longest adjacent line is connected		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	Yes/No	YES
10	connected to the remote bus		T LS
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	PROTECTE	D LINE DAT	ΓA
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 L	INE 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 LI	NE DATA (1	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

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	PROTECTI	ED LINE DA	TA
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 I	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

# 2.3.Input Data for Transmission Lines Substation – 220KV Lalitpur-Kalyanpura Ckt#01

	shortest adjacent line		
9	ADJACENT LONGEST I	<b>INE DATA</b>	(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

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	PROTECT	ED LINE DA	TA
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

# $2.4\ Input \ Data\ for\ Transmission\ Lines\ Substation-220 KV\ Lalitpur-Kalyanpura\ Ckt\#02$

	shortest adjacent line		
9	ADJACENT LONGEST L	<b>INE DATA</b>	(from remote bus)
9.1	Name of the substation to which the		220 KV KALYANPURA-
9.1	longest adjacent line is connected		LPGCL Ckt#01
9.2	Line Length of longest adjacent line	Km	18.52
9.3	Positive seq. RESISTANCE of	Ohms/Km	0.0800
9.5	longest adjacent line		0.0800
9.4	Positive seq. REACTANCE of	Ohms/Km	0.4002
9.4	longest adjacent line	Onms/Km	
9.5	Zero seq. RESISTANCE of longest	Ohms/Km	0.2401
9.5	adjacent line		
9.6	Zero seq. REACTANCE of longest	Ohms/Km	1.2010
9.0	adjacent line	OIIIIS/ KIII	1.2010
10	Is there a transformer	Yes/No	YES
10	connected to the remote bus		TES
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	%	9.63
	transformers1		9.03

Sl. No.	Description	Units	Value
	Station Name	765KV &220KV SWITCHYARD LALITPUR	
1	Line Reference	Lalit	220kv pur-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 LIN		
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

## 2.5 Input Data for Transmission Lines Substation – 220KV Lalitpur-Dunara Ckt#01

8.6	Zero seq. REACTANCE of shortest adjacent line	Ohms/Km	1.2010
9	ADJACENT LONGEST LINE	<b>DATA</b> (from	n 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

Sl. No.	Description	Units	Value
	Station Name	765KV &220KV SWITCHYARD LALITPUR	
1	Line Reference	Lalitp	220kv our-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 LIN		
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

## 2.6 Input Data for Transmission Lines Substation – 220KV Lalitpur-Babina Ckt#01

8.6	Zero seq. REACTANCE of shortest adjacent line	Ohms/Km	1.2010
9	ADJACENT LONGEST LINE	<b>DATA</b> (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	765KV Lalitpur-Agra / Fatehabad CKT#01	
Main I/II	Ma	in-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	
ТРР	0.5	0.35	
TPE	0.5	0.35	
	ZONE 3		
X1	190.32	230.16	
	7.66	9.18	
X0	631.32	618.41	
R0	158.32	153.01	
RFPP	20	75.00	
RFPE	50	125.00	

X1InFw	209.36	253.18
Pow	er Swing	
Operation	On	on
tSecurity	0.035	0.04
Unblock	off	off
tSendMin	0.1	0.10
tCoord	0	0.00
SchemeType	Permissive UR	Permissive UR
Operation	On	on
Over Curr	ent protection	1
U2>	140	140
T1	4.00	4.00
U1>	109	109
Operation Step 1	On	On
Over Volt	age protection	1
AutoInit	On	On
tDLD	0.3	0.3
tSOTF	0.3	0.3
tDuration	0.3	0.3
UPh<	60	60
IPh<	20	20
UB	765	765
Ib	3000	3000
	ch Onto Fault Logic	1
TPE	1	0.50
TPP	1	0.50
RFPE	50	75.00
RFPP	20	60.00
R0	7.92	6.39
X0	31.57	25.84
R1	0.38	0.38
X1	9.52	9.62
	DNE 5	
TPE	0.8	1.50

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	<b>Reviewed Setting</b>
MICOM P442	765KV Lalitpur-Agra	
Line Settings	MAI	
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		
$\Delta R$ or R5	37.95	8.733
$\Delta X \text{ or } Z5$	37.95	8.733

Line Name	765KV Lalitpur-Agra	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 S	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	<b>Reviewed Setting</b>
MICOM P442	765KV Lalitpur-Agra	
Line Settings	MAI	
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		
$\Delta R$ or R5	37.95	8.733
$\Delta X$ or Z5	37.95	8.733

Line Name	220KV LALITPUR	-DUNARA CKT#01
Main I/II	Ma	in-I
Relay	ABB &	REL670
Description/Parameter	Existing setting	Reviewed setting
Z	ONE 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
Z	ONE 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
ТРР	0.35	0.50
TPE	0.35	0.50
Z	ONE 3	_ <b>I</b>
X1	42.94	63.06
	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

Z	CONE 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 Swi	tch 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 Vol	tage Protection	
Operation Step 1	ON	ON
U1>	110	110
T1	0.025	3.00
U2>	140	140
Τ2	0.1	0.1
Over Cur	rent 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
Pov	wer 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- D	
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
ΔΧ	5.08	1.398

Line Name	220KV LALITPUR	-BABINA CKT#01
Main I/II	Ma	in-I
Relay	ABB & 2	REL670
Description/Parameter	Existing setting	Reviewed setting
ZO	NE 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
ТРР	0	0.00
TPE	0	0.00
ZO	NE 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
	NE 3	1
X1	42.94	47.70
	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

Z	ONE 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
ТРР	1	0.50
TPE	1	0.50
Automatic Swit	ch 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 Volt	age Protection	
Operation Step 1	ON	ON
U1>	110	110
T1	3.00	3.00
U2>	140	140
Τ2	0.1	0.1
Over Curr	rent 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
Pow	ver 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- B	
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
ΔΧ	4.06	2.796

Line Name	220 KV LPGCL- KALYANPURA Circu	
Main I/II	Mai	n-I
Relay	ABB & I	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		YANPURA 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
Τ2	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
Т3	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		
$\Delta \mathbf{R}$	5.08	1.398
ΔΧ	5.08	1.398

Line Name	220 KV LPGCL- KALYANPURA Circuit#		
Main I/II	Main-I		
Relay	ABB & I	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	
ТРР	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 S	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
J	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- KAL		
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	
Τ2	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	
Т3	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	
ΔΧ	5.08	1.398	

SUBSTATION Name	765/220kV Lalithpur Substation		
DIFFERENTIAL PROTECTION FOR	765kv Bus-1 Reactor		
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	Α		2000
Secondary ct on HV side	Α		1
LV Side			
CT ratio(LV)		2000/1	2000/1
Primary ct on LV side	Α		2000
Secondary ct on LV side	Α		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

# 4.0 765 kV Bus Reactor Protective Relay Settings Review

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	Α	0.2	0.20
Is2, PU	Α	1	1.50

SUBSTATION Name	765/220kV Lalithpur Substation		
DIFFERENTIAL PROTECTION FOR	765KV AGRA CKT#01		
Reactor	L	LINE REACTO	R 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	Α		300
Secondary ct on HV side	Α		1
LV Side			
CT ratio(LV)		300/1	300/1
Primary ct on LV side	Α		300
Secondary ct on LV side	Α		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
			1.000

# 5.0 765 kV Line Reactor Protective Relay Settings Review

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	Α	0.2	0.20
Is2, PU	Α	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 $\Omega$	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	
		Relay Make &	Relay Make & Model		MICOM P642	
			K1%	30	30	
			K2%	80	80	
1	Differential		Is/Id	0.2	0.2	
1	Differential	Biased	Ih(2)%	20	20	
			Ih(5)%	20	20	
			HS 1	7.7	7.7	
			HS 2	10.0	10.0	
		Relay Make &	Aake & Model		MICOM - P643	
	2 <b>Over Fluxing</b>	Voltage for F	Relay	765	765	
		V/HZ >1	1	2.75	1.1	
2		T(S)		<u>55</u>	1000	
		V/HZ >2	2	3.080	1.2	
		T(S)		4.0	42	
		Relay Make &	Model	Ν	IICOM - P141	
		Stabilizing Resistance	R stab	868.72		
3	3 <b>REF Protection</b>		HV	1000/1	A donted cottings are stable	
		CT Ratio	CT Ratio	LV	200/1	Adopted settings are stable.
			NCT	300/1		
4	Overcurrent	Relay Make &	Model	Ν	IICOM P-642	
4	Protection	Pickup Currer	nt 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
		Relay Make & Model	MICOM - P643	
6	Earth fault	PSM(A) IN > 1	160	160
		TSM(s)	0.40	0.40

SUBSTATION NAME	765KV &220KV SWITCHYARD LALITPUR	Existing settings		
PROTECTED EQUIPMENT	TRANSFORMER	_		
RELAY	DIFFERENTIAL - 87T	ICT 1	ICT 1	
RELAY TYPE	MICOM - P642			
	Specifications	1		
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 comper	nsation 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	1		
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		1
High set 1	8.571428571	7.7	7.7
High set 2	11.14285714	10	10

# 6.2 Station Transformers Protection Relay Setting Review

	765KV &220KV			
SUBSTATION NAME	SWITCHYARD LALITPUR	Existing settings		
PROTECTED EQUIPMENT	TRANSFORMER			
RELAY	DIFFERENTIAL - 87T	ST-1	ST-2	
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 compensa	tion 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 O	LTC current - MIN and MAX		1	
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	240.0252			
tappping (HV)	249.9352			
Secondary Load current (CT-HV)	0.4166			
Relay current for (HV)	0.9524			
Differential Current for minimum	0.1765			
tapping				
Biasing Current	1.0882			
Operating current of relay	0.4176			

90% of operating Current	0.3759		
	STABLE		
Differential Current for maximum	0.0476		
tapping	0.0470		
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						
	R	elay Make & Model		MICOM P741			
		Differentia	al Bus Bar Protection				
	Setting	Unit	Existing	Reviewed			
1	220 kV BUS BAR CUA						
	Phase Slope kCZ%30		30				
	IDCZ>2 Current	А	2400	2400			
	Phase Slope K2	%	60	60			
	ID>2 Current	А	2400	2400			
2		220 kV	BUS BAR CUB				
	Phase Slope kCZ	%	30	30			
	IDCZ>2 Current	А	2400	2400			
	Phase Slope K2	%	60	60			

	ID>2 Current	А	2400	2400				
3		765 kV BUS BAR CUA						
	Phase Slope kCZ	%	30	30				
	IDCZ>2 Current	А	3600	3600				
	Phase Slope K2	%	60	60				
	ID>2 Current	А	3600	3600				
4		765 kV	BUS BAR CUB					
	Phase Slope kCZ	%	30	30				
	IDCZ>2 Current	А	3600	3600				
	Phase Slope K2	%	60	60				
	ID>2 Current	А	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	<b>Positive to Earth</b>	Negative To Earth
1	1 Dank 1		245 V	115.6 V	129.6 V
1	1 Bank 1	1B	245.7 V	115.6 V	129.6 V
2	Douls 2	2A	244 V	114.5 V	129.9 V
2	2 Bank 2	2B	244.2	114.6 V	129.3 V

	Switchyard Unit		Positive to Negative	<b>Positive to Earth</b>	Negative To Earth
1	220 V	Bank-1	221.8 V	115.8 V	105.4 V
1	220 V	Bank-2	240.8 V	115.8 V	124.9 V
	40 17	Bank-1	51.37 V	0	51.26 V
2	48 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  $\Omega$  & 10  $\Omega$  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**

				Observati	on and Recon	mendations	
SI No	Name	Protection	Zone	Parameter	Existing	Recommendation	Remarks
				XOPE	252.53	206.69	80% of the protected line reactance / resistance & Resistive Reach as per NRPC Guideline
			ZONE 1	ROPE	63.33	51.14	for REL 670
				RFFWPP	20.00	30.00	
				X1FwPP	142.74	115.39	
				XOPE	473.50	310.04	For Single CKT:120% and for Double CKT:150% of protected line reactance/resistance &
				ROPE	118.74	76.71	Resistive Reach as per NRPC Guidelines for REL 670
			ZONE 2	RFFWPP	20.00	60.00	
				RFFWPE	50.00	75.00	
				tPP	0.50	0.35	-
				tPE	0.50	0.35	-
				X1FwPP	190.32	230.16	
				R1PP	7.66	9.18	
				XOPE	631.32	618.41	120% of(protected line reactance + remote end longest line reactance) & Resistive Reach
	-		ZONE 3	ROPE	158.32	153.01	per NRPC Guidelines for REL 670
	せ	Distance Main-1		RFFWPP	20.00	75.00	
	Č			RFFWPE	50.00	125.00	
	ā			tPP	0.80	1.50	-
	ā			tPE	0.80	1.50	-
	å			XOPE	31.57	25.84	It was observed that if protected line length is more than 100 km then the
	Ě			ROPE	7.92	6.39	reactance of Zone RV is 10% of line reactance & Resistive Reach as per NRPC Guidelin
	2 <u>e</u>		Zone 5	RFFWPP	20.00	60.00	for REL 670
	atk			RFFWPE	50.00	75.00	
1	765kv 1 / Fate			tPP	1.00	0.50	-
	<b>8</b> >			tPE	1.00	0.50	-
	765kv Lalitpur-Agra / Fatehabad Ckt			X1InFw	209.36	253.18	-
	60			R1L1n	8.42	9.18	-
	4		ZPSB	R1F1nFw	22.00	82.50	-
	2		(Power Swing)	RLdOutFw	354.04	74.82	-
	ġ			RLdOutRw	354.04	74.82	-
	ii -			KLdRFw	0.90	0.75	-
	e.		Zone 1	R1G	59.86	43.66	80% of the protected line reactance / resistance
	_			R1Ph	59.86	30.00	
				Z2 Ph Reach	142.80	115.48	
			Zone 2	R2G	59.86	43.66	For Single CKT:120% and for Double CKT:150% of protected line reactance/resistance
				R2Ph	59.86	32.75	
				tZ2	0.50	0.35	-
				Z3 Ph Reach	190.50	230.35	
	Distance Main-2	Zone 3	R3G	59.86	43.66	120% of(protected line reactance + remote end longest line reactance)	
		Lone o	R3Ph	59.86	32.75		
				tZ3	0.80	1.50	
				R4G	59.86	43.66	It was observed that if protected line length is more than 100 km then the
			Zone 4	R4Ph	59.86	32.75	reactance of Zone RV is 10% of line reactance
				tZ4	1.00	0.50	
			Power Swing	$\Delta R$ or R5	37.95	8.73	
			i ower owing	ΔX or Z5	37.95	8.73	

			XOPE	252.53	205.58	
		ZONE 1	ROPE	63.33	50.87	80% of the protected line reactance / resistance & Resistive Reach as per NRPC Guideline
		-	RFFWPP	20.00	30.00	for REL 670
			X1FwPP	142.74	114.77	
			XOPE	473.50	308.37	
			ROPE	118.74	76.30	For Single CKT:120% and for Double CKT:150% of protected line reactance/resistance &
		ZONE 2	RFFWPP	20.00	60.00	Resistive Reach as per NRPC Guidelines for REL 670
		EQUIC 2	RFFWPE	50.00	75.00	
			tPP	0.50	0.35	
			tPE	0.50	0.35	
			X1FwPP	190.32	230.16	
			R1PP	7.66	9.18	
			XOPE	631.32	618.41	120% of(protected line reactance + remote end longest line reactance) & Resistive Reach
			ROPE	158.32	153.01	per NRPC Guidelines for REL 670
2		ZONE 3	RFFWPP	20.00	75.00	
5kv Fatehabad Ckt	Distance Main-1		RFFWPP	50.00	125.00	
Ū			tPP	0.80	123.00	
σ			tPE	0.80	1.50	
a			XOPE	31.57		
ak			ROPE	7.92	25.70	It was observed that if protected line length is more than 100 km then the
<u> </u>					6.36	reactance of Zone RV is 10% of line reactance & Resistive Reach as per NRPC Guidelin
بت <		Zone 5	RFFWPP	20.00	60.00	for REL 670
765kv 1 / Fate			RFFWPE	50.00	75.00	
1 <u>5</u>			tPP	1.00	0.50	-
			tPE	1.00	0.50	-
2			X1InFw	209.36	253.18	-
8			R1L1n	8.42	9.18	-
7		ZPSB	R1F1nFw	22.00	82.50	-
2		(Power Swing)	RLdOutFw	354.04	74.82	-
ā			RLdOutRw	354.04	74.82	-
± 1			KLdRFw	0.90	0.75	-
7 Lalitpur-Agra		Zone 1	R1G	59.86	43.66	80% of the protected line reactance / resistance
		20110 1	R1Ph	59.86	30.00	
			Z2 Ph Reach	142.80	114.86	
		Zone 2	R2G	59.86	43.66	For Single CKT:120% and for Double CKT:150% of protected line reactance/resistance
		20110 2	R2Ph	59.86	32.75	
			tZ2	0.50	0.35	-
			Z3 Ph Reach	190.50	230.35	
	Distance Main-2	Zone 3	R3G	59.86	43.66	120% of(protected line reactance + remote end longest line reactance)
		Zone 3	R3Ph	59.86	32.75	
			tZ3	0.80	1.50	-
			R4G	59.86	43.66	It was observed that if protected line length is more than 100 km then the
		Zone 4	R4Ph	59.86	32.75	reactance of Zone RV is 10% of line reactance
			tZ4	1.00	0.50	
		David Carlo	ΔR or R5	37.95	8.73	
		Power Swing	ΔX or Z5	37.95	8.73	-

			2551422	20.00	20.00	
		ZONE 1	RFFWPP	20.00	30.00 50.00	Resistive Reach as per NRPC Guidelines for REL 670
			RFFWPE	50.00		
			X1FwPP	<u>39.94</u> 7.98	55.41	
			R1PP		11.08	Ear Single CVT:120% and far Double CVT:150% of protocted line resistance (resistance 9
			XOPE ROPE	169.33	166.28 33.24	For Single CKT:120% and for Double CKT:150% of protected line reactance/resistance &
		ZONE 2		36.70		Resistive Reach as per NRPC Guidelines for REL 670
			RFFWPP	20.00	60.00	
			RFFWPE	50.00	75.00	
			tPP	0.35	0.50	-
			tPE	0.35	0.50	-
			X1FwPP	42.94	63.06	
			R1PP	8.58	12.60	
			XOPE	128.87	189.23	120% of(protected line reactance + remote end longest line reactance) & Resistive Reach
		ZONE 3	ROPE	25.76	37.83	per NRPC Guidelines for REL 670
			RFFWPP	20.00	75.00	
			RFFWPE	50.00	125.00	
220kv 220kv Lalitpur-Dunara Ckt#01	Distance-1		tPP	1.00	1.50	-
₩ ¥			tPE	1.00	1.50	-
11			X1FwPP	0.50	7.39	
Ľ			R1PP	0.10	1.48	It was observed that if protected line length is less than 100 km then the
U U			XOPE	6.75	22.17	reactance of Zone RV is 20% of line reactance & Resistive Reach as per NRPC Guidelin
D		ZONE 5	ROPE	0.50	4.43	for REL 670
<u>ب</u> <			RFFWPP	1.00	60.00	IOI KEE 070
a z a			RFFWPE	1.00	75.00	
			tPP	1.00	0.50	-
2 220kv			tPE	1.00	0.50	-
n O			X1InFw	47.23	69.36	-
<u>ٺ</u>			R1L1n	8.58	12.60	-
5		ZPSB	R1F1nFw	22.00	82.50	-
Q		(Power Swing)	RLdOutFw	78.43	74.82	-
::			RLdOutRw	78.43	74.82	-
			KLdRFw	0.59	0.75	-
Ľ		Auto reclose	RREC	Off	ON	-
		Zone 1	R1G	33.87	6.99	80% of the protected line reactance / resistance
		20110 1	R1Ph	25.40	5.24	
			Z2	16.29	22.60	
		Zone 2	R2G	33.87	6.99	For Single CKT:120% and for Double CKT:150% of protected line reactance/resistance
		20116 2	R2Ph	25.88	5.24	
			tZ2	0.35	0.50	-
			Z3	17.52	25.72	
	Distance Main-2	Zone 3	R3G	33.87	6.99	120% of(protected line reactance + remote end longest line reactance)
	Distance wain-2	ZUIIE 5	R3Ph	25.40	5.24	
			tZ3	1.00	1.50	-
			Z4	2.41	1.21	the same share would be a three to share the state of the
		7 4	R4G	33.87	6.99	It was observed that if protected line length is less than 100 km then the
		Zone 4	R4Ph	25.40	5.24	reactance of Zone RV is 20% of line reactance & Resistive Reach
			tZ4	1.00	0.50	-
			Delta R	5.08	1.40	
1		Power Swing	Delta X	5.08	1.40	-

		1				
			X1FwPP	29.55	19.32	
			R1PP	5.91	3.86	80% of the protected line reactance / resistance & Resistive Reach as per NRPC Guideline
		ZONE 1	XOPE	88.68	57.97	for REL 670
			ROPE	17.73	11.59	
			RFFWPP	20.00	30.00	
			X1FwPP	39.94	36.22	
			XOPE	169.33	108.68	For Single CKT:120% and for Double CKT:150% of protected line reactance/resistance
			ROPE	36.70	21.73	Resistive Reach as per NRPC Guidelines for REL 670
		ZONE 2	RFFWPP	20.00	60.00	
			RFFWPE	50.00	75.00	
			tPP	0.35	0.50	-
			tPE	0.35	0.50	-
			X1FwPP	42.94	47.70	
			R1PP	8.58	9.54	
220kV LALITPUR-BABINA CKT#01			XOPE	128.87	143.15	120% of(protected line reactance + remote end longest line reactance) & Resistive Reach
#		ZONE 3	ROPE	36.70	28.62	per NRPC Guidelines for REL 670
	Distance Main-1		RFFWPP	20.00	75.00	
Ŭ	5		RFFWPE	25.76	125.00	
4	r l		tPP	1.00	1.50	-
Ż			tPE	1.00	1.50	-
		ZONE 5	X1FwPP	0.50	4.83	
A I			XOPE	6.75	14.49	It was observed that if protected line length is less than 100 km then the
a a			ROPE	0.50	2.90	reactance of Zone RV is 20% of line reactance & Resistive Reach as per NRPC Guidelin
3			RFFWPP	1.00	60.00	for REL 670
	5		RFFWPE	1.00	75.00	
<u>م</u>	-		tPP	1.00	0.50	-
			tPE	1.00	0.50	-
			X1InFw	47.23	69.36	-
			R1L1n	8.58	12.60	-
>		ZPSB	R1F1nFw	22.00	82.50	-
Í Á		(Power Swing)	RLdOutFw	78.43	74.82	-
20			RLdOutRw	78.43	74.82	-
2	i l		KLdRFw	0.58	0.75	-
		Auto reclose	RREC	Off	ON	-
		Zone 1	R1G	22.86	6.99	80% of the protected line reactance / resistance
		201101	R1Ph	20.32	5.24	
			Z2	13.66	14.77	
		Zone 2	R2G	22.86	6.99	For Single CKT:120% and for Double CKT:150% of protected line reactance/resistance
			R2Ph	20.86	5.24	
			R3G	22.86	6.99	120% of(protected line reactance + remote end longest line reactance)
Dis	Distance Main-2	Zone 3	R3Ph	20.32	5.24	120% of protected line reactance ( remote end longest line reactance)
			tZ3	0.80	1.50	-
			R4G	22.86	6.99	It was observed that if protected line length is less than 100 km then the
		Zone 4	R4Ph	20.32	5.24	reactance of Zone RV is 20% of line reactance & Resistive Reach
			tZ4	1.00	0.50	-
		Dowor Swing	Delta R	4.06	2.80	
		Power Swing	Delta X	4.06	2.80	-

			XOPE	43.30	33.36		
			ROPE	9.23	6.67	For Single CKT:120% and for Double CKT:150% of protected line reactance/resistance &	
		ZONE 2	RFFWPP	20.00	35.58	Resistive Reach as per NRPC Guidelines for REL 670	
			RFFWPE	50.00	40.02		
			X1FwPP	14.82	17.79		
			R1PP	2.96	3.56		
			XOPE	44.49	53.38	120% of(protected line reactance + remote end longest line reactance) & Resistive Reach a	
			ROPE	8.89	10.67	per NRPC Guidelines for REL 670	
		ZONE 3	RFFWPP	20.00	44.47		
			RFFWPE	50.00	66.71		
			tPP	1.00	1.50	-	
2			tPE	1.00	1.50	-	
			X1FwPP	1.19	1.48		
and	Distance Main-1		R1PP	0.24	0.30		
			XOPE	3.56	4.45	It was observed that if protected line length is less than 100 km then the	
-		701/5 5	ROPE	7.11	0.89	reactance of Zone RV is 20% of line reactance & Resistive Reach as per NRPC Guideline	
Ckt		ZONE 5	RFFWPP	7.11	60.00	for REL 670	
υ			RFFWPE	5.33	75.00		
, a			tPP	1.00	0.50	-	
2 7			tPE	1.00	0.50	-	
4 <u>0</u> <u>0</u>		ZPSB (Power Swing)	X1InFw	16.30	19.57	-	
220kv anpura			R1L1n	2.96	3.56	-	
			R1F1nFw	22.00	48.92	-	
a			RLdOutFw	78.43	74.82	-	
¥			RLdOutRw	78.43	74.82	-	
Ľ,			KLdRFw	0.58	0.75	-	
a 220kv Lalitpur-Kalyanpura		Auto reclose	RREC	Off	ON	-	
ij		Zone 1	R1G	33.87	6.99	80% of the protected line reactance / resistance	
al		20110 1	R1Ph	25.40	5.24	80% of the protected line reactance / resistance	
		Zone 2	R2G	33.87	6.99	For Single CKT:120% and for Double CKT:150% of protected line reactance/resistance	
		20110 2	R2Ph	25.40	5.24	Tor single CK1.120% and for Double CK1.130% of protected line reactance/resistance	
			Z3	6.05	7.26		
		Zone 3	R3G	33.87	6.99	120% of(protected line reactance + remote end longest line reactance)	
	Distance Main-2	Zone S	R3Ph	25.40	5.24		
			tZ3	1.00	1.50	-	
			Z4	0.48	0.61	It was observed that if protected line length is less than 100 km then the	
		Zone 4	R4G	33.87	6.99	reactance of Zone RV is 20% of line reactance & Resistive Reach	
		Lone	R4Ph	25.40	5.24		
			tZ4	1.00	0.50	-	
		Power Swing	Delta R	5.08	1.40		
		rower owing	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

#### REPORT OF PROTECTION AUDIT

Elect. Test & Commissioning Division, Agra Elect. Test & Commissioning Sub-Division, 400 KV S/S Agra

-	I	Elect. Test & Commissioning Sub-Division, 400	
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			
TRANSM SUBSTAT		TRANSMISSION SW ZONE AGRA 765KV S/S AGRA						
SUBJECT			S OBSERVED					
REFEREN DATE	CE	10.01.24						
S.No.	BAY NAME/BUS	VOLTAGE	PROTECTION /ELEMENT/ EQUIPMENTS/ SYSTEM AUDITED	SETTINGS	DEFICIENCIES/Non-conformities observed			
					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.			
1	765kV LINES	765KV	765KV LALITPUR CKT 1&2		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%.			
					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.			
2	765kV LINES	765KV	765KV Ghatampur & Gr Noida		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.			
					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.			
3	4006/111055	400/04			Backup directional earth fault setting is 0.1A (pickup), which is not as per the norms.			
5	400kV LINES	400KV	400KV Agra Firozabad		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.			
					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.			
4	400kV LINES	400KV	400KV Agra South 1		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.			
					In Main 1 & Main 2 protection, over voltage protection is Ph-N. But as per guidelines, it should be Ph-Ph.			
5	400kV LINES	400KV	400KV Agra pilipokhar-1		Backup directional over current setting is 1.5A (pickup) at 0.1s DT delay, which is not as per the norms.			
5	100117 21125	10010			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%.			
					In Main 1 & Main 2 protection, over voltage protection is Ph-N. But as per guidelines, it should be Ph-Ph.			
				Settings enclosed	Backup directional over current setting is 1.5A (pickup) at 0.1s DT delay, which is not as per the norms.			
6	400kV LINES	400KV	400KV Agra pilipokhar-2	as annexture A1	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%.			
					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.			
7	400kV LINES	400KV	400KV Manth Mathura 1 & 2		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%.			
					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.			
	1001		40010 / Y		DTPC not commissioned.			
8	400kV LINES	400KV	400KV PG 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) 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%.			
				ł	guidelines, over voltage setting for stage 2 should be 140%. 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 O/C setting IDMT: 0.14A (pickup) at 0.15 TMS & High set at 0.055 DT delay is not as per the norms. Backup HV E/F setting IDMT: 0.11A (pickup) at 0.165 TMS & High set at 0.055 DT delay is not as per the norms.			
<i>c</i>	107	765KV/			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.			
9	ICT	400KV	1500MVA ICT 1 & 2		Backup LV E/F setting IDMT: 0.14A (pickup) at 0.055 TMS & High set at 0.055 DT delay is not as per the norms.			
			I	I.				

				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.
			DRODAVAD ZCEIOU - literus 48.2	REF setting is 18A primary pickup current which is not as per the norms
10	REACTOR	765KV	3*80MVAR 765KV Lalitpur 1&2 line reactor	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 R relay.
	DEACTOR	765107	3*80MVAR 765KV Gr. Noida &	REF setting is 15A (in Ghatampur), 18A (in Gr. Noida) primary pickup current which is not as per the norms.
11	REACTOR	765KV	Ghatampur line reactor	As secondary settings are more reliable as compared to primary values. Thus, implementation of secondary settings must be done in R relay.
				REF setting is 27A primary pickup current which is not as per the norms
12	REACTOR	765KV	3*80MVAR 765KV BUS reactor	As secondary settings are more reliable as compared to primary values. Thus, implementation of secondary settings must be done in Ri relay.
		400KV		REF setting is 12A primary pickup current which is not as per the norms.
13	REACTOR		125MVAR 400KV Bus reactor	As secondary settings are more reliable as compared to primary values. Thus, implementation of secondary settings must be done in R 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
			DC E/F	NO (+ve to earth=115.1V & -ve to earth = 115.8V
16	DC Status		BATTERIES	Battery no 61 in battery bank no 1 is defective.
			CHARGERS	HEALTHY
	ANALYSIS OF	NO OF FI	EMENTS TRIPPED MORE THAN 2 TIM	IN MONTH NO OF ELEMENTS TRIPPED MORE THAN 2 TIMES IN A MONTH = 0
17	TRIPPINGS FROM JULY		MULTIPLE TRIPPINGS	MULTIPLE TRIPPINGS=0
	2023		TRIPPINGS UNEXPLAINED	TRIPPINGS UNEXPLAINED=1
			STATUS OF SPS	SPS INSTALLED AT LALITPUR END
	SPS/CB/CT/CVT		STSTUS OF CB TESTING	CHECKED IN R/T AND FOUND OK(not tested through CB Analyser)
18	/SEL		STSTUS OF CT/CVT	
			STSTUS OF CI/CVI	OK(SCADA)

#### 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
1	200 KV OKALENE	BUS BAR not available hense ZONE 4 Setting is 160 mS	BUS BAR Pannel requirement sent to design circle by transmission wing
		Backup Non Directional O/C setting is 5 Amp at 0 DT Delay	Settings Updated as per norms
2	220 KV TBC	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
		REF relay is found in Hang Position in both Tranformers	Inform to Transmission wing for resolve the relay hanging problem
3		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
4	132 KV BAH 155	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
5	152 KV FATEHBAD 155	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	<b>Deficiencies Found</b>	Action Taken
			Main 2 relay is Defective.	Card damage & Informed to Trans. wing.
			Autoreclose is unhealthy.	PLCC prot.Pannel not commissioned.Informed to Trans.Wing
1		220KV FZD-MNP PG LINE	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
			Carrier and DTPC unhealthy.	Informed to Trans. Wing & PJFTL.
2			Autoreclose is unhealthy.	PLCC & DTPC Unhealthy.Informed to Trans. Wing & PJFTL.
2		220KV FZD-FZD(400kV) PJFTL LINE	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	220kV S/S FIROZABAD	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
			TMS in IDMT E/F is 0.15s it should be 0.24s as per the Norms.	Settings Updated as per Norms
6		132KV TUNDLA LINE	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.
			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
8		220kV SRGJ-MNP UPPTCL LINE	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
			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
9		220kV SRGJ-MNP PGCIL LINE	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
	220kV S/S SIRSAGANJ		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
		1001177 1/1-1	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

1 1		100101 7 17 1/1 -11		1
			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
			IDMT E/F is set at 0.4A pu@TMS0.35s.It should be0.2A as per Norms.	Settings Updated as per Norms
		132kV BUS-COUPLER	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
			VTFF is ON with 1s delay in M1 relay. It should be 5s as per the Norms.	Settings Updated as per Norms
12			E/F is not enabled in both M1 & M2 relays.	Settings Updated as per Norms
12		220kV TUNDLA- AGRA PG LINE	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
		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
13	220kV S/S TUNDLA		E/F is not enabled in both M1 & M2 relays.	Settings Updated as per Norms
15			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			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
	5		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	
-	100001111111	High Set in o/c & E/F Relay is 0.3s Which must be 0.25s as per Norms	Settings Updated as per Norms	
		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	
4	160MVA T/F II	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	
5		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	
0	10211 + 11000 2	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	
,	05 WIVA 1/1	Differential pickup current is 0.13A which is not as per the Norms	Settings Updated as per Norms	
8	33 ky 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	
0		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.
2	220 KV Agia 1st & 2liu	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
2		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
/	152KV Kailway I	Bus PT is used in protection	Line PT connected
8	132KV Railway 2	Bus PT is used in protection	Line PT connected
0	152K ( Kaliway 2	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			
			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				
1	ETD-I Aligarh	220kV S/S Boner	Circuit Breaker	Found healthy and testing is not done in yaer 2023	To be done by Transmission wing. Informed to transmission wing.				
			220kv Aligarh-I line	Backup E/F Found desable. A/R dead Time found 0.6 sec. whereas it should be 1.0 sec	Backup E/F is make Enabled. A/R dead time is changed to 1.0 sec as per SOP.				
			220kv Aligarh-II line	Backup E/F Found desable. A/R dead Time found 0.6 sec. whereas it should be 1.0 sec	Backup E/F is make Enabled. A/R dead time is changed to 1.0 sec as per SOP.				
	ETD-II Aligarh	220kV S/S Sikandrarao	220kv Harduaganj line	Backup E/F Found desable. A/R dead Time found 0.6 sec. whereas it should be 1.0 sec	Backup E/F is make Enabled. A/R dead time is changed to 1.0 sec as per SOP.				
2			220kv Kasganj line	Backup E/F Found desable. A/R dead Time found 0.6 sec. whereas it should be 1.0 sec	Backup E/F is make Enabled. 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
			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				
		220 KV	GPS CLOCK	Healthy But Relay is not Synchronised	Relays are Synchronised to GPS				
3	ETD-1 ALIGARH	SUBSTATION KHAIR	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)				

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			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					
		220 KV HDJ LINE	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.					
			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					
		220 KV NAPP LINE	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		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					
ETD-2 ALIGARH	SUBSTATION ATRAULI	220 KV ALIGARH-1 LINE	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					
			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					
		220 KV ALIGARH-2 LINI	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.					
		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.	-	-				
				-	-				
		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			
400KV Aligarh	400KV 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
		ETD-2 ALIGARH SUBSTATION ATRAULI	ETD-2 ALIGARH 220 KV SUBSTATION ATRAULI 220 KV ALIGARH-1 LINE 220 KV ALIGARH-2 LINE 220 KV ALIGARH-2 LINE Circuit Breaker GPS Clock GPS Clock 6PS Clock 6PS Clock 7PLCC 220KV Khair PLCC 220KV Khair PLCC 220KV Khair PLCC 220KV Sikandra Rao-1 PLCC 220KV Sikandra Rao-1 PLCC 220KV Sikandra Rao-1 PLCC 220KV Sikandra Rao-2 PLCC 220KV Atrauli-1 PLCC 220KV Atrauli-1 PLCC 220KV Atrauli-1 PLCC 220KV Atrauli-2 500 MVA ICT-1	400KV Aligarh       400KV Aligarh         400KV Aligarh       400KV Aligarh         400KV Aligarh       400KV Aligarh         400KV Aligarh       400KV Aligarh         400KV Aligarh       400KV Aligarh	400K V Aligarh         400K V Aligarh         220 KV HDJ LINE				

			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													
			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	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													
6	ETD-Mainpuri	SUBSTATION Mainpuri	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													
		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													
7	ETD-Mainnuri			Main-II (Dist. Prot.)Relay Required as Par Prot. Scheme in Both 220 KV Line	To be done by Trasmission wing. Inform to Transmission													
/	ETD-Mainpuri		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.													
			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													
8	ETD-Mainpuri	220 KV SUBSTATION	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													
1		Kasgani (Soron)																

אסאפוון (אסיטיון)	160 M/VA T/E_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 Undated As nar 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

S.NO.	<b>Protection Element</b>	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	
	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	

#### Name of S/S - 220KV Phoolbagh

#### Electy . Test & Commissioning Division - I Panki , Knapur

## Name of S/S - 220KV Sikandara

S.NO.	<b>Protection Element</b>	Deficiencies Found	Action Taken
		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.
1	220 KV ORAI LINE	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.
		PLCC DEFECTIVE/CARRIER PROTECTION UNHEALTHY	Panel is there but not commissioned. Informed to Maintenance wing for commissioning of it.
2	2 220KV PG (Bhauti) LINE	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/EQUIP MENTS/SYSTEM AUDITED	DIFFICIENCIES/NON-CONFORMITIES OBSERVED	STATUS OF REMEDIAL ACTION.		
					Both main1 & main2 protection relay have Siemens 7SA611 relay.	Information for differentiate the both M1 & M2 relay with different make conveyed to transmission wing.	
1	400 KV BAYS	400 KV	400 KV 400 KV Aligarh	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.		
				Backup Earth Fault protection disabled in both Main1 & Main2 relays.	Backup Earth Fault protection setting is now enabled in Main1 relay.		
2	400 KV BAYS	400 KV	400 KV Rewa Road	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.		
				Backup Earth Fault protection disabled in both Main1 & Main2 relays.	Backup Earth Fault protection setting is now enabled in Main1 relay.		
3	400 KV BAYS	400 KV	400 KV Unnao	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 ICT	400/220KV 400/220KV	500 MVA ICT-1 315 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	EQUIPM	ENTS/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			
		Number of eleme	ents tripped more than 2 times in a month	o			
12 A	ANALYSIS OF TRIPPING FROM JULY 2023	1	Multiple trippings	2			
		Tri	ipping Un-explained	0			
13 SPS/CB/CT/			Status of SPS	Not Available			
	SPS/CB/CT/CVT/SEL	SPS/CB/CT/CVT/SEL	SPS/CB/CT/CVT/SEL	S	itatus 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.	<ul> <li>(a). For replacement of PIR CB to Non-PIR CB in both ICTs conveyed to transmission wing.</li> <li>(b). Information for performing CBs timing conveyed to transmission wing.</li> </ul>
			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.		

### 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) L		AR Disable	There is 220 KV HT Cable used in Line,
2	220 KV kkidwai nnagar Panki line Line	AR Disable	therefore 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,
2	220 KVMetro line-2	AR Disable	therefore 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	
3	220 KV Kidwai nagar line	AR Disable	
4	220 kv kanpur South Line	AR Disable	all O/c & E/F Relay needs to replaced by
5	220 KV Bithoor Line	AR Disable	main 2 (distance relay) After installation of Relays AR Wiil be Enable. Work in Progress
6	220 kv RPH Line	AR Disable	
7	220 kV Chibra mau Line	AR Disable	

# Electy . Test & Commissioning Division - I Panki , Knapur

# Name of S/S - 220KV Rania

S.NO.	<b>Protection Element</b>	Deficiencies Found	Action Taken
		PLCC DEFECTIVE/CARRIER PROTECTION UNHEALTHY	Informed to Maintenance wing for replacement of PLCC panel
1	220 KV Rania-Panki LINE	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.
		PLCC DEFECTIVE/CARRIER PROTECTION UNHEALTHY	Informed to Maintenance wing for replacement of PLCC panel
2	220KV PG (Bhauti) LINE	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	

Electy . Test & Commissioning Division - I Panki , Knapur

## Name of S/S - 220KV RPH

S.NO.	Protection Element	Deficiencies Found	Action Taken
	220 KV PANKI LINE	CARRIER PROTECTION UNHEALTHY	Due to defective PLCC panel.Informed to Maintenance wing for replacement of PLCC panel
1		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
	220 KV UNNAO LINE	CARRIER PROTECTION UNHEALTHY	Due to defective PLCC panel.Informed to Maintenance wing for replacement of PLCC panel
2		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	/5	Chhibramau
220	1. 1. 2	15	Chingrania

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		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 FARRUKHABAD	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
5.NU.	Protection Element		
1	220KV Kanpur South -	No, deiciencies found	Settings Updated as per L. N. 237ET&CC(G) Dated 26.04.2024
1	Fathehpur (PGCIL) line	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	No, deiciencies found	Settings Updated as per L. N. 237ET&CC(G) Dated 26.04.2024
2	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
	60 MVA T/F II	No, deiciencies found	Settings Updated as per L. N. 237ET&CC(G) Dated 26.04.2024
4		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

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	No, deiciencies found	Settings Updated as per L. N. 237ET&CC(G) Dated 26.04.2024
1	(PGCIL) Line	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	No, deiciencies found	Settings Updated as per L. N. 237ET&CC(G) Dated 26.04.2024
2	(PGCIL) Line	No, deiciencies found	Settings Updated as per L. N. 237ET&CC(G) Dated 26.04.2024
		REF relay is faulty	To be inform E.E. ETD-II, Govind Nagar, Kanpur Nagar
3	160 MVA T/F I	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
		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

# 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
1		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	No, deiciencies found	Settings Updated as per L. N. 237ET&CC(G) Dated 26.04.2024
Ĩ	(PGCIL) line I	No, deiciencies found	Settings Updated as per L. N. 237ET&CC(G) Dated 26.04.2024
2	220KVSarh - Fathehpur	No, deiciencies found	Settings Updated as per L. N. 237ET&CC(G) Dated 26.04.2024
L	(PGCIL) line II	No, deiciencies found	Settings Updated as per L. N. 237ET&CC(G) Dated 26.04.2024
	160 MVA T/F I	No, deiciencies found	Settings Updated as per L. N. 237ET&CC(G) Dated 26.04.2024
3		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

## MATHURA DIVISION

TRAN	SMISSION	TRANSMISSION SW ZONE AGRA							
SUBS	TATION	220 KV S/S	Chhata						
SUBJ	ECT	DEFICIENCI	ES OBSETVED						
REFE	RENCE								
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	Auto reclose is not working in 220kv manth & 220 vrindavan line				
2	220KV BAYS	220KV	220 KV MANT	annexure A-1	Main -II distance protection required as per prot scheme for 220kv Manth & Vrinda	It has been intimated to Tranmission wing to replace relay panel and A/R wiil be enable in new panel			

		PROTECTION AUDIT				
	ISMISSION	TRANSMISS		ONE AGRA		
	TATION	220 KV S/S (				
SUBJ	ECT RENCE	DEFICIENCIE	S OBSETV	ED		
DATE						
5.100	BAY NAME /BUS	VOLTAGE		SETTINGS	DEFICIENCIES/Non-conformities observed	Action taken/Remarks
1	220KV BAYS	220KV	220 KV AGRA	52111105	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
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. 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	additional high set setting of E/F is disable as per norms Zone 4 trip delay time corrected as per noms and VT FF Also Corrected 5 sec as per norms.
					per the norms. 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
3	220KV/132KV T/F	220KV/132 KV	160 MVA T/F 1	Settings enclosed as annexure A-1	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.
			//132 160 MVA V 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
4	220KV/132KV T/F	220KV/132 KV			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	EQ	UIPMENT	S/SYSTEM AUDITED	status observed	REMARK EXN
<u> </u>		1	DC E/F		NO (- ve to earth-63.5V while +ve to earth Is 54.8V)	
6	DC	DC Status		BATTERIES	HEALTHY	
Ē				CHARGERS	HEALTHY	
7	7 ANALYSIS OF TRIPPINGS FROM JULY 2023		NO OF ELEMENTS TRIPPED MORE THAN 2 TIMES IN A MONTH	0		
			MULTIPLE TRIPINGS	0 NA		
				STATUS OF SPS		
8	SPS/CB/	/CT/CVT/SEL		STATUS OF CB TESTING STATUS OF CT / CVT	CHECKED IN R/T AND FOUND OK(not tested through CB Analyser) OK	
1	1			STATUS OF CL/CVI STATUS OF SEL	OK OK(SCADA)	
9				vations made in previous	Not available	
	protection audit (Internal/Third party)			,		

					PROTECTION AUDIT	
TRAN	SMISSION	TRANSMISS				
	ATION	220 KV S/S		UNE AGRA		
SUBJE	ст	DEFICIENCI		/ED		
REFER	ENCE					
DATE S.NO.	BAY NAME /BUS		1	0577711000		Anting Astrony (Demonstra
1	220KV BAYS	VOLTAGE 220KV	220 KV Sikandra	SETTINGS	DEFICIENCIES/Non-conformities observed No E/F stage active found in either M1 or M2, So, during audit, IDMT E/F has been enable in M2 relay.	Action taken/Remarks 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.
					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
4	220KV/132KV T/F	220KV/132 KV	100 MVA- I&II		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.
				Settings enclosed as	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	annexure A-1	There is no 160MVA T/F at 2	120kV S/S Kiraoli
6	132KV/33KV T/F	132KV/33K V 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 Fatehpu r Sikri		TMS in IDMT E/F stage found @ 0.25. As per it should be 0.24S	Settings updated as per norms.
				-	CTR 220/1 must be reviewed and corrected as per actual field CTR.	Settings updated as per norms.
10	132 KV BAY	132 KV	132 KV BC		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	EQ	UIPMENT	S/SYSTEM AUDITED	status observed	REMARK EXN
6	DC St	atus		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)
0	DC SI	atus		BATTERIES	HEALTHY	
				CHARGERS	HEALTHY	
7	ANALYSIS OF TRIPPIN	GS FROM JL	JLY 2023	NO OF ELEMENTS TRIPPED MORE THAN 2 TIMES IN A MONTH MULTIPLE TRIPINGS		
				TRIPPINGS UNEXPLAINED		
				STATUS OF SPS STATUS OF CB TESTING	NA CHECKED IN R/T AND FOUND OK(not tested through CB Analyser)	
8	SPS/CB/CT	CVT/SEL		STATUS OF CT / CVT	OK	
9		aken on the ction audit (		STATUS OF SEL tions made in previous hird party)	OK(SCADA) Not available	

					PROTECTION AUDIT	
TRAN	ISMISSION	TRANSMISSION	W ZONE AGRA			
SUBS	TATION	220 KV S/S mant				
SUBJ		DEFICIENCIES OB	SETVED			
	RENCE					
DATE						
S.NO	BAY NAME /BUS	VOLTAGE		SETTINGS	DEFICIENCIES/Non-conformities observed	Action taken/Remarks
1	220KV BAYS	220KV	220 KV MANT		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	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	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/SYSTE	M AUDITED	status observed	REMARK EXN
				DC E/F	NO (- ve to earth-62.5V while +ve to earth Is 65.8V)	
6		DC Status		BATTERIES	HEALTHY	
				CHARGERS	HEALTHY	
7	ANALYSIS	OF TRIPPINGS FR	DM JULY 2023	NO OF ELEMENTS TRIPPED MORE THAN 2 TIMES IN A MONTH	0	
				MULTIPLE TRIPINGS	0	
				TRIPPINGS UNEXPLAINED	0	
				STATUS OF SPS	0	
8		SPS/CB/CT/CVT/	SEL	STATUS OF CB TESTING	0	
-		,,,,,,,,,		STATUS OF CT / CVT	0	
	l			STATUS OF SEL	0	
9	Remedial actio		seervations made in ernal/Third party)	previous protection audit	Not available	

					PROTECTION AUDIT	
	SMISSION		SION SW ZONE AGRA			
_	TATION	220 KV S/S				
SUBJ	RENCE	DEFICIENCI	ES OBSETVED			
DATE						
S.NO	BAY NAME /BUS	VOLTAGE		SETTINGS	DEFICIENCIES/Non-conformities observed	Action taken/Remarks
1	220KV BAYS	220KV	220 KV Meetai - Maant line		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	Settings enclosed	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	Action taken/Remarks  Action taken/Remarks  These settings are calculated by PGCIL and there is no false tripping history.  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.  REMARK EXN  REMARK EXN  REMARK EXN  REMARK EXN
TRAN	SMISSION	TRANSMISSION	SW ZONE AGRA			
SUBS	ATION	400 KV S/S Agra	South			
SUBJE	СТ	DEFICIENCIES O				
REFER	ENCE					
DATE						
S.NO.	BAY NAME /BUS	VOLTAGE		SETTINGS	DEFICIENCIES/Non-conformities observed	Action taken/Remarks
1	400KV BAYS	400KV	400 KV Firozabad		As given in the protection audit sheet	
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	These settings are calculated by PGCIL and there is no false tripping history.         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.         REMARK EXN         Image: Comparison of the setting set tripping history.
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	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.  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.  REMARK EXN  110V)  REMARK EXN
7	132 KV BAY	132 KV	132 KV Bodla, Kheragarh 1, Mathura, Gwalior road , Agra cant		As given in the protection audit sheet	
8	132 KV BAY	132 KV	132 KV Bodla, Kheragarh 2		As given in the protection audit sheet	These settings are calculated by PGCIL and there is no false
9	132 KV BAY	132 KV	132KV Railway		As given in the protection audit sheet	
S.NO.	BAY NAME /BUS		EQUIPMENTS/SYSTEM AU	DITED	status observed	REMARK EXN
	· · ·	•		DC E/F	No (- ve to earth-115 V while +ve to earth Is 110V)	
9		DC Stat	us	BATTERIES	HEALTHY (All Dry Cells)	
				CHARGERS	HEALTHY	
				NO OF ELEMENTS TRIPPED		
				MORE THAN 2 TIMES IN A	0	
10	ANALY	SIS OF TRIPPING	5 FROM JULY 2023	MONTH		
				MULTIPLE TRIPINGS	0	
				TRIPPINGS UNEXPLAINED		
11		SPS/CB/CT/C	`VT/SFI	STATUS OF SPS	NA CHECKED IN R/T AND FOUND OK(not tested through CB Analyser)	
		5, 5, 65, 61, 61, 6		STATUS OF CT / CVT	ОК	
	Demedial estimate			STATUS OF SEL	OK(SCADA)	
12	Remedial action ta	ken on the obsec	ervations made in previous prote party)	ction audit (Internal/Third	Enclosed as annexure in sheet A2	

#### **Protection audit** Details of relays Settings of ict's of 400 ky 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.

	S. Name of Discri N. Substation	_	1 Azamgarh Sequential	SPS at 220	LBB Protec 1, 160MVA	2 Azamgarh-1 Azamgarh-								C N V	220 KV S/S Azamgarh-2 (Badgahan)	220 KV S/S Azamgarh-2 (Badgahan)
STATUS OF ACTI	Discripencies as per Internal Protection Audit Report	CB Testing not done in 2023	Sequential Event logger is installed but not working.	SPS at 220 KV S/S Azamgarh is not provided	LBB Protection Relays are not provided at 160MVA ICT- 1, 160MVA ICT-2 & 200MVA ICT	PLCC Channel Link not commissioned at 220 KV Azamgarh-Harhua Line	PLCC Channel not working at 220 KV Azamgarh- Jaunpur Line		No CB Testing done in Year-2023	No CB Testing done in Year-2023 Sequential Event logger is not installed.	No CB Testing done in Year-2023 Sequential Event logger is not installed. LBB Protection Relays are not provided at 160MVA ICT- 1, 160MVA ICT-2 & 200MVA ICT	No CB Testing done in Year-2023 Sequential Event logger is not installed. LBB Protection Relays are not provided at 160MVA ICT- 1, 160MVA ICT-2 & 200MVA ICT 1, 160MVA ICT-2 & 200MVA ICT Line		VA ICT- arnath	oMVA ICT- -Sarnath	oMVA ICT- -Sarnath CT
STATUS OF ACTION BEING TAKEN OF INTERNAL PROTECTION AUDIT REPORT OF YEAR 2024	Action Taken by T&C	N/A	N/A	Scheme available at 400 KV S/S Azamgarh for tripping at 220 KV S/S Azamagarh.	NIA	N/A	PLCC panel is healthy at 220KV Azamgarh end	and not healthy at 220KV Jaunpur end	and not healthy at 220KV Jaunpur end N/A	and not healthy at 220KV Jaunpur end N/A	and not healthy at 220KV Jaunpur end N/A N/A	and not healthy at 220KV Jaunpur end N/A N/A	and not healthy at 220KV Jaunpur end N/A N/A N/A , N/A Relay is available but not commissioned	and	nd	and
ON AUDIT REPORT OF YEAR 2024	Action Taken by Transmission	It is scheduled in upcomming Shutdowns	troubleshooting of event logger has been completed on 05-09-2024	r Scheme available at 400 KV S/S Azamgarh for tripping at 220 KV S/S Azamagarh.	Requirement of LBB panel has been sent	Line is operated radially PLCC panel for Haruha Line is available at Azamgath End but its pair is not available Haruha End		<ul> <li>PLCC panel is healthy at 220KV Azamgarh end and not healthy at 220KV Jaunpur end</li> </ul>		100						
18109124	Remark			2 1 2 2 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1				Under scope TSC	Under scope TSC	Under scope TSC	Under scope TSC	Under scope TSC To be taken up by transmission/Microwave	Under scope TSC To be taken up by transmission/Microwave To be taken up by transmission.	Under scope TSC To be taken up by transmission/Microwave To be taken up by transmission.	Under scope TSC To be taken up by transmission/Microwave To be taken up by transmission. To be taken up by transmission.	Under scope TSC To be taken up by transmission/Microwave To be taken up by transmission. To be taken up by transmission.

Continued

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Electricity Test & Commissioning Circle, Gorakhpur

GORAKHPUR ZONE

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ALLAND.

	Inbuilt in SCADA system (SAS S/S)	NA	Sequential Event logger is not installed.		
	DRs are being checked for relay trip time. CBs of relays with high tripping time will be tested	NA	No CB Testing done in Year-2023	400 KV S/S Rasara (GIS)	ch
	Approval for SPS logic will be sent to SLDC at earliest.	NIA	SPS at 400 KV S/S Rasara (GIS) is not provided		
	Purchase Order has been placed to M/S GE T&D India Ltd, Service engineer visit	Software updation is required.	Sequential Event logger records only alarms & not updating events		
	<ul> <li>(1) CB testing of 400kV ICT 3rd done on date.</li> <li>(2) CB testing of 400kV ICT 3rd done on date.</li> <li>(3) CB testing of 400kV ICT 1st done on dt.</li> <li>(3) CB testing of 400kV ICT 1st done on dt.</li> <li>(4) CB testing of 400kV ICT 2nd done on dt.</li> <li>(5) CB testing of 400kV Anpara L6 line done on dt.</li> <li>(6) CB testing of 400kV Anpara L6 line done on dt.</li> <li>(7) 04.2024.</li> <li>(6) CB testing of 400kV Anpara L6 line done on dt.</li> <li>(7) 08.04.2024.</li> <li>(8) CB testing of 400kV Anpara L6 line done on dt.</li> <li>(9) CB testing of 400kV Anpara L6 line done on dt.</li> <li>(9) CB testing of 400kV TBC bay done on dt.</li> <li>(9) CB testing of anti-08.04.2024.</li> <li>(9) CB testing anti-08.04.2024.</li> </ul>	N/A	CB Testing was not done in Year-2023 except 400 KV Azamgarh Line		
	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.	400 KV Mau-PGCIL (Ballia) Line Relay is not time sync.		-
	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.	PLCC Channel -2 Make BPL is Defective since 2017 (DTPC not Available due to OPGW)	PLCC Ghannel-2 is not healthy at 400 KV Mau-Anpara Line	400 KV S/S Kasara, Mau	4
	NIA	M-1 Prot. Is on PLCC & M-2 Prot. is on DTPC. (DTPC Commissioned)	PLCC Channel-2 is not healthy at 400 KV Mau- Azamgarh Line		
	NIA	Now sync. Through eathernet cable.	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.		
	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.	NA	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		
	PR for relay panel has been created at division level . PR No. is 103000193	NIA	LBB Prot Relays of All 400KV Lines are Non-Numerical		-
Remark	Action Taken by Transmission	Action Taken by T&C	Discripencies as per Internal Protection Audit Report	Substation	Z

Continued

							on.			Z (O
- 14 - 14 - 14 - 14 - 14 - 14 - 14 - 14							220 KV S/S Rasara (AIS)			Name of Substation
		Bus bar Protection is not Provided	Sequential Event logger is not installed	SPS at 220 KV S/S Rasara (AIS) is not provided.	No CB Testing done in Year-2023	REF protection are not Provid MVA ICT-1 & 160MVA ICT-2	LBB Protection Relays are not provided at 2No 220/132KV 160MVA ICT-1 &160MVA ICT-2	A/R in M-1 Protection is not configur at 220 KV Rasara-Rasara(400) Line	AVR in M-1 Protection is not co at 220 KV Rasara-Deoría Line	Discripencies as Auc
		Provided.	s not installed.	ra (AIS) is not provided.	ear-2023	ovided at 2No. 220/132KV 16 T-2	re not provided at 2No. 1 & 160MVA ICT-2	A/R in M-1 Protection is not configurable & not working at 220 KV Rasara-Rasara(400) Line	A/R in M-1 Protection is not configurable & not working at 220 KV Rasara-Deoria Line	Discripencies as per Internal Protection Audit Report
						REF Prot.				
		N/A	NA	NIA	NIA	REF protection are not Provided at 2No. 220/132KV 160 Turret CT not installed in both ICTs to enable MVA ICT-1 & 160MVA ICT-2 REF Prot.	N/A	N/A	N/A	Action Taken by T&C
		Not in scheme as 220KV S/S has one Main Bus and one transfer bus.	Inbuilt in SCADA system (SAS S/S)	SPS is not provided since Load at 220KV S/S Rasara is less tha 50%.	DRs are being checked for relay trip time. CBs of relays with high tripping time will be tested.		Requirement for LBB protection relays has been sent to HQ, it will be configured after the allotment.	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.	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.	Action Taken by Transmission
						To be taken up by transmission.				Remark
	Continued						19 1			

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	Requirement of Event Logger panel has been sent to Idestan circle. After receiving it will be installed	NIA	Sequential Event Logger is not installed		-
	CE testing of some breakers has been done in the month of auguest 2024 remaining CB testing will be done as per availability of shut down	* N/A	No CB testing done in year 2023		
No SPS installed till date To be taken up by transmission	Requirement of SPS panel is being sent. After receiving it will be installed.	N/A	SPS at 220KV S/S Basti (AtS) is not provided		
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.	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.	N/A	No PLCC Channel is working and Auto-reclose function not working	220 KV S/S Basti (AIS)	N
	Requirement of distance protection panel has been sent to design circle. After receiving it will be replaced.	N/A	Backup Protection relay of 220KV Basti-Tanda line is Electromechanical type		
	Inbuilt in SCADA system (SAS S/S)	N/A	Sequential Event Logger is not installed		
	In month of May 2024, CB testing has been done	N/A	No CB testing done in year 2023		_
No SPS installed till date.	Requirement of SPS panel is being sent. After receiving it will be installed.	N/A	SPS at 400KV S/S Basti is not provided		
	LBB Protection provided.	N/A	LBB protection are not provided at 2 No. 400/220/33KV 500 MVA Transformers, 2 No. 220/132/11KV 200 MVA Transformers		
T&C To be taken up by Transmission		N/A	Routine testing is not done of 400 Kv Basti- Gorakhpur ckt-1 in 2023	0.7	
power tech Pvt Ltd Sec-63 Noida under supervision of Transmission & in presence of	shutdown in this year	NIA	Routine testing is not done of 400 KV Basti-Tanda ckt-2 in 2023		
Routine testing was in scope of M/S Elite	Routine testing was not done due to unavailability of shutdown it will be caaried out as per availability of	N/A	Routine testing is not done of 400 KV Basti-Tanda ckt-1 in 2023	Basti	-
Either PLCC/DTPC may be .To be taken up by Transmission/Microwave	Construction of line is done by ETD Gonda. Installation of DTPC in the scope of ETD Gonda.	NIA	PLCC Link/DTPC not available at 220 KV Basti(4)- Gonda ckt-II		_
Either PLCC/DTPC may be installed To be taken up by Transmission/Microwave	Installation of OPGW is in progress. After completion of OPGW laying work DTPC will be taken in service.	N/A	PLCC Link/DTPC not available at 220 KV Basti(4)- Gonda ckt-I	0.7	
Either PLCC/DTPC may be installed To be taken up by Transmission/Microwave	Installation of OPGW is pending After completion of OPGW laying work DTPC will be taken in service.	N/A	PLCC Link/DTPC not available at 220 KV Basti(4)- Basti(2) line		
	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.	N/A	Only one PLCC channel working at 400 KV Basti- Gorakhpur ckt-2		
Remark	Action Taken by Transmission	Action Taken by T&C	Discripencies as per Internal Protection Audit Report	Name of Substation	S.N.
	ET&C Division, Basti	EEING TAKEN OF INTERNAL P	STATUS OF ACTION		
			2		

						220 KV S/S Dulhipar	220 KV S/S Dulhipar	220 KV S/S Dulhipar	220 KV S/S Dulhipar	220 KV S/S Dulhipar	Bansi 220 KV S/S Dulhipar	220 KV S/S Bansi 220 KV S/S Dulhipar	220 KV S/S Bansi 220 KV S/S Dulhipar	220 KV S/S Bansi 220 KV S/S Dulhipar	220 KV S/S Bansi 220 KV S/S Dulhipar	220 KV S/S Bansi 220 KV S/S Dulhipar	220 KV S/S Bansi 220 KV S/S Dulhipar
Sequential Event Logger is not installed	No CB testing done in year 2023	SPS at 220KV S/S Dulhipar(AIS) is not provided	A/R not working at 220 KV Dulhipar-Basti (4)ckt-1	A/R not working at 220 KV Dulhipar-Basti(4) ckt-2	DTPC not Provided and A/R Not working at 220 KV Dulhipar-Gorakhpur(PG) line	DTPC not Provided and A/R Not working at 220 KV Dulhipar-Bansi line	Sequential Event Logger is not installed	No CB testing done in year 2023	SPS at 220KV Bansi(AIS) Substation is not provided	DC Earth fault observed at time of audit		DTPC not installed at 220 KV Bansi-Basti(220 KV) line	DTPC not installed at 220 KV/Bansi-PGCIL line		M1 and Backup relays are not time Sync at 220 KV Bansi-Basti line	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	Relays of 2 No. 220/132KV 160MVA Transformers are not time sync 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
NIA	NIA	N/A	A/R is working, checked by T&C on dated 03.09.2024 during Shutdown.	A/R will be checked by T&C as per availability of shut down.	A/R is not working which is checkéd 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 working cheked by T&C on dated 03.09.2024 DTPC is not provided.	N/A	N/A	N/A	Source-I +VE To E 116 3 -VE To E 3.08 V Source-II +VE To E 71 8 -VE To E 42.2 V	Current status	NIA	N/A			GPS clock is defective	GPS clock is defective
Inbuilt in SCADA system (SAS S/S)	CB testing will be done in upcoming months	Requirement of SPS panel is being sent . After receiving it No SPS installed till date. To be taken up by will be installed.	A/R is working, checked by T&C on dated 03.09.2024 during Shutdown.	A/R will be checked by T&C as per availability of shutdown	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 availability of shut down. DTPC has been installed after t installation of OPGW at connecting transmission lines DTPC will be taken in service	DTPC has been installed atter 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	Inbuilt in SCADA system (SAS S/S)	CB testing equipment is not available. Third party firm for CB testing has been contacted	Requirement is being sent, after receiving it will be installed	DC Earth fault is being detected and shall be resolved shortly		CTL C respondentation of the company source	TTDC Bequirement to ECCDC is being sent			spair	
Contented		It No SPS installed till date. To be taken up by transmission			To be taken by Transmission/Microwave. Line is only charged to LILO portion from Duihipar end.	To be taken by Transmission/Microwave (Line is only charged to LILO portion from 220 KV Dulhipar end.)			No SPS installed till date. To be taken up by transmission								

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KUSHINAGAR		220 KV S/S			Maharaigani	200 KV SIS	Anand Nagar	220 KV S/S				Deona	220KV S/S				0005	ZZUKV SIS	200001 010				BARAHUWA	220KV S/S		Name of Substation	
SPS at 220KV S/S Hata is not provided	induines are not provided with carrier protection	all lines are not provided with device protection	the lines/Transformers/busbar are not time	Sequential event logger is not installed	CB Testing is not done in year 2023	SPS at 220KV S/S Maharajganj is not provided	Sequential event logger is not installed	SPS at 220KV S/S Anand Nagar is not provided	Sequential event logger is not installed	CB Testing is not done in year 2023	SPS at 220KV Deona S/S is not provided	DTPC not healty and AR not working at 220KV Deone-Hata okt-II	DTPC not healty and AR not working at 220KV Deoria-Hata ckt-I	PLCC channel not healthy and AR not working at 220KV Deoria-Gorakhpur line	DTPC not healty and AR not working at 220 KV Deoria- Rasara (AtS) line	Sequential event logger is not installed	SPS at 220KV S/S Gola is not provided	CB Testing is not done in year 2023	Relays of all the lines/Transformers are not time synchronised.	Sequential event logger is not installed	SPS at 220KV S/S Barahuwa is not provided	Backup Protection relay of 220KV Barahua-PGCIL line Is Electromechanical type	A/R on all 4 lines are not working *	All the 4 lines are provided with PLCC links are old and defective not working	Relays of all the lines/Transformers/busbar are not time synchronised.	Discripencies as per Internal Protection Audit Report	SIAIUS
NA	NIA	are not the synchronised.	Although GPS clock on S/S is healthy, stil relays	N/A	NIA	NIA	N/A	N/A	N/A	N/A	N/A	NIA	N/A	Card defective	N/A	N/A	NIA	N/A	Defective GPS Clock has been changed. Now all relays are time sync. <sup>®</sup>	N/A	NJA	NIA	A/R is working on 220KV Barhuwa-Khorabar line	DTPC on 220KV Barhuwa-Khorabar line is working	Although GPS clock on S/s is healthy, still relays are not time synchronised.	Action Taken by T&C	STATUS OF ACTION BEING FACTOR OF VEAR 2024 ETSC Division, SORAKHPUR
proposal for SPS being made	WORK IS IN DIOGRESS	unter to to processor	LAN wire laying under progress	Inbuilt in SCADA system (SAS S/S)	CB testing will be done in upcoming months		Inbuilt in SCADA system (SAS S/S)	Inbuilt in SCADA system (SAS S/S)	Requirement send to HQ_PR_No_1010003432	Testing is proposed as per availability of S/D	Proposal is being made	EE Microwave has been requested for DTPC Installation at 220 KV Hata Ckt -II at Both end				Inbuilt in SCADA system (SAS S/S)		CB testing will be done in upcoming months	Now all relays are time sync.	Requirement for SEL has been sent	proposal for SPS being made	requirement for numeric relay has been sent	carrier will be made healthy in coordination with Microwave wing once DTPC links will be available	DTPC requirements has been raised and will be made functional in coordination with Microwave wing	company engineer being requisitioned for relay synchronising	Action Taken by Transmission	NEEDIN AUDIT REPORT OF YEAR 2024
	UTPO on all tines are not installed yet	DTDC on all links are not installed unit				To be taken up by transmission.							To be taken up by transmission/Microwave	To be taken up by transmission	To be taken up by transmission/Microwave		To be taken up by transmission.						Still carrier is not healthy on other 3 lines thus A/R is still not working	DTPC on other lines are not installed yet.		Remark	

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				- 220 KV S/S Gorakhpur										400 KV S/S GORAKHPUR				Substation
Sequential Event Logger is not installed.	No CB testing done in year 2023	220KV Barahua line is not Time sync	220KV Bus-I and Bus-II have been extended with Section Isolator, Clicuit Breaker and CTs. Sectionalized zone got unprotected which may result mai tripping of Main Buses	CB timings are to be taken annually and no record found	PLCC/DTPC panel is not available/functional at 220 KV Gorakhpur ckt-l≪	and 220KV Deoria line.	DTPC not available at 220KV Gorakhpur-Deoria line	DTPC is not provided PLCC Link is not Healthy and A/R not working at 220KV Gorakhpur-Barahua line	Sequential Event Logger(Alstom) is not Healthy	Neutral Earthing Delta is not Earthed with Substation Earthmat on 400KV Transformers	CB Testing is not done in year 2023	SPS at 400KV S/S Gorakhpur is not Time synchronised	LBB relay of 400KV Azamgarh line is not Time sync	LBB relay of 400KV Azamgarh line is Electromechanical type	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.	CB timings are to be taken annually and no record found	CTs are to be provided on 125 MVAR Reacter	Discripencies as per Internal Protection Audit Report
NIA	N/N	Obsolete panel	N/A	NIA	NIA	N/A	DTPC Card Faulty	NIA	NIA	NIA	N/A	SPS is now time sync SPS has been time synchronised on dated 20.06.2024	NJA	NIA	NIA	NIA	No CTs Installed till date	Action Taken by T&C
Requirement has been sent to Headquarter by concerned division		Requirement has been sent to Head Quarter by concerned Division.	No Changes 220 kV Bus bar Protection has been available for sectionalized zone at 400 kV SS, Gorakhpur.	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	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.	DTPC Panel connection is in progress of 220 KV Hata- I&II and 220 KV Deona Line					CB testing will be done in upcoming months			Requirement has been sent to Headquarter by concerned division.	220 kV Bus bar Protection has been available for sectiolized zone at 400 kV SS, Gorakhpur	03 Nos 400 KV/220 KV C B has been tested rest will be tested along with routine testing	Requirement has been sent to Headquarter by concerned division	Action Taken by Transmission
	To be taken up by transmission.						To be taken up by transmission/Microwave wing.	DTPC not available till now Requirement has been sent to Head Quarter by concerned Division	No Sequential Event Logger is installed till date Tender under process in Zonal office	To be taken up by transmission.			To be taken up by transmission					Remark

A.

(Sanjay Singh) Superintending Engineer

## U.P.POWER TRANSMISSION CORPORATION LIMITED JHA

उ०प्रo पावर ट्रांसमिशन कारपोरेशन लिमिटेड (उ०प्रo सरकार का उपक्रम)

Office Of The	ANARMONICA COLORA	कार्यालय
Superintending Engineer	it fo	अधीक्षण अभियन्ता
Electricity Test. & Comm. Circle		विद्युत परीक्षण एवं परिचालन मण्डल
132kv Sub Station, Hansari, Jhansi		132 के0वी0 सब—स्टेशन हंसारी, झाँसी
Mobile:- 9458096679	GST No. :- 09AAACU8823E12	29 दूरभाष :- 9458096679
E-mail:- setncjhansi@upptcl.org	g	ईमेल : setncjhansi@upptcl.org
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विषय:-Protection Audit 2023 में अंकित कमियों के सम्बन्ध में कृत कार्यवाही।

मुख्य अभियन्ता, पारेषण दक्षिण–मध्य, झाँसी।

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

दिनांक:- 31/08/24

पत्रांकः- 310 / वि0परी0एवंपरि0मं0(झाँसी) /

प्रतिलिपि निम्नलिखित को ई0-मेल द्वारा सूचनार्थ एवं आवश्यक कार्यवाही हेत्र प्रेषित:-

- 1. निदेशक (आपरेशन), उ०प्र०पा०ट्रा०का०लि०, लखनऊ।
- 2. अधीक्षण अभियन्ता, विद्युत परीक्षण एवं परिचालन मण्डल, मेरठ।

(संदीप सिंह कुशवाहा) अधीक्षण अभियन्ता

ई–मेल द्वारा

JHANSI ZONE

# PROTECTION AUDIT ANALYSIS OF ET&CC JHANSI

SR. NO.	NAME OF S/S	REMARK	ACTION TAKEN
		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
1	400KV S/S ORAI	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.	<ol> <li>400 KV Banda Rewa Road Line-Ist carrier problem Reactified.</li> <li>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.)</li> <li>400 KV Banda Orai Line-Ist Channel- Ist carrier reactification problem Reactified.</li> <li>400 KV Banda Orai Line-Ist Channel- II nd &amp; 400 KV Banda Orai line IInd carrier reactification problem under process, informed by EE 400KV Orai.</li> <li>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.)</li> </ol>
		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	220KV S/S ORAI	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	

		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
5	220KV S/S MAHOBA	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.
		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
6	220KV S/S PAHADI	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
		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.
7	220KV S/S KALYANPURA (LALITPUR)	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
		1. CARRIER FAILED IN 220KV DUNARA LINE.	Rectified on dated 10.06.2024
9	220KV S/S BABINA	2. REF RELAY IS NOT ACTIVE IN160MVA -1	DUE TO UNAVAILABILITY IN BUSHING CT which has informed to ETD
/	220RV 5/5 BABINA	2. KEI KEEAT IS NOT ACTIVE INTOMIVA -1	Jhansi dated on 09/8/2024
		3. BUS-I BLOCK ALARM OCCERS IN 220KV BUS BAR RELAY.	Rectified on dated 10.06.2024
		1. CARRIER FAILED IN 220KV PARICHHA-II LINE.	Rectified on dated 15.06.2024
10	220KV S/S DUNARA	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	observations n	on taken on the nade in Previous dit (Internal/Third Party)	Time synchronization of relays done, some relays replaced with numeric relay	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.
			panels		
2	Lines				
	a.	Healthiness of Main-1,	Healthy		
	b.	Settings	ОК		
	с.	Reach	ОК		
	d.	Time	ОК		
	e.	SOTF	ОК		
	f.	BRC Alarm	ОК		
	g.	Power Swing	ОК		
	h.	Fuse Fail Monitoring	ОК		
	i.	Auto Reclose	Functional		
	j.	Healthiness of Carrier	In 220 KV Dohna-Bareilly		
		Protection	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
	I.	GPS Synchronization	relays time synchronized except CSC and ERL.		
			except coc and Ent.		
	m.	Last testing	testing done in time	testing done in time	
3	Transformer/ Reactor				
	a.	Healthiness of	all relays are ok		
	a.	Differential, Backup, REF Protection	an relays are on		
	h	Cattings			
	b.	Settings	settings are kept as per the recommendation		
	c.	Last testing	testing done in time		
4	Bus Bar & LBB	<u> </u>			
	a.	Healthiness	At 400 KV Bareilly 400 kv	at 400 kv bareilly 220 kv system new bus bar relay	220KV Busbar
			system bus bar relay is in healtyhy220 kv bus bar relays out of service due	panel is to be comissioned after receving of control cable	Numerical panel recieved but 4cx2,5sqmm cable
			to exhausted capacity		avaited from design which is to be required for its commissioning

b. Settings OK c. Status OV Sustem a. DC Earth Fault Charger No.1 at 400 KV System a. DC Earth Fault Charger No.1 at 400 KV Positive to Suster V Positive to Suster V Positive to Earth=-231V Negative to Earth=-231V Negative to Earth=-231V Negative to Earth=-231V Positive to Earth=-232V Positive to Earth=-232V Positive to Earth=-238V Positive to Earth=-238V Charger No.3 & 4 (48V) OK b. Batter/s- 220V/110V/48V Make Exide/HBL Battery Status CK C. Chargers Make AZ ELECTRONICS CK Carger Status CK Carger Status CK CARger Status CK CK CC CARger Status CK CC CARger Status CK CC CC CARger Status CK CC CC CARger Status CK CC CC CARger Status CK CC CC CC CC CC CC C	with the help of T&C team trying to rectify DC problem, work is under progress.
Status of DC       System       Charger No.1 at 400 KV       Positive is fully grounded. soon rectified one soon.         a.       DC Earth Fault       Charger No.1 at 400 KV       Positive is fully grounded. soon rectified one soon.         Positive to       Negative=233v       Positive to Earth=2V       Negative=231V         Negative to Earth= -231V       Negative to Earth= -231V       Positive to Earth= -231V         Positive to       Negative=238V       Positive to Soon.         Positive to       Negative=238V       Positive to Earth= -238V         Positive to Earth= 0.4V       Negative to Earth= -238V       Positive to Earth= -238V         Positive to Earth= -238V       Negative to Earth= -238V       Positive to Earth= -238V         Positive to Earth= -238V       Negative to Earth= -238V       Positive to Earth= -238V         Negative to Earth= -238V       Negative to Earth= -238V       Positive to Earth= -238V         Negative to Earth= -238V       OK       OK       Make         Exide/HBL       Exide/HBL       Exide/HBL       Eattery Status         OK       OK       OK       OK       OK	with the help of T&C team trying to rectify DC problem, work is under progress. will be done Maintenance team with the help of T&C team trying to rectify DC problem, work is under
Status of DC       System       Charger No.1 at 400 KV       Positive is fully grounded. soon rectified one soon.         a.       DC Earth Fault       Charger No.1 at 400 KV       Positive is fully grounded. soon rectified one soon.         Positive to       Negative=233v       Positive to Earth=2V       Negative=231V         Negative to Earth= -231V       Negative to Earth= -231V       Positive to Earth= -231V         Positive to       Negative=238V       Positive to Soon.         Positive to       Negative=238V       Positive to Earth= -238V         Positive to Earth= 0.4V       Negative to Earth= -238V       Positive to Earth= -238V         Positive to Earth= -238V       Negative to Earth= -238V       Positive to Earth= -238V         Positive to Earth= -238V       Negative to Earth= -238V       Positive to Earth= -238V         Negative to Earth= -238V       Negative to Earth= -238V       Positive to Earth= -238V         Negative to Earth= -238V       OK       OK       Make         Exide/HBL       Exide/HBL       Exide/HBL       Eattery Status         OK       OK       OK       OK       OK	with the help of T&C team trying to rectify DC problem, work is under progress. will be done Maintenance team with the help of T&C team trying to rectify DC problem, work is under
Status of DC       System       Charger No.1 at 400 KV       Positive is fully grounded. soon rectified one soon.         a.       DC Earth Fault       Charger No.1 at 400 KV       Positive is fully grounded. soon rectified one soon.         Positive to       Negative=233v       Positive to Earth=2V       Negative=231V         Negative to Earth= -231V       Negative to Earth= -231V       Positive to Earth= -231V         Positive to       Negative=238V       Positive to Soon.         Positive to       Negative=238V       Positive to Earth= -238V         Positive to Earth= 0.4V       Negative to Earth= -238V       Positive to Earth= -238V         Positive to Earth= -238V       Negative to Earth= -238V       Positive to Earth= -238V         Positive to Earth= -238V       Negative to Earth= -238V       Positive to Earth= -238V         Negative to Earth= -238V       Negative to Earth= -238V       Positive to Earth= -238V         Negative to Earth= -238V       OK       OK       Make         Exide/HBL       Exide/HBL       Exide/HBL       Eattery Status         OK       OK       OK       OK       OK	with the help of T&C team trying to rectify DC problem, work is under progress. will be done Maintenance team with the help of T&C team trying to rectify DC problem, work is under
Status of DC       System       Charger No.1 at 400 KV       Positive is fully grounded. soon rectified one soon.         a.       DC Earth Fault       Charger No.1 at 400 KV       Positive is fully grounded. soon rectified one soon.         Positive to       Negative=233v       Positive to Earth=20       Positive is fully grounded. rectification soon.         Negative=233v       Positive to Earth=-231V       Positive is fully grounded. rectification soon.         Positive to Earth= 0.4V       Negative=238V       Positive to Earth= 0.4V         Positive to Earth= -238V       Positive to Earth= -238V         Positive to Earth= -238V       Positive to Earth= -238V         Positive to Earth= -238V       Negative to Earth= -238V         Negative to Earth= -238V       Negative to Earth= -238V         Negative to Earth= -238V       Negative to Earth= -238V         Negative to Earth= 0.4V       Negative to Earth= 0.4V         Negative to Earth= 0.4V	with the help of T&C team trying to rectify DC problem, work is under progress. will be done Maintenance team with the help of T&C team trying to rectify DC problem, work is under
Status of DC       System       Charger No.1 at 400 KV       Positive is fully grounded. soon rectified one soon.         a.       DC Earth Fault       Charger No.1 at 400 KV       Positive is fully grounded. soon rectified one soon.         Positive to       Negative=233v       Positive to Earth=20       Positive is fully grounded. rectification soon.         Negative=233v       Positive to Earth=-231V       Positive is fully grounded. rectification soon.         Positive to Earth= 0.4V       Negative=238V       Positive to Earth= 0.4V         Positive to Earth= -238V       Positive to Earth= -238V         Positive to Earth= -238V       Positive to Earth= -238V         Positive to Earth= -238V       Negative to Earth= -238V         Negative to Earth= -238V       Negative to Earth= -238V         Negative to Earth= -238V       Negative to Earth= -238V         Negative to Earth= 0.4V       Negative to Earth= 0.4V         Negative to Earth= 0.4V	with the help of T&C team trying to rectify DC problem, work is under progress. will be done Maintenance team with the help of T&C team trying to rectify DC problem, work is under
Status of DC       System       Charger No.1 at 400 KV       Positive is fully grounded. soon rectified one soon.         a.       DC Earth Fault       Charger No.1 at 400 KV       Positive is fully grounded. soon rectified one soon.         Positive to       Negative=233v       Positive to Earth=2V       Negative=231V         Negative to Earth= -231V       Negative to Earth= -231V       Positive to Earth= -231V         Positive to       Negative=238V       Positive to Soon.         Positive to       Negative=238V       Positive to Earth= -238V         Positive to Earth= 0.4V       Negative to Earth= -238V       Positive to Earth= -238V         Positive to Earth= -238V       Negative to Earth= -238V       Positive to Earth= -238V         Positive to Earth= -238V       Negative to Earth= -238V       Positive to Earth= -238V         Negative to Earth= -238V       Negative to Earth= -238V       Positive to Earth= -238V         Negative to Earth= -238V       OK       OK       Make         Exide/HBL       Exide/HBL       Exide/HBL       Eattery Status         OK       OK       OK       OK       OK	with the help of T&C team trying to rectify DC problem, work is under progress. will be done Maintenance team with the help of T&C team trying to rectify DC problem, work is under
Status of DC       System       Charger No.1 at 400 KV       Positive is fully grounded. soon rectified one soon.         a.       DC Earth Fault       Charger No.1 at 400 KV       Positive is fully grounded. soon rectified one soon.         Positive to       Negative=233v       Positive to Earth=2V       Negative=231V         Negative to Earth= -231V       Negative to Earth= -231V       Positive to Earth= -231V         Positive to       Negative=238V       Positive to Soon.         Positive to       Negative=238V       Positive to Earth= -238V         Positive to Earth= 0.4V       Negative to Earth= -238V       Positive to Earth= -238V         Positive to Earth= -238V       Negative to Earth= -238V       Positive to Earth= -238V         Positive to Earth= -238V       Negative to Earth= -238V       Positive to Earth= -238V         Negative to Earth= -238V       Negative to Earth= -238V       Positive to Earth= -238V         Negative to Earth= -238V       OK       OK       Make         Exide/HBL       Exide/HBL       Exide/HBL       Eattery Status         OK       OK       OK       OK       OK	with the help of T&C team trying to rectify DC problem, work is under progress. will be done Maintenance team with the help of T&C team trying to rectify DC problem, work is under
System     Charger No.1 at 400 KV     Positive is fully grounded. soon rectified one soon.       a.     DC Earth Fault     Charger No.1 at 400 KV     Positive is fully grounded. soon rectified one soon.       Positive to Earth=233v     Positive to Earth=21     Positive to Earth=-231V       Negative to Earth=-231V     Regative=233V     Positive is fully grounded. rectification soon.       Positive to Earth=-231V     Positive to Earth=-231V     Positive is fully grounded. rectification soon.       Positive to Earth=-238V     Positive to Earth=-238V     Positive to Earth=-238V       Positive to Earth=-238V     Positive to Earth=-238V     Positive to Earth=-238V       Positive to Earth=-238V     Negative to Earth=-238V     Positive to Earth=-238V       Positive to Earth=-238V     Negative to Earth=-238V     Positive to Earth=-238V       Positive to Earth=-238V     Negative to Earth=-238V     Positive to Earth=-238V       DK     OK     OK     OK       b.     Batteries- 220V/110V/48V     OK     DK       Battery Status     OK     Image: Exide/HBL     Image: Exide/HBL       Battery Status     OK     Image: Exide/HBL     Image: Exide/HBL	with the help of T&C team trying to rectify DC problem, work is under progress. will be done Maintenance team with the help of T&C team trying to rectify DC problem, work is under
a. DC Earth Fault DC	with the help of T&C team trying to rectify DC problem, work is under progress. will be done Maintenance team with the help of T&C team trying to rectify DC problem, work is under
b. Batteries- 220V/110V/48V Megatives Dearth=-238V Positive to Earth=-238V Negative to Earth=-238V Neg	team trying to rectify DC problem, work is under progress. will be done Maintenance team with the help of T&C team trying to rectify DC problem, work is under
b.       Batteries-220V/110V/48V         b.       Battery Status         OK         DK         Battery Status         OK	rectify DC problem, work is under progress. will be done Maintenance team with the help of T&C team trying to rectify DC problem, work is under
Positive to Earth=2V         Negative to Earth= -231V         Charger No.2       Positive is fully grounded. rectification soon.         Positive to       Negative=238V         Positive to Earth= 0.4V       Negative to Earth= -238V         Positive to Earth= -238V       Positive to Earth= -238V         b.       Batteries- 220V/110V/48V         Make       Exide/HBL         Battery Status       OK         Gravity       OK	work is under progress. will be done Maintenance team with the help of T&C team trying to rectify DC problem, work is under
b.       Batteries- 220V/110V/48V         b.       Batteries- 220V/110V/48V         Make       Exide/HBL         Battery Status       OK	work is under progress. will be done Maintenance team with the help of T&C team trying to rectify DC problem, work is under
b. Batteries- 220V/110V/48V b. Make Exide/HBL Battery Status OK Desitive to Charger No.2 Positive is fully grounded. rectification soon. Positive to Sarth= 0.4V Negative=238V Positive to Earth= 0.4V Negative to Earth= -238V Charger No.3 & 4 (48V) OK	will be done Maintenance team with the help of T&C team trying to rectify DC problem, work is under
b. Batteries- 220V/110V/48V b. Make Exide/HBL Battery Status OK Desitive to Charger No.2 Positive is fully grounded. rectification soon. Positive to Sarth= 0.4V Negative=238V Positive to Earth= 0.4V Negative to Earth= -238V Charger No.3 & 4 (48V) OK	will be done Maintenance team with the help of T&C team trying to rectify DC problem, work is under
b. Batteries- 220V/110V/48V Make Exide/HBL Battery Status OK Gravity OK	with the help of T&C team trying to rectify DC problem, work is under
b. Batteries- 220V/110V/48V Make Exide/HBL Battery Status OK Gravity OK	with the help of T&C team trying to rectify DC problem, work is under
b. Batteries- 220V/110V/48V Make Exide/HBL Battery Status OK Gravity OK	team trying to rectify DC problem, work is under
b. Batteries- 220V/110V/48V Make Exide/HBL Battery Status OK	rectify DC problem, work is under
b. Batteries- 220V/110V/48V Make Exide/HBL Battery Status OK	work is under
b. Batteries- 220V/110V/48V Make Exide/HBL Battery Status OK Gravity OK	
b. Batteries- 220V/110V/48V Make Exide/HBL Battery Status OK Gravity OK	progress.
b. Batteries- 220V/110V/48V Make Exide/HBL Battery Status OK Gravity OK	
b. Batteries- 220V/110V/48V Make Exide/HBL Battery Status OK Gravity OK	
b. Batteries- 220V/110V/48V Make Exide/HBL Battery Status OK Gravity OK	
b. Batteries- 220V/110V/48V Make Exide/HBL Battery Status OK Gravity OK	
b. Batteries- 220V/110V/48V Make Exide/HBL Battery Status OK Gravity OK	
220V/110V/48V       Make     Exide/HBL       Battery Status     OK       Gravity     OK	
Make     Exide/HBL       Battery Status     OK       Gravity     OK	
Battery Status OK Gravity OK	
Battery Status OK Gravity 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 Unnao ckt-1	
a. Name of Element Unnao ckt-1 tripped more than two unnao ckt-2	
times in a month	
b. Multiple Trippings YES	
c. Trippings Unexplained All Explained	
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
	Tender of PD/Tan-
9 Status of CT/CVT CT & CVT Testing done at	Delta testing of all CTs
the time of commissioning	is under process will
commissioning	be done soon.
10 Status of Sequential Event Logger Installed but capacity	Requirement send to
(SEL) exhausted	
	Design Circle for upgradation

# SUBSTATION : 220 KV Substation DohnaAUDIT 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	observations n	I on taken on the nade in Previous lit (Internal/Third Party)			
2	Lines				
	a.	Healthiness of Main-1, Main-2, & Backup relays	Healthy		
	b.	Settings	ОК		
	с.	Reach	ОК		
	d.	Time	ОК		
	e.	SOTF	OK		
	f.	BRC Alarm	ОК ОК		
	<u>g.</u> h.	Power Swing 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 Imu.		
	k.	GPS Clock	Available		
	Ι.	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		
	с.	Last testing	testing done in time		
4	Bus Bar & LBB				
	a.	Healthiness	relay healthy		
	b.	Settings	ОК		
-	C.	Status	ОК		
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		

İ.	1	1	Charger No.2	negative is partially grounded. soon rectification	1
			Positive to	will be done soon	
			Negative=118.8V		
			Positive to Earth= 88.2V	4	
			Negative to Earth= -		
			31.8V Charger No.3 & 4 (48V)		
	b.	Batteries-	ОК		
	5.	220V/110V/48V			
		Make	Exide		
		Battery Status	OK/48 volt cell no		
		Gravity	ОК		
	с.	Chargers Make	radetron & statcon		
			power controls ltd		
		Status	ОК		
	d.	DCDB Make	statcon power controls		
			ltd		
		Status	ОК		
6	Analysis of tri	pping from July 2023			
	a.	Name of Element	nil		
		tripped more than two			
		times in a month			
	b.	Multiple Trippings	YES		
	с.	Trippins Unexplained	All Explained		
7	Status of SPS		Not Installed		
8	Status of CB T	esting	not done		
6	Status of CT/C	VT	CT & CVT Testing done		
			during comissioning		
	Status of Sequ	ential Event Logger	not installed		
	b.	Multiple Trippings	Nil		
	С.	Trippins Unexplained	Nil ( All Explained)		
7	Status of SPS		Not Installed		
8	Status of CB		220 KV CB testing is not		
	Testing		done.		
9	Status of		CT & CVT Testing done at		
	CT/CVT		the time of		
			commissioning		
10	Status of Sequ	ential Event Logger	Not Available		
10	Status of Sequ	ential Event Logger	Not Available	<u> </u>	

DIVISION : ET&C Divi	sion Bareilly
SUBSTATION : 220 K	V Substation Amariya
AUDIT DATE:	21.03.2024

DIVISION : ET&C Division Bareilly SUBSTATION : 220 KV Substation Amariya							
AUDIT DAT	E:	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	observations n	on taken on the nade in Previous dit (Internal/Third Party)	NO record found				
2	Lines						

	a.	Healthiness of Main-1, Main-2, & Backup relays	Healthy		
	b.	Settings	settings ok		
	с.	Reach	ОК		
	d.	Time	ОК		
	e.	SOTF	ОК		
	f.	Fuse Fail Monitoring	ОК		
	g.	BRC Alarm	ОК		
	h.	Power Swing	ОК		
	i.	Auto Reclose	Functional		
	j.	Healthiness of Carrier Protection	ОК		
	k.	GPS Clock	Available		
	l.	GPS Synchronization	OK		
		Last tast's a			
3	m. Transformer/	Last testing	testing done in time		
3	Reactor				
	a.	Healthiness of Differential, Backup, REF Protection	ok		
	b.	Settings	ok		
	с.	Last testing	testing		
4	Bus Bar & LBB				
	a.	Healthiness	Healthy		
	b.	Settings	ОК		
5	c. Status of DC	Status	ok		
5	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
			Positive to Earth=53.8V		No Leakage at Present
			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	1	
			available. It is obtained		
			by Chopper limit and		
			convert it from 110V to		
			48V.		
	b	Pattorica	Patton Park 1 9 11		
	b.	Batteries- 220V/110V/48V	Battery Bank I & II		
		Make	Exide Industrial		
		Battery Status	Healthy		
		Gravity	ОК		
	с.	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	ОК
6	Analysis of		
	tripping from		
	July 2023		
	a.	Name of Element	Nil
		tripped more than two	
		times in a month	
	b.	Multiple Trippings	Nil
	5.	Matthe mppings	
	с.	Trippins Unexplained	No
7	Status of SPS		Not Installed
8	Status of CB		Testing done
	Testing		
9	Status of		Testing done
	CT/CVT		
10	Status of Sequential Event Logger		Available. It is SAS
	(SEL)		(SCADA) based system.
1	L		
DIVISION : E	T&C Division E	Bareilly	

	TION : <mark>220 KV Su</mark> TE:				
S.No.	Name of Bay	Name of Protection system	Status of Protection System	Remark	Action to be taken by Transmission wing
1	observations	on taken on the made in Previous dit (Internal/Third Party)	No record found.		
2	Lines a.	Healthiness of Main-1, Main-2, & Backup relays	Healthy		
	b. c. d.	Settings Reach Time Settings.	ОК ok OK		
	e. f.	SOTF Fuse Fail Monitor	ОК		
	g. h. i.	BRC Alarm Power Swing Auto Reclose Healthiness of Carrier	ok OK operational OK		
	j. k.	Protection GPS Clock	Available but defective		Tendering is in Process
	Ι.	GPS Synchronization	Defective		FIOCESS
	m.	Last testing	testing done in time		

	Transformer/	Í.	I	1	I
3	Reactor				
	Reactor				
	a.	Healthiness of	Healthy		
		Differential, Backup,			
		REF Protection			
	b.	Settings	ok		
	<u>р.</u> с.	Last testing	Testing done.		
4	C. Bus Bar & LBB		Testing done.		
4	a.	Healthiness	Healthy		
	b.	Settings	ok		
	с.	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		
	с.	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 Itd		
		Status	OK		
G	Applysis of	Status	ОК		
6	Analysis of				
	tripping from				
	Julv 2023	Name of Element	Nil		
	a.				
		tripped more than two			
		times in a month			
	b.	Multiple Trippings	Nil		
	N.	manuple mphiligs	1 111		
	с.	Trippins Unexplained	Nil		
7	Status of SPS		Not Installed		
1	Status UI SF S	l	not installeu	I	1

8	Status of CB Testing		not done	
	Status of CT/CVT		Testing done during comissioning	
10	Status of Seque (SEL)	00	Available. It is SAS (SCADA) based system.	

# SUBSTATION : 220 KV Substation Faridpur

b.

Settings

S.No.	Name of Bay	Name of Protection system	Status of Protection System	Remark	Action to be taken by Transmission wing
1		on taken on the	No record found.		
		nade in Previous dit (Internal/Third Party)			
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	ОК		
	с.	Reach	ОК		
	d.	Time	ОК		
	e.	SOTF	ОК		
	f.	BRC Alarm	ОК		
	g.	Power Swing	OK		
	h.	Fuse Fail Monitoring	ОК		
	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		
	Ι.	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.		
	с.	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

Not Configured

I		Status	Icolotor & CD status are	I	1
	с.	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	ОК		
		Gravity	ОК		
	с.	Chargers Make	Chhavi Electrical Make		
		Status	ОК		
	d.	DCDB Make	Nitya Electricals		
		Status	ОК		
6	Analysis of tri	pping from July 2023			
-	a.		Nil		
		tripped more than two			
		times in a month			
	b.	Multiple Trippings	Nil		1
	~.				
	с.	Tripping Unexplained	Nil ( All Explained)		1
	U.				
7	Status of SPS	1	SPS is not available.	SPS is not available.	
8	Status of SP3	octing	Breaker timing test is		
°	Status OI CB I	esculg			
			pending.		
9	Status of CT/C	CVT	CT & CVT Testing done at		
			the time of		
			commissioning		
10	Chabur of Com	instial Frank Langer			+
10		uential Event Logger	Installed and healthy		
	(SEL)		1		

# SUBSTATION : 220 KV Substation C.B.GanjAUDIT 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		n taken on the nade in Previous it (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	ОК		
с.	Reach	ОК		
d.	Time	ОК		
e.	SOTF	ОК		
f.	BRC Alarm	ОК		
g.	Power Swing	ОК		
h.	Fuse Fail Monitoring	ОК		
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 beer 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		
I.	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	
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.		

4			200MVA T/F-I& II completed which was due Apr in -2024	30.04.2024	
	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	ОК		
	с.	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	
	u.		Positive to	have not been identified, soon	
			Negative=108V		
			Positive to Earth=80V	identification/rectification will be done soon as per availability of the Shutdown	
			Negative to Earth= -26V		
			Charger No.2	It seems that negative is ground, faulty feeders	
			Positive to	have not been identified, soon	
			Negative=118V	identification/rectification will be done soon as per	
			Positive to Earth=87V	availability of the Shutdown	
			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	ОК		
	с.	Chargers Make	Redetron Electrical		
		Status	Make/JVV OK		
	d.	DCDB Make	Redetron /Uptron		
	u.	Status	OK		
6	Analysis of trip	ping from July 2023			
	a.	Name of Element tripped more than two times in a month	Nil		
		unies in a month			
	b.	Multiple Trippings	Nil		
	с.	Tripping Unexplained	Nil ( All Explained)		
7	Status of SPS	1	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 Seque	ential Event Logger	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 BadaunAUDIT 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	observations n	on taken on the nade in Previous dit (Internal/Third Party)	No record found.		
2	Lines				
2	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	ОК		
	с.	Reach	ОК		
	d.	Time	ОК		
	e.	SOTF	ОК		
	f.	BRC Alarm	ОК		
	g.	Power Swing	ОК		
	h.	Fuse Fail Monitoring	ОК		
	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 OCBTI II
	k.	GPS Clock	Available		
	Ι.	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.		
	с.	Last testing	10.05.2024 (Routine Testing of 200MVA T/F- I& II completed which was due June in -2024)		
4	Bus Bar & LBB	······		<u> </u>	
	a.	Healthiness	Healthy		
	<u>b.</u> c.	Settings Status	OK 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	1

1	1	1	Positive to	have not been identified, soon	I
			Negative=120V		
			Positive to Earth=119.4V	identification/rectification will be done soon as per availability of the Shutdown	
			Negative to Fastle 21/		
			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	ОК		
	с.	Gravity Chargers Make	OK ZBB Electrotech Make		
	с.	Chargers Make	ZBB Electrotech Make		
		Status	ОК		
	d.	DCDB Make	Expo fyn make		
c	Anchesis	Status	ОК		
6	Analysis of tri	pping from July 2023 Name of Element	Nil		
		tripped more than two times in a month			
	b.	Multiple Trippings	Nil		
	с.	Trippins Unexplained	Nil ( All Explained)		
7	Status of SPS		Not installed		
8	Status of CB T	esting	Breaker timing test is		
9	Status of CT/C	VT	pending. CT & CVT Testing done at		
5			the time of		
			commissioning		
10	Status of Sequ	ential Event Logger	Not installed		
SUBSTATI AUDIT DATE		bstation Dataganj 21.03.2024			
S.No.	Nome of De	Name of Bratastics	Status of Protection	Pomork	Action to be taken h
5.NO.	Name of Bay	Name of Protection system	Status of Protection System	Remark	Action to be taken by Transmission wing
1	Remedial Actio	on taken on the	No record found.	<u> </u>	
		nade in Previous			
	Protection Aud	dit (Internal/Third Party)			
2	Lines				
	a.	Healthiness of Main-1,	Healthy		
		Main-2, & Backup			
		relays			
	b.	Settings	ОК		
	<u>р.</u> с.	Reach	ОК		
	d.	Time	OK		
	e.	SOTF	ОК		
1	f.	BRC Alarm	ОК		
	1.	Power Swing	OK		

h.     Fue fail Monitoring     OK       i.     Auto Reclose     Functional       i.     Healthiness of Carter     Healthy       Reality     Protection     All Protection relays Synchronization     All Protection relays Synchronization       m.     Last testing     OURDIE Testing of 2200V     Ioutine testing of 2200V OCBTL I. & II Carried out OURDIE Testing of 2200V       3     Transformer/ Reactor     Healthy     Interference       a.     Healthiness of Differencial, Backup, REF Protection     Healthy       b.     Settings     All setting have been done as per Recommandation. Over Inscing studing are enable in 150 MAICT (1, U. OT, With mass studing are been made as per Recommandation.     Routine testing of 2200V 160MVA 1/F-I & II Carried out on 27.04.2024 is 8.04.2024       c.     Last testing     Routine testing of 2200V 160MVA 1/F-I & II completed which was repetively.     Routine testing of 2200V 160MVA 1/F-I & II Carried out on 27.04.2024 is 8.04.2024       4     Bus Bar & LUB     Healthy     Ion     Ion       5     Status of DC System     Solution & G Status of DC Negative to Earth = 56V     Ion       6     Status of DC Negative to Earth = 56V     Ion     Ion       Negative to Earthine 50V     Negative to Earthine 56V     Ion       7     Status of DC Negative to Earthine 56V     Ion     Ion       8     DC Earth Fault Negative to Earthine 56V<	1	1.	I	la.	1	
j.     Healthiness of Corrier Protection     Healthy Protection relays Synchronization I.     Social Corrier Protection relays Synchronization I.     Mail Protection relays Synchronization OCBT I. 8 II completed which was due in Aug- 2024     Social Corrier Protection relays Synchronization on 19.04.2024 & 20.04.2024 respectively.       3     Transformer/ Reactor     Realthiness of Differential, Backup, REF Protection     Healthy Healthy Bas Bar & LBB     Healthy Protection       b.     Settings     All setting have been done as per Recommandation. Over Recommandation. Over Recommandation.     Routine testing of 220KV 160MVA T/F-18 II Carried out on 17.04.2024 & 18.04.2024 (Carried out on 17.04.2024 & 18.04.		h.	Fuse Fail Monitoring	ОК		
j.     Healthiness of Corrier Protection     Healthy Protection relays Synchronization I.     Social Corrier Protection relays Synchronization I.     Mail Protection relays Synchronization OCBT I. 8 II completed which was due in Aug- 2024     Social Corrier Protection relays Synchronization on 19.04.2024 & 20.04.2024 respectively.       3     Transformer/ Reactor     Realthiness of Differential, Backup, REF Protection     Healthy Healthy Bas Bar & LBB     Healthy Protection       b.     Settings     All setting have been done as per Recommandation. Over Recommandation. Over Recommandation.     Routine testing of 220KV 160MVA T/F-18 II Carried out on 17.04.2024 & 18.04.2024 (Carried out on 17.04.2024 & 18.04.		i	Auto Reclose	Functional		
k.         GPS Clock         Available		i.				
I.     GPS Synchronization     All Protection relays Synchronized with GPS       n.     Last testing     Routine Testing of 220KV 0CBTL I & II Carried out OCBTL I & II completed which was due in Aug- 2024       3     Transformer/ Reactor     Healthy       a.     Healthiness of Differential, Backup, REF Protection     Healthy       b.     Settings     All setting have been done as per Recommandation. Over fluxing setting are enable in 150 MVA (CFL) II. 0.0TI, WTI Fan Start, Runp Start etc settings has been made as per Recommandation.       c.     Last testing     Routine Testing of ISOMVA /T/F-I & III Completed which was c.     Routine testing of 220KV 150MVA /T/F-I & III Carried out on 17.04.2024 & 18.04.2024       4     Bus Bar & LBB - Metathiness D.     Healthy Status of DC System     Netering No.1 Positive to Shart Status are as per recommadation.       5     Status of DC System     OC Earth Fault OC Earth Fault All Asstraty 2004 Positive to Earth=-56V     Charger No.1 Positive to Earth=-56V       Charger No.2 Positive to Earth=-56V     Positive to Earth=-56V     Positive to Earth=-56V		,				
Image: synchronized with GPS     Routine Testing of 220KV OCBTL 1 & II Carried out OCBTL 1 & II CARRENT 0 & II CARR						
n.     Last testing     Routine Testing of 220KV     Routine tes		Ι.	GPS Synchronization			
3     Transformer/ Reactor     Image: Complete of Multiple of Multi				Synchronized with GPS		
3     Transformer/ Reactor     Healthiness of Differential, Backup, REF Protection     Healthy     Image: Construction of the second of the second of the secon		m.	Last testing			
3     Transformer/ Reactor     Healthiness of Differential, Backup, REF Protection     Healthy       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 (CT-1, IL OTI, WT IFA Start, Pump Start etc settings has bben made as per Recommandation.     Routine testing of 220KV 160MVA T/F-1& II       c.     Last testing     Routine Testing of 160MVA T/F-1& II     Carried out on 17.04.2024 & 18.04.2024       4.     Bus Bar & LBB     Healthy     —       a.     Healthiness     Multine Testing of 160MVA T/F-1& II     Carried out on 17.04.2024 & 18.04.2024       4.     Bus Bar & LBB     Healthy     —       b.     Settings     OK     —       c.     Status     Isolator & CB status are as per recomendation.     —       5     Status of DC System     DC Earth Fault     Charger No.1 Positive to Negative 10V Positive to Earth=-56V     —       Negative to Earth=-56V     —     —     —       Positive to Negative to Earth=-56V     —     —       Positive to Negative to Earth=-56V     —     —       Negative to Earth=-56V     —     —       Positive to Earth=-56V     —     —       Negative to Earth=-56V     —     —       Negative to Earth=-56V     — <td></td> <td></td> <td></td> <td>which was due in Aug-</td> <td>on 19.04.2024 &amp; 20.04.2024 respectively.</td> <td></td>				which was due in Aug-	on 19.04.2024 & 20.04.2024 respectively.	
Reactor       Reactor       Healthiness of Differential, Backup, REF Protection       Healthy Backup, REF Protection       Healthy All setting have been done as per Recommandation. Over fluxing setting are enable in 160 MVA [CT-1], U.CTI, WTI Fan Start, Pump Start etc settings has bbeen made as per Recommandation.       Routine testing of 220KV 160MVA T/F-1& II Carried out on 17.04.2024 k 18.04.2024         c.       Last testing       Routine Testing of 106MVA T/F-1& II completed which was due in lube.2024       Routine testing of 220KV 160MVA T/F-1& II Carried out on 17.04.2024 k 18.04.2024         4       Bus Bar & LBB a.       Healthiness       Healthy       —         5       Status of DC System       Isolator & CD status are as per recomnation.       —         5       Status of DC System       DC Earth Fault       Charger No.1 Positive to Negative 10V Positive to Earth=56V       —         9       DC Earth Fault       Charger No.2 Positive to Earth=56V       —       —         10       Negative to Earth=56V       —       —         10				2024		
Image: set in the set	3					
Image: Setting in the setting have been done as per Recommandation. Over fluxing setting are enable in 160 WMA (T-I, II. OT), WT Fan Start, Pump Start etc settings has bbeen made as per Recommandation.       Routine testing of 160 WMA (T-I, II. OT), WT Fan Start, Pump Start etc settings has bbeen made as per Recommandation.         c.       Last testing       Routine Testing of 160 WMA (T-I, II. OT), WT Fan Start, Pump Start etc settings has bbeen made as per Recommandation.       Routine testing of 160 WMA (T/F-I & II. OT), WT Fan Start, Pump Start etc settings has bbeen made as per Recommandation.         4       Bus Bar & LBB       Image: WT Fan Start, Pump Start etc settings fan Start etc settings fan Start etc settings fan Start etc settings has bbeen made as per Recommandation.       Image: WT Fan Start, Pump Start etc setting fan Start etc setting		Reactor				
Image: Protection       All setting have been done as per Recommandation. Over fluxing setting are enable in 160 MVA [CT-1]. I. OTI, WT Fan Start, Pump Start etc. settings has been made as per Recommandation.       Routine testing of 160 MVA [CT-1]. I. OTI, WT Fan Start, Pump Start etc. settings has been made as per Recommandation.         c.       Last testing       Routine Testing of 160 MVA T/F-1 & II         c.       Last testing       Routine Testing of 160 MVA T/F-1 & II         a.       Healthiness       Healthy         b.       Status of DC       Image: Proceedings         c.       Status of DC       Image: Proceedings         a.       Healthiness       Healthon.         5       Status of DC       Image: Proceedings         A.       DC Earth Fault       Charger No.1         Positive to       Positive to Earth=56V         Charger No.2       Positive to         Positive to       Positive to Earth=56V         Charger No.3 (48V)       Image: Pont Pault         Attern Log Park Pault       Image: Pont Pault         Attern Log Paultive To Pont Pault       Image: Pont Pault         Positive to       Image: Pont Pault		a.	Healthiness of	Healthy		
REF Protection       Image: 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 et settings has bbeen made as per Recommandation.       Image: settings       Image: settings <td></td> <td></td> <td></td> <td>,</td> <td></td> <td></td>				,		
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.     Routine testing of 220KV 160MVA T/F-1 & II Carried out on 17.04.2024 & 18.04.2024       c.     Last testing     Routine Testing of 160MVA T/F-1 & II Completed which was flue in Luke.2024     Routine testing of 220KV 160MVA T/F-1 & II Carried out on 17.04.2024 & 18.04.2024       4     Bus Bar & LBB a.     Healthiness     Healthy       b.     Settings     OK       C.     Status of DC System     Isolator & CB status are as per recomendation.     Image: Carried out on 17.04.2024 & 18.04.2024       5     Status of DC System     DC Earth Fault     Charger No.1 Positive to D Negative 110V Positive to Earth=55V     Image: Carried out on 17.04.2024 & 18.04.2024       6     Status of DC System     Charger No.1 Positive to Earth=55V     Image: Carried out on 17.04.2024 & 18.04.2024       7     Status of DC System     Charger No.1 Positive to Earth=55V     Image: Carried out on 17.04.2024 & 18.04.2024       8     DC Earth Fault     Charger No.2 Positive to Earth=56V     Image: Carried out on 17.04.2024 & 18.04.2024       9     Positive to Earth=56V     Image: Carried out on 17.04.2024 & 18.04.2024     Image: Carried out on 17.04.2024 & 18.04.2024       100     Positive to Earth=56V     Image: Carried out on 17.04.2024     Image: Carried out on 17.04.2024       101     Positive to Earth=56V     Image: Carried out o			REF Protection			
A       Bus Bar & LBB       Recommandation. Over fluxing settings are enable in 160 MVA ICT, II. OTI, WTI Fan Start, Pump Start etc settings has bben made as per Recommandation.       Routine testing of 220KV 160MVA T/F-1 & II         C.       Last testing       Routine Testing of 160MVA T/F-1 & II       Carried out on 17.04.2024 & 18.04.2024         4       Bus Bar & LBB       Healthy       Image: Carried out on 17.04.2024 & 18.04.2024         4       Bus Bar & LBB       Image: Carried out on 17.04.2024 & 18.04.2024       Image: Carried out on 17.04.2024 & 18.04.2024         5       Status of DC       Isolator & CB status are as per recomendation.       Image: Carried out on 17.04.2024 & 18.04.2024         5       Status of DC       Isolator & CB status are as per recomendation.       Image: Carried out on 17.04.2024 & 18.04.2024         6       OK       Image: Carried out on 17.04.2024 & 18.04.2024       Image: Carried out on 17.04.2024 & 18.04.2024         7       Status of DC       Status of DC       Image: Carried out on 17.04.2024 & 18.04.2024         6       OK       Image: Carried out on 17.04.2024 & 18.04.04.2024       Image: Carried out on 17.04.2024 & 18.04.0224         7       Status of DC       Isolator & CB status are as per recomendation.       Image: Carried out on 17.04.2024 & 18.04.024         8       Image: Carried out on 17.04.2024       Image: Carried out on 17.04.2024 & 18.04.04       Image: Carried out on 17.04.		b.	Settings	All setting have been		
4       Bus Bar & LBB       Healthiness       Healthiness       Healthiness         4       Bus Bar & LBB       Hue in luk-2024       Carried out on 17.04.2024 & 18.04.2024         4       Bus Bar & LBB       Hue in luk-2024       respectively.         5       Status of DC       Isolator & CB status are as per recomendation.       Isolator & CB status are as per recomendation.         5       Status of DC       Isolator & CB status are as per recomendation.       Isolator & CB status are as per recomendation.         6.       DC Earth Fault       Charger No.1       Positive to Negative=110V       Image: Charger No.2         9.       DC Earth Fault       Charger No.2       Positive to Sarth=-56V       Image: Charger No.3 (48V)         4.       Negative to Earth=-56V       Image: Charger No.3 (48V)       Image: Charger No.3 (48V)						
in 160 MVA ICT-I, II. OTI, WTI Fan Start, Pump Start etc settings has bben made as per Recommandation.       Routine Testing of 160MVA T/F-I & II Carried out on 17.04.2024 & 18.04.2024 respectively.         4       Bus Bar & LBB a. Healthiness       Routine Testing of 160MVA T/F-I & II Carried out on 17.04.2024 & 18.04.2024 respectively.         4       Bus Bar & LBB a. Healthiness       Healthiness Healthy         b.       Settings       OK         c.       Status of DC System       Image: Charger No.1         a.       DC Earth Fault       Charger No.1 Positive to To Negative 110V Positive to Earth=55V         Negative to Earth=55V       Image: Charger No.2 Positive to Earth=56V         Charger No.2 Positive to Earth=56V       Image: Charger No.3 (Charger No.3 (48V)         Vegative to Earth=56V       Image: Charger No.3 (48V)						
4       Bus Bar & LBB       Routine Testing of 160MVA T/F-1 & II       Carried out on 17.04.2024 & 18.04.2024         4       Bus Bar & LBB       Image: Completed which was due in lulw-2024       Carried out on 17.04.2024 & 18.04.2024         5       Status of DC       Status       Isolator & C.Battweet IIOV       Positive to NA         5       Status of DC       System       Image: Charger No.1       Image: Charger No.1         6.       DC Earth Fault       Charger No.1       Image: Charger No.2       Image: Charger No.2         7       Status of DC       Status to Earth=55V       Image: Charger No.2       Image: Charger No.2         9.       DC Earth Fault       Charger No.2       Image: Charger No.3       Image: Charger No.3         6.       Status to Earth=56V       Image: Charger No.3       Image: Charger No.3       Image: Charger No.3         7.       Status of DC       Status to Earth=56V       Image: Charger No.3       Image: Charger No.3       Image: Charger No.3         8.       DC Earth Fault       Charger No.3       Image: Charger No.3       Image: Charger No.3       Image: Charger No.3       Image: Charger No.3         9.       Charger No.3 (48V)       Image: Charger No.3 (48V)       Image: Charger No.3       Image: Charger No.3       Image: Charger No.3       Image: Charger No.3       Ima						
Image: start etc settings has bben made as per Recommandation.       Start etc settings has bben made as per Recommandation.         C.       Last testing       Routine Testing of 160MVA T/F-I & II Carried out on 17.04.2024 & 18.04.2024 respectively.         4       Bus Bar & LBB       Image: completed which was drue in Luby-2024         a.       Healthiness       Healthy         b.       Settings       OK         C.       Status of DC       Isolator & CB status are as per recomendation.         5       Status of DC       Isolator & CB status are as per recomendation.         6       DC Earth Fault       Positive to Interperiod Positive to Earth=55V         Negative to Earth=-56V       Image: No.2       Image: No.2         Positive to Interperiod Negative to Earth=-56V       Image: No.2       Image: No.2         Positive to Interperiod Negative to Earth=-56V       Image: No.2       Image: No.2         Positive to Earth=-56V       Image: No.2       Image: No.2       Image: No.2         Positive to Earth=-56V       Image: No.2       Image: No.2       Image: No.2         Positive to Earth=-56V       Image: No.2       Image: No.2       Image: No.2         Positive to Earth=-56V       Image: No.2       Image: No.2       Image: No.2       Image: No.2         Positive to Earth=-56V       Image: N						
k     bben made as per Recommandation.     Routine testing of 220KV 160MVA T/F-I & II Carried out on 17.04.2024 & 18.04.2024       c.     Last testing     Routine Testing of 160MVA T/F-I & II completed which was due in lulv_2D24     Routine testing of 220KV 160MVA T/F-I & II Carried out on 17.04.2024 & 18.04.2024       4     Bus Bar & LBB     Healthiness     Healthiness       a.     Healthiness     Healthine       b.     Settings     OK       c.     Status     Isolator & CB status are as per recomendation.     Isolator & CB status are as per recomendation.       5     Status of DC System     DC Earth Fault     Charger No.1 Positive to Negative=110V Positive to Earth=-56V     Image: Charger No.2 Positive to Earth=-56V       Negative to Earth=-56V     Negative to Earth=-56V     Image: Charger No.3 (48V) 48 Battery bank is						
Recommandation.       Recommandation.       Recommandation.       Recommandation.         c.       Last testing       Routine Testing of 160MVA T/F-1 & II Carried out on 17.04.2024 & 18.04.2024 respectively.         4       Bus Bar & LBB       Image: Carried out on 17.04.2024 & 18.04.2024         a.       Healthiness       Healthy       Image: Carried out on 17.04.2024 & 18.04.2024         b.       Settings       OK       Image: Carried out on 17.04.2024 & 18.04.2024         c.       Status       Healthy       Image: Carried out on 17.04.2024 & 18.04.2024         b.       Settings       OK       Image: Carried out on 17.04.2024 & 18.04.2024         c.       Status       Healthy       Image: Carried out on 17.04.2024 & 18.04.2024         b.       Settings       OK       Image: Carried out on 17.04.2024 & 18.04.2024         c.       Status of DC       Settings       OK         c.       Status of DC       System       Image: Charger No.1         a.       DC Earth Fault       Charger No.1       Image: Charger No.1         a.       DC Earth Fault       Negative to Earth= 56V       Image: Charger No.2         Positive to       Negative to Earth= 56V       Image: Charger No.3 (48V)       Image: Charger No.3 (48V)         A B Battery bank is       Image: Charger No.3 (4						
Image: Constraint of the sector of the se						
Image: status of DC       Image: status of DC       Image: status of DC       Image: status of DC         System       Image: status of DC       Image: status of DC       Image: status of DC         A       DC Earth Fault       Image: status of DC       Image: status of DC         System       Image: status of DC       Image: status of DC       Image: status of DC         System       Image: status of DC       Image: status of DC       Image: status of DC         System       Image: status of DC       Image: status of DC       Image: status of DC         System       Image: status of DC       Image: status of DC       Image: status of DC         System       Image: status of DC       Image: status of DC       Image: status of DC       Image: status of DC         System       Image: status of DC       Image: status of DC       Image: status of DC       Image: status of DC         System       Image: status of DC         System       Image: status of DC       Image				Recommandation.		
Image: Section of the section of th			Last testing	Routine Testing of	Boutine testing of 220KV 160MVA T/E-L& II	
4       Bus Bar & LBB       in lubz-2024         a.       Healthiness       Healthy       in lubz-2024         b.       Settings       OK       in lubz-2024         c.       Status       Isolator & CB status are as per recomendation.       in lubz-2024         5       Status of DC system       Image: Charger No.1       image: Charger No.1         a.       DC Earth Fault       Charger No.1       image: Charger No.1         Positive to Earth=55V       Image: No.2       Image: No.2         Positive to Earth=54V       Positive to Earth=54V       Image: No.2         Positive to Earth=54V       Image: No.2       Image: No.2         Positive to Earth=54V       Image: No.2       Image: No.2         Positive to Earth=54V       Image: No.2       Image: No.2         Positive to Earth=54V       Image: No.3 (48V)       Image: No.3 (48V)         AB Battery bank is       Image: No.3 (48V)       Image: No.3 (48V)		0.				
4       Bus Bar & LBB       Healthiness       Healthy       Image: Constraint of the second seco					respectively.	
a.     Healthiness     Healthy     Image: Constraint of the second sec	4	Bue Der 8 I DD		due in July-2024		
b.       Settings       OK       Isolator & CB status are as per recomendation.         5       Status of DC       Isolator & CB status are as per recomendation.       Isolator & CB status are as per recomendation.         5       Status of DC       Isolator & CB status are as per recomendation.       Isolator & CB status are as per recomendation.         6       System       Isolator & CB status are as per recomendation.       Isolator & CB status are as per recomendation.         7       System       Isolator & CB status are as per recomendation.       Isolator & CB status are as per recomendation.         8       DC Earth Fault       Charger No.1       Positive to Negative=110V       Isolator & CB status=-56V         Positive to Earth=-56V       Isolator & CB statu=-10V       Positive to Earth=-56V       Isolator & CB statu=-56V         Negative to Earth=-56V       Isolator & DE statu=-56V       Isolator & DE statu=-56V       Isolator & DE statu=-56V         Negative to Earth=-56V       Isolator & DE statu=-56V       Isolator & DE statu=-56V       Isolator & DE statu=-56V         Charger No.3 (48V)       Isolator & DE statu=-56V       Isolator & DE statu=-56V       Isolator & DE statu=-56V	4			Healthy		
Status of DC       as per recomendation.          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=-56V       .         Charger No.2       .         Positive to       .         Negative to Earth= 56V       .         Charger No.3 (48V)       .         48 Battery bank is       .						
5       Status of DC       System       Image: Charger No.1       Image: Charger No.1         a.       DC Earth Fault       Charger No.1       Image: Charger No.1       Image: Charger No.1         Positive to       Negative=110V       Positive to Earth=55V       Image: Charger No.2       Image: Charger No.2         Negative to Earth=0       Negative to Earth=54V       Image: Charger No.3 (48V)       Image: Charger No.3 (48V)       Image: Charger No.3 (48V)         Negative to Earth=-56V       Image: Charger No.3 (48V)       Image: Charger No.3 (48V)       Image: Charger No.3 (48V)		с.	Status	Isolator & CB status are		
System       Charger No.1       Image: System Positive to Negative=110V       Positive to Negative=110V         Positive to Earth=55V       Positive to Earth=55V       Image: System Positive to Earth=56V         Negative to Earth= -56V       Image: System Positive to Earth= 54V       Image: System Positive to Earth= -56V         Negative to Earth= -56V       Image: System Positive to Earth= -56V       Image: System Positive to Earth= -56V         Negative to Earth= -56V       Image: System Positive to Earth= -56V       Image: System Positive to Earth= -56V         Negative to Earth= -56V       Image: System Positive to Earth= -56V       Image: System Positive to Earth= -56V         Negative to Earth= -56V       Image: System Positive to Earth= -56V       Image: System Positive to Earth= -56V         Negative to Earth= -56V       Image: System Positive to Earth= -56V       Image: System Positive to Earth= -56V         Negative to Earth= -56V       Image: System Positive to Earth= -56V       Image: System Positive to Earth= -56V         Negative to Earth= -56V       Image: System Positive to Earth= -56V       Image: System Positive to Earth= -56V				as per recomendation.		
a.       DC Earth Fault       Charger No.1       Positive to         Positive to       Negative=110V       Positive to Earth=55V         Negative to Earth= -56V       Image: Charger No.2         Positive to To       Negative=110V         Positive to Earth= 54V       Image: Charger No.3         Negative to Earth= -56V       Image: Charger No.3 (48V)         Megative to Earth= -56V	5					
Positive to       Negative=110V         Positive to Earth=55V       Image: Charger No.2         Negative=110V       Positive to         Negative=110V       Image: Charger No.2         Positive to Earth= 54V       Image: Charger No.3 (48V)         Negative to Earth= -56V       Image: Charger No.3 (48V)         A8 Battery bank is       Image: Charger No.3 (48V)			DC Earth Fault	Charger No.1		
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					4	
Charger No.2				Positive to Earth=55V		
Positive to       Negative=110V       Positive to Earth= 54V       Negative to Earth= -56V       Charger No.3 (48V)       48 Battery bank is				Negative to Earth= -56V		
Negative=110V       Positive to Earth= 54V       Negative to Earth= -56V       Charger No.3 (48V)       48 Battery bank is						
Positive to Earth= 54V       Negative to Earth= -56V       Charger No.3 (48V)       48 Battery bank is						
Negative to Earth= -56V       Charger No.3 (48V)       48 Battery bank is					4	
Charger No.3 (48V) 48 Battery bank is						
48 Battery bank is				Negative to Earth= -56V		
48 Battery bank is				Charger No.3 (48V)		
				available and healthy.		
b. Batteries-		b.				
220V/110V/48V			220V/110V/48V			
Make Exide	1		Make	Exide		
Battery Status OK						

1		Gravity	ОК
	с.	Chargers Make	chlorite Make
	Status		ОК
	d.	DCDB Make	Nitya Electro controls pvt
			Itd
		Status	ОК
6	Analysis of tr	ipping from July 2023	
	a.	Name of Element	Nil
		tripped more than two	
		times in a month	
	b.	Multiple Trippings	Nil
	с.	Trippins Unexplained	Nil ( All Explained)
7	Status of SPS	<u> </u>	Not installed
8	Status of CB	Testing	Breaker timing test is
		-	pending.
9	Status of CT/	СVТ	CT & CVT Testing done at
			the time of
			commissioning
10	Status of Seq	uential Event Logger	Installed and healthy

### <u>2024</u>

### 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
	Remedial Actio	on taken on the observations	NO record found		Taken by
1	made in Previo	us Protection Audit			Transmission
-	(Internal/Third				Wing
	-				9
	Lines	Haalthingaa af Main 1 Main 2			
	a.	Healthiness of Main-1, Main-2,	Healthy		
		& Backup relays			
	b.	Settings	ОК		
	с.	Reach	ОК		
	d.	Time	ОК		
	e.	SOTF	ОК		
	f.	Fuse Fail Monitoring	ОК		
	g.	BRC Alarm	ОК		
	h.	Power Swing	ОК		
2	i.	Auto Reclose	Functional		
2		Healthiness of Carrier	DTPC panels are available for		
	j.	Protection	220kV Balrampur line & 220 KV		
		Protection	Sohawal (PGCIL) line.		
	k.	GPS Clock	Available		
			All relays synchronised with		
	Ι.	GPS Synchronization	GPS.		
			08.06.2024 (Routine testing of	All ements has been tested which were	
			220kV Bahraich-Balrampur line	due till July 2024.	
	m.	Last testing	and 220 KV PGCIL line has been		
		2000 0000000			
			done which was due in Dec		
	Transformer/		2023)		
	Reactor				
	Reactor	Healthiness of Differential,	Healthy		
	a.		Healthy		
		Backup, REF Protection	All setting have been done as		
			-		
	L	Cattings	per Recommandation. OTI, WTI		
3	b.	Settings	Fan Start, Pump Start etc		
			settings has been made as per		
			Recommandation		
			17.01.2024 (Routine testing of	All ements has been tested which were	
			160 MVA T/F-I & 160 MVA T/F-	due till July 2024.	
	с.	Last testing	II) , 16.01.2024 (100 MVA T/f)		
			has been done which was due		
			in March 2024		
		Bus Bar & LBB			
4	a.	Healthiness	Healthy		
	b.	Settings	ОК		
	с.	Status	Isolator & CB status are healthy		
	Status of DC				
	System				
			Charger No.1 (110V)	4	
			Positive to Negative=108V	4	
			Positive to Earth=51.8V		
			Negative to Earth= -56.3V		
			Charger No.2 (110V)		
		DC Earth Fault	Positive to Negative=120V		
	a.		Positive to Earth=62V		
			Negative to Earth= -60V		
			Charger No.3 (48V)		
			48V Battery set is available and	1	-
5			healthy		
2		Batteries- 220V/110V/48V			
		Make	Exide Industrial		
		Battery Status			
			Healthy	<u> </u>	l
	h	Gravity	OK		

	υ.	Chargers Make	HBL Ltd. Make		
		Status	Healthy		
		DCDB Make	Asian switchgear(P) Ltd		
	с.	Status	Healthy		
	с.	Chargers Make	HBL Ltd. Make		
		Status	Healthy		
	d.	DCDB Make	Asian switchgear(P) Ltd		
	-	Status	Healthy		
	Analysis of				
	tripping from				
	July 2023				
6	a.	Name of Element tripped more	Nil		
	-	than two times in a month			
	b.	Multiple Trippings	Nil		
	с.	Trippins Unexplained	Nil ( All Explained)		
7		Status of SPS	Not Applicable	SPS is not applicable for 220 KV S/s	
8	s	tatus 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 S	equential 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
	Remedial Actio	n taken on the observations	No record found.		Taken by
1	made in Previo	us Protection Audit			Transmission
	(Internal/Third	Partv)			Wing
	Lines				
	a.	Healthiness of Main-1, Main-2,	Healthy		
	a.	& Backup relays			
	b.	Settings	ОК	Now settings have been kept as per	
	Ы.	Settings		recommendation	
	с.	Reach	ОК		
	d.	Time	ОК		
	e.	SOTF	ОК		
2	f.	Fuse Fail Monitoring	ОК		
2	g.	BRC Alarm	ОК		
	h.	Power Swing	ОК		
	i.	Auto Reclose	Functional		
	j.	Healthiness of Carrier	DTPC		
	j.	Protection			
	k. GPS Clock		Available		
	I. GPS Synchronization		Synchronised		
	m.	Last testing		All ements has been tested which were	
		Last testing		due till July 2024.	
	Transformer/				
	Reactor				
	a.	Healthiness of Differential,	Healthy		
	а.	Backup, REF Protection			
			All setting have been done as		
3			per Recommandation. OTI, WTI		
	b.	Settings	Fan Start, Pump Start etc		
			settings has been made as per		
			Recommandation		
	с.	Last testing		All ements has been tested which were	
	с.	9		due till July 2024.	
		Bus Bar & LBB			
	a.	Healthiness	Healthy		
4	b.	Settings	ОК		
	с.	Status	Isolator & CB status are healthy		
	Status of DC				
	System				
	-,		Charger No.1 (110V)		

1			Positive to Negative=122V		
			Positive to Earth=58V		
			Negative to Earth= -64V		
			Charger No.2 (110V)		
	a.	DC Earth Fault	Positive to Negative=122V		
			Positive to Earth=60V		
			Negative to Earth= -62V		
5			Charger No.3 (48V)		
			48 Battery bank is available and		
			healthy.		
		Batteries- 220V/110V/48V			
	b.	Make	Exide Industrial		
	5.	Battery Status	Healthy		
		Gravity	ОК		
	c.	Chargers Make	JBB Electricals		
	с.	Status	Healthy		
	d.	DCDB Make	Asian		
	-	Status	Healthy		
	Analysis of				
	tripping from				
	July 2023				
6	a.	Name of Element tripped more	Nil		
		than two times in a month			
	b.	Multiple Trippings	Nil		
	С.	Trippins Unexplained	Nil ( All Explained)		
7		Status of SPS	Not Applicable	SPS is not applicable for 220 KV S/s	
			Not Done	Circuit breaker testing not done till date	
8	S	tatus of CB Testing		for which intimated to Transmission	
				wing wide lett. no. 266/ET&CD,Gonda dtd.09.10.24	
			CT & CVT Testing done at the	44.03.10.24	
9		Status of CT/CVT	time of commissioning		
10	Status of S	equential Event Logger (SEL)	Not Available		
10			NOT AVAIIABLE	1	1

### 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
	Remedial Actio	n taken on the observations	No record found.		Taken by
1	made in Previo	us Protection Audit			Transmission
	(Internal/Third	Party)			Wing
	Lines				
		Healthiness of Main-1, Main-2,	Healthy		
	a.	& Backup relays			
	b.	Settings	ОК		
	с.	Reach	ОК		
	d.	Time Settings.	ОК		
	e.	SOTF	ОК		
	f.	Fuse Fail Monitor	ОК		
2	g.	BRC Alarm	ОК		
	h.	Power Swing	ОК		
			Functional		
		Healthiness of Carrier	DTPC panels are available for		
	j.	Protection	220kV Bahraich line & 220 KV		
		Protection	Gonda(400) line.		
	k.	GPS Clock	Available		
	Ι.	GPS Synchronization	Synchronized		
	m.	Last testing	24.12.2023		
	Transformer/				
	Reactor				
	a.	Healthiness of Differential,	Healthy		
	d.	Backup, REF Protection			
3			All setting have been done as		
5			per Recommandation. OTI, WTI		
	b.	Settings	Fan Start, Pump Start etc		
			settings has been made as per		
			Recommandation		
	с.	Last testing	21.12.2023		

		Bus Bar & LBB		1	
4	a.	Healthiness	Healthy		
	b.	Settings	ОК		
	с.	Status	Functional		
	Status of DC				
	System				
			Charger No.1 (110V)		
			Positive to Negative=121V		
			Positive to Earth=59V		
			Negative to Earth= -62V		
	a.	DC Earth Fault	Charger No.2 (110V)		
	d.	DC Earth Fault	Positive to Negative=122V		
			Positive to Earth=60V		
			Negative to Earth= -62V		
			Charger No.3 (48V)		
5			NA		
		Batteries- 220V/110V/48V			
	b.	Make	Exide Industrial		
	D.	Battery Status	Healthy		
		Gravity	ОК		
		Chargers Make	Charger No.1 & 2 (110V Make		
		Chargers Make	Statcon Energia)		
	с.	Status	Healthy		
		Chargers Make	NA		
		Status	NA		
	d.	DCDB Make	Siemens Electrical		
		Status	Healthy		
	Analysis of				
	tripping from				
	July 2023				
6	a.	Name of Element tripped more	Nil		
	d.	than two times in a month			
	b.	Multiple Trippings	Nil		
	с.	Trippins Unexplained	Nil ( All Explained)		
7		Status of SPS	Not Applicable	SPS is not applicable for 220 KV S/s	
			Not Done	Circuit breaker testing not done till date	
8	s	tatus of CB Testing		for which intimated to Transmission	
		-		wing wide lett. no. 266/ET&CD,Gonda dtd.09.10.24	
	+		CT & CVT Testing done at the	นเน.บร.10.24	
9		Status of CT/CVT	•		
10	Status of S	equential Event Logger (SEL)	time of commissioning Not Available		
10	Jiaius UI S	equential Event Logger (JEL)	NUL AVAIIADIE		

				PROTECTION A	UDIT OF UPPT	CL SUBSTATION 22	<b>JKV CHINHAT</b>						
	Previous	Protection Audit											
		SERVATIONS											
		L ACTIONS IF ANY					N/A N/A						
	KEIVIEDIA								1				
(A) Lir	nes												
	_			220 KV SATRIKH									Action to be taken by Transmission wing
				ROAD	220KV PG LKO	220KV GOMTINAGAR	220KV K.ROAD	220 KV LMRC I				Remarks	
1		Healthiness of I		OK	OK	OK	OK	OK	OK				
2		Healthiness of I		OK	OK	OK	OK	OK	OK				
3		Healthiness of	B/U	OK	OK	ОК	ОК	ОК	ОК	A/R not appli			
										I & II Due to L	G Cable		
4		Settings-Rea		OK	OK	OK	OK	OK	OK				
5		Settings-Tir		OK	OK	OK	OK	OK	OK				
6		lealthiness of carrie		OK	OK	ОК	OK	ОК	OK				
		Healthiness of Auto	Reclosure										
7				Not working	Not working	Not working	ОК	U/G	U/G			Proposed in month of sept 24	Timely Shutdown will be arranged.
8		Last Routine te	sting	01.07.2024	18.07.2023	22.04.2024	19.07.2023	22.09.2023	23.09.2023			The posed in the number of sept 2.1	inner shataown win be arrangea.
(B) Tr	ransformers / Re	eactor											
				200 MVA T/F-1	200 MVA T/F-II								1
1	F	lealthiness of Differ		OK	OK								4
2		Healthiness of R	F Kelay	OK	OK OK							l	4
3 4	H	ealthiness of BACKL ealthiness of BACKL	r nelay(HV) P Relay(LV)	OK OK	OK OK							1	1
5	п	SETTINGS	i neidy(Ev)	OK	OK							1	1
6		LAST TESTIN	G	19.03.2024	19.12.2023	1	1	1	1	1		NO Routine testing pending	1
(C)	BU	SBAR & LBB											
				220 KV BUS									
1		HEALTHINE		OK									
2		SETTINGS		OK									
(D)		Status of DC sy	stem										
(5)		Status of De s	stem		Positive to								
					negative	Positive to earth	-ve to earth						To identify the DC Earth Fault exact location
1		DC EARTH FA		I	120V	112	8V					Need to be checked by Transmission	shutdown of all the feeders is required which
2		BATTERIES ( 220)	/110V)	Ш	119 V	111	7.6					wing	will be performed in the coming winter
		48 V			52 V	0.5 V	52 V						season.
3		CHARGER			3								
(5)		SIS OF TRIPPINGS											
<u>(E)</u>	ANAL	ISIS OF TRIPPINGS	KOIVI JULT 2025										
1	Name of eler	ment tripped more t	han 2 times in a month	NO									
2		Multiple tripp		NO									
3		Trippings unexp		NO									
(F)		STATUS OF	PS	Not Applicable									
(0)													
(G)		STATUS OF CB T	DUILE	1		1	1						
								220 KV SATRIKH			200 MVA T/F-		
				LMRC I & II	REMARK	220KV K.ROAD	220KV PG LKO	ROAD	220 KV GNR	200 MVA T/F-I	200 MVA T/F- II		
1		TIMING TE		LMRC I & II 03.08.2018	REMARK	220KV K.ROAD 14.09.2021	220KV PG LKO 07.07.2020			200 MVA T/F-I 06.01.2021	200 MVA T/F- II 23.12.2022		
2		OVERHAULI	IG	LMRC I & II 03.08.2018	REMARK		220KV PG LKO 07.07.2020	ROAD	220 KV GNR	200 MVA T/F-I 06.01.2021	п		
			IG	LMRC I & II 03.08.2018	REMARK		220KV PG LKO 07.07.2020	ROAD	220 KV GNR	200 MVA T/F-I 06.01.2021	п		
2 3		OVERHAULI CRM/DCRI	IG 1	LMRC I & II 03.08.2018	REMARK		220KV PG LKO 07.07.2020	ROAD	220 KV GNR	200 MVA T/F-I 06.01.2021	п		
2		OVERHAULI	IG 1	03.08.2018	REMARK		220KV PG LKO 07.07.2020	ROAD	220 KV GNR	200 MVA T/F-I 06.01.2021	п		
2 3		OVERHAULI CRM/DCRI	IG 1	03.08.2018 220 KV SATRIKH		14.09.2021	07.07.2020	ROAD 23.11.2021	220 KV GNR 10.01.2023	200 MVA T/F-I	п		
2 3 (H) 1	ACC	OVERHAULI CRM/DCRI STATUS OF	IG 1 CT PROTECTION	03.08.2018	220KV PG LKO PS, PS, PS	14.09.2021 220KV K.ROAD PS, PS, PS	07.07.2020 20 KVGNR PS, PS, PS	ROAD 23.11.2021 20 KV LMRC I PS, PS, PS	220 KV GNR 10.01.2023 220 KV LMRC II PS, PS, PS	200 MVA T/F-I	п		
2 3		OVERHAULI CRM/DCRI STATUS OF	IG 1 CT PROTECTION	03.08.2018 220 KV SATRIKH ROAD PS, PS, PS 0.2, 1.0, 0.2	220KV PG LKO PS, PS, PS 0.5, 0.5, 0.5	14.09.2021 220KV K.ROAD	07.07.2020	ROAD 23.11.2021 20 KV LMRC I PS, PS, PS	220 KV GNR 10.01.2023 220 KV LMRC II	200 MVA T/F-I	п		
2 3 (H) 1	AC	OVERHAULI CRM/DCRI STATUS OF CUARACY CLASS FOR CUARACY CLASS FOR	IG 1 CT PROTECTION R METERING	03.08.2018 220 KV SATRIKH ROAD PS, PS, PS 0.2, 1.0, 0.2 200 MVA T/F-I	220KV PG LKO PS, PS, PS 0.5, 0.5, 0.5 200 MVA T/F-II	14.09.2021 220KV K.ROAD PS, PS, PS	07.07.2020 20 KVGNR PS, PS, PS	ROAD 23.11.2021 20 KV LMRC I PS, PS, PS	220 KV GNR 10.01.2023 220 KV LMRC II PS, PS, PS	200 MVA T/F-1 06.01.2021	п		
2 3 (H) 1	AC	OVERHAULI CRM/DCRI STATUS OF CUARACY CLASS FOR CUARACY CLASS FOR CUARACY CLASS FOR CUARACY CLASS FOR	IG 1 T PROTECTION R METERING PROTECTION	03.08.2018 220 KV SATRIKH ROAD PS, PS, PS 0.2, 1.0, 0.2 200 MVA T/F-1 PS, PS, PS	220KV PG LKO PS, PS, PS 0.5, 0.5, 0.5 200 MVA T/F-II PS, PS, PS	14.09.2021 220KV K.ROAD PS, PS, PS	07.07.2020 20 KVGNR PS, PS, PS	ROAD 23.11.2021 20 KV LMRC I PS, PS, PS	220 KV GNR 10.01.2023 220 KV LMRC II PS, PS, PS	200 MVA T/F-I 06.01.2021	п		
2 3 (H) 1	AC	OVERHAULI CRM/DCRI STATUS OF CUARACY CLASS FOR CUARACY CLASS FOR	IG 1 T PROTECTION R METERING PROTECTION	03.08.2018 220 KV SATRIKH ROAD PS, PS, PS 0.2, 1.0, 0.2 200 MVA T/F-I	220KV PG LKO PS, PS, PS 0.5, 0.5, 0.5 200 MVA T/F-II	14.09.2021 220KV K.ROAD PS, PS, PS	07.07.2020 20 KVGNR PS, PS, PS	ROAD 23.11.2021 20 KV LMRC I PS, PS, PS	220 KV GNR 10.01.2023 220 KV LMRC II PS, PS, PS	200 MVA T/F-I 06.01.2021	п		
2 3 (H) 1 2 	AC	OVERHAULI CRM/DCRI STATUS OF CUARACY CLASS FOF CUARACY CLASS FOF CUARACY CLASS FOF CUARACY CLASS FOF	IG PROTECTION R METERING PROTECTION R METERING R METERING	03.08.2018 220 KV SATRIKH ROAD PS, PS, PS 0.2, 1.0, 0.2 200 MVA T/F-1 PS, PS, PS	220KV PG LKO PS, PS, PS 0.5, 0.5, 0.5 200 MVA T/F-II PS, PS, PS	14.09.2021 220KV K.ROAD PS, PS, PS	07.07.2020 20 KVGNR PS, PS, PS	ROAD 23.11.2021 20 KV LMRC I PS, PS, PS	220 KV GNR 10.01.2023 220 KV LMRC II PS, PS, PS	200 MVA T/F-I 06.01.2021	п		
2 3 (H) 1	AC	OVERHAULI CRM/DCRI STATUS OF CUARACY CLASS FOR CUARACY CLASS FOR CUARACY CLASS FOR CUARACY CLASS FOR	IG PROTECTION R METERING PROTECTION R METERING R METERING	03.08.2018 220 KV SATRIKH ROAD PS, P5, P5 0.2, 1.0, 0.2 200 MVA T/F-1 PS, P5, P5 0.5, 0.2, 0.2	220KV PG LKO PS, PS, PS 0.5, 0.5, 0.5 200 MVA T/F-II PS, PS, PS	14.09.2021 220KV K.ROAD PS, PS, PS	07.07.2020 20 KVGNR PS, PS, PS	ROAD 23.11.2021 20 KV LMRC I PS, PS, PS	220 KV GNR 10.01.2023 220 KV LMRC II PS, PS, PS	200 MVA T/F-I 06.01.2021	п		
2 3 (H) 1 2 	AC	OVERHAULI CRM/DCRI STATUS OF CUARACY CLASS FOF CUARACY CLASS FOF CUARACY CLASS FOF CUARACY CLASS FOF	IG PROTECTION R METERING PROTECTION R METERING R METERING	03.08.2018 220 KV SATRIKH ROAD PS, PS, PS 0.2, 1.0, 0.2 200 MVA T/F-1 PS, PS, PS 0.5, 0.2, 0.2 220 KV SATRIKH	220KV PG LKO PS, PS, PS 0.5, 0.5, 0.5 200 MVA T/F-II PS, PS, PS 2.0, 0.5, 0.5	14.09.2021 220KV K.ROAD PS, PS, PS 0.5, 0.5, 0.5	07.07.2020 220 KVGNR PS, PS, PS 1.0, 0.2, 0.2	ROAD 23.11.2021 220 KV LMRC I PS, PS, PS 0.2, 0.2, 0.2	220 KV GNR 10.01.2023 220 KV LMRC II PS, PS, PS 0.2, 0.2, 0.2	200 MVA T/F-I 06.01.2021	п		
2 3 (H) 1 2 	AC ACC AC	OVERHAULI CRM/DCR/ STATUS OF CUARACY CLASS FOO CUARACY CLASS FOO CUARACY CLASS FOO CUARACY CLASS FOO CUARACY CLASS FOO STATUS OF (	IG PROTECTION R METERING PROTECTION R METERING I METERING YI	03.08.2018 220 KV SATRIKH ROAD PS, PS, PS 0.2, 1.0, 0.2 200 MVA T/F-1 PS, PS, PS 0.5, 0.2, 0.2 220 KV SATRIKH ROAD	220KV PG LKO PS, PS, PS 0.5, 0.5, 0.5 200 MVA T/F-II PS, PS, PS 2.0, 0.5, 0.5 220KV PG LKO	14.09.2021 220KV K.ROAD PS, PS, PS 0.5, 0.5, 0.5 220KV K.ROAD	07.07.2020 220 KVGNR PS, PS, PS 1.0, 0.2, 0.2 220 KVGNR	ROAD 23.11.2021 220 KV LMRC I PS, PS, PS 0.2, 0.2, 0.2	220 KV GNR 10.01.2023 220 KV LMRC II PS, PS, PS 0.2, 0.2, 0.2 220 KV LMRC II	200 MVA T/F-I 06.01.2021	п		
2 3 (H) 1 2 		OVERHAULI CRM/DCRI STATUS OF CUARACY CLASS FOF CUARACY CLASS FOF CUARACY CLASS FOF CUARACY CLASS FOF	IG I I I PROTECTION RMETERING PROTECTION VI I PROTECTION VI PROTECTION PROTECTION	03.08.2018 220 KV SATRIKH ROAD PS, PS, PS 0.2, 1.0, 0.2 200 MVA T/F-1 PS, PS, PS 0.5, 0.2, 0.2 200 KV SATRIKH ROAD 3P, 3P, 3P 1.0, 0.2, 0.2	220KV PG LKO PS, PS, PS 0.5, 0.5, 0.5, 0.5 200 MVA T/F-II PS, PS, PS 2.0, 0.5, 0.5, 0.5 220KV PG LKO 3P, 3P, 3P 0.5, 0.5, 0.5	14.09.2021 220KV K.ROAD PS, PS, PS 0.5, 0.5, 0.5	07.07.2020 220 KVGNR PS, PS, PS 1.0, 0.2, 0.2	ROAD 23.11.2021 220 KV LMRC I PS, PS, PS 0.2, 0.2, 0.2 220 KV LMRC I	220 KV GNR 10.01.2023 220 KV LMRC II PS, PS, PS 0.2, 0.2, 0.2	200 MVA T/F-I 06.01.2021	п		
2 3 (H) 1 2 (I) (I) 1		OVERHAULI CRM/DCR/ STATUS OF CUARACY CLASS FOR CUARACY CLASS FOR UNARACY CLASS FOR CUARACY CLASS FOR STATUS OF 4 CUARACY CLASS FOR CUARACY CLASS FOR CUARACY CLASS FOR	IG PROTECTION R METERING PROTECTION R METERING VI PROTECTION X METERING VI	03.08.2018 220 KV SATRIKH ROAD PS, PS, PS 0.2, 1.0, 0.2 200 MVA T/F-1 PS, PS, PS 0.5, 0.2, 0.2 220 KV SATRIKH ROAD 3P, 3P, 3P 1.0, 0.2, 0.2 200 MVA T/F-1	220KV PG LKO PS, PS, PS 0.5, 0.5, 0.5 200 MVA T/F-II PS, PS, PS 2.0, 0.5, 0.5 220KV PG LKO 3P, 3P, 3P 0.5, 0.5, 0.5 200 MVA T/F-II	14.09.2021 220KV K.ROAD PS, PS, PS 0.5, 0.5, 0.5 220KV K.ROAD 3P, 3P, 3P	07.07.2020 220 KVGNR PS, PS, PS 1.0, 0.2, 0.2 220 KVGNR 3, 3P, 3P	ROAD           23.11.2021           220 KV LMRC I           PS, PS, PS           0.2, 0.2, 0.2           220 KV LMRC I           3P	220 KV GNR 10.01.2023 220 KV LMRC II PS, PS, PS 0.2, 0.2, 0.2 220 KV LMRC II 3P	200 MVA T/F-I 06.01.2021	п		
2 3 (H) 1 2 (I) (I) 1		OVERHAULI CRM/DCRI STATUS OF CLUARACY CLASS FOR CLUARACY CLASS FOR CLUARACY CLASS FOR STATUS OF 41 STATUS OF	IG I I I PROTECTION RETERING PROTECTION VI PROTECTION RETERING VI PROTECTION RETERING I PROTECTION RETERING I PROTECTION	03.08.2018 220 KV SATRIKH ROAD PS, PS, PS 0.2, 1.0, 0.2 200 MVA T/F-1 PS, PS, PS 0.5, 0.2, 0.2 200 KV SATRIKH ROAD 3P, 3P, 3P 1.0, 0.2, 0.2	220KV PG LKO PS, PS, PS 0.5, 0.5, 0.5, 0.5 200 MVA T/F-II PS, PS, PS 2.0, 0.5, 0.5, 0.5 220KV PG LKO 3P, 3P, 3P 0.5, 0.5, 0.5	14.09.2021 220KV K.ROAD PS, PS, PS 0.5, 0.5, 0.5 220KV K.ROAD 3P, 3P, 3P	07.07.2020 220 KVGNR PS, PS, PS 1.0, 0.2, 0.2 220 KVGNR 3, 3P, 3P	ROAD           23.11.2021           220 KV LMRC I           PS, PS, PS           0.2, 0.2, 0.2           220 KV LMRC I           3P	220 KV GNR 10.01.2023 220 KV LMRC II PS, PS, PS 0.2, 0.2, 0.2 220 KV LMRC II 3P	200 MVA T/F-I 06.01.2021	п		

		,					1		-		1	
	I											
(J)	ST/	ATUS OF SEQUENTIAL EVENT	LOGGER									
		NOT AVAILABLE										
		PRO	DTECTION AUD	IT OF UPPTO	L SUBSTATIO	N 220 KV BKT						
	1											
	Previo	ous Protection Audit										
	11000	Previous prot. dt C	5 02 2010									
			3.03.2013									
	C	OBSERVATIONS		R	elay settings were to	be reviewed						
	REIVIEU	DIAL ACTIONS IF ANY	setting	gs of 220 kV lines	and both IFs has bee	en checked and changed as p	er SOP					
												Action to be taken by Transmission wing
(A)	Lines											
				220 KV SITAPUR								
				LINE	220 KV PGCIL LINE						Remarks	
1	1	Healthiness of Main 1		OK	OK							
2		Healthiness of Main 2		NA	NA							
3	<u> </u>	Healthiness of B/U		OK	OK							
4	<u> </u>	Settings-Reach		OK	OK						AR Problem of both lines was resolved	Problem Resolved
				OK							on 26.04.2024	FIODIeIII Resolved
5	<b>↓</b>	Settings-Time			OK						4	
6	<u> </u>	Healthiness of carrier protect		OK	OK						4	
7		Healthiness of Auto Reclos	ure	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										
	1			60 MVA T/F-I	60 MVA T/F-II		1			İ	İ.	1
1	+	Healthiness of Differential R	elav	OK	OK						1	
2	+	Healthiness of REF Relay		NA	NA		1	H	-		1	1
		Healthiness of REF Relay	4.0.0									
3		Healthiness of BACKUP Relay	(HV)	OK	OK						OK	Every Relay and Control Panel is Healthy
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)	F	BUSBAR & LBB										
				220KV BUS								
1	<u> </u>	HEALTHINESS		Not Working							LOI has been issued by transmission	Engineer will come after one week.
2		SETTINGS		NOT WORKING							wing for recitification purpose	Engineer mit eente alter ene weekt
	<u> </u>	SETTINGS										
	l											
(D)		Status of DC system										
					Positive to							
					negative	Positive to earth	-ve to earth				Need to be checked by Transmission	
1		DC EARTH FAULT		110 V	120 V	1.7 V	- 118V				wing	Resolved on 04.09.2024.
2		BATTERIES (220V/110V/48	SV)	48 V	52V	52V					wing	
3	1	CHARGERS			3	0.2	-51 V					
	<u>†                                    </u>				÷							
<u>(E)</u>	AN(	ALYSIS OF TRIPPINGS FROM J	UI V 2022									
	ANA	ALTSIS OF TRIPPINGS FROM J	011 2025									
	l											
												No Tripping
1	Name of e	element tripped more than 2 t	imes in a month	NO					1		1	
2		Multiple trippings		NO								
3	1	Trippings unexplained			İ		1			1	1	
	†T								-			
(F)	+	STATUS OF SPS		NOT AVAILABLE			1	<u> </u>	-		1	NOT AVAILABLE
<u></u>	<b>н</b> г	318103 01 313		INOT AVAILABLE			+		-		4	NUT AVAILABLE
	┥───────────────────────											
(G)	<b></b>	STATUS OF CB TESTING					1					
				220 KV LINE								
				SITAPUR	REMARK							
1		TIMING TEST		05.10.2023								As Soon Bkr Timing testing will be start.
2		OVERHAULING		05.10.2023		220 KV PGCIL.	60 MVA T/F-I &II Not [	Done				As Soon BRETIMING lesung will be start.
3	1	CRM/DCRM		05.10.2023	İ					1		
	1						1			1	1	
(H)	+	STATUS OF CT							1			
(1)	<u>+</u> т	<u>SIAIOS OF CI</u>		220 KV SITAPUR		60 MI/A 7/5 I	60 MI/A 7/5 1	<u> </u>	-		1	
						60 MVA T/F-I	60 MVA T/F-II		1		1	
				LINE	220 KV PGCIL LINE							
		UARACY CLASS FOR PROTECTI		PS	PS	PS	PS					OK
1			G R,Y,B *	0.2	0.2	0.2	0.2					
1		CUARACY CLASS FOR METERIN										
2		CUARACY CLASS FOR METERIN										
2												
		CUARACY CLASS FOR METERIN		220 KV SITAPUR		60 MVA T/F-I	60 MVA T/F-II					
2		CUARACY CLASS FOR METERIN			220 KV PGCIL LINF	60 MVA T/F-I	60 MVA T/F-II					
2	ACC	CUARACY CLASS FOR METERIN		LINE	220 KV PGCIL LINE							ОК
2 (I)	ACC	CUARACY CLASS FOR METERIN STATUS OF CVT UARACY CLASS FOR PROTECTI	DN R,Y,B <sup>¢</sup>	LINE 3P	3P	3P	3P					ОК
2	ACC	CUARACY CLASS FOR METERIN	DN R,Y,B <sup>¢</sup>	LINE								ОК

					-			-					
(L)	ST	ATUS OF SEQU	ENTIAL EVEN	T LOGGER									
			1										
			SCADA	Available								Partially Working	Partially Working
				DROTECTI		LIDDTCI CIID							
				PROTECTIO	JN AUDIT OF	- UPPICL SUB	STATION 220 KV KU	KSI KUAD	i	i			
-	Previous Prot	ection Audit d	t 06-03-2019										
		OBSERVATIONS				l lelay setting were to	he reviewed						
		JESERVATIONS			ĸ	leidy setting were to	De levieweu		-				
	REME	DIAL ACTIONS I	FANY	settin	igs of 220 ky lines a	and both TEs has bee	en checked and changed as pe	er SOP					
(A)	Lines												
					220 KV PGCIL I	220 KV PGCIL II	220 KV H. ROAD	220 KV CHINHAT					Action to be taken by Transmission wing
1													
1			ess of Main 1		OK	OK	OK	OK				Remarks	
2			ess of Main 2 iness of B/U	2	NA OK	NA OK	NA OK	NA OK					
3			iness of B/U ngs-Reach		OK OK	OK OK	OK	OK OK					
5			ings-Reach		OK	OK	OK	OK					
6		Healthiness o		ection	OK	OK	OK	OK					
		Healthiness			U.	U.	01	- OK					
7					Not Working	Not Working	ок	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 problem 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 Ro	utine testing		11.09.2023	14.09.23	15.04.23	17.04.23					
(1)													
(8)	Transformers /	Reactor	<u> </u>		200 141/4	100 MVA TF	160 MVA TF	1				1	
1		Healthiness o	f Differential	Relay	200 MVA OK	0K	160 MVA TF OK	1				1	
2			ess of REF Rela		OK	OK	OK					1	
3	1	Healthiness of	BACKUP Rela	ay(HV)	OK	OK	OK	1				1	
4		Healthiness o			OK	OK	OK					1	
5		SE	TTINGS		OK	OK	OK					]	
6		LAS	T TESTING		09.05.2024	10.05.2024	10.05.2024						
(C)	E	BUSBAR & LBB											
L					220KV BUS							LOI has been issued by transmission	Work in progress
1			LTHINESS		Not Working						 	wing for rectification purpose	
2	ļ,	SE	TTINGS	1									
(D)		Statu-	of DC system										
(0)		Status	DL SYSTEM			Positive to							
1						negative	Positive to earth	-ve to earth				1	
1		DC FA	RTH FAULT			122 V	0.8 V	-ve to earth -119 V				Need to be checked by Transmission	DC earth being traced by taking shutdowns
2		BATTERIES	220V/110V/4	48V)		53 V	0.2	-119 V -53 V				wing	DC earth being traced by taking shutdowns in phased manner without disturbing load
3			ARGERS	,			0.2	53 V				1	in phased manner without disturbing load supply.
<u> </u>		CH										• •	supply.
<u>(E)</u>	ANA	ALYSIS OF TRIP	PINGS FROM	JULY 2023									
<u> </u>								1					
1	Name of e	element tripped	l more than 2	times in a month								1	
2	inanie or e		ole trippings		NO							1	
3	1		s unexplained	4								1	
		TIPPING	- anexplained				1						

(F)	STATUS OF SPS	- 1	NOT AVAILABLE									
(0)										-		
(G)	STATUS OF CB TEST	NG		REMARK								
1	TIMING TEST		PGCIL I		160 MVA	СНТ	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 II	220 KV H. ROAD	220 KV CHINHAT		100 MVA TF				
1	ACCUARACY CLASS FOR PR	DTECTION	PS	PS	PS	PS	PS	PS	PS			
2	ACCUARACY CLASS FOR M	ETERING	0.2	0.2	0.2	0.2	0.2	0.2	0.2			
(1)										-		
(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 PR	TECTION	3P	3P	3P	3P	3P	3P	3P			
2	ACCUARACY CLASS FOR M	ETERING	0.2	0.2	0.2	0.2	0.2	0.2	0.2			
-			0.2	0.2	UIL	0.2	0.2	0.2	0.2			
(L)	STATUS OF SEQUENTIAL EVE	NT LOGGER										
	SCADA	Available									Partially Working	PR submitted for AMC of SCADA
	PROTE			STATION 220	KV KANPUR ROAD							
<b>—</b>	FROTE		JEFFICE JUE		REAL ON ROAD							
	Previous Protection Audit								<u> </u>			
	Flevious Protection Addit					-						
	OBSERVATIONS			NA								
	REMEDIAL ACTIONS IF ANY			No								
												Action to be taken by Transmission wing
(A)	Lines										Remarks	
			220 KV	220 KV UNNAO								
			S.NAGAR LINE	LINE								
1	Healthiness of Mair		OK	OK								
2	Healthiness of Mair	2	NA	NA								
3	Healthiness of B/t		ОК	ОК							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	
4	Settings-Reach		ОК	ОК							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,
5	Settings-Time		OK	OK								as the line comprises both section of UG and
6	Healthiness of carrier pro		NA	NA						l		OH. the requirement of Distance relay is
7	Healthiness of Auto Rec	losure	NA	NA							NO ROUTINE TESTING PENDING	being sent to design circle.
8	Last Routine testin	g	08.08.2023	08.08.2023								
(8)	Transformers / Reactor								<u> </u>			
(8)			60 MVA T/F-I	60 MVA T/F-II	60 MVA T/F-III				+	1	ł	
1	Healthiness of Differenti	al Relav	OK	OK	OK					<u> </u>		
2	Healthiness of REF R		NA	NA	NA							
3	Healthiness of BACKUP R		OK	OK	OK				-	-	OK	
4	Healthiness of BACKUP R		OK	OK	OK				1		1	
5	SETTINGS		OK	OK	OK				1	1	1	
6	LAST TESTING		30.04.2024	30.04.2024	30.04.2024				1	1	NO ROUTINE TESTING PENDING	1
(C)	BUSBAR & LBB											
			220KV BUS									
1	HEALTHINESS		OK								ОК	
2	SETTINGS		OK									
(D)	Status of DC system	<u>n</u>										

1										
		Positive to								
		negative	Positive to earth	-ve to earth					ок	
	DC EARTH FAULT	233 V	114 V	114 V						
2	BATTERIES (220V/110V/48V)	220 V								
3	CHARGERS	2								
<u>(E)</u>	ANALYSIS OF TRIPPINGS FROM JULY 2023									
1	Name of element trianed more than 2 times in a month	0								
-	Name of element tripped more than 2 times in a month	0							ОК	
2	Multiple trippings							-	-	
3	Trippings unexplained	0								
(F)	STATUS OF SPS	NOT AVAILABLE								
(G)	STATUS OF CB TESTING									
			REMARK							
1	TIMING TEST	NA							ОК	
2	OVERHAULING	NA							ÖK	
3	CRM/DCRM	NA								1
ſ										
(H)	STATUS OF CT									
				60 MVA T/F-I	60 MVA T/F-II	60 MVA T/F-III		1		
1		220 KV TL	221 KV TL			·····,· ···				1
1	ACCUARACY CLASS FOR PROTECTION	PS	PS	PS	PS	PS	1		ОК	1
2	ACCUARACY CLASS FOR METERING	0.2	0.2	0.2	0.2	0.2			1	1
⊢-́		0.2	0.2	0.2	0.2	0.2		1	1	1
(I)	STATUS OF CVT	1	<u> </u>		1			1		
(1)		+	ł	CO MO11 - /	60 M / /- /	CO NOVA = /=				1
1		220 KV TL	221 KV TL	60 MVA T/F-I	60 MVA T/F-II	60 MVA T/F-III				1
<u> </u>				20				_	OK	
1	ACCUARACY CLASS FOR PROTECTION	PS	PS	PS	PS	PS			4	1
2	ACCUARACY CLASS FOR METERING	0.2	0.2	0.2	0.2	0.2				
(J)									ОК	
	Working								Sit	
	PROTI	ECTION AUD	IT OF UPPTCL	SUBSTATION 220 K	V HARDOI ROA	D				
	Previous Protection Audit									
	OBSERVATIONS		No Record	found						
	REMEDIAL ACTIONS IF ANY									
			1		1					Action to be taken by Transmission wing
										Action to be taken by transmission wing
(A)	Lines.									Action to be taken by transmission wing
(A)									Pomarke	Action to be taken by transmission wing
	Lines	220 KV							Remarks	Action to be taken by fransmission wing
1		220 KV	220 KV KURSI	220KV JEHTA CKT-I	220KV JEHTA CKT-II				Remarks	
		S.NAGAR LINE	220 KV KURSI ROAD LINE	220KV JEHTA CKT-I	220KV JEHTA CKT-II				Remarks	Action to be taken by transmission wing
		S.NAGAR LINE CKT-I	ROAD LINE						Remarks	Action to be taken by transmission wing
1	Healthiness of Main 1	S.NAGAR LINE CKT-I OK	ROAD LINE OK	ОК	ОК				Remarks	Action to be taken by transmission wing
2	Healthiness of Main 1 Healthiness of Main 2	S.NAGAR LINE CKT-I OK OK	ROAD LINE OK OK	OK OK	OK OK				Remarks OK	Action to be taken by transmission wing
2	Healthiness of Main 1 Healthiness of Main 2 Healthiness of B/U	S.NAGAR LINE CKT-I OK OK NA	ROAD LINE OK OK NA	OK OK NA	OK OK NA					Action to be taken by transmission wing
2 3 4	Healthiness of Main 1 Healthiness of Main 2 Healthiness of B/U Settings-Reach	S.NAGAR LINE CKT-I OK OK NA OK	ROAD LINE OK OK NA OK	ОК ОК NA ОК	OK OK NA OK					Action to be taken by transmission wing
2 3 4 5	Healthiness of Main 1 Healthiness of Main 2 Healthiness of B/U	S.NAGAR LINE CKT-I OK OK NA OK OK	ROAD LINE OK OK NA OK OK	OK OK NA OK OK	OK OK NA OK OK					Action to be taken by transmission wing
2 3 4 5 6	Healthiness of Main 1 Healthiness of Main 2 Healthiness of B/U Settings-Reach	S.NAGAR LINE CKT-I OK OK NA OK OK OK	ROAD LINE OK OK OK OK OK	ОК ОК NA ОК ОК ОК	OK OK NA OK OK OK					Action to be taken by transmission wing
2 3 4 5	Healthiness of Main 1 Healthiness of Main 2 Healthiness of B/U Settings-Reach Settings-Time Healthiness of carrier protection	S.NAGAR LINE CKT-I OK OK NA OK OK	ROAD LINE OK OK NA OK OK	OK OK NA OK OK	OK OK NA OK OK					Action to be taken by transmission wing
2 3 4 5 6	Healthiness of Main 1 Healthiness of Main 2 Healthiness of B/U Settings-Reach Settings-Time	S.NAGAR LINE CKT-I OK OK NA OK OK OK	ROAD LINE OK OK OK OK OK	ОК ОК NA ОК ОК ОК	OK OK NA OK OK OK					
2 3 4 5 6 7	Healthiness of Main 1 Healthiness of Main 2 Healthiness of B/U Settings-Reach Settings-Time Healthiness of carrier protection Healthiness of Auto Reclosure	S.NAGAR LINE CKT-I OK OK OK OK OK	ROAD LINE OK OK OK OK OK OK	ОК ОК ОК ОК ОК ОК	OK OK NA OK OK OK				ОК	
2 3 4 5 6 7 8	Healthiness of Main 1 Healthiness of Main 2 Healthiness of B/U Settings-Reach Settings-Time Healthiness of Arrier protection Healthiness of Artio Reclosure Last Routine testing	S.NAGAR LINE CKT-I OK OK OK OK OK	ROAD LINE OK OK OK OK OK OK	ОК ОК ОК ОК ОК ОК	OK OK NA OK OK OK				ОК	
2 3 4 5 6 7 8	Healthiness of Main 1 Healthiness of Main 2 Healthiness of B/U Settings-Reach Settings-Time Healthiness of carrier protection Healthiness of Auto Reclosure	S.NAGAR LINE CKT-1 OK OK NA OK OK OK 31.01.2024	OK           OK           NA           OK           OK           OK           OK           OK           OK           OK	ОК ОК ОК ОК ОК ОК	OK OK NA OK OK OK				ОК	
2 3 4 5 6 7 8 8 (B)	Healthiness of Main 1 Healthiness of Main 2 Healthiness of B/U Settings-Reach Settings-Time Healthiness of Carrier protection Healthiness of Auto Reclosure Last Routine testing Transformers / Reactor	S.NAGAR LINE (KT-1) OK OK OK OK OK OK 31.01.2024 200 MVA T/F-1	ROAD LINE           OK           OK           OK           OK           OK           OK           Z7.04.2024           OK	ОК ОК ОК ОК ОК ОК	OK OK NA OK OK OK				ОК	
2 3 4 5 6 7 8	Healthiness of Main 1 Healthiness of Main 2 Healthiness of B/U Settings-Reach Healthiness of carrier protection Healthiness of Auto Reclosure Last Routine testing Transformers / Reactor	S.NAGAR LINE CKT-1 OK OK NA OK OK OK 31.01.2024	OK           OK           OK           OK           OK           OK           OK           Z7.04.2024           200 MVA T/F-II           OK	ОК ОК ОК ОК ОК ОК	OK OK NA OK OK OK				OK NO ROUTINE TESTING PENDING	
2 3 4 5 6 7 8 (B)	Healthiness of Main 1         Healthiness of Main 2         Healthiness of B/U         Settings-Time         Healthiness of carrier protection         Healthiness of Auto Reclosure         Last Roufine testing         Transformers Reactor         Healthiness of Differential Relay	S.NAGAR LINE (KT-1) OK OK OK OK OK 31.01.2024 200 MVA T/F-1 OK	OK           OK           NA           OK           NA (Relay not	ОК ОК ОК ОК ОК ОК	OK OK NA OK OK OK				ОК	
2 3 4 5 6 7 8 (B) 1 2	Healthiness of Main 1 Healthiness of Main 2 Healthiness of B/U Settings-Reach Settings-Time Healthiness of carrier protection Healthiness of Auto Reclosure Last Routine testing Transformers / Reactor Healthiness of Differential Relay Healthiness of REF Relay	S.NAGAR LINE (KT) OK OK OK OK 31.01.2024 200 MVA T/F-1 OK	OK           OK           NA           OK           OK           OK           Z7.04.2024           Z00 MVA T/F-II           OK           NA (Relay not available)	ОК ОК ОК ОК ОК ОК	OK OK NA OK OK OK				OK NO ROUTINE TESTING PENDING	
2 3 4 5 6 7 8 (B) 1 2 3	Healthiness of Main 1 Healthiness of Main 2 Healthiness of B/U Settings-Reach Healthiness of Auto Reclosure Last Routine testing Transformers / Reactor Healthiness of Differential Relay Healthiness of BACKUP Relay(HV)	S.NAGAR LINE (KT-1) OK OK OK OK OK 200 MVA T/F-1 OK OK	OK           OK           OK           OK           OK           OK           Z7.04.2024           Z00 MVA T/F-II           OK           NA (Relay not available)           OK	ОК ОК ОК ОК ОК ОК	OK OK NA OK OK OK				OK NO ROUTINE TESTING PENDING	
2 3 4 5 6 7 8 (B) 1 2 3 4	Healthiness of Main 1 Healthiness of Main 2 Healthiness of B/U Settings-Reach Settings-Time Healthiness of carrier protection Healthiness of Differential Relay Healthiness of BACKUP Relay(HV) Healthiness of BACKUP Relay(HV) Healthiness of BACKUP Relay(HV)	S.NAGAR LINE (KT-1) OK OK OK OK OK 31.01.2024 200 MVA T/F-1 OK OK OK	OK           OK           NA           OK           OK           Z00 MVA T/F-II           OK           NA (Relay not available)           OK           OK	ОК ОК ОК ОК ОК ОК	OK OK NA OK OK OK				OK NO ROUTINE TESTING PENDING OK	
2 3 4 5 6 7 8 (B) 1 1 2 3 4 5	Healthiness of Main 1 Healthiness of Main 2 Healthiness of B/U Settings-Reach Healthiness of carrier protection Healthiness of Differential Relay Healthiness of Differential Relay Healthiness of BACKUP Relay(HV) Healthiness of BACKUP Relay(LV) SETTINGS	S.NAGAR LINE (KT-1) OK OK OK OK OK 200 MVA T/F-1 OK OK OK OK	OK           OK           OK           OK           OK           OK           Z1.04.2024           Z00 MVA T/F-II           OK           NA (Relay not available)           OK           OK           OK	ОК ОК ОК ОК ОК ОК	OK OK NA OK OK OK				OK NO ROUTINE TESTING PENDING	
2 3 4 5 6 7 8 (B) 1 2 3 4	Healthiness of Main 1         Healthiness of Main 2         Healthiness of B/U         Settings-Reach         Settings-Time         Healthiness of Carrier protection         Healthiness of Auto Reclosure         Last Routine testing         Transformers / Reactor         Healthiness of Differential Relay         Healthiness of BACKUP Relay(HV)         Healthiness of BACKUP Relay(LV)         SETTINGS	S.NAGAR LINE (KT-1) OK OK OK OK OK 31.01.2024 200 MVA T/F-1 OK OK OK	OK           OK           NA           OK           OK           Z00 MVA T/F-II           OK           NA (Relay not available)           OK           OK	ОК ОК ОК ОК ОК ОК	OK OK NA OK OK OK				OK NO ROUTINE TESTING PENDING OK	
2 3 4 5 6 7 8 (B) 1 1 2 3 4 5 6	Healthiness of Main 1 Healthiness of Main 2 Healthiness of B/U Settings-Reach Healthiness of arrier protection Healthiness of carrier protection Healthiness of Carrier protection Healthiness of Carrier protection Healthiness of Carrier protection Healthiness of Differential Relay Healthiness of Differential Relay Healthiness of BACKUP Relay(HV) Healthiness of BACKUP Relay(HV) Healthiness of BACKUP Relay(V) SETTINGS LAST TETING	S.NAGAR LINE (KT-1) OK OK OK OK OK 200 MVA T/F-1 OK OK OK OK	OK           OK           OK           OK           OK           OK           Z1.04.2024           Z00 MVA T/F-II           OK           NA (Relay not available)           OK           OK           OK	ОК ОК ОК ОК ОК ОК	OK OK NA OK OK OK				OK NO ROUTINE TESTING PENDING OK	
2 3 4 5 6 7 8 (B) 1 2 3 4 5	Healthiness of Main 1 Healthiness of Main 2 Healthiness of B/U Settings-Reach Healthiness of arrier protection Healthiness of carrier protection Healthiness of Carrier protection Healthiness of Carrier protection Healthiness of Carrier protection Healthiness of Differential Relay Healthiness of Differential Relay Healthiness of BACKUP Relay(HV) Healthiness of BACKUP Relay(HV) Healthiness of BACKUP Relay(V) SETTINGS LAST TETING	S.NAGAR LINE (KT-1) OK OK OK OK OK 31.01.2024 200 MVA T/F-1 OK OK OK OK OK OK OK OK	OK           OK           OK           OK           OK           OK           Z1.04.2024           Z00 MVA T/F-II           OK           NA (Relay not available)           OK           OK           OK	ОК ОК ОК ОК ОК ОК	OK OK NA OK OK OK				OK NO ROUTINE TESTING PENDING OK	
2 3 4 5 6 7 8 (B) 1 2 3 4 5 6 6	Healthiness of Main 1         Healthiness of Main 2         Healthiness of B/U         Settings-Time         Healthiness of arrier protection         Healthiness of Auto Reclosure         Last Routine testing         Transformers (Reactor         Healthiness of Differential Relay         Healthiness of BACKUP Relay(HV)         Healthiness of BACKUP Relay(HV)         Healthiness of BACKUP Relay(LV)         SETTINGS         LAST TSTING         BUSBAR & LBB	S.NAGAR LINE (KT-1) OK OK OK OK OK OK OK OK OK OK	OK           OK           OK           OK           OK           OK           Z1.04.2024           Z00 MVA T/F-II           OK           NA (Relay not available)           OK           OK           OK	ОК ОК ОК ОК ОК ОК	OK OK NA OK OK OK				OK NO ROUTINE TESTING PENDING OK No Routine testing Pending	
2 3 4 5 6 7 8 (B) 1 1 2 3 4 5 6 (C) 1	Healthiness of Main 1         Healthiness of Main 2         Healthiness of B/U         Settings-Reach         Settings-Time         Healthiness of Carrier protection         Healthiness of Auto Reclosure         Last Routine testing         Transformers / Reactor         Healthiness of Differential Relay         Healthiness of BACKUP Relay(HV)         Healthiness of BACKUP Relay(LV)         SETTINGS         LAST TESTING         BUSBAR & LBB         HEALTHINESS	S.NAGAR LINE (KT-1) OK OK OK OK OK OK OK OK OK OK	OK           OK           OK           OK           OK           OK           Z1.04.2024           Z00 MVA T/F-II           OK           NA (Relay not available)           OK           OK           OK	ОК ОК ОК ОК ОК ОК	OK OK NA OK OK OK				OK NO ROUTINE TESTING PENDING OK	
2 3 4 5 6 7 8 (B) 1 1 2 3 4 5 6 (C)	Healthiness of Main 1         Healthiness of Main 2         Healthiness of B/U         Settings-Time         Healthiness of arrier protection         Healthiness of Auto Reclosure         Last Routine testing         Transformers (Reactor         Healthiness of Differential Relay         Healthiness of BACKUP Relay(HV)         Healthiness of BACKUP Relay(HV)         Healthiness of BACKUP Relay(LV)         SETTINGS         LAST TSTING         BUSBAR & LBB	S.NAGAR LINE (KT-1) OK OK OK OK OK 31.01.2024 200 MVA T/F-1 OK OK OK OK OK OK OK OK	OK           OK           OK           OK           OK           OK           Z1.04.2024           Z00 MVA T/F-II           OK           NA (Relay not available)           OK           OK           OK	ОК ОК ОК ОК ОК ОК	OK OK NA OK OK OK				OK NO ROUTINE TESTING PENDING OK No Routine testing Pending	
2 3 4 5 6 7 8 (B) 1 1 2 3 4 5 6 (C) 1	Healthiness of Main 1         Healthiness of Main 2         Healthiness of B/U         Settings-Reach         Settings-Time         Healthiness of Carrier protection         Healthiness of Auto Reclosure         Last Routine testing         Transformers / Reactor         Healthiness of Differential Relay         Healthiness of BACKUP Relay(HV)         Healthiness of BACKUP Relay(LV)         SETTINGS         LAST TESTING         BUSBAR & LBB         HEALTHINESS	S.NAGAR LINE (KT-1) OK OK OK OK OK OK OK OK OK OK	OK           OK           OK           OK           OK           OK           Z1.04.2024           Z00 MVA T/F-II           OK           NA (Relay not available)           OK           OK           OK	ОК ОК ОК ОК ОК ОК	OK OK NA OK OK OK				OK NO ROUTINE TESTING PENDING OK No Routine testing Pending	
2 3 4 5 6 7 8 <b>(B)</b> 1 1 2 3 4 4 5 6 6 ( <b>C</b> ) 1 2	Healthiness of Main 1         Healthiness of Main 2         Healthiness of Main 2         Healthiness of Main 2         Settings-Time         Healthiness of Auto Reclosure         Last Routine testing         Transformers / Reactor         Healthiness of Differential Relay         Healthiness of BACKUP Relay(HV)         Healthiness of BACKUP Relay(LV)         SETTINGS         LAST TESTING         HEALTHINESS         HEALTHINESS         SETTINGS         HEALTHINESS         HEALTHINESS	S.NAGAR LINE (KT-1) OK OK OK OK OK OK OK OK OK OK	OK           OK           OK           OK           OK           OK           Z1.04.2024           Z00 MVA T/F-II           OK           NA (Relay not available)           OK           OK           OK	ОК ОК ОК ОК ОК ОК	OK OK NA OK OK OK				OK NO ROUTINE TESTING PENDING OK No Routine testing Pending	
2 3 4 5 6 7 8 (B) 1 1 2 3 4 5 6 (C) 1	Healthiness of Main 1         Healthiness of Main 2         Healthiness of B/U         Settings-Reach         Settings-Time         Healthiness of Carrier protection         Healthiness of Auto Reclosure         Last Routine testing         Transformers / Reactor         Healthiness of Differential Relay         Healthiness of BACKUP Relay(HV)         Healthiness of BACKUP Relay(LV)         SETTINGS         LAST TESTING         BUSBAR & LBB         HEALTHINESS	S.NAGAR LINE (KT-1) OK OK OK OK OK OK OK OK OK OK	OK           OK           OK           OK           OK           OK           Z1.04.2024           Z00 MVA T/F-II           OK           OK	ОК ОК ОК ОК ОК ОК	OK OK NA OK OK OK				OK NO ROUTINE TESTING PENDING OK No Routine testing Pending	
2 3 4 5 6 7 8 <b>(B)</b> 1 1 2 3 4 4 5 6 6 <b>(C)</b> 1 2 2	Healthiness of Main 1         Healthiness of Main 2         Healthiness of Main 2         Healthiness of Main 2         Settings-Time         Healthiness of Auto Reclosure         Last Routine testing         Transformers / Reactor         Healthiness of Differential Relay         Healthiness of BACKUP Relay(HV)         Healthiness of BACKUP Relay(LV)         SETTINGS         LAST TESTING         HEALTHINESS         HEALTHINESS         SETTINGS         HEALTHINESS         HEALTHINESS	S.NAGAR LINE (KT-1) OK OK OK OK OK OK OK OK OK OK	OK           OK           OK           OK           OK           OK           Z7.04.2024           Z00 MVA T/F-II           OK           OK           OK           OK           Z00 MVA T/F-II           OK           Positive to	ОК ОК ОК ОК ОС ОК ОС ОК ОС 06.04.2024	OK OK OK OK OK 04.05.2024				OK NO ROUTINE TESTING PENDING OK No Routine testing Pending	
2 3 4 5 6 7 8 (B) 2 3 4 5 6 (C) 1 2	Healthiness of Main 1         Healthiness of Main 2         Healthiness of Main 2         Healthiness of Main 2         Settings-Time         Healthiness of Auto Reclosure         Last Routine testing         Transformers / Reactor         Healthiness of Differential Relay         Healthiness of BACKUP Relay(HV)         Healthiness of BACKUP Relay(LV)         SETTINGS         LAST TESTING         HEALTHINESS         HEALTHINESS         SETTINGS         HEALTHINESS         HEALTHINESS	S.NAGAR LINE (KT-1) OK OK OK OK OK OK OK OK OK OK	OK           OK           OK           OK           OK           OK           Z1.04.2024           Z00 MVA T/F-II           OK           OK	ОК ОК ОК ОК ОК ОК	OK OK NA OK OK OK				OK NO ROUTINE TESTING PENDING OK No Routine testing Pending	

r										
(D)	Status of DC system	Positive t	_							
2	SETTINGS									avilabilty of service engineer
1	HEALTHINESS	Not Worki							rectification purpose	shutdown will be arraged in sep last after
		220KV BL	s						LOI has been issued by transmission for	
(C)	BUSBAR & LBB									
6	LAST TESTING	07.10.202	3 07.08.2023						NO ROUTINE TESTING PENDING	
5	SETTINGS	OK	OK							
3	Healthiness of BACKUP Relay(HV) Healthiness of BACKUP Relay(LV)		OK OK						1	
2	Healthiness of REF Relay	OK	OK OK						ок	
1	Healthiness of Differential Relay	60 MVA T/ OK	F-II 60 MVA T/F-III OK						1	
(B)	Transformers / Reactor	(01) ··· -/	CO MUA 7/5 ···							
		14.06.202	4 21.06.2024			 				
8	Last Routine testing	part 14.06.202	part				-		NO ROUTINE TESTING PENDING	
7	Healthiness of Auto Reclosure	NA Due to c		1						
5	Settings-Time Healthiness of carrier protection	OK OK	OK OK							
4	Settings-Reach	OK	OK							
3	Healthiness of Main 2 Healthiness of B/U	NA NA	NA							
1	Healthiness of Main 1 Healthiness of Main 2	OK OK	OK OK							
		RBL LINE	LINE							
(A)	Lines	220 KV PG0	CIL- 220 KV SATRIKH						Remarks	
										Action to be taken by Transmission wing
	REMEDIAL ACTIONS IF ANY	-								
	OBSERVATIONS	I	NO RECORD F	OUND	1					
	Previous Protection Audit									
		PROTECTIO		TCL SUBSTATION 22	<b>KV CG CITY</b>		L	1		
	NA	4								
(L)	STATUS OF SEQUENTIAL EVENT LOG									
2	ACCUARACY CLASS FOR METERING	G I,II (0.2)	0.5	0.5						
-		0.5 except J	ehta-							
1	ACCUARACY CLASS FOR PROTECTION R	t,Y,B <sup>♠</sup> PS	PS	PS					ОК	
		220 KV T	L							
			200 MVA T/F-I	200 MVA T/F-II			1			
(I)	STATUS OF CVT						-			
2	ACCUARACY CLASS FOR METERING			0.5						
1		0.5 except J	hta-						1	
1	ACCUARACY CLASS FOR PROTECTIO	220 KV T	L PS	PS					ОК	
			200 MVA T/F-I	200 MVA T/F-II						
(H)	STATUS OF CT									
3	CRM/DCRM	NA							l	
2	OVERHAULING	NA							UK	
1	TIMING TEST	NA	RÉWARK						ОК	
(G)	STATUS OF CB TESTING		REMARK							
		NUT AVAILA								
(F)	STATUS OF SPS	NOT AVAILA	BLE							
3	Multiple trippings Trippings unexplained	0								
1	Name of element tripped more than 2 times Multiple trippings	in a month 0 0							ОК	
<u>(E)</u>	ANALYSIS OF TRIPPINGS FROM JULY 2	2023					-			
3	BATTERIES ( 220V/110V/48V) CHARGERS		2							
2	DATTERIES ( 220)//110///48//)		110 V	1	1		1	1		

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							
	chrittochis				1				
(E)	ANALYSIS OF TRIPPINGS FROM JULY 2023								
<u> </u>	ANALISIS OF TRIFFINGS FROM JOLT 2023								
1	Name of element tripped more than 2 times in a month	NIL							
2	Multiple trippings	NIL							
3	Trippings unexplained	NIL							
					1				
(5)	STATUS OF SPS	NOT AVAILABLE							
(F)	STATUS OF SPS	NUT AVAILABLE							
(G)	STATUS OF CB TESTING								
			REMARK						
1	TIMING TEST								
2	OVERHAULING								
3	CRM/DCRM	NOT DONE							
5	entitybentit	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	
					1			1	
1	ACCUARACY CLASS FOR PROTECTION	PS	PS	PS	PS				
2	ACCUARACY CLASS FOR METERING	0.2	0.2	0.2	0.2			1	
	ACCOMMACT CLASS FOR IVIE FERING	0.2	0.2	0.2	0.2	<b>├</b> ───		1	
		ł			+			+	
(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				
(L)	STATUS OF SEQUENTIAL EVENT LOGGER								
(1)								Partially Warking	ROO haa haan aant far reatification
	SCADA Available							Partially Working	BOQ has been sent for rectification
	PROTE	CTION AUDI	T OF UPPTCL :	SUBSTATION 220 KV	/ GOMITI NAGA	R	· · · · · · · · · · · · · · · · · · ·		
	Previous Protection Audit dt 08-03-2019								
	Flevious Flotection Addit at 08-03-2015								
	OBSERVATIONS	I R	elay setting were to	be reviewed					
	OBSERVATIONS	R	elay setting were to	be reviewed	1				
					er SOP				
				be reviewed en checked and changed as p	er SOP				Action to be taken by Transmission win
					er SOP			-	Action to be taken by Transmission wing
					er SOP			-	Action to be taken by Transmission win
	REMEDIAL ACTIONS IF ANY Settin				er SOP			- Durada	Action to be taken by Transmission win
(A)		ngs of 220 kv lines :	and both TFs has bee		er SOP			Remarks	Action to be taken by Transmission win
(A)	REMEDIAL ACTIONS IF ANY Settin	ngs of 220 kv lines and the second seco	and both TFs has bee		er SOP				Action to be taken by Transmission win
(A)	REMEDIAL ACTIONS IF ANY Settin	ngs of 220 kv lines :	220 KV CHINHAT LINE		er SOP			Remarks	Action to be taken by Transmission win
1	REMEDIAL ACTIONS IF ANY Settin	ngs of 220 kv lines and the second seco	and both TFs has bee		er SOP			- Remarks	Action to be taken by Transmission win
1	REMEDIAL ACTIONS IF ANY Settin	220 kV lines 220 kV S.NAGAR LINE OK	and both TFs has bee 220 KV CHINHAT LINE OK		er SOP			Remarks	Action to be taken by Transmission win
1 2	REMEDIAL ACTIONS IF ANY Settin	220 kv lines 220 kv S.NAGAR LINE OK OK	220 KV CHINHAT LINE OK OK		er SOP			-	Action to be taken by Transmission win
1 2 3	REMEDIAL ACTIONS IF ANY Settin	220 kv lines 220 kv S.NAGAR LINE OK NA	220 KV CHINHAT LINE OK OK NA		er SOP			AR Problem of both lines was resolved	Action to be taken by Transmission win
1 2 3 4	REMEDIAL ACTIONS IF ANY Settin	220 kv lines - 220 kv S.NAGAR LINE OK OK NA OK	220 KV CHINHAT LINE OK OK NA OK		er SOP			-	Action to be taken by Transmission win
1 2 3 4 5	REMEDIAL ACTIONS IF ANY Settin	220 kv lines 220 kv S.NAGAR LINE OK NA OK OK	220 KV CHINHAT LINE OK OK NA OK OK		er SOP			AR Problem of both lines was resolved	Action to be taken by Transmission win
1 2 3 4 5 6	REMEDIAL ACTIONS IF ANY Settin	220 kV lines 220 kV S.NAGAR LINE OK OK NA OK OK	220 KV CHINHAT LINE OK OK OK OK OK		er SOP			AR Problem of both lines was resolved	Action to be taken by Transmission win
1 2 3 4 5 6 7	REMEDIAL ACTIONS IF ANY Settin	220 kV lines . 220 kV S.NAGAR LINE OK OK OK OK OK NO Working	220 KV CHINHAT LINE OK OK OK OK OK OK OK NO Working		er SOP			AR Problem of both lines was resolved	Action to be taken by Transmission win
1 2 3 4 5 6	REMEDIAL ACTIONS IF ANY Settin	220 kV lines 220 kV S.NAGAR LINE OK OK NA OK OK	220 KV CHINHAT LINE OK OK OK OK OK		er SOP			AR Problem of both lines was resolved	Action to be taken by Transmission win
1 2 3 4 5 6 7	REMEDIAL ACTIONS IF ANY Settin	220 kV lines . 220 kV S.NAGAR LINE OK OK OK OK OK NA OK NC Working	220 KV CHINHAT LINE OK OK OK OK OK OK OK NO Working		er SOP			AR Problem of both lines was resolved	Action to be taken by Transmission win
1 2 3 4 5 6 7 8	REMEDIAL ACTIONS IF ANY Settin	220 kV lines . 220 kV S.NAGAR LINE OK OK OK OK OK NA OK NC Working	220 KV CHINHAT LINE OK OK OK OK OK OK OK NO Working		er SOP			AR Problem of both lines was resolved	Action to be taken by Transmission win
1 2 3 4 5 6 7 8	REMEDIAL ACTIONS IF ANY Settin	220 kV lines 220 kV S.NAGAR LINE OK OK NA OK OK Not Working 05.03.2024	220 KV CHINHAT LINE OK OK OK OK OK NA Working 04.03.2024	en checked and changed as p				AR Problem of both lines was resolved	Action to be taken by Transmission win
1 2 3 4 5 6 7 8 (B)	REMEDIAL ACTIONS IF ANY Settin	220 kV 220 kV S.NAGAR LINE OK OK OK OK OK OK Not Working 05.0.2024 60 MVA T/F-1	220 KV CHINHAT LINE OK OK OK OK OK Not Working OK OK OK At Working OK OK	en checked and changed as p	60 MVA T/F-IV			AR Problem of both lines was resolved	Action to be taken by Transmission win
1 2 3 4 5 6 7 8 8 ( <b>B</b> )	REMEDIAL ACTIONS IF ANY     Settin       Lines	220 kV lines. 220 kV S.NAGAR LINE OK OK OK OK NA OK OK OK OK OK OK	220 KV CHINHAT LINE OK OK OK OK NA OK OK Not Working 04.03.2024 60 MVA T/F-II OK	en checked and changed as p	60 MVA T/F-IV OK			AR Problem of both lines was resolved	Action to be taken by Transmission win
1 2 3 4 5 6 7 7 8 ( <b>B</b> ) 1 2	REMEDIAL ACTIONS IF ANY     Settin       Lines     Healthiness of Main 1       Healthiness of Main 2       Healthiness of B/U       Settings-Time       Healthiness of Auto Reclosure       Last Routine testing       Transformers / Reactor       Healthiness of Differential Relay       Healthiness of Differential Relay	220 kV lines. 220 kV S.NAGAR LINE OK OK NA OK OK Not Working OK 60 MVA T/F-1 OK OK	220 KV CHINHAT LINE OK OK OK OK Not Working OK AC.3.2024 GO MVA T/F-II OK	en checked and changed as p 	60 MVA T/F-IV OK			AR Problem of both lines was resolved on dt 04.03.2024 & 05.03.2024	Action to be taken by Transmission win
1 2 3 4 5 6 7 7 8 ( <b>B</b> ) 1 2 3	REMEDIAL ACTIONS IF ANY     Settin       Lines     Healthiness of Main 1       Healthiness of Main 2     Healthiness of Main 2       Healthiness of Auin 8/U     Settings-Time       Healthiness of Auto Reclosure     Last Routine testing       Transformers / Reactor     Healthiness of Differential Relay       Healthiness of Staff Refay     Healthiness of REF Relay       Healthiness of BACKUP Relay(HV)     Healthiness of BACKUP Relay(HV)	220 kV lines. 220 kV S.NAGAR LINE OK OK OK OK OK OK OK OK OK	220 KV CHINHAT LINE OK OK OK OK OK OK SOK OK SOK OK OK	en checked and changed as p	60 MVA T/F-IV OK OK			AR Problem of both lines was resolved	Action to be taken by Transmission win
1 2 3 4 5 6 7 8 ( <b>B</b> ) 1 2	REMEDIAL ACTIONS IF ANY     Settin       Lines     Healthiness of Main 1       Healthiness of Main 2       Healthiness of B/U       Settings-Time       Healthiness of Auto Reclosure       Last Routine testing       Transformers / Reactor       Healthiness of Differential Relay       Healthiness of Differential Relay	220 kV lines. 220 kV S.NAGAR LINE OK OK NA OK OK Not Working OK 60 MVA T/F-1 OK OK	220 KV CHINHAT LINE OK OK OK OK Not Working OK AC.3.2024 GO MVA T/F-II OK	en checked and changed as p 	60 MVA T/F-IV OK			AR Problem of both lines was resolved on dt 04.03.2024 & 05.03.2024	Action to be taken by Transmission win
1 2 3 4 5 6 7 8 (B) 1 2 3 4	REMEDIAL ACTIONS IF ANY     Settin       Lines	220 kV lines. 220 kV S.NAGAR LINE OK OK OK NA OK OK OK OK OK OK	220 KV CHINHAT LINE OK OK OK OK NA Working 04.03.2024 60 MVA T/F-II OK OK OK	en checked and changed as p en checked and changed as p 60 MVA T/F-III 0K 0K 0K 0K	60 MVA T/F-IV ОК ОК ОК			AR Problem of both lines was resolved on dt 04.03.2024 & 05.03.2024	Action to be taken by Transmission win
1 2 3 4 5 6 7 8 (B) 1 2 3 3 4 5	REMEDIAL ACTIONS IF ANY     Settin       Lines     Healthiness of Main 1       Healthiness of Main 2       Healthiness of Main 2       Healthiness of Main 2       Settings-Time       Healthiness of Auto Reclosure       Last Routine testing       Healthiness of Differential Relay       Healthiness of Differential Relay       Healthiness of BACKUP Relay(HV)       Healthiness of BACKUP Relay(HV)       Healthiness of SETTINGS	220 kV 3.NAGAR LINE OK OK OK OK OK OK OK OK OK OK	220 KV CHINHAT LINE OK OK OK OK Not Working OK OK OK OK OK	en checked and changed as p control of the second se	60 MVA T/F-IV OK OK OK OK			AR Problem of both lines was resolved on dt 04.03.2024 & 05.03.2024	Action to be taken by Transmission win
1 2 3 4 5 6 7 8 (B) 1 2 3 4	REMEDIAL ACTIONS IF ANY     Settin       Lines	220 kV lines. 220 kV S.NAGAR LINE OK OK OK NA OK OK OK OK OK OK	220 KV CHINHAT LINE OK OK OK OK NA Working 04.03.2024 60 MVA T/F-II OK OK OK	en checked and changed as p en checked and changed as p 60 MVA T/F-III 0K 0K 0K 0K	60 MVA T/F-IV ОК ОК ОК			AR Problem of both lines was resolved on dt 04.03.2024 & 05.03.2024	Action to be taken by Transmission win
1 2 3 4 5 6 7 8 (B) 1 2 3 4 4 5	REMEDIAL ACTIONS IF ANY     Settin       Lines     Healthiness of Main 1       Healthiness of Main 2       Healthiness of Main 2       Healthiness of Main 2       Settings-Time       Healthiness of Auto Reclosure       Last Routine testing       Healthiness of Differential Relay       Healthiness of Differential Relay       Healthiness of BACKUP Relay(HV)       Healthiness of BACKUP Relay(HV)       Healthiness of SETTINGS	220 kV 3.NAGAR LINE OK OK OK OK OK OK OK OK OK OK	220 KV CHINHAT LINE OK OK OK OK Not Working OK OK OK OK OK	en checked and changed as p control of the second se	60 MVA T/F-IV OK OK OK OK			AR Problem of both lines was resolved on dt 04.03.2024 & 05.03.2024	Action to be taken by Transmission win
1 2 3 4 5 6 7 8 (B) 1 2 3 4 4 5	REMEDIAL ACTIONS IF ANY     Settin       Lines     Healthiness of Main 1       Healthiness of Main 2       Healthiness of Main 2       Healthiness of Main 2       Settings-Time       Healthiness of Auto Reclosure       Last Routine testing       Healthiness of Differential Relay       Healthiness of Differential Relay       Healthiness of BACKUP Relay(HV)       Healthiness of BACKUP Relay(HV)       Healthiness of SETTINGS	220 kV 3.NAGAR LINE OK OK OK OK OK OK OK OK OK OK	220 KV CHINHAT LINE OK OK OK OK Not Working OK OK OK OK OK	en checked and changed as p control of the second se	60 MVA T/F-IV OK OK OK OK			AR Problem of both lines was resolved on dt 04.03.2024 & 05.03.2024	Action to be taken by Transmission win
1 2 3 4 5 6 7 8 (B) 1 2 3 4 4 5	REMEDIAL ACTIONS IF ANY     Settin       Lines     Healthiness of Main 1       Healthiness of Main 2       Healthiness of Main 2       Healthiness of Main 2       Settings-Time       Healthiness of Auto Reclosure       Last Routine testing       Healthiness of Differential Relay       Healthiness of Differential Relay       Healthiness of BACKUP Relay(HV)       Healthiness of BACKUP Relay(HV)       Healthiness of SETTINGS	220 kV 3.NAGAR LINE OK OK OK OK OK OK OK OK OK OK	220 KV CHINHAT LINE OK OK OK OK Not Working OK OK OK OK OK	en checked and changed as p control of the second se	60 MVA T/F-IV OK OK OK OK			AR Problem of both lines was resolved on dt 04.03.2024 & 05.03.2024	Action to be taken by Transmission win
1 2 3 4 5 6 7 8 (B) 1 2 3 3 4 5	REMEDIAL ACTIONS IF ANY     Settin       Lines     Healthiness of Main 1       Healthiness of Main 2       Healthiness of Main 2       Healthiness of Main 2       Settings-Time       Healthiness of Auto Reclosure       Last Routine testing       Healthiness of Differential Relay       Healthiness of Differential Relay       Healthiness of BACKUP Relay(HV)       Healthiness of BACKUP Relay(HV)       Healthiness of SETTINGS	220 kV 220 kV S.NAGAR LINE OK OK OK OK OK OK OK OK OK OK	220 KV CHINHAT LINE OK OK OK OK Not Working OK OK OK OK OK	en checked and changed as p control of the second se	60 MVA T/F-IV OK OK OK OK			AR Problem of both lines was resolved on dt 04.03.2024 & 05.03.2024	
1 2 3 4 5 6 7 8 (B) 1 2 3 4 5 6	REMEDIAL ACTIONS IF ANY     Settin       Lines     Healthiness of Main 1       Healthiness of Main 2       Healthiness of Main 2       Healthiness of Auto Reclosure       Last Routine testing       Transformers / Reactor       Healthiness of Differential Relay       Healthiness of BACKUP Relay(HV)       Healthiness of BACKUP Relay(HV)       Healthiness of BACKUP Relay(HV)       SETTINGS	220 kV lines. 220 kV S.NAGAR LINE OK OK OK OK OK OK OK OK OK OK	220 KV CHINHAT LINE OK OK OK OK Not Working OK OK OK OK OK	en checked and changed as p control of the second se	60 MVA T/F-IV OK OK OK OK			AR Problem of both lines was resolved on dt 04.03.2024 & 05.03.2024	all shudown arranged for testing of bus bar
1 2 3 4 5 6 7 8 (B) 1 2 3 3 4 5	REMEDIAL ACTIONS IF ANY     Settin       Lines     Healthiness of Main 1       Healthiness of Main 2       Healthiness of Main 2       Healthiness of Main 2       Settings-Time       Healthiness of Auto Reclosure       Last Routine testing       Healthiness of Differential Relay       Healthiness of Differential Relay       Healthiness of BACKUP Relay(HV)       Healthiness of BACKUP Relay(HV)       Healthiness of SETTINGS	220 kV 220 kV S.NAGAR LINE OK OK OK OK OK OK OK OK OK OK	220 KV CHINHAT LINE OK OK OK OK Not Working OK OK OK OK OK	en checked and changed as p control of the second se	60 MVA T/F-IV OK OK OK OK			AR Problem of both lines was resolved on dt 04.03.2024 & 05.03.2024	all shudown arranged for testing of bus bar protection panel by testing team and service
1 2 3 4 5 6 7 8 <b>(B)</b> 1 2 3 4 5 6 1	REMEDIAL ACTIONS IF ANY     Settin       Lines     Healthiness of Main 1       Healthiness of Main 2       Healthiness of BAU       Settings-Time       Healthiness of Auto Reclosure       Last Routine testing       Transformers / Reactor       Healthiness of Differential Relay       Healthiness of BACKUP Relay(HV)       Healthiness of BACKUP Relay(HV)       Healthiness of BACKUP Relay(HV)       SETTINGS       HEALTHINESS	220 kV lines. 220 kV S.NAGAR LINE OK OK OK OK OK OK OK OK OK OK	220 KV CHINHAT LINE OK OK OK OK Not Working OK OK OK OK OK	en checked and changed as p control of the second se	60 MVA T/F-IV OK OK OK OK			AR Problem of both lines was resolved on dt 04.03.2024 & 05.03.2024	all shudown arranged for testing of bus bar protection panel by testing team and servic engineer. testing completed on
1 2 3 4 5 6 7 8 (B) 1 2 3 4 5 6	REMEDIAL ACTIONS IF ANY     Settin       Lines     Healthiness of Main 1       Healthiness of Main 2       Healthiness of Main 2       Healthiness of Auto Reclosure       Last Routine testing       Transformers / Reactor       Healthiness of Differential Relay       Healthiness of BACKUP Relay(HV)       Healthiness of BACKUP Relay(HV)       Healthiness of BACKUP Relay(HV)       SETTINGS	220 kV lines. 220 kV S.NAGAR LINE OK OK OK OK OK OK OK OK OK OK	220 KV CHINHAT LINE OK OK OK OK Not Working OK OK OK OK OK	en checked and changed as p control of the second se	60 MVA T/F-IV OK OK OK OK			AR Problem of both lines was resolved on dt 04.03.2024 & 05.03.2024	all shudown arranged for testing of bus bar protection panel by testing team and servic engineer. testing completed on
1 2 3 4 5 6 6 7 7 8 8 1 2 2 3 4 5 6 1 2 2 1 2 2	REMEDIAL ACTIONS IF ANY     Settin       Lines	220 kV lines. 220 kV S.NAGAR LINE OK OK OK OK OK OK OK OK OK OK	220 KV CHINHAT LINE OK OK OK OK Not Working OK OK OK OK OK	en checked and changed as p control of the second se	60 MVA T/F-IV OK OK OK OK			AR Problem of both lines was resolved on dt 04.03.2024 & 05.03.2024	all shudown arranged for testing of bus bar protection panel by testing team and servic engineer. testing completed on
1 2 3 4 5 6 7 8 <b>(B)</b> 1 2 3 4 5 6 1	REMEDIAL ACTIONS IF ANY     Settin       Lines     Healthiness of Main 1       Healthiness of Main 2       Healthiness of BAU       Settings-Time       Healthiness of Auto Reclosure       Last Routine testing       Transformers / Reactor       Healthiness of Differential Relay       Healthiness of BACKUP Relay(HV)       Healthiness of BACKUP Relay(HV)       Healthiness of BACKUP Relay(HV)       SETTINGS       HEALTHINESS	220 kV lines. 220 kV S.NAGAR LINE OK OK OK NA OK OK OK OK OK OK OK OK OK OK	220 KV CHINHAT LINE OK OK OK OK Not Working OK OK OK OK OK	en checked and changed as p control of the second se	60 MVA T/F-IV OK OK OK OK			AR Problem of both lines was resolved on dt 04.03.2024 & 05.03.2024	all shudown arranged for testing of bus bar protection panel by testing team and servic engineer. testing completed on
1 2 3 4 5 6 6 7 7 8 8 1 2 2 3 4 5 6 1 2 2 1 2 2	REMEDIAL ACTIONS IF ANY     Settin       Lines	220 kV S.NAGAR LINE OK OK OK OK OK OK OK OK OK OK	220 KV CHINHAT LINE OK OK OK OK OK OK OK OK OK OK OK OK OK	en checked and changed as p 60 MVA T/F-III OK OK OK OK OK OK OK OK	60 MVA T/F-IV OK OK OK OK			AR Problem of both lines was resolved on dt 04.03.2024 & 05.03.2024	all shudown arranged for testing of bus bar protection panel by testing team and service
1 2 3 4 5 5 6 7 7 8 (B) 1 2 3 4 4 5 6 6 7 7 8 1 2 2 2	REMEDIAL ACTIONS IF ANY     Settin       Lines	220 kV lines. 220 kV S.NAGAR LINE OK OK OK NA OK OK OK OK OK OK OK OK OK OK	220 KV CHINHAT LINE OK OK OK OK Not Working OK OK OK OK OK	en checked and changed as p control of the second se	60 MVA T/F-IV OK OK OK OK			AR Problem of both lines was resolved on dt 04.03.2024 & 05.03.2024	all shudown arranged for testing of bus ba protection panel by testing team and servi

I         Note         No		Т			1			1	1	1			
1     U     U     U     I <td>1</td> <td></td> <td>DC EARTH FAUL</td> <td>т</td> <td>119 V</td> <td>0</td> <td>118</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>	1		DC EARTH FAUL	т	119 V	0	118						
1     U     U     U     I <td>2</td> <td></td> <td>BATTERIES ( 220V/11)</td> <td>)V/48V)</td> <td>110 V. 48V</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>	2		BATTERIES ( 220V/11)	)V/48V)	110 V. 48V								
	3												
	(-)												
	<u>(E)</u>	AN	ALYSIS OF TRIPPINGS FR	<u>OM JULY 2023</u>									
	1	Name of e	element tripped more that	n 2 times in a month	60 MVA T/F-4	3 TIMES							
Image: mage:	2		Multiple trippin	gs		0.000							
Image: state	3		Trippings unexpla	ned	NIL								
Image: state	(5)		CTATUS OF CD	_									
I     I </td <td>(F)</td> <td></td> <td>STATUS OF SP</td> <td><u>&gt;</u></td> <td>NOT AVAILABLE</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>	(F)		STATUS OF SP	<u>&gt;</u>	NOT AVAILABLE								
I     I </td <td>(G)</td> <td></td> <td>STATUS OF CB TES</td> <td>TING</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>	(G)		STATUS OF CB TES	TING									
						REMARK							
3     Image: status of the statu			TIMING TEST		_								
Image: Image					NOT DONE								
Image: mark     Ima													
I     V </td <td>(H)</td> <td></td> <td>STATUS OF CT</td> <td></td>	(H)		STATUS OF CT										
1     ■     ■     ■     ■     Pi<					220 1/1 1	220 814 71	60 MVA T/F-I CT	60 MVA T/F-II CT					
2        0     0.2              0                   10 <td>1</td> <td></td> <td>ACCUARACY CLASS FOR P</td> <td>ROTECTION</td> <td></td> <td></td> <td>PS</td> <td>PS</td> <td>PS</td> <td>PS</td> <td></td> <td>1</td> <td></td>	1		ACCUARACY CLASS FOR P	ROTECTION			PS	PS	PS	PS		1	
Image: state in the s													
Image: state in the s											 -		
I         I         22 VI         52 VI         55 VI<	(1)		STATUS OF CV	<u>r</u>					CO 840/4 T/5 III	CO 500/0 T/F 0/			
1					220 KV TL	220 KV TL	60 WIVA 1/F-I	60 IVIVA 1/F-II	60 IVIVA 1/F-III	60 IVIVA 1/F-IV			
Image: constraint of squares and states of squares and	1		ACCUARACY CLASS FOR P	ROTECTION	PS	PS							
Image: mark mark     Image: mark mark     Image: mark	2		ACCUARACY CLASS FOR	METERING	0.5	0.5	0.5	0.5	0.5	0.5			
Image: mark mark     Image: mark mark     Image: mark	(1)	67		(ENIT LOCCER									
Image: with the second protection Audit       Image: with the second protectic A	()	31	ATUS OF SEQUENTIAL EN	Not Available									
Image: state of the state													
Image: matrix matri		1		PF	OTECTION A	UDIT OF UPP	ICL SUBSTATION 22	O KV BIJNOR	1				
Image: matrix matri		Drouis	ous Protection Audit										
		Previo											
Image: Image			OBSERVATIONS		1	NA							
(A)     Line     Image: Single set of the		REME	DIAL ACTIONS IF ANY		1			1					
$ \begin{array}{ c c c c c c } \hline \hline \hline \hline \hline \hline \hline \hline \hline \hline \hline \hline \hline \hline \hline \hline \hline \hline \hline$												-	Action to be taken by Transmission wing
$ \begin{array}{ c c c c c c } \hline \hline \hline \hline \hline \hline \hline \hline \hline \hline \hline \hline \hline \hline \hline \hline \hline \hline \hline$													
$ \begin{array}{ c c c c c c } \hline \hline \hline \hline \hline \hline \hline \hline \hline \hline \hline \hline \hline \hline \hline \hline \hline \hline \hline$	(A)	Lines										Remarks	
Image: margine soft Main 1     Image: margine soft Main 2     Image: margin 2     Image: margine soft Main 2 <th< td=""><td><i>(</i></td><td></td><td></td><td>1</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></th<>	<i>(</i>			1									
1     Image: Imag													
2     Heathines of Main 2     OK     OK     N <t< td=""><td>1</td><td></td><td>Healthiness of Ma</td><td>in 1</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>-</td><td></td></t<>	1		Healthiness of Ma	in 1								-	
3     Healthines of B/U     NA     NA     NA     Image: Constrained by the constrai													
5       Settings-Time       OK       OK       OK       Inclusion	3											UK UK	
6       Healthness of Auto Reclosure       OK				1								-	
7       Healthines of Auto Reclosur       0K				rotaction								-	
			Healthiness of Auto R	eclosure									
Image: Image												NO ROUTINE TESTING PENDING	
Image: Image	(5)	Transfermer	/ Peoster										
1       Healthiness of Differential Relay       OK       td>(B)</td> <td>ransformers</td> <td>/ neactor</td> <td></td> <td>160 MVA T/F-I</td> <td>160 MVA T/F-II</td> <td></td> <td> </td> <td></td> <td>  </td> <td></td> <td></td> <td></td>	(B)	ransformers	/ neactor		160 MVA T/F-I	160 MVA T/F-II							
$\begin{array}{c c c c c c c c c c c c c c c c c c c $			Healthiness of Differen	tial Relay	OK	OK						1	
3       Healthiness of BACKUP Relay(HV)       OK       /td> <td></td> <td>Healthiness of REF</td> <td>Relay</td> <td>OK</td> <td>ОК</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>ок</td> <td></td>	2		Healthiness of REF	Relay	OK	ОК						ок	
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	3		Healthiness of BACKUP	Relay(HV)	OK	OK						4	
6       LAST TESTING       06.09.2023       07.09.2023		-		nciay(LV)				1	-	+		1	
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$								1				NO ROUTINE TESTING PENDING	1
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1     HEALTHINESS     OK     C     C     OK       2     SETIINGS     OK     I     I     I     I       4     I     I     I     I     I     I       (D)     Status of DC system     I     I     I     I     I       Positive to earth     -ve to earth     -ve to earth     I     I     I     I	(C)		BUSBAR & LBB		220KV/ BU/C							<u> </u>	
2     SETTINGS     OK     Image: Setting S	1	-	HEALTHINESS					+				ок	
Positive to negative     Positive to earth													
Positive to negative     Positive to earth											-		
negative Positive to earth -ve to earth	(D)		Status of DC syst	<u>em</u>	Positive to								
						Positive to earth	-ve to earth						
1 DC DAMITACE 120.4 V 01 V -37 OK	1		DC EARTH FAUL	.T	120.4 V	61 V	-59					ОК	

		• •	1			-	1		1	1	1	
2	BATTERIES ( 220V/110	(/48V)	110 V									
3	CHARGERS		2									
<u>(E)</u>	ANALYSIS OF TRIPPINGS FRO	M JULY 2023										
1	Name of element tripped more than		0								ОК	
2	Multiple tripping		0									
3	Trippings unexplair	ed	0									
(F)	STATUS OF SPS		NOT AVAILABLE									
(G)	STATUS OF CB TEST	NG										
				REMARK								
1	TIMING TEST		29.09.23 (TL)	06.09.23 (TFS)							ОК	
2	OVERHAULING		29.09.23 (TL)	06.09.23 (TFS)							UK UK	
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						
	ACCUARACY CLASS FOR PR	OTECTION	PS	PS	PS	PS	1		1		ок	
2	ACCUARACY CLASS FOR P		0.2	0.2	0.2	0.2	ł		1			
		2.2000	0.2	0.2	0.2	0.2	1	1	1		1	
(I)	STATUS OF OUT		1	<u> </u>		+		+	ł			
(I)	STATUS OF CVT		220 101 71 4	220 101 71 2	CO MULT 7/7 -	CO MO/2 =/=						
		OTECTION	220 KV TL 1	220 KV TL 2	60 MVA T/F-I	60 MVA T/F-II	+				CK.	
1	ACCUARACY CLASS FOR PR		3P	3P	3P	3P	1		l		ОК	
2	ACCUARACY CLASS FOR N	ETERING	0.2	0.2	0.2	0.2						
			-									
(I)	STATUS OF SEQUENTIAL EV										<u> </u>	
⊢⊢⊢		Working	_								ОК	
		Р	ROTECTION	AUDIT OF UPP	TCL SUBSTATION 40	<b>DO KV JEHTA</b>						
								1	1			
	Previous Protection Audit											
	Flevious Flotection Addit											
<b>├</b> ──┼	OBSERVATIONS		1	NA	1	1	1		l		1	
	UDSERVATIONS						1	1	1			
	DENAEDIAL ACTIONIC IE ANIV			NIA								
	REMEDIAL ACTIONS IF ANY		1	NA	I	1						
	REMEDIAL ACTIONS IF ANY			NA								Action to be taken by Transmission wing
	REMEDIAL ACTIONS IF ANY			NA								Action to be taken by Transmission wing
				NA							Durada	Action to be taken by Transmission wing
(A) L				NA							Remarks	Action to be taken by Transmission wing
(A) L								220/0/ 04 0000		223.107	Remarks	Action to be taken by Transmission wing
(A) <u>L</u>			400 UNNAO CKT			400 KV KURSI	220KV HARDOI		220 KV	221 KV	Remarks	Action to be taken by Transmission wing
(A) L	lines		1	400 UNNAO CKT-1	400 KV KURSI ROAD-1	ROAD-2	ROAD-1	ROAD-2	MALLAWAN 1	MALLAWAN 2	Remarks	Action to be taken by Transmission wing
1	ines		1 OK	400 UNNAO CKT-1 OK	OK	ROAD-2 OK	ROAD-1 OK	ROAD-2 OK	MALLAWAN 1 OK	MALLAWAN 2 OK	Remarks	Action to be taken by Transmission wing
1 2	Lines Healthiness of Mai Healthiness of Mai	2	1 OK OK	400 UNNAO CKT-1 OK OK	OK OK	ROAD-2 OK OK	ROAD-1 OK OK	ROAD-2 OK OK	MALLAWAN 1 OK OK	MALLAWAN 2 OK OK	Remarks	Action to be taken by Transmission wing
1 2 3	ines	2	1 OK	400 UNNAO CKT-1 OK OK	ОК ОК ОК	ROAD-2           OK           OK           OK	ROAD-1           OK           OK           OK	<b>ROAD-2</b> ОК ОК ОК	MALLAWAN 1 OK OK OK	MALLAWAN 2 OK OK OK		Action to be taken by Transmission wing
1 2 3 4	Lines Healthiness of Mai Healthiness of Mai	2	1 OK OK OK	- 400 UNNAO CKT-1 ОК ОК ОК	ОК ОК ОК ОК	ROAD-2           OK           OK           OK           OK           OK	ROAD-1           OK           OK           OK           OK	ROAD-2           OK           OK           OK           OK           OK	MALLAWAN 1 OK OK OK	MALLAWAN 2 OK OK OK OK	Remarks	Action to be taken by Transmission wing
1 2 3 4 5	ines Healthiness of Mai Healthiness of Mai Healthiness of B/	2	1 ОК ОК ОК ОК ОК	400 UNNAO CKT-1 ОК ОК ОК ОК	ОК ОК ОК ОК	ROAD-2           OK           OK           OK	ROAD-1           OK           OK           OK           OK           OK           OK	<b>ROAD-2</b> ОК ОК ОК ОК	MALLAWAN 1 OK OK OK OK OK	MALLAWAN 2 OK OK OK OK OK		Action to be taken by Transmission wing
1 2 3 4	Lines Healthiness of Mai Healthiness of Mai Healthiness of B/ Settings-Reach Settings-Time	12 J	1 OK OK OK OK OK	400 UNNAO CKT-1 OK OK OK OK OK	ОК ОК ОК ОК ОК ОК	ROAD-2           OK           OK           OK           OK           OK	ROAD-1           ОК           ОК           ОК           ОК           ОК           ОК           ОК	<b>ROAD-2</b> ОК ОК ОК ОК ОК	MALLAWAN 1 OK OK OK OK OK	MALLAWAN 2 OK OK OK OK OK		Action to be taken by Transmission wing
1 2 3 4 5	Lines Healthiness of Mai Healthiness of Mai Healthiness of Mai Settings-Reach Settings-Time Healthiness of carrier pr	12 J Itection	1 ОК ОК ОК ОК ОК	400 UNNAO CKT-1 ОК ОК ОК ОК	ОК ОК ОК ОК	ROAD-2           OK           OK           OK           OK           OK           OK	ROAD-1           OK           OK           OK           OK           OK           OK	<b>ROAD-2</b> ОК ОК ОК ОК	MALLAWAN 1 OK OK OK OK OK	MALLAWAN 2 OK OK OK OK OK		Action to be taken by Transmission wing
1 2 3 4 5 6 7	Healthiness of Mai Healthiness of Mai Healthiness of Mai Healthiness of Mai Settings-Reach Settings-Time Healthiness of carrier pr Healthiness of Auto Re	2 J Intection losure	1 OK OK OK OK OK OK	400 UNNAO CKT-1 OK OK OK OK OK OK	ОК ОК ОК ОК ОК ОК ОК	ROAD-2           OK	ROAD-1           OK	ROAD-2 OK OK OK OK OK OK	MALLAWAN 1 OK OK OK OK OK OK	MALLAWAN 2 OK OK OK OK OK OK	ок	Action to be taken by Transmission wing
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2       Image: Mathines of Rule       NA												
3       Instantinges of y/L       NA												
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $		Healthiness of Main 2	OK	OK	OK	OK						
5       Settings Time       OK       /td> <td>Healthiness of B/U</td> <td>NA</td> <td></td> <td></td> <td>NA</td> <td></td> <td></td> <td></td> <td></td> <td>OK</td> <td></td>	3	Healthiness of B/U	NA			NA					OK	
5       Settings Time       OK       /td> <td></td> <td>OK</td> <td>OK</td> <td>OK</td> <td>OK</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>	4		OK	OK	OK	OK						
6       Healthiness of carrier protection       OK       td>5</td> <td></td>	5											
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	6											
8       Last Routine testing       20.07.2023       19.05.20.20.20.20.20.20.20.20.20.20.20.20.20.	7	Healthiness of Auto Reclosure	OK	OK	OK	OK						
8       Last Routine testing       20.07.2023       19.05.20.20.20.20.20.20.20.20.20.20.20.20.20.	1 1											
state with testing       2007.203       19.05.202       10.05.202       10.05.202       10.05.202       10.05.202       10.05.202       10.05.202       10.05.202       10.05.202       10.05.	1	1									Pending routine testing is to be done by	Working agency informed us that they will
8       LatR durine testing       2007.2023       19.05.2022       19.05.2024       08.02.2024 <td>1  </td> <td>1</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>perform the Routinre testing of relay and all</td>	1	1										perform the Routinre testing of relay and all
Latest Routine testing   09.02.024 07.02.024 08.02.2024 08.02 08.02.2024 08.02 08.02.2024 08.02 08.02.2024 08.02 08.02.2024 08.02 08.02.2024 08.02 08.02.2024 08.02 08.02.2024 08.02 08.02.2024 08.02 08.02.2024 08.02 08.02.2024 08.02 08.0		Last Douting tooting	20.07.2022	10 OF 2022	10.05.2022	10.05.2022					nave been informed accordingly	the equipments in the 2nd week of
Image: ReaderImage:	ŏ		20.07.2023									september-24.
$ \begin{array}{ c c c c c } \hline   &   &   &   &   &   &   & 0 WA T/F-I &   & 0 WA T/F-I &   &   &   &   &   &   &   &   &   & $	(5)			09.02.2024	07.02.2024	08.02.2024						
$ \begin{array}{c c c c c c } \hline \begin{tity c c c c c c c c c } \hline tity c c c c c c c c c c c c c c c c c c c$	(8)	Iranstormers / Reactor	co	co								
$\begin{array}{c c c c c c c c c c c c c c c c c c c $		Uselikkingen of Differential Dalay		60 MVA T/F-II							4	
3       Healthiness of BACKUP Relay(IV)       OK       OK       Inc											4	
3       Healthiness of BACKUP Relay(HY)       0K       0K       Image: Constraint of Con											ОК	
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	3	Healthiness of BACKUP Relay(HV)	UK	UK							4	
6       LAST TESTING       26.12.23       12.02.024       Image: Constraint of the sector of the secto		Healthiness of BACKUP Relay(LV)		OK							4	1
$ \begin{array}{ c c c c c c } \hline \begin{tabular}{ c c c c } \hline \begin{tabular}{ c c c c } \hline \begin{tabular}{ c c c } \hline \begin{tabular}{ c c c c } \hline \begin{tabular}{ c c c c } \hline \begin{tabular}{ c c c c } \hline \begin{tabular}{ c c c c } \hline \begin{tabular}{ c c c c } \hline \begin{tabular}{ c c c c } \hline \begin{tabular}{ c c c c } \hline \begin{tabular}{ c c c c } \hline \begin{tabular}{ c c c c } \hline \begin{tabular}{ c c c c } \hline \begin{tabular}{ c c c c } \hline \begin{tabular}{ c c c c c } \hline \begin{tabular}{ c c c c c } \hline \begin{tabular}{ c c c c c c } \hline \begin{tabular}{ c c c c c c c } \hline \begin{tabular}{ c c c c c c c c c c c c c c c c c c c$							+					4
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $		LAST TESTING	26.12.23	12.02.2024			+				No routine testing is pending	
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	6											
1     HEALTHINES     OK     C     Image: Constraint of the status of DC system     OK     Image: Constraint of the status of												
2       SETTINGS       OK       I       Inclusion		BUSBAR & LBB	22010 / 2110		1						CK CK	
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	(C)						1	1	1		UK	
Positive to negative         -ve to earth         Positive to earth	(C) 1	HEALTHINESS	OK									
Positive to negative         -ve to earth         Positive to earth	(C) 1	HEALTHINESS	OK									
Image: Image:	(C) 1 2	HEALTHINESS SETTINGS	OK									
1         DC EARTH FAULT         113 V         Fluctuating         Image: Problem Resolved           2         BATTERIES (220V/110V/48V)         110 V         Fluctuating         Image: Problem Resolved	(C) 1 2	HEALTHINESS SETTINGS	OK OK									
2 BATTERIES (220V/110V/48V) 110 10 10 10 10 10 10 10 10 10 10 10 10	(C) 1 2	HEALTHINESS SETTINGS	OK OK Positive to		Profiling in the							
	(C) 1 2 (D)	HEALTHINESS SETTINGS Status of DC system	OK OK Positive to negative								Debler Developed	
3     UTARGERS     Image: Constraint of the second	(C) 1 2 (D) 1	HEALTHINESS SETTINGS Status of DC system DC EARTH FAULT	OK OK Positive to negative 113 V								Problem Resoloved	
	(C) 1 2 (D) 1 2 1 2	HEALTHINESS SETTINGS Status of DC system DC EARTH FAULT BATTERIES (220//110V/48V)	OK OK Positive to negative 113 V								Problem Resoloved	
	(C) 1 2 (D) 1 2 1 2	HEALTHINESS SETTINGS Status of DC system DC EARTH FAULT BATTERIES (220//110V/48V)	OK OK Positive to negative 113 V								Problem Resoloved	

<u>(E)</u>	ANA	ALYSIS OF TRIPI	PINGS FROM	IULY 2023									
1	Name of e	lement tripped	more than 21	imes in a month	NIL								
2		Multip	le trippings		NIL								
3			unexplained		NIL								
(F)		STAT	US OF SPS		Not Available								
(G)		STATUS C	F CB TESTING	<u>i</u>									
					220 BBK-I	REMARK	220 BBK-II	220 KV CG City	220 CHT	60MVA-I	60MVA-II 03.12.2021		
1		TIM	ING TEST		19.05.22		19.05.2022	19.05.2022	30.11.2021	24.03.2022	03.12.2021		
2		OVER	RHAULING										
3		CRN	//DCRM										
-													
(H)		<u>STAT</u>	US OF CT		222.101	222 10 1 22 20 20 20 20 1							
					220 KV	220 KV CG CITY		220KV BARABANKI	60 MVA T/F-I	60 MVA T/F-II			
					CHINHAT LINE PS	LINE PS	220KV BARABANKI I LINE	II LINE					
1	A	CCUARACY CLA	SS FOR PROT			0.2	PS 0.2	PS 0.2	PS 0.2	PS 0.2			
2		ACCUARACY CL	ASS FUR IVIET	ERING	0.2	0.2	0.2	0.2	0.2	0.2			
(I)		STAT	JS OF CVT										
(1)		JIAN	<u>03 0F CV1</u>		220 KV	220 KV CG CITY		220KV BARABANKI	60 MVA T/F-I				
1					CHINHAT LINE	LINE	220KV BARABANKI I LINE	II LINE	OU IVIVA 1/F-I	61 MVA T/F-II		1	
1		CCUARACY CLA	SS FOR DROT	ECTION	3P	3P	3P	3P	3P	3P		1	
2		ACCUARACY CL			0.2	0.2	0.2	0.2	0.2	0.2		1	
L	r i	ACCOMMENCE CL	, I ON IVIET		0.2	0.2	0.2	U.2	0.2	0.2			
(J)	ST/	ATUS OF SEQUE	NTIAL EVENT	LOGGER	1					1			
		SCADA		Available	1				1	1		ок	
			F	ROTECTION A	UDIT OF UPP	TCL SUBSTAT	ION 220 KV BARABA	NKI					
			<u>-</u>										
	Previo	us Protection A	udit										
	<u></u>												
	0	DBSERVATIONS		1		No Record fo	ound						
		DIAL ACTIONS IF	ANY										
													Action to be taken by Transmission wing
(A)	Lines											Remarks	
					220 KV PGCIL I	220 KV PGCIL II	220 KV SATRIKH I	220 KV SATRIKH II					
1		Healthin	ess of Main 1		OK	OK	OK	OK					
2		Healthin	ess of Main 2		OK	OK	OK	OK				AR Problem of PG-I & II lines was	
3		Healthi	ness of B/U		NA	NA	NA	NA				resolved on dated 21.05.2024 &	
4		Setti	ngs-Reach		OK	OK	OK	OK				22.05.2024 and satrikh line I &II	No tipping Since problem resolved
5		Setti	ngs-Time		OK	OK	OK	OK				praposed in month of sept 24	
6		Healthiness of	carrier prote	ction	OK	OK	OK	OK					
7		Healthiness of	of Auto Reclos	ure	Not Working	Not Working	Not Working	Not Working					
8		Last Ro	utine testing		21.05.2024	22.05.2024	18.12.2023	18.12.2023				No routine is pending	
(B)	Transformers /	Reactor										4	
<u> </u>				1	160 MVA TF I	160 MVA TF II						 4	
1	-	Healthiness o			OK	OK						4	
2		Healthine	ss of REF Rela	y (LIV.()	OK	OK						ОК	
3		Healthiness of			OK	OK OK						4	
4		Healthiness of	TTINGS	Y(LV)	OK OK	OK						 1	
6			TESTING		27.04.2024	27.07.2024				+		 NO routine testing is pending	ок
		LASI	12311110		27.04.2024	27.07.2024	1			1			o
(C)	R	BUSBAR & LBB	l		-				-	1			
	¥			L	220KV BUS					1		1	
1		HFA	LTHINESS		Not Working					1		LOI has been issued by transmission	02 Nos ZIV Make peripheral relays found
					°			İ				for rectification purpose	defective, have been send to ZIV Bangaluru
2			TTINGS										for recticication ,soon will be rectified.
- <sup>2</sup>		SE	COMITT		+							 ł	
(D)	I	Ctatur r	of DC system	I	1								
		318105 0	n DC system		<u> </u>	Positive to		1	1			1	
1						negative	Positive to earth	-ve to earth				1	
-					1	inc <sub>b</sub> auve	i ositive to carti		1			1	
1		(DCDB) DC	EARTH FAUL	т	110-I/110-II/48V	107/119.6/51.4	55.8/56.1/6.3	51.1/63.5/44.9	1	1			
<u> </u>		(0000)00	, c, avri i AUL	•	110 1/ 110 1/ 401	12/0.9/12/0.8/52.	55.0/ 50.1/ 0.5	51.1/05.5/74.5				1	
2		BATTERIES (	220V/110V/4	8V)	1	2			1	1			
3			ARGERS		110V-I/II	120.4/120	55.4/56.7	640/64.1	1	1		1	
⊢ ¯			48 V		51.9	8	44	0.0/04.1	1	1		1	
	l I				51.5					1		•	
<u>(E)</u>	ANA	ALYSIS OF TRIPI	PINGS FROM	ULY 2023	1					1			
					1							1	
1 <sup>11</sup>													

<b>_</b>							1			
1	Name of element tripped more than 2 times in a r	onth 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				
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.
(1)	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									
					1				i	
	SCADA Available								Working	ОК

# CONCLUSION OF PROTECTION AUDIT 2024

## DIVISION : ET&C Division Sarojini Nagar

# SUBSTATION : 765kV Substation UnnaoAUDIT 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		No record found.		
	observations ma	de in Previous			
	Protection Audit				
	(Internal/Third P	arty)			
2	Lines				
	a.	Healthiness	Healthy		
		of Main-1,			
		Main-2, &			
		Backup			
		relavs			
	b.	Settings	ОК		
	с.	Reach	ОК		
	d.	Time	ОК		
	e.	SOTF	ОК		
	f.	Fuse Fail	ОК		
		Monitor			
	g.	BRC Alarm	ОК		
	h.	Power Swing			
		Auto Reclose	ОК		
	i.	Healthiness	PLCC available		PLCC channels are
	J.	of Carrier	and DT enable		healthy & inter-
		Protection	but OPGW is not		tripping tested in Jul-
		FIOLECTION	Through at both		2024, found healthy at 765kV Unnao
			765KV lines.		end. OPGW is
					installed on only
			Earthwire is		Obra C-Unnao line
			available only at		but not through upto
			765KV UNNAO-		Obra C end .
			ANPARA C line.		
	k.	GPS Clock	No GPS clock		Work tender in
			available &		process
			Requirement		
			sent.		

1	<b> </b> 1.	GPS	Time is	
	. 		synchronised in	
		1	relav by SNTP	
	m.	on Last testing	Testing	
		Last testing	Completed in	
			2023.	
3	Transformer/		2025.	
	Reactor			
	a.	Healthiness	Healthy	
		of		
		Differential,		
		Backup, REF		
		Protection		
	b.	Settings	In 1000MVA ICT	All the settings
			I,II & III, IDMT O/C	are as set by
			& E/F is not	Manufacture's
			proper & required	recommended
			to correct. In	Commissioning
			1000MVA ICT I&II,	Engineer.
			E/F High set	Departmental
			setting is not	Guidelines is
			correct as per	required
			Recommandation	regarding
			and 5th	765/400kV ICTs.
			Harmonics is set	
			at 10% only which	
			is also require to	
			correct it.	
	c. d.	PMU Last testing	Testing done.	
4	Bus Bar & LBB	Last testing	resting done.	
-	a.	Healthiness	Healthy	
	b.	Settings	ОК	
	с.	Status	In Ckt.	
5	Status of DC			
	System			
	a.	DC Earth	Battery Bank No.1	
		Fault	(110V)	
			Positive to	
			Negative=120.4V	
			Positive to	
			Earth=60.2V	
			Negative to	
1	I	I	Earth= -60.2V	

	Battery Bank No.2		
	(110V)	ļ	
	Positive to		
	Negative=121.4V		
	Positive to		
	Earth=59.4V		
	Negative to		
	Earth= -62.0V		
	Battery Bank No.3	In 110V Battery	Partially grounded
	(110V)	Bank 3, Positive	DC is rectified.
	Positive to	of DC is partially	
	Negative=118V	grounded.	
	Positive to	Biodifided.	
	Earth=52.7V	ļ	
	Negative to		
	Earth= -66.2V		
	Battery Bank No.4	In 110V Battery	Partially grounded
	(110V)	Bank 4, Positive	DC is rectified.
	Positive to	of DC is partially	
	Negative=119.5V	grounded.	
	Positive to	Biodificed.	
	Earth=53.56V	ļ	
	Negative to		
	Earth= -65.9V		
	Battery Bank No.5		
	(110V)	ļ	
	Positive to		
	Negative=123.3V	ļ	
	Positive to		
	Earth=65V	ļ	
	Negative to		
	Earth= -57.5V		
	Battery Bank No.6		
	(110V)	ļ	
	Positive to		
	Negative=120.0V	ļ	
	Positive to		
1	Earth=61.4V	ļ	
	Negative to		
	Earth= -58.8V		
	Battery Bank No.7	In 48V Battery	For PLCC panel,
	(48V)	Bank 1, Positive	Positive of DC is
	Positive to	of DC is fully	kept grounded.
	Negative=51.0V	grounded.	
		Bioundeu.	
	Positive to Earth=		

			Negative to		
			Earth= -51.0V		
			Charger No.8 (48V)	In 48V Battery Bank 2, Positive	For PLCC panel, Positive of DC is
			Positive to		
			Negative=51.2V	of DC is fully	kept grounded.
			Positive to Earth=	grounded.	
			0.00V		
			Negative to		
			Earth= -50.7V		
	b.	Batteries-	Lartin50.7 V		
	5.	220V/110V/4			
		8V Make	HBL		
		Battery	Healthy		
		<u>Status</u>	ОК		
		Gravity			
	с.	Chargers	Charger No.1 to 6		
		Make	(110V Make HBL),		
			Charger No. 7		
			(48V Make Shah		
			Shahib) and		
			Charger No.8		
			(48V Make Max		
		Status	Healthy		
	d.	DCDB Make			
		Status	ОК		
6	Analysis of				
	tripping from				
	July 2023				
	a.	Name of	Nil		
		Element			
		tripped more			
		than two			
		times in a			
		month			
	b.	Multiple	Nil		
		Trippings			
	с.	Trippins	Nil		
		Unexplained			
	Status of SPS		Not Installed		SPS installation is
-				1	yet to be proposed
7	Status of CB		Testing done		

	Status of		Testing done	
9	CT/CVT			
	Status of Sequen	tial Event	Not Installed	SCADA INBUILT
	Logger (SEL)		separately and	
10			requirement sent.	

## SUBSTATION : 400 KV Substation Unnao AUDIT DATE:

11.03.2024

S.No.	Name of Bay	Name of	Status of	Remark	Action to be taken
		Protection	Protection System		by Transmission
		svstem			wing
1	Remedial Action	taken on the	No record found.		
	observations ma	de in Previous			
	Protection Audit				
	(Internal/Third P	arty)			
2	Lines				
	a.	Healthiness	Healthy		
		of Main-1,			
		Main-2, &			
		Backup			
		relavs			
	b.	Settings	In 400KV Unnav-	In220 KV Unnav -	
			Agra line Earth	RPH line and 220	settings updated.
			Fault setting is	KV Unnav -Bithur	Requirement to
			found at 0.8Amp	&220 KV Unnav-	replace static with
			with definete	GIS Kanpur line	numerical relays
			time which is not	Back -up relay is	had been sent.
			correct & require	static required to	
			to correct.In	replace with	
			Backup relay in all	numerical relay.	
			220KV lines Earth		
			Fault plug setting		
			is at 0.5Amp		
			which is also		
			required to		
			update.		
	с.	Reach	ОК		

	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.
d.				
e.	SOTF	ОК		
f.	Fuse Fail Monitor	ОК		
g.	BRC Alarm	ОК		
	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.
h.				
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. k.	Healthiness of Carrier Protection GPS Clock	No DTPC & No PLCC in 220KV Unnav- DahiChauki line, 220KV Unnav- RPH line & 220KV Unnav-Bithur line. OK		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

1	<b>I</b> I.	GPS	All 400 KV lines		Additional GPS
			are synchronised		clock ports are
		on	but 220 KV lines		not available for
			are not		synchronisation
			synchronised		of 220kV lines
	m.	Last testing	Testing done		
3	Transformer/				
	Reactor				
	a.	Healthiness	Healthy		
		of			
		Differential,			
		Backup, REF			
		Protection			
	b.	Settings	In 315MVA ICT-II,	Diff realy& REF	Due to static and
			HV&LV side O/C &	Relay of 315	electromechanical
			E/F plug setting is	MVA-1 is	relays in 315MVA
			not proper. It	static,and HV	ICT-1 , the
			should be	side and LV side	settings as per
			according to the	o/c and earth	given guidelines
			full load current	fault relay is	could not be
			of Transformer.In	Electromechanic	updated, requires
			the same way in	al requred to	Numerical relays.
			, 160MVA T/F-III,	replace with	, In 160 MVA-1 Diff
			HV&LV side O/C &	-	and REF Relay is
			E/F plug setting is		static and HV and
			not found ok &	Diff and REF	LV side OC and EF
			required to	Relay is static	relay is
			updated.	and hy and ly	electromechanical
			upuateu.		
				side o/c and e/f	so settings could
				relay is	not be fed in relay
					as per guidelines,
				al it is required	it is required to
				to replace with	replace with
				numerical relay.	numerical relay.
					Requirement for
					numercal relays
					have been sent.
			Available		
	c. d.	PMU Loct tosting	Available.		
4	a. Bus Bar & LBB	Last testing	Testing done.		
4		Healthiness	Healthy		
	a. b.	Settings	OK		
	с.	Status	In Ckt.		
	L.	Jiaius	III UKL		

System					
а.	DC Earth	Battery Bank No.1	In 220V Battery	Maintenance	
	Fault	(220V)	Bank 1, Positive	team trying to	
		Positive to	of DC is partially	rectify DC	
		Negative=235V	grounded.	problem, work	
		Positive to		under progress	
		Earth=89.1V	-		
		Negative to			
		Earth= -146.1V			
		Battery Bank No.2	In 220V Battery	Maintenance	
		(220V)	Bank 2, Positive	team trying to	
		Positive to	of DC is partially	rectify DC	
		Negative=240V	grounded.	problem, work	
		Positive to		under progress	
		Earth=94V	-		
		Negative to			
		Earth= -146.9V		<b> </b>	
		Battery Bank No.3	In 48V Battery	For PLCC panel	
		(48V)	Bank 1, Positive of DC is fully	Positive of DC	
		Positive to		kept grounded	
		Negative=52.0V	grounded.		
		Positive to Earth=	0		
		0.663V	-		
		Negative to			
		Earth= -51.2V			
		Battery Bank No.4	In 48V Battery	For PLCC panel	
		(48V)	Bank 2, Positive	Positive of DC i	
		Positive to	of DC is partially	kept grounded	
		Negative=52.4V	grounded.		
		Positive to Earth=	8.00.000		
		1.106V			
		Negative to			
		Earth= -51.3V			
b.	Batteries-				
	220V/110V/4				
	8V				
	Make	Exide Industrial			
	Battery	Healthy			
	Status				
	Gravity	ОК		1	

	с.	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	ОК	
6	Analysis of tripping from July 2023			
	a.	Name of Element tripped more than two times in a month	Nil	
	b.	Multiple Trippings	Nil	
	с.	Trippins Unexplained	Nil	
			Installed but out	New transducers
			of service. Service	are available at
			Engineer is	substation.
			awaited.	Service engineer
				have been
				informed to
				replace defective
7	Status of SPS			transducers.
8	Status of CB		Testing done	
	Testing Status of			
9	Status of CT/CVT		Testing done	
10	Status of Sequen	tial Event	Installed	

SUBSTATION : 220kV Substation Dahi Chauki, UnnaoAUDIT DATE:11.03.2024

S.No.			Status of Protection System	Action to be taken by Transmission
		svstem		wing
1	<b>Remedial Action</b>	taken on the	No record found.	
2	Lines			

a.	Healthiness	Healthy	
	of Main-1,		
	Main-2, &		
	Backup		
	relays		
b.	Settings	ОК	
с.	Reach	ОК	
	Time	In 220KV Dahi	Recommended
		Chauki- Sarojini	setting have been
		Nagar line, Zone 4	updated.
		time setting is	Zone-4 time =
		500 ms which is	450msec
		incorrect &	
		required to	
		update and	
		backup earth	
		fault time is	
d.		incorrect also.	
	SOTF	In 220KV Dahi	SOTF enabled &
		Chauki- Sarojini	tested during
		Nagar line, SOTF	routine testing.
_		is OFF.	
e. f.	<b>F F</b>	L. 220/07 D. L.	
т.	Fuse Fail	In 220KV Dahi	VT Fuse Fail
	Monitor	Chauki- Sarojini	function enabled
		Nagar line, VT	& found ok.
g.	BRC Alarm	Euse Fail is OFF. OK	
<u>b.</u> h.	Power Swing		
	Auto Reclose		
i.			
j.	Healthiness	PLCC & Optical	Short line,
	of Carrier	Fibre is not	Differential line
	Protection	available at	protection relay
		220KV Dahi	available &
		Chauki-Unnav	Functional.
		line.	
k.	GPS Clock	ОК	
Ι.	GPS	ОК	
	Synchronizati		
	, on		 
m.	Last testing	Testing done	
Transformer/			
Reactor			

	a.	Healthiness	Healthy		
		of			
		Differential,			
		Backup, REF			
	b.	Settings	ОК		
	с.	Last testing	Testing done.		
4	Bus Bar & LBB	0			
	a.	Healthiness	Healthy		
	b.	Settings	ОК		
	с.	Status	In Ckt.		
5	Status of DC				
	System				
	a.	DC Earth	Battery Bank No.1		
		Fault	(110V)		
			Positive to		
			Negative=124.1V		
			Positive to		
			Earth=62.0V		
			Negative to		
			Earth= -60.8V		
			Battery Bank No.2		
			<b>(110V)</b> Positive to		
			Negative=124.2V Positive to		
			Earth=63.3V Negative to		
			Earth= -60V		
				In 48V Battery	For PLCC panel,
			(48V)		Positive of DC is
			Positive to	of DC is fully	kept grounded.
			Negative=51.9V	grounded.	Rept grounded.
			Positive to Earth=	gioundea.	
			0.90V		
			Negative to		
			Earth= -50.7V		
	b.	Batteries-			
		220V/110V/4			
		8V			
		Make	Exide Industrial		
		Battery	Healthy		
		Status			
		Gravity	ОК		

	c.	Chargers Make	Charger No.1 & 2 (110V Make Redtron), Charger No. 3 (48V Make Redtron)	
		Status	Healthy	
	d.	DCDB Make		
		Status	ОК	
6	Analysis of tripping from July 2023			
	a.	Name of Element tripped more than two times in a month	Nil	
	b.	Multiple Trippings	Nil	
	с.	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 Sequen	tial Event	Installed	

### CONCLUSION OF PROTECTION AUDIT

#### DIVISION : ET&C Division Shahjahanpur SUBSTATION : 220 KV Substation Mallawan AUDIT DATE: 19.02.2024

	Name of Bay	Name of Protection system	Status of Protection System	Remark	Action to be taken Transmission win
1		taken on the observations s Protection Audit arty}	No record found.		Substation is newly energised on 03.08.20
2	Lines				
	a.	Healthiness of Main-1,	Healthy		
		Main-2, & Backup relays			
	b.	Settings	OK		
	с.	Reach	OK		
	d.	Time SOTF	OK OK		
	e. f.	BRC Alarm	9K		
	g.	Power Swing	OK		
	h.	Fuse Fail Monitoring	OK .		
	L	Auto Reclose Healthiness of Carrier	Functional In 220 KV Mallawa-Jehta I & II line DTPC is OK but there is problem in Optical Fiber.	Because OPGW work	Repairing work of OP
	j.	Healthiness of Carrier Protection	In 220 KV Malawa Jetta I & II line OTRC is OK but there is problem in Diptical Piter.	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 OP has been completed. OPGW is healthy.
	k.	GPS Clock	Available		
	L	GPS Synchronization	ABB relay NEL 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 is: to firm for scada maintenance, howev action is not taken by yet.Continuous correspondence is be done.
	m.	Last testing	11 03.3021 [Tetting was done at Commissioning Time].After that testing is overdue.	Routine testing of 220KV Hardol line, 132KV Railwayi line, Baghauli Ckt-1 & 2, Bihaur Line have been done in M/O June -2024. have been done in M/O Feb-2024. M/O Feb-2024. availability of the concerned firm & shutdown	Relay testing of all transformers and line have been done. Bus protection testing is scheduled in oct 24 .
3	Transformer/ Re	actor			
	a.	Healthiness of Differential, Backup, REF Protection	REF relay is ok. But IN 160 MWA-1 Differential relay (Malac Stang CSC-326) is found faulty & out of ckt. It is send to repair in factory. In 160 MWA-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 replaced by firm and being taken into servi
	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. do sec for HV side as well as UV side in both Transformers. It is required to correct with equal to High set of O/C as per Recommandation. Over fluxing setting is disable in both Transformera 10 MVA T/F-A 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				
			Healthy		
	a	Healthiness Settingr			
	a b. c.	Healthiness Settings Status	OK Lioslare R. 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 te: is scheduled in oct'24
	a b. c. Status of DC Syst	Settings Status em	protection is in circuit	isolator status and C.B.status.	
	a b. c. Status of DC Syst a.	Settings Status	protection is in circuit  Charace Mo.1  Probatives 121.65V	isolator status and C.B.status. It seems that positive is partially grounded,	
	a c. Status of DC Syst a.	Settings Status em	protection is in circuit	Isolator status and C.B. status. It seems that positive is partially grounded, faulty feeders have been identified, soon restification will be done soon as per availability of the Shutdown It seems that Negative is partially grounded. faulty	Is scheduled in oct'2 Positive is partially grounded, faulty fee have been identified Negative is partially grounded, faulty fee have been identified
	a b. C Status of DC Syst a	Settings Status em	protection is in circuit	Isolator status and C.B.status. It seems that positive is partially grounded, faulty feeders have been identified, soon rectification will be done soon as per availability of the Shutdown It seems that Negative is partially	is scheduled in oct'24
	a.	Settings Status on DC Earth Fault	protection is in circuit	Isolator status and C.B. status. It seems that positive is partially grounded, fauly feeders have been identified, soon rectification will be done soon as per availability of the Shutdown It seems that Negative is partially grounded. fauly feeders have been identified, soon rectification will be done soon as per	Is scheduled in oct?24 Positive is partially grounded, faulty fees have been identified Negative is partially grounded, faulty fees have been identified
	a b C Status of DC Syst a. b.	Settings Status em	protection is in circuit	Isolator status and C.B. status. It seems that positive is partially grounded, fauly feeders have been identified, soon rectification will be done soon as per availability of the Shutdown It seems that Negative is partially grounded. fauly feeders have been identified, soon rectification will be done soon as per	Is scheduled in oct?24 Positive is partially grounded, faulty fees have been identified Negative is partially grounded, faulty fees have been identified
	a.	Settings Status on DC Earth Fault Settoning 220//110/48/V Make	protection is in circuit	Isolator status and C.B. status. It seems that positive is partially grounded, fauly feeders have been identified, soon rectification will be done soon as per availability of the Shutdown It seems that Negative is partially grounded. fauly feeders have been identified, soon rectification will be done soon as per	Is scheduled in oct?24 Positive is partially grounded, faulty fees have been identified Negative is partially grounded, faulty fees have been identified
	a.	Setting Status on DC Earth Fault Battories 200/1101/489/ Make Battories 200/1101/489/	protection is in circuit	Isolator status and C.B. status. It seems that positive is partially grounded, fauly feeders have been identified, soon rectification will be done soon as per availability of the Shutdown It seems that Negative is partially grounded. fauly feeders have been identified, soon rectification will be done soon as per	Is scheduled in oct'2 Positive is partially grounded, faulty fee have been identified Negative is partially grounded, faulty fee have been identified
	a.	Settings Status on DC Earth Fault Settoning 220//110/48/V Make	protection is in circuit	Isolator status and C.B. status. It seems that positive is partially grounded, fauly feeders have been identified, soon rectification will be done soon as per availability of the Shutdown It seems that Negative is partially grounded. fauly feeders have been identified, soon rectification will be done soon as per	Is scheduled in oct'2 Positive is partially grounded, faulty fee have been identified Negative is partially grounded, faulty fee have been identified
	a.	Settings Status on DC Earth Fault DC Earth Fault Make my 20105 Make my 20105	protection is in circuit	Isolator status and C.B. status. It seems that positive is partially grounded, fauly feeders have been identified, soon rectification will be done soon as per availability of the Shutdown It seems that Negative is partially grounded. fauly feeders have been identified, soon rectification will be done soon as per	Is scheduled in oct'2 Positive is partially grounded, faulty fee have been identified Negative is partially grounded, faulty fee have been identified
5	2. b. c.	Settings Status on DC Earth Fault Settings 220/1107/48/V Make Battery Status Gravity Make	protection is in circuit	Isolator status and C.B. status. It seems that positive is partially grounded, fauly feeders have been identified, soon rectification will be done soon as per availability of the Shutdown It seems that Negative is partially grounded. fauly feeders have been identified, soon rectification will be done soon as per	Is scheduled in oct'2 Positive is partially grounded, faulty fee have been identified Negative is partially grounded, faulty fee have been identified
	ь. с. d.	Settings Status on DC Earth Fault DC Earth Fault Earthean 200/1107/48/V Male Status Status Gravity Male CCDB Male Status CCDB Male Status	protection is in circuit	Isolator status and C.B. status. It seems that positive is partially grounded, fauly feeders have been identified, soon rectification will be done soon as per availability of the Shutdown It seems that Negative is partially grounded. fauly feeders have been identified, soon rectification will be done soon as per	Is scheduled in oct'2 Positive is partially grounded, faulty fee have been identified Negative is partially grounded, faulty fee have been identified
5	ь. с. d.	Settings Status on DC Earth Fault DC Earth Fault DC Earth Fault DC Earth Fault Mala Organy Materia Status Gravity Grav Gravity	protection is in circuit	Isolator status and C.B. status. It seems that positive is partially grounded, fauly feeders have been identified, soon rectification will be done soon as per availability of the Shutdown It seems that Negative is partially grounded. fauly feeders have been identified, soon rectification will be done soon as per	Is scheduled in oct?24 Positive is partially grounded, faulty fees have been identified Negative is partially grounded, faulty fees have been identified
5	a. b. c. d. Analysis of triggi a. b.	Setting. Seture on OC Earth Fault DC Earth Fault Settenies. 220//110//48V Make Seture Charger Mate Status Seture Se	protection is in circuit	Isolator status and C.B. status. It seems that positive is partially grounded, fauly feeders have been identified, soon rectification will be done soon as per availability of the Shutdown It seems that Negative is partially grounded. fauly feeders have been identified, soon rectification will be done soon as per	Is scheduled in oct?24 Positive is partially grounded, faulty fees have been identified Negative is partially grounded, faulty fees have been identified
5	b. C. C. Analysis of triggi S. Status of GPS. Status of GP (ST Fest	Settings Status on DC Easth Fault DC Easth Fault DC Easth Fault Status S	protection is in circuit	Isolator status and C.B. status. It seems that positive is partially grounded, fauly feeders have been identified, soon rectification will be done soon as per availability of the Shutdown It seems that Negative is partially grounded. fauly feeders have been identified, soon rectification will be done soon as per	Is scheduled in oct?24 Positive is partially grounded, faulty fees have been identified Negative is partially grounded, faulty fees have been identified
5	b. C. C. Analysis of triggi S. Status of GPS. Status of GP (ST Fest	Setting. Seture on OC Earth Fault DC Earth Fault Settenies. 220//110//48V Make Seture Charger Mate Seture Se	protection is in circuit	Isolator status and C.B. status. It seems that positive is partially grounded, fauly feeders have been identified, soon rectification will be done soon as per availability of the Shutdown It seems that Negative is partially grounded. fauly feeders have been identified, soon rectification will be done soon as per	Is scheduled in oct2 Positive is partially grounded, faulty fee have been identified grounded, faulty fee have been identified grounded, faulty fee have been identified have bee

#### DIVISION : ET&C Division Shahjahanpur SUBSTATION : 220 KV Substation Hardoi AUDIT DATE: 20.02.2024

5.No.	Name of Bay	Name of Protection system	Status of Protection System	Remark	Action to be taken by Transmission wing
1		taken on the observations	No record found.		
	(Internal/Third P	arty)			
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 F/F is enabled in Backup relay which is not recommended. In 220 KV Hardoi Shahjahanpur line Backup relay bug 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	ΩK.		
	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 AJarm	QK		
	h.	Power Swing	QK		
	L	Auto Reclose	Functional		
	ŀ	Healthiness of Carrier Protection	In 220 KV Hardol - 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 lines.
	k	GPS Clock	Available		1
	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	
3	Transformer/ Reactor				
	a.	Healthiness of Differential, Backup, BEE 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	Now settings have	
			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	been changed as per	
	с.	Last testing	Last Testing of Both Transformers done in Feb 2023. Testings are not done properly e.g. 2nd & 5th	recommendation	
			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	
4	Bus Bar & LBB			18.03.2024	
*	BUS BAT & LBB	Healthiness	Healthy		
	c. Status of DC	Settings Status	OK In Ckt		
5	System				
	a.	DC Earth Fault	Chareer 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		
	1		Positive to Earth= 67.6V Nesative to Earth= -49.2V		
		1	Charger No.3 (48V) Positive to Negative=49V	Positive of 48 volt DC found fully	Faulty cable has been identified and same has
	L		Positive to Farth= 0.00V Necative to Farth= 44V	grounded.	been rectified.
	b.	Batteries- 220V/110V/48V			
	1	Make Battery Status	DK		
	с.	Gravity Chargers Make	OK Charper No.1 (110V Make STATCON ENERGIAA)		
	Ľ	Status Chargers Make	Charger No. 1 11UV Make STATCON ENERGIAN Old & Need to replace Charger No. 2 (110V Make Volt Electronics)		
		and go a make	Charper No.2 (110V Make Volt Electronics) Old & Need to replace		Charger replaced with
	L	Status Chargers Make	Channes Mar 7 (1997) Malain Chaile Chanlain		new JVV make charger
		Chargers Make Status	Chareer No. 3 (48V Make Shah Shahib) OK		
L	d.	DCDB Make Status	OK		
6	Analysis of tripping from				
	July 2023		NI		
	1	Name of Element tripped more than two times in a			
	a. b.	month Multiple Trippings	Nil		
	c.	Trippins Unexplained	Nil ( All Explained)		
7	Status of SPS Status of CB		Not Installed 132 KV CB testing done in 2023 but 220 KV CB testing is not done.		Trip/Close time test of
5	Testing				220KV CB done.
9	Status of CT/CVT		CT & CVT Testing done at the time of commissioning		
	Status of Sequen	itial Event Logger (SEL)	Not Available	1	
AUDIT DATE:	N : 220 KV SUDSI	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	NO record found		
1		s Protection Audit			
-	(Internal/Third P	s Protection Audit			
2		s Protection Audit arty) Healthiness of Main-1,	Healthy		
2	(Internal/Third P Lines a.	s Protection Audit arty) Healthiness of Main-1, Main-2, & Backup relays			
2	(Internal/Third P Lines	s Protection Audit arty) Healthiness of Main-1,	Healthy Zone 3 & Zone 4 setting is not correct and required to revise. P.D. time is nevised because it was set at 3 sec.		
2	(Internal/Third P Lines a.	s Protection Audit arty) Healthiness of Main-1, Main-2, & Backup relays	Zone 3 & Zone 4 setting is not correct and required to revise. P.D. time is revised because it was set	Now settings have	
2	(Internal/Third P Lines a.	s Protection Audit arty) Healthiness of Main-1, Main-2, & Backup relays 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	
2	(Internal/Third P Lines a.	e Protection Audit arty) Healthiness of Main-1, Main-2, & Backup relays Settings Reach Time	Zone 3 & Zone 4 setting is not correct and required to revise. P.D. time is revised because it was set at 3 sec.	been changed as per	
2	(Internal/Third P Lines a.	s Protection Audit arty) Healthiness of Main-1, Main-2, & Backup relays 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.	been changed as per	
2	(Internal/Third P Lines a.	Protection Audit arty) Healthiness of Main-1, Main-2, & Backup relays Settings Settings Beach Time SOTF Fuse Fall Monitoring B&C Alarm	Zene 3 & Zone 4 setting is not correct and required to revise. P.D. time is revised because it was set at 3 ec.	been changed as per	
2	(Internal/Third P Lines a.	Protection Audit arty) Healthiness of Main-1, Main-2, & Backup relays Settings Settings Begch Time SOTF and Monitoring BEC Alarm Power Swing Auto Recise	Zero 3 & Zone 4 setting is not correct and required to revise. P.D. time is revised because it was set at 3 sec. DE DE DE DE DE DE DE DE DE DE	been changed as per	
2	(Internal/Third P Lines a.	s Protection Audit arth) Healthiness of Main-1, Main-2, & Backup relays Settings Beach Time Face Fall Monitoring Face Fall Monitoring Face Sming Autor Beclose Health Beclose Health Beclose Health Beclose	20xxx 8 20xx 6 setting is not correct and required to revise. P.D. time is revised because it was set at 3 sec. 05 06 06 06 06 06 06 06 06 06 06	been changed as per	
2	(Internal/Third P Lines a.	Protection Audit arty) Healthiness of Main-1, Main-2, & Backup relays Settings Beach. Time SOTF Fuse Fall Monitoring BEC Alarm Power Swing Auto Beckse Healthiness of Carrier	Zero 3 & Zone 4 setting is not correct and required to revise. P.D. time is revised because it was set at 3 sec. DE DE DE DE DE DE DE DE DE DE	been changed as per	
2	(Internal/Third P Lines a.	s Protection Audit tryl) Healthiness of Main 1, Main 2, & Backup relays Settings Backh Tione SOTF Face Fall Monitoring REC Alarm Frowt Smith Ratio Becklos Mat	Zeno 1 & Zono 4 setting is not correct and required to revise. P.D. time is revised because it was set at 3 sec.	been changed as per	
2	(Internal/Third P Lines a.	Protection Audit yrr)  Ieasthorns of Main 1, Main 2, & Backup relays Settings  Reach Time SoTF Fuse Fall Monitoring Fuse Fall Monitoring Fuse Fall Monitoring Fuse Fall Auto Beckard Form Former Song Auto Beckard GPS Synchronization Last settion	Zero B & Zone 4 setting is not correct and required to revise. P.D. time is newlad because it was set at 3 sec. CR CR CR CR CR CR CR CR CR CR	been changed as per	
2	()nternal/Third P Lines 2 b b b b b c c c d d c c d d b b c c c d d b b c c d d b b c c d d b c c d d c d c	Protection Audit vrv)  Additions of Main 1,  Main 2, & Backup relays  Settings  Planth Planth  Planth  Planth  Planth  Planth  Planth	Zero B & Zone 4 setting is not correct and required to revise. P.D. time is newlad because it was set at 3 sec. CR CR CR CR CR CR CR CR CR CR	been changed as per	
2	(Internal/Third P Lines a. b. b. c. c. d. d. c. d. d. f. k. b. k. l. k. k. k. l. k. k. k. k. k. k. k. k. k. k. k. k. k.	Protection Audit     try      The Addition Audit     try      Main 2, & Backspreidy     Settings      Beach     Tree      Reach     Tree      Tree      Reach     Tree      Tree      Reach     Tree       Tree	2014 S 2016 4 setting is not correct and required to revise. P.D. time is revised because it was set     if 3 sec.      Co.      en changed as per		
2	()nternal/Third P Lines 2 b b b b b c c c d d c c d d b b c c c d d b b c c d d b b c c d d b c c d d c d c	Protection Audit viry)  Reachiness of Main-1, Main-2, & Backup relays  Settings  Reach  Reac	2014 & Stone 4 setting is not correct and required to revise. P.D. time is revised because it was set     at 3 sec.     Concentration of the setting is not correct and required to revise. P.D. time is revised because it was set     at 3 sec.     Concentration of the setting is not correct and required to revise. P.D. time is revised because it was set     at 3 sec.     Concentration of the setting is not correct and required to revise. P.D. time is revised because it was set     added and the setting is not correct and required to revise. Concentration of the setting is not a setting is not an advect and the setting is not a setting is not an advect and the setting is not an advect and the setting is not advect and the setting is not advect and and the setting is not advect and and the setting is not advect and advect advect and the setting is not advect and and the setting is not advect and advect ad	been changed as per	
2	(Internal/Third P Lines a. b. b. c. c. d. d. c. d. d. f. k. b. k. l. k. k. k. l. k. k. k. k. k. k. k. k. k. k. k. k. k.	Protection Audit     try      The Addition Audit     try      Maint-2, & Backspreidy     Settings      Beach     Tree      Reach     Tree      Tree	Zenor & B. Toole 4 setting is not correct and required to revise. P.D. time is noviced because it was set at 3 sec.  Sec. Sec.	been changed as per recommendation	
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3	(Internal/Third P Unes a b c c c c c c c c c c c c c	Protection Audit tri  Tri  ReadThores of Mains I,  Mains J, & Backup relays  Settings  ReadTh  Face Sall Monitoring  BitC Aarm  Face Sall Monitoring  BitC Aarm  Face Sall Monitoring  BitC Aarm  Face Sall Monitoring  BitC Aarm  Face Sall Monitoring  BitC Aarm  Face Sall Monitoring  BitC Aarm  Face Sall Monitoring  BitC Aarm  Face Sall  Anto Becking  Ext Lesting  Lest testing  Lest testing  HeadThores  HeadThores	Zon X & Ston 4 setting is not correct and required to revise. P.D. time is revised because it was set     at 3 sec.     Concerning the set of the set of the section of the set of the section of the set of the section of the se	been changed as per reamendation	
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3	(nternal/hird p Unes	Protection Audit tri  Tri  ReadThese of Mains I,  Mains J, & Backup relays  Settings  Settings  Settings  Settings  Settings  Settings  Settings  Let testing  Let testing  Let testing  Let testing  Let testing  Settings	Zon X & Ston 4 setting is not correct and required to revise. P.D. time is revised because it was set     at 3 sec.     Concerning the set of the set of the section of the set of the section of the set of the section of the se	Been charged as per recommendation.	
3	[0.ter.and/hird p Unes a L L L L L L L L L L L L L L L L L L	Protection Audit ury)  Indefinitions of Main 1, Main 2, & Backspreider, Settings  Reach  Rea	2014 3 & Jone 4 setting is not correct and required to revise. P.D. time is revised because it was set     at 3 sec.     Concentration of the setting is not correct and required to revise. P.D. time is revised because it was set     at 3 sec.     Concentration of the setting is not correct and required to revise. P.D. time is revised because it was set     at 3 sec.     Concentration of the setting is not correct and required to revise. P.D. time is revised because it was set     at 3 sec.     Concentration of the setting is not correct and required to correct and the setting is in the setting of Both Transformers done in December 2023.     Setting of Both Transformers done in December 2023.     Setting to 100MVA-1 & 160MVA-1 & 160MVA-1 is not incorporated in Bus Bar.     SetTing of Itage 1100MUA 1 is not incorporated in Bus Bar.	New settings have been charged as per recommendation 	
3	(nternal/hird p Unes	Protection Audit uny machiness of Main 1, Machiness of Main 1, Main 2, & Backspreight 1, Main 2, & Backspreight 2, Settings Beach Beach Teach 1, Main 2, & Backspreight 2, Beach Teach 2, Teach	A Store 4 acting is not correct and required to revise. P.D. time is revised because it was set     at 3 acc.      accc     acc     acc     acc     acc     acc     acc     acc     acc	been charged as per recommendation	
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3	(nternal/hird p Unes	Protection Audit uny machiness of Main 1, Machiness of Main 1, Main 2, & Backspreight 1, Main 2, & Backspreight 2, Settings Beach Beach Teach 1, Main 2, & Backspreight 2, Beach Teach 2, Teach	A Stars 4 acting is not correct and required to revise. P.D. time is revised because it was set     if 3 sec.      G	New settings have been charged as per recommendation in a set of the set of the been charged as per recommendation Concerned testing much been written bM/S Concerned testing much been written bM/S completes to do due much be been written bM/S completes of the been set of the been much been per by the testing been per by the test	
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3	(Internal/hird p Unes	Protection Audit uny  properties of Main 1,  matchiness of Main 1,  matchiness of Main 1,  main 2, & Backspreidy  Settings   Fittings	An 3 & Store 4 setting is not correct and required to revise. P.D. time is revised because it was set     at 3 sec.     Concernent of the setting is not correct and required to revise. P.D. time is revised because it was set     at 3 sec.     Concernent of the setting is not correct and required to revise. P.D. time is revised because it was set     at 3 sec.     Concernent of the setting is not correct and required to revise. P.D. time is revised because it was set     at 3 sec.     Concernent of the setting is not correct. Concernent of the setting of the setting of the setting of the setting of the setting is not incorporated in thus ther.     Setting of Both Transformers done in December 2023.     Setting of Both Transformers done in December 2023.     Setting of Both Transformers is 100 MVA 1 & 100 MV	New settings have been charged as per recommendation in a set of the set of the been charged as per recommendation Concerned testing much been written bM/S Concerned testing much been written bM/S completes to do due much be been written bM/S completes of the been set of the been much been per by the testing been per by the test	
3	(nternal/hird p Unes	Protection Audit units inty)  Teachiness of Main 1, Main 2, & Backup relays Settings  Settings  Settings  Settings  Settings  Settings  Settings  Settings  Settings  Settings  Last testing  Settings  Set	A Dark & Sons 4 acting is not correct and required to revise. P.D. time is revised because it was set     if 3 acc.      Get	New settings have been charged as per recommendation in a set of the set of the been charged as per recommendation Concerned testing much been written bM/S Concerned testing much been written bM/S completes to do due much be been written bM/S completes of the been set of the been much been per by the testing been per by the test	
3	(Internal/hird p Unes	Protection Audit uny  properties of Main 1,  main 2, & Backgord Main 1,  main 2, & Backgord Main 1,  main 2, & Backgord Main 2,  Settings   Reach  Re	Lest 14 Store 4 setting is not correct and required to revise. P.D. time is revised because it was set     at 3 sec.     Concerning of the setting is not correct and required to revise. P.D. time is revised because it was set     at 3 sec.     Concerning of the setting is not correct and required to revise. P.D. time is revised because it was set     at 3 sec.     Concerning of the setting is not correct and required to revise. P.D. time is revised because it was set     added to the setting is not correct and required to revise. The setting of the s	New settings have been charged as per recommendation in a set of the set of the been charged as per recommendation Concerned testing much been written bM/S Concerned testing much been written bM/S completes to do due much be been written bM/S completes of the been set of the been much been per by the testing been per by the test	
3	(Internal/hird p Unes	Protection Audit trip trip)  Batchines of Main L, Main 2, & Backup relays  Settings  Settings  Sorra Face Salt Monitoria Bit Catern Face Salt Monitoria B	An 24 & Store 4 acting is not correct and required to revise. P.D. time is revised because it was set     at 3 sec.     A 2000 ACT ACT ACT ACT ACT ACT ACT ACT ACT ACT	New settings have been charged as per recommendation in a set of the set of the been charged as per recommendation Concerned testing much been written bM/S Concerned testing much been written bM/S completes to do due much be been written bM/S completes of the been set of the been much been per by the testing been per by the test	
3	(Internal/hird p Unes	Protection Audit strip: trip)  TextPhones of Main 1, Main 2, & Backup relays  Settings  Settings  Settings  Settings  Settings  Settings  Last setting  Last setting  Last setting  Settings  Carbon  Carbon  Settings  Last setting  Settings  Setti	An 3 & Store 4 setting is not correct and required to revise. P.D. time is revised because it was set     at 3 sec.     A Store 4 setting is not correct and required to revise. P.D. time is revised because it was set     at 3 sec.     A Store 4 setting is not correct and required to revise. P.D. time is revised because it was set     at 3 sec.     A Store 4 setting is not correct and required to revise. P.D. time is revised because it was set     at 3 sec.     A Store 4 setting is not correct and required to revise. P.D. time is revised because it was set     add to a setting is not correct.     A Store 4 setting is not correct and required to revise.     A Store 4 setting is not correct as a revised because it was set     add to A T/F-2 Differential relay. Backup relay & REF relay is found Healthy.     A Store 4 and a to 2023.     A Store 4 and 4 and 2024.     A Store 4 and 4 and 2 and 4	New settings have been charged as per recommendation in a set of the set of the been charged as per recommendation Concerned testing much been written bM/S Concerned testing much been written bM/S completes to do due much be been written bM/S completes of the been set of the been much been per by the testing been per by the test	
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3	(Internal/Third P Unes a 	Protection Audit trip trip)  and Theorem 2 of Main L, Main 2, & Backup relays  Settings  Settings  Settings  Settings  Settings  Settings  Auto Becking E Common Main Common	An 3 & Store 4 setting is not correct and required to revise. P.D. time is revised because it was set     at 3 sec.     A Store 4 setting is not correct and required to revise. P.D. time is revised because it was set     at 3 sec.     A Store 4 setting is not correct and required to revise. P.D. time is revised because it was set     at 3 sec.     A Store 4 setting is not correct and required to revise. P.D. time is revised because it was set     at 3 sec.     A Store 4 setting is not correct and required to revise. P.D. time is revised because it was set     add to a setting is not correct.     A Store 4 setting is not correct and required to revise.     A Store 4 setting is not correct as a revised because it was set     add to A T/F-2 Differential relay. Backup relay & REF relay is found Healthy.     A Store 4 and a to 2023.     A Store 4 and 4 and 2024.     A Store 4 and 4 and 2 and 4	New settings have been charged as per recommendation in a set of the set of the been charged as per recommendation Concerned testing much been written bM/S Concerned testing much been written bM/S completes to do due much be been written bM/S completes of the been set of the been much been per by the testing been per by the test	
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7 8 9			No		
	c. Status of SPS	Trippins Unexplained	Not installed		
9	Status of CB Testing		Testing done Testing done		
10	Status of CT/CVT Status of Sequen	tial Event Logger (SEL)	Available. It is SAS (SCADA) based system.		
SUBSTATIO		ation Shahjahanpur			
UDIT DATE:		21.02.2024			
S.No.	Name of Bay	Name of Protection system	Status of Protection System	Remark	Action to be taken b Transmission wing
1		taken on the observations	No record found.		
	(Internal/Third Pa	Protection Audit arty)			
2	Lines	Healthiness of Main-1,	220 KV Shahjahanpur Azizpur line distance Protection Relay did not function properly.	Distance Relay has	New Panel have been
	_	Main-2, & Backup relays		been declared unreliable , C& R	received , will be commissioned during o
				panel will be replaced soon	load season
				replaced soon	
	h	Settines	ne Reach settings are incorrect in 220KV Shahjahanpur- ROZA-II line.		
				Now settings have	
		Reach		been changed as per recommendation	
	d.	Time Settings. SOTF	OK OK	recommendation	
	f. R-	Fuse Fail Monitor BRC Alarm	OK BRC setting is 0.5 Amp in 220 KV ROZA-II line.		
	h.	Power Swing Auto Reclose	OK 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	
	L. J.	Healthiness of Carrier	OK .	recommendation	
	k	Protection GPS Clock	Available		
	- -	GPS Synchronization	Defective 220 KV Hardol line testing was due in 2023.	tendering is in nrocess	
3	m. Transformer/ Reactor	Carry 1021018	ARAM IN F THE SHORE HITE WAS USED IN 2023.		
	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		
	1		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 &	Now settings have	
	L		require to enable also.	been changed as per recommendation	
4	c. Bus Bar & LBB	Last testing	Testing done.		
	a. b.	Healthiness Settings Status	Healthy It is suggested to run the bus bar without closing the bus coupler. Out of Ckt since last 2019.Cabling Tender work is finalize. It will taken into service within a month.		
	C. Status of DC				
5	System	DC Earth Earth	Charger No.1 (110V)		
		DC Earth Fault	Charger No.1 (1109) Positive to Nesative=121.9V Positive to Earth=120.1V	Faulty feeder has been identified &	
			Charger No.2 (110V)	rectified on dated 24.04.2024	
			Positive to Nexative=123.2V Positive to Earth=120.5V	24.04.2024	
			Negative to Earth= -1.4V Charger No.3 (48V)	Rectified on dated	
			Positive to Negative=55.5V Positive to Earth= 0.00V	12.03.2024	
	b.	Batteries- 220V/110V/48V	Negative to Earth= -55.0V		
	1	Batteries- 220V/110V/48V Battery Status	110V Battery Bank I & II (Make Exide Industrial) Healthy		
	с.	Gravity Chargers Make	Meaning OK Charger No.1.2.8.3 ( Make /VV)		
		Status	In 110V Chargers Negative of DC is fully grounded and in 48V charger Positive of DC is fully grounded.		
		DCDB Make	Day		
6	Analysis of tripping from	Status	OK		
	July 2023	Name of Element tripped	Nil		
	[	more than two times in a month			
	b.	Multiple Trippings	NI		
	с.	Trippins Unexplained	Nil		
7	Charles a Come		Not Installed		
8	Status of SPS Status of CB		Only 220 KV Shahjahanpur-Azizpur line CB has been tested. Rest is not completed & required to	Tendering is in	
	Status of CB Testing		Not installed Doly 220 KV Shahjahanpur-Azizpur line CB has been tested. Rest is not completed & required to complete it Testing done but 220 KV PGCIL CT is 0.5 class which is required to change as earliest.	ntoress	
9	Status of CB Testing Status of CT/CVT	tial Event Logger (SEL)	Only 220 KV Shahjahanpur-Azizpur line CB has been tested. Rest is not completed & required to complete it	Tendering is in nmress Recommended Tendering is in nmress	
9 10 SUBSTATIO	Status of CB Testing Status of CT/CVT	ation GOLA	Only 220 KV Shahjahanpur-Azizpur line CB has been tested. Rest is not completed & required to complete it Testing done but 220 KV PGCIL CT is 0.5 class which is required to change as earliest.	nrocess Recommended	
9 10 SUBSTATIO JUDIT DATE:	Status of CB Testing Status of CT/CVT Status of Sequen N : 220 KV Subst	ation GOLA 21.02.2024	Only 220 O'shalphanpur-Aitigur line (2 has been tented. Reit is not completed & required to moments a Testing done but 220 KV MGCL CT is 0.5 class which is required to change as earliest. Not installed	nmress Recommended Tendering is in nmress	
9 10 UBSTATIO	Status of CB Testing Status of CT/CVT Status of Sequen	ation GOLA	Only 220 KV Shahjahanpur-Azizpur line CB has been tested. Rest is not completed & required to complete it Testing done but 220 KV PGCIL CT is 0.5 class which is required to change as earliest.	nrocess Recommended	Action to be taken i Transmission wing
9 10 UBSTATIO UDIT DATE:	Status of CB Testine Status of CT/CVT Status of Sequen N : 220 KV Subst Name of Bay Remedial Action	ation GOLA 21.02.2024 Name of Protection system taken on the observations	Only 220 O'shalphanpur-Aitigur line (2 has been tented. Reit is not completed & required to moments a Testing done but 220 KV MGCL CT is 0.5 class which is required to change as earliest. Not installed	nmress Recommended Tendering is in nmress	
9 10 SUBSTATIO UUDIT DATE: S.No. 1	Status of CB Testing Status of CT/CVT Status of Sequen N : 220 KV Subst Name of Bay Remedial Action made in Previous (Internal/Third Pa	ation GOLA 21.02.2024 Name of Protection system taken on the observations Protection Audit	Only 220 V Shalphanpur-Artigue line CB has been tested. Rest is not completed & required to momenta a Testing done but 220 KV HGCL CT is 0.5 class which is required to change as earliest. Not installed Status of Protection System	nmress Recommended Tendering is in nmress	
9 10 SUBSTATIO JUDIT DATE: S.No.	Status of CB Testing Status of CT/CVT Status of Sequen N : 220 KV Subst Name of Bay Remedial Action made in Previous	ation GOLA 21.02.2024 Name of Protection system taken on the observations Protection Audit arty) Healthiness of Main-1,	Only 220 V Shalphanpur-Artigue line CB has been tested. Rest is not completed & required to momenta a Testing done but 220 KV HGCL CT is 0.5 class which is required to change as earliest. Not installed Status of Protection System	nmress Recommended Tendering is in nmress	
9 10 SUBSTATIO UUDIT DATE: S.No. 1	Status of CB Testing Status of CT/CVT Status of Sequen N : 220 KV Subst Name of Bay Remedial Action made in Previous (Internal/Third P: Unes a.	ation GOLA 21.02.2024 Name of Protection system taken on the observations Protection Audit arty) Healthiness of Main-1, Main-2, & Backup relays	Only 220 Vishiphanpur-Attigur line (2) has been tested. Reit is not completed & required to incented as Testing done but 220 V IGCL CT is 0.5 class which is required to change as extlest. Not installed Status of Protocolon System No record found. Healthy	nmress Recommended Tendering is in nmress	
9 10 SUBSTATIO UDIT DATE: S.No. 1	Status of CB Testing Status of CT/CVT Status of Sequen N : 220 KV Subst Name of Bay Remedial Action made in Previous (Internal/Third Pa	ation GOLA 21.02.2024 Name of Protection system taken on the observations Protection Audit arty) Healthiness of Main-1,	Only 220 Vshiphanpur-Attigur line CB has been tested. Rest is not completed & required to constants J. Testing done but 220 V HGCL CT is 0.5 class which is required to change as earliest. Not installed Status of Protection System No record found.	Recommended Tendering is in process Remark	
9 10 SUBSTATIO UUDIT DATE: S.No. 1	Status of CB Testing Status of CT/CVT Status of Sequen N : 220 KV Subst Name of Bay Remedial Action made in Previous (Internal/Third P: Unes a.	ation GOLA 21.02.2024 Name of Protection system taken on the observations Protection Audit arty) Healthiness of Main-1, Main-2, & Backup relays Settings	Only 220 V Shalphanpur Aritypur Inic (2) has been tested. Reit is not completed & required to contain a learning done but 220 kV PGCk CT is 0.5 class which is required to change as earliest. Not installed Status of Protection System No record found. No record found. Healthy (// High set enable in 220 kV GCUA-Shalpikhanpur line which is not required as per recommandation.	nmress Recommended Tendering is in nmress	
9 10 SUBSTATIO UUDIT DATE: S.No. 1	Status of CB Testing Status of CT/CVT Status of Sequen N : 220 KV Subst Name of Bay Remedial Action made in Previous (Internal/Third P: Unes a.	Alton GOLA 21.02.2024 Name of Protection system taken on the observations Protection Audit arty Healthiness of Main-1, Main-2, & Backup relays Settings Beach Time	Only 220 V Shalphanpur Artigrup Im CIB has been tested. Reit is not completed & required to constants. J Testing done but 220 KV RGL CT is 0.5 class which is required to change as earliest. Not installed Status of Protection System No record found. No record found. Vesathry E/F High set enable in 220 KV GOLA-shalphanpur line which is not required as per recommandation. CM CM	Anness Recommended Tendering is in norres Remark Setting are as per	
9 10 SUBSTATIO UUDIT DATE: S.No. 1	Status of CB Testing Status of CT/CVT Status of Sequen N : 220 KV Subst Name of Bay Remedial Action made in Previous (Internal/Third P: Unes a.	Altern GOUA 21.02.2024 Name of Protection system taken on the observations Protection Audit Protection Audit Healthness of Main 2, Backup relays Settings Entry Settings Entry Biology Audit Biology Audit	Only 220 V Shalphanpur Artigrup line (2) has been tested. Reit is not completed & required to constants. Testing done but 220 KV RGK CT is 0.5 class which is required to change as earliest. Not installed Status of Protection System Nor record found. Healthy (/7 High set enable in 220 KV GOLA-Shalphanpur line which is not required as per recommandation. Of Of Of Of Of Of Of Of	Anness Recommended Tendering is in norres Remark Setting are as per	
9 10 SUBSTATIO UUDIT DATE: S.No. 1	Status of CB Testing Status of CT/CVT Status of Sequen N : 220 KV Subst Name of Bay Remedial Action made in Previous (Internal/Third P: Unes a.	Altern GOEA 21.02.2024 Name of Protection system taken on the observations Protection Audio Protection Audio Protection Audio Protection Audio Settings Protection Audio Settings Protection Audio Settings Protection Audio Settings Protection Audio Protection Audio P	Only 220 V Shalphanpur Artigrup Ine CIB has been tested. Reit is not completed & required to constants. J. Terring done but 220 KV HGCL CT is 0.5 class which is required to change as earliest. Rei rescaled  Status of Protection System  No record found.  Rei r	Recommended Tendering is in innoress Remark Setting are as per recommandation	
9 10 SUBSTATIO UUDIT DATE: S.No. 1	Status of CB Testing Status of CT/CVT Status of Sequen N : 220 KV Subst Name of Bay Remedial Action made in Previous (Internal/Third P: Unes a.	Altern GOEA 21.02.2024 Name of Protection system taken on the observations Protection Audit Healthness of Main 1, Healthness of Main 2, Healthness of Mai	Only 220 V Shalphanpur-Attigue line (2) has been tested. Reit is not completed & required to incented as Testing done but 220 KV IGCL C1 is 0.5 class which is required to change as extilent. Not installed Status of Protection System No record found. Ref. High set enable in 220 KV GOLA-Shalphanpur line which is not required as per recommandation. CK GK GK GK GK GK GK GK GK GK G	Anness Recommended Tendering is in norres Remark Setting are as per	
9 10 SUBSTATIO UUDIT DATE: S.No. 1	Status of CB Testing Status of CT/CVT Status of Sequen N : 220 KV Subst Name of Bay Remedial Action made in Previous (Internal/Third P: Unes a.	Alton COEA 21.02.2024 Name of Protection system taken on the observations, Protection Audit Protection Audit Healthiness of Main 1, Main 2, & Backup relays Settings Reach Time Settings Reach Time Setting Protection Audit Protection Audit Protection Audit Settings	Chip 220 V Shalphanpur Artigrup Im Cl3 has been tested. Reit is not completed & required to contained. Tending done but 220 KV PIGLET is 0.5 class which is required to change as earliest. Not installed Status of Protection System No record found. Healthy L/7 High set enable in 220 KV GOLA-Shalphanpur line which is not required as per recommandistion. CK CK CK CK CK CK CK CK	Recommended Tendering is in innoress Remark Setting are as per recommandation	
9 10 SUBSTATIO UDIT DATE: S.No. 1	Status of CB Testing Status of CT/CVT Status of Sequen N : 220 KV Subst Name of Bay Remedial Action made in Previous (Internal/Third P: Unes a.	Altern SOEA 21.02.2024 Name of Protection system taken on the observations Protection Audu This Protection Audu Healthiness of Main 1, Main 2, & Backup relays Settings Prove Soning Auto Beclose Mach B	Only 220 V Shalphanpur Atrigun (III has less tested. Ret is not completed & required to constants.) Tending done but 220 KV RGCL CT 6.0.5 class which is required to change as earliest. Not installed  Status of Protection System  Not received found.  Not received found.  Very High set enable in 220 KV GGLA-Shalphanpur line which is not required as per recommandation.  CM CM CM CM CM CM CM CM CM CM CM CM CM	Anonam Recommender Tendering is in connent Remark Setting are as per recommandation.	
9 10 SUBSTATIO UDIT DATE: S.No. 1	Status of CB Testion Status of Sequen N : 220 KV Subset Name of Bay Remedial Action made in Previous Unternal/Hume L be B b b b b b	Altern GOEA 21.02.2024 Name of Protection system taken on the observations Protection Audit try) Protection Audit Protection Audit Reach Reach These Beck Manager Beck Manager Beck Manager Beck Manager Beck Manager Beck Manager Beck Manager Beck Manager Beck Manager Beck Manager Beck Manager Beck Manager Beck Manager Beck Manager Beck Manager Beck Manager Beck Manager Beck Manager Beck Manager	Only 220 V Shalphanpur Atogue Ine CB has been tested. Reit is not completed & required to incented a. Testing done but 220 KV HGCL CT is 0.5 class which is required to change as earliest. Not installed Status of Protection System No record found. It was a state of Protection System Record System R	Anoram Recommended Tendering is in Anoram Remark Setting an as pro- procemmandation.	
9 10 SUBSTATIO UUDIT DATE: S.No. 1	Status of CB Feature Status of CL/CVT Status of Sequence Name of Bay Remedial Action Remedial r>Remedia R	Altern GOEA 21.02.2024 Name of Protection system taken on the observations Protection Audit try) Protection Audit Protection Audit Reach Reach These Beck Manager Beck Manager Beck Manager Beck Manager Beck Manager Beck Manager Beck Manager Beck Manager Beck Manager Beck Manager Beck Manager Beck Manager Beck Manager Beck Manager Beck Manager Beck Manager Beck Manager Beck Manager Beck Manager	Only 220 V Shalphanpur Atogue Ine CB has been tested. Reit is not completed & required to incented a. Testing done but 220 KV HGCL CT is 0.5 class which is required to change as earliest. Not installed Status of Protection System No record found. It was a state of Protection System Record System R	Anoram Recommended Tendering is in Innoram Remark Setting are as per recommandation.	
9 10 UUBSTATIO SNo. 1 2	Status of CB Testing Status of CL(VCT Status of Sequen N : 220 KV Subst Name of Bay Remedial Action made in Previous (Internal/Third P B. B. C. C. C. C. C. C. C. C. C. C. C. C. C.	Altern GOEA 21.02.2024 Name of Protection system taken on the observations protection Audit tri) Main 2, & Backup relays Settings	Only 220 V Shalphanpur Atogue Ine CB has been tested. Reit is not completed & required to incented a. Testing done but 220 KV HGCL CT is 0.5 class which is required to change as earliest. Not installed Status of Protection System No record found. It was a state of Protection System Record System R	Anoram Recommended Tendering is in Innoram Remark Setting are as per recommandation.	
9 10 UUBSTATIO SNo. 1 2	Status of CB Testing Status of Sugar Name of Bay Internet Status of Sugar Internetiation Status of Sugar Internetiation Status Bandar Bandar C C C C C C C C C C C C C C C C C C C	Altern GOLA 21.03.2024 Rame of Protection system and of Protection system in the department of the system in the system of the system in the system of the system in the system of the system is system of the system of the system is system of the system of the system is system of the system of the system is system of the system of the system is system of the system of the system is system of the system of the system of the system is system of the system of the system of the system is system of the system of the system of the system is system of the system of the system of the system is system of the system of the system of the system of the system is system of the system of the system of the system of the system is system of the system of the system of the system of the system is system of the system of the system of the system of the system is system of the s	Only 220 V Shalphanpur Artigrup Im CIB has been tested. Reit is not completed & required to contained	Anoram Recommended Tendering is in Innoram Remark Setting are as per recommandation.	
9 10 UUBSTATIO SNo. 1 2	Status of CB Testing Status of Sugar Name of Bay Internet Status of Sugar Internetiation Status of Sugar Internetiation Status Bandar Bandar C C C C C C C C C C C C C C C C C C C	Altern GOLA 21.02.2024 Rame of Protection system and on the observations arrive than Audio Automation and Automations Automation and Automations Settings Beach Beach Trane Beach Beach Beach Auto Bectore of Automations Automa	Only 220 V Shalphanpur Artigrup Im CI3 has been tested. Reit is not completed & required to contents Testing done but 220 KV PGCL CT is 0.5 class which is required to change as earliest. Not installed  Status of Protection System  No record found.  No record found.  Very Status of Protection System  Very St	Amona Amona	
9 10 UBSTATIO SNo. 1 2	Status of CB Testing Status of Sugar Name of Bay Internet Status of Sugar Internetiation Status of Sugar Internetiation Status Bandar Bandar C C C C C C C C C C C C C C C C C C C	Altern GOEA 21.02.2024 Name of Protection system taken on the observations Protection Audit Protection Audit Main 2, & Backup relays Settings Protection Audit Dispace Soft Time Soft Sof	Only 220 V Shalphanpur Attigue Ine CIB has been tested. Reit is not completed & required to incentes a Tening done but 220 KV FIGUL CT is 0.5 class which is required to change as earliest. Not installed Status of Protection System No record found. It is a set of Protection System No record found. It is a set of the	Amona Amona	
9 10 UBSTATIO SNo. 1 2	Status of CB Testing Status of Sugar Name of Bay Internet Status of Sugar Internetiation Status of Sugar Internetiation Status Bandar Bandar C C C C C C C C C C C C C C C C C C C	Altern GOLA 21.02.2024 Rame of Protection system and on the observations arrive than Audio Automation and Automations Automation and Automations Settings Beach Beach Trane Beach Beach Beach Auto Bectore of Automations Automa	Only 220 Vishiphanpur Artigrup line (2) has been tested. Reit is not completed & required to contain a Testing done but 220 KV PGCL C1 & 0.5 class which is required to change as earliest. Not installed Status of Protection System No record found. For record found. Visit Protection System Visit	Amona Amona	
9 10 UUBSTATIO SNo. 1 2	Status of CB Testing Status of Sugar Name of Bay Internet Status of Sugar Internetiation Status of Sugar Internetiation Status Bandar Bandar C C C C C C C C C C C C C C C C C C C	Altern GOLA 21.03.2024 Rame of Protection system and or the desirutations Protection Audit International Content of Content Protection Audit International Content Settings Settings Settings Settings Settings Content Protection Content Content Protection Content C	Column 220 KV PGCL CT & 0.5 Class which is required to change as earliest. Testing done but 220 KV PGCL CT & 0.5 Class which is required to change as earliest. Resting and one but 220 KV PGCL CT & 0.5 Class which is required to change as earliest. Resting and the second seco	Amona Amona	
9 10 BUBSTATIO SNo. 1 2 3	Status of CB Testing Status of CL/CVT Status of Sequence Remedia Account Remedia	Altern GOLA 21.02.2023 Rame of Protection system reaction and the observations any control and add reaction and any control and any control Healthiness of Main 1, Main 2, & Backup relays Settings Beach Prover Strong Auto Beclose Girls Any Control Beach Beach R	Only 220 V Shalphanpur Attigue Inc (2) has been tested. Reit is not completed & required to contained	Amonan Amonan Recommended Recommended Recommended Remark Setting are as per recommandation  Personing for testing to working agency as per AMC. Personing for testing to working agency as per AMC.	
9 10 UUSTATIO UUDIT DATE: 5.Mo. 1 2	Status of CB Testing Status of Sequence Nature of CL/CVT Status of Sequence Remeted a Sector Remeted a Secto	Alton COCKA 21.02.2024 Name of Protection system taken on the observations Protection Audit Protection Audit Main 2, & Backup relays Settings Protection Audit Soft Time Soft	Only 220 VShiphapuru-Kingun Hen Cl3 has been tented. Reit is not completed & required to contained a Tending done but 220 KV RGCL CT 6.0.5 class which is required to change as earliest. Not installed Status of Protection System Received Found. Not received found. Versite the stable in 220 KV GOLA-Shahiphangur Time which is not required as per recommandation. CV Figh set enable in 220 KV GOLA-Shahiphangur Time which is not required as per recommandation. CV Figh set enable in 220 KV GOLA-Shahiphangur Time which is not required as per recommandation. CV Figh set enable in 220 KV GOLA-Shahiphangur Time which is not required as per recommandation. CV Figh set enable in 220 KV GOLA-Shahiphangur Time which is not required as per recommandation. CV Figh set enable in 220 KV GOLA-Shahiphangur Time which is not required as per recommandation. CV Fight Set enable in 220 KV GOLA-Shahiphangur Time which is not required as per recommandation. CV Fight Set enable in 220 KV GOLA-Shahiphangur Time which is not required as per recommandation. CV Fight Set enable in 220 KV GOLA-Shahiphangur Time which is not required as per recommandation. CV Fight Set enable in 220 KV GOLA-Shahiphangur Time which is not required as per recommandation. CV Fight Set enable in 220 KV GOLA-Shahiphangur Time which is not required as per recommandation. CV Fight Set enable in 220 KV GOLA-Shahiphangur Time which is not required as per recommandation. CV Fight Set enable in 220 KV GOLA-Shahiphangur Time and 220 KV GOLA-Shahiphangur Time and 220 KV GOLA-Shahiphangur Time and 220 KV GOLA-Shahiphangur Time and 220 KV GOLA-Shahiphangur Time and 220 KV GOLA-Shahiphangur Time and 220 KV GOLA-Shahiphangur Time and 220 KV GOLA-Shahiphangur Time and 220 KV GOLA-Shahiphangur Time and 220 KV GOLA-Shahiphangur Time and 220 KV GOLA-Shahiphangur Time and 220 KV GOLA-Shahiphangur Time and 220 KV GOLA-Shahiphangur Time and 220 KV GOLA-Shahiphangur Time and 220 KV GOLA-Shahiphangur Time and 220 KV GOLA-Shahiphangur Time and 220 KV GOLA	Anonam Recommended Tendering is in Anonam Remark Setting and as pro- tracommand/stop. Setting and as pro- tracommand/stop. Status is as it was. Persuing for testing to working agency as per ANC.	
9 10 BUBSTATIO SNo. 1 2 3	Status of CB Testing Testing Status of CB Testing Status of Stegues Rame of Bay Rame of Rame of Rame	Altern GOLA 21.02.2023 Rame of Protection system reaction and the observations any control and add reaction and any control and any control Healthiness of Main 1, Main 2, & Backup relays Settings Beach Prover Strong Auto Beclose Girls Any Control Beach Beach R	Only 220 V Shalphanpur Atigup the CLB has been tested. Reit is not completed & required to contained	Amonan Amonan Recommended Recommended Recommended Remark Setting are as per recommandation  Personing for testing to working agency as per AMC. Personing for testing to working agency as per AMC.	
9 10 10 10 11 2 3	Status of CB Testing Status of Sequence Nature of CL/CVT Status of Sequence Remeted a Sector Remeted a Secto	Altern GOLA 21.02.2023 Rame of Protection system reaction and the observations any control and add reaction and any control and any control Healthiness of Main 1, Main 2, & Backup relays Settings Beach Prover Strong Auto Beclose Girls Any Control Beach Beach R	Only 220 V Shaphanpur Attigue Inc (2) has been tested. Reit is not completed & required to contained	Anonam Recommended Tendering is in Anonam Remark Setting and as pro- tracommand/stop. Setting and as pro- tracommand/stop. Status is as it was. Persuing for testing to working agency as per ANC.	
9 10 5.No. 1 2	Status of CB Testing Testing Status of CB Testing Status of Stegues Rame of Bay Rame of Rame of Rame	Altern GOLA 21.02.2023 Rame of Protection system Laken on the observations Protection Audio Protection Audio Protection Audio Protection Audio Settings Setti	Only 220 Visibiliharupur Atigun (III) the CLB has been tested. Reit is not completed & required to contain a	Anonam Recommended Tendering is in Anonam Remark Setting and as pro- tracommand/stop. Setting and as pro- tracommand/stop. Status is as it was. Persuing for testing to working agency as per ANC.	
9 10 10 10 1 2 3 4	Status of CB Testing Testing Status of CB Testing Status of Stegues Rame of Bay Rame of Rame of Rame	Altern GOLA 21.02.2023 Rame of Protection system Laken on the observations Protection Audio Protection Audio Protection Audio Protection Audio Settings Setti	Only 220 V Shalphanpur Arigup the CLB has been tested. Reit is not completed & required to contain a generation a generation a generation a generation a generation of the test 220 KV EGU. CT is 0.5 class which is required to change as earliest. Not installed  Status of Protection System  For record found.  For record found.  For record found.  For record found.  Very Fligh set enable is 220 KV GOU.4-Shalphanpur Time which is not required as per recommandation.  For record found.  Very Fligh set enable is 220 KV GOU.4-Shalphanpur Time which is not required as per recommandation.  For the status of Protection System  Code Generation of the status of the	Anonam Recommended Tendering is in Anonam Remark Setting and as pro- tracommand/stop. Setting and as pro- tracommand/stop. Status is as it was. Persuing for testing to working agency as per ANC.	
9 10 5.No. 1 2	Status of CB Testing Status of CT(CVT Status of CT(CVT Status of Stepson Status of Stepson Status of Stepson Remedial Action made in Previous (internal/Thirle b. Uner C. C. C. Status of Stepson Resolution Reso	Altern GOLA 21.02.2023 Rame of Protection system Laken on the observations Protection Audio Protection Audio Protection Audio Protection Audio Settings Setti	Only 220 VShiphanpur Atigun (III) the CLB has been tested. Reit is not completed & required to contract	Anonam Recommended Tendering is in Anonam Remark Setting and as pro- tracommand/stop. Setting and as pro- tracommand/stop. Status is as it was. Persuing for testing to working agency as per ANC.	
9 10 10 10 11 2 3	Status of CB Testing Testing Status of CB Testing Status of Stegues Rame of Bay Rame of Rame of Rame	Alex of DCLA 21.03.2023 Rame of Protection system and of Protection system in control of the downstion Protection Addit in the downstion of the downstion Settings Setings Settings Settings Set	Only 220 V Shaphanpur Arigup Im C IB has been tested. Reit is not completed & required to contract	Anonam Recommended Tendering is in Anonam Remark Setting and as pro- tracommand/stop. Setting and as pro- tracommand/stop. Status is as it was. Persuing for testing to working agency as per ANC.	
9 10 5.No. 1 2 3	Status of CB Testing Status of CT(CVT Status of CT(CVT Status of Stepson Status of Stepson Status of Stepson Remedial Action made in Previous (internal/Thirle b. Uner C. C. C. Status of Stepson Resolution Reso	Altern GOLA 21.02.2023 Rame of Protection system methods and the observations any observations result of Automation Healthiness of Main 1, Main 2, & Backup relays Settings Beach Time Soft and II Beach Prover String Auto Beclose Girl S and II Beach Reach C C C C C C C C C C C C C C C C C C C	Only 220 Visibiliharpur Atigup the CLB has been tested. Reit is not completed & required to change as earliest. Testing done but 220 KV RGK CT is 0.5 class which is required to change as earliest. Not installed Status of Protection System Recent for a state of Protection System Recent for a state of Protection System Recent for a state of Protection System Recent for a state of Protection System Recent for a state of Protection System Recent for a state of Protection System Recent for a state of the state of Protection System Recent for a state of Protection System Recent for a state of Protection System Recent for a state of Protection System Recent for a state of Protection System Recent for a state of Protection System Recent for a state of Protection System Recent for a state of Protection System Recent for a state of Protection System Recent for a state of Protection System Recent for a state of Protection System Recent for a state of Protection System Recent for a state of Protection System Recent for a state of Protection System Recent for a state of Protection System Recent for a state of Protection System Recent for a state of Protection System Recent for a state of Protection System Recent for a state of Protection Recent for a state of Recent for a state of Recent for a state of Recent for a state of Recent for a state of Recent for a state of Recent for a state of Recent for a state of Recent for a state of Recent for a state of Recent for a state of Recent for Rec	Anonam Recommended Tendering is in Anonam Remark Setting and as pro- tracommand/stop. Setting and as pro- tracommand/stop. Status is as it was. Persuing for testing to working agency as per ANC.	Action to be taken to Transmittion using

			Charger No 2 (110V Make Chhahi Flectricali		
	d.	Status DCDB Make	Healthy		
6	Analysis of tripping from	Status	OK		
	July 2023		Nil		
		Name of Element tripped more than two times in a	Nu		
	a. b.	month Multiple Trippings	NI		
	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 not done		
9	Status of CT/CVT		Testing done		
10	Status of Sequen	tial Event Logger (SEL)	available and Healthy		
STATIO	ON : 220 KV Subst	ation Nighasan 21.02.2024			
S.No.	Name of Bay	Name of Protection system	Status of Protection System	Bemark	Action to be taken
					Transmission win
2	Remedial Action Lines		No record found.		
	a.	Healthiness of Main-1, Main-2, & Backup relays	Healthy		
	b.	Settings	OX.		
	c. d.	Reach Time	OK OK		
	e. f.	SOTF Fuse Fail Monitor	OK OK		
	g.	BRC Alarm	BRC is not Enable in 220KV Nighasan-Kandauni line.		
				Not Provided from beginning in Settings	
	h.	Power Swing Auto Reclose	OK Auto Reclose is OFF in 220KV Nighasan-Gola Line.	Now it is in on	
	L.	Healthiness of Carrier	Not Applicable	Position	
	k.	Protection 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, REE 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.	
		Backup, REF Protection	1/1 ***	or Farmer.	
	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	Corrected as per Norms	
	с.	Last testing	In context as net Norms 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	Norms	
			reported to SDO Transmission on 23.12.23 by T&C wing. Fan Start/Fan Dropout, Pump start/ pump	Tertiary WTI of	
			dropout does not checked properly in 100 MVA T/F-II.	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	
				regarding rectification.	
	b.	Settings	ox	regarding rectification.	
5	b. C. Status of DC	Settings Status	DK. Mith Centrol unit is faulty.	regarding rectification.	
5	b. c. Status of DC System a.		Main Control unit is Faulty. Charser No.1 (110V)	regarding rectification.	
5	b. C. Status of DC System a.	Status	Main Centrol unit is Faulty. Charter No.1 (1100) Paulites to Measthers 117.9V Paulites to Measthers 117.9V Paulites to Antrol 16.4V Paulites to An	regarding rectification.	
5	b. c. Status of DC System a.	Status	Main Control and a Faults. Character Main L11300 Character Main L11300 Paratises to Restances L1.7 V Paratises to Earlish 16 AV Seconder to Earlish 16 AV Seconder to Earlish 16 AV Seconder to Earlish 16 AV Seconder to Earlish 17 AV Seconder to Earlish 18 AV Seconder to Earlish	regarding rectification.	
5	b. C. Status of DC System a.	Status	Main Control and its Faults. Garante Main 111800  Garante Main 111800  Patistics to Research Sector 20 V  Patistics to Endershield Sector 20 V  Patistics to Endershield Sector 20 V  Control to Sector 20 V  Control to Sector 20 V  Patistics to Endershield Secto	regarding rectification.	
5	b. Status of DC System a.	Status	Main Control and its Faulty.  Character Ma 11800.  Character Ma 11800.  Paratite to Instantion 112 0V  Paratites to Earthon 116 0V  Character Ma 201400.	In 48V Charger	
5	b. C. Status of DC System a.	Status	Main Control and its Faulty.  Garante Na. C1000  Garante Na. C1000  Caracter Na. C100	In 48V Charger Postive of Dc Is fully grounded. In	
5	b. Status of DC System a.	Status	Main Control unit & Faulty. Character Shall Control C	In 48V Charger Postive of Dc is fully grounded. in communication	
5	b. Status of DC System a.	Status DC Earth Fault	Main Control and its Faulty.  Garante Na. C1000  Garante Na. C1000  Caracter Na. C100	In 48V Charger Positive of DC is fully grounded, in communication	
5	a.	Status DC Earth Fault DC Earth Fault Batteries- 2201/1101/489	Main Control unit & Faulty. Character No. 11300 Character No. 1130	In 48V Charger Postive of Dc is fully grounded. in communication	
5	a.	Status DC Earth Fault DC Earth Fault Batteriose. 220//110/48/M Mailer Battery Struss Gravity	Main Control and it faulty.  Garart Ma 11100  Garart Ma 11100  Garart Ma 11100  Patients to Earths: 15 29  Patients to Earths: 15 29  Patients to Earths: 15 29  Control to 21 20  Control to 21  Control to 21 20  Control to 21 2	In 48V Charger Postive of Dc is fully grounded. in communication	
5	a.	Status DC Earth Fault Batteries 220//110/48W Make Battery Status Caugers Make Status	Main Control and In Faulty.  Character No. 111001  Character No. 111001  Character No. 11100  Character No. 11100  Character No. 11100  Character No. 11100  Character No. 11100  Character No. 11100  Character No. 1100  Charac	In 48V Charger Postive of Dc is fully grounded. in communication	
5	a.	Status DC Earth Fault DC Earth Fault Make Make Status Gravity Gravity Gravity Gravity Gravity Gravity Gravity Gravity Status Status Status	Main Control unit & Faults. Character Main 111300 Character Main 111300 Character Main 111300 Character Main 111300 Character Main 111300 Character Main 11130 Character Main 1110 Character Main 1110 Character Main 1110 Character Main 1110 Character Main 1110 Character Main 111 C	In 48V Charger Postive of Dc is fully grounded. in communication	
5	a.	Status DC Earth Fault DC Earth Fault Batteriors - 220//13/07/489/ Make Battery Status Gravity Gravity Gravity Chargers Male	Main Control unit is faults.  Garante Main 111800  Charante Main 111800  Patalates ta Endershield 27 89  Patalates ta Endershield 27 89  Patalates ta Endershield 27 89  Patalates ta Endershield 27 89  Patalates ta Endershield 27 89  Patalates ta Endershield 27 89  Patalates ta Endershield 28 99  Patalates ta Endershield 28  Patalates ta Enders	In 48V Charger Postive of Dc is fully grounded. in communication	
5	System a. b. c. c. d. Analysis of trupping from	Statu DC Earth Fault DC Earth Fault Batteries - 220/110//89/ Male Battery Statu Covers Male Covers Male Covers Male	Main Control unit & Faulty.  Charact No. 11000  Charact No. 11000  Charact No. 11000  Charact No. 11000  Charact No. 11000  Charact No. 11000  Charact No. 1100  Charact No. 1	In 48V Charger Postive of Dc is fully grounded. in communication	
5	<u>System</u> a. b. c. d.	Status DC Earth Fault DC Earth Fault Bartenister, 200/1109/486/ Malla Bartenister, 200/1109/486/ Malla Bartenister, 200/1109/486/ Gardin Coupers Male Scalan Coupers Male Scalan Coupers Male Scalan	Main Control unit & Faulty.  Character No. 11100  C	In 48V Charger Postive of Dc is fully grounded. in communication	
6	System           a.           b.           c.           c.           d.           Analysis of           tripping from           July 2023	Status DC Earth Fault DC Earth Fault Batteries 220//110//68V Mala Batteries 220//110//68V Mala Batteries 220//110//68V Mala Datas Da	Main Control unit & Faulty.  Charact No. 11000  Charact No. 11000  Charact No. 11000  Charact No. 11000  Charact No. 11000  Charact No. 11000  Charact No. 1100  Charact No. 1	In 48V Charger Postive of Dc is fully grounded. in communication	
6	System           a.           b.           c.           c.           d.           Analysis of           tripping from           July 2023	Status DC Earth Fault DC Earth Fault Satteries. 220//110//48V Maker Maker Maker Status Occupent Make Status Occupent Make Status Occupent Make Status Occupent Make Status Occupent Maker Status Occupent Maker Maker Status Occupent Maker Status Occupent br>Status Occupent Status Occupen	Main Control unit is Faults. Character Main 11300 C	In 48V Charger In 48V Charger Postive of Dc is fully grounded. in communication	
6	System         4.           4.         .           b.         .           c.         .           d.         .           d.         .           d.         .           b.         .           c.         .	Status DC Earth Fault DC Earth Fault DC Earth Fault Eartisetes 220/1109/480V Maile Battery Status Gravity Maile Status Status Status Name of Element tripped Name of Element tripped month	Main Control unit is Faults. Charact No. 11300	In 48V Charger In 48V Charger Postive of Dc is fully grounded. in communication	
5 6	System           a.           b.           c.           c.           d.           Analysis of           tripping from           July 2023	Status DC Earth Fault DC Earth Fault Satteries. 220//110//48V Maker Maker Maker Status Occupent Make Status Occupent Make Status Occupent Make Status Occupent Make Status Occupent Maker Status Occupent Maker Maker Status Occupent Maker Status Occupent br>Status Occupent Status Occupen	Main Control unit is Faults. Charare this 11300 Charare this 11300 Charare this 11300 Charare this 11300 Charare this 11300 Charare this 1130 Charare this 1	In 48V Charger In 48V Charger Postive of Dc is fully grounded. in communication	
6 7 8	System A	Status DC Earth Fault DC Earth Fault DC Earth Fault DC Earth Fault Status Status Gravity Dddat Gravi	Main Control unit is Faulty.  Garare No. 11000  Garare No. 11000  Garare No. 11000  Control to Negative Status 17.2V  Faulties to Instatus 16.2V  Faulties to Instatus 16.2V  Faulties to Instatus 16.2V  Faulties to Instatus 16.2V  Faulties to Instatus 16.2V  Faulties to Instatus 17.2V  Faulties to Instatus 17.2V  Faulties to Instatus 17.2V  Faulties to Instatus 17.2V  Faulties to Instatus 16.2V  Faulties to Instatus 16.2V  Faulties to Instatus 16.2V  Faulties to Instatus 16.2V  Faulties to Instatus 16.2V  Faulties to Instatus 16.2V  Faulties to Instatus 17.2V  Faulties to Instatus 16.2V  Faulties to Instatus 16.2V  Faulties to Instatus 17.2V  Faulties to Instatus 17.2V  Faulties to Instatus 17.2V  Faulties to Instatus 16.2V  Faulties to Instatus 17.	In 48V Charger In 48V Charger Postive of Dc is fully grounded. in communication	
6	System a. b. C. C. d. d. supple from by 2023 a. b. C. d. d. Status of SPS Status of CB Factors Status of CD Factors Status of CD Factors Status of CD Factors Status of CD Status of	Status DC Earth Fault DC Earth Fault DC Earth Fault Eastenise 220/1330/489/ Malle Eastenise 220/1330/489/ Malle Status Chargen Malle Status Status Name of Element tripped more than two times in a month Multiple Tripping. Tripping. Tripping.	Main Control unit is Faults. Charare this 11300 Charare this 11300 Charare this 11300 Charare this 11300 Charare this 11300 Charare this 1130 Charare this 1	in AV Charger In AV Charger Poster of Cis fully grounded in communication years of Cis fully be archived in a communication years of Cis fully in rs of Cis	
6 7 8	System a. b. C. C. d. d. supple from by 2023 a. b. C. d. d. Status of SPS Status of CB Factors Status of CD Factors Status of CD Factors Status of CD Factors Status of CD Status of	Status DC Earth Fault DC Earth Fault DC Earth Fault DC Earth Fault Status Status Gravity Dddat Gravi	Main Control unit & Faulty. Character No. 511000 Character No. 511000 Character No. 511000 Character No. 51100 Character No. 5	In 48V Charger In 48V Charger Postive of Dc is fully grounded. in communication	
6 7 8 9 10	System A  System A  C  C  C  C  C  C  C  C  C  C  C  C	Status DC Earth Fault DC Earth Fault DC Earth Fault DC Earth Fault Earthoring 200/1109/48/W Earthoring 200/1109/1109/1109/1109/1109/1109/1100/1109/1109/1100/1109/1100/1100	Main Control unit & Faulty. Character No. 511000 Character No. 511000 Character No. 511000 Character No. 51100 Character No. 5	In AtV Charger Postlee of Circ fully grounded. In segmende	
6 7 8 9 10 3STATIO	System A System A C C C C C C C C C C C C Status of SP5 Status of Sequen N N C C Status of System N C C Status of Super C C C C C C C C C C C C C C C C C C C	Status DC Earth Fault DC Earth Fault DC Earth Fault DC Earth Fault DC Earth Fault DC Earth Fault DC Earth Mate Status DC DT Mate Status DC	Man Control unit & Faults.  Garare No. 11800  Garare No. 11800  Garare No. 11800  Control to Statustica U.2 V  Control to Statustica	In div Charger In div Charger Pather of Cis fully Common Cis fully Common Cis fully Common Cis fully Description D	
6 7 8 9 10	System A  System A  C  C  C  C  C  C  C  C  C  C  C  C	Status DC Earth Fault DC Earth Fault DC Earth Fault DC Earth Fault Earthoring 200/1109/48/W Earthoring 200/1109/1109/1109/1109/1109/1109/1100/1109/1109/1100/1109/1100/1100	Main Control unit & Faulty. Character No. 511000 Character No. 511000 Character No. 511000 Character No. 51100 Character No. 5	In AtV Charger Postlee of Circ fully grounded. In segmende	
6 7 8 9 10 SSTATIO SSTATIO S.SNo. 1	System A  System A  C  C  C  C  C  C  C  C  C  C  C  C	Status DC Earth Fault DC Earth Fault DC Earth Fault DC Earth Fault DC Earth Fault DC Earth Fault DC Earth Mate Status DC DT Mate Status DC	Main Control unit & Faults.  Caracter No. 11100  Caracter No. 111	In div Charger In div Charger Pather of Cis fully Common Cis fully Common Cis fully Common Cis fully Description D	Action to be taken
6 7 8 9 10 3STATIO	System A System A B G G G G G G G G G G G G G G G G G G	Status DC Earth Fault DC Earth Fault DC Earth Fault DC Earth Fault Eastering-2202/1109/48/W Eastery Status Gravity Eastery Status Gravity Eastery Status Gravity Eastery Status Cougen Male Status Cougen Male Status Cougen Male Status Cougen Status Cougen Status Eastery Status Eastery Status Eastery Status Eastery Status Eastery Status Eastery Status Eastery Status Eastery Status Eastery Status Eastery Status Eastery Status Eastery Status Eastery Status Eastery Status Eastery	Man Control unit & Faults.  Garare No. 11800  Garare No. 11800  Garare No. 11800  Control to Statustica U.2 V  Control to Statustica	In div Charger In div Charger Pather of Cis fully Common Cis fully Common Cis fully Common Cis fully Description D	Action to be taken Yanunission win
6 7 8 9 10 SSTATIO SSTATIO S.SNo. 1	System A System A C C C C C C C C C C C C C C C C C C	Status DC Earth Fault DC Earth Fault DC Earth Fault DC Earth Fault DC Earth Fault Earth Fa	Man Control unit a Faults.  Garare No. 11800  Garare No. 11800  Garare No. 11800  Garare No. 21800  Faults to Instatistical T.7.V  Faults to Instatistical	In AIV Charger,     In AIV Charger,     In AIV Charger,     Positive OCL Inly     grounded in     grounded in     communication     younger,     in AIV Charger,     communication     workshow     School And All All All All All All All All All Al	Action to be taken
6 7 8 9 10 SSTATIO SSTATIO S.SNo. 1	System A System A C C C C C C C C C C C C C C C C C C	Status DC Earth Fault DC Earth Fault DC Earth Fault DC Earth Fault Earth Fault Earth Fault Earth Fault Earth Fault Earth Fault Earth Fault Earth Fault Earth Fault Earth Fault Earth	Man Control unit a Faults.  Garare No. 11800  Garare No. 11800  Garare No. 11800  Garare No. 21800  Faults to Instatistical T.7.V  Faults to Instatistical	In AIV Charger Postlee of Cir. fully granueds. In segmented. In segmented. In Schuber Meridente Schuber Meridente Schuber Meridente Schuber Meridente Schuber Meridente Remark It was enabled in	Action to be taken
6 7 8 9 10 SSTATIO SSTATIO S.SNo. 1	System A System A C C C C C C C C C C C C C C C C C C	Status Status DC Earth Fault DC Earth Fault DC Earth Fault DC Earth Fault Earth Fault Earth Fault Earth Fault Earth Eart	Man Control and a Faults  Grant No. 11800  Grant No. 11800  Grant No. 11800  Grant No. 11800  Analytic to Instruction 17.9  Control	In div Charger In div Charger Pather of Cis fully Pather of Cis fully Pather of Cis fully Pather of Cis fully Pather of Cis fully Pather of Cis fully Pather of Cis fully Pather of Cis fully Pather P	Action to be taken Transmission win
6 7 8 9 10 SSTATIO SSTATIO S.SNo. 1	System A System A C C C C C C C C C C C C C C C C C C	Status DC Earth Fault DC Earth Fault DC Earth Fault DC Earth Fault Earth Fault Earth Fault Earth Fault Earth Fault Earth Fault Earth Fault Earth Fault Earth Fault Earth Fault Earth	Main Control unit is Faults.  Charact No. 51300  Charact No. 51300  Charact No. 51300  Charact No. 51300  Charact No. 51300  Charact No. 51300  Charact No. 51300  Charact No. 51300  Charact No. 51300  Charact No. 51300  Charact No. 51400  Status of Protection System  No. No. 51400  No. 514  No. 514	In AIV Charger,     In AIV Charger,     In AIV Charger,     Positive OCL Inly     grounded in     grounded in     communication     younger,     in AIV Charger,     communication     workshow     School And All All All All All All All All All Al	Action to be taken
6 7 8 9 10 SSTATIO SSTATIO S.SNo. 1	System A System A C C C C C C C C C C C C C C C C C C	Status DC Earth Fault DC Earth Fault DC Earth Fault DC Earth Fault DC Earth Fault DC Earth Fault Earth	Mon Control unit is Faults  Character No. 11300  Character No. 1130  Charact	In AIV Charger Pother of Cir. fully groundel. In ScADA Based event logger to aclaim. ScADA Based event logger to aclaim. Remark H was enabled in presence of A.E. T&C. ADODUR	Action to be taken Transmission with
6 7 8 9 10 SSTATIO SSTATIO S.SNo. 1	System A System A C C C C C C C C C C C C C C C C C C	Status Status DC Earth Fault DC Earth Fault DC Earth Fault Earth Fault Earth Fault Earth Fault Earth E	Main Control unit is Faults.  Same the 11100  Carrer to 11100  Carrer to 11100  Carrer to 21100  Paratics to Insention: 17 V  Paratics to Insention: 17 V  Paratics to Insention: 17 V  Paratics to Insention: 17 V  Paratics to Insention: 17 V  Paratics to Insention: 17 V  Paratics to Insention: 17 V  Paratics to Insention: 17 V  Carrer to 2100  Carr	In AtV Charger     In AtV Charger     Positive of Circ fully     granuckd, in     granuckd, in     sectors     verytem OC + should     be sethed     verytem OC + should     be sethed     verytem OC + should     be sethed     verytem OC + should     be sethed     verytem OC + should     be sethed     verytem OC + should     be sethed     verytem OC + should     verytem OC + should     verytem OC + should     verytem OC + should     verytem OC + should     verytem OC + should     verytem OC + should     verytem OC + should     verytem OC + should     verytem OC + should     verytem OC + should     verytem OC + should     verytem OC + should on     verytem OC + should     verytem OC + should on     verytem OC +	Action to be taken
6 7 8 9 10 SSTATIO SSTATIO S.SNo. 1	System A System A C C C C C C C C C C C C C C C C C C	Status DC Earth Fault DC Earth Fault DC Earth Fault DC Earth Fault DC Earth Fault DC Earth Fault Earth Fault Earth	Man Control und a Faults.  Garare No. 11800  Garare No. 11800  Garare No. 11800  Garare No. 11800  Analities to Instatistical 17.9V  Database in Egitaria 18.0V  Analities to Instatistical 17.9V  Control to Instatistical 19.0V  Control to Instatistical 19	In AIV Charger     In AIV Charger     In AIV Charger     Pather of Cis fully     grounded in     grounded in     searthard     ScADA Based event	Action to be taken
6 7 8 9 10 SSTATIO SSTATIO S.SNo. 1	System A System A C C C C C C C C C C C C C C C C C C	Status DC Earth Fault DC Earth Fault DC Earth Fault DC Earth Fault DC Earth Fault Earth Fa	Mon Control unit is Faults  Character No. 511000  Character No. 511000  Character No. 511000  Character No. 511000  Character No. 511000  Character No. 511000  Character No. 511000  Character No. 511000  Character No. 5110  Character No. 5110  Char	In ANC Darger     In ANC Darger     In ANC Darger     Positive of Cis fully     grounded.in     grounded.in     accommutation     acc	Action to be taken
6 7 8 9 10 SSTATIO SSTATIO S.SNo. 1	System A System A C C C C C C C C C C C C C C C C C C	Status  Status  DC Earth Fault  DC Earth Fault  DC Earth Fault  Eastenice, 220/130//48/ Malle  Markey Status  Corport  Matery Status  Corport  Matery Status  Corport  Matery Status  Corport  Matery Status  Corport  Matery Status  Corport  Matery Status  Name of Element tripped  Matiper Strenglained  Matiper Strenglained  Matiper Strenglained  Matiper Strenglained  Matiper Strenglained  Matery Status  Status  Mane of Polenest tripped  Mane of Matery Status  Status  Status  Status  Status  Status  Status  Status  Matery Status  Status  Matery Status  Status  Matery Status  Stat	Mon Control unit is Faults.	In AIV Charger Positive of Circ fully provide of Circ fully provide of Circ fully provide of Circ fully provide of Circ fully provide of Circ fully provide of Circ fully provide of Circ fully provide of Circ fully provide of Circ fully provide of Circ fully circle cir	Action to be taken
6 7 8 9 10 SSTATIO SSTATIO S.SNo. 1	System A System A C C C C C C C C C C C C C C C C C C	Status DC Earth Fault DC Earth Fault DC Earth Fault DC Earth Fault DC Earth Fault Earth Fa	Mon Control unit is Faults  Character No. 511000  Character No. 511000  Character No. 511000  Character No. 511000  Character No. 511000  Character No. 511000  Character No. 511000  Character No. 511000  Character No. 5110  Character No. 5110  Char	In ANC Darger     In ANC Darger     In ANC Darger     Positive of Cis fully     grounded.in     grounded.in     accommutation     acc	Action to be taken
6 7 8 9 10 SSTATIO SSTATIO S.SNo. 1	System A System A C C C C C C C C C C C C C C C C C C	Status  Status  DC Earth Fault  DC Earth Fault  DC Earth Fault  Battenics. 220/110//BW  Make  Battenics. 220/110//BW  Make  Charger Male  Status  Charger Male  Status  Charger Male  Status  Charger Male  Status  Charger Male  Charger Male  Status  Charger Male  Status  Charger Male  Status  Charger Male  Status  Charger Male  Status  Charger Male  Status  Charger Male  Status  Charger Male  Status  Charger Male  Status  Charger Male  Status  Charger Male  Status  Charger Male  Status  Charger Male  Status  Charger Male  Status  Charger Male  Status  Charger Male  Status  Charger Male  Status  Charger Status  Status  Charger Status  Status  Status  Status  Status  Status  Status  Status  Charger  Status  Status  Charger  Status  Charger  Status  Status  Charger  Charger  C	Mon Control unit is Faults.  Character No. 511000  Character No. 511000  Character No. 511000  Character No. 511000  Character No. 511000  Character No. 511000  Character No. 511000  Character No. 51100  Character No.	In div Charger In div Charger Pather of Cis fully Pather of Cis fully Pather of Cis fully Pather of Cis fully Pather of Cis fully Pather of Cis fully Pather of Cis fully Pather of Cis fully Pather of Cis fully Pather Pa	Action to be taken
6 7 8 9 10 10 SSTATIO S S S S S SSTATIO S SSTATIO S S S S S S S S S S S S S S S S S S S	System A System A B B C C C C C C C C C C C C C C C C C	Status DC Earth Fault DC Earth Fault DC Earth Fault DC Earth Fault DC Earth Fault DC Earth Fault Earth Fault Earth Fault Earth Fault Earth Fault Earth Fault Earth Fault Earth Fault Earth Fault Earth	Mon Control and a Faulty.  Character No. 511000  Character Sol 11000  haracter Sol 1100  Character S	In AIV Charger Positive OC Is fully provide the optimized of Cis fully provide of Cis fully provide of Cis fully provide of Cis fully provide of Cis fully provide of Cis fully provide of Cis fully provide of Cis fully provide of Cis fully provide of Cis fully provide of Cis fully provide of Cis fully full	Action to be taken
6 7 8 9 10 SSTATIO SSTATIO S.SNo. 1	System A System A B B C C C C C C C C C C C C C C C C C	Status Status DC Earth Fault DC Earth Fault DC Earth Fault DC Earth Fault Earthories 220/1130/480/ Make Status DC Earth Fault Make Status Charger Mate Status Charger Mate Status Nume of Element tripped more than too times in a morth Multipler Strenghained Trippes Charger (SE1) Status Earthories Status Charger (SE1) Status Earthories Status Earthories Status Earthories Status Earthories Status Earthories Status Earthories Status DC Earthories Status DC Earthories Status DC Earthories Status Earthories Status DC Earthories Status DC Earthories Status DC Earthories Status Earthories Status DC Earthories DC Earthor	Main Control unit & Faults  Character No. 11100  C	In div Charger In div Charger Pather of Cis fully Pather of Cis fully Pather of Cis fully Pather of Cis fully Pather of Cis fully Pather of Cis fully Pather of Cis fully Pather of Cis fully Pather of Cis fully Pather Pa	Action to be taken
6 7 8 9 10 10 SSTATIO S S S S S SSTATIO S SSTATIO S S S S S S S S S S S S S S S S S S S	System   System    System	Status Status DC Earth Fault DC Earth Fault DC Earth Fault DC Earth Fault Earthories 220/1130/480/ Make Status DC Earth Fault Make Status Charger Mate Status Charger Mate Status Nume of Element tripped more than too times in a morth Multipler Strenghained Trippes Charger (SE1) Status Earthories Status Charger (SE1) Status Earthories Status Earthories Status Earthories Status Earthories Status Earthories Status Earthories Status DC Earthories Status DC Earthories Status DC Earthories Status Earthories Status DC Earthories Status DC Earthories Status DC Earthories Status Earthories Status DC Earthories DC Earthor	Mon Control and a Faulty.  Character No. 511000  Character Sol 11000  haracter Sol 1100  Character S	In div Charger In div Charger Pather of Cis fully Pather of Cis fully Pather of Cis fully Pather of Cis fully Pather of Cis fully Pather of Cis fully Pather of Cis fully Pather of Cis fully Pather of Cis fully Pather Pa	Action to be taken
6 7 8 9 10 10 SSTATIO S S S S S SSTATIO S SSTATIO S S S S S S S S S S S S S S S S S S S	System   System    System	Statu Statu DC Earth Fault DC Earth Fault DC Earth Fault DC Earth Fault Earth Fault Earth Fault Earth Fault Earth Fault Earth Fault Earth Fault Earth	Mon Control unit is Faults  Character No. 11300  C	In div Charger In div Charger Pather of Cis fully Pather of Cis fully Pather of Cis fully Pather of Cis fully Pather of Cis fully Pather of Cis fully Pather of Cis fully Pather of Cis fully Pather of Cis fully Pather Pa	
6 7 8 9 10 10 SSTATIO S S S S S SSTATIO S SSTATIO S S S S S S S S S S S S S S S S S S S	System   System    System	Status  Status  DC Earth Fault  DC Earth Fault  DC Earth Fault  Battlenics. 220/110//BW  Make  DC Earth Fault  Battlenics. 220/110//BW  Make  Charger Male  Status  Charger Status  Charger Status  Charger Status  Charger Status  Status  Status  Charger Male  Status  Status  Charger Male  Status  Charger Male  Status  Charger Male  Status  Charger Male  Charger Male  Charger Male  Status  Charger Male  Char	Main Control unit & Faults  Character No. 11100  C	In div Charger In div Charger Pather of Cis fully Pather of Cis fully Pather of Cis fully Pather of Cis fully Pather of Cis fully Pather of Cis fully Pather of Cis fully Pather of Cis fully Pather of Cis fully Pather Pa	Action to be taken

	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 Status			
5	Status of DC System				
	a.	DC Earth Fault	Chareer No.1 (110V) Positive to Negative=121.7V	In Both Charger	
			Positive to Earth=47.2V	Positive of DC is	
			Negative to Earth= -74.3V Charger No.2 (110V)	found Partially grounded.	
			Positive to Negative=121.7V Positive to Earth=47.2V	-	
	b.		Negative to Earth= -74.3V		
		Batteries- 220V/110V/48V Make	110V Battery Bank I & II (Make Exide Industrial)		
		Battery Status Gravity	Nealthy OK		
	с.	Chargers Make			
	d.	Status DCDB Make	Healthy		
6	Analysis of	Status	OK .		
6	tripping from July 2023 a.	Name of Element tripped	220KV Kandauni-Nighasan line tripped more than two times in a month because there was a problem	The problem is	
		more than two times in a month	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.	rectified.	
	b. c.	Multiple Trippings Tripping Unexplained	NI		
7	Status of SPS		OK .		
8	Status of CB		Testing done		
9	Techno ( em tecno		Testing done		
9 10	Status of CT/CV1 Status of Sequer	ntial Event Logger (SEL)	OK		
TATIC	N : 220 KV Subs	tation Sitapur			
DATE:		22.02.2024			
i.No.	Name of Bay	Name of Protection system	Status of Protection System	Remark	Action to be taken by Transmission wing
1		1			Transmission wing
	made in Previou	taken on the observations s Protection Audit	No record found.		
	(Internal/Third P	Party)			
2	Lines a.	Healthiness of Main-1,	Healthy		
		Main-2, & Backup relays			
	b.	Settings	KZ1 settings are incorrect in 220KV B.K.T. line.	KZ1 settings changed	
		Reach	08	as per Norms.	<u> </u>
	d.	Time	OK		
	c.	SOTF Fuse Fail Monitor	OK OK		
	f.	BRC Alarm Power Swing	OK 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.	
		GPS Clock	available		
		GPS Synchronization	Defective		
	L	Last testing	220KV Sitapur-Shahjahanpur line tesing was due in 2023.	testing done in jan	
	Transformer/			2024	
1	Reactor	Healthiness of Differential,	REF relay (ERL T-Pro) is not installed in 100 MVA T/F.	bushing and neutral	
	a.	Backup, REF Protection	REF reay (ERL 1991) 6 Hot instance in 200 WWA 1/F.	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.	
4	r Bus Bar & LBB	Last testing	Testing done		
	aus oaf & LBB	Healthiness	Healthy		
5	D. C.	Settings Status	OK In Ckt.		
	Status of DC System				
	a.	DC Earth Fault	Chareer No.1 (110V) Positive to Nesative=115.4V	In Both Charger	
	1		Positive to Earth=111.4V	Negative of DC is	
	1		Negative to Earth= -3.7V Charger No.2 (110V)	found fully grounded.	
	1		Positive to Negative=115.9V Positive to Earth=97.4V		
	1		Negative to Earths -17.2V Charger No.3 (48V)	In 48V Charger	
			Positive to Negative=51.1V	Positive of DC is fully	
	L		Positive to Farth= 1.6V Necative to Farth= -48.1V	grounded.	
	b.	Batteries- 220V/110V/48V			
	1	Battery Status Gravity	Healthy OK		-
	C.	Chargers Make	Charger No.1 (110V Make MG Corporat) & Charger 2 (110V Make JVV)		
	d.	Status DCDB Make	Healthy		
6	Analysis of	Status	OK		
	tripping from July 2023				
	a.	Name of Element tripped more than two times in a month	Nil		
	b.	Multiple Trippings	Yes [1.0n 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.	
	с.	Trippins Unexplained	NI		
_	Status of SPS	1	Not Installed	Not Installed	
3	Status of CB Testing		Testing is under planning		
9	Status of CT/CV1	r	Testing done		
0	Status of Sequer	ntial Event Logger (SEL)	Not installed	Not Installed	
10					

#### CONCLUSION OF PROTECTION AUDIT

<u>2024</u>

DIVISION : ET&C Division Sultanpur SUBSTATION : 400 KV Substation Sultanpur AUDIT DATE: 21.02.2024

observations	system ion taken on the made in Previous udit (Internal/Third Party) Healthiness of Main-1, Main-2, & Backup relays Settings Reach Time SOTF BRC Alarm Power Swing Fuse Fail Monitoring Auto Reclose Healthiness of Carrier Protection GPS Clock	No record found. Healthy OK OK OK OK OK OK OK OK Functional Healthy	Main 1 & Main 2 relays installed for 400kV OBRA line has same make & model (Siemens Siprotec 7SA52).	Requirement send
a. b. c. d. e. f. g. h. i. j.	Main-2, & Backup relays Settings Reach Time SOTF BRC Alarm Power Swing Fuse Fail Monitoring Auto Reclose Healthiness of Carrier Protection	OK OK OK OK OK OK OK Functional	for 400kV OBRA line has same make & model (Siemens Siprotec	Requirement send
b. c. d. e. f. g. h. i. j.	Main-2, & Backup relays Settings Reach Time SOTF BRC Alarm Power Swing Fuse Fail Monitoring Auto Reclose Healthiness of Carrier Protection	OK OK OK OK OK OK OK Functional	for 400kV OBRA line has same make & model (Siemens Siprotec	Requirement send
c. d. e. f. g. h. i. j.	Reach Time SOTF BRC Alarm Power Swing Fuse Fail Monitoring Auto Reclose Healthiness of Carrier Protection	OK OK OK OK OK Functional		
d. e. f. g. h. i. j.	Time SOTF BRC Alarm Power Swing Fuse Fail Monitoring Auto Reclose Healthiness of Carrier Protection	OK OK OK OK OK Functional		
e. f. g. h. i. j.	SOTF BRC Alarm Power Swing Fuse Fail Monitoring Auto Reclose Healthiness of Carrier Protection	OK OK OK OK Functional		
f. g. h. i. j.	BRC Alarm Power Swing Fuse Fail Monitoring Auto Reclose Healthiness of Carrier Protection	OK OK OK Functional		
g. h. i. j.	Power Swing Fuse Fail Monitoring Auto Reclose Healthiness of Carrier Protection	OK OK Functional		
h. i. j.	Fuse Fail Monitoring Auto Reclose Healthiness of Carrier Protection	OK Functional		
i. j.	Auto Reclose Healthiness of Carrier Protection	Functional		
j.	Healthiness of Carrier Protection			
	Protection	licatiny		
k.		i i i i i i i i i i i i i i i i i i i		
		Available		
I.	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 & chutdown	
Transforme				
r/ Reactor				
a.	Healthiness of Differential, Backup, REF Protection	Healthy		
b.	Settings	Recommandation. Over fluxing setting are enable in 315 MVA ICT- I,III&IV. OTI, WTI Fan Start, Pump	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)		
a.	Healthiness	Healthy		
	Status	Isolator & CB status are healthy		
system		Charger No.1 Positive to Negative=240V Positive to Earth=25V Negative to Earth= -215V	faulty feeders have not been identified, soon identification/rectification will be done soon as per availability of the	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
	m. Transforme r/ Reactor a. b. c.	m. Last testing          Transforme         r/Reactor         Healthiness of         a.         Differential, Backup, REF         Protection         b.         Settings         c.         Last testing         a.         Healthiness of         Differential, Backup, REF         Protection         b.         Settings         c.         Last testing         a.         Healthiness         b.         Settings         c.         Status of DC	I.       GPS Synchronization         I.       GPS Synchronization         I.       Image: Image	I.     GPS Synchronization     protection relays installed for this element is not synchronized with GPS.       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 April-2024, 315MVA ICT-IV has been done in M/O April-2024, 315MVA ICT-IV has been done in Aug-2024 and rest of elements will tested as per availability of the concerned firm & thutdown       Transforme

	1		Charger No.2	It seems that positive is ground,	It seems that positive is ground,
	a.	DC Earth Fault	Positive to Negative=220V	faulty feeders have not been	faulty feeders have not been
			Positive to Earth= 10V	identified, soon	identified, soon
			Negative to Earth= -210V	identification/rectification will be	identification/rectification will be
_				done soon as per availability of the	done soon as per availability of the
5				Shutdown	Shutdown
			Charger No.3 (48V)		
			48 Battery bank is available and		
			healthy.		
		Batteries-			
		220V/110V/48V			
	b.	Make	Exide Industrial		
		Battery Status	Healthy		
		Gravity	ОК		
	c.	Chargers Make	Charger No. 1&2 (Chhavi Electrical		
			Make)		
		Status	Healthy		
		DCDB Make	L&T Switchgear		
		Status	Healthy		
	Analysis o	of tripping from July 2023			
		Name of Element tripped	Nil		
6	a.	more than two times in a			
Ŭ		month			
	b.	Multiple Trippings	Nil		
	с.	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	s	Status of CT/CVT	CT & CVT Testing done at the time		
			of commissioning	Or muse and Event Language	REQUIREMENT OF NEW EL SEND
10	Status of Se	quential 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 Protection system	Status of Protection System	Remark	Action to be Taken by Transmission Wing
	Remedial Acti	on taken on the	No record found.		
1	observations i	made in Previous Protection			
	Audit (Interna	l/Third Party)			
	Lines				
	a.	Healthiness of Main-1, Main	Healthy		
	ά.	2, & Backup relays			
	b.	Settings	ОК	Now settings have been kept as per recommendation	
	с.	Reach	ОК		
	d.	Time	ОК		
	e.	SOTF	ОК		
	f.	Fuse Fail Monitoring	ОК		
	g.	BRC Alarm	ОК		
	h.	Power Swing	ОК		
2	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		
	I.	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 nanel	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				
		Healthiness of Differential,	Healthy		
	a.	Backup, REF Protection	-		

1			All setting have been done as per		
3			5		
3	b.	Settings	Recommandation. OTI, WTI Fan Start,		
		_	Pump Start etc settings has been		
			made as per Recommandation		
			08.07.2024 (Routine testing of	All ements has been tested which were	
	с.	Last testing	63MVA T/F-I has done which was due	due till July 2024.	
			in March 2024)		
		Bus Bar & LBB			
4	a.	Healthiness	Healthy		
	b.	Settings	ОК		
	с.	Status	Isolator & CB status are healthy		
	Status of DC				
	System				
			Charger No.1 (110V)	It seems that negative is ground, faulty	It seems that negative is ground, faulty
			Positive to Negative=114.4V	feeders have not been identified, soon	feeders have not been identified, soon
			Positive to Earth=97.9V	identification/rectification will be done	identification/rectification will be done
			Negative to Earth= -16.2V	soon as per availability of the Shutdown	soon as per availability of the
	a.	DC Earth Fault		, ,	Shutdown
	d.	DC Earth Fault	Charger No.2 (110V)		
			DC Sourcs 2 is not available		
			Charger No.3 (48V)		
5			48 Battery bank is available and		
			healthy.		
		Batteries- 220V/110V/48V	incontiny.		
	b.	Make	Exide Industrial		
		Battery Status	Healthy		
	с.	Gravity	OK		
		Chargers Make	The Standard Battries Ltd. Make		
		Status	Healthy		
			Prem Electric & Auto Corporation		
	d.	DCDB Make	make		
	-	Status	Healthy		
	Analysis of				
	, tripping from				
	July 2023				
	July 2023	Name of Element tripped	Nil		
6	a.	more than two times in a			
	u.	month			
	b.	Multiple Trippings	Nil		
	с.	Trippins Unexplained	Nil ( All Explained)		
7		Status of SPS	Available but defective	SPS is defective since July 2023.	
-			Testing of 03 Nos circuit breaker has	Breaker timing test has not been	TENDER FOR TIMING TEST
			been completed.	completed for 03 Nos Ciecuit	FLOATED AFTER TAKING APPROVAL
8	Sta	itus of CB Testing	seen completed.	Breakers out of 08 Nos Circuit	
		-		Breakers by transmission wing,	
				which should be done soon	
_			CT & CVT Testing done at the time of		
9	S	tatus of CT/CVT	commissioning		
10	Status of Sec	quential Event Logger (SEL)	Not Available		
L	Status of Sequential Event Logger (SEL)				

# 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
	Remedial Acti	on taken on the	NO record found		
1	observations	made in Previous Protection			
	Audit (Interna	l/Third Party)			
	Lines				
	a.	Healthiness of Main-1, Main	Healthy		
	d.	2, & Backup relays			
	b.	Settings	ОК		
	с.	Reach	ОК		
	d.	Time	ОК		
	e.	SOTF	ОК		
	f.	Fuse Fail Monitoring	ОК		
	g.	BRC Alarm	ОК		
	h.	Power Swing	ОК		
2	i.	Auto Reclose	Functional		
	;	Healthiness of Carrier	ОК		
	J.	Protection			
	k.	GPS Clock	Available		
	Ι.	GPS Synchronization	ОК		

	m. Transformer / Reactor a.	Last testing Healthiness of Differential, Backup, REF Protection		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	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.	
		Bus Bar & LBB			
4	a.	Healthiness	Healthy		
1	b.	Settings	ОК		
	с.	Status	Functional		
	Status of DC				
5	a.	DC Earth Fault Batteries- 220V/110V/48V	Charger No.1 (110V) Positive to Negative=120V Positive to Earth=60V Negative to Earth=-59V Charger No.2 (110V) Positive to Negative=120V Positive to Earth=60V Negative to Earth=60V Charger No.3 (48V) 48 Battery bank is not available. It is obtained by Chopper limit and convert it from 110V to 48V. Evide Industrial	DC voltage on charger 1&2 are as per order	
	b.	Make	Exide Industrial		
1		Battery Status	Healthy		
3	с.	Gravity Chargers Make Status	OK Charger No.1 (110V Make Chloride Power System & Solution) Healthy		
		Chargers Make Status	Charger No.2 (110V Make Chloride Power System & Solution) Healthy		
	d.	DCDB Make	Asian Switchgear Pvt. Ltd.		
		Status	Healthy		
	Analysis of tripping from July 2023				
6	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	Sta	tus 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	S	tatus of CT/CVT	CT & CVT Testing done at the time of		
			commissioning	l	SAS system
10	Status of Sec	quential Event Logger (SEL)	Not Available	1	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	 Action to be Taken by Transmission Wing
	Remedial Action taken on the		No record found.	
1	observations	made in Previous Protection		
	Audit (Interna	I/Third Party)		
	Lines			

					requirement has been send
<i></i>	1 3		commissioning		done in till 30.11.2024
9	s	tatus of CT/CVT	CT & CVT Testing done at the time of		more then 10 year CT Testing to be
	5.		County commissioning WUIK.	wing.	
8	Sta	tus of CB Testing	testing/commissioning work.	least once in a year by transmission	will be completed till 31.10.2024
/		Status of JFJ	Testing done during routine	Breaker timing test should be taken at	Breaker timing test work is in progress,
7	ι.				
	<u> </u>	month			
6	a.	more than two times in a	110		
	July 2023	Name of Element tripped	Nil		
	Analysis of		·		
	d.				
	С.				
		_	Electrical)		
	b.				
			Postala ta decatata (		
			healthy.		
5			up, REF Protection       All setting have been done as per         Settings       All setting have been done as per         Recommandation. OTI, WTI Fan Start,       Pump Start etc settings has been         made as ner Recommandation       15.04.2024 (Routine testing of         Last testing       160MVA T/F-II has done which was         due in Jan-2024       All ements has been tested which were         due in Jan-2024       eutill July 2024.         *8 LB8       Punctional         Healthiness       Healthy         Settings       OK         Status       Functional         Charger No.1 (110V)       It seems that negative is ground, faulty         Positive to Negative=122V       feeders have not been identified, soon         Positive to Earth=95V       identification/rectification will be done         Negative to Earth=91V       d=""><td></td></td<>		
-					
					Negative to Earth= -46V
					Positive to Earth=74V
	a.	DCLaithiauit			Positive to Negative=120V
			Charger No. 2 (110V)	It seems that negative is ground, faulty	dc earth now improove something
				soon as per availability of the Shutdown	
					Negative to Earth= -43V
				-	Positive to Negative=123V Positive to Earth=80V
					Positive to Negative=123V
	System		Charger No. 1 (110)/)	It seems that negative is ground, foulty	dc earth now improove something
	C.	Status	Functional		
	b.				
4	a.				
		Bus Bar & LBB			
	с. 	•		uue (111 July 2024.	
	с.				
				All ements has been tested which were	
	ы.	Securitys			
3	þ.				
	a.	Backup, REF Protection	reality		
		Healthiness of Differential	Healthy		
	Transformer				
		-	Jan-2024		
	m.			due till July 2024.	
	1.			All ements has been tested which were	
	k.			GPS CLOCK HAS SUFFICIENT NO OF PORTS	
	<u> </u>		A		procurement.
	j.	Protection		Carrier Protection.	requirement has been send for
	i.	ricultimess of curren	220kV PGCIL Sohawal CktI&II lines	through DTPC regarding healthiness of	though DTPC and 220KV sultanpur to be connected when DTPC available.
			Carrier Protection is healthy for	It is required to connect all 220kV Lines	220Kv GIS darshan nagar connected
	i.				
2	h.				
2	g.				
2       h.       Power Swing       OK         i.       Auto Reclose       Functional         j.       Healthiness of Carrier       Protection         i.       GPS Clock       Available         i.       Last testing       Sultanpur line done         j.       Healthiness of Differential,       Healthy         j.       Bus Bar & LBB       Healthy         j.       Bus Bar & LBB       IOONVA T/F-II has cdide as ner Recom         j.       Status of DC       Status       Functional         status of DC       Status       Functional       Status         j.       Status of DC       Status       Positive to Negative         j.       a.       DC Earth Fault       Charger No.1 (100V					
				scheme	
	u.	2, & Backup relays		replaced by Main 1 & Main 2 protection	
	а	,		lines have One Main & Backup Protection scheme which should be	isto of production of main 2 rolay
			Healthy	220kV lines Sultanpur & 220kV Gonda	requirement has been send from division level for procurement of Main 2 Relay

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		made in Previous Protection	No record found.		
	Lines a.	Healthiness of Main-1, Main-	Healthy		
	b.	2, & Backup relays Settings	ОК		
	с.	Reach	OK		
	d.	Time	OK		
	e.	SOTF	ОК		
	f.	VT Fuse Fail	ОК		
	g.	BRC Alarm	ОК		
	h.	0	ОК		
2	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.		Available		
	١.	GPS Synchronization	All protection relays synchronized		
	m.	Last testing	with GPS 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.	
	Transformer / Reactor				
	a.	Healthiness of Differential,	Healthy		
	a.	Backup, REF Protection			
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	22.06.2024 (Routine Testing of 160MVA T/F-II has done on 22.06.2024 which was due in Jun-	All ements has been tested which were due till July 2024.	
		Bus Bar & LBB	2024)		
4	a.		Healthy		
	b.	Settings	OK		
	С.	Status	Functional		
	Status of DC				
	System				
			Charger No.1 (110V)	4	
			Positive to Negative=119.1V	4	
			Positive to Earth=54.8V	1	
	a.		Negative to Earth= -64.4V Charger No.2 (110V)		
			Positive to Negative=116.4V	1	
			Positive to Regative=110.4V	1	
			Negative to Earth= -54.6V	1	
5		Batteries- 220V/110V/48V			
	b.	Make	HBL Make		
	5.	Battery Status	Healthy		
		Gravity	ОК		
		Chargers Make	Charger No.1&2 (110V Make Chloride Power System & Solution)		
	С.		Healthy	l	
			Charger No.3 (48V Make Radetron) Healthy		
			Maha Mai Engineering make		
	d.		Healthy		
-	Analysis of	Jialus			
	tripping from July 2023				
6			Nil		
	a.	more than two times in a month			

	b.	Multiple Trippings	Nil		
	с.	Trippings Unexplained	Nil ( All Explained)		
7		Status of SPS	Not Installed		
8	Status of CB Testing		testing/commissioning work.	Breaker timing test should be taken at least once in a year by transmission wing.	
9	S	tatus of CT/CVT	CT & CVT Testing done at the time of commissioning	wine.	
10	Status of Sec	quential Event Logger (SEL)		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		on taken on the nade in Previous Protection I/Third Party)	No record found.		
	Lines	Healthiness of Main-1, Main-	Healthy		
	a.	2, & Backup relays			
	b.	Settings	ОК		
	с.	Reach	ОК		
	d.	Time	OK		
	e.	SOTF	OK		
	f.	Fuse Fail Monitor	OK OK		
	g. h.	BRC Alarm Power Swing	<u>ОК</u>		
	i.	Auto Reclose	Functional		
2	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, damand for this ho hone sout	DTPC module for Sultanpur-Amethi line is not available, Requiremenmt has been send and informed to microwave department.
	k.	GPS Clock	Available		
	I.	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	
	Transformer				
	/ Reactor	Healthiness of Differential,	Healthy		
	a.	Backup, REF Protection			
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	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	
		Bus Bar & LBB			
4	a.	Healthiness	Healthy		
	b. c.	Settings	OK Eurotional		
	C. Status of DC	Status	Functional		
	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
5			Charger No.3 (48V) 48 Battery bank is available and healthy.		
		Batteries- 220V/110V/48V			
	b.	Make	Exide Industrial		
		Battery Status	Healthy		
		Gravity	ОК	l	

		Chargers Make	Charger No.1 & 2 (110V Make STATCON ENERGIAA)		
	с.	Status	Healthy		
		Chargers Make	Charger No.3 (48V Make Radetron)		
		Status	Healthy		
	d.	DCDB Make	Asian Switchgear Pvt. Ltd.		
	÷.	Status	Healthy		
	Analysis of				
	tripping from				
	July 2023				
6		Name of Element tripped	Nil		
° °	a.	more than two times in a			
		month			
	b.	Multiple Trippings	Nil		
	с.	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
			Testing done during routine	Breaker timing test work is under	Breaker timing test work is in progress,
8	Sta	tus of CB Testing	testing/commissioning work.	progress by transmission wing, which	will be completed till 31.11.2024
				should be complete till 31.10.2024.	
9	Status of CT/CVT		CT & CVT Testing done at the time of		
			commissioning		
10	Status of Sec	uential Event Logger (SEL)	SAS & SEL are available	SAS & SEL (SCADA based Sifang make)	
10				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		on taken on the made in Previous Protection I/Third Party)	No record found		
	Lines				
	a.	Healthiness of Main-1, Main 2, & Backup relays	Healthy		
	b.	Settings	ОК		
	С.	Reach	ОК		
	d.	Time	ОК		
	e.	SOTF	ОК		
	f.	Fuse Fail Monitor	ОК		
	g.	BRC Alarm	ОК		
	h.	Power Swing	ок		
	i.	Auto Reclose	ОК		
2	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		
	I.	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 CktIII line has done on 20.04.2024 which was due in Jan- 2024)	All ements would be tested as per availability of Shutdown.	
	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	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.	
	ł	Bus Bar & LBB			
4	a.	Healthiness	Healthy		
-	b.	Settings	OK		
	<u>р.</u> с.	Status	Functional		
	Status of DC	510103			
	System				

1			Charger No.1 (110V)	1	
			Positive to Negative=121V		
			Positive to Earth=61V	1	
			Negative to Earth= -61V	1	
	a.	DC Earth Fault	Charger No.2 (110V)		
			Positive to Negative=121V		
			Positive to Earth=60V	1	
			Negative to Earth= -61V	1	
5		Batteries- 220V/110V/48V			
5	b.	Make	Exide Industrial		
	D.	Battery Status	Healthy		
		Gravity	ОК		
		Chargers Make	Charger No.1 & 2 (110V Make HBL		
		-	Power Systems Ltd.)		
	с.	Status	Healthy		
	0.	Chargers Make	Charger No. 3 (48V Make AZ		
		-	Electronics)		
		Status	Healthy		
	d.	DCDB Make	HBL Power Systems Ltd.		
		Status	Healthy		
	Analysis of				
	tripping from				
	July 2023				
6		Name of Element tripped	Nil		
	a.	more than two times in a			
		month			
	b.	Multiple Trippings	Nil		
7	с.	Trippins Unexplained Status of SPS	Nil ( All Explained)		
/		Status of SPS	Not Installed		Breaker timing test work is in progress,
8	St-	atus of CB Testing	Testing done during routine	Breaker timing test should be taken at	will be completed till 31.10.2024
0	518	itus of CB Testing	testing/commissioning work.	least once in a year by transmission	
			CT & CVT Testing done at the time of	wing.	more then 10 year CT Testing to be
9	S	tatus of CT/CVT	commissioning		done in till 30.11.2024
			SAS & SEL are available	SAS & SEL (SCADA based Sifang make)	
10	Status of Sec	quential Event Logger (SEL)		are available at the substation.	
L				are available at the substation.	

# PRAYAGRAJ ZONE

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1.5	Action Taken Repor	t Against Protection Audit - 2024	
	Ar mini ranci nopo-	0	

Division	Substation	Conclusion point mention by protection audit team	Action taken report
	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
ET&CD Mirzapur	÷	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 BHADOF	Carrier communication is healthy bu there are communication issue present in all feeders	1.Fiber optical cable is damaged at 220 kv t Machhlishahar end. Informe 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.	<ul> <li>For the Bus-Bar Protection following action has been taken: -</li> <li>(1) Requirement of New C&amp;R panel (siemens make bus bar unit relay) for 160MVA T/F-II panel send to transmission wing.</li> <li>(2) The faulty Bus bar unit relay of 160 MVA T/F-I has been replaced with another spare Bus bar unit relay.</li> <li>(3) Ethernet switch of Bus-Bar protection panel has been replaced with another spare Ethernet switch.</li> </ul>
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

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-		Action taken report o	on Protection Audit-220 kV SS Fatehpur Dt-11.03.2024	
SI 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 -li 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 Barida and 220 kV Malwan is having only Main-I and on 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 very serious for protection point of view so, relay in non direction 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.	Refay 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 Maiwan 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 CAMM Assistant Engineer Electy Test & Com Sub Div. IV U.P. Power Transmus ion Corp. Ltd. Radha Nagar, Fatehpur

228		Action taken report on I	Protection Audit -220 kV SS Malwan Dt-11.03.2024	
SI 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 ky line.	DTPC installed on both 220 kV Malwan And 220 kV Unchahar line.	220 kV Malwan fatehpur lire is having only Main-I and only Carrie 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 Assister Engineer Electy Test. & Com. Sub Div. IV U.P. Power Transmission Corp. Ltd. Radha Nagar, Fatehpur

Bate on which complete       R       Date on which complete       R       B       IS.03.2024       IS       IS       IS			Action Taken Rer	Action Taken Report on Protection Audis 220 KV Jhunsi		Audit Date - 19.02.2024
3     101/1000H1Cl dragent is atury.     15.03.034       3     2000H1Cl dragent is atury.     15.03.034       0     M1 and M2 Ragin dragent is atury.     15.03.034       10     M1 and M2 Ragin dragent is atury.     M1 and M2 Ragin dragent is atury.     15.03.034       10     M1 and M2 Ragin dragent is atury.     M1 and M2 Ragin dragent is atury.     15.03.041       10     M1 and M2 Ragin dragent is atury.     M1 and M2 Ragin dragent is atury.     15.03.041       11     M1 and M2 Ragin dragent is atury.     M1 and M2 Ragin dragent is atury.     15.03.041       12     M1 and M2 Ragin dragent is atury.     M1 and M2 Ragin dragent is atury.     15.03.041       13     M1 and M2 Ragin dragent is atury.     M1 and M2 Ragin dragent is atury.     15.04.041       14     M1 and M2 Ragin dragent is atury.     M1 and M2 Ragin dragent is atury.     15.04.041	SI. 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
M1 and M2 Relinks       Taimmassion wing 42.01 VJ. Imuta to the the procession in the the the procession in the the the procession in the the the procession in the the procession in the the procession.       Taimmassion mag 42.01 VJ. Imuta to the the procession in the the procession in the the procession in the the procession in the the procession.       Taimmassion mag 42.01 VJ. Imuta to the the procession in the the procession in the the procession in the the procession in the the procession.       Taimmassion mag 42.01 VJ. Imuta to the the procession in the the procession in the the procession in the the procession in the the procession in the the procession.       Taimmassion mag 42.01 VJ. Imuta to the procession in the the procession in the the procession in the the procession in the the procession.       Taimmassion mag 42.01 VJ. Imuta to the procession in the the procession in the the procession in the the procession in the the procession.         M1 and M2 and		m	110 V/300AH DC System -1 Battery charger is Faulty	Faulty Battery charger is replaced & Now DC System is helthy.	15.03.2024	
The second secon	5		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	
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*		Action Taken R	Action Taken Report on Protection Audi <mark>t-220 KV Phoolpur</mark>	0 KV Phoolpur	Audit 19.02
SI. 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
r,	7	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.	Tr,absmission 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	
° 6	m	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	
к.) -	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	25
• • • • • •	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	
* IN **	. 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 SI No . 4	
ب م ال	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	
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	Action Taken Rel	Action Taken Report on Protection Audit-220 KV SANCIPUR	KV SANGIPUR	Audif Date – 18.03.2024
l. No.	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
· _	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	
5	WTI Meter Faulty Of 160 Mva T/F-I.	Transmission wing of 220 KVWTIMeterUnderSangipur has been informedWarrantyM/sBHELand being instructed to updateassure thatWTIMeterthe protection scheme as soonwillbereplacedtillas possible.30.09.202430.09.2024	WTI Meter Under Warranty M/s BHEL assure that WTI Meter will be replaced till 30.09.2024	
ŝ	SAS, SEL & SPS Not Available.	Transmission wing of 220 KV S/S Sangipur is Sangipur has been informed SAS Substation & its SAS and being instructed to update SPS is not require at 220 kV Substation as possible.	220KV S/S Sangipur is SAS Substation & its SAS System work Normally, SPS is not require at 220 KV Substation	

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	Action Taken Repo	Action Taken Report on Protection Audit 220 KV PRATAPGARH	V PRATAPGARH	18.03.2024
Sl. No.	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
-	GPS SYSTEM	Transmission wing of 220 KV New GPS System has Requirement of New GPS Pratapgarh has been informed been expected to install System has been sent on and being instructed to update till 31.12.2024 date 13.05.2024 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-IIEarthingOn Dated 28.04.2024 DC-attended by transmission wingI& DC-IIEarthing& rectifiedat220KVproblemhasbeenPratapgarhattendedattendedattendedbeen	Earthing On Dated 28.04.2024 DC- on wing I & DC-II Earthing 220KV problem has been attended	
ω.	SAS, SEL & SPS NOT AVAILABLE	Transmission wing of 220 KV 220KV S/S Pratapgarh is Pratapgarh has been informed non SAS Substation, SPS and being instructed to update is not require at 220 KV the protection scheme as soon Substation	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 Expected to complete till Replacement work tender Pratapgarh has been informed 31.10.2024 under process and being instructed to update the protection scheme as soon as possible.	Expected to complete till 31.10.2024	Replacement work tender under process

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		Act	ion Taken Report Against Protection	UII Auult - 2021
- No	Division	Substation	Conclusion point mentioned by	Action taken report
ir. No.	DIVISION		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- relay and for 220 KV REWA ROAD line, Relay Panel replacement is ir progress.
-		220 KV Sirathu, Kaushambi	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.
	-		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
		220 KV Cantt,	GPS clock is not installed	Procurement of GPS clock is under process
		Prayagraj	Circuit Breaker timing test has not been in practice by	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	<ul> <li>(i).Panel requirement has been send by transmission wing for 220kv Rev Road-Sirathu line.</li> <li>(ii). Necessary action regarding rectification of keypad issue isunder process by transmission wing.</li> </ul>
			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 22 kV Cantt line ,220 kV Obra-I,III and Mirzapur lines.Requirement of DTPC sent to HQ. Carrier communication and inter tripping is healthy of other 220 kV lines
1	ET&CD-II Prayagraj	onts and	SAS & SEL are not available at the substation	SAS & SEL are not available at the substation. Informed transmision wi about the issue.
			SPS is not available.	SPS is not available.Informed transmision wing about the issue.
	2.		Breaker timing test has not been done by transmission	Informed to transmission wing for taking C.B timing test on regular
			Bus Bar Protection is not healthy due to wrong isolato	r Isolator and C.B status is now ok. Bus-Bar engineer visit expected for rectification in Bus-Bar relay panel.
			and CB status. 220 KV PGCIL-I, ISOLUX-I and ISOLUX-II Relay are not synchronise with GPS clock remaining all othe relays are synchronized.	s Ports are not available for 220KV ISOLUX-I & ISOLUX-II. 220KV PGCIL is now time synchronized.

Informed to transmission wing for mining on the reader of the reader.	Breaker timing test has not been done by transmission wing.	400KV Masauli	
Informed to transmission wing for taking C.B timing test on regular	Mecessary action sinceres Road-Obra III and 220 kV 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	separate for all phases		
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.	IN IS IN A REAL PROPERTY AND A REAL PROPERTY A		

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ACTION TAKEN REP	
PROTECTION AUDIT DATE:	-15.02.2024
NAME OF SUBSTATION: 220 KV SUB	STATION HARAHUA
	Action Taken
Audit Points	Previous Protection Audit has been done by CPRI in the year 2019, but still the
No record of previous Audit report is available.	Audit Points has not been received.
All protection relays are healthy except :-	New REF relay of 60 MVA T/F-I has been commissioned on date 12/03/2024.
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 entering
) Display of LV BCPU relay has been in faulty condition since 2022 but protection is in healthy condition as	Display of LV BCPU relay has been corrected on date 09/05/2024.
ii) ZIV make Decentralised low impedation the experisoning stage due to incomplete configuration in	Busbar protection is still unhealthy and needs to be corrected by Transmission wing.
e BB relay panel and the failure of communection and	110 V DC battery system-I is unhealthy and needs to be corrected.
. 110 V DC system - 1 is healthy, but 5 number of cells of this set is running in unhealthy condition	Healthy
. 110 V DC system – 2 is healthy	Data communication (via PLCC) is not healthy for Azamgarh line.
5. Data communication (via PLCC) is healthy only for Samath line via PLCC.	
5. SAS & SEL are available at the substation, but it is not working property.Efforts should be made to revive the SAS.	Revival of SAS is still pending.
7. SPS is not available	
e Annual routine testing of protective relays is done timely	
9. OTI & WTI protection setting of both the Transformers found in order.	Still not in practice.
10.Parallel running of both the 220 KV incoming lines is not in practice.	Carrier Protection implementation pending due to unavailability of OPGW an
10. Parallel running of both the LEPT 11. Carrier Protection (PLCC/DTPC) are not available on both the lines(220 KV AZAMGARH & SARNATH) available at 220 KV Harahua Substation.	PLCC ACCESSORIES.
available at 220 KV Harahua Substation. 12.Breaker Timing test has not been in practice by transmission wing, which should be done atleast once in	<sup>a</sup> Breaker timing test report is still pending from transmission wing.

ACTION TA	KEN REPORT
PROTECTION AUG	DIT DATE:-16.02.2024
UNIT OF SUBSTATION:-22	0 KV SUBSTATION BHELUPUR Action Taken
NAME OF SUBSTATION	Action Taxes
Audit Points	Previous Protection Audit has been done by CPRI in the year 2019, but still the Audit points has not been received.
	MAIN 1.5 MAIN II Distance protection scheme adoption on 220 KV Sahupuri lines-I&II is still pending.
All protection relays are healiny except units and the set of available one MAIN & Backup	110 V DC System-1 positive earthed has been rectified new charger (Make Chabbi) has been replaced and is in running condition.
ce of available one MAIN & Backup. 110 V DC system - 1 is positive earthed but it will be replaced within one week with new charger (Make Chhabi).	Healthy
	Healthy
110 V DC system - 2 is healthy.	
taxtoC evelop is healthy.	
Data communication is healthy through microwave.	
SAS & SEL are not available at the substation.	
SPS is not available.	
Annual routine testing of protective relays is done timely.	
0. OTI & WTI protection setting of both the transformera found in order.	New 80 MVA T/F -II has been commissioned and charged on date 92/03/2024.
11.One Transformer (60 MVA T/F-II) is in damage condition & other is in Commissioning stage. 11.One Transformer (60 MVA T/F-II) is in damage condition & other is in Commissioning stage. 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 1 rigorous study of frequent tripping of transformers with 33 KV feeders inorder to grade the timings with 33 kV feeders tripping , rigorous study of frequent tripping of transformers with 33 feeders (mostly cable based). as to minimise the frequency of tripping of transformers with 33 feeders (mostly cable based).	the
as to minimise the frequency of tripping or transmission wing, which should be done atleast once in a year. 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.
13. Breaker Having	Carrier Protection should not be functionalise due to unavailability of OPGW wire and related equipments on both the lines (Sahup lines-1ⅈ)
14. Carrier Protection (PLCQDTPC) is not even 15.220 KV Bus-Bar panel has not been commissioned.	220 KV Busbar Protection panel is not available.

ACTION TAKEN	REPORT
PROTECTION AUDIT D	ATE:-15.02.2024
NAME OF SUBSTATION: 220 KV SL	IBSTATION RAJA KA TALAB
Audit Points	Action Takan
No record of previous Audit report is evailable.	Previous Protection Audit has been done by CPRI in the year 2019,but still the Audit points has not been received.
All protection relays are healthy except >	
)) Bus bar protection has been found in faulty condition since 2018, due to defective BB relay panel.	Detective Central unit of Busbar Relay replaced, and Busbar protection made functional on dat 30.04.2024.
<li>Distance protection ( Main I, Make ZIV ) of 220 KV GIS BHADOHI LINE has been in faulty condition since 21/10/2023</li>	Distance protection Relay (MAIN 1,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 lest report is still pending from transmission wing.

# ACTION TAKEN REPORT PROTECTION AUDIT DATE:-17.02.2024 NAME OF SUBSTATION -220 KV SUBSTATION GAJOKHAR

Action Taken

	the burner send the set of the se
Audit Points	Previous Protection Audit has been done by CPRI in the year 2019 but still the Audit points has not been received.
No record of previous Audit report is system. 2. All protection relays are healthy, except One Main & BU scheme are available at two lines, 220 KV Samath-I & II lines 2. All protection relays are healthy, except One Main & BU scheme are available at two lines, 220 KV Samath-I & II lines	Implementation of Distance protection winiter a mean received and the second
n place of MAIN's & HANKED CALL	Healthy
a 110 V DC system -I(200AH) is healthy.	
4. 110 V DC system-II(300AH)= -ve earth	Rectification of -ve earth is still pending.
	Rectification of -ve earth is still pending.
5. 110 V DC system-lit(300AH)= -ve earth	Healthy
6.48V DC System(300AH)= healthy	
<ol> <li>6.48V DC System(300kh) - National</li> <li>6.48V DC System(300kh) - National</li> <li>6.7</li> <li>6.7</li> <li>6.7</li> <li>6.7</li> <li>6.7</li> <li>6.7</li> <li>6.7</li> <li>6.7</li> <li>6.7</li> <li>6.7</li> <li>6.7</li> <li>6.7</li> <li>6.7</li> <li>6.7</li> <li>6.7</li> <li>6.7</li> <li>6.7</li> <li>6.7</li> <li>6.7</li> <li>6.7</li> <li>6.7</li> <li>6.7</li> <li>6.7</li> <li>6.7</li> <li>7</li> <li7< li=""> <li>7</li> <li7< li=""> <li>7</li> <li>7<!--</td--><td>d Carrier Intertripping is still pending on 220 KV Sarnath-II line.</td></li></li7<></li7<></ol>	d Carrier Intertripping is still pending on 220 KV Sarnath-II line.
Lost mailable at 220 KV Dannas III and	
6. SAS & SEL are not evailable at the substation.	
7. SPS is not available.	
8. Annual routine testing of protective relays is done timely.	
the section section of both Transformers found in order.	
<ol> <li>OTI &amp; WTI protection seturing of energy of the energy of th</li></ol>	ar. Breaker timing test report is still pending from transmission wing.
10. Testing of Breaker timing has not been in practice by datamentary (Phase wise R,Y,B) has been commissioned on	
ist est make "Centralised low Impedance Busbar Scheme (	
11. Set reads and is in healthy condition.	

date 26.11.2018

	Action Taken Rep	port
	Protection Audit Report-	16.02.2024
	Name of Substation-220 kV Sub	station, 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.

Action Taken	stnio9 tibuA	
r pending due to its unavailability. r pending due to its unavailability.	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.	٢
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.	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.	8
	SAS (Substation Automation System) & SEL (Sequential Event Logger) are not available in the substation.	6
	SPS (Special Protection System) is not available in the substation	(
	Annual Routine Testings of Protection Relays are done timely.	1
	Settings of OTI & WTI Protection of all three (220 kV/ 132 kV) transformer are found in order	1
rest	Data communication through Microwave is healthy	1
Ratification of this issue is still pending.	Keypads & HMI of REF Relay (Alstom Make, MiCOM - P642) installed on 200 MVA TF-I (Aditya Make) are not responding & found defective.	

<b>PROTECTION AUDIT DATE:</b> 21.01.2024 & 23.01.2024           NAME OF SUBSTATION: SARNATH, VARANASI           Audit Point         Audit Point           Audit Point         Action Taken           1         220 KV Busbar Protection is not         220 KV Busbar Protection has been commissioned           2         Duplicate busbar protection at 400 KV         Installation and commissioning work is in under           3         Carrier aided protection is not available at through 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 three on time.         Neither PLCC nor DTPC is available on Line.           5         Carrier aided protection is not available at three of DTPC has been placed by transmission wing on dated 26.08.2021 but panel didn't receive.         Since Feeder is TSS hence not required.		ACTION TAKEN REPORT	EN REPORT
NAME OF SUBSTATION: 400 KV SUB         Audit Point       Audit Point         220 KV Busbar Protection is not       220 KV Busbar Protection at 400 KV         Busbar protection       at 400 KV         Busbar protection       at 400 KV         Busbar protection       at 400 KV         Busbar protection       at 400 KV         Busbar protection       at 400 KV         Busbar protection       at 400 KV         Busbar protection       at 400 KV         Busbar protection       at 400 KV         Busbar protection       at 400 KV         Busbar protection       at 400 KV         Busbar protection       at 400 KV         Busbar protection       at 220 KV Azamgarh line.         Carrier aided protection is not available at 220 KV Beerapatti TSS Feeder.       220 KV Beerapatti TSS Feeder.		PROTECTION AUDIT DATE:	21.01.2024 & 23.01.2024
Audit Point         220 KV Busbar Protection is not commissioned.         220 KV Busbar Protection at 400 KV Busbar protection         Duplicate busbar protection is not available at 220 KV Harhua line, only data is running through PLCC.         Carrier aided protection is not available at 220 KV Azamgarh line.         Carrier aided protection is not available at 220 KV Azamgarh line.         Carrier aided protection is not available at 220 KV Azamgarh line.         Carrier aided protection is not available at 220 KV Azamgarh line.		NAME OF SUBSTATION: 400 KV SU	UBSTATION, SARNATH, VARANASI
220 KV Busbar Protection is not         commissioned.         Duplicate busbar protection at 400 KV         Busbar protection         Carrier aided protection is not available at 220 KV Harhua line, only data is running through PLCC.         Carrier aided protection is not available at 220 KV Azamgarh line.         Carrier aided protection is not available at 220 KV Azamgarh line.         Carrier aided protection is not available at 220 KV Azamgarh line.         Carrier aided protection is not available at 220 KV Azamgarh line.		Audit Point	Action Taken
Duplicate busbar protection at 400 KV         Busbar protection         Busbar protection         Carrier aided protection is not available at 220 KV Harhua line, only data is running through PLCC.         Carrier aided protection is not available at 220 KV Azamgarh line.         Carrier aided protection is not available at 220 KV Azamgarh line.         Carrier aided protection is not available at 220 KV Beerapatti TSS Feeder.	-	220 KV Busbar Protection is not commissioned.	220 KV Busbar protection has been commissioned on date 25.02.2024.
Carrier aided protection is not available at 220 KV Harhua line, only data is running through PLCC. Carrier aided protection is not available at 220 KV Azamgarh line. Carrier aided protection is not available at 220 KV Beerapatti TSS Feeder.	2	Duplicate busbar protection at 400 KV Busbar protection	Installation and commissioning work is in under progress.
Carrier aided protection is not available at 220 KV Azamgarh line. Carrier aided protection is not available at 220 KV Beerapatti TSS Feeder.	m	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.
Carrier aided protection is not available at 220 KV Beerapatti TSS Feeder.	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.
	10	Carrier aided protection is not available at 220 KV Beerapatti TSS Feeder.	Since Feeder is TSS hence not required.

ACTION	TAKEN REPORT
PROTECTION A	UDIT DATE:-18.01.2024
NAME OF SUBSTATION:	220/132KV SUBSTATION JAUNPUR Action Taken
Audit Points	Action Taken
. No Records of previous audit report is available	
<ul> <li>2. All protection relays are healthy except-</li> <li>2. All protection relays are healthy except-</li> <li>(i) Differential protection of 160MVA ICT I is active in REF protection relay (MICOM P642D) because Differential realy (MICOM P643) is faulty.</li> <li>(ii) Keypad issue found in O/C E/F relay of 160MVA T/F III</li> </ul>	Keypad now working
	Rectification of this issue is still pending at transmission end
<ol> <li>110V DC system 2 is slightly -ve earthed</li> <li>DTPC Carrier communication is availabe but not in working in</li> </ol>	DTPC installed but wiring incomplete.
	Protification of this issue is still pending at transmission end
220KV Machhlishahar Line. 5. PLCC Carrier communication is defective in 220KV Azamgarh Line	pending at transmission end
6. SEL is not available	Rectification of this issue is still pending at transmission end
<ul> <li>7. SPS is not available</li> <li>8. 220KV BUS PT is not available at the Substation Due to which HV</li> <li>OC/EF RELAY featured at non directional</li> </ul>	Rectification of this issue is still pending at transmission end
in Annual routine testing of protective relays is done timely .	
10. OTI & WTI protection of both the Transformers are healthy	

ACTION	TAKEN REPORT
PROTECTION	UDIT DATE:-16.01.2024
NAME OF SUBSTATION:	220/132KV SUBSTATION GHAZIPUR Action Taken
Audit Points	
. No Records of previous audit report is available	
<ul> <li>2. All protection relays are healthy except-</li> <li>(i) Differentional protection relay(SIPROTEC 7UT61) of 160MVA T/F-2 is faulty since 18.10.2023</li> <li>(ii)HV O/C E/F relay (SIPROTEC 7SJ8031) of 160MVA T/F/- 2 is faulty since 26.01.2023</li> </ul>	Tender to replace the panel is finalised at transmission end but due to load constraint it will be changed in winter
	Healthy
3. 110V DC system 1 is -ve earthed	New battery charger is required to rectify this issue. Proposal for new charger
4. 110V DC system 2 is +ve earthed	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.	-
z SPS pot available	
9. Appual 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 - <u>http://www.ipgcl-ppcl.gov.in/</u>



# 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) Ind 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





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/2024/२।[

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 14<sup>th</sup> 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

( सत्येंद्र कु. दोतान / Satyendra Kr. Dotan) Director Tel: 011-26732045 Email: <u>cenpccea@gmail.com</u>

**Distribution** List

- 1. SE/EE from RPCs of concerned subgroup of NPC (Protection)
- 2. DGM (SO), NLDC/DGM (NERLDC)/DGM (WRLDC)/Mgr.(ERLDC)

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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**

Page 1 of 26

## 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 14<sup>th</sup> 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.

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- 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:

 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 15<sup>th</sup> of the subsequent month and the same shall be reviewed in the ensuing PCSC meeting of RPCs.
  - a) The Dependability Index defined as

$$\mathbf{D} = \frac{Nc}{(N_C + N_F)}$$

Where,  $N_{\rm C}$  is the number of correct operations at internal power system faults and  $N_{\rm F}$  is the number of failures to operate at internal power system faults.

b) The Security Index defined as

$$S = \frac{Nc}{(Nc + Nu)}$$

Where,  $N_{\rm C}$  is the number of correct operations at internal power system faults and is the number of unwanted operations.

c) The Reliability Index defined as

$$R = \frac{Nc}{(Nc + NI)}$$

Where,  $N_{\rm C}$  is the number of correct operations at internal power system faults and  $N_{\rm I}$  is the number of incorrect operations and is the sum of  $N_{\rm F}$  and  $N_{\rm U}$ 

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.

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## <u>Revised Final Standard Operating Procedure (SOP) to address the Grid Disturbances</u> (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.

Sr. No.	Grid Event <sup>4</sup> (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

TABLE 8 : REPORT SUBMISSION TIMELINE

\*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 maloperation 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/maloperation, 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 30<sup>th</sup> and the 31<sup>st</sup> 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. <u>Criteria for choosing substations for third party protection audit:</u>

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. <u>Protection audit Procedure:</u>

- 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

Applicat			Voltage Level (in						Intimation request for charging of new	Acknowledment sent	Request for test charging and trial run	Provisional Approval for Test Charging/Trial			Request for Trial Operation Certificate(		
EID n Month	Name of element	Owner	kV)	Bay No	Bay Type	Substation	State	Approved in SCM/Statury Body Reman	rk element (formatA)	by NRLDC (Format II)	(Format8)	operation(Format IV)	Actual date & time of	charging	Format C)	Trial Run Operation Cert Trial Run/Operation	ficate Detail
	400kV Main Bay 406 of 400kV Sikar_2(PSTL)-Neemrana(PG)-2 at								04 Sep 2024 19:54, 29	05 Sep 2024 15:07, 02	01 Oct 2024 09:14, 30 Sep 2024 12:50, 27 Sep	Oct 2024 09:01, 30 Sep	Late		Cute	Period	Certificate
119210 Aust - 20	24 Sikar 2(PSTL) 220kV Main Bay 209 of 400/220 kV	PSTL.	400kV	405	5 Main Bay	Sikar 20PSTL)	RAJASTHAN	30-09-2019 - 10:05. 6. 4.3.5. 11-12	Aux 2024 16:07	Sep 2024 16:30	2024 21:03	2024 10:09	01-Oct-2024	17:52			
119228 Sep - 20	220kV Main Bay 209 of 400/220 kV 500 MVA ICT-3 at Bahadutgarh(PG) 400kV Tie Bay 405 of 125MVAR BR		220kV	205	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 02-10-2024 - 18:40	<u> </u>
119196 Aug - 20	1 and Neemrana(PG)-2 at Sikar 2(PSTL)	PSTL	400kV	40	5 Tie Bay	Sikar 2095TL)	RAJASTHAN	30-09-2019 - 10:00. 6. 4.3.5. 11	29 Aut 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			
	40564 To Bay 408 of 1500 Miles of	r.									30 Sen 2024 13:02:29	01 0rt 2024 17-13 30					
119193 Aug - 20	24 2 and Line (Future) at Sikar_2(PSTL) 400kV Main Bay 404 of 125MVAR 24 8R-1 at Sikar_2(PSTL)	PSTL	400kV	408		Sikar_2(PSTL)	RAJASTHAN	30-09-2019 - 10:00, 6, 4.3.5, 11	29 Aug 2024 16:06	04 Sep 2024 15:45	Sep 2024 23:57 30 Sep 2024 13:03, 29 Sep 2024 08:49	Sep 2024 10:15 01 Oct 2024 16:02, 30 Sep 2024 10:12	02-Oct-2024	21:15			
		PSTL	400kV	404		Sikar_2(PSTL)	RAJASTHAN	30-09-2019 - 10:00, 6, 4.3.5, 11	29 Aug 2024 16:07				02-Oct-2024	22:19			-
119193 Aug - 20	24 ICT-2 at Sikar_2(PSTL) 765kV Main Bay 718 of 1500 MVA 24 ICT-2 at Sikar_2(PSTL)	PSTL	400kV 765kV		Main Bay	Sikar_2(PSTL) Sikar_2(PSTL)	RAJASTHAN	30-09-2019 - 10:00, 6, 4.3.5, 11 30-09-2019 - 10:00, 6, 4.3.5, 11	29 Aug 2024 16:06 29 Aug 2024 16:06	04 Sep 2024 15:45	30 Sep 2024 13:02, 29 Sep 2024 23:57 30 Sep 2024 13:02, 29	Sep 2024 10:15 01 Oct 2024 17:13, 30 Sep 2024 10:15	05-Oct-2024 05-Oct-2024	01:05			
	265kV Main Bay 715 of 1500MVA		70384		, main usy	ana_20 210	- Contraction	30-09-2019 - 10:00, 0, 4:3-3, 11	19748 2024 2030	043020242245	01 Oct 2024 18:35, 30 Sen 2024 13:02, 30 Ser	Sep 2024 10:15 03 Oct 2024 14:58, 01 Oct 2024 15:55, 30 Sep	0.0001004	01.31			
119192 Aut - 20	24 ICT-1 at Sikar 2(PSTL) 765kV Main Bay 703 of 765kV Sikar_2(PSTL)-Aligath(PG)-1 at	PSTL	765kV	715	5 Main Bay	Sikar 2095TL)	RAJASTHAN	30-09-2019 - 10:00. 6. 4.3.5. 11	29 Aut 2024 16:06	04 Sep 2024 15:20	2024 00:05	2024 10:17	05-Dct-2024	02:15			
119190 Aug - 20		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	
	765kV Main Bay 703R of 3 x 110MVAR Switchable Convertable LINE_REACTOR of 765kV																
119190 Aure - 20	Sikar_2(PSTL)-Aligath(PG)-1 at Sikar_21(PSTL)	PASTL	765kV	2038	Main Bay	Sikar 2095TL)	RAIASTHAN	30-09-2019 - 10:00. 6. 4.3.6. 13	31 Aug 2024 05:28, 28	05 Sep 2024 10:00, 28	02 Oct 2024 21:24, 27 Sen 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	
111110 100 - 20	400kV Main Bay 409 of Line	PALIC	70384	70.4R	(PERFECTION OF CONTRACT.		No. Common	17-08-2018 - 11:00, 14th and 15th	Aug 2024 08:46 17 Sep 2024 14:38, 13 Sep 2024 11:03, 12 Sep 2024 18:57, 11 Sep	17 Sep 2024 15:21, 16 Sep 2024 17:07, 13 Sep	30 1014 13.30		0.0001004	2107		001010101111	
	ACME_Deoghar_Ftgh1(PG) - Fatehgarh Pooling (FBTL) bay and	ACME_Deo				ACME_Deoghar_Ftgh1(		meeting of Northern region constituents meetings, 7 and 8 and				Oct 2024 15:59, 20 Sep					
119230 Sep - 20	4 Bus 2 at ACME_Deoghar_Ftgh1(PG)	ghar_SPPL	400kV	405	Main Bay	PG)	RAJASTHAN	Serial No 8 and 9, 14/21 and 14/33	2024 17:23 17 Sep 2024 14:38, 13 Sep 2024 11:03, 12 Sep 2024 18:57, 11 Sep	2024 11:34 17 Sep 2024 15:21, 16	2024 11:35	2024 11:02	05-Oct-2024	23:54			
	400kV Main Bay 407 of 400 kV Line ACME_Deoghar_Ftgh1(PG) - Fatehearh Pooline(FBTL) and 400kV					Fatehgarh		17-08-2018 - 11:00, 14th and 15th meeting of Northern region constituents meetings, 7 and 8 and	Sep 2024 11:03, 12 Sep 2024 18:57, 11 Sep	Sep 2024 17:07, 13 Sep 2024 10:42, 11 Sep 2024 16:21, 11 Sep	04 Oct 2024 17:09, 03	04 Oct 2024 19:44, 04 Oct 2024 15:59, 20 Sep					
119230 Sep - 202	24 Bus-1 at Fatehearh Pooline(FBTL)	ahar SPPL	400kV	403	7 Main Bay	PoolinalfBTL)	RAJASTHAN	Serial No 8 and 9. 14/21 and 14/33	2024 13:42, 10 Sep 2024 17:23 17 Sep 2024 14:38, 13	2024 16:21, 11 Sep 2024 11:34 17 Sep 2024 15:21, 16 Sep 2024 17:07, 13 Sep	2024 11:35	2024 11:02	05-Oct-2024	23:54			
	400kV Tie Bay 408 of Line ACME_Deoghar_Ftgh1(PG) -							17-08-2018 - 11:00, 14th and 15th meeting of Northern region				04 Oct 2024 19:44, 04					
119230 Sep - 202	Fatehgarh Pooling (FBTL) bay and BUS-1 at ACME_Deoghar_Ftgh1(PG	ACME_Deo	400kV	408	B Tie Bay	ACME_Deoghar_Ftgh1( PG)	RAJASTHAN	constituents meetings, 7 and 8 and Serial No 8 and 9, 14/21 and 14/33	2024 13:42, 10 Sep 2024 17:23	2024 16:21, 11 Sep 2024 11:34	Oct 2024 17:34, 18 Sep 2024 11:35	Oct 2024 15:59, 20 Sep 2024 11:02 03 Oct 2024 14:57, 01	05-Oct-2024	00:17			
	765kV Main Bay 709 of 330 MVAR					11 AMAT					Sep 2024 13:03, 29 Sep	Oct 2024 16:10, 30 Sep					
119194 Aust - 20	24 BR-1 at Sikar 2(PSTL) 400kV Main Bay 401 of 1500MVA	PSTL	/65kV	70	r Infain Bay	Sikar 2095TLI	INUASTHAN	30-09-2019 - 10:00. 6. 4.3.5. 11	29 Aut 2024 16:07	04 Sep 2024 15:31	2024 23:57 01 Oct 2024 18:35, 30 Sep 2024 18:02 30.5~	2024 10:13 03 Oct 2024 14:58, 01 Oct 2024 15:55, 30 Sep	06-Oct-2024	01:40			
119192 Aug - 20	400kV Man bay 401 0 1500MVA 24 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 17 Sep 2024 14:38, 13	04 Sep 2024 15:20 17 Sep 2024 15:21, 16	2024 00:05	2024 10:17	05-Oct-2024	03:07			-
	400kV Main Bay 404 of Power							17-08-2018 - 11:00, 14th and 15th meeting of Northern region	See 2024 11-02 12 See	Sep 2024 17:07, 13 Sep 2024 10:42, 11 Sep 2024 16:21, 11 Sep	04 Oct 2024 17:09, 03	04 Oct 2024 19:44, 04					
119230 Sep - 20	Transformer-4 and Bus-1 at ACME Deophar Fteh1(PG)	ACME_Deo shar SPPL	400kV	404	4 Main Bay	ACME_Deoghar_Ftgh1( PG)	RAJASTHAN	meeting of Northern region constituents meetings, 7 and 8 and Serial No 8 and 9. 14/21 and 14/33	2024 13:42, 10 Sep 2024 17:23	2024 16:21, 11 Sep 2024 11:34	2024 11:35	Oct 2024 15:59, 20 Sep 2024 11:02	06-Oct-2024	16:45			
119195 Aut - 20	765kV Main Bay 712 of 330MVAR 24 BR-2 at Sikar 2(PSTL)	PSTL	765kV	713	2 Main Bay	Sikar 2095TLI	RAJASTHAN	30-09-2019 - 10:00. 6. 4.3.5. 11	29 Aut 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			
	24 BR-2 at Sikar 2/PSTLI 765kV Main Bay 706R of 3 x 110MVAR Switchable Convertable LINE, REACTOR of 765kV																
119191 Aut - 20	LINE_FEACTOR of 765kV Sikar_2(PSTL)-Aligath(PG)-2 at 24 Sikar_2(PSTL)	PASTL	765kV	705R	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	1
	765kV Main Bay 719R of Line																
	Reactor Bay of 240MVAr Switchabi Line Reactor of765 KV Bhadla-II -	•						30-09-2019 - 15:30, 6, 4.3 (x) , (xiii),	14 Sep 2024 10:00, 13	18 Sep 2024 16:58, 13							
119235 Sep - 20	58 SIKAR-II line ckt-1 at Bhadia 2 (PG) 220kV Main Bay 213 of 220 kV at Bikaner 2 ?Prerak Line and (Prerak	PSTL	765kV	719R	Main Bay	Bhadla 2 (PG)	RAJASTHAN	5	Sep 2024 01:31	Sep 2024 11:30	21 Sep 2024 19:17	26 Sep 2024 12:58	08-Oct-2024	23:24			-
	Bikaner_2 /Pretak Line and (Pretak line is currently charged through Bi 203 at Bikaner_2 and same shall be shifted to 213 Bay at Bikaner_2) at	r i									01.041.3034.15.05.03	07 04 2024 26:38 04					
119218 Aure - 20	shifted to 213 Bay at Bikaner_2) at Bikaner_2 (PBTSL)	PBTSL	220kV	215	3 Main Bay	Bikaner_2 (PBTSL)	RAIASTHAN	25-08-2022 - 10:00, 1, 3.1,3.2, 4	31 Aut 2024 13:26			07 Oct 2024 16:38, 04 Oct 2024 08:56, 30 Sep 2024 10:11	09-Oct-2024	20:10			
								17-08-2018 - 11:00, 14th and 15th	17 Sep 2024 14:38, 13 Sep 2024 11:03, 12 Sep	17 Sep 2024 15:21, 16 Sep 2024 17:07, 13 Sep 2024 10:42, 11 Sep							
	400kV Main Bay 406 of Power Transformer-2 and Bus-2 at	ACME_Deo				ACME_Deoghar_Ftgh1(		meeting of Northern region constituents meetings, 7 and 8 and	2024 13:42, 10 Sep			Oct 2024 15:59, 20 Sep					
119230 Sep - 203	ACME Deophar Ftah1(PG) 400kV Tie Bay 412T (435) of 400 kV	ehar SPPL	400kV	405	5 Main Bav	PGI	RAJASTHAN	Serial No 8 and 9. 14/21 and 14/33	2024 17:23	2024 11:34	2024 11:35	2024 11:02	09-Oct-2024	23:00			
	Jaisalmer 2 - Corneight parks Pvt. Ltd transmission line and Future Tr							22-06-2018 - 10:00, 40th SCM, C,	04 Oct 2024 12:04, 30	04 Oct 2024 15:10, 03	09 Oct 2024 14:17, 06	10 Oct 2024 09:31, 07					
119251 Sep - 20.	M bay at Jaisalmer(RS) 400kV Main Bay 412A (434) of 400 by Juicebox 2, Corposible parks Bet	RRVPNL	400kV	412T (435)	The Bay	Jasalmer(IS)	RAJASTHAN	114	Sep 2024 18:22	Oct 2024 09:58	Oct 2024 12:55	Oct 2024 16:59	10-Oct-2024	21:16			
119251 Sep - 202	kV Jaisalmer 2 - Corneight parks Put Ltd transmission line at Jaisalmer(IS)	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			
	N Jaisalmer(RS) 400kV Main Bay 401 of 400 kV S/C line from 400 kV GSS Jaisalmer 2 a	Corneight Parks Pvt.				Corneight Parks Pvt.					08 Oct 2024 18:17, 07	10 Oct 2024 20:06, 07					
119252 Oct - 202	400kV Tie Bay 402 of 400 kV S/C	Limited	400kV	403	Main Bay	Limited	RAJASTHAN	21-08-2023 - 10:00, 1, 1, 2	01 Oct 2024 17:27	03 Oct 2024 16:55	Oct 2024 10:47	Oct 2024 16:59	11-Oct-2024	00:40			
	line from 400 kV GSS Jaisalmer 2 and 400/33 kV , 200 MVA, ICT-1 at	Corneight Parks Pvt.				Corneight Parks Pvt.		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				
119252 001-202	14 Conneight Parks Pvt. Limited 400kV Main Bay 403 of 400/33 kV 200 MVA, ICT-1 at Conneight Parks	Corneight Parks Pvt.	40087	40.	2 THE DAY	Corneight Parks Pvt.	INURSITIAN	21-08-2025 - 10:00. 1. 1. 2	0108202417:27	03 001 2024 16:55	08 Oct 2024 10:47	10 Oct 2024 20:06, 07	11-00-2024	01:00			
119252 Oct - 202	14 Pvt. Limited 400kV Main Bay 406 of 400/33 kV	Corneight	400kV	403	3 Main Bay	Limited	RAJASTHAN	21-08-2023 - 10:00, 1, 1, 2	01 Oct 2024 17:27	03 Oct 2024 16:55	Oct 2024 10:47	Oct 2024 16:59	11-Oct-2024	01:09			
119252 Oct - 202	200 MVA, ICT-2 at Corneight Parks Pvt. Limited	Parks Pvt. Limited	400kV	405	5 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			
	400kV Tie Bay 405 of 400/33 kV , 200 MVA, ICT-2 and FUTURE BAY at					Corneight Parks Pvt.					08 Oct 2024 18:17, 07	10 Oct 2024 20:06, 07					
119252 Oct - 202	200 MVA, ICT-2 and FUTURE BAY at 14 Comeinth Parks Pxt. Limited 400kV Main Bay 403 of 400kV Sikar_2(PSTL)-Neemrana(PG)-1 at	Limited	400kV	40	5 Tie Bay	Limited	RAJASTHAN	21-08-2023 - 10:00. 1. 1. 2	01 Oct 2024 17:27 04 Sep 2024 19:54, 29	03 Oct 2024 16:55 05 Sep 2024 15:06, 03	Oct 2024 10:47 01 Oct 2024 09:14, 30 5cm 2024 12:40, 27.5cm	Oct 2024 16:59 01 Oct 2024 12:09, 01 Oct 2024 09:00, 30 Sep	11-Oct-2024	01:19			
119199 Aug - 20	24 Sikar_2(PSTL) 400kV Tie Bay 402 of 1500MVA ICT	PSTL	400kV	403	Main Bay	Sikar_2(PSTL)	RAJASTHAN	30-09-2019 - 10:00, 6, 4.3.5, 11-12	Aug 2024 16:07	Sep 2024 10:29		2024 10:08 03 Oct 2024 14:58, 01	11-Oct-2024	23:57			
119192 Aust - 20	1 and Neemrana(PG)-1 at Sikar 2(PSTL)	PSTL	400kV	402	2 Tie Bay	Sikar 20PSTL)	RAJASTHAN	30-09-2019 - 10:00. 6. 4.3.5. 11	29 Aut 2024 16:06	04 Sep 2024 15:20	Sep 2024 13:02, 30 Sep 2024 00:05	Oct 2024 15:55, 30 Sep 2024 10:17	12-Oct-2024	00:08			
	765kV Main Bay 722R of 240 MVA																1
110326	Switchable Convertible LINE_REACTOR of 765 KV Bhadia-II- SIKAR-II line ckt-2 at Bhadia_2 (PG)	as n	TEELM	1110	Main R	Readly 3 (NO	BA INCTINGT	30-09-2019 - 15:30, 6, 4.3 (x) , (xiii) ,	14 Sep 2024 10:00, 13	18 Sep 2024 16:57, 13	21 Sep 2024 19:17	26 5	16-Oct-2024	00.67			1
**#230  Sep - 20;		PSIL	765kV	1228	Main Bay	Bhadla_2 (PG)	ANALY INVITED	5 17-08-2018 - 11:00, 14th and 15th	Sep 2024 01:31 17 Sep 2024 14:38, 13 Sep 2024 11:03. 12 Sep	17 Sep 2024 11:30 Sep 2024 15:21, 16 Sep 2024 17:07 13 free			10-001-2024	00.57		1	
	400kV Main Bay 401 of Power Transformer-3 and Bus-1 at	ACME_Deo				ACME_Deoghar_Ftgh1(		meeting of Northern region constituents meetings, 7 and 8 and	Sep 2024 11:03, 12 Sep 2024 18:57, 11 Sep 2024 13:42, 10 Sep	2024 10:42, 11 Sep 2024 16:21, 11 Sep	04 Oct 2024 17:09, 03 Oct 2024 17:34, 18 See	04 Oct 2024 19:44, 04 Oct 2024 15:59, 20 Sep					1
119230 Sep - 20	AGME Depehar Fteh1(PG)	shar SPPL	400kV	403	Main Bay	PG)	RAJASTHAN	Serial No 8 and 9, 14/21 and 14/33	2024 17:23 17 Sep 2024 14:38, 13	2024 11:34 17 Sep 2024 15:21, 16	2024 11:35	2024 11:02	19-Oct-2024	19-22		1	<u> </u>
	400kV Tie Bay 402 of Power Transformer -3 and Power Transformer -1 at							17-08-2018 - 11:00, 14th and 15th meeting of Northern region constituents meetings, 7 and 8 and	Sep 2024 11:03, 12 Sep 2024 18:57, 11 Sep 2024 13:42, 10 Sep	Sep 2024 17:07, 13 Sep 2024 10:42, 11 Sep 2024 16:21, 11 Sep	04 Oct 2024 17:09, 03	04 Oct 2024 19:44, 04 Oct 2024 15:59, 20 Sep					
	14 ACME_Deoghar_Ftgh1(PG)	ACME_Deo ghar_SPPL	400kV	403	2 Tie Bay	ACME_Deoghar_Ftgh1( PG)	RAJASTHAN	constituents meetings, 7 and 8 and Serial No 8 and 9, 14/21 and 14/33 20-01-2016 - 00:00, 37, 1.2.2.2 (a).	2024 13:42, 10 Sep 2024 17:23	2024 16:21, 11 Sep 2024 11:34		Oct 2024 15:59, 20 Sep 2024 11:02 31 Oct 2023 20:58, 31	19-Oct-2024	19:50			-
118883 Aug - 20	765kV Main Bay 812 of GT-1 at Ghatampur_TPS(UP) 220kV Main Bay 201 of 220 kV	NUPPL	765kV	811	2 Main Bay	Ghatampur_TPS(UP)	UTTAR PRADESH	20-01-2016 - 00:00, \$7, 1.2.2.2 (a), 4	02 Sep 2023 15:59	07 Sep 2023 11:20	31 Oct 2023 20:51, 27 Oct 2023 16:33		21-Oct-2024	01-51			-
119216 Aut - 20	Bikaner_2 - ACME Line at Bikaner_3 24 (PBTSL)	PBTSL	220kV		Main Bay	Bikaner 2 (PBTSL)	RAJASTHAN	25-08-2022 - 10:00 1 3 1 4	31 Aut 2024 13:30	02 Sep 2024 14:28	23 Oct 2024 01:37		25-0:1-2024	21.56			1
	765kV Tie Bay 714 of 1500MVA ICT 1 and Bhadla_3 Line-1 (Future) at	-		20		and a statistic					01 Oct 2024 18-35 30	03 Oct 2024 14:58, 01 Oct 2024 15:55, 30 Sep					
119192 Aug - 20	24 Sikar_2(PSTL) 765kV Tie Bay 717 of 1500 MVA IC	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	2024 00:05	2024 10:17	29-Oct-2024	23:40		1	-
119193 Aut - 20	2 and Bhadla_3 Line-2 (Future) at Sikar 2/PSTL1 765kV Main Bay 710 of 765kV	PSTL	765kV	713	7 Tie Bay	Sikar 2095TL)	RAJASTHAN	30-09-2019 - 10:00. 6. 4.3.5. 11	29 Aut 2024 16:06	04 Sep 2024 15:45	30 Sep 2024 13:02, 29 Sep 2024 23:57	01 Oct 2024 17:13, 30 Seo 2024 10:15	30-Oct-2024	00:13			
	Sikar_2(PSTL)-Bhadla_2(PG)-1 at	as n	765kV		Main Bay	Sikar_2(PSTL)	BA INCTINGT	20.00.2010.10.00.0	05 Sep 2024 14:17, 29 Aug 2024 16:07	09 Sep 2024 17:16, 02	29 Oct 2024 09:33, 24	29 Oct 2024 14:56, 25 Oct 2024 15:03	30-Oct-2024	01:03			1
	24 Sikar_2(PSTL) 765kV Main Bay 710R of 330MVAR LR of 765kV Sikar_2(PSTL)-	PSIL	- 45KV	710	e tellam baly	adm_dysfL)	ANALY INVITED	30-09-2019 - 10:00, 6, 4.3.5, 11	Aug 2024 16:07 05 Sep 2024 14:17, 29	Sep 2024 16:24 09 Sep 2024 17:16, 02	Oct 2024 08:38 29 Oct 2024 09:33, 24	29 Oct 2024 15:03	ar-001-2024	0103		1	
119197 Aut - 20	24 Bhadla 2(PG)-1 at Sikar 2(PSTL) 765kV Main Bay 707 of 765kV	PSTL	765kV	710R	Main Bay	Sikar 209STL)	RAJASTHAN	30-09-2019 - 10:00. 6. 4.3.5. 11	Aug 2024 16:07	Sep 2024 16:24	Oct 2024 08:38	Oct 2024 15:03	30-Oct-2024	01:03			
119198 Aut - 20	Silvar 2/25TI L/Bhadla 2/2012 at	PSTL.	765kV	703	Main Bay	Sikar 209STL)	RAJASTHAN	30-09-2019 - 10:00 6 4 3 5 11	05 Sep 2024 14:18, 29 Aux 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	30-0ct-2024	01.56			
	24 Sikar 2(PSTL) 765kV Tie Bay 708 of 765kV Sikar_2(PSTL)-Bhadla_2(PG)-2 and								05 Sep 2024 14:18, 29	09 Sep 2024 17:16, 02	29 Oct 2024 09:33, 24	29 Oct 2024 14:56, 25					
119198 Aug - 20	24 330MVAR BR-2 at Sikar_2(PSTL) 765kV Tie Bay 711 of 765kV	PSTL	765kV	708	S Tie Bay	Sikar_2(PSTL)	RAJASTHAN	30-09-2019 - 10:00, 6, 4.3.5, 11	Aug 2024 16:07	Sep 2024 16:24	Oct 2024 08:38	Oct 2024 15:04	30-Oct-2024	02:10			<u> </u>
119197 Aut - 20	Sikar_2(PSTL)-8hadla_2(PG)-1 and 350MVA8.8R-2 at Sikar_2(PSTL) 330MVA8.8R-2 at Sikar_2(PSTL)	PSTL.	765kV	711	Tie Bay	Sikar 209STL)	RAJASTHAN	30-09-2019 - 10:00.6.4.3.5.11	05 Sep 2024 14:17, 29 Aut 2024 16:07	09 Sep 2024 17:16, 02 Sep 2024 16:24	29 Oct 2024 09:33, 24 Oct 2024 08:38 20 Oct 2024 08:38	29 Oct 2024 14:56, 25 Oct 2024 15:03 29 Oct 2024 15:00, 25	30-0ct-2024	02-18			-
119266 Oct - 202	220kV Main Bay 213 of 220 kV METL Ckt-2 at Bahadurserh(PG) 220kV Main Bay 212 of 220 kV	D POWERGRI	220kV			Bahadureach(PG)	HABYANA	28-09-2022 - 10:30, 9, 4.1.4 (ii \& iii). 11 28-09-2022 - 10:30, 9, 4.1.4 (ii \&	17 Oct 2024 17:48	21 Oct 2024 14:52			30-0:1-2024	19.49			
119266 Oct - 202	220kV Main Bay 212 of 220 kV METL Ckt-1 at Bahadurgarh(PG) 220kV Main Bay 210 of 220 kV	D	220kV	215	2 Main Bay	Bahadurgarh(PG)	HARYANA	ii), 11	17 Oct 2024 17:48	21 Oct 2024 14:52		29 Oct 2024 10:32 Oct 2024 15:00, 25 Oct 2024 10:32	30-Oct-2024	19:57			
		POWERGRI	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			
119266 Oct - 202	14 Bahadurgarh(PG)																
119266 Oct - 202	Bahadurgarh(PG)     220kV Main Bay 211 of 220 kV     Kharkhoda pocket B Ckt-2 at     Bahadurearh(PG)	POWERGRI	220kV		Main Bay	Bahadureach(PG)		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	20:05			

#### BUS Report from 01-10-2024 to 31-10-2024

	Apple	atio sth Name of el			Voltage Level (in	Bue No.	fee Tens	for Chang	Cault Local	Normal Current Consulty	Substitution		Approved in SCM/Statury Body		Intimation request for charging of new element (Ecrmet#)	Acknowledment sent	charging and trial run		Actual date & time of c		Request for Trial Operation Certificate( Econat ()	Trial Run Operation Cert	
CASE D				Owner		aut No	BUE TYDE	aut scheme	Page Level	Normal Current Casacity	Susciston	5189	SCHUSTELEV BODY	Nemark .	Costa	Ov NALDC IF CARLST III	Inte	constant on a re-	Actual data & time of c	Dee	Format Ci	Trial Run/Operation	Certificate No
													17-08-2018 - 11:00										
													14th and 19th meeting		17 Sep 2024 14:38, 13	17 Sep 2034 15-21 16							
													of Northern region		Sep 2024 11:03, 12 Sep								
													constituents meetings, 7		2024 18:57, 11 Sep 2024		04 Oct 2024 17:09:03	04 Oct 2024 19:44, 04					
		400kV Main	Rus Main Rus 2 at	ACME Deo							ACME_Deoghar_Ftgh1[		and 8 and Secial No 8		12:42.10 Sep 2024	16:21.11 Sep 2024	Oct 2024 17:34, 18 Sep	Oct 2024 15:59, 20 Sep					
11192	30 Sec - 2	1024 ACME Dep	har FarhälPGI	ettar SPPL	400kV	Main Rus 2	Main Rus	One & Half Breaker	SOKA	2000A		RAIASTHAN	and 9, 14/21 and 14/23		17:23	11:34	2024 11:25	2024 11:02	05-Oct-2024	22:54			
													17-08-2018 - 11:00										
													14th and 15th meeting		17 Sep 2024 14:38, 13	17 Sep 2024 15:21, 16							
													of Northern region		Sep 2024 11:03, 12 Sep	Sep 2024 17:07, 13 Sep							
													constituents meetings, 7		2024 18:57, 11 Sep 2024								
				ACM5_Deo							ACME_Deoghar_Ftgh1[		and 8 and Serial No 8				Oct 2024 17:34, 18 Sep						
11192	30 Sec - 2	1024 ACME Deo	har FørhälPGI	ahar SPPL	400kV	Main Bus 1	Main Rus	One & Half Breaker	528A	2000A	PG	RAIASTHAN	and 9. 14/21 and 14/23		17:23	11:34	2024 11:25	2024 11:02	06-Oct-2024	00:17			
													11-09-2018 - 11:00,										
													15th meeting of										
													Northern region		17 Sep 2024 14:30, 13			06 Oct 2024 13:16, 05					
				ACM5_Deo							ACME_Deoghar_Ftgh1[		constituents meetings,		Sep 2024 18:36, 13 Sep			Oct 2024 19:28, 04 Oct					
11192	42 Sec-1	1024 ACME Dep	har FathälPGI	ehar SPPL	23kV	Rus-2 (Panel-2)	Main Rus	Single Rus.	25kA	2150A	89	RAIASTHAN	8.9/33		2024 15:20	2024 16:54	2024 18:58	2224 16:59	06-Oct-2024	17:20			-
													11-09-2018 - 11:00,										
													15th meeting of										
													Northern region		17 Sep 2024 14:30, 13								
				ACME_Deo							ACME_Deoghar_Ftgh1[		constituents meetings,		Sep 2024 18:36, 13 Sep								
11192	40 Sec - 2	1024 ACME Dep	bar PathälPGi	ethar SPPL	23kV	Run-1 (Panel-1)	Main Rus	Single Rus.	25kA	2150A	89	RAIASTHAN	8.9/33		2024 15:20	2024 16:54	2024 18:58	2224 16:59	06-Oct-2024	17:22			
			Rus 2 at Rikaner 2										25-08-2022 - 10:00.1.				04 Oct 2024 15:05, 02 Oct 2024 15:19, 29 Sep	07 Oct 2024 16:38, 04					
		220kV Main 2024 (PBTSL)	eus a at examer_2	20110	22044		Main Rus	Double Main & Transfer		40004	Bikaner 2 (PBTSL)	PANACTUAN	25-08-2022 - 10:00, 1, 3.1.3.2.4		31 Aur 2024 13:26	02 Sep 2024 54-28	Oct 2024 15:19, 29 Sep 2024 08:28		09-Oct-2024	20:09			1
11192	ati nat-	awe ( realTS.)		PMD4	2ABN		Main aus	Louge Main & Transfer	SERA for Life.	READA	weater 2 (HSTS)	KAIASIPAN	4142.4		1 41 Aug 2004 12:26	UK MD 2028 54:28	A124 08:28	A144 10711	109-00-2024	ACM .		1	+

#### BUS REACTOR Report from 01-10-2024 to 31-10-2024

S.N		Applicati	lo .									Approved in					Acknowledment sent	Request for test charging and trial run				Request for Trial Operation Certificate(		
•	CASEID	n Month	h Name of element	Owner	Voltare Level	MVAR Capacity	Substation	Make	Configuration	Secial No	State	SCM/Statury Body	Remark	<b>Bus Reactor Details</b>	OLD MVAR Capacity	element (FormatA)	by NRLDC (Format 8)	(Format®)	operation(Format IV)	Actual date &	time of charging	Format C)	Idal Run Operation Cert	tificate Details
																							Trial Run/Operation	
																Date	Date	Date	Date	Date	Time	Date	Period	Certificate No.
			400kV, 125MVAR Bus Reactor 1 at									30-09-2019 - 10:00, 6,						30 Sep 2024 12:03, 29						
1	1119195	Aug - 202	M Sikar_2(PSTL)	PSTL	400kV	125MNAR	Skar_2(PSTL)	CG POWER	2-Phase	BHR11458/1	RAJASTHAN	4.3.5, 11		New		29 Aug 2024 16:07	02 Sep 2024 17:25	Sep 2024 08:49	Sep 2024 10:12	00-Oct-2024	21.57			
																		01 Oct 2024 19:10, 30						
			765kV, 3x110 MVAR Bus Reactor 1							Gepe170-190-L0710, Gope170-		30-09-2019 - 10:00, 6,						Sep 2024 13:03, 29 Sep						
2	1119194	Aug - 202	14 at Skar_2(PSTL)	PSTL	769AV	2x110 MVAR	Skar_2(PSTL)	GE 20	2x1-Phase	170-L0709, Gepo170-120-L0769	RAJASTHAN	4.3.5, 11				29 Aug 2024 16:07	04 Sep 2024 15:31	2024 23:57	2024 10:13	06-Oct-2024	01:40			
			765kV, 2x110MVAR Bus Reactor 2							Gopo170-90-L0701, Gopo170-160-		30-09-2019 - 10:00, 6,						30 Sep 2024 12:02, 29						
- 2	1119195	Aug - 202	H at Skar 2(PSTL)	PSTL	269.V	2x110MVAR	Skar 2(PSTL)	GE	2x1-Phase	L0708, Goop 170-150-L0707	RAJASTHAN	4.3.5.11		New		29 Aut 2024 16:07	04 Sep 2024 15:27	Sep 2024 22:57	Sep 2024 10:14	07-Oct-2024	17:37			

BUS SECTIONALIZER Report from 01-10-2024 to 31-10-2024

		Applicatio			Voltage Level (in	Associated Transmission	Associated Transmission								Provisional Approval for Test Charging/Trial			Request for Trial Operation Certificate(		
5.0	o CASE ID	n Month	Name of element	Owner	kV)	Element1	Element2	Substation	State	Approved in SCM/Statury Body	Remark	element (FormatA)	by NRLDC (Format II)	(format8)	operation(Format IV)	Actual date &	time of charging	Format C)	Trial Run Operation	n Certificate Details
																			Trial Run/Operation	
												Date	Date	Date	Date	Date	Time	Date	Period	Certificate No.
			220kV Bus Sectionalizer Bay 211 of											04 Oct 2024 15:05, 02	07 Oct 2024 16:38, 04					
			220 KV Bus-1 and 220 KV Bus-3 at											Oct 2024 15:19, 29 Sep	Oct 2024 08:56, 30 Sep					
	1 111921	8 Aug - 2024	Bikaner 2 (PBTSL)	PBTSL	220kV	220 KV Bus-3	220 KV Bus-1	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	2024 08:28	2024 10:11	09-Oct-2024	20:09			

GE	NERATI	NG UN	IT Report from 01-1	0-2024	to 31-10-202	14																						
	-	Applicatio	Name of element			Installed		Max Continuous Gen	Mis Candinuaus Des Casailte	Auxiliary Concentration	Make	berial No.	Conferration	10de	SCM/CEA/CTU/MAPC	Record a	brömation request for charging of new	Advantedment sent	Request fortest charging and trial run	Providenal Approval for Test Charging/Trial	Adual date &		Request for Stal Operation Certificate( Format C)	Trid Sun Danutio		COD Date	CMD/CR0/MD	Baard of Directors
	CARENO	1000	And a second	Caller	Contain Drift.	Canada	Brin Casarry	Caracter	Canada	ALL PLOT DE LA CONSTRUCT			Contraction		Internet Internet	17 Mart	Date	Date .	Date	Date	Date	Time		Trial Run/Operation Period	Certificate No.	Date	Date	Date
1	1119186	ui - 2036	IND MAR, 777 MAA 21 M MARA BHEL UNIT No 1 M 2008/DMW THOC 1777 ADD/RUA/11.00 10	140C	2507	680 MW	777 Mich.	en enw	361 550	6705	845	1007ALERO	1-Mag		22-06-2018 - 15-00, 40, 20.1. 76		05 Aug 2020 16 16 08	07 Aug 2020 17 (0), 05 Aug 2020 12 (0)	13 Aug 2024 17 (8, 12 Aug 2034 13 31, 12 Aug 2024 10 37, 08 Aug 2024 10 07	13 Aug 2024 17 48, 13 Aug 2034 15 47, 13 Aug 2026 13 88, 13 Aug 2020 29 43	28-041-2024	a.o.						

#### LINE REACTOR Report from 01-10-2024 to 31-10-2024

																	intimation request for			Provisional Approval			Request for Trial		
	- I.	estate			Voltare Level													Acknowledment sent	Request for test	Provisional Approval			Requect for final Operation Certificate(		
N													Approved in				charging of new	Acknowledment sett	charging and that run	for fest charging/frail					
CASE	12 n	Month	Name of element	Owner	6a.kV0	MVAR Capacity	Line Name	Substation	Make	Configuration	Secial No	State	SCM/Statury Body	Remark	Line Reactor Details	OLD MYAR Casacity	element (FormatA)	by NRIDC (Format II)	(Formatik)	operation/Format IV)	Actual date & t	time of charaina	Format Cl	Trial Run Operation Cert	Efficantie Overtaillis
																								Trial Run/Operation	
	_																Date	Date	D ate	Date	Date	Time	Cuse	Period	Certificate No.
			3 x 110MVAR Switchable																						
			Convertable LINE_REACTOR of				765kV				Gopo172-20-L0759,														
	Au		765kV Skar_2(PSTL) Algarh(PG) 1				Sikar_2(PSTL)-				Gopo172-40-L0761,		30-09-2019 - 10:00, 6,					05 Sep 2024 10:00, 28						05-10-2024 - 23:15 to	
1 1115	1190 20		at Sikar 2095Tu	PASTL	765kV	2 x 110MVAR	Aligath/PG-1	Sikar 2(PSTL)	GETADUTD	Aut-Phase	Gooot72-90-L0766	RALASTHAN	4.26.13		New		28 Aug 2024 08:46	Aug 2024 15:58	Sep 2024 19:58	0/2 2024 16:04	05-Oct-2024	22:07		06-10-2024 - 22:15	
			3 x 110MVAR Switchable																						
			Convertable LINE_REACTOR of				765kV				Gopo172-50-10762,														
	Au	4 - F	765kV Skar_2(PSIL) Algarh(PG) 2				Sikar_2(PSTL)-				Gopo172-70-L0764,		30-09-2019 - 10:00, 6,				21 Aug 2024 05:33,	05 Sep 2024 10:00, 28	02 Oct 2024 21:24, 27	04 Oct 2024 17:13, 01				07-10-2024 - 19:25 to	
3 4440	101 20	12.4	er Gawr SileChil	D& CTI	76.664	3 v 11/MAULO	AlexiNEC.3	Giner 200CT11	GETEOITO	2v1.2hasa	Gnov473.48.18358	DALECTURN/	436 13		Name		27 Aux 2034 22-20	Aux 2034 10-02	Gan 3934 10-08	0+ 2024 16:02	10.0+3034	+9-73		20101-1010-101	
			240 MVAR Switchable Convertable				765 XV Bhadla-II																		
			LINE_REACTOR of 765 KV Bhadla-II -				- SKAR-Elline ckt						30-09-2019 - 15:30, 6,				14 Sep 2024 10:00, 13								
3 1119	225 50	10 - 2024	SIKAR-II line ckt-1 at Bhadla 2 (PG)	PSTL	765kV	240 MVAR	1	Rhadia 2 IPGI	GE	2x1-Phase	6090170/2/2/10	RALASTHAN	4.2 (c). (all), 5		New		Sep 2024 01:31	Sep 2026 11:30	21 Sep 2026 19:17	26 Sep 2024 12:58	08-Oct-2024	22:24			
			240 MVAR Switchable Convertable				765 XV Bhadla-II																		
			LINE_REACTOR of 765 KV Bhadla-II -				- SKAR-Elline ckt						30-09-2019 - 15:30, 6,				14 Sep 2024 10:00, 13								
4 1119	226 50		SIKAR-II line ckt-2 at Bhadla 2 (PG)	PSTL	765kV	240 MVAR	2	Rhadia 2 IPGI	GE	2x1-Phase	G0P0170/5/6/4	RALASTHAN	4.200.040.5		New		Sep 2024 01:31	Sep 2026 11:30	21 Sep 2026 19:17	26 Sep 2024 12:58	16-Oct-2024	00:57			
			50 Non-Switchable Non-																						
			Convertable LINE_REACTOR of 400																25 Oct 2024 14:34, 24						
				POWERGR			600 KV Kanpur-						29-06-2022 - 11:55,							Oct 2024 08:47, 23				29-10-2024 - 11:00 to	
5 1115	268 00		Kanpur/PGI	0	400kV	50	AgralPGI Ckt-1	Kangur(PG)	TAR	à-Phase	PM0200232	UTTAR PRADESH	\$2 NRPC A 22.2 & 4		Replacement	50	22 Oct 2024 12:27	22 Oct 2024 09:49	Oct 2024 12:55	0/2 2024 14:36	29-Oct-2024	22.59		20-10-2024 - 11:00	
			2x110MVAR Switchable																						
			Convertable LINE REACTOR of				265kV																		
	A4	a -	265kV Skar 2(PSTL) Rhada 2(PG)-				Sikar 2195TU-						30-09-2019 - 10:00. 6.				05 Sep 2024 14:17, 29	09 Sep 2024 17:16.02	29 Oct 2024 09:33, 24	29 0/2 2024 14:56 25					
6 1119	197 20	124	1 at Sikar 2(PSTL)	PSTL	765kV	2x110MVAR	Shadia 2(PG)-1	Silar 2(PSTL)	GE	2x1-Phase	111	RAIASTHAN	4.3.5.11				Aug 2024 16:07	Sep 2024 16:24	Oct 2024 OR:28	Oct 2024 15:03	30-Oct-2024	05:03			
			2x120MVAR Switchable																						
			Convertable LINE REACTOR of				265kV																		
	A4	a -	265kV Skar 2(PSTL) Rhada 2(PG)-				Sikar_2(PSTL)-						30-09-2019 - 10:00. 6.				05 Sep 2024 14:18, 29	09 Sep 2024 17:16.02	29 Oct 2024 09:33, 24	29 0/2 2024 14:56 25					
2 1110	100 20	12.4	2 at Sikar 2(PSTL)	PCT)	76544	2v110AFVBR	Rhadia 2(PG)-2	Silver 2005D1	66	2x1-Phase	111	RAIASTHAN	4 3 5 11		New		Aux 2024 16:07	Sep 2024 16:24	017 2024 09:28	0/7 2024 15:04	30-Oct-2024	20:45			

#### New AC Lines Report from 01-10-2024 to 31-10-2024

_																					
													Intimation request for		Request for test	Provisional Approval			Request for Trial		
		Applicatio			Voltage Level (in						Approved in		charging of new	Acknowledment sent	charging and trial run	for Test Charging/Trial			Operation Certificate(		
S.No	CASE ID	n Month	Name of element	Owner	kV1	Circuit No	Line Length	Conductor Type	Tower Configuration	Sate	SCM/Statury Body	Remark	element (FormatA)	by NRLDC (format II)	(Format8)	operation/Format IV)	Actual date & time of c	harging	Format Cl	<b>Trial Run Operation Cert</b>	oficate Details
																				Trial Run/Operation	
													Date	Date	Date	Date	Date	Time	Date	Period	Certificate No.
															01 Oct 2024 09:14, 30	01 Oct 2024 12:45, 01					
			400kV Sikar_2(PSTL)-Neemrana(PG)-								30-09-2019 - 10:05, 6,		O4 Sep 2024 29:54, 29	05 Sep 2024 15:07, 02	Sep 2024 12:50, 27 Sep	Oct 2024 09:01, 30 Sep					
1	1119210	Aug - 202	1 2	PSTL	400kV	2	133.5 kM	Twin HTLS	Double	RAJASTHAN to RAJASTHAN	4.3.5, 11-12		Aug 2024 16:07	Sep 2024 16:30	2024 21:03	2024 10:09	01-Oct-2024	17:31			
											30-09-2019 - 10:00, 6,		31 Aug 2024 05:28, 28	05 Sep 2024 10:00, 28	02 Oct 2024 21:24, 27	04 Oct 2024 17:13, 01				05-10-2024 - 23:15 to	
2	1119290	Aug - 202	765kV Sikar_2(PSTL)-Algarh(PG)-1	PASTL	765kV	1	256.937 kM	AL59 Zebra	Double	RAJASTHAN to UTTAR PRADESH	4.3.6, 13		Aug 2024 08:46	Aug 2024 15:58	Sep 2024 19:58	Oct 2024 15:04	05-Oct-2024	21:41		06-10-2024 - 23:15	
											17-08-2018 - 11:00,										
											14th and 15th meeting		17 Sep 2024 14:38, 13								
											of Northern region		Sep 2024 11:03, 12 Sep	Sep 2024 17:07, 13 Sep							
				ACME_De							constituents meetings,		2024 18:57, 11 Sep	2024 10:42, 11 Sep	04 Oct 2024 17:09, 03	04 Oct 2024 29:44, 04					
			400kV Fatehgarh Pooling(F0TL)-	oghar_SPP							7 and 8 and Serial No 8			2024 16:21, 11 Sep		Oct 2024 15:59, 20 Sep					
3	1119230	Sep - 2024	ACME_Deoghar_Ftgh1(PG)-1	L	400kV	1	16.03	ALS9 Moose	Single	RAJASTHAN to RAJASTHAN	and 9, 14/21 and 14/33			2024 11:34	2024 11:35		05-Oct-2024	23:54			
											30-09-2019 - 10:00, 6,				02 Oct 2024 21:24, 27	04 Oct 2024 17:13, 01				07-10-2024 - 19:25 to	
- 4	1119193	Aug - 202	765kV Sikar_2(PSTL)-Algarh(PG)-2	PASTL	765kV	2	256.937 kM	AL59 Zebra	Double	RAJASTHAN to UTTAR PRADESH	4.3.6, 13		Aug 2024 23:28	Aug 2024 15:57	Sep 2024 19:58	Oct 2024 15:03	07-Oct-2024	19:23		08-10-2024 - 19:25	
				Corneight																	
			400kV Jaisalmer(RS)-Corneight	Parks Pvt.						1	21-08-2023 - 10:00, 1,				08 Oct 2024 18:17, 07	10 Oct 2024 20:06, 07					
5	111925	0ct - 2024	Parks Put. Limited -1	Limited	400kV	1	15.208	Twin Moose	Double	RAJASTHAN to RAJASTHAN	1, 2		01 Oct 2024 17:27	03 Oct 2024 16:55	Oct 2024 10:47		10-Oct-2024	23:39			
																01 Oct 2024 12:09, 01					
			400kV Sikar_2(PSTL)-Neemrana(PG)-	1						1	30-09-2019 - 10:00, 6,		04 Sep 2024 29:54, 29	05 Sep 2024 15:06, 03	Sep 2024 12:50, 27 Sep	Oct 2024 09:00, 30 Sep					
6	1119191	Aug - 202	1 1	PSTL	400kV	1	133.5 kM	Twin HTLS	Double	RAJASTHAN to RAJASTHAN	4.3.5.11-12		Aue 2024 16:07	Sep 2024 10:29	2024 21:03	2024 10:08	11-Oct-2024	23:57			

	144			Capacity to be		Testender							107 Kinkage								intimation request in sharping of new			Previsional Approval for Test Durging/Trial					COD Declared by	
-	n - 16-	-	Real Vanne	-	Walkson I area!	franks of Real	Town of Mr.	Reador No.	Sala VERIAL BA	#7 to	and the second s	PT MAX Balan	Burlauf March 194	Increasing Trans	Incast on Males	Total Marcell Incoments	Includes & Bullet	Assess / Assess	Reporting Balls	Research	Date	Date of the local division of the local divi		Outer		ins of durates		a listed	S	Althou Banks
	-	- Annual	ion Susial rable Drowy																		Dete	344	Date:	Onto: 01 Oct 2024 26:47, 67	Date	2.ex	Date	Gate		
		Invier	One Private																		21 See 2024 10 18 24	27 See 2024 15:47.25	Over 2024 12:47, 30	Que 2024 15-41-05						
2229	SK Sex-2	IN LINE	(TESSA)	13.4.956	1164	13.4 MW	SOLAR PV PARK	t 2	* N		E Denish	11.2 Mills	11 KI 2 M KI	Central Invoter	LINGSON .		11855	TRUES			Sex 2026 23.16		Sex 2024 20:55	Que 2024 12 M	01-0+12024	2147				
		Samit	ion Susial nable Energy One Private																			27 See 2024 15-47-25	07 Dei 2026 17 27,05	09 Cet 2024 26:67, 67						
			City Private				COLUMN THE PARTY						11 (11 (11 (11 (11 (11 (11 (11 (11 (11								21 bey 2024 12-34, 34	1 37 Sep 2024 16-47, 26	Gen 2024 12-03, 50	Over 2024 10-41, 05						
_		Damit	ion Susial nable Energy																					01 Oct 2024 26:57, 67						
		Service.	One Private																		21 Sep 2024 12-18, 24	27 Sep 2024 15:47, 25	Oct 2024 12:57, 30	Ovi 2024 15-41, 05						
24258	55 Sex - 2	224 Umited	CTRACEAU Inter Traceau Internet	154.956	1184	15.6.305	STAR PV PAR		0 <u>M</u>		1 Denish	13.2.455	11/0/245/0	Central Invoter	SUNDAD/K		11855	78515			Sex 2026 23.15	See 2224 09-26	Sex 2024 22:55	0xx 2024 13:34 01 0x 2024 16:47, 07	15:0x12024	21.67				
			ion Susializable Energy One Private																			27 See 2024 15 47 - 25	07 Det 2026 13 27,05	04 Get 3024 36.67, 67						
3426	at tex 2	124 Limited	TENAN	114 MW	3384	15.4 MW	SOLID PUTPING		2 34	34	a Denish	13.2 Mills	11 61/245 67	Central Inveter	SUNDADW.		11000	18555			5re 2026 23.16	See 3024 09:26	See 2624 20.55	Ovt 202611-M	09-0++2024	21.67				
		Samit	ion Susial nable Energy																				07 Dei 2026 17 27,05	04 Ce+ 3024 36-57, 67						
		- Invice	One Private									12 1 440									21 Sep 2024 12-38, 24	27 Sep 2024 15-47, 25	Ore 2024 12:57, 32	0++202415-41,05						
4.44	110 Care - 70	114	101101	11.1.1.04	1184	11.4 544	1/1 18 B/ 81.18		* **		7 Realish	13 3 8448	*****	Pasted Invation	110/10/10	-	11444	10110			Fam. 30745 33.5.8	1 17 fee 2020 15 22 16	Real VILLA VILLA	Aug 1014 11.84	N8-7-1-5774	11.41				
																					17 Mg 2021 18 20, 13	See 2024 16-58, 13	One 19714 12-08-04	Con 1014 1 1 00 00						
			reghanizelar Pesare																											
121	53 Sex - 2	221 Private	Embel	253866	1164	253MW	Seler.	21023/Panel 2	21		1 702.4	12.15515	TRUE POINT	Central Invoter	Long		1.011.003	ACMI Denature 1995			Sex 2026 11:08		On 2024 19-29	Over 2026 16-58	11-0++2024	1745				
			Jale: Pear Plant MPC																			09 Det 2024 17/08, 09 0+# 2024 36/68, 09								
	10.0	111 1111	Saar Paar Part Kirk	12.004	1104	177 6864	Darlar.				a hubba	111.040.0	The off day	Control Investory	Caluer Tech		110000	ALC: NO. OF CO.			NO. 004 1034 12 13	04 3334 34.48	10.04 3031 30.14	14 (34 1034 1144	10.000	0043				
-																														
			Salar Pearst NIPC																			Circl 2024 26-58, 09								
125	54 0++-2	224 Limited		12.5566	1184	131.685/8	Salar.		1 11	1	1 Techla	12.1.455	11/54	Central Invoter	Cellus Tech		118500	NTK REARIES			04-Det 2024 22-22	0+# 2024 36.68 09 0++ 2024 12/08.09	32 Crit 2026 30-14	14 Oct 2024 12 M	11.0+1.2024	0043				
		and and	Jalar Pears Plant MPC																			Qre 2024 36-58, 09								
2221	54 04-2	224 Limited		121506	1104	131.6854	Salar.		+ 14		8 Techiles	12.1 Mill	111125-011	Central Involution	Celos Tech		1189/08	NTC ROUTER			04 One 2024 22-22		10 CH 2026 10-14	14 Oct 2024 12 Mil	11-0++2024	0253				
																					17 Sep 2034 14-37, 18	17 Sep 2024 15 22, 16	GE Cut 2026 19-81, 07	04 Ce+ 3024 31-57, 68						
																					Sep 2026 1836, 13	Sep 2024 26-58, 13 Sep 2024 26-58, 13	Over 2024 25-09, 06 Over 2024 09-24, 05	Ovi 2024 17-09, 07						
-	22 Jan 2	ICMIE 124 Private	imphar Jolar Pearer	11110.04	1104	10 March 10	Darlar.	2 (CD Panel 2		1		12.1345	TRUE POST OF	Central Inveter	town a		1.016.000	ACMI Denature 1995			Sep 2026 1430, 13 Sep 2026 1108	Sep 2024 16-67, 13 Sep 2024 12-65	Cen 2024 09-24, 05 Cen 2024 19-29	Over 2024 10-28, Oc	15-0++2024	1246				
and all	all serve	COL PLANE		451000	1.00	CHER	Sec.	Charlenge -		0	10 HILA	A. 19613	unemans.	CARRENT PORT	MORTHAN .		1,08,050	AND ADDRESS AND			VI Im WHAT I	LITTLE MALLETT M	OF CHARGE STORE THE REST. OF T	24 Oct 2024 21-07-08	al salt doct	108				
		ACM12	enghar Solar Pewer					1.072.0 +++ 1				12 2340					1.000.000	ACASE Company 1980			Grg 2026 14:80, 13	Sep 2024 26:67, 13	Ore 2024 09-24, 05	Over 2024 10-18, 06	10.000					
-4-02	11 Car - 1	VU Brinde	Tarbal	1112.04	1184	to water	Balan	1.071 Accel 1	- u			11 BARLS	THEFT	Paste of Lensies	C.mm.mm		17.04 MAG	Arbit Panakas 1881				17 fee 2020 15:22.16			11.0.1.0.0.0	1100				
																						See 2024 16-58, 13		Ovt 2026 17 09.07						
		ACMER	reghar Solar Pears																											
	113 fam - 3	114 0	Testhed	18.9	1184	10 Yearlan	Reading	1-1797-Based-1			+ ++	12.0.000	TTUITS AND AN	Cashed Invation	1		9 / Mil Million	Arbeit Passabare 1980			1- 30% 11.0#		Aug 2014 18-28	Aug 2014 14:48	14.0	14.65				
																					17 Sep 2024 14-37, 18	175ey20241532,16 See20241658,13	GE Der 2026 19-31, 07	08 Ce+ 3024 15-57, 68						
		10000	mather Jolar Pesare																		Grap 20200 18.84, 13		Con 2024 20-04, 06	Cert 2014 17-06, 07						
125	53 Sec - 2	224 Private		253	1104	253	Salar.	3-1033 Panel 3	12	1	2 N.CON	12.1 Mill	116/340.65.97	Central Involution	Lowne		1.011.003	ACMI Denature 1995							18-0++2024	1749				
																					17 Sep 2024 14-27, 18	17 Sep 2024 15-22, 16	06 Cei 2024 19-81, 07	04 Ce+ 3024 31-57, 68						
			imphar Solar Pearer																		Gry 2026 1836, 13	Sep 2024 26-58, 13 Sep 2024 26-58, 13	Over 2024 20-08, 06	0++201413-06,02						
		ICMIE 124 Private	engnar sosar Power	11110.04	1104	10 March 10	Darlar.	1 (C2 Panel 3			e aurra	13 1940	TRUE POST OF	Central Inveter	town a		1.016.000	ADMI Desetur 1975			Sep 2026 1430, 13 Sep 2026 1108	Sep 2024 16-67, 13 Sep 2024 12-65	Cen 2024 09-24, 05 Cen 2024 19-29	Over 2024 10-28, Oc	10.000	14.00				
	_													and the second second																
	1	1				1															Gray 2026 18-86, 13	Sep 2024 26-58, 13	Ove 2024 20-08, 06	Owe 2024 17:00,07						
		ACM12	eighar Solar Pewer					1000 Percent 1				12 2340	The state of the second	Cambral Incodes			1.016 Mag	ADM Deather 1975			Sep 2026 14:80, 13 Sep 2026 11:08	5ep 2024 36-67, 13 5ep 2024 32-67	Orin 2024 09-24, 05 Orin 2024 19-29	0++ 2024 10-18, 04 0++ 2024 16-58	18-0++2024					
1020	an ser 2	AND TONE		ANDRE	1182	Canet	Mar.	a maximum dia			and street.	A 19715	THE REAL P.	Lene at trader	Lange Ba	-	A ACIE MOLE	auto amatar 1975							atomood	1330				
	1	1				1																								
	1		inghar Solar Pears			1															Sep 2026 14:80, 13	Sep 2024 26-57, 13	Ore 2024 09-24, 65	Ove 2024 10-18, 06						
	119 Fam. 7	112 8-1-44	Testad	1118.04	1184	10 Walter	Rates	1.0788.Band-1			* ****	11 844-5	TRUTTALEN	Passion I formation	t		3 File March	Arbeit Passakov 1880			0	Aug 2024 12.01	Aug 1014 18-18	Aug 101010.00	18.0	11.44				
	1	1				1															17 Mg 2004 16:00, 13	17 Sep 2024 16-33, 18 Sep 2024 26-58, 13	Out 2014 20-08 20-08	Ten 1014 13 00 01						
		ACM12	mather Jalar Pears																											
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# rhps.phem@sjvn.nic.in

From: Sent: To:	Power House Electrical MaintenanceDEPARTMENT <rhps.phem@sjvn.nic.in> 09 September 2024 10:30 rohit sharma; nrldcso2; rtamcjammu; nrldcoutage; nrldcso; sunil kumar1; Santosh Kumar</rhps.phem@sjvn.nic.in>
Cc:	prakashchand197; Sanjeev Kumar; VAIBHAV VIVEK, 20717 Dy Manager, PHD, RHPS; 20406 Sanjeet Singh Parmar
Subject: Attachments:	Re: Regarding failed carrier protection at PLCC panel of Jhakri- Rampur ckt-2. 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@gridindia.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

-0/0-

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" cprakashchand197@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** 

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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

# 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" cprakashchand197@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

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

<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 0000 content co

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

-0/0-

AGM(Elect.)/HOD), Power House Electrical Maintenance Deptt. (PHEM) **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

-0/0-

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@sivn.nic.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

-0/0-

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 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

-0/0-

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,

**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,

**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.

**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>

<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,

<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

<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.

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>

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.

-0/0-

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 DDDD Content Conten

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 \_\_\_\_\_

**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

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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 <<u>rhps.phem@sjvn.nic.in</u>> Sent: Monday, August 01, 2022 12:39 To: Narendra Kumar Meena {नरेंद्र कुमार मीणा} <<u>nkmeena@powergrid.in</u>> Cc: SUNIL KUMAR {सुनील कुमार} <<u>sunil.kumar1@powergrid.in</u>>; Rohit Sharma {रोहित शर्मा} <<u>rohit.sharma@powergrid.in</u>>; prakashchand197 <<u>prakashchand197@gmail.com</u>>; 20711 Arun Kumar <<u>arun\_kr@sjvn.nic.in</u>>; Vinay.painuly <<u>vinay.painuly@gmail.com</u>>; Sanjeev Kumar <<u>sanjeev\_kr@sjvn.nic.in</u>>; Er. Pintu Das DGM Rampur HPS SJVN Ltd <<u>pintu.das@sjvn.nic.in</u>> **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 {नरेंद्र कुमार मीणा}" <<u>nkmeena@powergrid.in</u>> To: "Power House Electrical MaintenanceDEPARTMENT" <<u>rhps.phem@sjvn.nic.in</u>> Cc: "SUNIL KUMAR {सुनील कुमार}" <<u>sunil.kumar1@powergrid.in</u>>, "Rohit Sharma {रोहित शर्मा}" <<u>rohit.sharma@powergrid.in</u>>, "prakashchand197" <<u>prakashchand197@gmail.com</u>>, "arun\_kr" <<u>arun\_kr@sjvn.nic.in</u>>, "Vinay.painuly" <<u>vinay.painuly@gmail.com</u>>, "sanjeev\_kr" <<u>sanjeev\_kr@sjvn.nic.in</u>> 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} <<u>sunil.kumar1@powergrid.in</u>> wrote:

++

Thanks

With Regards

Sunil Kumar

ULDC

----- Forwarded message ------

From: Power House Electrical MaintenanceDEPARTMENT <<u>rhps.phem@sjvn.nic.in</u>> 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} <<u>rohit.sharma@powergrid.in</u>>,SUNIL KUMAR {सुनील कुमार} <<u>sunil.kumar1@powergrid.in</u>>

Cc: prakashchand197 <<u>prakashchand197@gmail.com</u>>,20711 Arun Kumar <<u>arun\_kr@sjvn.nic.in</u>>,Vinay painuly <<u>Vinay.painuly@gmail.com</u>>,Sanjeev Kumar <<u>sanjeev\_kr@sjvn.nic.in</u>>

**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" <<u>rhps.phem@sjvn.nic.in</u>> To: "Rohit Sharma रोहित शर्म" <<u>rohit.sharma@powergrid.in</u>>, "sunil kumar1" <<u>sunil.kumar1@powergridindia.com</u>>

Cc: "prakashchand197" < <u>prakashchand197@gmail.com</u> >, "20711 Arun Kumar" < <u>arun kr@sjvn.nic.in</u> >, "Vinay painuly" < <u>Vinay.painuly@gmail.com</u> >, "Sanjeev Kumar" < <u>sanjeev kr@sjvn.nic.in</u> >, "sunil kumar1" < <u>sunil.kumar1@powergridindia.com</u> >, "20711 Arun Kumar" < <u>arun kr@sjvn.nic.in</u> >,"Vinay painuly" < <u>Vinay.painuly@gmail.com</u> > 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
 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

दावात्यागः यह ईमेल पावरग्रिड के दावात्याग नियम व शर्तों द्वारा शासित है जिसे <u>http://apps.powergrid.in/Disclaimer.htm</u> पर देखा जा सकता है।
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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 पावरग्रिङ के दावात्याग नियम व शर्तों द्वारा शासित है जिसे <u>http://apps.powergrid.in/Disclaimer.htm</u> पर देखा जा सकता है। Disclaimer: This e-mail is governed by the Disclaimer Terms & Conditions of POWERGRID which may be viewed at <u>http://apps.powergrid.in/Disclaimer.htm</u>
-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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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

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.

-0/0-

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!!!

>

>

- > >
- > -0/0-

> 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></rhps.phem@sjvn.nic.in>	
> To: "Rohit Sharma □□□□ □□□□" <rohit.sharma@powergrid.in>, "Rohit Sharma □□□□ □□□</rohit.sharma@powergrid.in>	"
<pre><rohitsharma@powergrid.in></rohitsharma@powergrid.in></pre>	
> Cc: prakashchand197@gmail.com, "20711 Arun Kumar" <arun kr@sjvn.nic.in="">, "vinay painuly"</arun>	
<pre><vinay.painuly@gmail.com>, "Er. Pintu Das DGM Rampur HPS SJVN Ltd" <pintu.das@sjvn.nic.in>,</pintu.das@sjvn.nic.in></vinay.painuly@gmail.com></pre>	
"20406 Sanjeet Singh Parmar" <ss parmar@sjvn.nic.in="">, "Sanjeev Kumar" <sanjeev kr@sjvn.nic.in<="" th=""><th>&gt;</th></sanjeev></ss>	>
> 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!!!	
> Centie reminder z	
>	
>	
From: "Power House Electrical MaintenanceDEPARTMENT" <rhps.phem@sjvn.nic.in></rhps.phem@sjvn.nic.in>	
<ul> <li>To: "Rohit Sharma </li> <li>Content of the state of t</li></ul>	"
<pre><rohitsharma@powergrid.in></rohitsharma@powergrid.in></pre>	
Cc: prakashchand197@gmail.com, "20711 Arun Kumar" <arun kr@sjvn.nic.in="">, "vinay painuly"</arun>	
vinay.painuly@gmail.com>, "Sanjeev Kumar" <sanjeev kr@sjvn.nic.in="">, "Er. Pintu Das DGM Ramj</sanjeev>	r
HPS SJVN Ltd" <pre>conducted as@sivn.nic.in&gt;, "20406 Sanjeet Singh Parmar" <ss parmar@sivn.nic.in=""></ss></pre>	
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 prote	otion
for both channels 1&2 of Nj-RH-2 is continuously failed since 22/09/2022 at 22:47hrs (Detail of relay	
has been attached herewith).	eveni
> In view of the above, you are requested to inform us what action is taken at your end.	
> 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></rhps.phem@sjvn.nic.in>	
> To: nkmeena@powergrid.in	
> Cc: "sunil kumar1" <sunil.kumar1@powergrid.in>, "rohit sharma" <rohit.sharma@powergrid.in>,</rohit.sharma@powergrid.in></sunil.kumar1@powergrid.in>	
prakashchand197@gmail.com, "20711 Arun Kumar" <arun kr@sjvn.nic.in="">, "vinay painuly"</arun>	
<pre><vinay.painuly@gmail.com>, "Sanjeev Kumar" <sanjeev kr@sjvn.nic.in="">, "Er. Pintu Das DGM Ramj</sanjeev></vinay.painuly@gmail.com></pre>	NU P
	Jui
HPS SJVN Ltd" <pintu.das@sjvn.nic.in> Sont: Tugodov, August 0, 2022 5:08:40 PM</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,	1 - 12
> In continuation to your trailing mail, it has further been submitted that PLCC panels in both power s	tation

> AGM(Elect.)/HOD),

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. >

>

<sup>&</sup>gt; From: pradeepk@tejasnetworks.com

<sup>&</sup>gt; To: nkmeena@powergrid.in

<sup>&</sup>gt; 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 {

<sup>&</sup>gt; Sent: 02 August 2022 11:27

```
> To: Pradeep Kumar <pradeepk@tejasnetworks.com>
> Cc: SUNIL KUMAR {
<rohit.sharma@powergrid.in>; Power House Electrical MaintenanceDEPARTMENT
<rhps.phem@sjvn.nic.in>; prakashchand197 <prakashchand197@gmail.com>; 20711 Arun Kumar
<arun kr@sivn.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 {
<rohit.sharma@powergrid.in>; prakashchand197 <prakashchand197@gmail.com>; 20711 Arun Kumar
<arun kr@siyn.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.
>
>
>
>
```

> > To: "Power House Electrical MaintenanceDEPARTMENT" <rhps.phem@sjvn.nic.in> □□□□]" <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 > > >> >> >> ++ >> >> >> >> Thanks >> >> With Regards >> >> Sunil Kumar >>

>> ULDC >> >>
>> Forwarded message >> From: Power House Electrical MaintenanceDEPARTMENT <rhps.phem@sjvn.nic.in></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 { <a <rhps.phem@sjvn.nic.in="" electrical="" house="" href="mailto:log:log:log:log:log:log:log:log:log:lo&lt;/td&gt;&lt;/tr&gt;&lt;tr&gt;&lt;td&gt;&lt;pre&gt;&gt;&gt; Cc: prakashchand197 &lt;prakashchand197@gmail.com&gt;,20711 Arun Kumar&lt;br&gt;&lt;arun_kr@sjvn.nic.in&gt;,Vinay painuly &lt;Vinay.painuly@gmail.com&gt;,Sanjeev Kumar&lt;br&gt;&lt;sanjeev_kr@sjvn.nic.in&gt;&lt;br&gt;&gt;&gt;&gt;&lt;/pre&gt;&lt;/td&gt;&lt;/tr&gt;&lt;tr&gt;&lt;td&gt;&gt;&gt;&gt; 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.&lt;/td&gt;&lt;/tr&gt;&lt;tr&gt;&lt;td&gt;&gt;&gt;&gt; It's a reminder&lt;/td&gt;&lt;/tr&gt;&lt;tr&gt;&lt;td&gt;&lt;/td&gt;&lt;/tr&gt;&lt;tr&gt;&lt;td&gt;&gt;&gt;&gt; Sir,&lt;/td&gt;&lt;/tr&gt;&lt;tr&gt;&lt;td&gt;&gt;&gt;&gt; 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&amp;2 on dated 28.07.2022 &amp; 29.07.2022( Copy of IED events attached herewith)&lt;/td&gt;&lt;/tr&gt;&lt;tr&gt;&lt;td&gt;&gt;&gt;&gt; This is for your kind information and necessary action at your end please.&lt;/td&gt;&lt;/tr&gt;&lt;tr&gt;&lt;td&gt;&gt;&gt;&gt;&lt;/td&gt;&lt;/tr&gt;&lt;tr&gt;&lt;td&gt;&gt;&gt;&gt;&lt;/td&gt;&lt;/tr&gt;&lt;tr&gt;&lt;td&gt;&gt;&gt;&gt;&lt;/td&gt;&lt;/tr&gt;&lt;tr&gt;&lt;td&gt;&gt;&gt;&gt;&lt;/td&gt;&lt;/tr&gt;&lt;tr&gt;&lt;td&gt;&gt;&gt;&gt;&lt;/td&gt;&lt;/tr&gt;&lt;tr&gt;&lt;td&gt;&gt;&gt;&gt;&lt;/td&gt;&lt;/tr&gt;&lt;tr&gt;&lt;td&gt;&gt;&gt;&gt;&lt;/td&gt;&lt;/tr&gt;&lt;tr&gt;&lt;td&gt;&gt;&gt;&gt;&lt;/td&gt;&lt;/tr&gt;&lt;tr&gt;&lt;td&gt;&gt;&gt;&gt; From: " maintenancedepartment"="" power=""> &gt;&gt;&gt; To: "Rohit Sharma □ □ □ □ □ □ □ □ □ □ <rohit.sharma@powergrid.in>, "sunil kumar1"</rohit.sharma@powergrid.in></a>
<sunil.kumar1@powergridindia.com></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"</vinay.painuly@gmail.com></arun_kr@sjvn.nic.in></prakashchand197@gmail.com>
<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></vinay.painuly@gmail.com></arun_kr@sjvn.nic.in></sunil.kumar1@powergridindia.com></sanjeev_kr@sjvn.nic.in>
>>> 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.
>>>
>>>

>>>
>>>
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>>>
>>> -0/0-
>>> 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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>>> AGM(Elect.)/HOD),
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>>> Distt. Kullu, H.P., Pin 172023
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> Power House Electrical Maintenance Deptt. (PHEM)
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Vill. Bayal, P.O. Koyal, Tehsil Nirmand/



Website: www.forumofld.in

Email: fold@grid-india.in

# Minutes of the 44<sup>th</sup> Meeting of Forum of Load Despatchers (FOLD) held on 20<sup>th</sup> March, 2023 through Online

 The 44<sup>th</sup> meeting cum workshop of the Forum of Load Despatchers (FOLD) was held on 20<sup>th</sup> 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. <u>The Agenda of the meeting are :</u>

# 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 44<sup>th</sup> 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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REFERENCES

# 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
СВ	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 41<sup>st</sup> 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.

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# 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.

# 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"

# 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)

Name	Date modified	Туре	Size
ABB.cfg	6/25/2022 1:42 PM	CFG File	3 KB
😽 ABB.dat	6/25/2022 1:42 PM	KMP - MPEG Mov	124 KB
MiCOM.CFG	6/25/2022 1:36 PM	CFG File	2 KB
MICOM.DAT	6/25/2022 1:36 PM	KMP - MPEG Mov	1,329 KB

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

- 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

# 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	МІСОМ	
	Duration	3.000 s	0C.01
	TriggerPosition	17.00 %	0C.02
	TriggerMode	Extended	0C.03
No.	Settings	SIEMENS	Value
	Settings Waveform Capture	SIEMENS	Value Save with Pickup
	Waveform Capture	SIEMENS	
0402A	Waveform Capture		Save with Pickup

FIG 2: DR PARAMETER SETTINGS EXAMPLE FOR MICOM AND SIEMENS RELAY

# 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.

# 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*.

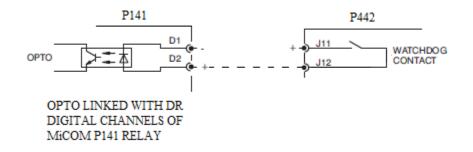
# PROTOCOL FOR MONITORING HEALTHINESS OF DR INCLUDING LOSS OF SUPPLY AND TIME SYNCHRONIZATION

#### 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 "LPHD" has а 'Logical Node' called 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	17.	72.16.0.140		
RedServIP-Add	0.0	.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:

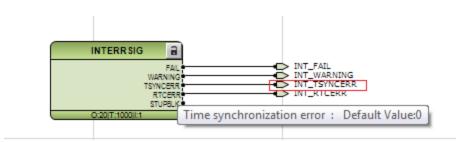


FIG 5: TIME SYNCHRONIZATION MONITORING FOR ABB MAKE RELAYS

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 AnnunciatorPanel (for audible alarm) in case of loss of time synchronization

	Information					rce					
Number	Display text	Long text	Туре	ві	F	S	С				
				ы				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.

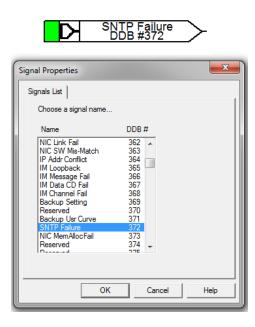


FIG 7: TIME SYNCHRONIZATION MONITORING FOR MICOM MAKE RELAYS

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

# 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.

### **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	DIGITAL CHANNELS	REMARKS
NO.		
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	DIGITAL CHANNELS	REMARKS
NO.		
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 <sup>1</sup>/<sub>2</sub> CB SCHEME

SL NO.	ANALOG AND DIGITAL CHANNELS	REMARKS
1	RØ TIE CT CURRENT	<b>TABLE 10</b> and <b>11</b> are also applicable for
2	YØ TIE CT CURRENT	400kV and above lines.
3	BØ TIE CT CURRENT	<b>TABLE 12</b> are the additional signals which
4	TIE CT NEUTRAL CURRENT	should be configured.
5	RØ TIE CB OPEN	N.B. <b>Pole Discrepancy</b> relay(PDR) is
6	RØ TIE CB CLOSE	present in the CB Marshalling box, the status of which may be received in the relay and
7	YØ TIE CB OPEN	configured as Digital Input if potential free
8	YØ TIE CB CLOSE	contact is available.
9	BØ TIE CB OPEN	contact is available.
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 VØ START         3       DIFFERENTIAL RØ TRIP         5       DIFFERENTIAL RØ TRIP         6       DIFFERENTIAL RØ TRIP         7       DIFFERENTIAL UNPESTRAINED TRIP (HIGHSET)         9       2%D HARMONIC BLOCK OPERATED         10       5%T HARMONIC BLOCK OPERATED         11       OVERFLUXING ALARM         12       OVERFLUXING TRIP         14       REF STARTALARM         15       REF TRIP         14       REF STARTALARM         15       REF TRIP         16       BUCHHOLZ ALARM         17       BUCHHOLZ ALARM         18       MAIN TANK PRV TRIP         19       OLT CPVT TRIP         18       MAIN TANK PRV TRIP         19       OLT CPVT TRIP         11       HV WTI ALARM         22       HV WTI ALARM         23       LV WTI TRIP         24       LV WTI TRIP         25       OTI ALARM         26       OTI ALARM         27       MOG ALARM         28       AIRCELL FAILURE         29       86 OPEARTED HV         30       96 OPEARTED HV         31       86 OPEAR			
4       DIFFERENTIAL RØ TRIP         5       DIFFERENTIAL YØ TRIP         6       DIFFERENTIAL BØ TRIP         7       DIFFERENTIAL UNRESTRAINED TRIP (HIGHSET)         9       2 <sup>ND</sup> HARMONIC BLOCK OPERATED         11       OVERFLUXING ALARM         12       OVERFLUXING ALARM         14       REF START/ALARM         15       REF TRIP         16       BUCHHOLZ ALARM         17       BUCHHOLZ ALARM         18       MAIN TANK PRV TRIP         19       OLC PRV TRIP         20       OSR TRIP         21       HV WTI ALARM         22       HV WTI TRIP         23       LV WTI TRIP         24       LV WTI TRIP         25       OTI ALARM         26       OTI TRIP         27       MOG ALARM         28       AIRCELL FAILURE         29       86 OPEARTED HV         30       96 OPEARTED LV         31       NV CB OPEN         34       HV CB OPEN         35       LV CB OPEN         36       LV CB CLOSE         37       HNZBCU FAULTY         38       MANZPZU FAULTY <td>2</td> <td>DIFFERENTIAL YØ START</td> <td></td>	2	DIFFERENTIAL YØ START	
5       DIFFERENTIAL YØ TRIP         6       DIFFERENTIAL BØ TRIP         7       DIFFERENTIAL UNRESTRAINED TRIP (HIGHSET)         9       2 <sup>ND</sup> HARMONIC BLOCK OPERATED         10       5 <sup>TH</sup> HARMONIC BLOCK OPERATED         11       OVERFLUXING ALARM         12       OVERFLUXING TRIP         14       REF START/ALARM         15       REF TRIP         16       BUCHHOLZ ALARM         17       BUCHHOLZ ALARM         18       MAIN TANK PRV TRIP         19       OLC PRV TRIP         20       OSR TRIP         21       HV WTI ALARM         22       HV WTI ALARM         23       LV WTI TRIP         24       LV WTI TRIP         25       OTI ALARM         26       OTI TRIP         27       MOG ALARM         28       AIRCELL FAILURE         29       86 OPEARTED HV         30       96 OPERATED LV         31       NC B OPEN         34       HV CB OLOSE         35       LV CB OPEN         36       LV CB OPEN         37       HNOR ALARMS/TRIPS         38       MAIN2/BCU FAULTY	3		
6       DIFFERENTIAL BØ TRIP         7       DIFFERENTIAL TRIP (CURVE)         8       DIFFERENTIAL UNRESTRAINED TRIP (HIGHSET)         9       2% HARMONIC BLOCK OPERATED         10       5 <sup>TH</sup> HARMONIC BLOCK OPERATED         11       OVERFLUXING ALARM         12       OVERFLUXING HIGHSET TRIP         14       REF START/ALARM         15       REF TRIP         16       BUCHHOLZ ALARM         17       BUCHHOLZ ALARM         18       MAIN TANK PRV TRIP         19       OLTC PRV TRIP         20       OSR TRIP         21       HV WTI ALARM         22       HV WTI TRIP         23       LV WTI TRIP         24       LV WTI TRIP         25       OTI ALARM         26       OTI ALARM         27       MOG ALARM         28       AIRCELL FAILURE         29       86 OPEARTED HV         31       86 OPEARTED LV         32       96 OPEARTED LV         33       HV CB OPEN         34       HV CB OPEN         35       LV CB OPEN         36       LV CB OPEN         36       LV CB OPEN <td>4</td> <td>DIFFERENTIAL RØ TRIP</td> <td></td>	4	DIFFERENTIAL RØ TRIP	
7       DIFFERENTIAL TRIP (CURVE)         8       DIFFERENTIAL UNRESTRAINED TRIP (HIGHSET)         9       2 <sup>ND</sup> HARMONIC BLOCK OPERATED         11       OVERFLUXING ALARM         12       OVERFLUXING TRIP         13       OVERFLUXING TRIP         14       REF STARTALARM         15       REF TRIP         16       BUCHHOLZ ALARM         17       BUCHHOLZ ALARM         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 ALARM         23       LV WTI TRIP         24       LV WTI TRIP         25       OTI ALARM         26       OTI TRIP         27       MOG ALARM         28       AIRCELL FAILURE         29       86 OPEARTED HV         30       96 OPEARTED LV         31       86 OPEARTED LV         32       96 OPEARTED LV         33       HV CB CLOSE         34       HV CB CLOSE         35       LV CB OPEN	5	DIFFERENTIAL YØ TRIP	
8       DIFFERENTIAL UNRESTRAINED TRIP (HIGHSET)         9       2 <sup>ND</sup> HARMONIC BLOCK OPERATED         10       5 <sup>TH</sup> HARMONIC BLOCK OPERATED         11       OVERFLUXING ALARM         12       OVERFLUXING TRIP         14       REF START/ALARM         15       REF TRIP         16       BUCHHOLZ ALARM         17       BUCHHOLZ ALARM         18       MAIN TANK PRV TRIP         19       OLTC PRV TRIP         10       OSR TRIP         21       HV WTI ALARM         22       HV WTI ALARM         23       LV WTI TRIP         24       LV WTI TRIP         25       OTI ALARM         26       OTI TRIP         27       MOG ALARM         28       AIRCELL FAILURE         29       86 OPEARTED HV         30       96 OPEARTED LV         31       86 OPEARTED LV         32       96 OPEARTED LV         33       HV CB OLOSE         34       HV CB OLOSE         35       LV CB OPEN         36       LV CB CLOSE         37       FIREFIGHTING ALARMS/TRIPS         38       MAIN2/BCU FAULTY <td>6</td> <td>DIFFERENTIAL BØ TRIP</td> <td></td>	6	DIFFERENTIAL BØ TRIP	
9       2 <sup>ND</sup> HARMONIC BLOCK OPERATED         10       5 <sup>TH</sup> HARMONIC BLOCK OPERATED         11       OVERFLUXING ALARM         12       OVERFLUXING TRIP         14       REF START/ALARM         15       REF TRIP         16       BUCHHOLZ ALARM         17       BUCHHOLZ TRIP         18       MAIN TANK PR V TRIP         19       OLTC PRV TRIP         20       OSR TRIP         21       HV WTI ALARM         22       HV WTI ALARM         23       LV WTI TRIP         24       LV WTI TRIP         25       OTI ALARM         26       OTI TRIP         27       MOG ALARM         28       AIRCELL FAILURE         29       86 OPEARTED HV         30       96 OPEARTED LV         31       86 OPEARTED LV         33       HV CB OLOSE         34       HV CB CLOSE         35       LV CB OPEN         36       LV CB CLOSE         37       FIREIGHTING ALARMS/TRIPS         38       MAIN2/BCU FAULTY         39       TIME SYNCHRONIZATION STATUS	7	DIFFERENTIAL TRIP (CURVE)	
105 <sup>TH</sup> HARMONIC BLOCK OPERATED11OVERFLUXING ALARM12OVERFLUXING TRIP13OVERFLUXING TRIP14REF START/ALARM15REF TRIP16BUCHHOLZ ALARM17BUCHHOLZ ALARM18MAIN TANK PRV TRIP19OLTC PRV TRIP20OSR TRIP21HV WTI ALARM22HV WTI ALARM23LV WTI ALARM24LV WTI TRIP25OTI ALARM26OTI TRIP27MOG ALARM28AIRCELL FAILURE2986 OPEARTED HV3096 OPERATED HV3186 OPEARTED LV33HV CB OPEN34HV CB CLOSE35LV CB OPEN36LV CB OPEN37FIREFIGHTING ALARMS/TRIPS39TIME SYNCHRONIZATION STATUS	8	DIFFERENTIAL UNRESTRAINED TRIP (HIGHSET)	
11OVERFLUXING ALARM12OVERFLUXING TRIPDEFINE STAGES13OVERFLUXING HIGHSET TRIPI14REF START/ALARMI15REF TRIPI16BUCHHOLZ ALARMI17BUCHHOLZ TRIPI18MAIN TANK PRV TRIPI19OLTC PRV TRIPI20OSR TRIPI21HV WTI ALARMI22LV WTI ALARMI23LV WTI TRIPI24LV WTI TRIPI25OTI ALARMI26OTI TRIPI27MOG ALARMI28AIRCELL FAILUREI2986 OPEARTED HVI3096 OPERATED LVI3186 OPEARTED LVI33HV CB ODENI34HV CB CLOSEI35LV CB OPENI36LV CB LOSEI37FIREFIGHTING ALARMS/TRIPSI39TIME SYNCHRONIZATION STATUSI	9	2 <sup>ND</sup> HARMONIC BLOCK OPERATED	
12OVERFLUXING TRIPDEFINE STAGES13OVERFLUXING HIGHSET TRIPI14REF START/ALARM15REF TRIP16BUCHHOLZ ALARM17BUCHHOLZ TRIP18MAIN TANK PRV TRIP19OLTC PRV TRIP20OSR TRIP21HV WTI ALARM22HV WTI TRIP23LV WTI TRIP24LV WTI TRIP25OTI ALARM26OTI TRIP27MOG ALARM28AIRCELL FAILURE2986 OPEARTED HV3096 OPEARTED LV33HV CB OPEN34HV CB CLOSE35LV CB OPEN36MAIN2/BCU FAULTY39TIME SYNCHRONIZATION STATUS	10	5 <sup>TH</sup> HARMONIC BLOCK OPERATED	
13OVERFLUXING HIGHSET TRIP14REF START/ALARM15REF TRIP16BUCHHOLZ ALARM17BUCHHOLZ ALARM18MAIN TANK PRV TRIP19OLTC PRV TRIP20OSR TRIP21HV WTI ALARM22HV WTI TRIP23LV WTI TRIP24LV WTI ALARM25OTI ALARM26OTI TRIP27MOG ALARM28AIRCELL FAILURE2986 OPEARTED HV3096 OPERATED HV3186 OPEARTED LV33HV CB OPEN34HV CB CLOSE35LV CB CLOSE36LV CB CLOSE37FIREFIGHTING ALARMS/TRIPS38MAIN2/BCU FAULTY39TIME SYNCHRONIZATION STATUS	11	OVERFLUXING ALARM	
14REF START/ALARM15REF TRIP16BUCHHOLZ ALARM17BUCHHOLZ ALARM18MAIN TANK PRV TRIP19OLTC PRV TRIP20OSR TRIP21HV WTI ALARM22HV WTI TRIP23LV WTI TRIP24LV WTI TRIP25OTI ALARM26OTI TRIP27MOG ALARM28AIRCELL FAILURE2986 OPEARTED HV3096 OPERATED HV3186 OPEARTED LV33HV CB OPEN34HV CB CLOSE35LV CB CLOSE36LV CB CLOSE37FIREFIGHTING ALARMS/TRIPS38MAIN2/BCU FAULTY39TIME SYNCHRONIZATION STATUS	12	OVERFLUXING TRIP	DEFINE STAGES
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 TRIP         24       LV WTI TRIP         25       OTI ALARM         26       OTI TRIP         27       MOG ALARM         28       AIRCELL FAILURE         29       86 OPEARTED HV         30       96 OPERATED LV         31       86 OPEARTED LV         32       96 OPEARTED LV         33       HV CB OPEN         34       HV CB CLOSE         35       LV CB CLOSE         36       LV CB CLOSE         37       FIREFIGHTING ALARMS/TRIPS         38       MAIN2/BCU FAULTY         39       TIME SYNCHRONIZATION STATUS	13	OVERFLUXING HIGHSET 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 ALARM         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         33       HV CB OPEN         34       HV CB CLOSE         35       LV CB CLOSE         36       LV CB CLOSE         37       FIREFIGHTING ALARMS/TRIPS         38       MAIN2/BCU FAULTY         39       TIME SYNCHRONIZATION STATUS	14	REF START/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         33       HV CB OPEN         34       HV CB OPEN         35       LV CB OPEN         36       LV CB CLOSE         37       FIREFIGHTING ALARMS/TRIPS         38       MAIN2/BCU FAULTY         39       TIME SYNCHRONIZATION STATUS	15	REF TRIP	
18       MAIN TANK PRV TRIP         19       OLTC PRV TRIP         20       OSR TRIP         21       HV WTI ALARM         22       HV WTI ALARM         23       LV WTI TRIP         24       LV WTI TRIP         25       OTI ALARM         26       OTI TRIP         27       MOG ALARM         28       AIRCELL FAILURE         29       86 OPEARTED HV         30       96 OPEARTED LV         31       86 OPEARTED LV         32       96 OPEARTED LV         33       HV CB OPEN         34       HV CB OPEN         35       LV CB OPEN         36       LV CB CLOSE         37       FIREFIGHTING ALARMS/TRIPS         38       MAIN2/BCU FAULTY         39       TIME SYNCHRONIZATION STATUS	16	BUCHHOLZ ALARM	
19OLTC PRV TRIP20OSR TRIP21HV WTI ALARM22HV WTI ALARM23LV WTI TRIP23LV WTI ALARM24LV WTI TRIP25OTI ALARM26OTI TRIP27MOG ALARM28AIRCELL FAILURE2986 OPEARTED HV3096 OPERATED HV3186 OPEARTED LV3296 OPEARTED LV33HV CB OPEN34HV CB CLOSE35LV CB OPEN36LV CB CLOSE37FIREFIGHTING ALARMS/TRIPS38MAIN2/BCU FAULTY39TIME SYNCHRONIZATION STATUS	17	BUCHHOLZ TRIP	
20OSR TRIP21HV WTI ALARM22HV WTI TRIP23LV WTI ALARM24LV WTI TRIP25OTI ALARM26OTI TRIP27MOG ALARM28AIRCELL FAILURE2986 OPEARTED HV3096 OPERATED HV3186 OPEARTED LV3296 OPEARTED LV33HV CB OPEN34HV CB CLOSE35LV CB OPEN36LV CB CLOSE37FIREFIGHTING ALARMS/TRIPS38MAIN2/BCU FAULTY39TIME SYNCHRONIZATION STATUS	18	MAIN TANK PRV TRIP	
21HV WTI ALARM22HV WTI TRIP23LV WTI ALARM24LV WTI TRIP25OTI ALARM26OTI TRIP27MOG ALARM28AIRCELL FAILURE2986 OPEARTED HV3096 OPERATED HV3186 OPEARTED LV3296 OPEARTED LV33HV CB OPEN34HV CB CLOSE35LV CB OPEN36LV CB CLOSE37FIREFIGHTING ALARMS/TRIPS38MAIN2/BCU FAULTY39TIME SYNCHRONIZATION STATUS	19	OLTC PRV TRIP	
22HV WTI TRIP23LV WTI ALARM24LV WTI TRIP25OTI ALARM26OTI TRIP27MOG ALARM28AIRCELL FAILURE2986 OPEARTED HV3096 OPERATED HV3186 OPEARTED LV3296 OPEARTED LV33HV CB OPEN34HV CB CLOSE35LV CB OPEN36LV CB CLOSE37FIREFIGHTING ALARMS/TRIPS38MAIN2/BCU FAULTY39TIME SYNCHRONIZATION STATUS	20	OSR TRIP	
23LV WTI ALARM24LV WTI TRIP25OTI ALARM26OTI TRIP27MOG ALARM28AIRCELL FAILURE2986 OPEARTED HV3096 OPEARTED HV3186 OPEARTED LV3296 OPEARTED LV33HV CB OPEN34HV CB CLOSE35LV CB OPEN36LV CB CLOSE37FIREFIGHTING ALARMS/TRIPS38MAIN2/BCU FAULTY39TIME SYNCHRONIZATION STATUS	21	HV WTI ALARM	
24LV WTI TRIP25OTI ALARM26OTI TRIP27MOG ALARM28AIRCELL FAILURE2986 OPEARTED HV3096 OPERATED HV3186 OPEARTED LV3296 OPEARTED LV33HV CB OPEN34HV CB CLOSE35LV CB OPEN36LV CB CLOSE37FIREFIGHTING ALARMS/TRIPS38MAIN2/BCU FAULTY39TIME SYNCHRONIZATION STATUS	22	HV WTI TRIP	
25OTI ALARM26OTI TRIP27MOG ALARM28AIRCELL FAILURE2986 OPEARTED HV3096 OPERATED HV3186 OPEARTED LV3296 OPEARTED LV33HV CB OPEN34HV CB CLOSE35LV CB OPEN36LV CB CLOSE37FIREFIGHTING ALARMS/TRIPS38MAIN2/BCU FAULTY39TIME SYNCHRONIZATION STATUS	23	LV WTI ALARM	
26OTI TRIP27MOG ALARM28AIRCELL FAILURE2986 OPEARTED HV3096 OPERATED HV3186 OPEARTED LV3296 OPEARTED LV33HV CB OPEN34HV CB CLOSE35LV CB OPEN36LV CB CLOSE37FIREFIGHTING ALARMS/TRIPS38MAIN2/BCU FAULTY39TIME SYNCHRONIZATION STATUS	24	LV WTI TRIP	
27MOG ALARM28AIRCELL FAILURE2986 OPEARTED HV3096 OPERATED HV3186 OPEARTED LV3296 OPEARTED LV33HV CB OPEN34HV CB CLOSE35LV CB OPEN36LV CB CLOSE37FIREFIGHTING ALARMS/TRIPS38MAIN2/BCU FAULTY39TIME SYNCHRONIZATION STATUS	25	OTI ALARM	
28AIRCELL FAILURE2986 OPEARTED HV3096 OPERATED HV3186 OPEARTED LV3296 OPEARTED LV33HV CB OPEN34HV CB OPEN35LV CB OPEN36LV CB OPEN37FIREFIGHTING ALARMS/TRIPS38MAIN2/BCU FAULTY39TIME SYNCHRONIZATION STATUS	26	OTI TRIP	
2986 OPEARTED HV3096 OPERATED HV3186 OPEARTED LV3296 OPEARTED LV33HV CB OPEN34HV CB OPEN35LV CB OPEN36LV CB OPEN37FIREFIGHTING ALARMS/TRIPS38MAIN2/BCU FAULTY39TIME SYNCHRONIZATION STATUS	27	MOG ALARM	
3096 OPERATED HV3186 OPEARTED LV3296 OPEARTED LV33HV CB OPEN34HV CB CLOSE35LV CB OPEN36LV CB CLOSE37FIREFIGHTING ALARMS/TRIPS38MAIN2/BCU FAULTY39TIME SYNCHRONIZATION STATUS	28	AIRCELL FAILURE	
3186 OPEARTED LV3296 OPEARTED LV33HV CB OPEN34HV CB CLOSE35LV CB OPEN36LV CB CLOSE37FIREFIGHTING ALARMS/TRIPS38MAIN2/BCU FAULTY39TIME SYNCHRONIZATION STATUS	29	86 OPEARTED HV	
3296 OPEARTED LV33HV CB OPEN34HV CB CLOSE35LV CB OPEN36LV CB CLOSE37FIREFIGHTING ALARMS/TRIPS38MAIN2/BCU FAULTY39TIME SYNCHRONIZATION STATUS	30	96 OPERATED HV	
33HV CB OPEN34HV CB CLOSE35LV CB OPEN36LV CB CLOSE37FIREFIGHTING ALARMS/TRIPS38MAIN2/BCU FAULTY39TIME SYNCHRONIZATION STATUS	31	86 OPEARTED LV	
34HV CB CLOSE35LV CB OPEN36LV CB CLOSE37FIREFIGHTING ALARMS/TRIPS38MAIN2/BCU FAULTY39TIME SYNCHRONIZATION STATUS	32	96 OPEARTED LV	
35LV CB OPEN36LV CB CLOSE37FIREFIGHTING ALARMS/TRIPS38MAIN2/BCU FAULTY39TIME SYNCHRONIZATION STATUS	33	HV CB OPEN	
36LV CB CLOSE37FIREFIGHTING ALARMS/TRIPS38MAIN2/BCU FAULTY39TIME SYNCHRONIZATION STATUS	34	HV CB CLOSE	
37       FIREFIGHTING ALARMS/TRIPS         38       MAIN2/BCU FAULTY         39       TIME SYNCHRONIZATION STATUS	35	LV CB OPEN	
38     MAIN2/BCU FAULTY       39     TIME SYNCHRONIZATION STATUS	36	LV CB CLOSE	
39 TIME SYNCHRONIZATION STATUS	37	FIREFIGHTING ALARMS/TRIPS	
	38	MAIN2/BCU FAULTY	
40 LAN NETWORK STATUS	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 <sup>ND</sup> HARMONIC BLOCK OPERATED	
10	5 <sup>TH</sup> 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 123
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
9	ZONE A LBB BACKUP/EXTERNAL TRIP	Bus 1 and Main Bus 2
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 <sup>ND</sup> HARMONIC BLOCK OPERATED	
7	5 <sup>TH</sup> 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 <sup>ST</sup> STAGE RESIDUAL OVERVOLTAGE	
16	2 <sup>ND</sup> 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,
35	RØ CB CLOSE	FIELD CB ETC. (AS PER
36	YØ CB OPEN	APPLICABLE SCHEME) AND
37	YØ CB CLOSE	AS PER (GANG OPERATED OR
38	BØ CB OPEN	SINGLE POLE CB)
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 <sup>RD</sup> HARM.)	
63	100% STATOR EARTH FAULT TRIP (3 <sup>RD</sup> 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:

- 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.

CT		
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	<ul> <li>DR downloading facility at the substation</li> <li>a. Centralized DRPC</li> <li>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</li> </ul>	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	<ul> <li>Mode of DR trigger available in the IEDs for protection functions <ul> <li>a. DR trigger "only with trip"</li> <li>b. DR trigger with both "Start and trip"</li> </ul> </li> </ul>	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%

## TABLE 27: FIELD STATUS WITH RESPECT TO TOR POINTS

### 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  $(1\emptyset$ -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.

Sl No.	Case Description	Probable Explanation	DR channels required for analyzing the event
1.	A single pole ( $R\emptyset$ 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.	<ul> <li>AR Start</li> <li>AR in progress</li> <li>AR Unsuccessful</li> <li>Protection Status of the other healthy phases</li> </ul>
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.	<ul><li>AR Block Status</li><li>CB Ready Status</li><li>Carrier Healthy</li></ul>
3.	For an 1 and <sup>1</sup> / <sub>2</sub> 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	<ul> <li>Wait for Master in Tie Bay CB</li> <li>AR Block Status</li> <li>CB Ready Status</li> </ul>
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	<ul> <li>LBB Initiation</li> <li>CB Open/Close status per pole</li> <li>Analog values of current</li> <li>86R status</li> </ul>
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	<ul> <li>Vsynch analog channel</li> </ul>

## TABLE 28: CASES OF UNSUCCESSFUL AUTO-RECLOSURE OPERATIONS

Sl			DR channels required
No.	Case Description	Probable Explanation	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	<ul> <li>Earth fault start</li> <li>Zone 3 pickup</li> <li>Zone 3 Optd</li> <li>VT Fuse Fail</li> <li>Time Synch Status</li> </ul>
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	<ul> <li>Earth fault Start</li> <li>Earth fault Operated</li> <li>Zone 3 pickup</li> <li>Time Synch Status</li> </ul>
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	<ul> <li>Zone 2, Zone 3 pickups</li> <li>Carrier Healthy</li> <li>Earth fault Start</li> <li>Time Synch Status</li> </ul>
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	<ul> <li>Carrier Healthy</li> <li>Zone 2 pickup</li> <li>Time Synch Status</li> </ul>
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.	<ul> <li>Earth Fault Start</li> <li>Earth Fault Operate</li> <li>Time Synch Status</li> </ul>
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	<ul> <li>OC and EF Start</li> <li>OC and EF Trip</li> <li>OC and EF HS Optd</li> </ul>
7.	Frequent loss of the double circuit line in spite of corridor clearance not being an issue	Lightning faults, poor tower footing earthing	<ul> <li>Analog values of current and voltages</li> <li>Mutual compensation current channel</li> <li>Time Synch Status</li> </ul>

## TABLE 29: UNDER/OVER REACHING BY DISTANCE RELAY

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.	<ul> <li>Current and voltage channels</li> <li>Pre-fault duration of 500ms</li> </ul>
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.	<ul> <li>Pre-fault duration of 500ms</li> <li>Current and voltage channels</li> <li>Carrier and DT signal channels</li> </ul>
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.	<ul> <li>Pre-fault duration of 500ms</li> <li>Overcurrent Start</li> <li>Overcurrent Trip</li> <li>Zone pickups and trips</li> <li>Time Synch Status</li> </ul>
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	<ul> <li>Pre-fault duration of 500ms</li> <li>SOTF initiation</li> <li>Current and voltage phasors</li> </ul>
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	<ul> <li>Pre-fault duration of 500ms</li> <li>SOTF initiation</li> <li>Current and voltage phasors Harmonic Table</li> </ul>
13.	Spurious DT signal which led to the tripping of CB at remote end	Issue of hard wiring in the PLCC Panel	<ul><li>DT Send</li><li>Carrier Send</li><li>Manual CB Trip</li></ul>

Sl	Case Description	Probable Explanation	DR channels required for
No.	*	*	analyzing the event
1.	During an out of zone fault, the differential protection of the transformer is operated	CT saturation, Loose CT connection	<ul><li>Pre-fault data of 500ms</li><li>Idiff and Irest current</li><li>HV and LV current values</li></ul>
2.	During an out of zone fault, the restricted earth fault protection is operated	NCT Polarity mismatch, loose connection in CT path	<ul> <li>Pre-fault data of 500ms</li> <li>NCT current value</li> <li>HZREF resultant current/voltage (if applicable)</li> </ul>
3.	Spurious operation of PRD, Buchholz relay	Due to moisture ingress during rainy season, mechanical jerk	<ul> <li>Inherent protection operate status</li> <li>All analog channels</li> <li>Pre-fault data of 500ms</li> </ul>
4.	Tripping of the transformer in differential protection during charging operation	2 <sup>nd</sup> harmonic blocking value should be checked along with fault current (if any)	<ul> <li>2<sup>nd</sup> harmonic blocking</li> <li>All analog channels</li> </ul>
5.	Mal-operation of the NIFPS system	The status inputs of the NIFPS control box might have mal- operated	<ul> <li>Inherent protection operate status</li> <li>86 relay status</li> <li>Analog value of current</li> </ul>
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	<ul> <li>V/f pickup</li> <li>V/f Alarm</li> <li>V/f trip operated</li> <li>Pre-fault values</li> <li>All voltage channels</li> </ul>
7.	Buchholz relay operation during an earthquake	Due to mechanical jerk and improper slant of the pipe connecting conservator with main tank	<ul><li>Buchholz operate status</li><li>Pre-fault data of 500ms</li><li>Time synch status</li></ul>
8.	Differential protection operated during stormy weather	Damaged lightning arrester	<ul> <li>Pre-fault data of 500ms</li> <li>Analog values of current and voltages</li> </ul>

# TABLE 30: CASES OF TRANSFORMER DIFFERENTIAL TRIPPINGS

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	<ul> <li>Analog current values of all the bays</li> <li>Busbar differential current</li> <li>Busbar restraint current</li> <li>Isolator and CB status</li> <li>Busbar operate Zone status</li> <li>Busbar trip status</li> </ul>
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	<ul> <li>86 status of each bay</li> <li>LBB initiation</li> <li>LBB trip</li> <li>Pre-fault data of 500ms</li> </ul>
3.	Busbar mal-operation due to external fault	CT saturation, CT loose connection, CT polarity issue	<ul> <li>Pre-fault data of 500ms</li> <li>Analog current values of all the bays</li> <li>Busbar differential and restraint current</li> <li>Bus Zone status</li> <li>Check Zone status (if any)</li> <li>Busbar Trip status</li> </ul>

# TABLE 31: OPERATION OF BUSBAR PROTECTION

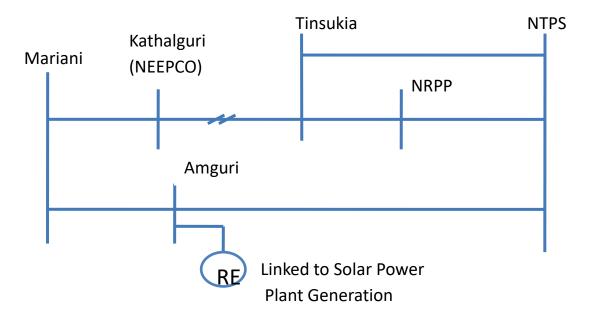
# CHAPTER 12

# 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

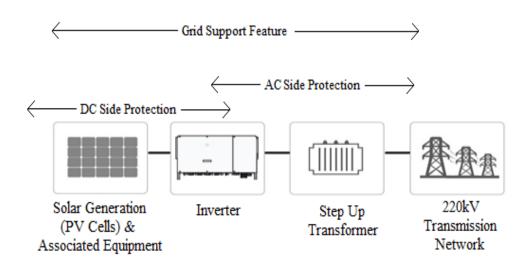


FIG 9: DC SIDE, AC SIDE AND GRID SUPPORT FEATURES IN A RE GENERATION PLANT

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
	A-B line				Output type (address: 5002) is 1:
22	voltage/phase A	5019	U16	0.1 V	upload phase voltage; 2: upload line
	voltage				voltage
	B-C line				Output type (address: 5002) is 1:
23	Voltage/phase B	5020	U16	0.1 V	upload phase voltage; 2: upload line
	Voltage				voltage
	C-A line				Output type (address: 5002) is 1:
24	Voltage/phase C	5021	U16	0.1 V	upload phase voltage; 2: upload line
	Voltage				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	\$32	var	
22	D. C.	5025		0.001	>0 means leading
33	Power factor 5	5035	5035 S16	0.001	<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

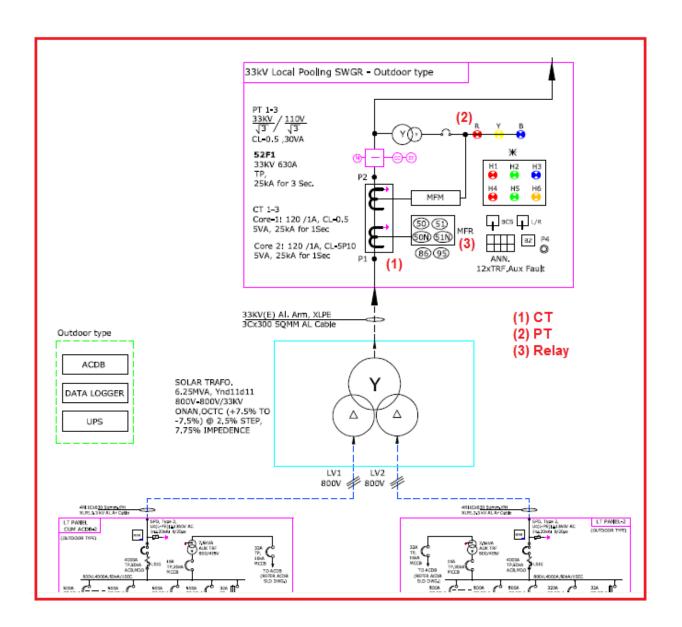
FIG 11: SCRENSHOT OF MODBUS ADDRESSES FOR CONDITION MONITORING OF INVERTER FUNCTIONS (FROM INVERTER MANUAL)

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

### TABLE 32: REMARKS AGAINST TOR POINTS FOR AMGURI RE PLANT

### **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.
- 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
- General Studies for 765/400/220kV Substation and Switchyard of Thermal/Hydro PowerProjects, CEA, 2012
- "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
- 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



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То

### The Member Secretary, Northern Regional Power Committee, 18-A, Shaheed Jeet Singh Marg, Katwaria Sarai, New Delhi-110016. Email: <u>seo-nrpc@nic.in</u>

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 54<sup>th</sup> Protection Sub-Committee.

Reference: Meeting notice for 54<sup>th</sup> 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 54<sup>th</sup> 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 CktI and CktII from 400/220 kV GIS of PKATL at	NRLDC (in
	Arandwala (Kala-Amb) to 220/132/33 kV AIS of HPPTCL at Andheri (Kala-Amb).	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 Sept2024)

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

Dated: 13-11-2024

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 Phone: 0177-2838666, Telefax: 0177-2837649 GST No. 02AAAAH7757E1ZX Email: sehpsldc@gmail.com, cehpsldc@gmail.com, mdhpsldc@gmail.com, Web: www.hpsldc.com

DA: As above

### Annexure-XV

operation of over voltage at Unnao end and review the trippings.

Status of remdial action taken (to be updated by respective constituents) S No Agenda Remdial actions recommended during PSC meeting 54th PSC 52nd PSC 53rd PSC PSC Forum requested HP to complete the protection audit as per mentioned timelines (protection audit 1. Protection audit of 220kV Kunihar has been awarded to POWERGRID on 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 5/s 2 1. In ext phase, protection audit of substations in downstream and HPSEBL representative informed that protection audit of 220kV Kunihar was done Frequent multiple elements tripping at 220kV Kunihar, Baddi, Upperla Nangal complex and during between 17-19th October 2024. Award of protection audit of other stations is load loss event in HP control area would be completed.) and resolve the protection related issues. HP was also requested to share the upstream of 220kV Kunihar S/s would be completed, tender process of rest yet to be done. Audit report of Kunihar S/s shall be submitted in a week reports of protection audit to NRPC & NRI DC after completion of audits. of the stations is in process. HVPNL representative informed that clearance related to OPGW received BBMB representative stated the matter has been taken up with HVPNL and is pending a) Expedite the implementation of differential protection in short lines to avoid undesired operation of from POWERGRID. Matter was forwarded to design team and is pending at 2 Multiple elements tripping at 220kV Hissar(BBMB) 07th May 2024, 11:16 hrs at their end. HVPNL representative informed that design team has compiled all such distance protection that stage. requirements in Haryana control area and is not working on the further process. Rajasthan representative stated that three faulty PU were replaced from the RVPNL representative stated that correspondence with the firm is still going on and as a) Bus bar protection at 220kV bus at 400/220kV Akal shall be made operational at the earliest. future bay and one PU is still unhealthy which is in warranty period. Process an alternative, possibility of replacing healthy PU from any other station is being Multiple elements tripping at 400/220kV Akal (RS) on 08th Jun 2024, 19:53 hrs 3 is getting delayed due to lack of response from the OEM. Process will be explored. Issue of time sync will be able to resolve only if bus bar protection get b) Time synchronization of recording instruments (DR/EL) need to be ensured. spedited and will try to resolve the bus bar protection issue on priority. operational a) NHPC shall follow up with the relay engineer and taken necessary remedial actions to ensure proper 1.Shutdown has been planned in 1st week of November 2024, testing of As per details received from NHPC present status is as follows: operation of A/R scheme at Parhati2 end A/R scheme and implementation of differential protection will be done •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 Multiple elements tripping at 400kV Sainj (HP), 400kV Parbati2 & Parbti3 (NHPC) Stations b) NHPC and HPPTCL shall review the healthiness of PLCC at Parbati3 and Sainj end and take necessary during that period. 4 actions to ensure their proper operation. on 07th May 2024, 16:17 hrs 2. PLCC card at Parabti3 end will be replaced by the end of September differential protection will be done during that period. c) Expedite the implementation of differential protection in 400kV Parbati2-Sainj line. 2024. For dual test of PLCC operation, PLCC at Sianj end also need to be PLCC card at Parabti3 end has been replaced and made functional. However, for dual d) Standardisation of recording instruments (DR/EL) need to be ensured healthy. test, PLCC at Sainj end also need to be functional. Khedar RGTPS representaitve informed that issues with the settings of the Micom a) Revised corrected protection settings of Main-2 Micome P4442 distance protection relay and A/R HVPNI representative informed that Khedar(RGTPS) have conducted 3rd relays has been resolved however in REL 670 relay installed at Khedar end, only 1-ph 5 Multiple elements tripping at 400kV Khedar(RGTPS) Station at 10th May 2024, 19:35 hrs party protection audit. Status of corrective action taken yet to be confirmed. A/R option is not available. 3-ph A/R has been disabled now and it has been kept as 1 scheme at Khedar(RGTPS) end need to implemented at the earliest. ph/2-ph A/R. 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 3a) In view of short line length of 400KV Koteshwar(PG)-Tehri D/C, POWERGRID shall plan for the 6 Multiple elements tripping at 400kV Koteshwar(PG) on 17th May 2024, 17:21 hrs Update yet to be received differential protection in the line on priority in near future to avoid overreach of distance protection. 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 a) Punjab shall expedite the commissioning of new bus scheme Punjab representative informed that tender of bus bar protection has been PSTCL representative informed that tender of bus bar scheme is in process Multiple elements tripping at 220kV Sarna (PS) on 04th May 2024, 07:10 hrs B) POWERGRID shall revise the Z-4 time delay setting of Kishenpur lines at Sarna (PS) end as 160msec processed, bus bar protection at 220kV Sarna will be commissioned within 4- POWERGID(NR-2) representative informed that Z-4 time delay setting of lines of their till bus bar get operational. 5 months tentatively control area has been revised. UP representative informed that this case has been communicated to design UPPTCL representative informed that process is still at the design team stage. Design 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. team. In response, they have asked the list of all such stations in UP control team is compiling all such requirements and further process will be initiated within 1 8 area. Further follow up actions is expected in due time course. 2 months RVUNL representative informed that process is at same stage. It will take around 01 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. 9 year to complete all the process and implementation of hus coupler Regarding non-operation of A/R, Rajasthan representative informed that RVPNL representative informed that request of relay panel has been floated howeve 10 Frequent tripping of 220 KV Anta(NT)-Sakatpura(RS) (RS) Ckt-1 relay penal is old, same is planned to be replaced with new within one DI of the same is yet to be issued. month. PSC forum requested POWERGRID to review the healthiness of A/R in lines at POWERGRID representaitve stated that they will review the status of A/R Saharanpur(PG) end. Any issue in A/R operation need to be rectified at the earliest 11 Frequent tripping of 220 KV Saharanpur(PG)-Shamli(UP) (UP) Ckt-1 peration at Shahranpur(PG) and shall ensure its proper operation in future. and A/R should be kept enable. UPPTCL shall take necessary actions to minimise the occurrence of faults in line. NTPC representative stated that they will look into the issue and share the 12 Frequent tripping of 400 KV Dadri(NT)-Panipat(BB) (PG) Ckt-1 updated on the same PSC forum requested POWERGRID to review the healthiness of A/R in lines at UP representative informed that new relay is available at site. Relay will be Saharanpur(PG) end. Any issue in A/R operation need to be rectified at the earliest 13 Frequent tripping of 220 KV Khara(UP)-Saharanpur(PG) (UP) Ckt-1 and A/R should be kept enable. UPPTCL shall expedite the replacement of relay at eplaced during lean season as per the shutdown opportunity. Khara(UP) end. POWERGRID representaitve stated that they will review the status of A/R 14 Multiple elements tripping event at Baghpat(PG) & Baghpat(UP) operation at Shahranpur(PG) and shall ensure its proper operation in future. Continuous follow ups are being done for expeditious delivery of material. 15 Multiple elements tripping event at Patiala(PG) Thereafter, new bus bar protection will be implemented RVPNL representative stated that process got delayed. They will expedite the 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 commissioning of Bus bar protection at 220kV bus at 400/220kV Bhadla(RS) UPPTCL representative informed that bus bar relay is implemented, and its 17 Multiple elements tripping at 400/220kV Lucknow(UP) Replacement of bus bar relay with numerical bus bar relay need to be expedited. mmissioning will be done in November 2024 as per shutdown availability. Necessary changes in logic of bay assignment may be done to ensure reliable operation of LBB and bus 18 Multiple elements tripping at 400/220kV Muzaffarnagar(UP) bar protection d that detail analysis and protection review has be Review of protection system need to be done to avoid such undesired operation and proper operation Haryana representative agreed to share the revised details analysis of the 19 Multiple elements tripping at 220kV Shahbad(HR) and 220kV Rajokheri(HR) essary changes in setting have also been done. Report of the same is of protection system need to be ensured. event. Frequent tripping of 220 KV Nara(UP)-Roorkee(UK) (UP) Ckt-1 PTCLII representative stated that they will analyse the event and share the analysis PSTCL representative was requested to ensure timely submission of DR/EL so that Frequent tripping of 220 KV Sarna(PS)-Udhampur(PDD) (PDD) Ckt-1 analysis of the event and necessary remedial action can be taken. PSTCL representative agreed for the same. UP was requested to share the DR of over voltage protection and review the

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

Status of actions points recommended during previous PSC meetings (to be discussed in 54th PSC meeting)

Multiple elements tripping at 220kV Khodri HEP & Chibro HEP on 5th, 11th & 19th September 2024	BTmely submission of disturbance recorder (DR) and event logger (EL) Nies need to         be ensured. As per EFGC Clause 37.2 (c). Disturbance Recorder (DR) station benet         Logger (EL), Data Acquisition System (DAS) shall be submitted within 24 hrs of the event.         BHPPTCL shall taken necessary actions to rectify the protection related issue in 220kV         Kinder/Marit ckt.2         BOY protection needs to be disabilid in 220kV lines at the earliest.         BOVer frequency and over current protection operation in units at Khodri HEP need to be reviewed.         BAR should be made operational in Sarawan line at the earliest.         BUVH shall share the CPRI audit report and details of remedia action taken within one week.         BUBAR and Clause and Claus
Multiple elements tripping at 400/220kV Jaisalmer(RS) Akal(RS) on 20th September 2024	BRVPNL shall share the detailed analysis of the event within one week.

# Annexure-XVI

										Grid Event summary for October 2024									
S.No.	Category of Gris Incident/ Disturbance	Name of Elements (Tripped/Manually opened)	Affected Area	Owner/ Agency	Out	tage	Rev	ival	Duration (hh:mm)	Event (Ar reported)	Energy Unserved due to Generation loss (MU)	Energy Unserved due to Load loss (MU)	Loss of generati during the Gri	on / loss of load d Disturbance	% Loss of gene load w.r.t A Generation/Load Grid during the G	Antecedent I in the Regional	Antecedent Gen the Regio		Fault Clearance time (in ms)
	(GI-I 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 IV Falebach III(FG): KSRPL_H)&_THG3_PG (RENEW SURVA ROSHN PRIVATE LIMITED CE	l Rajasthan	RSRPL, PGCIL	5-0ct-24	11:50	5-0ct-24	22:25	10:35	(Generators of 20)/(3V)/SBN: F153 statute executes through 220 KV hetelgeth III/F6): F38PL, yeb_TF163 ptG (IEEEW SURFA ROSHN PRVNTE LIMITED) CLL During antecedent condition, RSPL F163 tation station and responseling assists 200K/ (size F38PL). The phase of the phase of the phase of the phase of the phase intercedent condition, RSPL F163 tation station allow responseling assists 200K (size F38PL). The phase of the phase of the phase intercedent condition, RSPL F163 tation station allow responsel as 155Nr, 220 KV hetelpan III/F6). SSRPL, yeb_TF163 (size F38PL) and the phase intercedent condition, RSPL F163 tation station allow responsel as 200 kreation, III/F6, RSRPL, yeb_TF163 (size F38PL), the phase intercedent condition with 200 kBu- i and Bus-II. yeb_Res f28DL, dening the event, give assignmention of sponse. 320 KV BBH vs (size weak balance) will be to f58DL dening the event, give assignmention of sponse. 320 KV BH vs (size weak balance) will be to f58DL dening the event, give assignmention of sponse. 320 KV bis betweed to RC other area. will be to f58DL dening in dening in dening in dening in dening the response of the response o	0	0	310	0	0.488	0.000	63574	70955	NA
2	GD-1	1)220 KV Jauljivi (PG)-Ohaulganga(NH) (PG) Cls1 2)220 KV Jauljivi (PG)-Ohaulganga(NH) (PG) Cls2 3)70 MW Unit-4 at Dhaulganga(NH)	Uttarakhand	PGCIL, NHPC	5-0ct-24	18:23	5-0ct-24	19:06	00:43	Nouring extendent contribut, only 70.000 Unit 4.5 (Shulpangapille)) an entrong and parameting approx. GMAN( on reported. SCMAM (on and available). Unit 1, 2 & 1 were under shutdown. (Bui Angoniet, at 15: Angoniet, 2004 Naule) (Mol Shulpangapille)) (In a transport of the Statistication of GS contractive schemer. BURING part Matter 2004 Naule) (Shulpangapille)) (Shulpangapille)) (Shulpangapille)) (Shulpangapille)) (Shucame dead. Make per Mult 2004 Naule) (Shulpangapille)) (Shulpangapille)) (Shulpangapille)) (Shucame dead. Make per Mult 2004 Naule) (Shulpangapille)) (Shulpangapille)) (Shulpangapille)) (Shulpangapille)) (Shulpangapille)) (Shulpangapille)) (Shucame dead. Make per Mult 2004 Naule) (Shulpangapille)) (Shulpangapille)) (Shulpangapille)) (Shulpangapille)) (Shucame dead. (Make per Mult 2004 Naule) (Shulpangapille)) (Shulpangapille)) (Shulpangapille)) (Shulpangapille)) (Shucame dead. (Make per Mult 2004 Naule) (Shulpangapille)) (Shulpangapille)) (Shulpangapille)) (Shulpangapille)) (Shucame dead. (Make per Mult 2004 Naule) (Shulpangapille)) (Shul	o	o	70	0	0.106	0.000	53633	65902	NA
3	GI-2	11220W Obra, A-Shhupini cit 2220W Obra, A-Reva Road cit 2 3400/223W 315 MW ICT 1 at Obra 8(UP) 4400/223W 240 MW ICT 3 at Obra 8(UP)	Uttar Pradesh	UPPTCL	9-0ct-24	11:39	9-0ct-24	12:22	00:43	NOVD201 AV Chan - 8 substation has 2*315 MA (CT 1, 82) and one 240MAA CT (CT 3). During antecedent condition, 2*315 MA & 240 MAA (CT), were carrying 104MW (CT1), 101MW (CT2) and 78MW (ICT3) respectively. NOVD202 AV 251 MA (CT, 1, 240 MAX (CT) ar Chan EVALUATE: A Constraint of the antecedent condition. 2*315 MA & 240 MAA (CT) are Chan. NOVD202 MAR (CT) are Chan. NOVD204 AV 251 MAR (CT, 1, 240 MAX (CT) are Chan. 8*40 CONSTRAINT (CT), 240 MAX (CT) are Chan. 8*40 CONSTRAINT (CT), 240 MAX (CT) are Chan. 8*40 CONSTRAINT (CT), 240 MAX (CT) are Chan. 8*40 CONSTRAINT (CT), 240 MAX (CT) are Chan. 8*40 CONSTRAINT (CT), 240 MAX (CT) are Chan. 9*40 Find Part (CT), 240 MAX (CT) are Chan. 9*40 Find Part (CT), 240 MAX (	0	O	0	0	0.000	0.000	9381	68876	960
4	GI-2	133 AW Unit-2 does HFU (UP)           133 AW Unit-2 does HFU (UP)           133 AW Unit-2 does HFU (UP)           133 AW Unit-2 does HFU (UP)           500 AW Unit-3 L Ribmad HFU (UP)           500 AW Unit-2 Ribmad HFU (UP)           520 AW Unit-2 Ribmad HFU (UP)           520 AW Unit-2 Ribmad HFU (UP)           520 AW Unit-2 Ribmad HFU (UP)           520 ZW ZW Unit-2 Ribmad HFU (UP)           520 ZW ZW ZW AW (AT-2 at Obs-A (UP)           5220 ZW ZW UD0 MA (CF-2 at Obs-A (UP)           5220 ZW ZW ZW ZW ZW ZW AW (AT-2 at Obs-A (UP)	Uttar Pradesh	UPPTCL	9-0ct-24	17:04	9-Oct-24	17:43	00:39	(Ubors A hss 1, 220/112 IV, 100MA transformers which were carrying approx. 46MV, SIMW and 45MW during antecedent condition. II)Br reported, during incidence water where conditions, 220/1221V 100 MAI CT 18. 4CT 21 types of n8 4 earth faith protection at Obe-A(UP) which led to complete shifting of load on 220/1221V 100 MAI CT 3 at Obe-A (UP). II)Br reported and the set of the set o	0	0.065	215	100	0.352	0.164	13090	61049	120
5	GI-2	1400/2201/ 315 MVA CT 3 at Schlpur(US) 2400/2201/ 315 MVA CT 3 at Schlpur(US) 2400/2201/ 315 MVA CT 3 at Schlpur(US) 42201/ 4101upur Ashlpur (US) 42201/ 4101upur Ashlpur (US) (21 42201/ 4101upur Ashlpur (US) (21 421201/ 4101upur - Jacpur (US) (21	Uttarakhand	PTCUL	10-Oct-24	10:56	10-Oct-24	11:17	00:21	HeV0/220/1231V Eahlpur has 2*155 600/2004 and 2*160/MX 220/1231V ETL. High regord methods, at 10:56:11.006, LV and CE of 313MAK CT 2*166/MX 220/1231V ETL. High regord methods at 10:56:11.006, LV and CE of 313MAK CT 2*160/MX 220/1231V CTL. High regord methods at 10:56:10.000, LV and CE of 313MAK CT 2*160/MX 220/1231V CTL. 12:000 https://crt. 12:000 https://crt	o	0.082	0	247	0.000	0.366	9411	67486	NA
6	GI-1	1)220 KV Amargarh (INDIGRID)-Ziankote(IX) (PDD JK) Ck-1 2)220 KV Amargarh (INDIGRID)-Ziankote(IX) (PDD JK) Ck-2	Jammu & Kashmir	JIPDD & INDIGRID	11-0ct-24	10:03	11-0xt-24	11:09	01:06	(220)/13/W Zaholick V (how to be at 2200 V dot L , and in the A proof box 2000 Amrgan b achieted to 18 at at on the same tops 2000 Amrgan b achieted to 18 at at on the same tops (2V tower) and line length is "21.4km, Market State (2000 Amrgan b) (2000 A	o	0.195	0	175	0.000	0.269	9322	65076	80
7	Gi-1	1) 220 KV Wagoons(PG)-Pampore(PD0) (PG) Cis-1 2) 220 KV Wagoons(PG)-Pampore(PD0) (PG) Cis-2	Jammu & Kashmir	PDD-JK & PGCIL	16-0ct-24	13:45	16-0ct-24	13:49	00:04	(120/)131W Pampore(PDD) has single main and transfer Bus arrangement at 220W side. Il/During antecedent condition, power flow from Wagoour(PDS) (s to Branpore(PDD) (s sea spprox. 140 MW (70 MW exch) through 220 KV Wagoour(PD) (PG) (PG) (PG) Bus Propried, 113-156 hr., Yshava dis cutputed and 220W mail bits arrangement at 20W mail bits and share to earth fault (search location of fault and instance of 113 Jam from Wagoour(PD) (PG) (PG) (D/C. II/During this same flow arrangement(PDD) (PG) (PG) (ES) to Integrate and en Yin phase to earth fault (search location of fault and instance of 113 Jam from Wagoour and (Jam) (PG) (PG) (PG) (PG) (PG) (PG) (PG) (PG	0	0.023	0	350	0.000	0.605	46640	57853	1000
8	GI-2	1) 400W Muradrugar 2-Mathura (UP) Oct 2) 400W Muradrugar 2-Simboli (MST (UP) Oct 1 3) 400W Muradrugar 2-Simboli (MST (UP) Oct 2 4) 400W Muradrugar 2, 2(UP) (PG) Ckt	Uttar Pradesh	UPPTCL	17-0ct-24	00:43	17-0ct-24	02:48	02:05	(400/2201/121X Murdingsr New(UP) has one and half broker scheme at 400W level and double main and transfer bus scheme at 220W level. II) An opported tap CP CP Murdingsr 2 and a full broker scheme at 400W level and double main and transfer bus scheme at 220W level. II) An opported tap CP CP Murdingsr 2 and a full broker scheme at 400W level and double main and transfer bus scheme at 220W level. III) Dart to display double scheme at 400W hundingsr 2. Nathanu (JP) CR LT byged on YA plays to each full and the CR	0	0	0	0	0.000	0.000	39096	53675	280

S.Ne	Category of Ga Incident/ Disturbance	id Name of Elements (Tripped/Manually opened)	Affected Area	Owner/ Agency	ou	itage	Re	rival	Duration (hh:mm)	Even (Ar reported)	Energy Unserved due to Generation loss (MU)			ion / loss of load id Disturbance	load w.r.t.	eration / loss of Antecedent d in the Regional Grid Disturbance	Antecedent Gen the Regio	neration/Load in onal Grid	Fault Clearance time (in ms)
	(GI-I to GD-				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	11 220 KV Lalobel(KS)-Guasa(KS) (PG) CH 220 KV Sawalima/Bogur(KS)-Duasa(KS) (PG) CH 31 220 KV Sawalima/Bogur(KS)-Duasa(KS) (PG) CH 31 220 KV Sawalima/SD Duasa(KS) (PG) CH 32 220 KV Mandres (PG)-Duasa(KS) (CH 40 220 KV Sawalima/SD CH 40 220 KV Saw	Rajasthan	RVPNL, PGCIL	21-0et-24	15:32	21-0x1-24	16:08	00:36	(122)/132V Daus(15) has double main and transfer bas scheme at 220W (set.) (122)/132V Daus(15) has double main and transfer bas scheme at 220W (set.) (122)/132V Daus(15) has double main and transfer bas scheme at 220W (set.) (122)/132V Daus(15) has double main and transfer bas scheme at 220W (set.) (122)/132V Daus(15) has double main and transfer bas scheme at 220W (set.) (122)/132V Daus(15) has double main and transfer bas scheme at 220W (set.) (122)/132V Daus(15) has double main and transfer bas scheme at 220W (set.) (122)/132V Daus(15) has double main and transfer bas scheme at 220W (set.) (122)/132V Daus(15) has double main and transfer bas scheme at 220W (set.) (122)/132V Daus(15) has double main and transfer bas scheme at 220W (set.) (122)/132V Daus(15) has double main and transfer bas scheme at 220W (set.) (122)/132V Daus(15) has double main and transfer bas scheme at 220W (set.) (122)/132V Daus(15) has double main and transfer bas scheme at 220W (set.) (122)/132V Daus(15) has double main and transfer bas scheme at 220W (set.) (122)/132V Daus(15) has double main and transfer bas scheme at 220W (set.) (122)/132V Daus(15) has double main and transfer bas scheme at 220W (set.) (122)/132W Daus(15) has double main and transfer bas scheme at 220W (set.) (122)/132W Daus(15) has double main and transfer bas scheme at 220W (set.) (122)/132W Daus(15) has double main and transfer bas scheme at 220W (set.) (122)/132W Daus(15)/102W (set.) (122)/132W Daus(15)/102W (set.) (122)/132W Daus(15)/102W (set.) (122)/132W Daus(15)/102W (set.) (122)/132W Daus(15)/102W (set.) (122)/132W Daus(15)/102W (set.) (122)/132W Daus(15)/102W (set.) (122)/132W Daus(15)/102W (set.) (122)/132W Daus(15)/102W (set.) (122)/132W Daus(15)/102W (set.) (122)/132W Daus(15)/102W (set.) (122)/132W Daus(15)/102W (set.) (122)/132W Daus(15)/102W (set.) (122)/132W Daus(15)/102W (set.) (122)/132W Daus(15)/102W (set.) (122)/132W Daus(15)/102W (set.) (122)/132W Daus(15)/102W (set.) (122)/132W Daus(15)/102W (set.) (122)/13	٥	0.102	0	170	0.000	0.285	47795	59608	560
10	GI-1	1) 220/1334V 100MVA ICT-1 at Giri(IHP) 2) 220/1334V 100MVA ICT-2 at Giri(IHP)	Himachal Pradesh	HPPTCL	21-Oct-24	09:42	21-Oct-24	09:52	00:10	Incluring stratecture contines, 3221132V 102MA CT1 & 4 2 archiv(P) were carrying approx. 100 MPA exch (Mar sproyted, 407-647, Mar 20211XV 102MACT1 & 2 ar cliv(P) were carrying approx. 101 MPA exch (Mar sproyted, 407-647, Mar 20211XV 102MACT1 & 2 ar cliv(P) were carrying approx. 105 MPA exch (Mar sproyted, 407-647, Mar 2021XV 102MACT1 & 2 ar cliv(P) were carrying approx. 105 MPA exch (Mar 2024) approx. 105 MPA e	o	0.036	0	215	0.000	0.354	48257	60747	NA
11	GI-2	1) 400HV Bus 1 at Algarh (UP) 2) 400 HV Panis-Algarh (UP) Ct 3) 400 HV Algarh-Silandrabad (UP) Ct 4) 400 HV Algarh-Silandrabad (UP) Ct 5) 400 HV Algarh-Shahmi (UP) Ct 5 1 5) 400 HV Algarh-Shahmi (UP) Ct 5 2	Uttar Pradesh	UPPTCL	23-Oct-24	12:08	23-Oct-24	12:52	00:44	(400/2010/ Alignh(UP) has one and half breaker scheme at 400k/ level and double main and transfer bus scheme at 220k/ level. I) Are reported, at 12.08 hrs, differential protection of line reactor of 400 k/ Pauki Alignh (UP) Ct spectrad (exact reason of differential protection operation of line reactor of 400 k/ Pauki Alignh (UP) Ct yet to be abared). III During the same time, Bus bar protection operated at 400k/ bus-1 at Alignh(UP) they are to be protection of sou bar operation of 400 k/ Bus-1 at Alignh(UP) yet to be shared). III During the same time, Bus bar protection operated at 400k/ bus-1 at Alignh(UP) inpliced and Bus-1 became dead (exact reason of bus bar operation of 400 k/ Bus-1 at Alignh(UP) yet to be shared). IVALUE to 10k, all the demonstrances to the bus bar operated in the system. Value per SAUA, noting in formation downed in UP control area.	o	o	0	0	0.000	0.000	52196	60961	NA
12	GI-2	1) 4000Y Bus 1 at Obra B(UP) 2) 400/20 W 315 MVA CT at Obra B(UP) 2) 400/20 W 315 MVA CT at Obra S(UP) 2) 200 MV 000 CT 000 Obra S(UP) 3) 200 MV 000 CT 15 - UNT 11 6) 200 MV 000 TT 5 - UNT 13	Uttar Pradesh	UPPTCL	25-0ct-24	12:52	25-0xt-24	14:06	01:14	(40)2201V Obs 8(UP) has dealer anis and transfer has scheme at both 400V and 220W (red.) (B)2012 Obs 8(UP) has dealer anis and transfer has scheme at both 400V and 220W (reget, which are a scheme at both 400V and 220W (reget, which are a scheme at both 400V and 220W (reget, which are a scheme at both 400V and 220W (reget, which are a scheme at both 400V and 220W (reget, which are a scheme at both 400V and 220W (reget, which are a scheme at both 400V and 220W (reget, which are a scheme at both 400V and 220W (reget, which are a scheme at both 400V and 420W (reget, which are a scheme at both 400V and 420W (reget, which are a scheme at both 400V and 420W (reget, which are a scheme at both 400V and 420W (reget, which are a scheme at both 400V and 420W) (reget, research 400V and 420W) (reget, research 400V and 420W (reget, research 400V) (reget, research 40	o	o	150	0	0.254	0.000	49979	59077	120
13	GD-1	2) 400 KV Alwarl ATE, Hrindaun (RS) (ATE, Cit	Rajasthan	ATIL, RVPNL	30-Oct-24	14:15	30-Oct-24	16:33	02:18	(400)/2201V Alwar400(R5) has one and half-breaker scheme at 400KV level and double main and transfer bus scheme at 220KV level. 400 KV Alwar40(R1), HindsungR5) (ATL) CLI is the only 400KV line connected to Alwar400(R5). The active power coming from industuryR5, Juan MA(R5), Manufact), ManufactoryR5, and Daual(P5) through the 460/220KV CLT at Alwar400(R5). Alwar400(R5). The active power coming from industuryR5, Juan MA(R5), ManufactoryR5, and Daual(P5) through the 460/220KV CLT at Alwar400(R5). Alwar400(R5). The active power coming from industuryR5, Juan MA(R5), ManufactoryR5, and Daual(P5) through the 460/220KV CLT at Alwar400(R5). Alwar400 KV Alwar400(R5). The Active power coming from through the Alwar400 KV and the Alwar40 KV and the Alwar400(R5), and the analysis are complete back on a coming of 5.759A and 5.272AA in 8 and Y phase respectively from Hindbar4(R5) end, fault areas in a non-1 at Hindbar4(R5) end (scheme at Alwar400(R5), with the tripping of this Line three was no source of power left to any of the 220KV feeders. Hence complete blackult occurred at 400/220K Alwar400(R5). Alwar400 KV Alwar40(R5), R P20 Alwar40kaR2(R5) CLI also tripped during the same time (eact reason of the same of the 220KV feeders. Hence complete blackult occurred at 400/220K Alwar400(R5). Alwar40 KV Alwar40(R5), R P20 Alwar40kaR2(R5) CLI also tripped during the same time (eact reason of the same of the 220KV feeders. Hence complete blackult occurred at 400/220K Alwar40(R5), R P20 Alwar40kaR2(R5), CLI also tripped during the same time (eact reason of the same yet to be shared). Alwar40 KV Alwar40(R5), R P20 Alwar40kaR2(R5), CLI also tripped during the same feed do m. Alwar40(R5), P20 Alwar40kaR2(R5), R Alwar40kaR2(R5), Alwar40kaR2, Alwar40KaR3, Alw	0	1.15	0	500	0.000	0.818	53878	61088	80

Sr No	Element Name	Outage Date	Outage Time	Reason
		02-Oct-24	20:10	Phase to earth fault B-N
1	220 KV Nanauta(UP)-Saharanpur(PG) (UP) Ckt-1	12-Oct-24	07:19	Phase to earth fault B-N
		17-Oct-24	11:05	Phase to earth fault R-N
		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
2	220 KV RAPS_B(NP)-Sakatpura(RS) (RS) Ckt-1	17-Oct-24	08:51	Transient fault
		25-Oct-24	00:51	Transient fault
		06-Oct-24	00:11	Phase to earth fault B-N
		11-Oct-24	05:39	Phase to earth fault B-N
3	220 KV Saharanpur(PG)-Shamli(UP) (UP) Ckt-1	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
		04-Oct-24	19:59	Phase to earth fault B-N
4	220 KV Sarsawan(UP)-Khodri(UK) (UP) Ckt-1	04-Oct-24	21:59	Phase to earth fault B-N
		23-Oct-24	14:05	Phase to earth fault R-N
		08-Oct-24	05:42	Phase to earth fault R-N
		14-Oct-24	01:47	Phase to earth fault B-N
5	400 KV Muradnagar_2-Mathura (UP) Ckt-1	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-XVIII

#### Grid Event to be discussed in 54th PSC Meeting

S.N	ni	gory of Grid Incident/ isturbance	Name of Elements (Tripped/Manually opened)	Affected Area	Owner/ Agency	Out	age	Event (As reported)	Loss of generat during the Gr	tion / loss of load rid Disturbance	Fault Clearance time (in ms)	Points of discussion
	(GI	I-I to GD-V)	-			Date	Time		Generation Loss(MW)	Load Loss (MW)		
1	L	GD-1	1)220 KV Jauljivi (PG)-Dhauliganga(NH) (PG) Ckt-1 2)220 KV Jauljivi (PG)-Dhauliganga(NH) (PG) Ckt-2 3)70 MV Unit-4 at Dhauliganga(NH)	Uttarakhand	PGCIL, NHPC	5-Oct-24	18:23	IDuring antecedent condition, only 70 MW Unit-4 at Dhauligangi(NH) was running and generating approx. 69MW (as reported, SCADA data not available). Unit-1, 2 & 3 were under shutdown. IIJAs reported, at 18:2Mns, 22 0KV Jauliju (PG)-Dhauligang(NH) (PG) (CH-1 & 2 Tripped due to maffunction of GIS controller software. IIJAs reported, at 18:2Mns, 22 0KV Jauliju (PG)-Dhauligang(NH) alo tripped due to loss of evacuation path. Hence 220kV Dhauligang(NH) S/s became dead. VJAs per PAU at 400kV BarelliJ(PG), no fault signature was observed. VJAs per PAU at 400kV BarelliJ(PG), no fault signature was observed. VJAs reported by Dhauliganga, Generation loss of 69MW was reported at Dhauligang(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	2	GI-2	1)220KV Obra, A-Sahupuri ckt 2)220KV Obra, A-Reva Road cht-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	() 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 72MW (ICT3) respectively. () 400/220X V35 MVA ICT-1, 240 MVA ICT-3 at Obra B, 220W Obra, -A substation has 2*315 MVA (ICT-3) at Obra B, 220W Obra, -A substation has 2*315 MVA (ICT-3) at Obra. B, 220W Obra, -A substation has 2*315 MVA (ICT-3) at Obra. B, 220W Obra, -A substation has 0*20K Obra, -A subsupuri ext. Fault location was Skin from Subsupuri end. Fault was in 2-15 from Dbra end and 2-2 from Subsupuri end. W/Oh this fault, distance protection at both ends operated. GB opened from Subsupuri end Newer CB at Obra end and V2-16 more contraction operation and 400/220W V35 MV (ICT-3) at Obra. HAN CT-3, 400 MVA (ICT-3) and ICT-16 and Info (ICT-2) and fault located with the tripping of 220V Obra, A-Malabade Newa Road ekt-2 on 2-4 distance protection operation. W/M respired, LBB protection din't operate (relay is of static type) and fault cleared with the tripping of 220V Obra, A-Malabade Newa Road ekt-2 on 2-4 distance protection operation. W/M respired, ICT-3 & 40 MVA (ICT-3) and Info Info (ICT-2) and respired. W/M respired At ICT-3 and WIM Info (ICT-2) and respired. W/M respired At ICT-3 at Info Info Info (ICT-2) and Info Info Info (ICT-3) respectively. W/M respired Info Info Info Info (ICT-2) and Info Info Info (ICT-3) respectively. W/M respired Info Info Info Info Info Info Info Info	0	0	960	Details analysis of the event and remedial action taken details.
3	8	GI-2	133 MW Unit-1 at Obra HEP (UP) 233 MW Unit-2 at Obra HEP (UP) 333 WW Unit-3 at Obra HEP (UP) 450 MW Unit-1 at Rihand HEP (UP) 550 MW Unit-2 at Rihand HEP (UP) 550 MW Unit-2 at Rihand HEP (UP) 72021324V U0 MK ICT-3 at Obra-A (UP) 812021324V 100 MK ICT-3 at Obra-A (UP) 812021324V 100 MK 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. (I)Obra-A has 3, 220/132 KV, 100MVA transformers which were carrying approx. 46MW, 51MW and 45MW during antecedent condition. (I)Osra-A has 3, 220/132 KV, 100MVA transformers, 220/132 KV 100 MVA (CT-1 & ICT-2 tripped on B-N earth fault protection at Dbra-A(UP) which led to complete shifting of load on 220/132 KV 100 MVA (CT-3 at Obra-A (UP). IIIVA are suit of overloading of the 3rd transformer, ICT-3 also tripped on O/C protection at 17:04 hrs. IVAI the same time 17:04 hrs, 03 Units at Obra Hydro and 03 Units at Rhand HEP (connected at Bus-2) also tripped leading to a total generation loss of approx. 215 MW. V/Osnidering the above incider, fihand manually tripped loor A, Obra HJ, Don H2 and Oharwad lines from perspective of safety. v)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 (CT-1 at Kashipur(UK) 2)400/220kV 315 MVA (CT-2 at Kashipur(UK) 3)220/328V 160 MVA (CT-3 at Kashipur(UK) 4)200V Jafaper, Asahipur (UK) (Ct 5)220kV Pantnagar – Kashipur (UK) (Ct 6)132kV Kahipur – Jaspur (UK) (Ct	Uttarakhand	PTCUL	10-0ct-24	10:56	()400/220/132kV Kashipur has 2*315 400/220kV and 2*160MVA 220/132kV ICTS. (i)400/220/132kV Kashipur has 2*315 400/220kV and 2*160MVA 220/132kV ICTS. (i)As reported, at 10:56:13.086, IV 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 begiven by Uttarakhand-SLDC on this matter. Will the tripping of 315MVA ICT-1 Kashipur, case-2 of SF for transformers at 400KV Kashipur (PICUL) substation operated. As a result of the SFS present in Kashipur sub-station, the following lines also tripped 1220V hatpur-shapipur (UK) Ctt 1220W hatpur-shapipur (UK) Ctt	0	247	NA	Details analysis of the event and remedial action taken details.
5	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 5/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. i)During antecedent condition, 220kV Amargarh(NDIGRID)—Ziankote(IX) (PID IX) (PW as carrying 114 MW each and feeding Ziankote load. iii)As reported, at 10:03 hrs, 220 KV Amargarh(NDIGRID)-Ziankote(IX) (PID IX) (PD DIX) (D/C tripped from both ends on Y4 phase to phase fault. During patrolling it was found that the fault had occurred between Tower no.7 band 77, as own locals were curriting trees in the vicinity of line and transches of tree had fallen on the line. MAs 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	5	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	1/220/122W Pampore(PDD) has single main and transfer Bus arrangement at 220KV side. I/During antecedent condition, power flow from Wagoora(PG) 5/s to Pampore(PDD) 5/s was approx. 140 MW (70 MW each) through 220 KV Wagoora(PG)-Pampore(PDD) (PG) D/C. III/Jiks reported, at 13:45 hms, *phase disc ruptured in 220KV main Bus at Pampore. Iv/Due to this, 220M Wagoora(PG)-Pampore(PDD) (PG) CK-1 tripped from Pampore and on YA phase to earth fault (exact location of fault and nature of protection operated yet to be shared). V/Due to this, 220M Wagoora(PG)-Pampore(PDD) (PG) (CK-1 at tripped from Pampore and on YA phase to earth fault (exact location of fault and nature of protection operated yet to be shared). V/During the same multiple and PG-Pampore(PDD) (PG) (CK-1 at tripped from Vagoora end sensing the fault in zone-2 with fault distance of 11.91Km from Wagoora end. vijAs per PMU at Amargan()IND(GRD), YA phase to earth fault converted to YB-N double phase to earth fault with delayed fault clearing time of 1000ms is observed. vijAs 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-Simbholl_PMSTL (UP) Ckt-1 3) 400kV Muradnagar_2-Simbholl_PMSTL (UP) Ckt-2 4) 400 KV Dadri(NT)-Muradnagar_2(UP) (PG) Ckt	Uttar Pradesh	UPPTCL	17-Oct-24	00:43	()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. ()400/220/132kV Muradnagar_2-MokV Muradnagar_2-2 mol and full (UP) Ckt tripped on Y-N phase to earth fault with fault current of 4.0556A from Muradnagar_2 and and fault clearing time of 291 ms; to come -1 distance protection operated is goe PD & Muradnagar_2 and and PD received at Mathum and [as reported]. ()100/220/132kV Muradnagar_2 C & at Muradnagar_2 and of 400 KV badri(NT)-Muradnagar_2. 2 mol and fault clearing time of 291 ms; to delayed opening of CB at Muradnagar_2 and of 400 KV badri(NT)-Muradnagar_2. 2 mol 400 KV badri(NT)-Muradnagar_2. 4 mol 400 KV badri(NT)-Muradnagar_2. 4 mol 400 KV badri(NT)-Muradnagar_2. 4 mol 400 KV badri(NT)-Muradnagar_2. 4 mol 400 KV badri(NT)-Muradnagar_2. 4 mol 400 KV badri(NT)-Muradnagar_2. 4 mol 400 KV badri(NT)-Muradnagar_2. 4 mol 400 KV badri(NT)-Muradnagar_2. 4 mol 400 KV badri(NT)-Muradnagar_2. 4 mol 400 KV badri(NT)-Muradnagar_2. 4 mol 400 KV badri(NT)-Muradnagar_2. 4 mol 400 KV badri(NT)-Muradnagar_2. 4 mol 4	0	0	280	Details analysis of the event and remedial action taken details.

S.No.	Category of Gri Incident/ Disturbance	Name of Elements (Tripped/Manually opened)	Affected Area	Owner/ Agency	Out	age	Event (Asreported)		tion / loss of load rid Disturbance	Fault Clearance time (in ms)	Points of discussion
	( GI-I to GD-V				Date	Time			Load Loss (MW)		
8	GD-1	1) 220 KV Lalsote(R5)-Dausa(R5) (PG) Ckt 2) 220 KV Sawaimadhopur(R5)-Dausa(R5) (PG) Ckt 3) 220 kV Bass(P6)-Dausa(R5) (PG) Ckt 1 4) 220 kV Bass(P6)-Dausa(R5) (PG) Ckt 2 5) 220 kV Mandwar(R5)-Dausa(R5) Ckt 6) 220 kV VJ Sina(R5)-Dausa(R5) Ckt 7) 220/324 kV Sina(R5)-Dausa(R5) Ckt 8) 220/132kV 100MVA iCT-2 at Dausa(R5)	Rajasthan	RVPNL, PGCIL	21-Oct-24	15:32	(1)220/132W 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)Dar popted, at 25:22 hs, Phylase CVT of Main-Bus-I flashover accurred due to copier opening Gelay setting was 110ms), fault was also sensed by Main Bus-II. IV/Due to this bus fault, all the 220KV lines connected to Bus-3 & II at Dausa(RS) sensed the Buu't in zone-4 and fault cleared from Dausa(RS) and in zone-4 (non-4 delay setting was 160ms). But in 20 KV Lisbor(RS) Dausa(RS) (FO) Chara(RS) (FS) Chara(RS) (FS) Chara(RS) (FS) Chara(RS) (FS) Chara(RS) (FS) Chara(RS) (FS) Chara(RS) (FS) Chara(RS) (FS) Chara(RS) (FS) Chara(RS) (FS) Chara(RS) (FS) Chara(RS) (FS) Chara(RS) (FS) Chara(RS) (FS) Chara(RS) (FS) Chara(RS) (FS) Chara(RS) (FS) (FS) Chara(RS) (FS) Chara(RS) (FS) Chara(RS) (FS) Chara(RS) (FS) Chara(RS) (FS) Chara(RS) (FS) (FS) Chara(RS) (FS) Chara(RS) (FS) Chara(RS) (FS) Chara(RS) (FS) (FS) Chara(RS) (FS) Chara(RS) (FS) Chara(RS) (FS) Chara(RS) (FS) Chara(RS) (FS) Chara(RS) (FS) Chara(RS) (FS) (FS) Chara(RS) (FS) Ch	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	(400/220KV Aligarh(UP) has one and half breaker scheme at 400kV level and double main and transfer bus scheme at 220kV level. (jAs 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 vet to be shared). (jDuring 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) vet to be shared). (jDuring the same time, Bus bar protection operated at 400kV Bus-1 at Aligarh(UP) also operated (exact reason of opening of tie CBs of 400 KV lines connected to Bus-1 at Aligarh(UP) vet to be shared). (jDa be shared). (jAs per PMU at Aligarh(PG), no fault is observed in the system. (jAs 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) Ck-1 4) 200 MVO ra TPS - UNIT 0 5) 200 MVW Obra TPS - UNIT 11 6) 200 MWW Obra TPS - UNIT 13	Uttar Pradesh	UPPTCL	25-Oct-24	12:52	(40/220KV Obra-B(UP) has double main and transfer bus scheme at both 400kV and 220kV level. (i)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 (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 (ii)S - Thon 25 MC 104 C 24. 400/220 KW 05 ML 21 at 00 Tang E(IVP), 400 KW 06 ML 104 C 21 And 200 MW Obra TPS - UNIT 09, 11 & 13 were connected to 400KV Bus 1 at 05-m8(UP) and rest of the elements were connected to 400KV Bus 2 at 05-m8(UP), (ii)S reported, at 122 Stns, while synchronizing 200 MW Obra TPS - UNIT 09, busbar differential protection operated at 400KV Bus 1 at 05m-8(UP) (wi)Due to busbar protection operation, all the elements connected to 400KV Bus - 1 Obra-8(UP) tripped and Bus-1 became dead. (v)Due to busbar protection operation, all the elements connected to 400KV Bus - 1 Obra-8(UP) tripped and Bus-1 became dead. (v)As per FXDA. No change in demands to observed in UP control area. However, generation loss of approx. 150 VM occurred at 05-m8(UP), (vi)As eproted by Obra-8, dare investigation it was found that interrupter unit of C 8 at 000V vide of 200 MW Obra TS - UNIT 09 was damaged. This CGL make SF6 type C 8 which was commissioned on 001 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.

			Outag	e	Brief Reason
S. No.	Name of Transmission Element Tripped	Owner/ Utility	Date	Time	(As reported)
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
	t Clearance time has been computed using PMU Data from n	earest node available a	nd/or DR provide	d by respect	ive utilities ( Annexure- II)
	if written Preliminary report furnished by constituent(s) phase sequencing (Red, Yellow, Blue) is used in the list conte	nt.All information is as	per Northern Rea	ion unless si	pecified.
	ping seems to be in order as per PMU data, reported inform	-			
		of Regulation for variou			
1	Fault Clearance time(>100ms for 400kV and >160ms for 220kV)	1. CEA Grid Standard-3.			ng Criteria
2	DR/EL Not provided in 24hrs	1. IEGC 37.2(c) 2. CEA			
3	FIR Not Furnished	1. IEGC 37.2(b) 2. CEA			
4	Protection System Mal/Non Operation				tric Lines: 43.4.A 2. CEA (Technical
5	A/R non operation	1. CEA Technical Standa	ard of Electrical Pla	ants and Elec	tric Lines: 43.4.C 2. CEA Technical

### Annex V

# Annexure-XX

			Status of Recording Instrum	ents (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 S	station Event logger/SAS s	tatus			
				<u></u>				Status of Action be	eing taken
S. No.	Name of	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 commissioning / rectification of station event logger (in case of non- existence or unhelathy EL)	Tenetative date for commissioning/healthiness	Any other remarks
	Division		00010/						N.
			220KV	No	No	No YES	No	No	No
		220KV S/S Azizpur 220KV S/S Hardoi	220KV 220KV	YES No	YES No	No	No	No	No
	T&CD,		220KV	YES	YES	YES			
1		220 KV SITAPUR	220KV	No	No	No	No	No	No
	5 1		220 KV	YES	YES	NO			
		220 KV NIGHASAN	220KV	YES	YES	NO			
		220 KV GOLA	220KV	YES	YES	YES			
2	TROD Condo	220 KV GONDA	220/132/33 KV 220/132/33	NOT AVAILABLE					
2	T&CD, Gonda	220 KV BALRAMPUR 220KV BAHRAICH	KV 220/132/33	NOT AVAILABLE					
			KV						
		765kV Unnao	765kV	No	-	-	-	31.08.2024	-
3	T&CD, Sarojini	400kV Unnao	400kV	Yes	Healthy	No	31.05.2024	-	-
J	Nagar	220K v <sup>I</sup> Salojini Ivagai	400kV 220kV	Yes No	Unhealthy -	-	31.05.2024	- 31.08.2024	-
		220KV/35KV Dam	220kV 220kV	Yes	- Healthy	Yes			-
		Chambel Haman	22UNV	105	ricaluly	105	-	-	-
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	220KV S/S DOHNA 220 KV PILIBHIT 220 KV AMARIYA 220 KV Badaun	400KV 220KV 220KV 220KV 220KV 220 KV 220 KV	YES YES No SAS SAS Not Installed	YES YES N/A YES YES	YES YES N/A NO YES			All elements not connected due to exhausted capacity - - -
			220 KV	SAS	Yes	Yes			<u> </u>
			220 KV	Not Installed					
			220 KV	SAS	No				
		220KV Hardoi Rd	220KV	NO	-	•	-	-	ļ
		220KV GIS Kanpur Rd	220KV	Yes	Yes	Yes	-	-	ļ
		220KV Bijnor Rd.	220KV	Yes	Yes	Yes	-	-	ļ
		220 KV SS CHINHAT	220 KV	NO	NA	NA			<b> </b>
6	T&CD Lucknow	220 KV SS C G CITY	220 KV	NOT WORKING	Unhealthy	NA			
		220 KV SS K ROAD 220 KV SS BKT	220 KV	YES YES	Healthy	SYNC			<b> </b>
		220 KV SS BKI 220 KV SS GOMTI NAGAR	220 KV 220 KV	NO	Healthy NA	SYNC NA			
		220 KV SS GOM II NAGAR 220 KV SS SATRIKH ROAD	220 KV 220 KV	NO YES	NA Healthy	NA SYNC			
		220 KV SS SATRIKH ROAD 220 KV SS BARABANKI	220 KV 220 KV	YES	Healthy	SYNC			<del> </del>
						F			1

								DETAI	LS OF TIME SY	NCHRONISA	TION OF R	ELAY WITH GPS CLOCK A	AT 765/400/220	KV SUBSTATION									
1				Diffactor des cuos	x		GITAGE OF T	UNITED OF LINE						onsas or icri				WHETHER BUS BAR PL DYNORIC	NTECTON IS THE NEED				
840.	Name of Division	NAME OF US		WHETHER WORKING P SVIELARS	NARTHER OF CLOCK HAR SUPPORTING OF PORTS UNP, NE AS LETC		ABAR OF TRANSMESON LAS	Mark 1	MALIN 2		840.	NAME OF ICT	PARTICIDA	HV SOE BACK UP PROTECTOR	LV BOE BACK UP PROTECTION	NP PROTECTION	OVERLUXBLE	NV 102	12304	INVESTIGATION CONTRACTORS	INSTANCE OF IT THE DIVIDUAL OF IT THE	WHETHER OF SCHEME IS ON DINCHRONIZO	å siter being taken and tenka date of syndroxitation
		20KV 3.5 Targetangur	OPLODOX IL COMMINI	OR CLOCK R.MCT WORKING	OPE CLOCK HALE SUFFICIENT HE OF PORTS		Visi ad asses anala Visi ad asses anala Visi ad asses anala Visi ad Andrew 202 XV Panlar Stee	ant sair ant sair	MOTION -	unt tour unt tour	1 2 3	TAN MAIN IFT A TAN MAIN IFT A TAN MAIN IFT	MAT INSU MAT INSU MAT INSU	ann nair ann nair	unt taur unt taur unt taur	whit sour		unt sour unt sour	unnar unnar	NOT APPLICABLE	ACT UNC	ANT APPLICABLE	
		Delphagur				÷	220 KV Herbit Ine Vel de Autor Ine 220 KV Astron Ine	MOTING NOTING	MOTION MOTION MOTION	LOT TOP NOT TOP		142 Mills XCT 4											
		220Ki QʻLHanini	OPECIDIX IL AVAILABLE	OPE GLOCK IS WORKING	OPS GLOCK HALSSUFFICIENT NO OF PORTS	-	220 W Dubjehangur Inn 1999 M Aufresse Tex	NOT DISC.	MOTOR/	ket tok	3	140 Milli XT 4 141 Milli VT 4	anc without	LINC LINT NUT	unrear.	ant top	ure nor	unrear	untar	NOT APPLICABLE	ACT DISC	NOT APPLICABLE	
	T&CD, Shahjahanpur					1																	
		222 CV UK BRIJVIK	OPS CADOX IS NOT ANALASSE				220 KV BKT LINE 220 KV BPN POCA LINE 220 KV KNYDAN LINE	NOT DISC.	NOT ENC.	NET THE		140 M/A 708 140 M/A 708	NOT DISC NOT DISC	901 990 901 990	NOT THE	NOT DISC.	NOT DINC	NOTONC	NOT DAY	NOT APPLICABLE	NOT APPLICABLE	ACT APPLICABLE	
		220 KV 1/5 KANDUN	OPECIDOX IL AVAILABILE	OPE GLOCK IE MORRING	GPS GLOCK HALL SUFFICIENT NO OF PORTS	2	228 KV SETAPLIK LINK 228 KV NIDAJALJAN 228 KV POLIL JIKO J JAM 228 KV POLIL JIKO J JAM	NOT THE	MITTER:	NOT THE		THE MACH THE	MALE REP.	107 Mar	we car	w <sup>12</sup> 000'	we tak	un t tour	worner.				
		122 O 11 M D 6144	OPS GLOCK IS NOT AVAILABLE						MART DON'	with the second	1		and some	NOT TOWN	MOT TOTAL	NOT THE	107 100r	wit some	107 Mar.	NOT 3YNC	NOT STINC	NOT APPLICABLE	
_			UT LECT & BUT APLANA			2	220 KV SOLA LINE 220 KV KINILINE	NDT BYNG NDT BYNG	NOT BYNG	NOT BYING NOT BYING	2	162 M/A 705 162 M/A 705 1 162 M/A 705 2	NDT RYNG NDT RYNG NDT RYNG	NOT 30100 NOT 30100 NOT 30100	NET RYNE NET RYNE NET RYNE	NOT SYNC NOT SYNC NOT SYNC	NOT SYNC NOT SYNC NOT SYNC	NOT BING NOT BING NOT BING	NOT RYNE NOT RYNE NOT RYNE	NOT SYNC NOT SYNC	NOT SHILL NOT SHILL	NO DIVISION	
		220,532 Kir Genda	OPECADOX IL A MARABAR	OPE GLOCKE WORKING	OPS GLOCK HALSUFFICIENT NO OF PORTS		222 KV PSCILLINI 223 KV PSCILLINI	NOT MINE NOT MINE NOT MINE NOT MINE	NGT 3795 NGT 3795 NGT 3795 NGT 3795	NOT MING		220/112 KV 200 MV 8 KT -1 220/112 KV 200 MV 8 KT -1	NOT IPING	NOT INNO	NOT MING	NOT SINC	NOT YOUR	NOTANK	NGT XING NGT XING	NOT APPLICABLE	NOTING	NOT APPLICABLE	
2	TBCD, Ganda									NOT MINE NOT MINE NOT MINE		220/111 0/ 100 Million 07 J	Server Server	MOT DOM:	MAR MAN	and total	are user	NOTIVING	are use				
		220/132 KV Bah-sadi	GPS CLOCK IS RUBLABLE	GPS CLOCK IS NOT WORKING	GPS CLOCK HAS SUPPLICENTING OF PORTS							220/182 KV 100 MILBUET	NOT STNC	NOT INNO	NOT INNE NOT INNE NOT INNE	NOT WINE	307.3350	NOT 3396	NOT YOUR	NOT APPLICABLE	NOTIVING	NOT APPLICABLE	
		THE EXTENSIO	GPS CLOCK IS NOT AVAILABLE	NOT APPLICABLE	NOT APPLICABLE				MACES MADE		1	765/000 EV 1000 MILL (27 -1 765/000 EV 1000 MVA (27 -1 566/000 EV 1000 MVA (27 -1 1000 MILL (200 MILL (27 -20	VNCEY M/P VNCEY M/P	NINC BY MITP NINC BY MITP NINC BY MITP NOT NINC NOT NINC NOT NINC NITC NINC	NUMC BY SINCE SUMC BY SINCE LODGE BY SINCE	VINCEF MOP VINCEF MOP VINCEF MOP	VINCER MOP VINCER MOP VINCER MOP MOTIONC MOTIONC MOTIONC	VINCEY MOP VINCEY MOP	MINE BY MATP MINE BY MATP MADE BY MATP MATE MATP	NOT APPLICABLE	SINCEY SNIP	NOT APPLICABLE	
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		400/233 KY UNINO	OPS GLOCK IS AN INLAND	GPS CLOCK IS WORKING	OPS CLOCK DOES NOT HAVE SUPPLOES NO OF PORTS	1	400 KV UNINAO BARELY ZUNE 000KV UNINAO BARELY ZUNE	1000- 10000 10000	NOT STAT	NOT 1796 NOT 1796										NOT SINC	NOT SINC	NOT SINC	MOT SHOWING COM TIME (APPROXIMATELY MINING ADVING
						1	220 KV UNING-PHOOL BAGH 1 LINE		NOT APPLICABLE	NOT APPLICABLE	1	220/112 KV 160 MIA (CT -)	NOTIVAL	NOTIVINE	NOTIONC	NOTIVING	NOTIONC	NOTIVING	NOTAPPUCABLE				
						1	220 KV UNINO-PHODU MIGH 2 LINE 220 KV UNINO- BTHODKUME			NOT APPLICABLE	2	220/112 KV 140 MVA K7 -0 220/112 KV 140 MVA K7 -0	NOT SINC	NOT SINC	NOT INC	NOT SINC	NOT SINC		NOT APPLICABLE				
		330/132 KY UMMAD	GPS CLOCKIS NOT KINILABLE	NOT APPLICABLE	NOT APPLICABLE	4	220 KYUNNAO-RPH LNE 220 KYUNNAO-GISKANPUR KDAD LNE	NOTAPPLICABLE	NOT APPLICABLE	NOT APPLICABLE										GPS CLOCK IS NOT	GPS CLOCK IS NOT AVAILABLE	GPS CLOCK IS NOT AVAILABLE	NO EVENT LOGGER INSTALLED
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Sr.No	Station Name	Voltage Level	Disturbance recorder/station event logger healthy (Yes or No)	Standardisatio n (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 Synchronise d	
51	Baghpat	220kV	DR and event logger are inbuilt in relays.(Yes) No centralised event logger is available.	Yes	Partially Synchronise d	
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 reco	rding instrum	ents (220 kV & above	station of PT	CUL)	-
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	

#### https://mail.grid-india.in/owa/#path=/mail

## Annexure-XXI

# 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;

### \*\*\*Warning\*\*\*\*

This email has not originated from Grid-India. Do not click on attachment or links unless sender is reliable. Malware/ Viruses can be easily transmitted via email.

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@gridindia.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

\*CAUTION: This mail has originated from outside Adani. Please exercise caution with links and attachments.\*

उत्तर प्रदेश राज्य भार प्रेषण केन्द्र लि० यू०धो०एस०एल०डी०सी०परिसर, विभूति खण्ड ।।,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

Dated: - 07 08 2024

No: - 2661 /SE(R&A)/EE-II/SPS 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

(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.
- 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) 06/08/2024, 13:10

001.bmp

UNSIDE CORPERS कार्यालय OFFICE OF THE अधीक्षण अभियन्ता SUPERINTENDING ENGINEER विद्युत पारेषण मण्डल **Electricity Transmission Circle** उ०प्र०पावर द्रांसमिशन कारपोरेशन लि० U.P. Power Transmission Corporation Ltd. 132 KV Bhopa Road Sub-station 132 के०वी० भोपारोड उपकेन्द्र मुजफ्फरनगर-251001 Muzaffarnagar-251001 Ph. (0131-2608038 दुरमाष (0131-2608038 E-mail : seetcmzn@upptel.org, seetcmzn@gmail.com RATED S. Jost-24 संख्या / No. /E.T.C./MZN/400 KV S/S Shamli 1062

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
	1	otal	251	164

 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.15 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			132 KV Jasala	58	1	1	1	1
2	Uttar Pradesh		132 KV Kairana-I	20.5		1		1
3	Case-1 =50 MW	220 KV	132 KV Kairana-II	20.5	-	Sec. 1		1
4	Case-2 =100 MW	Subsatatio	132 KV Lalukheri	72	+	-	1	1
5	Case-3 =200 MW Case-4 = 300 MW	n, Shamli	132 KV Jinjhana	80	2010		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			132 KV Jasala	38	1		-1	
2	Uttar Pradesh		132 KV Kairana-I	13.5	1		1	1
3	Case-1 = 50 MW	220 KV	132 KV Kairana-II	13.5 .	-		1	1
4	Case-2 -100 MW	Subsatatio	132 KV Lalukheri	47	· · · · ·	1	1	1
5	Case-3 = 200 MW Case-4 = 300 MW	n, Shamli	132 KV Jinjhana	52	-	201	1	1
	Case-4 - 200 M W	No. States	Total Relief	164	51.5	99	164	164

1/1

#### 002.bmp

Alternatively HVDC Mundra-Mahendargarh SPS may be shifted to 400 KV Sub-Station Shamli, details of 132 m 400 KV Sub-Station Shamli with its Maximum and Average load is as follows :

S.No. Name of feeder	Name of feeder	Connected Load (MVA)	Maximum Load (MW)	Average Load (MW)	
			53		
1	132 KV Budhana		78	51 .	
2	132 KV Kharad	63+40	19		
-	132 KV Jalalpur	40+40	41	21	
3		63+63+40	74	48	
4	132 KV Thanabhawan	and the second se	35	23	
5 132 KV Kaniyan	40+40		303		
	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

Lord Condition

(). In	Maximum Load Co	indicitori -				1.		
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
			132 KV Budhana	82	-			1
1	Uttar Pradesh		132 KV Kharad	78		1000	1	
2	Case-1 50 MW		132 KV Jalalpur	41	1	-	1	1
3	Case-2 100 MW	Subsatatio	132 KV Thanabhawan	74		1	-	
4	Case-3 - 200 MW		132 KV Kaniyan	35	1	1	•	1
5	Case-4 = 300 MW	B. C. S.	Total Relief	310	76	109	201	310

# (B). In Average Load Condition :-

5. 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
372			132 KV Budhana	53		1		
-	Uttar Pradesh	1.1.1.1.1.1.1.1	132 KV Kharad	51	1	1		
2	Case-1 =50 MW	400 KV	132 KV Jalalpur	27			1	1-1-1-
3	Case-2 =100 MW	Subsatatio	132 KV Thanabhawan	48				
4	4 Case-3 -200 MW		132 KV Kaniyan	23				1
5	Case-4 -300 MW		Total Relief	202	51	104	202	202

Submitted for information and necessary action

with . (Nikhil Kumar) Superintending Engineer

दिनाके / DATED

#### संख्या / No.

### /E.T.C./MZN/

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



Superintending Engineer (R&A) 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
Thana Bhawan -2	25	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.
Jasala-1	25	Only one line exists.
Jasala-2	25	Only one fine exists.
Kharad-1	50	Only one line exists which is normally kept
Kharad-2	50	open at Kharad and load of Kharad is normally fed from 400kV Shamli S/s.
Baraut-1	150 (case-4)	No such line exist at 220kV Shamli S/s.
Baraut-2	150 (case-4)	INO SUCH THE CAISE at 220KV Shahin 5/8.

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. 22. /ETCC-MT/

## Superintending Engi Dated/- 30/05 124

- 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/NewEngl.etter01

## **Rajasthan Details**

S.No.	Name of Sub- Station	Feeder name as per existing detail	Revised name of Existing Feeder /Line/Equipment	Average Load relief (MW )	Remark		
		132 kV GSS Mundawar	132 kV GSS Pinan	25			
1		132 kv GSS Bansoor	132 kV GSS Telco	45			
	220 kV GSS Alwar	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					
		132 kV GSS Gangapur	132 kv GSS Karoi	15			
3	220 kV GSSV Bhilwara	132 kV GSS Danta	132 kV GSS Danta	30			
5	220 KV GSSV Dilliward	132 kV GSS Devgarh	132 kV GSS Bankali	18			
		132 kV GSS Kareda	152 KV G55 Balikali	10			
		132 kV GSS Kuchera	132 kV GSS Dhawa	25			
4	400 kV GSS Merta	132 kV GSS Lamba	- 132 kV GSS Lamba jatan	55			
		132 kV GSS Gotan					

## Revised updated feeder details (radial) along with expected average Load Relief

Email

Email

# 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>, "XEN MP Hisar" <xenmpcchsr@hvpn.org.in>, "XEN MP CC" <xenmpccggn@hvpn.org.in>

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

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# 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 <sesIdcop@hvpn.org.in>;

#### 2 attachments (209 KB)

Email SPS Rewari.pdf; Regarding SPS Bhiwani.pdf;

#### \*\*\*\*Warning\*\*\*\*

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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"

<sup>&</sup>lt;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 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

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--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 - <u>xentsbhw@hvpn.org.in</u> Phone No: 01664-242797(O)

То

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 2 <sup>nd</sup> 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 2 <sup>nd</sup> 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 2 <sup>nd</sup> 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

1. SE/TS Circle, HVPNL, Hisar for kind information, please.

# 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>;

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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 CKTI	120
2	220 KV BAMNAULI-PAPANKALAN-I CKTII	120
3	220 KV MANDAULA- GOPALPUR CKTI	212
4	220 KV MANDAULA- GOPALPUR CKTII	214

Regards,

SLDC Delhi

On Tue, Aug 27, 2024 at 10:07 AM NRLDC SO 2 <<u>nrldcso2@grid-india.in</u>> 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.)		
	220/66kV Gobindgarh	66kV Talwara-19(ADANI SPS)	375	430		
	220/00kV Gobinugarn	66kV Talwara-2(ADANI SPS)	375	430		
Punjab		66kV Gill road-1(DADRI SPS)	543	610		
Control Area	220/66kV Lalton kalan	66kV Gill Road-2(DADRI SPS)	518	692		
		66kV Dugri(DADRI SPS)	325	450		
		66kV Malerkotla(ADANI SPS)	213	403		
	220/66kV Malerkotla	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
	220/132kV Alwar	Sh. Vijaypal Yadav XEN (Prot.)	9413361407	xen.prot.alwar@rvpn.co.in
	220/132RV Alwal	Ms. Pooja Verma AEN (Comm)	9413375366	aen.comm.alwar@rvpn.co.in
	220/12214/ Detenderh	Sh. Mukesh Somra AEN (MPT&S) , Sh.	9414061442	aen.mpt&s.rtg@rvpn.co.in
	220/132kV Ratangarh	Dharmender Singh ( Comm.)	9413383246	aen.comm.ratangarh@rvpn.co.in
Rajasthan	220/132kV Bhilwara	Sh. Madhusudan Sharma, AEN (SLDC-comm	9413383176	aen.subsldc.bhl@rvpn.co.in
		Sh. Suresh Garg, XEN (MPT&S)	9414061424	xen.mpts.bhl@rvpn.co.in
	220/12210/ Morto	Mukesh Kumar (AEN Prot.) Mahip	7734806466	aen.prot.mertacity@RVPN.CO.IN
	220/132kV Merta	Singh (Aen) Comm)	9413362995	aen.comm.merta@RVPN.CO.IN
BBMB	400/220kV Bhiwani(BBMB)			
	400/220kV Hissar(PG)			
	Bhiwani(PG)			
POWERGRID	400/220kV Bahadurgarh(PG)			
	400/220kV Dhanonda	Gautam / SSE, 400kV Dhanonda	9313472669	dhanonda400kv@gmail.com
Haryana	220kV Lulahir	Er. Subhash Chander	9416373135	sse220kvlulaahir@hvpn.org.in
naryana	220kV Rewari	Er. Kavinder Yadav	9315315649	sse220kvrwr@hvpn.org.in
	132kV Charkhi Dadri	Vivek Sangwan	9034459489	sse132kvdadri@hvpn.org.in
	220/66kV Gobindgarh	Er. Harwinder Singh	96461-18184	ae-220kvg1-mgg@pstcl.org
Punjab	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.
UP	400kV Muradnagar	Er. D.S. Sengar	9412748666	ee400mrd2@upptcl.org
Delhi	400/220kV Bamnauli			
Deun	400/220kV Mandola			

# Summary of df/dt operation during May-June 2024

			Loa	d throw-off	quantum (St	ate-wise)		Total Load	
Date	Time	Delhi	Punjab	Haryana	Rajasthan	UP	Uttarakhand	throw-off quantum	Remarks
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 ru	n/black start sch	edule plan for 202	4-25	Remarks
S.No.	Name of Generatiing	Fuel	Compliance to 34.3 of IEGC for mock trial runs (Last date on	Tentaive schedule	e plan for mock trial run	
	Station	Туре	which mock drill carried out)	Black start exercise of generating unit (dead bus charging)	Mock black start of subsytem (black start of generating unit / island operation / synchronidation)	
NTPC	1	1			1	
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 NHPC	Koldam HEP	Hydro	14-Mar-24	12-03-2025	12-03-2025	
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 13	Chamera HPS-III URI-I	Hydro Hydro	04-Dec-17 20-Dec-16	1st week of December 1st week of December	1st week of December 1st week of December	
13	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 18	Sewa-II Parbati-3	Hydro	29-May-22 22-Dec-20	3rd week of November 4th week of December	3rd week of November 4th week of December	
18	Kishanganga	Hydro Hydro	22-Det-20	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	
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			
				s due to Tandem operation	1	
IPPGCL(Ir	1 1 3	nerating	Corporation Ltd.)/ Delh	I Gencos	ſ	
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 Haryana	Rithala(TPPDL)	Gas				Not in operation
34	Western Yamuna	Hydro				
Himachal	Canal (WYC-I & II) Pradesh	L			<u> </u>	
35	Bhabha	Hydro				
36	Bassi	Hydro				
37	Ghanvi	Hydro				
38 39	Giri Larji	Hydro Hydro				<u> </u>
40	Phojal	Hydro				
41	Sainj HEP	Hydro				
42	Swara Kuddu HEP	Hydro				
43 Malana P	Bajoli Holi HEP ower Company Ltd.	Hydro				
aiana F	company can					

	Mock	trial ru	n/black start sch	edule plan for 202	Remarks	
				<b>_</b>		
			Compliance to 34.3 of	Tentaive schedul	e plan for mock trial run	
	Name of Generatiing	Fuel	IEGC for mock trial			
44	Malana-I	Hydro	12-Mar-24			
	ower Company Ltd.		1		Π	
45	Malana-II Power Ltd.	Hydro	03-Jan-19			
46	AD Hydro	Hydro	27-Jan-23	24-02-2025	24-02-2025	
JSW			1		1	
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 geang any support from OEM alaer COVID-19 The planning for changing the governing system is in Process.
50 Jammu &	Sorang HEP Kashmir	Hydro				
51	Kasnmır Baghlihar-I	Hydro				
52	Baghlihar-II	Hydro				
53	Lower Jhelum	Hydro	20-Dec-16			
54 Punjab	Upper Sindh	Hydro	20-Dec-16		1	
	Jogendernagar/					
55	Shanan	Hydro				
56 57	UBDC Mukerian	Hydro Hydro				
	Anandpur Sahib					
58	(APS)	Hydro				
59	Ranjit Sagar (Thein Dam)	Hydro		04-05-2024	04-05-2024	
Rajasthar		<u> </u>			ļ	
60	Ramgarh GT Extn.	Gas				
61	Dholpur CCPP	Gas				
	Rana Pratap Sagar		10 1			
62	(RPS)	Hydro	16-Jan-11			
63 64	Jawahar Sagar Mahi Bajaj Sagar I	Hydro Hydro	21-Jul-15			
65	Mahi Bajaj Sagar II	Hydro	24-Mar-16			
Uttar Pra	desh	1				
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				
	h power Venture Ltd.	Lud				
71 Uttrakha	Vishnu Prayag IPP nd	Hydro				
72	Ramganga	Hydro				
73	Chibro	Hydro				
74 75	Dhalipur Khodri	Hydro Hydro				+
76	Khatima	Hydro				
77	Chilla	Hydro				
78 79	Maneri Bhali-I Maneri Bhali-II	Hydro Hydro				
80	Vyasi HEP	Hydro				
81	Dhakrani HEP	Hydro				
82 83	Kulhal HEP Gamma GPS	Hydro Gas				
83 84	Sravanti GPS	Gas	NA	NA	NA	
L&T						

	Mock	trial ru	Remarks			
S No.	Name of Generatiing	Fuel	Compliance to 34.3 of IEGC for mock trial	Tentaive schedule	e 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

Sr. No.	Scheme Name	State Control Area	Date of review of SPS	-	Tentaitve schedule of SPS Mock testing during 2024-25	Remarks
			-	out		
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 39	SPS for Transformers at 400kV Ajmer (RVPN) Substation	Rajasthan				
	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	<u> </u>			
42 43	SPS for Transformers at 400kV Bhadla (RVPN) Substation SPS for Transformers at 400kV Ratangarh (RVPN) Substation	Rajasthan Rajasthan	<u> </u>			
43	SPS for Transformers at 400kV Ratangarh (RVPN) Substation SPS for Transformers at 400kV Nehtaur(UPPTCL) Substation	Uttar Pradesh	+	05-07-2022	<u>                                     </u>	
44	SPS for Transformers at 400kV Nentaur(OPPTCL) Substation SPS for Transformers at Obra TPS	Uttar Pradesh		03-07-2022	counducted on 20-05-2024	
45	SPS for Transformers at 400KV Kashipur (PTCUL) substation	Uttarakhand		03-09-2023	Septemeber 2024	
40	SPS for Transformers at 400KV Kashipur (Prece) substation SPS for Transformers at 400KV Fatehgarh Solar Park (AREPRL)	ADANI		05 05 2025	Septemeber 2024	
47	SPS to relive transmission congestion in RE complex (Bhadla2)	POWERGRID				
48	SPS to renve transmission congestion in RE complex (Bradiaz) SPS for Transformers at 400kV Bikaner (RVPN) Substation	Rajasthan				
50	SPS for Transformers at 400kV Bikaler (NVFN) Substation	Delhi		06-09-2023		
51	SPS for Transformers at 400kV Balwara (RVPN) Substation	Rajasthan		00 05 2025		
52	SPS for Transformers at 400kV Hinduan (RVPN) Substation	Rajasthan				
53	SPS for Transformers at 400kV Suratgarh (RVPN) Substation	Rajasthan				

# 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 **31**<sup>st</sup> **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 31<sup>st</sup> 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.

(S Usha)

Power System Elements	Tests	Applicability
Synchronous Generator	<ol> <li>Real and Reactive Power Capability assessment.</li> <li>Assessment of Reactive Power Control Capability as per CEA Technical Standards for Connectivity</li> <li>Model Validation and verification test for the complete Generator and Excitation System model including PSS.</li> <li>Model Validation and verification of Turbine/Governor and Load Control or Active Power/ Frequency Control Functions.</li> <li>Testing of Governor performance and Automatic Generation Control.</li> </ol>	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)	<ol> <li>Real and Reactive Power Capability for Generator</li> <li>Power Plant Controller Function Test</li> <li>Frequency Response Test</li> <li>Active Power Set Point change test.</li> <li>Reactive Power (Voltage / Power Factor / Q) Set Point change test</li> </ol>	Applicable as per CEA Technical Standards for Connectivity.
HVDC/FACTS Devices	<ul> <li>(1) Reactive Power Controller (RPC) Capability for HVDC/FACTS</li> <li>(2) Filter bank adequacy assessment based on present grid condition, in consultation with NLDC.</li> <li>(3) Validation of response by FACTS devices as per settings.</li> </ul>	To all ISTS HVDC as well as Intra-State HVDC/FACTS as applicable

## Annexure-I: TESTS REQUIRED FOR POWER SYSTEM ELEMENTS

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			MVA	Make of			GT Det	ST Details			Sector	Control	Туре		and Reactiv ability asses		Assessment of Control Capab Technical S conne	ity as per CEA andards for	complete Gene		tation System	Turbine/G	overnor an	d verification of d Load Control or uency Control 15.	Testing of Gov performance and a Generation Co	utomatic	Revised Simulation	n Models	
S. No	Name of Plant	Unit	Capacity	Rating	Units	COD	Voltage Ratio	GT MVA Capacity	Tap Ratio of GT (Present	Head/No n Pit-	Name of Utility	Sector	Area	te (d	Last tested on (dd/mm/ yyyy)	Whether due?	Tentative Schedule date	Last tested on (dd/mm/ du yyyy)			Whether due?	Tentative Schedule date	Last tested on (dd/mm/y yyy)	Whether due?		Last tested on (dd/mm/ yyyy)	Tentative Schedule date	Whether Revised Models Submitted?	Remarks
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S. M	). Name of Plant	Unit	Installed	MVA	Make of	COD		GT Deta		Type (Pondage	Name of Utility	6	Control	Capa	nd Reactive bility asses		Control ( Techn	as per CEA ards for		tion test for Excitation	of Turbin Co Power,		r and Load tive Control	Test perform	ing of Gove ance and A eration Co	utomatic	Revised Simulation	n Models
3.1	. Name of Plant		Capacity	Rating	Units	00	Voltage Ratio		Tap Ratio of GT	/RoR etc.)	Name of Ounty	Sector		Last tested on (dd/mm/ yyyy)		Tentative Schedule date	Last tested on (dd/mm/ yyyy)	Tentative Schedule date	Last tested on (dd/mm/yyyy)	Tentative Schedule date	Last tested on (dd/mm/y yyy)	Whether due?	Tentative Schedule date		Whether due?	Tentative Schedule date	Whether Revised Models Submitted?	Remarks
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S. No.	Name of Plant	Unit	Installed	MVA	Make of	COD		GT Deta	ails	-	Name of Utility		Control	Туре		and Reactive ability asses		Contro	ment of Read of Capability a hnical Standa connectivi	as per CEA ards for	for the com Excit	fication test ator and m	Co Power,		r and Load tive Control	Test perform	ing of Gove ance and A eration Cor	utomatic	Revised Simulation	n Models
5. NO.	Name of Plant	Unit	Capacity	Rating	Units	COD	Voltage Ratio	GT MVA Capacity	Tap Ratio of GT (Present Tap/Total Taps)		Name of Utility	Sector	Area	Type	Last tested on (dd/mm/ yyyy)	Whether due?	Tentative Schedule date	Last tested or (dd/mm yyyy)	n Whether / due?	Tentative Schedule date	Last tested on (dd/mm/yyyy)	Tentative Schedule date	Last tested on (dd/mm/y yyy)	Whether	Tentative Schedule date	Last tested on (dd/mm/ yyyy)		Tentative Schedule date	Whether Revised Models Submitted?	Remarks

	Name of Plant	Unit	Installed	MVA	Make of	COD		GT Deta	aits	Name of Utility	Sector	Control			ind Reactiv ibility asses		Control Techr	ent of Reac Capability a nical Standa connectivit	ards for			ator and n	Co Power,	dation and e/Governor ntrol or Act /frequency Functions.	and Load ive Control	Testi performa	ng of Gover ince and Au eration Con	tomatic	Revised Simulation	n Models
5. NO.	Name of Plant	Cap	Capacity	Rating	Units	000	Voltage Ratio	GT MVA Capacity		Name of Ubility	Sector	Area	Туре	Last tested on (dd/mm/ yyyy)		Tentative Schedule date	Last tested on (dd/mm/ yyyy)		Tentative Schedule date	Last tested on (dd/mm/yyyy)	Whether	Tentative Schedule date	Last tested on (dd/mm/y yyy)	Whether	Tentative Schedule date	Last tested on (dd/mm/ yyyy)		Tentative Schedule date	Whether Revised Models Submitted?	Remarks
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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 Read	tive Power C Generator	apability for	Power Plant Co	ntroller Fu	nction Test	Frequen	y Response	lest	Active Power	Set Point cl	ange test	Reactive Power Q) Set	(Voltage / Po Point change		Revised Simulatio	on Models
		маке			Last tested on (dd/mm/yyyy)	Whether due?	Tentative Schedule date	Last tested on (dd/mm/yyyy)		Tentative Schedule date	Last tested on (dd/mm/yyyy)	Whether due?	Tentative Schedule date	Last tested on (dd/mm/yyyy)		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 Powe	er Controller (R for HVDC/FACT		Filter bank adeo present grid cor			Validation of	response by FAC per settings.	TS devices as	Revised Simulatio	n 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.I	End 1	End 2		Compensato	Make	Fixed	Variable Compensation	Variable Compensatio	Agency	Reactive Power for	Controller (RI HVDC/FACTS	C) Capability	on pr	adequacy as esent grid co nsultation wi		validation of re	sponse by FAC per settings.	TS devices as	Revised Simulatio	on Models
0			No.	r Location		Compensation	Positive	n Negative		Last tested on (dd/mm/yyyy)	Whether due?	Tentative Schedule date	Last tested on (dd/mm/y vvv)		Tentative Schedule date	Last tested on (dd/mm/yyyy)	Whether due?	Tentative Schedule date	Whether Revised Models Submitted?	Remarks
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S.No	End 1	End 2	Line No.	End	Capacity	Make	Reactive Power for	Controller (I r HVDC/FAC1		Filter bank adeo present grid con			Validation of res	ponse by FA er settings.	CTS devices as	Revised Simulatio	n 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			

उत्तर प्रदेश राज्य भार प्रेषण केन्द्र लि० य0पी0एस0एल0डी0सी0 परिसर, विभूति खण्ड- ।। गोमती नगर, लखनऊ-226010 ई मेल : sera@upsldc.org



Annexure-XXVI U.P. State Load Despatch Centre Ltd. UPSLDC Complex, Vibhuti Khand – II Gomti Nagar, Lucknow- 226010 E-mail:sera@upsldc.org

No: 359 0/CE(PSO)/SE(R&A)/EE-II/ SE (Operations), 18 – A SJSS Marg, Katwaria Sarai, New Delhi, 110016. (seo-nrpc@nic.in) Subject: Agenda for 54<sup>th</sup> PSC meeting-Regarding revision in logic of Anpara SPS

Date: 14-11- 2024

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 54<sup>th</sup> PSC meeting scheduled on 25.11.2024.

Encl: As above.

14.11.24

(Arshad Jamal Siddiqui) Chief Engineer (PSO) Date: 14-11 - 2024

# No: 3 990/CE(PSO)/SE(R&A)/EE-II/

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, 11<sup>th</sup> Floor, Shakti Bhawan Extn., Lucknow.
- 3. Director (Technical), UPRVUNL, 8th Floor, Shakti Bhawan Extension, Lucknow.

- 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.

de.

AV 14.11.24

(Arshad Jamal Siddiqui) Chief Engineer (PSO)

उत्तर प्रदेश राज्य भार प्रेषण केन्द्र लि० यू०५७८, ज्यएल०डी०सी० परिसर, विभूति खण्ड ।।,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: 37 83 /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, 11<sup>th</sup> 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.

 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.
- 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.
- 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.
- 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:-

- 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.</p>

- 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.
- 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 27<sup>th</sup> 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.
- 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 2<sup>nd</sup> 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)