



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

दिनांक:23.04.2024

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 50 वीं बैठक की कार्यसूची ।

Subject: Agenda for 50th Protection Sub-Committee Meeting.

संरक्षण उप-समिति की 50 वीं बैठक, दिनांक 29.04.2024 को 10:00 बजे से होटल क्राउन प्लाजा, ग्रेटर नोएडा में नोएडा पावर कंपनी लिमिटेड (NPCL) द्वारा आयोजित की जाएगी । उक्त बैठक की कार्यसूची संलग्न है । यह उत्तर क्षेत्रीय विद्युत् समिति की वेबसाइट (<http://164.100.60.165/>) पर भी उपलब्ध है । कृपया बैठक में भाग लेने की कृपा करे या इसके लिए उपयुक्त अधिकारियों की प्रतिनियुक्ति करें।

The 50th meeting of Protection Sub-Committee is scheduled to be held on 29.04.2024 (10:00 AM) at Hotel Crowne Plaza, Greater Noida by Noida Power Company Limited (NPCL). 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 or depute suitable officers for the same.

Signed by Dharmendra
Kumar Meena
Date: 23-04-2024 18:07:04

डी. के. मीणा
अधीक्षण अभियंता (संरक्षण)

Agenda of 50th Protection Sub-Committee Meeting (29th April, 2024)

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Agenda for
50th Meeting of Protection Sub-Committee (PSC) of
Northern Regional Power Committee

Date and time of meeting : 29.04.2024 10.00 Hrs.

Venue : Hotel Crowne Plaza, Greater Noida
(Hosted by NPCL)

A.1. Confirmation of minutes of 49th meeting of Protection Sub-Committee

A.1.1 49th PSC meeting was held on 25.01.2024. Minutes of the meeting were issued vide letter dtd. 08.03.2024. No comment has been received till the date.

Decision required from Forum:

Forum may approve the minutes of 49th PSC meeting.

A.2. Furnishing of substation details for implementation of Centralized Database for Protection Settings in Northern Region (agenda by NRPC Sectt.)

A.2.1 In 48th TCC & 70th NRPC Meeting (held on 17-18 Nov 2023), NRPC Committee has approved for development of a portal through PSDF for Centralized database containing details of relay settings for grid elements connected to 220 kV and above.

A.2.2 Further, a meeting was held on 08.01.2024 with POWERGRID to deliberate on tendering, wherein POWERGRID desired number of sub-stations and elements for which relay details shall be modelled in Centralized Database for preparation of estimate of work for implementation of the portal.

A.2.3 In view of above, it was requested vide letter dtd. 23.01.2024 (**Annexure-I**) to NRLDC/NLDC and SLDCs of Northern region to furnish the details of all elements connected at 220 kV and above, in respective control area latest by 30.01.2024.

A.2.4 A reminder mail dtd. 06.02.2024 was also sent for the same.

A.2.5 Further, in 216th OCC meeting held on 14.02.2024, SLDCs were requested to furnish the details of all elements connected at 220 kV and above of Transco, Generators, IPPs, TBCB projects and Private utilities in respective control area latest by

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28.02.2024 and NRLDC was requested to follow up with concerned CPSUs for submission of details latest by 28.02.2024.

A.2.6 The status of received details is attached as **Annexure-II**.

A.2.7 In order to implement the Centralized Database for Protection Settings in Northern Region, the required details are to be submitted by the concerned utilities so that approval may be taken in PSC.

A.2.8 Further, it has also been learnt that PSDF Fund has been blocked till March 2025. Therefore, forum may deliberate on future course of action for implementation of project.

Decision required from Forum:

Forum may consider to finalize the total no. of relays and substations to process the implementation Centralized Database. Forum may also deliberate on future course of action in view of delay in PSDF fund.

A.3. Proposal for line differential protection between 33KV OG feeder at UPPTCL Transmission substation and 33KV incomer feeder at NPCL 33KV S/s (agenda by Noida Power Company Limited)

A.3.1 NPCL vide letter dated 22.04.2024 (**Annexure-III**) has intimated issues in relay setting co-ordination with following sub-stations of UPPTCL:

- i. 220/132/33 kV Sector-123
- ii. 220/33 kV Sector-148
- iii. 220/33 kV RC Green
- iv. 132/33 kV Surajpur

A.3.2 NPCL has proposed following solution:

- i. Line differential protection as main and OC/EF backup.
- ii. Proper relay setting co-ordination between substations of UPPTCL and NPCL.

Decision required from Forum:

Members may deliberate on the above issue and proposal of NPCL.

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A.4. Submission of protection performance indices to NRPC Secretariat on monthly basis (agenda by NRPC Secretariat)

A.4.1 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*

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

A.4.3 Accordingly, the status of the indices reported for the months from Jan-2024 to March-2024 is attached as **Annexure-IV**.

A.4.4 Further, the summary of events that caused indices less than unity is also attached as **Annexure-V**. The concerned utilities are supposed to submit the reason for the same and corrective action taken to resolve the issue.

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- A.4.5** In view of above, it is requested that utilities may submit the performance indices of previous month by 7th day of next month element wise along with the reason for indices less than unity and required corrective action.

Decision required from Forum:

Members may deliberate.

A.5. Protection philosophy for Power Transformer and Reactor of Northern Region (agenda by NRPC Secretariat)

- A.5.1 In 71st NRPC meeting the finalized protection philosophy for Northern Region was approved in line with the decision of 49th Protection Sub-Committee meeting.
- A.5.2 In addition to that, draft protection philosophy for power transformer and reactor has been added and attached as **Annexure-VI**.
- A.5.3 After the finalization, the same will be put for approval of NRPC forum in upcoming meeting.

Decision required from Forum:

Members may discuss and finalize the philosophy accordingly.

A.6. Annual protection audit plan for FY 2024-25 (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).*
 - *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.6.2 In the 48th & 49th PSC meetings, each utility was requested to submit the Annual protection audit plan.

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- A.6.3 In view of above, some utilities have submitted their annual audit plans (enclosed as **Annexure-VII**) and others may submit annual audit plan for FY 2024-25 at the earliest. Further, the utilities may submit the protection audit report (for audited S/s as per submitted plan) to NRPC Secretariat and may update the compliance status regularly.

Decision required from Forum:

Utilities may submit annual audit plan for FY 2024-25 and comply the same timely. Compliance report for the audited substation may be submitted.

A.7. Constitution of committee for 3rd Party Protection Audit of identified Substations (agenda by NRPC Secretariat)

- A.7.1 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.7.2 Further, a Standard Operating Procedure (S.O.P.) for Protection System Audit (attached as **Annexure-VIII**) was circulated by NPC division of CEA wherein it is recommended to form a committee to conduct 3rd party protection audit of substations.

- A.7.3 Accordingly, a letter vide dated 06.02.2024 (**Annexure-IX**) was also sent to all members of NRPC for seeking the nomination(s) for conducting protection audit. The received nominations are attached as **Annexure-X**.

- A.7.4 As per discussion of 49th PSC meeting, Himachal Pradesh was recommended to have 3rd party protection audit at Kunihar, Baddi. Status is awaited.

- A.7.5 In view of above, committees having members from received nominations may be formed to conduct 3rd party protection audit substations based on recommendation of forum.

Decision required from Forum:

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Members may please discuss and form the suitable committees for the 3rd party protection audit of recommended substations.

A.8. Reports of prolonged non-compliance of the recommendations of the protection audit (agenda by NRPC Secretariat)

- A.8.1** As per discussion of the 14th meeting of NPC held on 03.02.2024, NPC division, CEA has desired (**Annexure-XI**) to monitor the exception report of prolonged non-compliance of the recommendations of the protection audit. Minutes of the meeting is attached as **Annexure-XII**.
- A.8.2** In view of above, utilities are required to send protection audit reports (internal/external) and its compliance status against observation points.
- A.8.3** Accordingly, prolonged non-compliance of the recommendations of the protection audit may be identified and same can be furnished to NPC, division by NRPC Secretariat.

Decision required from Forum:

All utilities are requested to provide the protection audit reports and compliance status of the same. Concerned utility may be directed to expedite the necessary required action of non-compliance of the recommendations of the protection audit.

A.9. External agencies conducting Third Party Protection Audit in Northern region (agenda by NRPC Secretariat)

- A.9.1** As per discussion of the 14th meeting of NPC held on 03.02.2024, the list of external agencies for conducting Third Party Protection Audit may be prepared by the Protection sub-group of NPC for reference.
- A.9.2** In view of above, NRPC Secretariat has to provide the list of external agencies for conducting Third Party Protection Audit to NPC division, CEA.
- A.9.3** As per standard practices and previous exercises done by utilities, it is requested that utilities may convey the names of external agencies for conducting Third Party Protection Audit to NRPC Secretariat so that same may be conveyed to NPC

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Division, CEA.

A.9.4 Accordingly, a list is to be prepared for the same.

Decision required from Forum:

Members may kindly intimate list of external agencies who have conducted Third Party Protection Audit in their organizations in past years.

A.10. Discussion on the comments provided by NRLDC on the SOP for Protection System Audit (agenda by NRPC Secretariat)

A.10.1 A Standard Operating Procedure (S.O.P.) for Protection System Audit (attached as **Annexure-XIII**) was circulated by NPC division of CEA.

A.10.2 Further, the status of implementation of approved SOP was discussed in the 14th NPC meeting held on 03.02.2024, Grid-India has submitted comments (**Annexure-XIV**) on the draft minutes of that meeting regarding approved SOP for protection system audit.

A.10.3 Members may kindly provide inputs/suggestions on the GRID-India comments. After finalization of suggestions, the same will be conveyed to NPC division, CEA.

Decision required from Forum:

Members may discuss and provide suggestions on the GRID-India comments on SOP for protection system audit.

A.11. Review of "Procedure and flow chart for approval of Protection Settings by NRPC Secretariat for "First Time Charging" (agenda by Adani Power Limited, Adani Green Energy Limited & Adani Energy Solution Limited)

A.11.1 In reference to the minutes of 49th PSC meeting issued vide letter dated 08.03.2024, it was decided at the A.4.6 as below:

Subsequently, it was gathered that the FTC procedure will remain same as being done by NRLDC. However, approval of protection settings shall be required from NRPC.

A.11.2 In view of above, Adani Power Limited vide letter dated 18.04.2024 & Adani Green

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Energy Limited vide letter dated 18.04.2024 & Adani Energy Solution Limited (All are attached as **Annexure-XV**), have highlighted following:

- i. Protection settings based on Protection Philosophy are considered as per the NRPC guidelines and further submitted to NRLDC for approval before FTC, therefore seeking separate approval from NRPC may take additional coordination & time.
- ii. As per regulation 14(2) (b) of IEGC 2023 approval of concerned RPC is required for i) any revision in settings and ii) implementation of new protection system for **grid connected** users. Therefore, it is not required during FTC.
- iii. requested to re-consider exclusion of this additional approval process from the FTC procedure.
- iv. Accordingly, deliberation on re-consideration of the requirements on obtaining approval of protection settings by NRPC in addition to the existing NRLDC approval for the FTC may be done.

A.11.3 Procedure followed by SRPC and WRPC are attached as **Annexures-XVI** and **Annexure-XVII** respectively.

A.11.4 In brief, procedure of SRPC for implementation of approval of protection settings is as below:

- a. 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.
- b. 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 SRPC/SRLDC for every new element to be commissioned. The mentioned information shall be submitted to the SRPC/SRLDC two months in advance for all the elements proposed to

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be commissioned. SRPC shall furnish the approved settings within forty days from the date of submission of the settings by the entity.

- c. The **Protection Coordination Sub-Committee** of SRPC shall review and approve the settings based on the inputs /report submitted by the entities.
- d. 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 SRPC. The owner entity shall inform all the adjacent entities about the change being carried out.
- e. SRPC in consultation with the SRLDC & Southern 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 SRPC & SRLDC. The modifications/changes, if any, in protection settings shall be advised to the respective users and STUs.

A.11.5 In brief, procedure of WRPC for implementation of approval of protection settings is as below:

- a. In case a new transmission line/element is to be synchronized first time, the new element entity should approach respective CTU/STU/concerned utility where it is getting connected, for getting details of line parameter at remote end, and the distance relay's settings and zone timings.
- b. The utilities at the remote end should provide the relay settings at their end along with the requisite data for carrying out protection setting of the new transmission line/element.
- c. The Bus fault levels of the incidental system to the new elements shall be provided by WRLDC/SLDC, as the case may be, to the utility proposing to connect the new element.
- d. The new utility shall then arrive at their settings for distance relays zone reach and timings and for that it shall adopt the overall settings of distance relay as per the guidelines approved in "Model Setting Calculations for typical IEDs, Line Protection Setting guide lines, Protection System Audit check list, Recommendations for Protection Management sub-Committee on

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Relay/Protection under Task Force for Power System Analysis under Contingencies” report and the CBIP guidelines on protection system relaying.

- e. The zone reaches and timings shall have to be suitably coordinated with the settings adopted in the remote stations. The settings at the remote S/Ss be modified in line with guidelines provided in “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” report and the CBIP guidelines on protection system relaying.
- f. The new Utility shall consult with all the remote end Utilities, and the setting revisions shall be agreed by all these Utilities. The agreement of these settings be conveyed to WRLDC/WRPC for getting the new element connected to ISTS. WRLDC based on the above information shall allow integration of new element in the system.
- g. These settings shall be forwarded to WRLDC/SLDC and with copies to CTU/STU/concerned utility and WRPC.
- h. The agreed settings shall be as an interim arrangement which is required to ratified in PCM of WR. The Utility concerned should put up the settings of its system (new element) and remote end settings to WRPC before the next PCM, for getting this approved in PCM of WR.
- i. For doubts or disagreement, if any, the matter can be referred to WRPC PCM, after adopting interim settings as above.

A.11.6 In view of above, form may deliberate and finalize the process (protocol) for approval of protection settings in NR.

A.11.7 Accordingly, decision may be taken on received application for approval of protection settings from HVPN, AYANA, HPPTCL, and PSTCL.

Decision required from Forum:

Forum may kindly discuss and devise appropriate course of action in view request of ADANI and practice followed in other RPCs.

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A.12. Furnishing of details of non-compliant Disturbance Recorder (agenda by NRPC Secretariat)

A.12.1 As per clause 17 of IEGC 2023;

The time synchronization of the disturbance recorders shall be corroborated with the PMU data or SCADA event loggers by the respective RLDC. Disturbance recorders which are non-compliant shall be listed out for discussion at RPC.

A.13.1 In the 48th PSC meeting, it was decided that concerned utilities shall do the needful for time synchronization of disturbance recorders with PMU data or SCADA event loggers and shall share the list of DRs which are non-complaint within one month's time.

A.13.2 In view of above, BBMB and Gorakhpur Circle (UPPTCL) have provided the required data. Utilities are again requested to share list of DRs which are non-complaint.

Decision required from Forum:

Utilities may share list of non-compliant DRs and do the needful for the compliance.

A.13. Points of NLDC for discussion (agenda by NLDC)

A.13.1 Following issues of Northern Region related to Generation, RE raised by NLDC for discussion are as below-

- a. In order to enhance grid connectivity of RAPP generation complex it is proposed to review of directional and non-directional earth fault and over current setting at 400kV Chittorgarh Stn(RS) to accommodate the N-1 loading limit of RAPP A,B and C evacuation during contingencies. The revised instantaneous over current setting of 3X315MVA ICT are proposed to be 1.2p.u.
- b. The multiple pole tripping issue of HVDC Champa-Kurukhetra due to lane change over issue and software issue.
- c. In order to address the high loading issue during contingencies suitable SPS provision to be provided in KTPS evacuation lines.
- d. The sub synchronous damping controller to be made functional at Champa and Kurukshetra end.
- e. The sub synchronous damping controller to be made functional in STATCOMs

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at Bhadla, Fatehgarh, Bikaner.

- f. The IBR based solar PV/WTG generators are non-complying LVRT/HVRT standards as per CEA technical standards for connectivity to grid regulation 2019 during tripping instances. The reason of non-compliance needs to be explained by RE generators.
- g. Root cause analysis along with remedial action plan to be explained by RE generators during High frequency oscillations in RE complex during high solar hours.

Decision required from Forum:

Forum may kindly discuss and issue necessary direction to the concerned.

A.14. Review of SPS scheme no. SPS/NR/GEN/01 SPS for reliable evacuation of power from NJPS, Rampur, Swara Kuddu, Baspa Sorang and Karcham Wangtoo HEP (agenda by HPPTCL)

- A.14.1 HPPTCL vide letter dated 27.03.2024 has submitted proposal for review of SPS for evacuation of power from NJPS, Rampur, Swara Kuddu, Baspa Sorang and Karcham Wangtoo HEP (attached as **Annexure-XVIII**).

Decision required from Forum:

Forum may deliberate on above proposal.

A.15. Issuance of General Guideline on Power Swing blocking for feeders emanating from generating stations (agenda by RVUNL)

- A.15.1 A major Grid Disturbance occurred on dated 29.03.2024 resulting in tripping of all the running units of KTPS, Kota on Over Frequency/ Over Speed Protection as not enough corridors was available for power evacuation.
- A.15.2 There were 09 no. available 220 KV feeders and during disturbance two of them tripped on power swing.
- A.15.3 RVUNL has desired discussion on Power Swing blocking be done in Zone -1 for feeders emanating from generating stations. A General Guideline may be issued by the forum on this issue.

Decision required from Forum:

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Forum may discuss and decide appropriate step.

A.16. Status of remedial actions recommended during 49th PSC meeting (agenda by NRLDC)

- A.16.1 As per the discussion in 49th PSC meeting, necessary remedial actions were recommended based on the analysis and discussion of the grid events. Details of the event analysis and recommended points is attached as **Annexure-XIX**. 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. Constituents can email the details via mail to NRLDC and NRPC.

Decision required from Forum:

Members may like to discuss.

A.17. Status of Bus bar protection (agenda by NRLDC)

- A.17.1 Clause - 4 in schedule - V of Central Electricity Authority (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations, 2022 reads as:
"Bus bar protection and local breaker backup protection shall be provided in 220kV and higher voltage interconnecting sub- stations as well as in all generating station switchyards".
- A.17.2 During analysis of many grid incidents/disturbances, it has been found that the Busbar protection at the affected substation was not present or non-operational which resulted in considerably increasing both the number of affected elements and fault clearance time. Accordingly, it becomes critical to monitor and keep Busbar protection at all the 220 kV and above voltage level substations healthy and operational.
- A.17.3 Continuous follow-ups have been done to expedite the commissioning of bus bar protection at 220kV & above stations and also to ensure their healthiness. On the basis of details received till date, it is observed that status of bus bar protection has been improved however, further improvement is desired.
- A.17.4 Constituent wise status of bus bar protection where bus bar protection is either not installed or installed but not operational along with present status as per detail received from constituents is attached as **Annexure-XX**.
- A.17.5 Constituents are requested to share the present status of remedial action taken/to be

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taken regarding commissioning and healthiness of bus bar protection at 220kV & above substations and also expedite the implementation of bus bar protection.

Decision required from Forum:

Members may like to discuss.

A.18. Replacement of electromechanical relays with numerical relays (agenda by NRLDC)

- A.18.1 Clause-37.2(c) of IEGC, clause-15(4) of CEA Grid standards and clause-48(4) of CEA Construction Standards 2022 mandates that *"each line or transformer or reactor or any other bay shall be provided with facility for disturbance recording, event logging and time synchronizing equipment"*.
- A.18.2 During analysis of grid incidents/disturbances, it has been found that there are few stations where electromechanical relays are still in use and thus disturbance recorders are not available there which accounts for violation of Clause-37.2(c) of IEGC, clause-15(4) of CEA Grid Standards and clause 48(4) CEA Construction Standards 2022.
- A.18.3 In addition, clause-3 in part III (Grid Connectivity Standards applicable to Transmission Line and Sub-Station) of Standards for Connectivity to the Grid, 2007 reads as
"Two main numerical Distance Protection Schemes shall be provided on all the transmission lines of 220 kV and above for all new sub-stations. For existing sub-stations, this shall be implemented in a reasonable time frame"
- A.18.4 It is known that Disturbance recorder (DR) is essential for analysis of grid incidents/disturbances. Its non-availability eventually affects the proper analysis of grid incidents/disturbances and monitoring of protection system.
- A.18.5 Deliberation on same subject has also been done during 48th PSC. During the meeting, all the constituents/SLDC/STU were requested to review the same in their control area and take expedite actions to replace electromechanical relays with numerical relays.
- A.18.6 Constituent wise details of static/electromechanical type protection relays at their respective substations along with its present status per detail received from constituents is attached as **Annexure-XXI**.
- A.18.7 Constituents are requested to share the status of remedial action taken/to be taken

Agenda of 50th Protection Sub-Committee Meeting (29th April, 2024)

regarding replacement of static/electromechanical relay with numerical relays at 220kV & above substations and also expedite the process of replacement of static/electromechanical relay with numerical relays.

Decision required from Forum:

Members may like to discuss.

A.19. Frequent outage of 800kV HVDC Champa-Kurukshetra inter-regional link (agenda by NRLDC)

- A.19.1 It has been observed that frequency of tripping of HVDC Champa-Kurukshetra has increased. 06 no of events of multiple pole trippings has been observed in this link since January 2024. List of all the tripping of HVDC Champa-Kurukshetra is enclosed as **Annexure-XXII**. The tripping of this high-capacity link may cause overloading of other parallel transmission lines and further tripping may cause cascade tripping.
- A.19.2 It is also well known that, on account of summer, the Northern Region load would remain high till September and therefore, high import requirement exists for the Northern Region. Thus, the HVDC Champa-Kurukshetra inter-regional link is a very important link for fulfilling the Northern Region demand requirement.
- A.19.3 It has been observed that major fault is either due to DC line fault, filter protection, software issues, protection mal-operation etc. The reason of most of the tripping seems similar indicating the repetitive nature of fault/tripping.
- A.19.4 POWERGRID(NR-1) is requested to elaborate on the issues and status of remedial measures taken/to be taken to avoid frequent tripping of this inter-regional link.

Decision required from Forum:

Member may like to discuss.

A.20. Review of protection system and load management in KTPS, RAPS generation complex in view of event of complete outage of the complex on 5th Jan24 & 29th Mar24 (agenda by NRLDC)

- A.20.1 On 29th March at 20:22hrs, multiple elements tripping occurred in RAPS, KTPS generation complex. KTPS, RAPS-A, RAPS-B & RAPS-C generation station got blackout during this incident. Initiating incident was blast of R-ph CT at 220kV side of 220/132kV 160MVA ICT-1 at Kota Sakatpura(Raj). As bus bar protection is not

Agenda of 50th Protection Sub-Committee Meeting (29th April, 2024)

available at Kota Sakatpura S/s, few of the 220kV lines tripped on Z-4 protection operation and Z-2 protection operation at Kota Sakatpura & KTPS respectively. Simultaneously, the remaining 220kV lines got significantly overloaded and tripped on distance protection operation during power swing. Thereafter due to lack of evacuation path, over frequency occurred in systems and KTPS units tripped on over frequency. SUTs at RAPS-B tripped for initiation of house load operation but it failed. SUTs of RAPS-C also tripped for switching of auxiliary supply to UTs but it also failed due to mismatch in frequency. It resulted in the tripping of RAPS-B & C units. Island formed with RAPS-A unit with the load of Debari and Chittorgarh which operated till 20:47hrs and later collapsed due to tripping of turbine generator on over fluxing. Detail analysis report of the tripping event is available on the link https://nrlcdc.in/Websitedata/Docs/Documents/Tripping%20Report/Preminilary%20Report/2024/03%20Mar/2024_03_29_KTPS_RAPS_%20Grid%20event.pdf

A.20.2 Similar events of blackout in KTSP, RAPS generation complex occurred on 05th January'24. Frequent disturbance in this complex having significant quantum of nuclear generation is serious issue. Necessary remedial actions at RAPS, KTPS and RVPN end need to be expedited to avoid any such event in future. Detail analysis report of the tripping event is available on the link https://nrlcdc.in/Websitedata/Docs/Documents/Tripping%20Report/Preminilary%20Report/2024/01%20Jan/2024_01_05_Grid%20event%20at%20%20KTPS_RAPS_Rajasthan.pdf

A.20.3 Deliberation on 05th January'24 event was done during 216th OCC meeting. KTPS, RAPS & Rajasthan were requested to take necessary remedial actions to take necessary remedial actions and share the details of remedial actions taken as agreed during discussion in 216th OCC meeting. Further, an online meeting was conducted on 05th April 2024, RAPS, KTPS & SLDC-Rajasthan agreed to take following remedial actions:

RAPS:

- i. Over flux protection in generator at RAPS-A was 112.5% instantaneously. Now, the time delay has been kept as 4sec on recommendation of NPCIL design team.
- ii. During the event, when frequency reached 51.5Hz, SUT of unit-4 at RAPS-B tripped and ATS breaker closed successfully. However, it got blocked as there is tie breaker connected to auxiliary bus feeding unit-3 auxiliary supply.

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On recommendation of design team, a logic has been implemented in which tie breaker will also trip along with SUT incomer breaker so that ATS scheme will not get blocked. Further review of ATS logic at RAPS-B is being done by NPCIL design team.

- iii. SUT-5&6 tripped on over frequency (51.5Hz with 200msec delay) and initiated the ATS to shift the total auxiliary load on UTs. However, due to mismatch in frequency at both the side of auxiliary bus, ATS failed and units at RAPS-C tripped. Review of ATS logic at RAPS-C is being done by NPCIL design team.
- iv. RAPS-C will explore the possibility of keeping total auxiliary load at 400kV side.
- v. RAPS will take necessary remedial actions to ensure the healthiness and availability of SCADA data.

Rajasthan:

- i. Commissioning of bus bar protection at 220/132kV Kota Sakatpura S/s will be expedited. (Rajasthan informed that material has been arrived, commission is getting delayed to workmanship. It will be commissioned in 2.5-3 months).
- ii. 220kV KTPS-Kota (PG) D/C will be kept in closed condition. Rajasthan will prepare a SOP for monitoring of import/export through these lines for any decision making required.
- iii. Rajasthan will connect the 220kV Chittorgarh with the 400/220kV Chittorgarh. It will strengthen the connectivity of RAPS with the grid. Possibility to operating 220kV Debari in ring may also be explored. (During 219 OCC meeting, Rajasthan informed that 220kV Chittorgarh has been connected with 400/220kV Chittorgarh on 17th April).
- iv. Separate display of RAPS, KTPS generation complex to be made at SLDC control room for effective decision monitoring and decision making. (During 219 OCC meeting, Rajasthan informed that separate display of RAPS, KTPS complex has been made and effective monitoring is being done.).
- v. Faulty RTUs also need to be rectified at the earliest to ensure the healthiness and availability of SCADA data.
- vi. Rajasthan will further explore the possible load management in this complex to avoid high overloading of 220kV lines.

A.20.4 In view of aforementioned grid disturbances in this complex, wherein all the reactors at RAPS-A, B & C tripped and went under poison out state, review of protection

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system and load management in the KTPS, RAPS generation complex (KTPS, RAPS-A, B & C and 220/132kV Kota Sakatpura) need to be done. Implementation of suitable SPS in KTPS evacuation lines may be explored to address the high loading issue during contingencies in this complex.

- A.20.5 A separate committee may be formed at RPC forum to review the protection system and load management in the KTPS, RAPS generation complex and to recommend necessary remedial actions to avoid such major grid disturbance in this complex in future.

Decision required from Forum:

Member may like to discuss.

A.21. Grid disturbance in 220kV Kunihar, Baddi complex during Feb'24 (agenda by NRLDC)

- A.21.1 Frequent events of multiple elements tripping have been reported in recent past (on 02nd Feb, 08th Feb and 16th Feb) in HP control area. Major affected substations were 220kV Kunihar, Baddi and Bhabha. Significant quantum of load in the range of 400-700MW affected during these grid events. Brief of events are attached as **Annexure-XXIV**.
- A.21.2 During Aug-Sept 2023 also, Grid events at Kunihar area were reported. Those events were discussed in 48th PSC meeting and PSC forum had recommended third party protection audit of Kunihar S/s. However, no update on the same have received and multiple events in recent past indicates that issues related to protection system and their coordination at these affected stations are still existing.
- A.21.3 DR/EL and detail analysis of any of these events have not received from HP. Therefore, HP is requested to analyse the tripping events in detail and share following details w.r.t. all three grid events occurred in Feb'24:
- Disturbance recorder and event logger details of all the tripped elements.
 - Sequence of tripping of elements.
 - Details of protection operated along with their protection settings.
 - Tripping analysis report along with corrective actions taken / planned to be taken.
- A.21.4 As per IEGC clause 37.2 (c), Disturbance Recorder (DR), station Event Logger (EL),

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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.21.5 During 48th & 49th PSC meeting, third party protection audit of this complex i.e., 220kV Kunihar, Baddi, Bhabha was recommended. However, no details in this regard received from HP. HP is requested to take necessary remedial actions on priority.

Decision required from Forum:

Member may like to discuss.

A.22. Availability and Standardization of recording instrument (Disturbance recorder and Station Event Logger) (agenda by NRLDC)

- A.22.1 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.22.2 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.22.3 Data of recording instruments (DR/EL) are very helpful in grid event analysis and also 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.22.4 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.22.5 In view of above, all the constituents are requested share the details w.r.t. availability and standardisation of disturbance recorder and event logger at the station of their respective control area in format attached as **Annexure-XXIII**.

Decision required from Forum:

Members may like to discuss.

Agenda of 50th Protection Sub-Committee Meeting (29th April, 2024)

A.23. Analysis of the tripping events occurred during January-2024 to March-2024 and status of remedial action taken (agenda by NRLDC)

- A.23.1 The list of major tripping events occurred during January-2024 to March-2024 is attached as **Annexure-XXIV**. Concerned constituents/utilities are requested to share the detailed analysis of the tripping elements along with status of remedial action taken/to be taken.

Decision required from Forum:

Members may like to discuss.

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

S. No.	NRPC Member Organization	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	SrGM-AM	DevanandKushwaha@powergrid.in
5	NLDC*	Executive Director	scsaxena@grid-india.in
6	NRLDC*	Executive Director	nroy@grid-india.in
7	NTPC	GM(OS-NR)	dmandal@ntpc.co.in
8	BBMB	Director (P&C)	ddpntjmp@bbmb.nic.in
9	THDC*	Chief General Manager (EM-Design)	rrsemwal@thdc.co.in
10	SJVN	Additional General Manager	prakash_chand@sjvn.nic.in
11	NHPC	General Manager (O&M)	hod-om-co@nhpc.nic.in
12	NPCIL*	Director (Finance)	df@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)	ce.ld@rvpn.co.in
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	bharatgujardti@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	GM-T	satyendrap@ipgcl-ppcl.nic.in
28	HPGCL	SE(Tech)	setechhg@hpgcl.org.in
29	RRVUNL*	CMD	cmd@rrvun.com
30	UPRVUNL	Chief Engineer, (L-2)	ce.ppmm@uprvunl.org
31	UJVNL*	Managing Director	mdujvnl@ujvnl.com
32	HPPCL*	Managing Director	md@hppcl.in
33	PSPCL*	CMD	cmd-ppcl@pspcl.in
34	UHBVN	Managing Director	md@uhbvn.org.in
35	Jodhpur Vidyut Vitran Nigam Ltd.	Managing Director	MD.JDVVNL@RAJASTHAN.GOV.IN
36	Paschimanchal Vidyut Vitaran Nigam Ltd.	Managing Director	md@pvvnl.org
37	UPCL*	Managing Director	md@upcl.org
38	HPSEB*	Managing Director	md@hpseb.in
39	Prayagraj Power Generation Co. Ltd.*	Head (Commercial & Regulatory)	sanjay.bhargava@tatapower.com
40	Aravali Power Company Pvt. Ltd*	CEO	SRBODANKI@NTPC.CO.IN
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*	CEO	sk.narang@larsentoubro.com
44	Lanco Anpara Power Ltd*	President	sudheer.kothapalli@meilanparapower.com
45	Rosa Power Supply Company Ltd	GM-ELECTRICAL	kesarinandan.pandey@relianceada.com
46	Lalitpur Power Generation Company Ltd	President	rnbedi.ltp@lpgcl.com
47	MEJA Urja Nigam Ltd.	DGM-EMD	rajeevpandey@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	iyotiprakash.panda@jsw.in
50	TATA POWER RENEWABLE*	Zonal Head, NR	dhmahabale@tatapower.com
51	UT of J&K*	Chief Engineer, JKPCCL	cejkpcl2@gmail.com
52	UT of Ladakh*	Chief Engineer, LPDD	cepladakh@gmail.com
53	UT of Chandigarh	Executive Engineer	elop2-chd@nic.in
54	Noida Power Corporation Limited	Head – Power Purchase	ssrivastava@noidapower.com
55	Fatehgarh Bhadla Transmission Limited	AGM- Protection and Metering	ashish.baviskar@adani.com
56	NTPC Vidyut Vyapar Nigam Ltd.	CEO	ceonvvn@ntpc.co.in

* Organizations from where nominations are not received for PSC, members of NRPC have been mentioned. Nomination for PSC forum may be sent at the earliest.



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

Date: 23.01.2024

सेवा में,
NRLDC/NLDC and SLDCs as per attached list (via e-mail)

Sub: Furnishing of substation details for implementation of Centralized Database for Protection Settings in Northern Region-reg.

Ref: Minutes of 48th TCC and 70th NRPC meeting held on 17th and 18th Nov 2023.

Reference is invited to implementation of Centralized Database for Protection Settings in Northern Region as discussed and approved in 48th TCC & 70th NRPC meeting (held on 17-18 Nov 2023).

In view of preparation of estimate of work for implementation of the same, it is required to know the number of sub-stations and elements for which relay details shall be modelled in Centralized Database.

Therefore, it is requested that following details of all elements connected at 220 kV and above, in your control area, may kindly be provided as under-

Voltage Level	Substations		Transmission lines		ICTs/GT		Reactors	
	No. of Substations	No. of Relays in substations	No. of Transmission lines	No. of Relays	No. of ICTs	No. of Relays	No. of Reactors	No. of Relays
765kV								
400kV								
220kV								
HVDC S/s								

It is requested to provide the above details **latest by 30.01.2024**.

Signed by D. K. Meena

Date: 24-01-2024 18:07:56

Reason: Approved
(डी. के. मीणा)

अधीक्षण अभियंता (संरक्षण)

I/33303/2024

Addressee list				
S. No.	NRPC Member	Category	Nominated/ Notified/ Delegated Member	E-mail
1	NLDC	National Load Despatch Centre	Executive Director	scsaxena@grid-india.in
2	NRLDC	Northern Regional Load Despatch Centre	Executive Director	nroy@grid-india.in
3	Delhi SLDC	State Load Despatch Centre	General Manager	gmsldc@delhisldc.org
4	Haryana SLDC		Chief Engineer (SO&C)	cesocomml@hvpn.org.in
5	Rajasthan SLDC		Chief Engineer (LD)	ce.ld@rvpn.co.in
6	Uttar Pradesh SLDC		Director	directorsldc@upsldc.org
7	Uttarakhand SLDC		Chief Engineer	anupam_singh@ptcul.org
8	Punjab SLDC		Chief Engineer	ce-sldc@punjabsldc.org
9	Himachal Pradesh SLDC		Chief Engineer	cehpsldc@gmail.com
10	J&K SLDC		Chief Engineer, JKPTCL	jksldc4@gmail.com ; sojppdd@gmail.com

Centralized database Portal			
Sr. No.	Utility	No. of Substation	No. of Relays
1	UPPTCL (Lucknow, Jhansi, Praygaraj, Meerut)	129	2798
2	765/400KV ANPARA 'D'TPS SWITCHYARD	2	94
3	400KV MUNPL Meja (2x660MW)	1	88
4	DTL	46	1387
5	BBMB	24	1078
6	HPPTCL	12	255
7	NHPC	13	298
8	Obra	2	115
9	OCBTL	2	66
10	Ghatampur Transmission Limited	0	29
11	PGCIL	96	9172
12	PTCUL	14	261
13	Rosa Power Supply Company Ltd	2	77
14	RVPN	143	7226
15	JAYPEE VISHNUPRAYAG HYDRO - ELECTRIC PLANT (4X100 MW)	0	14
16	Western U.P. Power Transmission Co. Ltd	15	356
17	ALAKNANDA HYDRO POWER COMPANY LIMITED	1	50
18	ANPARA C	2	118
19	2X660 MW Adani Power Ltd. Kawai	1	57
20	Lalitpur Power Generation Company Limited	2	114
21	AD hydro substation	1	24
Total		508	23677

P-90B/1909

Dated: 22.04.2024

To,

Superintendent Engineer (Protection),

Northern Regional Power Committee (NRPC),
Shaheed Jeet Singh Marg, Qutab Institutional Area,
New Delhi, Delhi 110016

Sub: Agenda for 50th Protection Sub-Committee Meeting.

Ref: 1. NRPC letter dated 15.04.2024.

Sir,

NPCL's agenda items for upcoming 50th Protection Sub-Committee Meeting are provided in **Annexure-A**.

Thanking you,

Yours faithfully,

For Noida Power Company Limited,



Sanket Srivastava

Head (Power Purchase)

Annexure-A

Agenda-1- Line differential protection between 33KV OG feeder at UPPTCL

Transmission Substations and 33KV Incomer feeder at NPCL 33KV Sw/s.

1. We would like to intimate you that Relay setting co-ordination at NPCL 33kv GIS switching s/s substation has to be done in accordance with the relay setting of 33 kV OG feeders at UPPTCL Transmission substations (220/132/33Kv Sector-123, 220/33Kv Sec-148, 220/33Kv RC Green & 132/33Kv Surajpur) as 33kv supply for NPCL is emanating from these substations.
2. Currently, Overcurrent & earth fault Protection systems are only used from the 33KV level at the UPPTCL & NPCL network. This protection system of overcurrent/earth fault is not zone-specific and Relay setting is done with time grading at UPPTCL & NPCL

Relay Settings of 33kv OG feeders (for NPCL) at UPPTCL Substations: -

Feeder Detail	Over Current	Earth Fault
33KV Fdr at UPPTCL sec-123 s/s	IDMT I> 400A TMS 0.1	IDMT Ie>80A, TMS 0.1
	DMT I>>> 4000 A with no delay	DMT Ie>>> 4000 A with no delay
	DMT High Set I>> 1400 A with 0.08 sec delay	DMT High Set Ie>> 400A with 0.08 sec delay

Relay Settings of 33kv feeder at NPCL 33kv GIS Panel: -

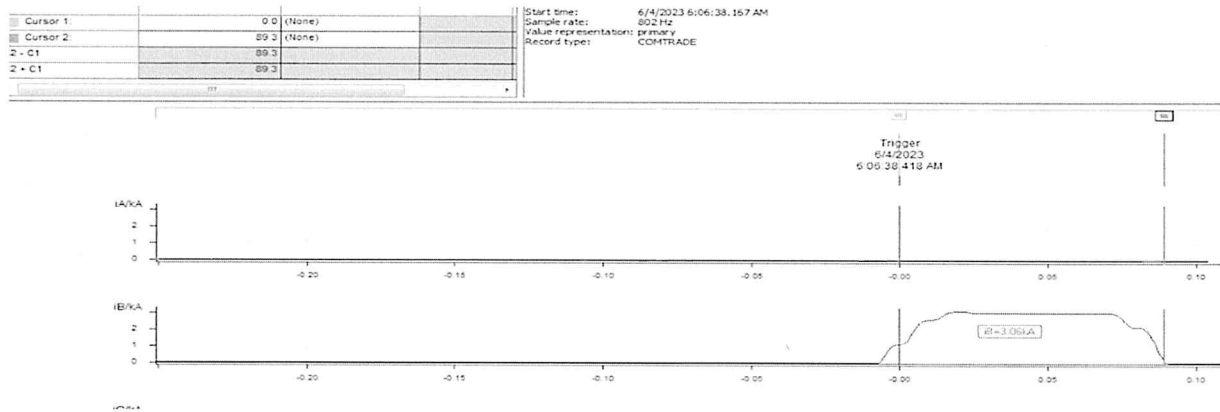
Feeder Detail	Over Current	Earth Fault
33KV OG at NPCL s/s	IDMT I> 300A TMS 0.05	IDMT Ie>40A, TMS 0.05
	DMT I>>> 1000 A with no delay	DMT Ie>>> 300 A with no delay
33KV IC at NPCL s/s	IDMT I> 370A TMS 0.1	IDMT Ie>60A, TMS 0.1
	DMT I>>> 1400 A with 0.1 sec	DMT Ie>>> 400A with 0.1 sec.

3. With the current Relay setting co-ordination, whenever a fault occurs with a Magnitude of 4000A or more at downstream, there will be unnecessary tripping of 33KV feeder at UPPTCL transmission sub-station along with 33kv OG feeder at NPCL s/s and, even trip

with fault current between 1400A to 4000A, considering the very less margin of time delay (0.08s) at 1400A is provided at 33KV OG of UPPTCL.

4. Kindly refer to the relay disturbance record for the Actual Fault isolation time by the 33KV Switchboard (Relay setting $I >>> 1000A$, $T=0ms$).

Total Break time recorded = 89.3 ms i.e. 0.089s.



Note that the total time taken by the 33KV switchboard to operate and isolate the fault will be at least a min 0.09 sec. (Relay Operating Time i.e 30ms plus Circuit Breaker Operation Time including arc quenching i.e 45 ms plus 86T relay operating time i.e 10ms plus cumulatively)

5. To increase power reliability in Greater Noida by minimizing such nuisance tripping at 33KV fdr at UPPTCL substation with downstream breaker, **we propose** zone-specific protection 'Line differential protection' (ANSI code- 87) between UPPTCL 33KV fdr and 33KV Incomer fdr at Switching s/s as main protection with IDMT Overcurrent/earth fault as backup protection.
6. This zone-specific protection will not only reduce tripping & outages but also strengthen the protection system of the network since this zone-specific protection will be fast & selective.

7. Protection Scheme with Differential Protection: -

The aim for coordination of protection devices should be to maintain the selectivity among the devices involved in several fault possibilities in order to assure safe operation and reliability of the system. In an efficient and coordinated protection system, faults are

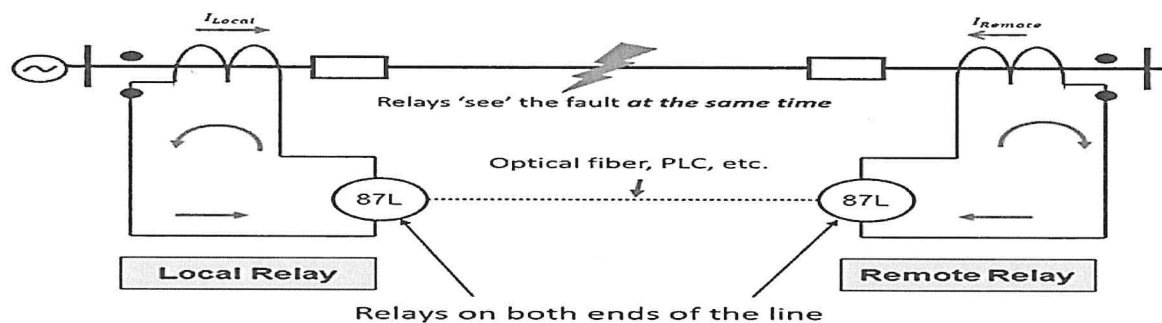
eliminated in the minimum possible time, isolating the **smallest part of the system containing the cause of the fault**.

The criteria for fault clearance must be so that the nearest device to the fault must trip and the isolated area must be as small as possible. To fulfil these criteria, the proposed method relies on the promising features of Line Differential protection and Overcurrent and relays.

The numerical differential protection relay is a Zone-specific short-circuit protection relay for cables and overhead lines in the power supply system. Due to rigorous local selectivity, the protected zone is limited at both ends of the line section and, power system topology and voltage levels play no role.

The differential protection Relay detects short-circuits using a phase-selective comparison of the current values measured by separate relays at both ends of the line in the zone to be protected, including weak current or high-resistance short circuits.

A communication link between both relays is required to exchange the measured values. The relays are designed for a fiber-optic link



Protection at UPPTCL side 33KV OG Feeder

- ANSI 87L differential as the main Protection
- ANSI 50/51 definite-time overcurrent/earth fault-time protection as backup protection

Protection at NPCL side 33KV Incomer Feeder

- ANSI 87L differential protection
- ANSI 50/51 definite-time overcurrent/earth fault-time protection
- Instantaneous Overcurrent/earth fault

Due to its selectivity, the differential protection is generally set as non-delayed, instantaneous main protection and hence, no other protection can disconnect the line more quickly and selectively.

For better understanding, kindly refer the below mention Fault Simulation at different fault conditions:

1. Fault occurred at any 33KV consumer or at 33KV downstream line with magnitude of more than 4KA
 - 33KV OG VCB at NPCL s/s will trip and isolate the fault.
 - But even after isolating the fault, upstream breaker 33KV OG VCB from UPPTCL s/s will trip affecting a very large network.

With the Proposed Scheme: - Only 33KV OG VCB at NPCL S/s will trip and no tripping in any upstream Breaker.

2. Fault occurred at any 33KV consumer or at 33KV downstream line with magnitude between 1400KA to 4000KA
 - 33KV OG VCB at NPCL s/s will trip and isolate the fault.
 - But even after isolating the fault, upstream breaker 33KV OG VCB from UPPTCL s/s may also trip, considering the very little margin of time delay (0.08s) at 1400A is provided.

With the Proposed Scheme: - Only 33KV OG VCB at NPCL S/s will trip and no chance of tripping of upstream breaker

3. Fault occurred between UPPTCL s/s and NPCL switching Sw/s with magnitude between 1400KA to 4000KA
 - No Tripping at NPCL s/s
 - 33KV OG VCB from UPPTCL s/s will trip after the delay of 0.08s.

With the Proposed Scheme: - 33KV OG VCB at UPPTCL S/s and 33KV IC VCB at NPCL s/s will trip on differential protection **without any delay** and isolate the fault from both ends.

4. Fault occurred between UPPTCL s/s and NPCL switching Sw/s with magnitude more than 4000KA
 - No Tripping at NPCL s/s
 - 33KV OG VCB from UPPTCL s/s will trip without any delay.

With the Proposed Scheme: - 33KV OG VCB at UPPTCL S/s and 33KV IC VCB at NPCL s/s will trip on differential protection **without any delay** and isolate the fault from both ends.

5. Fault occurred at any 11KV consumer or at 11KV downstream line with magnitude of more than 12KA
 - 11KV OG VCB at NPCL s/s will trip and isolate the fault.
 - But even after isolating the fault, upstream breaker 33KV OG VCB from UPPTCL s/s will trip affecting a very large network.

With Proposed Scheme: - Only 11KV OG VCB at NPCL S/s will trip and no tripping in any upstream Breaker

6. Fault occurred at any 11KV consumer or at 11KV downstream line with magnitude between 4.2KA to 12KA
 - 11KV OG VCB at NPCL s/s will trip and isolate the fault.
 - But even after isolating the fault, upstream breaker 33KV OG VCB from UPPTCL s/s may not trip and maybe trip, considering the very little margin of time delay (0.08s) at 1400A is provided.

With the Proposed Scheme: - Only 11KV OG VCB at NPCL S/s will trip and no tripping in any upstream Breaker.

The current Protection schemes and proposed protection schemes with differential protection are enclosed as **Annexure-I** & **Annexure-II** respectively, for reference.

Such protection Scheme is already implemented in Delhi and the same will help NPCL to improve power reliability and relieve the consumers of Greater Noida from unwarranted & recurring trippings of the upstream breaker.

Current Protection Scheme from UPPTCL 33KV OG fdr to NPCL network

33 kV Bus of UPPTCL

33 kV supply source from UPPTCL

33KV OG Feeder at UPPTCL S/s

Protection at UPPTCL side 33KV OG Feeder
 -ANSI 50/51 IDMT overcurrent/earth fault-time protection and Instantons OC/EF
 O/C setting - IEC NI - Ip-400 A, TMS-0.1 , Inst. - I >>>-1600 A with T-0.08sec,
 I>>>4000 with T- 0 sec
 E/F setting - IEC NI -Iep-60 A, TMS-0.1, Inst.- Ie >>>-400 A ,T-0.08sec

Four structure for metering composite CT-PT

NPCL 33/33kV Switching Substation

Protection at NPCL 33KV IC Feeder at Sw/s
 - Overcurrent/Earth fault protection
 O/C setting - IEC NI - Ip-400 A, TMS-0.1 , Inst. - I >>>-
 1200 A, T-0.1sec
 E/F setting - IEC NI -Iep-60 A, TMS-0.1, Inst.- Ie >>>-
 400 A ,T-0.1sec

O/C setting
 IEC NI - Ip-300 A, TMS-0.05
Inst. - I >>>-1000 A, T-0 s
 E/F setting
 IEC NI -Iep-40 A, TMS-0.05
Inst.- Ie >>>-250 A ,T-0 s

O/C setting
 IEC NI - Ip-250 A, TMS-0.1
 Inst. - I >>>-1000 A, T-0.1sec
 E/F setting
 IEC NI -Iep-40 A, TMS-0.05
Inst.- Ie >>>-250 A ,T-0 sec

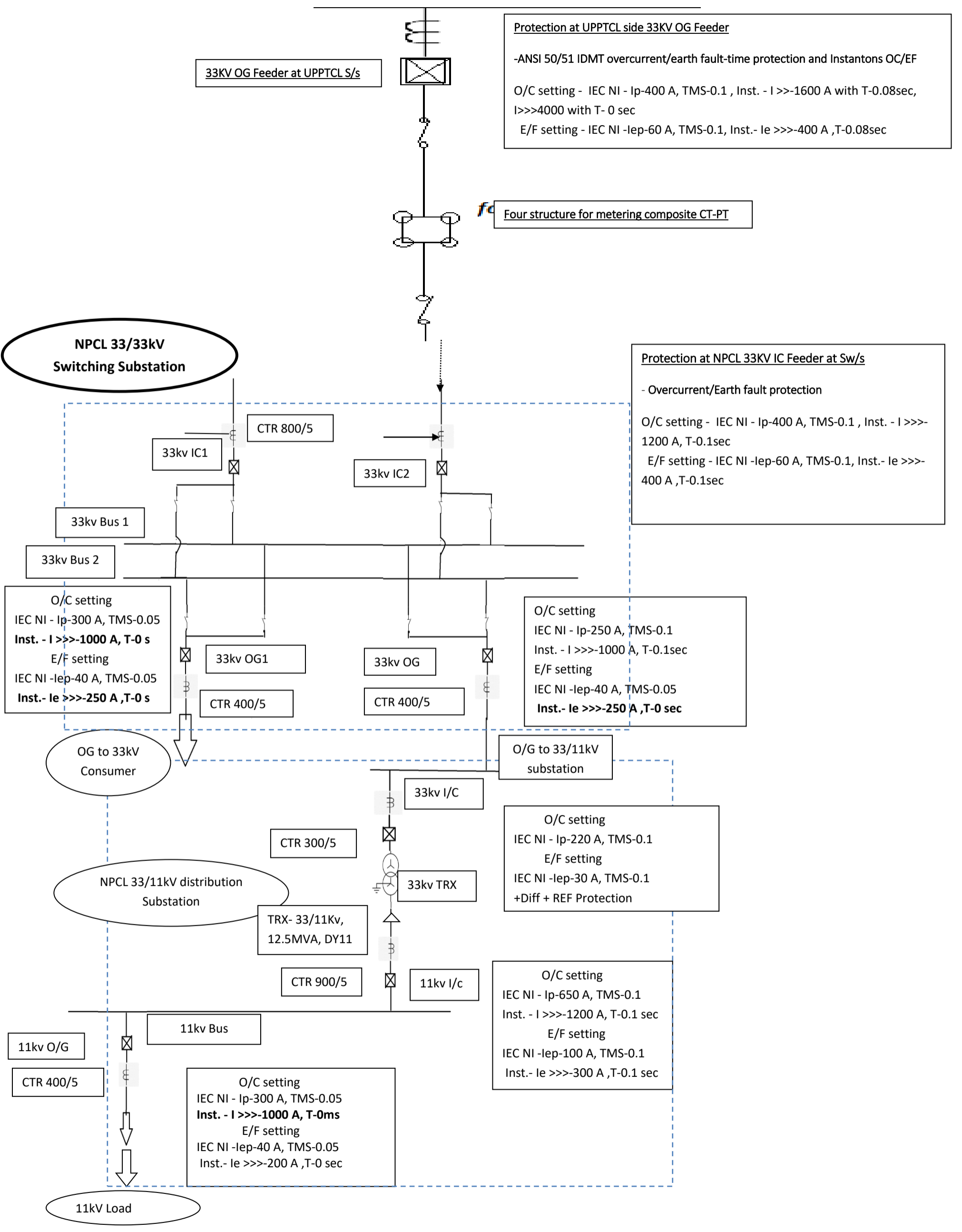
O/C setting
 IEC NI - Ip-220 A, TMS-0.1
 E/F setting
 IEC NI -Iep-30 A, TMS-0.1
 +Diff + REF Protection

O/C setting
 IEC NI - Ip-650 A, TMS-0.1
 Inst. - I >>>-1200 A, T-0.1 sec
 E/F setting
 IEC NI -Iep-100 A, TMS-0.1
 Inst.- Ie >>>-300 A ,T-0.1 sec

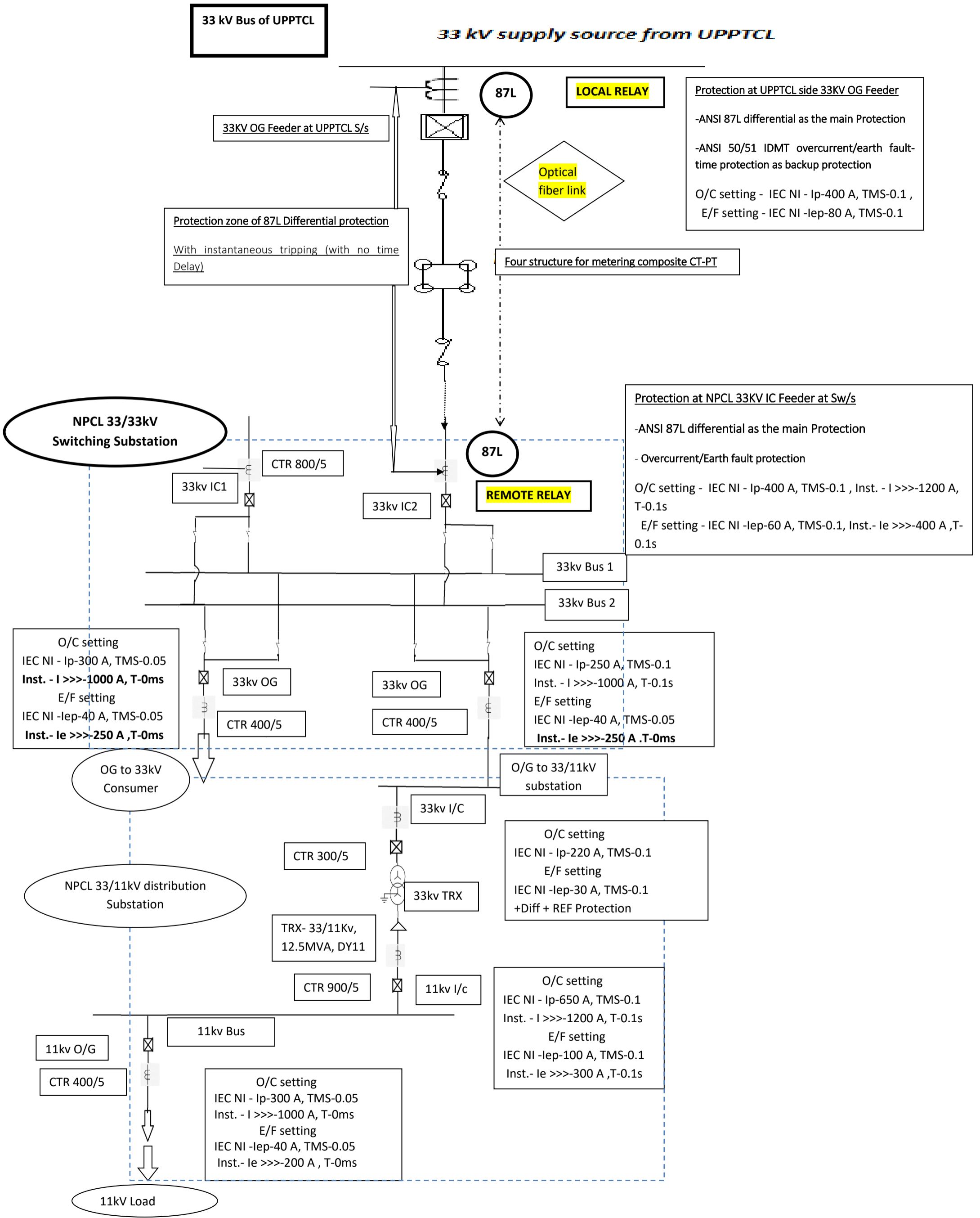
O/C setting
 IEC NI - Ip-300 A, TMS-0.05
Inst. - I >>>-1000 A, T-0ms
 E/F setting
 IEC NI -Iep-40 A, TMS-0.05
 Inst.- Ie >>>-200 A ,T-0 sec

11kv O/G
 CTR 400/5

11kV Load



Proposed Protection Scheme from UPPTCL 33KV OG fdr to NPCL network with Cable Differential Protection



Status of performance indices report of Jan. 2024		
S. No.	Utility	Status of Protection Performance indices
1	PGCIL	Received (NR-1)
2	NTPC	Not Received
3	BBMB	Not Received
4	THDC	Received
5	SJVN	Not Received
6	NHPC	Received
7	NPCIL	Not Received
8	DTL	Not Received
9	HVPNL	Received
10	RRVPNL	Received
11	UPPTCL	Received from Bareilly
12	PTCUL	Not Received
13	PSTCL	Not Received
14	HPPTCL	Not Received
15	IPGCL	Not Received
16	HPGCL	Not Received
17	RRVUNL	Not Received
18	UPRVUNL	Received from DTSP Anpara
19	UJVNL	Received
20	HPPCL	Not Received
21	PSPCL	Not Received
22	HPSEBL	Not Received
23	Prayagraj Power Generation Co. Ltd.	Not Received
24	Aravali Power Company Pvt. Ltd	Received
25	Apraava Energy Private Limited	Received
26	Talwandi Sabo Power Ltd.	Not Received
27	Nabha Power Limited	Received
28	Lanco Anpara Power Ltd	Not Received
29	Rosa Power Supply Company Ltd	Received
30	Lalitpur Power Generation Company Ltd	Received
31	MEJA Urja Nigam Ltd.	Received
32	Adani Power Rajasthan Limited	Not Received
33	JSW Energy Ltd. (KWHEP)	Not Received
34	Greenko Group	Not Received
35	Sravanthi Energy Private Ltd	Not Received
36	NTPC Renewable Energy wing	Not Received
37	RENEW POWER	Not Received
38	Adani Power Ltd	Received (Kawai)
39	Avaada Energy	Not Received
40	Mahindra Solar	Not Received
41	ACME Heeraqarh Powertech Pvt. Ltd.	Not Received
42	Tata Power Renewable Energy Ltd.	Received
43	Azure Power Pvt. Ltd.	Not Received
44	Thar Surya Pvt. Ltd.	Not Received
45	Ayana Renewable Power Pvt. LTD.	Not Received
46	CSP(JPL, Hero Future Energies	Not Received
47	ABC Renewable Energy(RJ-01) Pvt. Ltd.	Not Received
48	Eden Renewable Cite Pvt. Ltd.	Not Received
49	UT of J&K	Not Received
50	UT of Ladakh	Not Received
51	UT of Chandigarh	Not Received
52	ATIL	Not Received
53	INDIGRID	Not Received
54	POWERLINK	Not Received
55	ADHPL	Received
56	Sekura Energy Limited	Not Received
57	WUPPTCI	Not Received
58	SEUPPTCL	Not Received
59	Vishnuprayag Hydro Electric Plant (J.P.)	Not Received
60	Alaknanda Hydro Electric Plant (GVK)	Not Received

Status of performance indices report of Feb. 2024

S. No.	Utility	Status of Protection Performance indices
1	PGCIL	Received (NR-1)
2	NTPC	Received from Tanda(not in format)
3	BBMB	Not Received
4	THDC	Received from Tehri
5	SJVN	Not Received
6	NHPC	Received
7	NPCIL	Not Received
8	DTL	Received
9	HVPNL	Not Received
10	RRVNL	Not Received
11	UPPTCL	Received from Bareilly, Lucknow(Gomti Nagar, Sarojini Nagar),Gonda, Meerut zone,Sahajahanpur, Prayagraj
12	PTCUL	Not Received
13	PSTCL	Not Received
14	HPPTCL	Received
15	IPGCL	Not Received
16	HPGCL	Not Received
17	RRVUNL	Received
18	UPRVUNL	Not Received
19	UJVNL	Received
20	HPPCL	Not Received
21	PSPCL	Not Received
22	HPSEBL	Not Received
23	Prayagraj Power Generation Co. Ltd.	Not Received
24	Aravali Power Company Pvt. Ltd	Received
25	Apraava Energy Private Limited	Not Received
26	Talwandi Sabo Power Ltd.	Not Received
27	Nabha Power Limited	Received
28	Lanco Anpara Power Ltd	Not Received
29	Rosa Power Supply Company Ltd	Received
30	Lalitpur Power Generation Company Ltd	Received
31	MEJA Urja Nigam Ltd.	Not Received
32	Adani Power Rajasthan Limited	Not Received
33	JSW Energy Ltd. (KWHEP)	Not Received
34	Greenko Group	Not Received
35	Sravanthi Energy Private Ltd	Not Received
36	NTPC Renewable Energy wing	Not Received
37	RENEW POWER	Not Received
38	Adani Power Ltd	Not Received
39	Avaada Energy	Not Received
40	Mahindra Solar	Not Received
41	ACME Heeragarh Powertech Pvt. Ltd.	Not Received
42	Tata Power Renewable Energy Ltd.	Received
43	Azure Power Pvt. Ltd.	Not Received
44	Thar Surya Pvt. Ltd.	Not Received
45	Ayana Renewable Power Pvt. Ltd.	Not Received
46	CSP(JPL, Hero Future Energies	Not Received
47	ABC Renewable Energy(RJ-01) Pvt. Ltd.	Not Received
48	Eden Renewable Cite Pvt. Ltd.	Not Received
49	UT of J&K	Not Received
50	UT of Ladakh	Not Received
51	UT of Chandigarh	Not Received
52	ATIL	Not Received
53	INDIGRID	Not Received
54	POWERLINK	Not Received
55	ADHPL	Received
56	Sekura Energy Limited	Not Received
57	WUPPTCL	Received
58	SEUPPTCL	Not Received
59	Vishnuprayag Hydro Electric Plant (I.P.)	Received
60	Alaknanda Hydro Electric Plant (GVK)	Not Received

Status of performance indices report of March 2024		
S. No.	Utility	Status of Protection Performance indices
1	PGCIL	Not Received
2	NTPC	Not Received
3	BBMB	Not Received
4	THDC	Received from Tehri
5	SJVN	Not Received
6	NHPC	Received
7	NPCIL	Not Received
8	DTL	Received
9	HVPNL	Received
10	RRVNL	Not Received
11	UPPTCL	Received from Bareilly,Gonda,Sahajahanpur, Sultanpur
12	PTCUL	Not Received
13	PSTCL	Not Received
14	HPPTCL	Not Received
15	IPGCL	Not Received
16	HPGCL	Not Received
17	RRVUNL	Received from KATPP
18	UPRVUNL	Not Received
19	UJVNL	Received (Dhakatpur, Dharasu)
20	HPPCL	Not Received
21	PSPCL	Not Received
22	HPSEBL	Not Received
23	Prayagraj Power Generation Co. Ltd.	Not Received
24	Aravali Power Company Pvt. Ltd	Not Received
25	Apraava Energy Private Limited	Received
26	Talwandi Sabo Power Ltd.	Not Received
27	Nabha Power Limited	Not Received
28	Lanco Anpara Power Ltd	Not Received
29	Rosa Power Supply Company Ltd	Received
30	Lalitpur Power Generation Company Ltd	Not Received
31	MEJA Urja Nigam Ltd.	Not Received
32	Adani Power Rajasthan Limited	Not Received
33	JSW Energy Ltd. (KWHEP)	Not Received
34	Greenko Group	Not Received
35	Sravanthi Energy Private Ltd	Not Received
36	NTPC Renewable Energy wing	Not Received
37	RENEW POWER	Not Received
38	Adani Power Ltd	Received (Kawai, MTSCL)
39	Avaada Energy	Not Received
40	Mahindra Solar	Not Received
41	ACME Heeraagarh Powertech Pvt. Ltd.	Not Received
42	Tata Power Renewable Energy Ltd.	Received
43	Azure Power Pvt. Ltd.	Not Received
44	Thar Surya Pvt. Ltd.	Not Received
45	Ayana Renewable Power Pvt. Ltd.	Not Received
46	CSP(JPL, Hero Future Energies	Not Received
47	ABC Renewable Energy(RJ-01) Pvt. Ltd.	Not Received
48	Eden Renewable Cite Pvt. Ltd.	Not Received
49	UT of J&K	Not Received
50	UT of Ladakh	Not Received
51	UT of Chandigarh	Not Received
52	ATIL	Not Received
53	INDIGRID	Received
54	POWERLINK	Not Received
55	ADHPL	Received
56	Sekura Energy Limited	Not Received
57	WUPPTCL	Received
58	SEUPPTCL	Not Received
59	Vishnuprayag Hydro Electric Plant (I.P.)	Not Received
60	Alaknanda Hydro Electric Plant (GVK)	Not Received

Reasons for Performance Indices less than Unity- Jan.2024**Case- 1 80MVAr Bus Reactor (tripped due to fault in 86B relay of Bareilly- Unao Ckt-2) (UPPTCL)**

No. of failures to operate – 0

No. of Correct operation-4

No. of Unwanted operation-3

No. of incorrect operation -3

S.I. – 4/7

R.I. – 4/7

Reason for unwanted operation- Fault in 86B relay of Bareilly- Unao Ckt-2

Corrective action –

Taken- yes/no

Case- 2 400/220KV, 315 MVA ICT-II AT 400 KV GSS RATANGARH on 19.01.2024 (RVPN)

No. of Unwanted operation-1

No. of incorrect operation -1

S.I.-0

R.I.-0

Reason for unwanted operation-

Corrective action –

Taken- yes/no

Case- 3 220 KV RATANGARH I/C 1st on 22.01.2024 (RVPN)

No. of Unwanted operation-1

No. of incorrect operation -1

S.I.-0

R.I.-0

Reason for unwanted operation-

Corrective action –

Taken- yes/no

Case- 4 Tripping of -425/+550MVAR STATCOM-I FATEHGARH_2 on 23.01.2024(POWERGRID)

No. of Unwanted operation-1

No. of incorrect operation -1

S.I.-0

R.I.-0

Reason for unwanted operation- Tripped during rectification of punch points. Manual error by OEM Engineer.

Corrective action –

Taken- yes/no

Case- 5 Tripping of 800KV HVDC CHAMPA-KURUKSHETRA POLE-III on 10.01.2024 (POWERGRID)

No. of Unwanted operation-1

No. of incorrect operation -1

S.I.-0

R.I.-0

Reason for unwanted operation- T-Zone protection due to card of Pole-3 faulty at KKR end.

Corrective action –

Taken- yes/no

Reasons for Performance Indices less than Unity- Feb. 2024

Case- 1 Bus Bar trip at 220kV ROBERTSGANJ (Prayagraj, UPPTCL)

No. of Unwanted operation-1

No. of incorrect operation -1

S.I. – 0

R.I. – 0

Reason for unwanted operation-

Corrective action –

Taken- yes/no

Case- 2 220KV Sarsawa, 160 MVA ICT-I tripping (Muzzafarnagar, UPPTCL)

No. of Unwanted operation-1

No. of incorrect operation -1

S.I.-0

R.I.-0

Reason for unwanted operation- False tripping signal issue to OSR due rain water ingress.

Corrective action –

Taken- yes/no

Case- 3 tripping of 220 KV Nehtaur – Matore line (Moradabad-II, UPPTCL)

No. of Unwanted operation-1

No. of incorrect operation -1

S.I.-0

R.I.-0

Reason for unwanted operation- Instantaneous directional Earth fault stage -IV of instantaneous Earth fault was inadvertently switched on during relay checking.

Corrective action –

Taken- yes/no

Case- 4 tripping of 220kV phozal to ADHPL (HPPTCL)

No. of Unwanted operation-1

No. of incorrect operation -1

S.I.-0

R.I.-0

Reason for unwanted operation- SOTF logic problem in main-1 relay

Corrective action –

Taken- yes/no

Case- 5 tripping of 400KV FATEHABAD-HISAR (NR-1, POWERGRID)

No. of Unwanted operation-1

No. of incorrect operation -1

S.I.-0

R.I.-0

Reason for unwanted operation- Relay panel schematic error after bypassing of 400kV Fatehabad-Hissar and 400kV Hissar-Bhiwani BBMB line.

Corrective action –

Taken- yes/no

Reasons for Performance Indices less than Unity- March 2024

Case- 1 Tripping of 400/220kV 240MVA ICT-II, 220kV Snagipur line, 220/132kV 160MVA T/F-I & III (Sultanpur, UPPTCL)

No. of Unwanted operation-1 for each element

No. of incorrect operation -1 for each element

No. of correct operation-1 for each element

S.I. – 1/2

R.I. – 1/2

Reason for unwanted operation- Malfunction/false command issued by DI card of CBF function of 220kV Bus Bar Protection relay installed at 220kV S/S Sultanpur.

Corrective action –

Taken- yes/no



उत्तर क्षेत्रीय विद्युत समिति

NORTHERN REGIONAL POWER COMMITTEE



Protection Philosophy/Protocol of Northern Region

(developed in compliance of IEGC 2023)

~~Version: 2.0~~

~~(approved in 71st NRPC meeting held on 29.01.2024)~~

~~January 2024~~

*Protection Philosophy/Protocol of Northern Region
(approved in 71st NRPG meeting held on 29.01.2024)*

Contents

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1. Transmission line & Cable

S.N.	Protection Setting/ Protocol	Mandated Setting for transmission lines
1	Protection Scheme	<p>220kV and above: Independent Main-I and Main-II protection (of different make OR different type/different algorithm) of non-switched numerical type is to be provided with carrier aided scheme.</p> <p>132kV and below: One non-switched distance protection scheme and, directional over current and earth fault relays, should be provided as back up.</p>
2	Distance Protection Zone-1	<p>Reach: 80% of the protected line; 110% of the protected line (In case of radial lines) Time Setting: Instantaneous.</p>
3	Distance Protection Zone-2	<p>Reach: Single Circuit Line: 120% of length of principle line section. Double circuit line: 150% coverage of line to take care of under reaching due to mutual coupling effect.</p> <p>Time setting:</p> <ul style="list-style-type: none"> i. 0.35 second <i>(considering LBB time of 200mSec, CB open time of 60ms, resetting time of 30ms and safety margin of 60ms)</i> ii. 0.5-0.6 second <i>(For a long line followed by a short line)</i>

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4	Distance Protection Zone-3	<p>Reach: Zone-3 should overreach the remote terminal of the longest adjacent line by an acceptable margin (typically 20% of highest impedance seen) for all fault conditions.</p> <p>Time Setting: 800-1000 msec</p> <p>If zone-3 reach transcends to other voltage level, time may be taken upto 1.5 sec.</p>
5	Distance Protection Zone- 4	<p>The Zone-4 reverse reach must adequately cover expected levels of apparent bus bar fault resistance. Time may be coordinated accordingly.</p> <p>Where Bus Bar protection is not available, time setting: 160 msec.</p>
6	Power Swing Blocking	<p>Block tripping in all zones, all lines.</p> <p>Out of Step tripping to be applied on all inter-regional tie lines.</p> <p>Deblock time delay = 2s</p>
7	Protection for broken conductor	<p>Negative Sequence current to Positive Sequence current ratio more than 0.2 (i.e. $I_2/I_1 \geq 0.2$)</p> <p>Alarm Time delay: 3-20 sec.</p> <p>Tripping may be considered for radial lines to protect single phasing of transformers.</p>
8	Switch on to fault (SOTF)	<p>Switch on to fault (SOTF) function to be provided in distance relay to take care of line energization on fault.</p>
9	VT fuse fail detection function	<p>VT fuse fail detection function shall be correctly set to block the distance function operation on VT fuse failure.</p>
10	Carrier Protection	<p>To be applied on all 220kV and above lines with the only exception of radial feeders.</p>

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11	Back up Protection	<p>1. On 220kV and above lines with 2 Main Protections:</p> <ul style="list-style-type: none">• Back up Earth Fault protections alone to be provided.• No Over current protection to be applied. <p>2. At 132kV and below lines with only one Main protection:</p> <ul style="list-style-type: none">• Back up protection by IDMT O/C and E/F to be applied.
12	Auto Reclosing with dead time.	<p>AR shall be enabled for 220 kV and above lines for single pole trip and re-closing. Dead time = 1.0s. Reclaim time = 25.0s</p> <p>Auto-recloser shall be blocked for following:</p> <ol style="list-style-type: none">faults in cablesBreaker Fail RelayLine Reactor ProtectionsO/V ProtectionReceived Direct Transfer trip signalsBusbar ProtectionZone 2/3 of Distance ProtectionCircuit Breaker Problems. <p>CB Pole discrepancy relay time: 1.5 sec; for tie breaker: 2.5 sec</p>

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13	Line Differential	<p>For cables and composite lines, line differential protection with built in distance back up shall be applied as Main-I protection and distance relay as Main-II protection.</p> <p>For very short line (less than 10 km), line differential protection with distance protection as backup (built- in Main relay or standalone) shall be provided mandatorily as Main-I and Main-II.</p> <p>Differential protection may be done using dark fiber (preferably), or using bandwidth.</p>
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<p style="text-align: center;">14</p>	<p style="text-align: center;">Over Voltage Protection</p>	<p>FOR 765kV LINES/CABLE:</p> <p>Low set stage (Stage-I): 106% - 109% (typically 108%) with a time delay of 5 seconds. High set stage (Stage-II): 140% - 150% with a time delay of 100 milliseconds.</p> <p>400kV LINES/CABLE:</p> <p>Low set stage (Stage-I): 110% - 112% (typically 110%) with a time delay of 5 seconds. High set stage (Stage-II): 140% - 150% with a time delay of 100 milliseconds.</p> <p>FOR 220 KV LINES:</p> <p>No over-voltage protection shall be used.</p> <p>FOR 220 KV CABLE:</p> <p>Low set stage (Stage-I): 110% - 112% (typically 110%) with a time delay of 5 seconds. High set stage (Stage-II): 140% - 150% with a time delay of 100 milliseconds.</p> <p>Drop-off to pick-up ratio of overvoltage relay: better than 97%</p> <p>Grading: Voltage as well as time grading may be done for multi circuit lines/cable.</p>
<p style="text-align: center;">15</p>	<p style="text-align: center;">Resistive reach setting to prevent load point encroachment</p>	<p>Following criteria may be considered for deciding load point encroachment:</p> <ul style="list-style-type: none"> • 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

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		<p>rating (the minimum of the bay equipment individual rating) whichever is lower. (Caution: The rating considered is approximately 15minutes rating of the transmission facility).</p> <ul style="list-style-type: none"> • Minimum voltage (V_{min}) to be considered as 0.85pu (85%).
16	Direct Inter-trip	<p>To be sent on operation of following:</p> <ol style="list-style-type: none"> i. Overvoltage Protection ii. LBB Protection iii. Busbar Protection iv. Reactor Protection v. Manual Trip (400 kV and above) vi. Cable Fault (in composite lines)
17	Permissive Inter-trip	To be sent on operation of Distance Protection

2. Series Compensated lines

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1	Lines with Series and other compensations in the vicinity of Substation	<ul style="list-style-type: none"> • Zone-1:FSC end: 60% of the protected line. Time: Instantaneous; Remoted end: 60% of the protected line with 100ms-time delay. POR Communication scheme logic is modified such that relay trips instantaneously in Zone-1 on carrier receive. • Zone-2: 120 % of uncompensated line impedance for single circuit line. For Double circuit line, settings may be decided on basis of dynamic study in view of zero sequence mutual coupling. • Phase locked voltage memory is used to cope with the voltage inversion. Alternatively, an intentional time delay may be applied to overcome directionality problems related to voltage inversion. • over-voltage stage-I setting for series compensated double circuit lines may be kept higher at 113%.
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3. Busbar protection

1	Busbar protection	To be applied on all 220kV and above sub stations with the only exception of 220kV radial fed bus bars.
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4. Local Breaker Back-up

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1	Local Breaker Backup (LBB)	For 220 kV and above level substations as well as generating stations switchyards, LBB shall be provided for each circuit breaker. LBB Current sensor $I > 20\% I_n$ LBB time delay = 200ms In case of variation in CT ratio, setting may be done accordingly.
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5. Power Transformer

5.1 Differential Protection

1	Id min (sensitivity) i.e. multiple of trans. HV side rated current	Default: 0.3 pu Or If tap range is -X% to +Y%, then (X+Y)% may be kept as setting.
2	First Slope	around 10%. In case of differential relay with only two slopes, this slope is considered as zero.
3	Second Slope	15% to 25%
4	Third Slope	60% to 80%
5	Unrestrained operation level	10.0 pu special care shall be taken in order to prevent unwanted operation of transformer differential IED for through-faults due to different CT saturation of "T-connected" CTs. In such cases, unrestrained operational level may be taken as 20-25pu.
6	Max. ratio of 2nd harm. to fundamental harm dif. curr. in %	I2/I1Ratio = 15%
7	Max. ratio of 5th harm. to fundamental harm dif. curr. in %	I5/I1Ratio = 25%
8	Second and fifth harmonics restrain feature	Enabled
9	Cross block feature	Enabled

5.2 Restricted earth fault (REF) protection

1	Pick up current (IREF)	10% of Full load current (IFL).
2	Stabilizing resistor (RSTAB)	stabilizing resistor (RSTAB) is obtained by dividing stabilizing voltage (VSTAB) by pick-up current. Stabilizing voltage $VSTAB = IF \times (RCT + 2RL)$ $RSTAB = VSTAB / IREF$ Where: IF = Maximum through fault current, RCT = CT resistance, RL = CT circuit lead resistance.

5.3 Over Current Protection

1	Scheme	To be implemented on both sides of ICT
2	Low set Directional	Pick up: 125-150% of full load current Characteristics: IDMT Co-ordination: to be coordinated with distance relay zone 3 settings of outgoing feeders.
3	High Set Non-Directional	Pick Up: 110-130% of the through fault level of the transformer Characteristics: DT; 50 to 100msec

5.4 Earth Fault Protection

1	Scheme	To be implemented on both sides of ICT
2	Low set Directional	Pickup: 20-80% of rated full load current Characteristics: IDMT Co-ordination: to be coordinated with earth fault relay setting of outgoing feeders.
3	High Set Non-Directional	Pick Up: 110-130% of the through fault level of the transformer Characteristics: DT; 50 to 100msec

5.5 Overexcitation protection:

Shall be provided on both HV and LV sides as below:

U/F %	Time set (s)
110	9000
118	90
126	49.5
134	18
142	4
150	1

6. Shunt Reactor protection

6.1 Differential Protection

1	Id min (sensitivity) i.e. multiple of trans. HV side rated current	Default: 0.3 pu Or If tap range is -X% to +Y%, then (X+Y)% may be kept as setting.
2	First Slope	around 10%. In case of differential relay with only two slopes, this slope is considered as zero.
3	Second Slope	15% to 25%
4	Third Slope	60% to 80%
5	Unrestrained operation level	10.0 pu special care shall be taken in order to prevent unwanted operation of transformer differential IED for through-faults due to different CT saturation of "T-connected" CTs. In such cases, unrestrained operational level may be taken as 20-25pu.
6	Max. ratio of 2nd harm. to fundamental harm dif. curr. in %	I2/I1Ratio = 15%
7	Max. ratio of 5th harm. to fundamental harm dif. curr. in %	I5/I1Ratio = 25%
8	Second and fifth harmonics restrain feature	Enabled
9	Cross block feature	Enabled

6.2 Impedance/ Zone protection

1	Setting	60% of reactor impedance
2	Time setting	1 sec

6.3 Phase overcurrent

1	DT	setting of 2.5 times rated current with a time delay of 0.1s
2	IDMT	1.5 times of rated current

6.4 REF/ Residual OC

Status of Protection Audit Plan for FY 2024 -25

S. No.	NRPC Member	Category	Status
1	PGCIL	Central Government owned Transmission Company	Received
2	NTPC	Central Generating Company	Received
3	BBMB		Received
4	THDC		Received
5	SJVN		
6	NHPC		Received
7	NPCIL		
8	DTL		State Transmission Utility
9	HVPNL	Received	
10	RRVNL		
11	UPPTCL	Received for Agra, Jhansi, Lucknow, Meerut zone	
12	PTCUL		
13	PSTCL		
14	HPPTCL		
15	IPGCL	State Generating Company	
16	HPGCL		
17	RRVUNL		
18	UPRVUNL		
19	UJVNL		
20	HPPCL		
21	PSPCL		State Generating Company & State owned Distribution Company
22	HPSEBL	Distribution company having Transmission connectivity ownership	
23	Prayagraj Power Generation Co. Ltd.	IPP having more than 1000 MW installed capacity	Received
24	Aravali Power Company Pvt. Ltd		
25	Apraava Energy Private Limited		Received
26	Talwandi Sabo Power Ltd.		
27	Nabha Power Limited		
28	Lanco Anpara Power Ltd		
29	Rosa Power Supply Company Ltd		
30	Lalitpur Power Generation Company Ltd		Received
31	MEJA Urja Nigam Ltd.		
32	Adani Power Rajasthan Limited		
33	JSW Energy Ltd. (KWHEP)		
34	Greenko Group	Other IPP	
35	Sravanthi Energy Private Ltd		
36	NTPC Renewable Energy wing		
37	RENEW POWER		
38	Adani Power Ltd		
39	Avaada Energy		
40	Mahindra Solar		
41	ACME Heeragarh Powertech Pvt. Ltd.		
42	Tata Power Renewable Energy Ltd.		
43	Azure Power Pvt. Ltd.		
44	Thar Surya Pvt. Ltd.		
45	Ayana Renewable Power Pvt. LTd.		

46	CSP(J)PL, Hero Future Energies		
47	ABC Renewable Energy(RJ-01) Pvt. Ltd.		
48	Eden Renewable Cite Pvt. Ltd.		
49	UT of J&K	UT of Northern Region	
50	UT of Ladakh		
51	UT of Chandigarh		
52	ATIL		Other transmission licensee in NR
53	INDIGRID	Received	
54	POWERLINK		
55	ADHPL	Received	
56	Sekura Energy Limited		
57	WUPPTCI	Other transmission licensee in UP	
58	SEUPPTCL	Other transmission licensee in UP	
59	Vishnuprayag Hydro Electric Plant (J.P.)	Other Generating Units in UP	
60	Alaknanda Hydro Electric Plant (GVK)	Other Generating Units in UP	



भारत सरकार/Government of India
विद्युत मंत्रालय/Ministry of Power
केन्द्रीय विद्युत प्राधिकरण/Central Electricity Authority
एन.पी.सी. प्रभाग/National Power Committee Division
Ist Floor, Wing-5, West Block-II, RK Puram, New Delhi-66

No.4/MTGS/SG/NPC/CEA/2023/ 353

Date: 18.09.2023

Subject: Standard Operating Procedure for Protection System Audit- reg.

Standard Operating Procedure (S.O.P) for Protection System Audit is enclosed herewith for your kind information and necessary action.

Enclosure: As above

Yours faithfully,


 18.09.23

(सत्येंद्र कु. दोतान / Satyendra Kr. Dotan)
 Director, NPC & Member Convener (Sub-group)

Standard Operating Procedure for Protection System Audit

A protection system audit is a review and evaluation of the protection systems of a substation with an objective to verify whether required protection systems have been put in place at station by the concerned utility, and to recommend suitable measures to provide for the same.

Ministry of Power, had constituted a Committee under the Chairmanship of Chairperson CEA to examine the grid disturbances on the 30th and the 31st July 2012. One of important recommendation of the committee was conducting of extensive audit of protection system. List of sub-stations where protection audit is to be undertaken on priority basis was prepared and audited across the country. This was the beginning of protection audit across the country and large number of important 400 and 220kV substations were audited.

Keeping in view the importance of Protection System Audit, Standard Operating Procedure has been prepared for the reference purpose. It will provides a step-by-step guide for RPCs to follow during the audit process.

1. All users shall conduct third party protection audit of each sub-station at 220 kV and above (132 kV and above in NER) once in five years or earlier as advised by the respective RPC.
2. After analysis of any event, each RPC shall identify a list of substations / and generating stations where third-party protection audit is required to be carried out and accordingly advise the respective users to complete third party audit within three months.
3. The third-party protection audit report shall contain information sought in the format as per IEGC 2023 and its further amendments.
4. 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.

5. Criteria for choosing substations for third party protection audit:

The following criteria are generally applied during choosing a substation for protection audit.

- i. Substations/ Generating (SS/ GS) stations with frequent grid incidences or frequent maloperations or any grid occurrence in any substation which affected supply to large number of substations and caused significant load loss. In this case, third-party protection audit may be carried out within three months or as decided in the Protection sub-Committee Meeting of the RPC.
- ii. Based on request received from utilities for arranging protection audit in certain stations (e.g. for availing PSDF funding for Renovation and Upgradation of Protection system). In this case, preferably third-party protection audit may be carried out within three months.
- iii. 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.

6. Protection audit Procedure:

- i. After identification of stations for protection audit, the same is communicated to the owner utility seeking nomination of one nodal officer for each Station.
- ii. The nodal officer shall provide the details of substation for preparation of protection audit format (in line with IEGC and subsequent amendments).
- iii. Meanwhile nominations shall be sought from all utilities to form regional teams for audit. Regional teams comprising of engineers from various utilities /utility (other than the team of host State) of the region shall be formed based on the no. of SS to be audited. (Each team may consists of 3 or 4 engineers from utilities other than the host utility and at the maximum a team will be able to audit 3 to 4 stations in 7-9 days or so)
- iv. Once the team details and list of stations to be audited is finalised the details of nodal officers, team members , list of stations to be audited by each team is shared to all for further coordination regarding planning and conduction of audit.
- v. Based on the inputs received from nodal officer regarding the list of elements in the substation to be audited, protection audit formats shall be prepared by RPC (in line with IEGC) and circulated to nodal officer. The nodal officer along-with the substation engineers shall fill the audit format and furnish the same along-with various attachments sought as part of the audit format within a week or so. List of attachments shall be given in the covering page of audit format.
- vi. 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.
- vii. 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.
- viii. 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.
- ix. 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.
- x. 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.
- xi. The recommendations of all SS audited shall be inserted into audit recommendations database and update regarding recommendations shall be sought from respective utilities.
- xii. Action plan for rectification of deficiencies detected, if any, shall be submitted to the respective RPC and RLDC and monthly progress will be submitted.

xiii. 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.

I/33625/2024



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

दिनांक: 06 फ़रवरी, 2024

सेवा में / To,

उ.क्षे.वि.स. के सभी सदस्य (संलग्न सूचीनुसार)
Members of NRPC (As per List)

Subject: Nomination of officer(s) for conducting Third Party Protection Audit of substations in Northern region-reg.

Ref:

1. IEGC 2023
2. Discussion in 48th Protection Sub-Committee (PSC) meeting, held on 11th Oct 2023.

In compliance to clause 15 of IEGC 2023, third party protection audit of each sub-station at 220 kV and above (132 kV and above in NER) is to be conducted once in five years or earlier as advised by the respective RPC. The same was also discussed in 48th Protection Sub-Committee (PSC) meeting, held on 11th Oct 2023.

As per Standard Operating Procedure (S.O.P.) of Protection System Audit circulated (enclosed) by NPC division of CEA, there is requirement for formation of committee at regional level that can do the third party protection audit in Northern region.

In view of above, it is requested to send the nomination of officer(s) related to protection domain (at seo-nrpc@nic.in) with details as below:

Name of officer	Designation	Mobile No.	E-mail Id	Present Posting location

The above nominated officer shall be intimated for 3rd party protection audit of substation of other utilities, as and when required.

Encls: As above

Signed by D. K. Meena

Date: 07-02-2024 10:29:31

Responsible Officer

अधीक्षण अभियंता (संरक्षण)

List of addressee (via mail)				
NRPC Members for FY 2023-24				
S. No.	NRPC Member	Category	Nominated/Notified/Delegated Member	E-mail
1	Member (GO&D), CEA	Member (Grid Operation & Distribution), Central Electricity Authority (CEA)	Member (GO&D), CEA	member.god@cea.nic.in
2	Member (PS), CEA	Nodal Agency appointed by the Government of India for coordinating cross-border power transactions	Member (PS), CEA	memberspscea@nic.in
3	CTUIL	Central Transmission Utility	Chief Operating Officer	pcgarg@powergrid.in
4	PGCIL	Central Government owned Transmission Company	Director (Operations)	tyagir@powergrid.in
5	NLDC	National Load Despatch Centre	Executive Director	scsaxena@grid-india.in
6	NRLDC	Northern Regional Load Despatch Centre	Executive Director	nroy@grid-india.in
7	NTPC	Central Generating Company	Director (Finance)	jaikumar@ntpc.co.in
8	BBMB		Chairman	cmn@bbmb.nic.in
9	THDC		CGM (EM-Design)	akghildiyal@thdc.co.in
10	SJVN		CMD	sectt.cmd@sjvn.nic.in
11	NHPC		Director (Technical)	raj कुमार0610.rkc@gmail.com
12	NPCIL		Director (Finance)	df@npcil.co.in
13	Delhi SLDC	State Load Despatch Centre	General Manager	gmsldc@delhisldc.org
14	Haryana SLDC		Chief Engineer (SO&C)	cesocomml@hvpn.org.in
15	Rajasthan SLDC		Chief Engineer (LD)	ce.ld@rvpn.co.in
16	Uttar Pradesh SLDC		Director	directorsldc@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	State Transmission Utility	CMD	cmd@dtl.gov.in
21	HVPNL		Managing Director	md@hvpn.org.in
22	RRVPNL		CMD	cmd.rvpn@rvpn.co.in
23	UPPTCL		Managing Director	md@upptcl.org
24	PTCUL		Managing Director	md@ptcul.org
25	PSTCL		CMD	cmd@pstcl.org
26	HPPTCL	Managing Director	md.tcl@hpmail.in	
27	IPGCL	State Generating Company	Managing Director	md.ipgpc@nic.in
28	HPGCL		Managing Director	md@hpgcl.org.in
29	RRVUNL		CMD	cmd@rrvunl.com
30	UPRVUNL		Director (Technical)	director.technical@uprvunl.org
31	UJVNL		Managing Director	mdujvnl@ujvnl.com
32	HPPCL		Managing Director	md@hpgcl.in
33	PSPCL	State Generating Company & State owned Distribution Company	CMD	cmd-pspcl@pspcl.in
34	DHBVN	State owned Distribution Company (alphabetical rotational basis/nominated by state govt.)	Director (Projects)	directorprojects@dhbvn.org.in
35	Jaipur Vidyut Vitran Nigam Ltd.		Managing Director	md@jvvn.org
36	Madhyanchal Vidyut Vitaran Nigam Ltd.		Managing Director	mdmvnl@gmail.com
37	UPCL		Managing Director	md@upcl.org
38	HPSEB		Managing Director	md@hpseb.in
39	Prayagraj Power Generation Co. Ltd.		Head (Commercial & Regulatory)	sanjay.bhargava@tatapower.com
40	Aravali Power Company Pvt. Ltd.	IPP having more than 1000 MW installed capacity	CEO	SRBODANKI@NTPC.CO.IN
41	Apraava Energy Private Limited		CEO	rajneesh.setia@apraava.com
42	Talwandi Sabo Power Ltd.		COO	Vibhav.Agarwal@vedanta.co.in
43	Nabha Power Limited		CEO	sk.narang@larsentoubro.com
44	Lanco Anpara Power Ltd		President	sudheer.kothapalli@meilanparapower.com
45	Rosa Power Supply Company Ltd		Station Director	Hirday.tomar@relianceada.com
46	Lalitpur Power Generation Company Ltd		Managing Director	vksbankoti@bajajenergy.com
47	MEJA Urja Nigam Ltd.		CEO	hopmeja@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	vyotiprakash.panda@jsw.in
50	RENEW POWER	IPP having less than 1000 MW installed capacity (alphabetical rotational basis)	CEO	sumant@renew.com
51	UT of J&K	From each of the Union Territories in the region, a representative nominated by the administration of the Union Territory concerned out of the entities engaged in generation/ transmission/ distribution of electricity in the Union Territory.	Chief Engineer, JKPTCL	sojidd@gmail.com
52	UT of Ladakh		Chief Engineer, LPDD	cepladakh@gmail.com
53	UT of Chandigarh		Executive Engineer, EWEDC	elop2-chd@nic.in
54	BYPL	Private Distribution Company in region (alphabetical rotational basis)	CEO	Amarjeet.Sheoran@relianceada.com
55	Bikaner Khetri Transmission Limited	Private transmission licensee (nominated by central govt.)	Vice-President	nihar.raj@adani.com
56	Adani Enterprises	Electricity Trader (nominated by central govt.)	Head Power Sales & Trading	anshul.garg@adani.com
57	Ajmer Vidyut Vitran Nigam Ltd.	Special Invitee	Managing Director	md.avnl@rajasthan.gov.in
Special Invitees:				
RE Holding companies in NR with installed capacity of more than 1000 MW (provisional members as decided in 59th NRPC meeting)				

Nominations for 3rd Part Protection Audit Plan					
Sr. No	Utility	Name of officer	Designation	E-mail Id	Present Posting location
1		Swarup Kumar Das	GSM(E)	onm-protection@nhpc.nic.in	HQ/RQ
2	NHPC	Jaganath Pani	SM(E)	onm-protection@nhpc.nic.in	HQ/RQ
3	Jhajar Power Limited	Prabhat Kumar Mishra			
4	RPSCCL	Atul Nigam	DGM	atul.v.nigam@relianceada.com	Shahjhapur, UP
5	APCPL	NIRBHAY KUMAR	SR. MANAGER-EMD	nirbhaymishra01@apcpl.co.in	APCPL IGSTPP Jhajar
6	Nabha Power Limited	Chandresh Saxena	Joint General Manger	chandresh.saxena@larsentoubro.com	Nabha Power Plant
7		Vaibhav Vivek	Sr. Manager (E)	vaibhav.vivek@sjvn.nic.in	Rampur HPS
8		Vinay Painuly	Manager (E)	vinay.painuly@sjvn.nic.in	Rampur HPS
9	SJVN	Basant Lal Kohli	Sr. Manager	basant.lal@sjvn.nic.in	Nathpa Jhakri Hydro Power Station
10	HPPTCL	Rajat Sharma	Sr. Manager (E)	smprot1.tcl@hpmail.in	Hamirpur
11		Vinay Attri	EE	xenmpccfbd@hvpn.org.in	Faridabad
12	HVPNL	Sunil Tanwar	AEE	sunil.tanwar68@hvpn.org.in	Panipat
13	RVPN (Jodhpur)	Sh. Sunil Saini	Executive Engineer	xen.mpts.hgarh@rvpn.co.in	XEN (MPT&S), RVPN, Hanumangarh
14		Sh. Mukesh kumar	Assistant Engineer	aen.mpts.rtg@rvpn.co.in	AEN (MPT&S), Ratangarh
15		Sh. N.K. Thanvi	Assistant Engineer	xen.mpts.jodh@rvpn.co.in	O/o XEN (MPT&S), RVPN, Jodhpur
16	RVPN (Jaipur)	Sh. D.K. S. Rathore	Assistant Engineer	xen1.prot.jaipur@rvpn.co.in	XEN (MPT&S) RVPN, Jaipur
17		Sh. Umesh Sharma	Assistant Engineer	aen2.mpts.alwar@rvpn.co.in	AEN-2 (MPT&S) RVPN, Alwar
18		Sh. Dinesh Saini	Assistant Engineer	aen.mpts.tonk@rvpn.co.in	AEN (MPT&S) RVPN, Tonk
19	RVPN (Ajmer)	Sh. Raghavendra Tiwari	Assistant Engineer	tiwari.raghavendra@rvpn.co.in	ACE (MPT&S) RVPN, Ajmer
20		Sh. Dinesh Kumar Parashar	Assistant Engineer	parasharrvpn@gmail.com	AEN-2 (MPT&S) RVPN, Ajmer
21		Sh. Suresh Chandra Garg	Executive Engineer	xen.mpts.bhl@rvpn.co.in	XEN (MPT&S) RVPN, Bhilwara
22	LPGCL	Abhimanyu Upadhyay	General Manager-EMT	aupadhyay.ltp@lpgcl.com	LPGCL Lalitpur
23	Adani Energy Solution Limited (Transmission BU)	Mr. Ritesh Gupta	Asso. Manager	ritesh.gupta@adani.com	HO-Ahmedabad
24		Shri Niladri Mandal	Dy. Head- O&M	niladri.mandal@jvk.com	GVK
25	JVK	Shri Bishwambar Bag	Manager (Electrical)	bishwambar.bag@gvk.com	GVK
26	POWERGRID NR-2 (J&K)	Sh Burhanul Majeed	Asst Manager	burhan2366@powergrid.in	New Wanpoh
27	POWERGRID NR-2 (Punjab)	Sh Anil Kumar Yadav	Engineer	anil.yadav@powergrid.in	Amritsar
28	POWERGRID NR-2 (Haryana)	Sh Sahil Garg	Asst Manager	sahil.garg@powergrid.in	Kaithal
29	POWERGRID NR-2 (HP)	Sh Anil Kumar Verma	Ch Mgr	anilverma111@powergrid.in	Chamba
30		Er. Mohd Raza Ahmed	Superintending Engine	setncalbd@upttcl.org	Praygraj
31	UPPTCL	Er. Sushil Kumar Verma	Executive Engineer	eeetncdlko@upttcl.org	Lucknow
32		Er. Siddharth Bhorhari	Assitant Engineer	bhorhari2011@gmail.com	Orai
33		Er. Manish Kumar	Assitant Engineer	aetncgn@gmail.com	Greater Noida
34	UPRVUNL	Er. Manoj Kumar	Executive Engineer	ee.emcd_7.dtps.anpara@uprvunl.org	Anpara
35	DTL	Sh Parveen Kumar	Dy. Manager	kumarparveendtl@gmail.com	Delhi
36		Mohd Azhar	Dy. Manager	dtl.azhar@gmail.com	Delhi
37		Yashwant Singh Rawat	Dy. Manager	ysrawat1991@gmail.com	Delhi

Email

Reeturaj Pandey

Fwd: Exception report of prolonged non-compliance of the recommendations of the protection audit-reg.

From : Sh V K Singh <ms-nrpc@nic.in>

Wed, Feb 28, 2024 04:00 PM

Subject : Fwd: Exception report of prolonged non-compliance of the recommendations of the protection audit-reg.

To : Dharmendra Kumar Meena <dharmendra.cea@gov.in>, Reeturaj Pandey <pandeyr.cea@gov.in>

From: cenpccea@gmail.com

To: "Sh V K Singh" <ms-nrpc@nic.in>, "N. S. Mondal" <mserpc-power@nic.in>, "MEMBER SECRETARY" <mssrpc-ka@nic.in>, "Deepak Kumar" <ms-wrpc@nic.in>, "Member Secretary NERPC" <ms-nerpc@gov.in>, "SE P WRPC" <prc-wrpc@nic.in>, asitsingh@rediffmail.com, nsmondal34@gmail.com, vksinghcea@gmail.com

Cc: "rishika sh" <rishika_sh@yahoo.com>, skdotan21@gmail.com, "Himanshu Lal" <himanshulal.cea@gov.in>

Sent: Wednesday, February 28, 2024 4:03:31 PM

Subject: Exception report of prolonged non-compliance of the recommendations of the protection audit-reg.

Madam/Sir,

Kindly refer to the Minutes of the 14th meeting of NPC held on 03.02.2024 at Bangalore (Link for MoM : https://cea.nic.in/wp-content/uploads/nat_power_com/2024/02/Minutes_of_the_14th_NPC_meeting_held_on_03_02_2024_at_Bangalore-1.pdf). It was decided in the meeting that the exception report of prolonged non-compliance of the recommendations of the protection audit may be monitored by NPC on the basis of reports submitted by RPCs on a half yearly basis.

Therefore, it is requested to provide the reports of prolonged non-compliance (upto December 2023) of the recommendations of the protection audit by **18.03.2024.**

--

Regards,

O/o Chief Engineer

(National Power Committee Division)
Central Electricity Authority
Phone No: 011-26732014
New Delhi - 110066.



भारत सरकार/Government of India
विद्युत मंत्रालय/Ministry of Power
केन्द्रीय विद्युत प्राधिकरण/Central Electricity Authority
एन.पी.सी. प्रभाग/National Power Committee Division
1st Floor, Wing-5, West Block-II, RK Puram, New Delhi-66

No. CEA-GO-15-14/1/2021-NPC Division 83-104

Date: 27.02.2024

To
(As per distribution list)

विषय: 03.02.2024 को बैंगलोर में आयोजित एनपीसी की 14वीं बैठक के कार्यवृत्त के संबंध में।
Subject: Minutes of the 14th Meeting of NPC held on 03.02.2024 at Bangalore-reg.

कृपया 03.02.2024 को बैंगलोर में आयोजित एनपीसी की 14वीं बैठक का कार्यवृत्त आपकी जानकारी और आवश्यक कार्रवाई के लिए संलग्न है। यह सीईए वेबसाइट पर भी उपलब्ध है।

The Minutes of the 14th meeting of NPC held on 03.02.2024 at Bangalore is enclosed herewith for your kind information and necessary action, please. The same is also available on CEA website.

भवदीय/Yours faithfully

Encl: As above

रुशिका
 27/02/24

(रुशिका शरण/Rishika Sharan)
 मुख्य अभियन्ता एवं सदस्य सचिव, रा.वि.स /
 Chief Engineer & Member Secretary, NPC

Distribution List (Members of NPC):

1. Shri. Chowna Mein, Hon'ble Dy. Chief Minister and I/C Power, Govt. of Arunachal Pradesh, Block No.2, 5th Floor, A.P. Civil Secretariat, Itangar-791111. [Email: chowna.mein@gov.in]
2. Shri Ginko Lingi, Chairman, TCC, NERPC & Chief Engineer (P), TPMZ , Department of Power, Govt. of Arunachal Pradesh, Vidyut Bhawan, zero Point, Itanagar-791111. [Email: ginko.lingi@gmail.com]
3. Shri K Vijayanand, Chairperson, SRPC, Chairman & Managing Director , Transmission Corporation of Andhra Pradesh Limited, Vidyut Soudha, Gunadala, Eluru Rd, Vijayawada, Andhra Pradesh 520004.[Email: cmd.aptransco@aptransco.in ; vjanand@nic.in]
4. Shri AKV Bhaskar, Chairperson TCC, Director (Transmission & Grid Management), Transmission Corporation of Andhra Pradesh Limited, Vidyut Soudha, Gunadala, Eluru Rd, Vijayawada, Andhra Pradesh 520004. [Email: kannanvenkatabhaskar.angulabharanam@aptransco.co.in]
5. Shri Vishal Kumar Dev, IAS, Chairman ERPC, Principal Chief Secretary to Govt., Department of Energy, Govt. of Odisha, Bhubaneswar. [Email: chairman@gridco.co.in]
6. Shri Trilochan Panda, Managing Director, GRIDCO, Chairperson TCC ERPC, GRIDCO Limited, Regd. Office: Janpath, Bhubaneswar – 751022.
7. Shri Mohammed Shayin, IAS, Chairperson, NRPC, Managing Director, HVPNL, Shakti Bhawan, C-4, sector-6, Panchkula-134109. [Email: md@hvpn.org.in]
8. Shri Manmohan Matta, Director (Projects), Chairman TCC, NRPC, Shakti Bhawan, C-4, sector-6, Panchkula-134109. [Email: directorprojects@hvpn.org.in]
9. Shri Sanjay Dubey, Chairman WRPC & Principal Secretary (Energy), GoMP, VB-2, Vallabh Bhawan Annex, Mantralay, Bhopal-462001(M.P.).[Email: psenergyn@gmail.com]
10. Shri Raghuraj Rajendran, Chairman-TCC & Managing Director MPPMCL, Block No-15, Shakti Bhawan, Vidyut Nagar, Rampur, Jabalpur-482008. [Email: md@mppmcl.com]
11. Shri N.S. Mondal, Member Secretary, ERPC, 14, Golf Club Road, ERPC Building, Tollygunje, Kolkata-700033. [Email: mserpc-power@nic.in]
12. Shri V.K.Singh, Member Secretary, NRPC, 18-A, Shaheed Jeet Singh Marg, Katwaria Sarai, New Delhi-110066.[Email: ms-nrpc@nic.in]
13. Shri Asit Singh, Member Secretary, SRPC, No.29, Race Course Cross Road, Bengaluru-560009. [Email: mssrpc-ka@nic.in]
14. Shri Deepak Kumar, Member Secretary, WRPC, Plot No- F-3, MIDC Area, Marol, Opp. SEEPZ, Central Road, Andheri (East), Mumbai-40093.[email: ms-wrpc@nic.in]
15. Shri K B Jagtap, Member Secretary, NERPC, NERPC Complex, Dong Parmaw, Lapalang, Shillong-793006. [Email: ms-nerpc@gov.in]

Special Invitees:

1. CMD, GRID-INDIA, B-9, Qutab Institutional Area, Katwaria Sarai, New Delhi -110016.

2. CMD, NTPC, NTPC Bhawan, SCOPE Complex, Institutional Area, Lodhi Road, New Delhi-110003.
3. CMD, PowerGrid, Saudamini, Plot No.2, Sector-29, Gurugram-122001.
4. COO, CTU, Saudamini, Plot No.2, Sector-29, Gurugram-122001
5. Chief Engineer, GM Division, Sewa Bhawan, CEA, New Delhi.

Copy for kind information to:-

1. SA to Chairperson, CEA, New Delhi
2. SA to Member(Go&D),CEA, New Delhi



केंद्रीय विद्युत प्राधिकरण
Central Electricity Authority

राष्ट्रीय विद्युत समिति
National Power Committee

Minutes of 14th Meeting of
National Power Committee (NPC)
held on 03.02.2024
At Bangalore.

Minutes of 14th Meeting of National Power Committee (NPC) chaired by Chairperson, CEA held on 03.02.2024 at Bangalore.

1. Introduction

- a. The 14th meeting of National Power Committee (NPC) was held on 03.02.2024 (Saturday) at Bangalore. The meeting was hosted by SRPC. The list of participants is at **Annexure-A.**
- b. **Member Secretary, SRPC** extended warm and hearty welcome to Shri Ghanshyam Prasad, Chairperson CEA, Shri K Vijayanand, Chairperson SRPC, Chairperson TCC of WRPC, NRPC & SRPC, COO CTUIL, Director (SO), Grid-India, Director (SLDC), OPTCL, ED, PGCIL, Member Secretaries of NPC & RPCs, Members of NPC, Special Invitees and delegates to this 14th NPC meeting being hosted by SRPC at the Garden City, Bengaluru. He expressed heartfelt thanks Chairperson NPC for providing inspiring leadership to the NPC forum. He also thanked Chairperson SRPC for providing his guidance to conduct this meeting. He informed that SR demand has touched around 64 GW of maximum demand while SR may reach 100 GW by 2031-32 as per NEP. Out of SR Installed capacity of 290 GW, RE may be 219 GW by 2031-32. Till now Solar peak of 18.5 GW out of 22 GW, Wind peak of 16 GW out of 20 GW and simultaneous peak of 28 GW out of 42 GW has been achieved in Southern Region. Demand wise SR has achieved 61 % while energy wise in a day 32% of RE integration. He pose the challenges of increasing RE capacity in southern region and that it would be a big challenge which needs support of stake holders like SLDCs, RLDCs, Grid India, and CEA.
- c. **Chairperson NPC in his opening remarks emphasized that** there is a need to take power sector to the next level amid the changing scenario like integration of renewable energy, cyber security issues in power system which throws main challenges in the today's time. He stated that a few years ago, the conventional generators were major part of the installed capacity, but in present years there are transition in the power sector and it is also the need of the hour in order to align our system with global level. He also stated that with the increase in the RE integration, the challenge become more when we don't have other capacity to balance during the non-solar hours or non-wind season. In order to address such issue which are having implications at national level, the role of National Power Committee become more prominent. Historically, we integrated the generators and transmission lines within a state and formed multiple intra-state system. Next was the formation of the regional grids by making inter-state system there and eventually the concept of one nation one grid was become a reality. This brought flexibility in the system and the benefits from a region can be taken by any other part of the country. He further stated that there is a regional diversity of demands and generation in the different regions of the country. There is a need to develop a mechanism to utilise this diversity of demands and generation. A uniform mechanism can be formed to use the surplus generation of a region to the deficit region. He opined that gradually we are moving towards the flexible tie-ups regime. It may be helpful in the cost optimization of the power for the consumers. The depth of the power market may likely to increase in the upcoming times. He informed that in the 13th meeting of

NPC, the focus was on the need for harmonization and uniformity of the different procedures, philosophies and modalities which were being followed by various RPCs and RLDCs in fields of energy accounting, protection aspect, operational aspects and communication system of the grid. He further informed that the inter-regional exchange of energy has been increasing and there is need to enhance inter-regional capacity and subsequently preparing National Energy Account i.e. NEA, which is also one of the agenda items to be discussed during the meeting. He requested MS NPC to take up the agenda of the meeting.

- d. **MS NPC also welcomed Chairperson, CEA & NPC, all the members, special invitees and participants to the 14th meeting of National Power.** She thanked Chairperson, CEA for his able guidance for conducting the 14th NPC meeting. She thanked MS SRPC for arranging the meeting and for their warm hospitality at Bengaluru.

2. Confirmation of Minutes of 13th Meeting of NPC

- a. The Minutes of 13th Meeting of NPC held on 05.07.2023 at Kolkata was circulated vide letter No. CEA-GO-15-14/1/2021-NPC division/237 dated 31.07.2023.
- b. **MS NERPC** informed that in MoM of 13th NPC at item no. **"9. Review of Status of Islanding scheme**, it is mentioned that, *"MS NERPC informed that DPR of Assam-II was sent to NLDC and DPR of Tripura IS under preparation stage. MS NPC informed that the DPR of Assam-II IS has not been received by NPC Division for PSDF funding"*.
- c. **MS NERPC** suggested to modify the above para/information as below:
MS NERPC informed that the DPR of Guwahati Islanding scheme (approximate estimate of Rs 84 Cr) was placed at 23rd RPC meeting for approval. However, the same has been referred back to subcommittee of NERPC by 23rd NERPC to review the estimate as the cost was exorbitant. The subcommittee is re-examining the islanding scheme of Guwahati and the DPR with revised estimate will be finalized at the earliest and after taking of approval of RPC, it will be sent to PSDF by Assam State. Further he informed that Tripura islanding Scheme is also under review.
- d. **The Committee confirmed the Minutes of 13th NPC with the following modification:**

Item no. "9. Review of Status of Islanding scheme" as per approved MoM of 13th NPC	Modified part of Item no. "9. Review of Status of Islanding scheme as per comments of MS NERPC
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<p>MS NERPC informed that DPR of Assam-II was sent to NLDC and DPR of Tripura IS under preparation stage. MS NPC informed that the DPR of Assam-II IS has not been received by NPC Division for PSDF funding.</p>	<p>MS NERPC informed that the DPR of Guwahati Islanding scheme (approximate estimate of Rs 84 Cr) was placed at 23rd RPC meeting for approval. However, the same has been referred back to subcommittee of NERPC by 23rd NERPC to review the estimate as the cost was exorbitant. The subcommittee is re-examining the islanding scheme of Guwahati and the DPR with revised estimate will be finalized at the earliest and after taking of approval of RPC, it will be sent to PSDF by Assam State. Further he informed that Tripura islanding Scheme is also under review.</p>
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3. Best practices/procedures being followed by RPC

- a. **MS NPC** briefed the agenda to the Committee. She informed that the Subgroups of Operation, Protection, Communication and Commercial was constituted by the NPC to discuss best practices/procedures being followed by RPC as per the direction of Chairperson, CEA. It was decided in the 13th NPC meeting that draft S.O.P for Protection System Audit, Grid disturbance analysis, Communication outage, and Communication audit for S/s may be prepared by the concerned Subgroups. Accordingly, after due deliberations in the various meetings and based on inputs from RPCs, the following SOPs are finalised:
 - i. **SOP for Protection System Audit:** SOP (Attached at **Annexure-I**) was approved and circulated to all RPCs to implement. All RPCs have adopted the SOP and started to form the annual calendar for the same.
 - ii. **SOP for Grid Disturbances/Grid Incidents/Tripping's:** Subgroup finalized the SOP (Attached at **Annexure-II**) in the meeting held on 10.10.2023 and circulated to RPCs on 10.10.2023.
 - iii. **S.O.P for Communication Audit for Substations:** Subgroup finalized the SOP (Attached at **Annexure-III**) in the meeting held on 11.10.2023 and circulated to RPCs on 11.10.2023.
 - iv. **SOP for Communication System Outage Planning:** Subgroup finalized the SOP (Attached at **Annexure-IV**) in the meeting held on 03.11.2023 and circulated to RPCs on 03.11.2023.
- b. She further informed that in the pre-meeting among MS, RPCs and MS, NPC held on 29.01.2024, MS SRPC was of view that some of utilities wanted to conduct Third Party Protection Audit by external agencies in line with IEGC 2023 and they may be permitted to engage Third Party Auditors.

- c. **Chairperson NPC** queried whether the external agencies are certified or having expertise in conducting protection audit. MS SRPC informed that the external agencies are not certified however, they are having experience of conducting third party protection audit.
- d. **Chairperson NPC** opined that the utilities may conduct the third party protection audit as per the SOP finalised by the subgroup since the audit team will be formed excluding the member for the utility whose protection system is to be audited and therefore it may be considered as third party audit. He further opined that a list of external agencies for conducting third party protection audit may be prepared by protection sub-group of NPC for reference. He also suggested that exception report of prolonged non-compliance of the recommendations of the protection audit may be monitored by NPC on the basis of reports submitted by RPCs.
- e. **Chairperson NPC** suggested that Protection System Analysis Group (PSAG) may be constituted at RPC level consisting of the members from RPC, NPC, NLDC, RLDC, PGCIL, and 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. The PSAG may exist always to analyse such GD/GI in a region.
- f. Further, GRID-India vide email dated 19.02.2024 submitted suggestions on SOP for protection system audit, Grid Disturbances/Grid incidents/Tripping's, Communication audit for substations, and communication system outage planning. The copy of suggestions is attached at **Annexure-B**. GRID-India suggestions may be discussed in the respective subgroup of NPC and if agreed by the subgroup, suggestions of GRID-India may be incorporated suitably.
- g. **Decisions of the Committee:**

- i. **SOPs finalised by the respective subgroups were approved by the Committee, if any changes suggested by members of the subgroup, will be incorporated suitably and circulated to RPCs for implementation/adoption. The same may be ratified in the next meeting of NPC.**

(Action: Respective subgroups of NPC / NPC)

- ii. **The list of external agencies for conducting Third Party Protection Audit may be prepared by Protection sub-group of NPC for reference.**

(Action: Protection Subgroup of NPC)

- iii. **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. The PSAG may exist always to analyse such GD/GI in a region.**

(Action: RPCs Secretariat)

- iv. **The exception report of prolonged non-compliance of the recommendations of the protection audit may be monitored by NPC on the basis of reports submitted by RPCs on half yearly basis.**

(Action: NPC/RPCs)

4. Unified Accounting Software (UAS) for RPCs

- a. MS NPC informed that in the 13th meeting of NPC held on 05th July 2023, it was decided that the commercial subgroup of NPC would recommend on the standardization of the formats and software of the commercial accounts. The standard formats and software finalised by the commercial sub-group would be placed in next NPC meeting.
- b. She further informed that two meetings of commercial sub-group was held on 8.8.23 and 30.10.23. Based on the inputs/comments of ERPC and SRPC, the standardised output formats was discussed and the Final standard output formats (attached as **Annexure-V**) were circulated to all RPCs. The **Standard Output formats contains** the formats of the **Weekly account** (i.e. DSM Settlement Account, Ancillary Service Account (SRAS, TRAS) and Reactive Energy Account), **Monthly Account** (i.e. Regional Energy Account, RTA/RTDA, Ramping Account Format, SCED Account, Delayed payment accounts) and Additional formats of some commercial account. Further, a meeting to discuss the implementation of the Unified Accounting Software for RPCs under the chairmanship of Member (GO&D), CEA was held on 20.11.2023 at Sewa Bhawan, New Delhi in hybrid mode. (MoM is attached at **Annexure-VI**). In this meeting, the implementation of the Unified Accounting Software for RPCs were discussed in detail and the following decisions were taken:
- i. ERPC shall be the Nodal RPC for implementation of Unified Accounting Software for RPCs.
- ii. A Joint Committee shall be formed with representatives (Director/Superintending Engineer/ Deputy Director Level) from all RPCs, GM Division, CEA and NPC Secretariat. Superintending Engineer, ERPC would be the Member Convener of Joint Committee with following Term of Reference (TOR):
- Hiring of consultant for preparation of DPR
 - Identifying the possible source of funding i.e. through PSDF or RPC funds.
 - Preparation of NIT and other documents related to tendering.
 - Selection of vendor for commercial account software.
 - Execution of work order and certification of completion of work.
 - Recommend on O&M/AMC/Ownership of project.
 - Any other matter related to Unified Accounting Software.
- c. She further informed that in the pre-meeting among MS, RPCs and MS, NPC held on 29.01.2024, MS SRPC suggested that the development of Unified Accounting Software may be carried out in two phases. In Phase –I, Technical specifications and scope of work for commercial accounts may be finalised and in the Phase –II, Additional formats for information or analysis of operational data, report formations may be carried out.

MS SRPC also suggested the working level officers may be involved in the finalisation of technical specifications. In pre-meeting, NRPC representative suggested that the parallel efforts may also be carried out for identifying non uniformity in Commercial accounts wrt different RPCs so that same may be accommodated simultaneously in process finalisation. Further, a dedicated team/committee may also be formed at RPC for carrying out changes required after implementation of the UAS.

- d. The standard output formats of commercial accounts and constitution of the Committee along with its ToR was proposed for approval of the Committee.
- e. **Chairperson SRPC** raised the issue of funding for the Uniform Accounting Software and suggested that the PSDF funding may be provided for the smoother implementation of the project considering the importance of Accounts. It was suggested to plan the implementation of the UAS in the comprehensive manner considering the interoperability and uniformity among all the regions of the country.
- f. **Chairperson NPC queried regarding the cost estimates for implementation of the Unified Accounting Software for all RPCs.** MS NRPC informed that RPCs may share the cost for hiring of consultant and preparation of DPR, however, the project cost may be funded through PSDF.
- g. **Director (System Operation) Grid-India** informed that the cost of implementation for Uniform WBES software was around Rs. 20 crore including the cost of AMC. Accordingly, UAS may cost around Rs. 20-30 crore and the provision of migrating to 5 min scheduling was made in their WBES and other applications. It was opined that similar provision need to be made in Unified Accounting Software (UAS) of RPCs.
- h. **Chairperson NPC** suggested to prepare a proposal for UAS and thereafter, the PSDF funding may be sought. The project may be considered as critical project under PSDF guidelines for bringing interoperability uniformity in the system and importance of timely and accuracy of Regional accounts. ERPC will be nodal RPC for implementation of the UAS and the ToR of the Joint Committee may be revised considering the NEA and for carrying out changes required post implementation of the UAS. He also suggested to include the NTPC and some states as member of the Joint Committee.
- i. **Decisions of the Committee:**
 - i. **The standard output formats of commercial accounts were approved.**
 - ii. **ERPC will be nodal RPC for implementation of the UAS and the ToR of the Joint Committee may be revised considering the NEA, provisions of migrating to 5 min scheduling and for carrying out changes required post implementation of the UAS. NTPC and some states may be included as member of the Joint Committee.**

(Action: ERPC/JC/NPC)

- iii. **A proposal for UAS may be prepared and thereafter, the DPR may be submitted to nodal agency i.e. NLDC for PSDF funding. The project may be considered as critical item under PSDF guidelines for bringing interoperability and uniformity in the system and importance of timely and accuracy of**

Regional accounts. The cost for hiring of consultant and preparation of DPR will be shared equally by all RPCs.

(Action: ERPC/JC/RPCs)

iv. The following timeline was decided in the meeting:

- **Hiring of consultant- 45 days**
- **Preparation of DPR- 60 days**
- **Further timelines may be depending upon scope of work as per DPR.**

(Action: ERPC/JC)

5. National Energy Account (NEA)

- a. **MS NPC** briefed the agenda to the Committee. She informed that MoP vide letter dated 30.11.2016 (**attached as Annexure-VII**) observed that considering the changing scenarios, the functions of NPC may also be broadened including the functions to maintain the National Energy Account (NEA) involving the trans-national and inter-regional transmission transactions. The issue of National Energy Account was deliberated in various meetings (8th, 9th, 10th, 11th, 12th and 13th) of NPC and in the 11th meeting of NPC held on 28.02.2022, NPC and RPCs agreed that in future, if NEA would be mandated by CERC, the directions may be followed accordingly. It was also informed that the mock exercise of NEA was conducted by NLDC.
- b. **MS NPC** opined that since the Uniform Accounting Software (UAS) is being under discussion and in order to make the system futuristic, the provision of NEA may also be incorporated in the UAS. The proposed statement of account to be covered under NEA are as follows:
 - i. DSM account statement of inter-regional and cross border entities.
 - ii. Reactive Energy account statement of cross border entities.
 - iii. National SCED account statement which is currently issued by NLDC.
 - iv. SRAS and TRAS account statement.

The output formats of these statement of account are attached at **Annexure-VIII**. It was noted in pre-meeting among MS, RPCs and MS, NPC held on 29.01.2024 that Schedule of Inter Country transactions may be included in NEA.

c. Decisions of the Committee:

- i. **It was decided that the Joint Committee constituted for implementation of the UAS may also consider the NEA in the UAS software to make the system futuristic.**

(Action: ERPC/JC)

- ii. **The Schedule of Inter Country transactions may also be included in NEA.**

(Action: ERPC/JC)

6. Protection Setting Protocol (WRPC Agenda)

- a. **MS WRPC** informed that in 48th WRPC meeting it was suggested that the protection setting protocol for WR shall be drafted by WRPC within a month and the same shall be forwarded to NPC. The objective of protection setting protocol is to provide and maintain effective protection system having reliability, selectivity, speed and sensitivity to isolate faulty section and protect element(s). MS WRPC requested to prepare a uniform protection setting protocol for all regions, in consultation with all RPCs. The draft protection setting protocol prepared by WRPC is attached at **Annexure-IX**.
- b. **MS NPC** proposed to form a sub-committee with representations from all RPCs, NPC and RLDCs to finalise a uniform protection setting protocol for all regions.
- c. **MS SRPC** informed that Protection Protocol in compliance to IEGC 2023 has been prepared for southern region in consultation with stake holders and has been implemented in SR from 01.10.2023 and same has been informed to Commission. In IEGC it is mentioned that the Protection Protocol in particular system may vary based on operational experience. A sub group to analyse the proposed settings and recommend the settings to the respective entity has been constituted. The recommended settings are vetted in the monthly PCSC meetings.
- d. **Chairperson NPC** opined that the Protection Setting Protocol of WR and SR may be referred and a Uniform Protection Protocol and Uniform Protection Setting Procedure may be prepared for all the regions.
- e. It was 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. The subgroup may submit its report within 5 months.
- f. **Decision of the Committee:**

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. The subgroup may submit its report within 5 months.

(Action: Protection subgroup of NPC /RLDCs/GRID-India)

7. SOP for Voice over Internet Protocol (VOIP) connectivity to utilities from RLDC (NRPC Agenda)

- a. **MS NRPC** informed that a meeting was held under the chairmanship of Member Secretary (NRPC) on 06.07.2023 regarding provision of VOIP connectivity to the control centre / coordination centre of Indigrd & Sterlite with NRLDC. In this meeting, CTU was advised to prepare a draft SOP for providing the VOIP connectivity to control centres of TSPs/ Gencos etc. The draft SOP was deliberated in 23rd TeST meeting of NRPC held on 21.09.2023 wherein it was decided that SOP needs to be finalized for all regions as TSPs in other regions may also come up with such requirements. Hence,

issue may be taken up for deliberation in upcoming NPC meeting. (Draft SOP enclosed at **Annexure-X**).

- b. **CTU representative** informed that inputs related to cyber security has been incorporated as per CEA guidelines and it shall be further looked into for requisite compliance.
- c. **MS NPC** proposed to form a sub-committee with representations from all RPCs, CEA, RLDCs/Grid India, CTU, POWERGRID and concerned private entities to finalise a draft SOP for providing the VOIP connectivity to control centres of TSPs/ Gencos etc. She also informed that in the pre-meeting among MS, RPCs and MS, NPC held on 29.01.2024, it was suggested that representative from PCD Division, CEA may also be included as a member of sub-committee.
- d. **Director (System Operation), Grid-India** opined that there is need for expansion/up-gradation of exiting system since it was conceptualized way long back in year 2012. CTU stated that they are already planning a new VOIP system to replace the existing one as being deliberated in the RPCs.
- e. **Chairperson NPC/CEA** suggested that assessment of the system requirements needs to be ascertained considering the existing and the future requirements. CTU shall take up the same during planning of VOIP system.
- f. After detailed deliberations, it was decided that a sub-committee may be constituted under chairmanship of MS NRPC with representations from all RPCs, PCD Division, CEA, NPC, RLDCs/Grid India, CTU, POWERGRID and concerned private entities to finalise SOP at national level for providing the VOIP connectivity to control centres of TSPs/ Gencos etc. The sub-committee may submit its report within 4 months.
- g. **Decision of the Committee:**
 - i. **A sub-committee may be constituted under chairmanship of MS NRPC with representations from all RPCs, PCD Division, CEA, NPC, RLDCs/Grid India, CTU, POWERGRID and concerned private entities to finalise SOP at national level for providing the VOIP connectivity to control centres of TSPs/ Gencos etc. The sub-committee may submit its report within 4 months.**

(Action: NPC Secretariat/NRPC)

- ii. **The assessment of the system requirements needs to be ascertained considering the existing and the future requirements by CTU. CTU shall take up the same during planning of VOIP system.**

(Action: CTU)

8. Report on Automatic Under Frequency Load Shedding (AUFLS) and df/dt scheme

A. Report on AUFLS and df/dt scheme

- a. **MS NPC** briefed the agenda to the committee. She informed that in the 13th NPC meeting, it was decided that a task force under chairmanship of MS, SRPC with

members from Grid India, RPCs/NPC may be formed to review the report in order to address following suggestions of CMD, GRID-INDIA and MS,SRPC.

- i. The first stage will be set at 49.4 Hz.
 - ii. Total 25% relief will be planned in 4 stages-49.4 Hz, 49.2 Hz, 49.0 Hz & 48.8 Hz.
 - iii. Pumping load will be tripped before first stage (> 49.4 Hz). Battery energy system in charging mode will go in discharging mode (> 49.4 Hz), no storage will be in storage/charging mode at frequency < 49.4 Hz.
- b. She further informed that NPC Secretariat constituted task force on Automatic under Frequency Load Shedding (AUFLS) and df/dt scheme with the representatives from RPCs, NPC and GRID-INDIA. Accordingly, the meeting of the taskforce was held on 11.09.2023 under the chairmanship of MS, SRPC and based on the deliberations in the meeting and further comments received from members, the final Report of the Task Force (Attached at **Annexure-XI**) was prepared/ circulated among the Members and submitted to NPC by SRPC.
- c. Total 25% relief would be planned in four stages: Stage as shown in the table below:

S.No.	Stage of UFR Operation	Frequency (Hz)	% of Quantum Relief
1	<i>Stage-1</i>	49.40	5%
2	<i>Stage-2</i>	49.20	6%
3	<i>Stage-3</i>	49.00	7%
4	<i>Stage-4</i>	48.80	7%
Total			25%

- d. She summarised the recommendation of the report as below:
- i. NPC Secretariat will communicate region wise relief quantum (based on Regional Peak Demand Met during the previous FY) by 31st of May to RPCs for implementation in the next Financial Year (FY).
 - ii. Distribution of relief among State/UT to be carried out based on Regional relief and demand contribution in the average of Peak demand met ratio and demand met (consumption) ratio of State/UT in the previous FY by RPCs.
 - iii. Guidelines for identification of AUFLS feeders: Stage-1 & Stage-2 for downstream network at 11/22/33 kV level and Stage-3 & Stage-4 for upstream network at EHV (66/110/132 kV) level.
 - iv. Prioritization of the loads under the AUFLS and df/dt scheme: Feeders catering to critical loads are to be avoided. VIP areas, Airport, Metro, Railways, Defence etc. has been prioritized.
 - v. Quantum Identification for AUFLS by States/UT and monthly vetting: Each SLDC shall carry out month-wise Stage-wise analysis and furnish to RPC/RLDC. Actual Relief for the month and recommended Relief for the month for each Stage. The

data would be vetted by RLDC and discussed in OCC Meetings of RPC. As a general Guideline Actual Relief for the month should be 10% more than the recommended Relief for the month considering the Relay/breaker issues and a resilient safety net.

- vi. Analysis of AUFLS Event and discussion in OCC Meetings of RPC.
 - vii. Mapping of AUFLS feeder at SLDC and RLDC level.
 - viii. SLDCs shall download the data and store it for two years. The Data should be made available to RPCs/RLDCs/CEA/CERC for further studies or analysis.
 - ix. Settings of UFR for Pumping load/Energy Storage Systems: All Energy Storage Systems would change from charging mode to discharging mode at 49.50 Hz. If it is not possible then they would be tripped at 49.50 Hz. If ESS is injecting active power at 49.50 Hz not to be tripped. Pumping load will be tripped before AUFLS first stage. Irrigation Pumps would be tripped at 49.50 Hz.
 - x. All the relays procured in future to have a sampling period ranging from three (03) cycles to five (05) Cycles. No additional time delay to be incorporated in the relay other than the inherent measuring time.
 - xi. Testing/Inspection of UFR: SLDCs responsible for testing and chalk out a plan of relays testing schedule before 1st of December and submit the same to RPC/RLDC. The periodicity of testing of relays shall be twice in a year at 110 / 132 kV level and above Substations and once in a year at 66 kV level and below Substations.
 - xii. RPC would carry UFR inspection randomly on sample basis by the RPC Secretariat or through RLDC.
 - xiii. df/dt Scheme: It is specific to regions and therefore, the quantum of load shedding may be discussed at regional levels in the RPCs in consultation with the stakeholders.
- e. **Director SLDC (Odisha)** opined that the starting frequency/first stage of AUFLS may be considered at 49.5 Hz instead of 49.4 Hz keeping in view the operation of automatic demand side management at 49.9 Hz. MS SRPC clarified that the issue was discussed in detail in the UFR report under Chairmanship of MS, WRPC and the resilience of single grid needs to be harnessed before going for AUFLS load relief.
- f. **Chairperson NPC** queried whether the feeders under AUFLS are being monitored. MS NPC informed that the feeders are being monitored and RPCs shares the status update on the feeder monitoring to the NPC Secretariat. Chairperson NPC emphasised upon the monitoring of feeders under AUFLS and suggested that it may be made part of regular agenda in the appropriate RPC forum.
- g. **Chairperson NPC** queried if a feeder under AUFLS is under outage, then how the desired load shedding can be obtained. MS SRPC informed that in the report, it has been recommended that the actual load relief should be 10% more than the desired relief considering the Relay/breaker issues and a resilient safety net. He also informed that the load flow of feeders under AUFLS being monitored regularly by the SLDCs.
- h. **Chairperson SRPC** stated that the utilities generally kept agriculture feeders under AUFLS and feeders connected to city load are not covered under AUFLS.

- i. **MS NPC** informed that the reports recommended that the guidelines for identification of AUFLS feeders and prioritization of the loads under the AUFLS and df/dt scheme.
- j. Further, GRID-India vide email dated 19.02.2024 submitted following suggestions on implementation of AUFLS:

- i. The Distribution connected RE (DRE) rich areas shall not be included as loads for shedding under AUFLS.

- ii. AUFLS relay operation may also be standardized such as measurement, delay and operation time.

- iii. The mapping of feeders need to be carried out at all RLDCs also.

k. Decisions of the Committee:

- i. **The report of Task Force on Automatic under Frequency Load Shedding (AUFLS) and df/dt scheme was approved by the Committee. The same needed to be taken up for implementation by RPCs. In order to address the views of Director SLDC (Odisha) and suggestions of GRID-India, a meeting may be convened by NPC Secretariat with stakeholders and if any further changes are suggested it shall be brought to next meeting of NPC.**

(Action: NPC Secretariat)

- ii. **The monitoring of feeders under AUFLS may be prioritised by SLDC/RLDC/NLDC and it may be made part of regular agenda in the appropriate RPC forum to assess the performance.**

(Action: RPC Secretariat)

B. Settings of AUFLS schemes:

- a. **MS NPC** informed that in line with the recommendations of the sub-committee and further revision suggested by the Taskforce, the quantum of load shedding in different stages of AUFLS has been calculated based on the peak demand met of the region in the financial year (2022-23). The region wise peak demand met is as follows:

Region	NR	SR	WR	ER	NER
Peak Demand Met (MW)	76561	64337	71677	27218	3603

- b. The quantum of load shedding in different stages of AUFLS has been calculated based on the peak demand met of the region in the financial year (2022-23) as follows:

S. No.	Stage	Frequency (Hz)	Demand Disconnection (%)	Quantum of Load shed in MW						
				NR	SR	WR	ER	NER	All India Load shed	
AUFLS Set Points and Percentage Quantum of Relief										

1	Stage 1	49.4	5.00%	3828.05	3216.85	3583.85	1360.9	180.15	12169.8
2	Stage 2	49.2	6.00%	4593.66	3860.22	4300.62	1633.08	216.18	14603.76
3	Stage 3	49.0	7.00%	5359.27	4503.59	5017.39	1905.26	252.21	17037.72
4	Stage 4	48.8	7.00%	5359.27	4503.59	5017.39	1905.26	252.21	17037.72
	Total (in MW)			19140.35	16084.25	17919.25	6804.5	900.75	60849

c. **Decisions of the Committee:**

If any change is recommended in the meeting by NPC secretariat to look into the suggestion of Director SLDC (Odisha), for new stage of AUFLS at 49.5 Hz with 1-2% of Load relief, the same will be put upto to NPC and after approval of NPC the same would be communicated to RPCs for implementation.

(Action: NPC Secretariat)

9. Unified Real Time Dynamic State Measurement (URTDSM) project phase-II (PowerGrid Agenda)

- a. **MS NPC** informed that in the 13th NPC meeting, the report of subcommittee on uniform philosophy of PMU locations, new analytics and requirement of up gradation of Control Center under “Unified Real Time Dynamic State Measurement” (URTDSM) project phase-II under the chairmanship of MS, WRPC was approved by NPC. It was also decided that the PowerGrid may prepare the DPR of URTDSM project phase-II in accordance with the recommendation of the committee within three months. PSDF funding for URTDSM project phase-II may also be sought subsequently. RPCs were requested to provide full cooperation in preparation of DPR.
- b. **PowerGrid representative** informed that based on the recommendation of the report and the inputs received from entities, around 4000 PMUs will be installed in phase-II. The scope of work also includes the development of new analytics, up-gradation of existing analytics and integration of existing PMUs of phase-I etc. He further informed that the budgetary quotations were sought from 3 prospective bidders. All the bidders have informed about constraints in design & providing estimated cost because of large number of PMUs, large size of PDC & historian and new analytic applications in the Project. Till now, two budgetary quotations were received and based on that, cost estimates for phase-II have been worked out and it came around Rs. 3700 crore which includes Rs. 2300 crore for project implementation and rest amount for 7 years AMC.
- c. **MS ERPC** informed that the in ER, the state of Jharkhand is having majority of transmission lines at 132 kV level, however, the report of URTDSM phase-II recommends to install PMUs on 220 kV and above lines. He requested to considered 132kv lines of state of Jharkhand for PMU installation under phase-II. Chairperson NPC suggested to send their inputs with proper justification.

- d. **Chairperson NPC stated for** optimising number of PMUs to be installed under Phase II based on importance of PMUs location required for grid operations in consultation with the users like RLDC, SLDC.
- e. **Director (System Operation) GRID-India** informed that as per Central Electricity Authority (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations, 2022, the PMUs need to be installed in all the new substation and therefore all such new substation may be excluded from the scope for URTDSM phase-II.
- f. **ED (AM) PGCIL** informed that the IT components of phase –I will serve their useful life by 2026 (URTDSM phase I was commissioned in year 2018), therefore, these components may also include in the phase-II. Chairperson NPC stated to exclude such components from the scope of phase-II.
- g. **MS NPC** opined that the software analytics/reports under Phase-II may be finalised in consultation with the RLDCs/RPCs. The new technology options like AI, ML and big data analytics may be explored by RLDCs/RPCs/CTUIL while designing analytics software. **CTU representatives** appreciated the views of MS NPC and further added that URTDSM systems is critical for the increased complexity of power system network in light of large amount of renewable integration in the vast integrated Indian grid. The grid behaviours captured by PMUs and analysed by the applications may be empowered with Machine learning & Artificial Intelligence for adaptive solutions. The applications may generate meaningful reports periodically for separate zones depending upon its uniqueness. And the system database & intelligence may be periodically (every quarter or configurable for applicable administrative responsibility areas) revalidated for more realistic results and report generation.
- h. **CTU representative** suggested to reduce the storage time period of the data under URTDSM phase-II to optimise the cost estimates and in this context the input from Grid India may be taken for assessing the phase I storage requirements and historical data usage.
- i. **Chairperson TCC (SR)** stated that the analytics under phase-I are not of much use. He suggested that capacity building programs related to PMUs and its software analytics may be organised for the SLDCs. **Chairperson NPC** stated that a course may be designed on PMUs and its software analytics by NPTI.
- j. **ED (AM) PGCIL** informed that the AMC contract for software URTDSM phase-I needs to extend with IIT Mumbai for further years. **MS ERPC** informed that extension of contract has already been approved for ER. **MS SRPC** informed that SRPC forum is not satisfied with analytics and support of the IIT Mumbai and therefore, they may not be ready to extend the AMC contract further. **Chairperson NPC** opined that GRID-India may coordinate among RLDCs to have a consensus on whether to extend the AMC contract with IIT Mumbai for the software analytics for URTDSM phase-I.
- k. **Director SLDC (Odisha)** informed that the state of Odisha is implementing a separate WAMS projects. He requested the analytics which has been provided to them under URTDSM phase-I may be allowed to use for their separate WAMS project. The cost of customisation of analytics under URTDSM phase-I to make them for the use of WAMS of Odisha may be borne by the Odisha. PowerGrid informed that they will examine

whether it is possible as per their agreement with IIT Mumbai and coordinate with Odisha.

1. Decision of the Committee:

- i. PGCIL may revise the scope of DPR in line with above suggestions ((d) to (h)) and submit the DPR by March 2024.**

(Action: PGCIL)

- ii. PowerGrid will inform whether the customisation of analytics under URTDSM phase-I to make them for the use of WAMS of Odisha is possible as per their agreement with IIT Mumbai.**

(Action: PGCIL)

- iii. A course may be designed on PMUs and its software analytics for the SLDCs by NPTI.**

(Action: HRD Division, CEA/NPTI)

- iv. GRID-India may coordinate among RLDCs to have a consensus on whether to extend the AMC contract with IIT Mumbai for the software analytics for URTDSM phase-I.**

(Action: GRID-India)

10. Introduction of MPLS Technology in ISTS Communication (Agenda from CTU):

- a. **MS NPC** informed that in line with decision of the 13th NPC meeting, NPC Secretariat constituted the committee on 24.08.2023 with representative from RPCs, PCD Division CEA, GRID-INDIA, RLDCs, POWERGRID, CTU and some prominent states Kerala, Chhattisgarh, West Bengal .As of now the Joint Committee has held four (4) numbers of meetings on 19.09.2023, 17.10.2023, 05.12.2023 and 23.01.2024.
- b. **CTU representative** informed that the vendors of MPLS technology state that they are not able to meet the Make In India requirements completely and therefore, they are reluctant to go for PoC. However, CTU is consistently trying for the same.
- c. **Chairperson SRPC** opined that the MPLS technology may be implemented for the new and upcoming system and in the old and exiting system SDH technology may be used. He suggested to use hybrid approach with interoperability to slowly integrate the new technology.
- d. **Chairperson NPC** emphasised that the importance of trusted vendor for the communication system. He opined that whether the migration from SDH technology to MPLS technology is required need to be deliberated further. He suggested to develop a comprehensive plan for the future, considering the existing/available technology.
- e. **Decision of the Committee:**

CTU may submit the report on Introduction of MPLS Technology in ISTS system by July 2024.

(Action: CTU)

11. PUSHp portal (For Flexibilisation of PPA for Optimal Utilization of Resources & Reduction in Cost of Power for Consumers):

a. MS NPC informed that the PUSHp portal was launched on 09th March, 2023 by Hon'ble Minister of Power and NRE. The transaction on the portal has been started w.e.f. 03.04.2023. Twenty (20) Nos of States & UTs have started using the portal for declaration and requisition of surplus power. She informed that as on 03.02.2024, 94 number of request completed for allocation on portal. The status of successful transactions on the PUSHp portal is attached at **Annexure-XII**. She further informed that the following new Provision/Feature were added on the PUSHp portal:

i. Updating power requirement by the Buyers: As of now, some of the states-Bihar, Rajasthan, Andhra Pradesh, Jharkhand, Maharashtra, Odisha, Tamil Nadu, Uttar Pradesh, Haryana and Assam have updated their power requirement on the portal as and when required by them.

ii. Provision of Banking of Power feature under the PUSHp Portal: In the PUSHp Portal, a facility/provision has been provided to the States through which the States may intimate/declare the surplus power quantum which they are willing to bank for a certain period of duration. Any other state who wants to acquire this surplus power in deficit scenario and willing to undergo for banking with the surplus state, may give requisition for this surplus power for a same duration in the PUSHp Portal as per their mutual agreement. **PUSHp Portal shall be acting as match-making platform for banking of power.**

b. She further informed that in a meeting held on 7.12.2023 with the nodal officers, Punjab representative informed that NTPC is insisting for separate PPA for transactions on the PUSHp portal. In this meeting, NTPC informed that beneficiaries are required to enter into a generic PPA for the power allocated to them through PUSHp portal and to comply the scheduling requirements as per the provisions of act and regulations. NTPC has submitted the draft PPA format. In the minutes of the meeting held on 07.12.2023, it was concluded that the allocation of power through PUSHp portal is of temporary nature and the original allocation of power gets reinstated once the temporary allocation cease to exist. Further, the PUSHp portal facilitates the temporary allocation of power for a certain period which was earlier done by MoP/RPCs. In case of temporary re-allocation of power being done by MoP/RPCs, separate/another PPAs with the states/buyers was not required. In line with this, the separate PPA for the power allocated through PUSHp portal may not be necessary for creation of contracts and scheduling of power.

c. She further informed that a buyer having adequate LC/PSM/advance payment with a CGS/Gencos, the existing adequate LC/PSM/advance payment may be considered as valid PSM by CGS/Gencos for both short term and long term temporary power allocation through PUSHp portal. However, in absence of adequate LC/PSM/advance

payment, CGS/Gencos may review the existing LC/PSM on regular interval and request buyer to enhance LC/PSM/advance payment or ask for additional LC/PSM/advance payment for the short term and long term temporary power allocated through PUSHp portal. ED (commercial), NTPC agreed for the same.

- d. **Chairperson NPC** opined that there are terms and condition which an entity has to agree before login to the PUSHp portal. NTPC may add any specific points in these terms and condition and there is no need to enter into separate PPA with the states for the PUSHp portal.
- e. **Chairperson TCC (SR)** informed that the APERC has not approved the payments for the power taken by the state from the unallocated share of CGS from whom the state is not having firm share.
- f. **Decision of the Committee:**
 - i. **There are terms and condition which an entity has to agree before login to the PUSHp portal. NTPC may add any specific points in these terms and condition and there is no need to enter into separate PPA with the states for the PUSHp portal.**

(Action: NTPC)

- ii. **A buyer having adequate LC/PSM/advance payment with a CGS/Gencos, the existing adequate LC/PSM/advance payment may be considered as valid PSM by CGS/Gencos for both short term and long term temporary power allocation through PUSHp portal. However, in absence of adequate LC/PSM/advance payment, CGS/Gencos may review the existing LC/PSM on regular interval and request buyer to enhance LC/PSM/advance payment or ask for additional LC/PSM/advance payment for the short term and long term temporary power allocated through PUSHp portal.**

12. Establishment of State-of- the-Art National Unified Network Management System (N-UNMS) in main & backup configuration integrating all the regional UNMSs. (CTUIL Agenda)

- a. **CTU representative** briefed the agenda to the Committee. She informed that in line with CERC, CEA Regulations and RPC’s deliberation, establishment of State-of Art U-NMS for ISTS and State Utility Communication System for all the Regions have been envisaged for five Regional systems and one National system integrating all the regional ones; in main & backup configuration. This will facilitate centralized reporting/collection of PAN India communication Network of ISTS as well as State level system including cross border links at National Level. She informed the status of UNMS for each region as below:

Region	Vendor	Date of award	Control Center Location	Status
NR	Sterlite	09.08.2021	Main: Delhi, Backup: Lucknow	Commissioned

NER	Sterlite	09.08.2021	Main: Guwahati, Backup: Shillong	Commissioned
ER	NMS works	29.06.2022	Main: Kolkata, Backup: Patna	Commissioning in Feb'24/March' 24
SR	NMS works	17.01.2024	Main: Bangalore, Backup: Hyderabad	Awarded
WR	NA	NA	Main: Mumbai, Backup: Vadodara	Tender opened in Jan'24
National	NA	NA	Main: NLDC, Delhi, Backup: RLDC, Kolkata	Approval for NPC

- b. **Chairperson SRPC** opined that the regional UNMS system will monitor the inter-state and intra-state communication system, the objective of implementing the national UNMS is also similar.
- c. **Chairperson NPC** informed that national UNMS will be helpful in the monitoring of PAN India communication Network of ISTS as well as State level system including cross border links at National Level. A data repository will be created at national level which will be helpful in the communication system planning.
- d. It was suggested that the tariff of UNMS project at national level may be included as national component.
- e. RPCs opined that the agenda for implementation of national UNMS needs deliberations at RPC level.
- f. **Decision of the Committee:**

The agenda for implementation of national UNMS needs deliberations at RPC level for taking the views of RPCs. CTU may take up agenda for implementation of national UNMS in the upcoming meeting of RPCs. The cost booking under National Component may be included in proposal.

(Action: CTU/RPCs)

13. Membership of RE Generators in RPC (ERPC- Agenda)

- a. **MS NPC** informed that it was decided in the 13th meeting of NPC that the associations of solar and wind generators both on rotational basis may become the members of the RPCs. The participation of associations would be limited to technical and operational issues. GM Division, CEA would nominate the associations to RPCs in similar line of Traders/Private Transmission Licensees.
- b. **Deputy Director GM Division (CEA)** informed that the regulations and resolution on basis of which the membership of RPCs is being considered are applicable for conventional generators only.
- c. **Chairperson NPC suggested that GM Division may take up the matter in CEA.**

14. Any Other Agenda Items with the permission of Chairperson, NPC

14.1 Five (5) min Interface Energy Meters along with AMR system for PAN India (for all Five regions) (CTU Agenda)

- a. **CTU representative** informed that the proposal of the scheme “5 min Interface Energy Meter along with AMR system” for Southern Region was put up to 17th NCT meeting held on 31st Jan’2024. After deliberation, it was decided that the same scheme shall be worked out for complete PAN India National level. He **further** informed that the SRPC has proposed for the PSDF funding for “5 min Interface Energy Meter along with AMR system” for Southern Region.
- b. **Grid-India** informed that the provision of migrating to 5 min scheduling was made in their WBES and other applications. It was opined that similar provision need to be made in Unified Accounting Software (UAS) of RPCs.
- c. **Chairperson NPC** was of the view that 5 min IEM with AMR system may be implemented for pan India for smoother transition from 15 min to 5 min regime. **He further** opined that the proposal/DPR for 5 min IEM with AMR system for pan India may be prepared by PGCIL based on the input provided by CTUIL regarding the ISTS metering points in consultation with Grid India. CTU may prepare the roadmap and activities to be done for transition from 15 min to 5 min regime based on the previous studies/ reports in present context. He emphasized that the timeline of the activities may also be prepared and it may be in sync and coordination with each activities for smoother implementation of the project. The PSDF funding may not be possible because limited funds in PSDF. The funding of the project may be decided in the NCT meeting.
- d. **Decision of the Committee:**
 - i. **The agenda for 5 min Interface Energy Meters along with AMR system for PAN India (for all five regions) needs deliberations in all RPC. Agenda may be taken up in the upcoming meetings of all RPCs.**

(Action: CTU/RPCs/POWERGRID)

- ii. **The proposal/DPR for 5 min IEM with AMR system for pan India may be prepared by PGCIL based on the input provided by CTUIL regarding the ISTS metering points in consultation with Grid India.**

(Action: POWERGRID/CTU/GRID-India)

- iii. **CTU may prepare the roadmap and activities to be done for transition from 15 min to 5 min regime based on the previous studies/ reports in present context. The timeline of the activities may also be prepared and it may be in sync and coordination with each activities for smoother implementation of the project.**

(Action: CTU)

14.2 Mismatch between RTU-SCADA real time data and IEM data

- a. **Director SLDC (Odisha)** informed that in the special meeting of NPC held on 24.06.2022 it was decided that the pilot project of Integration of Interface Energy Meters (IEMs) into SCADA/EMS system for telemetry of meter data to MP SLDC was agreed to be implemented for the standby meters at MP side at the ISTS interface points. It was also agreed that the similar projects may be implemented at the two ISTS substations (one at new system and other at old system) in each region. He informed that such pilot project has not implemented in the ER due to various issues raised by PGCIL.
- b. **PGCIL representative** informed that the pilot project has the cyber security issues. Further, it will also add burden to the IEM, it may affect the commercial accounting.
- c. **Grid –India representative** stated that the difference in SEM and SCADA was less than 1%. The SCADA issues needs to be addressed by the entities rather than taking one more input from existing IEMs.
- d. **MS NPC** informed that the provision of telemetry of 1 min instantaneous MW power flow data from IEMs to SLDC for efficient drawl management has been made in the Technical Specification of 5 Min IEM, AMR and MDP system.
- e. **Chairperson NPC** suggested to form a sub-committee under chairmanship of MS WRPC with the representation from PGCIL, states, RPCs, RLDCs, CTUIL, NPC to look into the issue **SCADA vs SEM mismatch**, reason thereof and also study the pilot project being done by MP. The sub-committee may submit its report within 4 months.
- f. **Decision of the Committee:**

A sub-committee may be constituted under chairmanship of MS WRPC with the representation from PGCIL, RPCs, RLDCs, CTUIL, NPC and states to look into the issue SCADA vs SEM mismatch, reason thereof and also study the pilot project being done by MP. The sub-committee may submit its report within 4 months.

(Action: NPC Secretariat)

14.3 Agenda of operational Issues of DISCOMs at RPC level

- a. **Chairperson SRPC** opined that the RPC forum are being used mainly for addressing the issues of Generators, Transmission Licensee, PGCIL, CTU etc. however, the issues of the DISCOMs are not being deliberated at RPC level. He suggested to earmark some time and forum to discuss the issues of DISCOMs.
- b. **MS ERPC** informed that generally DISCOMs are not raising their issues in the RPC meetings because generally states are being represented in the RPCs by their transmission wing.
- c. **Chairperson TCC (WR)** stated that guidelines at Enterprise Level (Discom Level) needs to be brought out for number of operational/planning aspects of DISCOMs by central agencies like CEA.
- d. **Chairperson NPC** informed that Electricity Distribution Network Planning Criteria 2023 and Draft Distribution Perspective Plan 2030 has been published on CEA website and focus is there on Distribution aspects. He opined that DISCOMs have forums to

raise their infrastructural issues, however, there is no appropriate forum to discuss the operational issues of the DISCOMs. He suggested to earmark time and forum of RPC to take up the agenda related to operational issues of DISCOMs.

e. **Decision of the Committee:**

DP&T Divisions, CEA in coordination with the NPC to take lead in this aspect and Region-wise meeting may be held. RPCs may facilitate these meetings at regional level.

(Action: DP&T Divisions, CEA)

15. Status Update of the following Agenda items: The Status update on the following agenda items as received from RPCs is given below:

Agenda items	Decision/Deliberations in the 13 th NPC Meeting	Status Update
<p>Preparation of an annual calendar for conducting the protection system audits.</p>	<p>RPCs are requested to update the preparation of an annual calendar for conducting the protection system audits</p>	<p>The status provided by RPCs are as follows:-</p> <ul style="list-style-type: none"> • SRPC- SRPC has completed the Regional Protection Audit of 30 Substations for the FY 2023-24 during the Months of December 2023 & January 2024. As per IEGC Regulations, entities are required to furnish the third party audit plan for the next financial year to RPC by 31st October. Third Party Audit calendar for Southern Region would be prepared for FY 2024-25 after receipt of the audit plans from all SR entities. • WRPC- Tentative Annual calendar (will be firmed up shortly) enclosed at <u>Annexure –XIII</u> • NERPC- An annual calendar for protection audits of 132kV level & above substations has been prepared by NERPC. The same is being reviewed in monthly Protection sub-committee meetings. • NRPC- Utilities were sensitized for provision of IEGC 2023 that Annual audit plan for the next financial year shall be submitted by the users to their respective RPC by 31st October. NRPC Secretariat has received annual audit plan from 6 utilities till the date.

		Input is still awaited from ERPC.
Development of communication outage portal in RPCs	The communication outage portal developed by SRLDC shall be discussed with RPCs/NPC at Communication subgroup of NPC and RLDCs for implementation in other regions.	<p>The status provided by RPCs are as follows:-</p> <ul style="list-style-type: none"> • SRPC- Communication outage portal developed by SRLDC. • ERPC-Communication outage portal development is in process with ERLDC in consultation with SRLDC. • NERPC- NERPC requested NERLDC to develop communication outage portal similar in line with SRPC portal. NERLDC is in the process of development of the communication outage portal. • NRPC &WRPC-initiated discussion with RLDC for the development of the portal.
	<p>Deliberation/Decisions in 14th NPC Meeting: All RLDC/RPC may develop the common communication outage portal in line with SRLDC portal.</p>	
Conducting Cyber Security Audits	It was also decided in the 13 th NPC meeting that periodicity of conducting Cyber Security Audits - 6 months for IT audit and 1 year for OT audit may be followed by RPCs.	<p>The status provided by RPCs are as follows:-</p> <ul style="list-style-type: none"> • WRPC- A Regional Sub-Committee and Central Cyber Security Coordination Forum for CERT-GO as per provision of Regulation 53 of Indian Electricity Grid Code has been formed and nominations provided by WRPC. • SRPC- SR entities are insisted to carry out the cyber security audits for their IT as well as OT systems at least once in every 6 (six) months as per CEA (Cyber Security Guidelines) 2021. • NERPC- Cyber Security Audits for OT system is being done annual basis. However Cyber Security Audits for IT system is being planned by constituents. Matter will be taken up in the next NETeST Meeting. • NRPC- In accordance with Regulations 53 of IEGC, 2023, Northern Regional Cyber Security Co-

		<p>ordination forum is formed by NRLDC. 1st meeting of committee is scheduled to be held on 8th Feb, 2024.</p> <p>Input is still awaited from ERPC.</p>
<p>Review of Status of Islanding schemes</p>	<p>a. RPCs may handhold the states for timely implementation of the islanding scheme and the timeline may be given by RPC to each states for DPR preparation and implementation of Islanding Scheme.</p> <p>b. RPCs are requested to update the progress of each Islanding Scheme in the MIS report.</p>	<p>The detailed MIS report (as per information available in NPC Secretariat is attached at <u>Annexure-XIV</u>).</p> <p>The updated MIS report has been received from WRPC, NERPC, NRPC and SRPC Input is still awaited from ERPC.</p>
<p>Mapping of Feeders under AUFLS schemes on SCADA system</p>	<p>It was again requested to expedite the work by WRPC, NRPC and NERPC to conduct meetings with their DISCOMs to find solutions for feeder mapping and expedite it in their regions.</p>	<p>The status available with NPC Secretariat is attached at <u>Annexure-XV</u>.</p> <p>Summary of status of mapping of feeders:-</p> <ul style="list-style-type: none"> • In SR- As on 31.12.2023 mapping was 95% in SR. Andhra Pradesh-92%, Telangana-87%, Karnataka-96%, Kerala-100%, Tamil Nadu-97%, Puducheery-100%. • In WR- Madhya Pradesh: 100 %, Gujarat: NIL, Maharashtra: NIL, Goa: NIL, Chhattisgarh: NIL, DDDNH-NIL. • In NER- Assam-100 %, Meghalaya-100%, Nagaland-100%, Arunachal Pradesh – Nil Manipur – Nil, Mizoram – Nil (to be completed by Dec’23), Tripura – 20%. However, NERPC informed that States are being regularly sensitized in OCC forum for ensuring complete mapping of UFR feeders. Lack of RTUs at 33kV substations is a major hurdle. Shifting of feeders are underway.

		<ul style="list-style-type: none"> • In NR- UP-77.35 %, Punjab-90%, Haryana-99%, Delhi-100%, HP-86.9%, Rajasthan-0%. <p>Input is still awaited from ERPC.</p>
<p>Ensuring Proper Functioning of Under Frequency Relays (UFR) & df/dt Relays</p>	<p>a. The annual calendar and SOP for periodic inspection of AUFLS and df/dt relays to be prepared by RPCs.</p> <p>b. RPCs may also ensure to conduct the periodic inspections of AUFLS and df/dt relays as per the annual calendar.</p>	<ul style="list-style-type: none"> • SRPC had prepared Annual Calendar for periodic inspection of AUFLS and df/dt for the year 2023-24. Total 26 S/Ss were identified for Inspection in five States and UT. Inspection was carried out in 16 number of Sub Stations. Details are attached at <u>Annexure-XVI</u>. The SLDCs/S/Ss are advised on the actions to be taken based on the observations by SRPC. Action taken report also were sought. • WRPC had prepared Annual Calendar for periodic inspection of AUFLS and df/dt for the year 2023-24. Inspection was carried out in 8 number of Sub Stations. Details are attached at <u>Annexure-XVI</u>. • NERPC has prepared annual audit calendar for inspection of UFRs in the region. Inspection of UFR at 132kV Azara substation was conducted on 24.08.2023. Other sites of Assam have been identified for inspection, to be carried along with the protection audit in January'24. • Utilities submit report of mock exercises for healthiness of UFRs on quarterly basis to NRPC Secretariat. The compliance is monitored in monthly OCC meetings. NRPC has also conducted UFR inspection of 220 kV Rishikesh S/s of PTCUL recently. IEGC, 2023 requires RPC to carry out random inspection of the under-frequency relays. In view of this calendar for periodic inspection has not been prepared in NRPC. Further, a pre-prepared periodic inspection calendar would rule out the possibility of surprise inspection.

		Input is still awaited from ERPC.
Report on Power System Stabilizers (PSS) tuning	The report of the sub-committee was accepted by the NPC. The reports may be circulated for the stakeholders' consultation before implementation of recommendations of the report.	WRPC updated that the PSS tuning report was circulated with concerned stakeholders via email dated 18.08.2023. However, no update has been received regarding comments from stakeholder on the report. The report may adopted by RPCs.
	Deliberation in 14th NPC Meeting: The Report may be adopted by RPCs.	

16. Meeting ended with vote of thanks to Chair.

Annexure-I 14th NPC

भारत सरकार/Government of India
विद्युत मंत्रालय/Ministry of Power
केन्द्रीय विद्युत प्राधिकरण/Central Electricity Authority
एन.पी.सी. प्रभाग/National Power Committee Division
Ist Floor, Wing-5, West Block-II, RK Puram, New Delhi-66

No.4/MTGS/SG/NPC/CEA/2023/ 353

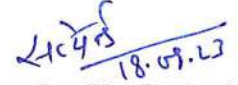
Date: 18.09.2023

Subject: Standard Operating Procedure for Protection System Audit- reg.

Standard Operating Procedure (S.O.P) for Protection System Audit is enclosed herewith for your kind information and necessary action.

Enclosure: As above

Yours faithfully,


18.09.23

(सत्येंद्र कु. दोतान / Satyendra Kr. Dotan)
Director, NPC & Member Convener (Sub-group)

Standard Operating Procedure for Protection System Audit

A protection system audit is a review and evaluation of the protection systems of a substation with an objective to verify whether required protection systems have been put in place at station by the concerned utility, and to recommend suitable measures to provide for the same.

Ministry of Power, had constituted a Committee under the Chairmanship of Chairperson CEA to examine the grid disturbances on the 30th and the 31st July 2012. One of important recommendation of the committee was conducting of extensive audit of protection system. List of sub-stations where protection audit is to be undertaken on priority basis was prepared and audited across the country. This was the beginning of protection audit across the country and large number of important 400 and 220kV substations were audited.

Keeping in view the importance of Protection System Audit, Standard Operating Procedure has been prepared for the reference purpose. It will provides a step-by-step guide for RPCs to follow during the audit process.

1. All users shall conduct third party protection audit of each sub-station at 220 kV and above (132 kV and above in NER) once in five years or earlier as advised by the respective RPC.
2. After analysis of any event, each RPC shall identify a list of substations / and generating stations where third-party protection audit is required to be carried out and accordingly advise the respective users to complete third party audit within three months.
3. The third-party protection audit report shall contain information sought in the format as per IEGC 2023 and its further amendments.
4. 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.
5. **Criteria for choosing substations for third party protection audit:**

The following criteria are generally applied during choosing a substation for protection audit.

- i. Substations/ Generating (SS/ GS) stations with frequent grid incidences or frequent maloperations or any grid occurrence in any substation which affected supply to large number of substations and caused significant load loss. In this case, third-party protection audit may be carried out within three months or as decided in the Protection sub-Committee Meeting of the RPC.
- ii. Based on request received from utilities for arranging protection audit in certain stations (e.g. for availing PSDF funding for Renovation and Upgradation of Protection system). In this case, preferably third-party protection audit may be carried out within three months.
- iii. 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.

6. Protection audit Procedure:

- i. After identification of stations for protection audit, the same is communicated to the owner utility seeking nomination of one nodal officer for each Station.
- ii. The nodal officer shall provide the details of substation for preparation of protection audit format (in line with IEGC and subsequent amendments).
- iii. Meanwhile nominations shall be sought from all utilities to form regional teams for audit. Regional teams comprising of engineers from various utilities /utility (other than the team of host State) of the region shall be formed based on the no. of SS to be audited. (Each team may consists of 3 or 4 engineers from utilities other than the host utility and at the maximum a team will be able to audit 3 to 4 stations in 7-9 days or so)
- iv. Once the team details and list of stations to be audited is finalised the details of nodal officers, team members , list of stations to be audited by each team is shared to all for further coordination regarding planning and conduction of audit.
- v. Based on the inputs received from nodal officer regarding the list of elements in the substation to be audited, protection audit formats shall be prepared by RPC (in line with IEGC) and circulated to nodal officer. The nodal officer along-with the substation engineers shall fill the audit format and furnish the same along-with various attachments sought as part of the audit format within a week or so. List of attachments shall be given in the covering page of audit format.
- vi. 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.
- vii. 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.
- viii. 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.
- ix. 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.
- x. 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.
- xi. The recommendations of all SS audited shall be inserted into audit recommendations database and update regarding recommendations shall be sought from respective utilities.
- xii. Action plan for rectification of deficiencies detected, if any, shall be submitted to the respective RPC and RLDC and monthly progress will be submitted.

xiii. 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.

Final Standard Operating Procedure (SOP) to address the Grid Disturbances (GDs)/Grid Incidents (GIs)/any other Protection Trippings

1. Immediately following an event (grid disturbance/incidence as defined in the CEA (Grid Standards) Regulations 2010 and subsequent amendment in the system, the concerned user/entity or SLDC shall inform to the RLDC through voice message.
2. Written flash report shall be submitted to RLDC and SLDC by the concerned user/entity within the time line specified in **Table 8** below, as per the IEGC, 2023.
3. In compliance of IEGC, 2023, All the Users, STU/SLDC are required to furnish the following information in respect of Grid Occurrences(GD/GI) within the time line specified in **Table 8** below, to RLDC/ RPC:
 - (i) First Information Report (FIR)
 - (ii) Event Logger (EL) output
 - (iii)Disturbance Recorder (DR) output
 - (iv)Trip event analysis report-TR (with pre and post fault system conditions)
 - (v) Data Acquisition System (DAS)
4. RLDC shall report the event (grid disturbance or grid incidence) to CEA, RPC and all regional entities within twenty-four (24) hours of receipt of the flash report.
5. After a complete analysis of the event, the user/entity shall submit a detailed report in the case of grid disturbance or grid incidence within one (1) week of the occurrence of event to RLDC and RPC.
6. Based on the above detailed report submitted to RLDC by the entities, RLDC shall Categorize Grid Occurrences into grid incidents (GIs) and grid disturbance (GDs) based on criteria as per the CEA (Grid Standards) Regulations 2010 and subsequent amendment. RLDC shall also submit the Auto Reclosure (A/R) failure events, PLCC related events, any other protection related events to RPCs on monthly basis.
7. RLDCs and NLDC (for events involving more than one region) shall prepare a draft report of each grid disturbance or grid incidence including simulation results and analysis along with associated PMU plots of appropriate resolution, which shall be discussed and finalized at the Protection sub-committee/sub-group of RPC as per the timeline specified in **Table-8** below.

TABLE 8 : REPORT SUBMISSION TIMELINE

Sr. No.	Grid Event [^] (Classification)	Flash report submission deadline (users/ SLDC)	Disturbance record and station event log submission deadline (users/ SLDC)	Detailed report and data submission deadline (users/ SLDC)	Draft report submission deadline (RLDC/ NLDC)	Discussion in protection committee meeting and final report submission deadline (RPC)
1	GI-1/GI-2	8 hours	24 hours	+7 days	+7 days	+60 days
2	Near miss event	8 hours	24 hours	+7 days	+7 days	+60 days
3	GD-1	8 hours	24 hours	+7 days	+7 days	+60 days
4	GD-2/GD-3	8 hours	24 hours	+7 days	+21 days	+60 days
5	GD-4/GD-5	8 hours	24 hours	+7 days	+30 days	+60 days

[^]The classification of Grid Disturbance (GD)/Grid Incident (GI) shall be as per the CEA Grid Standards.

(The above table is as per the IEGC 2023)

8. RPCs shall circulate all the GDs, GIs, near miss events, A/R events, PLCC mal-operation events, any other protection related event etc. along with the Agenda for Protection Co-Ordination Sub-Committee (PCSC) of RPCs. PCSC meetings are to be held in every month.
9. The implementation of the recommendations of the final report shall be monitored by the protection sub-committee of the RPC. Tripping portals deployed for reporting of the GDs & GIs on RLDCs portal, shall also have compliances reporting of PCSC recommendations on this portal. NLDC shall disseminate the lessons learnt from each event to all the RPCs for necessary action in the respective regions.
10. Constituents/entities shall furnish the following details to RPCs/RLDCs in respect of all the grid occurrences for analysis:
 - a) Detailed analysis of the events
 - b) SLD or equivalent pictorial representation clearly showing:
 - i. Location of fault with distance
 - ii. Fault details with type & relay indications
 - iii. CT/PT/CVT rating details with location
 - iv. Bus-bar arrangement/ Configuration of feeders and other information related to the ratings of the information required for analysis of the disturbance.
 - v. CB positions (OPEN/ CLOSE) before and after fault
 - vi. Isolator & Earth-switch positions (OPEN/CLOSE)
 - vii. Voltage, frequency & power flows with direction at the time of fault
 - c) Output of Event logger & Disturbance recorder
 - d) Remedial Action(s) taken
 - e) Relay setting details

HVDC Station Disturbance : Any additional data such as HVDC transient fault

record, switchyard equipment and any other relevant station data required for carrying out analysis of an event by RPC, NLDC, RLDC and SLDC shall be furnished by the users including RLDC and SLDC, as the case may be, within forty- eight (48) hours of the request. All users shall also furnish high-resolution analog data from various instruments including power electronic devices like HVDC, FACTS, renewable generation (inverter level or WTG level) on the request of RPCs, NLDC, RLDCs or SLDCs.

Generating Station Disturbance: Generating Station shall furnish high-resolution analog data from various instruments including AVR response, PSS response required for analysis of disturbance.

11. The respective entities (for which the Grid occurrence is placed in the PCSC agenda) shall present the Grid Occurrence which shall cover all related aspects such as:
 - a) Antecedent conditions,
 - b) Bus-configuration,
 - c) Reasons of GD/ GI occurrence,
 - d) Relevant Diagrams showing location of the fault,
 - e) Bus bar arrangement/configuration of feeders and other connected equipment with proper CB positions (OPEN/ CLOSE) at the time of occurrence of the fault,
 - f) Type of protections operated,
 - g) Substantiation of the protections operated by relevant DRs & ELs,
 - h) Reasons for protection systems mal-operation/non-operation,
 - i) Remedial measures taken/ proposed, etc.
12. In respect of failure or Non-operation of A/R events, PLCC mal-operation events, any other protection related event as given in the PCSC agenda the concerned entities, shall furnish the reasons along with remedial action taken to RPCs/RLDCs. The same would be analyzed by the PCSC.
13. In the PCSC meetings, all the GDs, GIs, near miss events, A/R non-operation/mal-operation, PLCC mal-operations, other protection related trippings/events as circulated in the agenda shall be analyzed in detail by the PCSC forum and conclude the suitable recommendations to avoid the recurrence of such incidents in the future.
14. The action plan by the entities shall be furnished to RPC for implementation of the PCSC recommendations along with the timelines.
15. The implementation of the PCSC recommendations shall be followed up in the monthly PCSC meetings of RPC.
16. When grid disturbances or grid incidents occurred at major/critical substations and at substations that affected critical/essential/strategic loads, a Protection System Analysis Group (PSAG) shall be constituted consisting of the members from RPC, NLDC, RLDC, PGCIL, a Protection Expert from the region along with the Entity under whose jurisdiction GD/GI occurred to analyze the GD/GI in detail by visiting the respective substation/substations physically and conducting the meetings. PSAG would finalize the remedial actions and recommendations after deliberations and detailed analysis. The progress of implementation of the PSAG shall be followed up in the monthly PCSC Meetings.
17. 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.

18. 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.

Para no.	Para heading	GRID-INDIA Comments	Rationale
2.(i)	SOP for Protection System Audit:	i. IEGC 2023 mandates third party protection audit and same may be added in the background for reference.	IEGC 2023 contains detailed provisions for carrying out protection audit and therefore may be added as reference.
		ii. Self audit alongwith third party audit need to be carried out by the stations . This is missing in agenda and therefore may be added.	Annual self audit has to be carried out by entities, the findings of self-audit may help in third party protection audit.
		iii. The audit shall also review the Site Responsibility Schedule in the stations where multiple agencies are involved.	In the projects based on TCB scheme, it is possible that line owner is different from substation owning entity. CEA standards specify a Site Responsibility schedule containing allocation of responsibilities among different entities. Protection audit may review the SRS for bringing out clarity in implemetation.
		iv. CBIP manual on power system protection may be referred.	CBIP manual on protection audit is also standard document and several custom clauses of this manual may be useful in Indian power system.
		v. The audit shall also review the withstand capability of physical structures for possible cyclones, wind speeds, humidity, earthquake etc.	Protection audit may contain the resiliency aspects such that station can withstand extreme weather and enviornmental conditions.
		vi. The reliability indices shall also be considered as one of the factors for carrying out audit.	As per IEGC reliability indices have to be computed and this parameter may be considered for carrying out protection audit.
		vii. IEGC 2023 recommends detailed requirement as ANNEXURE – 1 THIRD PARTY PROTECTION SYSTEM CHECKING & VALIDATION TEMPLATE FOR A SUBSTATION .This may be added in the SoP.	This template may be added for tabulating the results and data obtained in protection audit.
		viii. The protection details of nearby stations, lines and generators may also be required alongwith subject station for coordination purposes.	A template may be prepared for obtaining the details from nearby sttaions for coordination purposes.
		ix. The station shall share the readable files of DR/EL during any previous disturbance.	DR/EL records for previous disturbance may be one of the prerequisites to be submitted alongwith protection settings.
		x. In the SoP of protection audit, the audit of inter-regional line/HVDC is missed. The HVDC where tripping of all poles takes place shall be considered a candidate for audit. FACTS devices shall also be included for separate audit.	HVDC stations are missing in the SOP and since most of the HVDC links are inter-regional and high power carrying links, it is important that focussed audit shall be carried out for them.
		xi. The protection audit of IR lines may be conducted jointly by involved RPCs.	IR lines involve two regions and therefore, a joint audit by respective RPCs may be required.
		xii. The RE pooling stations need to be audited at higher frequency since addition/modification of elements within or nearby station take place at regular intervals. The philosophy adopted for auditing RE station may be added	RE pooling stations witness frequent addition of generation as well as transmission and this may involve the necessity to review the protection settings more frequently.
		xiii. The audit shall also contain review of practice being followed for activation/archival of DR (FOR committee report can be referred).	Forum of Regulators has released detailed report on standardisation of DR/Eland same may be refrrred during feedback to entity owner.
		xiv. All RE plants, together with their external compensating equipment (if any) should be audited	RE generation stations shall be audited alongwith external compensation equipment e.g STATCOM, Capacitor banks etc. .
		xv.Power and control Cable testing results, Frequency of DC earth fault to be included in periodic protection audit.	The cable testing, DC earth fault detection are rarely tested in site which may cause multiple tripping.
		xvi.Highest Flood levels Measurement and random inspection of tower strength assessment may be conducted in protection audit checklist.	Due to road construction/repairing there is possibility of mismatch between substation level and road level which may create flooding of substations in high rainy seasons.The strength of tower assessment is needed to detect any chance of tower collapse condition.

2.(ii)	SOP for Grid Disturbances/Grid Incidents/Tripping's:	i.RE plants shall also share the high resolution data for validation of plant performance after a grid disturbance. The details shall be shared for any event involving change in generation of the plant by more than 10 percent.	RE plant being inverter based resource may be observed vide high resolution data. RE plants shall submit details for events where change in generation during a step is more than 10%.
		ii. After a major grid disturbance, the feedback to transmission planners shall be shared and planners shall also submit the necessary remedial measures in the form of transmission addition etc.	In case during GD it emerges that any network related inadequacy contributed to the GD, the feedback shall be shared with planners as well.
		iii.In SI. No. 9 , it is mentioned that NLDC shall disseminate the lessons learned, it is suggested to modify " RLDC alongwith NLDC shall disseminate the lessons learned".	It seems that role of RLDCs got missed, therefore RLDCs have been added.
		iv.The event involving more than one region shall be discussed in both RPCs .	The GD/GI/Near-miss involving more than one region may require deliberation in respective RPCs.
		v. Few cascade tripping have been observed due to failure of auto changeover of auxiliary supply from one source to the other (refer Rajasthan – RAPS case). During event reporting, reliability of auxiliary scheme shall be checked.	The event analysis shall provide details of auxillary supply and in case of blackout , reliable operation of auxillary supply may be reviewed.
		vi. Grid disturbance analysis shall also review any loss of data at respective RLDC during event.	It is observed during events that there is partial/complete loss of telemetry at RLDC/NLDC. The analysis may also factor the continuity of telemetry.
2.(iii)	S.O.P for Communication Audit for Substations:	i.Audit shall validate the Performance requirement. - Communication system shall be able to conform the data interval time as specified in Schedule-I of CEA Technical standards for communication 2020.	These are added in line with CEA Technical Standards for Communication System in Power System Operations) Regulations, 2020 and IEGC 2023.
		ii. A site responsibility schedule for every interface point shall be prepared by the owner of the communication interface equipment at the interfacing location.	
		iii. Audit shall check whether the retention of historical data for ninety days has been kept or not.	
		iv.In Audit format status of integration with U-NMS may be kept.	
		v. Audit shall also check compliance to Cyber Security guidelines.	
2.(iv)	SOP for Communication System Outage Planning:	i. There is an annexure to the format for communication outage portal, as per process mentioned in portal , there is only option of self-declaration by requester i.e. there is no mechanism for checking the accuracy of details.	It is important that there is some mechanism for validation of data entered in portal.
		ii) In SI No 5 of SOP it is mentioned that a Web Portal named as "Communication System Outage Planning Portal" shall be developed by respective RLDCs. It is requested that this point may be deleted from SOP	Such clause can be deleted from SOP . Also as per Communication Regulations 2017 Outage planning is the responsibility of RPC.
		ii.In SI. No. 13 of SoP , it is mentioned that user has to obtain code from RLDC. Outages can be approved by Communication Outage planning committee. However, a fomat may be included where owner can submit information after availing outages. iii. Central Electricity Authority (Technical Standards for Communication System in Power System Operations) Regulations, 2020 has identified RPC as nodal agency for the purpose. "Monthly outage shall be planned and got approved by the owner of communication equipment in the concerned regional power committee, as per detailed procedure finalised by the respective regional power committee" .	It may be difficult for RLDC to monitor and handle so many codes for communication.
		The below points may be inserted suitably in the NPC SOP regarding AGC. iv. All the AGC communications links between NLDC and the power plants (2 links each between NLDC and the respective power plant) may be added to the outage monitoring list. In the SOP only "inter-regional AGC links" are mentioned.	AGC links are typically point to point connections between NLDC and the power plant. Hence, instead of focusing on inter-regional AGC links, links between NLDC and the power plant may be monitored.
		v. In case of a planned outage of an intermediate part of a communication link/channel/path, an alternate link may be planned to be configured to the extent possible, to avoid disruption of communication.	AGC links are supposed to operate with 99.99% availability. Alternate links to the extent possible may be created in advance, in case of planned outages.

		<p>vi. NLDC Detailed Procedure for Secondary Reserve Ancillary Services (SRAS) prepared in line with the CERC (Ancillary Services) Regulations, 2022, provides roles and a standard operating procedure for AGC communication failure identification and rectification. The same is available at https://grid-india.in/en/download/detailed-procedure-for-secondary-reserve-ancillary-services-sras-2022/?wpdmml=49193 and shall be adhered to in the real-time AGC system operation.</p>	<p>There is an operational SOP created by NLDC inline with CERC (Ancillary Services) Regulations, 2022. The same may be mentioned in the planning SOP to make the document holistic.</p>
		<p>vii. NLDC may submit the monthly communication availability report of the AGC communication links, as measured from the NLDC router to the plant router. However, this metric would also include the communication failure caused due to power plant side issues, apart from the CTUIL/POWERGRID (ULDC)/NLDC side issues. Wherever necessary, NLDC-submitted statistics may be analysed together with the power plant-submitted statistics (plant router to plant RTU, plant router to NLDC router), and POWERGRID-submitted statistics (NLDC MUX to plant MUX), to find the root cause and solutions.</p>	<p>This is inline with the NLDC SOP for SRAS/AGC. This ensures that NLDC, POWERGRID and the Power plants claim responsibility for their portion of communication availability for AGC.</p>

**Power**APML/NRPC/FTC/50th PSC/APL - Kawai/01

Date -: - 18.04.2024

To,
The Superintending Engineer - Protection
Northern Region Power Committee,
New Delhi.

Sub: - Request for review of "Procedure and flow chart for approval of Protection Settings by NRPC Secretariat for "First Time Charging".

Ref: - Point no. A4, Clause no. A.4.6 (page no.12) of minutes of 49th Protection Sub Committee Meeting dated 08/03/2024.

Dear Sir / Madam,

As per above cited sub & ref from the minutes of 49th Protection Sub Committee meeting dated 08/03/2024, we would like to deliberate on re-consideration of the requirements on obtaining approval of protection settings by NRPC in addition to the existing NRLDC approval for the FTC in 50th meeting of Protection Sub-committee to be held on April 29, 2024.

Since protection settings based on Protection Philosophy are considered as per the NRPC guidelines and further submitted to NRLDC for approval before FTC, therefore seeking separate approval from NRPC may take additional coordination & time.

We request the forum to re-consider exclusion of this additional approval process from the FTC procedure.

Thanking you,
Yours Faithfully,

For Adani Power Limited

Manoj Taunk
Associate Vice President (Protection and Metering).

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Ref: AGEL/NRPC/FTC/2024/01

Date: 18-Apr-2024

To,
The Superintending Engineer – Protection,
Northern Regional Power Committee,
New Delhi.

Sub: To include Agenda Item for the 50th meeting of Protection Sub-committee to be held on 29/04/2024 – matter as 'Review of requirement for Procedure and flow chart for approval of Protection Settings by NRPC Secretariat for FTC.

Reference: -

1. NRPC notice of meeting dated 15/04/2024.
2. Minutes of 49th Protection Sub Committee meeting dated 08/03/2024, point no. A4, clause no. A.4.6 (page no.12)

Dear Sir / Madam,

In reference to the Minutes of the 49th Protection Sub-Committee meeting dated 08-03-2024, point A4, clause A.4.6 (page 12), we propose adding an agenda item to the upcoming 50th meeting on 29-04-2024, to discuss and review the mentioned clause. This pertains to seeking approval for protection settings from NRPC, in addition to the existing procedure from RLDC for FTC

As per the minutes referred above, which states that *"Subsequently, it was gathered that the FTC procedure will remain same as being done by NRLDC. However, approval of protection settings shall be required from NRPC"* (Page No 12 of 46).

Sir, as a developer and utility, we suggest not to include the approval of NRPC as a FTC requirement, regarding which, we place our views and concerns to kindly revalidate and revise the recently finalized procedure mentioned above. Our point wise representation is as under,

1. Protection settings approval from NRPC will be redundant activity as RLDC reviews the same during FTC approval.
2. All the settings and philosophy of protections fully comply as per NRPC laid guidelines and requirements, which is strictly validated by RLDC to meet all technical aspects related.
3. Due to redundant procedure, adding another step for FTC approval, It will delay the charging of the transmission / Substation elements as forum approval will take extra time and coordination with NRPC and RLDC. This will be a difficult situation to handle the volume of all FTC clearances in due time.

Continues...

Adani Green Energy Ltd.

"Adani Corporate House", 4th Floor – South Wing,
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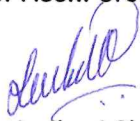
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Ahmedabad – 382 421, Gujarat, India**

4. There is development of Large RE generators which will be coming in NR region and FTC of one plant are to be taken in many tranches and each time NRPC approval for so many applications and installations will take much time to handle, may lead to difficult situation.
5. As per Regulation 14 (2) (b) of IEGC 2023, approval of the concerned RPC is required for (i) any revision in settings, and (ii) implementation of new protection system for grid connected users and it is not required during FTC.
6. Suggestions include submitting all settings directly to NRPC or RLDC can pass them post-FTC.

It is again requested to kindly revisit the change of the FTC procedure and to maintain the existing procedure to avoid any delay and coordination for the same.

Thanking you
Yours faithfully

For Adani Green Energy Limited



Authorized Signatory

(Sanjay Bhatt)

Adani Green Energy Ltd.

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Ref: AESL/NRPC/FTC/2024/01

Date: 18-Apr-2024

**The Superintending Engineer - Protection,
Northern Regional Power Committee,
New Delhi.**

Sub: - To include Agenda Item for the 50th meeting of Protection Sub-committee to be held on 29/04/2024 - matter as 'Review of requirement for Procedure and flow chart for approval of Protection Settings by NRPC Secretariat for FTC.

Reference: - (1) NRPC notice of meeting dated 15/04/2024.
(2) Minutes of 49th Protection Sub Committee meeting dated 08/03/2024, point no. A4, clause no. A.4.6 (page no.12)

Dear Sir / Madam,

Greetings from **Adani Energy Solutions Limited!**

In reference to the Minutes of the 49th Protection Sub-Committee meeting dated 08-03-2024, point A4, clause A.4.6 (page 12), we propose adding an agenda item to the upcoming 50th meeting on 29-04-2024, to discuss and review the mentioned clause. This pertains to seeking approval for protection settings from NRPC, in addition to the existing procedure from RLDC for FTC.

As per the minutes referred above, which states that "Subsequently, it was gathered that the FTC procedure will remain same as being done by NRLDC. However, approval of protection settings shall be required from NRPC"(Page No 12 of 46).

Sir, as a developer and utility, we suggest not to include the approval of NRPC as a FTC requirement, regarding which, we place our views and concerns to kindly revalidate and revise the recently finalized procedure mentioned above. Our point wise representation is as under,

1. Protection settings approval from NRPC will be redundant activity as RLDC reviews the same during FTC approval.
2. All the settings and philosophy of protections fully comply as per NRPC laid guidelines and requirements, which is strictly validated by RLDC to meet all technical aspects related.
3. Due to redundant procedure, adding another step for FTC approval, It will delay the charging of the transmission / Substation elements as forum approval will take extra time and coordination with NRPC and RLDC. This will be a difficult situation to handle the volume of all FTC clearances in due time.
4. There is development of Large RE generators which will be coming in NR region and FTC of one plant are to be taken in many tranches and each time NRPC approval for so many applications and installations will take much time to handle, may lead to difficult situation.
5. As per Regulation 14 (2) (b) of IEGC 2023, approval of the concerned RPC is required for (i) any revision in settings, and (ii) implementation of new protection system for grid connected users and it is not required during FTC.

Continues...

6. Suggestions include submitting all settings directly to NRPC or RLDC can pass them post-FTC.

It is again requested to kindly revisit the change of the FTC procedure and to maintain the existing procedure to avoid any delay and coordination for the same.

Thanking you.

Yours Faithfully,

For Adani Energy Solutions Limited



Authorized Signatory

(Sunil Raval)

- Set the definite time transformer overload relay at 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 SRPC/SRLDC for every new element to be commissioned. The mentioned information shall be submitted to the SRPC/SRLDC two months in advance for all the elements proposed to be commissioned. SRPC shall furnish the approved settings within forty days from the date of submission of the settings by the entity.

- vii) The PCSC of SRPC 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.
- viii) The PCSC of SRPC shall review and approve the settings based on the inputs /report submitted by the entities.
- ix) 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 SRPC.
- x) 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.
- xi) 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 SRPC. The owner entity shall inform all the adjacent entities about the change being carried out.
- xii) In case of failure of a protective relay or equipment failure, the Generating Company and Transmission Licensee shall inform appropriate LDC/SRLDC/SRPC. The Generating Company and Transmission Licensee shall take corrective action as soon as possible.
- xiii) Each Transmission Licensee shall coordinate Protection Systems on major transmission lines and interconnections with neighbouring Generating Company, Transmission Licensee and appropriate LDC.
- xiv) SRPC in consultation with the SRLDC & Southern 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 SRPC & SRLDC. The modifications/changes, if any, in protection settings shall be advised to the respective users and STUs.
- xv) SRPC 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. SRLDC 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.
- xvi) If System Protection Schemes(SPS) is recommended to be implemented by the appropriate forum/Sub-Committee of SRPC on account of operational & system

constraints, the same shall be implemented by the concerned Transmission licensee/Generating Company/Entities within the specified timelines.

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 behaviour of the system, adoption of safe operating limits, isolation of incipient faults,

7.1. The Disturbance Monitoring Requirements include the following:

- i) Each Transmission Licensee and Generating Company shall provide Sequence of Event (SOE) recording capability by installing Sequence of Event recorders or as part of another device, such as a Supervisory Control and Data Acquisition (SCADA) Remote Terminal Unit (RTU), 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
- All Circuit Breaker Supervision Signals.

The SOP of the NPC is enclosed at Annexure 1.2

Roles and Responsibilities:

All utilities of WR connected with ISTS system should plan the TPPA of the substations in their control area and submit it to WRPC.

WRPC & WRLDC to monitor the TPPA implementation of ISTS licensees and IPPs substations.

SLDCs to monitor the TPPA implementation of state-owned substations of GENCOs and TRANSCO.

4) Protocol 4 : Database

The relay settings should be available at the STU-HQ/CTU for the State Substations/ISTS-substations and the same be forwarded to SLDCs/WRLDC, and WRPC for voltage levels of 400kV & above and ISTS lines (of all kV levels). A database of all the above elements of State and Inter-Regional network should be maintained at WRLDC/CTU/SLDC/STU/WRPC as the case may be (in addition to being maintained by respective utilities for their systems).

Roles and Responsibilities:

Implementation of this protocol should be done by All utilities of WR

Relay setting data maintaining responsibility : SLDCs/STU, CTU, WRLDC and WRPC

5) Protocol 5 : New Transmission line Element Integration

- a) In case a new transmission line/element is to be synchronized first time, the new element entity should approach respective CTU/STU/concerned utility where it is getting connected, for getting details of line parameter at remote end, and the distance relay's settings and zone timings.
- b) The utilities at the remote end should provide the relay settings at their end along with the requisite data for carrying out protection setting of the new transmission line/element.

- c) The Bus fault levels of the incidental system to the new elements shall be provided by WRLDC/SLDC, as the case may be, to the utility proposing to connect the new element.
- d) The new utility shall then arrive at their settings for distance relays zone reach and timings and for that it shall adopt the overall settings of distance relay as per the guidelines approved in *“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” report and the CBIP guidelines on protection system relaying.*
- e) The zone reaches and timings shall have to be suitably coordinated with the settings adopted in the remote stations. The settings at the remote S/Ss be modified in line with guidelines provided in *“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” report and the CBIP guidelines on protection system relaying.*
- f) The new Utility shall consult with all the remote end Utilities, and the setting revisions shall be agreed by all these Utilities. The agreement of these settings be conveyed to WRLDC/WRPC for getting the new element connected to ISTS. WRLDC based on the above information shall allow integration of new element in the system.
- g) These settings shall be forwarded to WRLDC/SLDC and with copies to CTU/STU/concerned utility and WRPC.
- h) The agreed settings shall be as an interim arrangement which is required to ratified in PCM of WR. The Utility concerned should put up the settings of its system (new element) and remote end settings to WRPC before the next PCM, for getting this approved in PCM of WR.
- i) For doubts or disagreement, if any, the matter can be referred to WRPC PCM, after adopting interim settings as above.

Roles and Responsibilities:

(i) New Utility:

- should consult the settings with the remote end Utilities and get it agreed among themselves.
- Should submit the proposed settings of their end to all the remote end utilities.
- Should get the settings agreed among all the remote end utilities. This shall be treated as interim settings. The agreement shall be conveyed to WRLDC/WRPC for time first time charging.
- The settings adopted and change in remote end settings along with all the parameters considered for the settings be conveyed to WRPC before the next PCM for including it as agenda point in PCM.

(ii) WRLDC:

- After receipt of agreement of all the remote end Utilities and relevant data (as given under (i) above), WRLDC shall allow integration of the new element in the system.

(iii) WRPC :

- In case of disagreement of the settings, after receipt of such communication from the new entity shall arrange meeting of all the stake holders to resolve the issue.

6) Protocol 6: Network changes

In case of any network changes such as due to Protocol 5 above or otherwise, the existing utilities need to review the reaches and timings for the distance relay. For this the utility whose substation configuration is getting changed due to the network change/ addition, shall indicate to all remote ends and next to remote ends S/Ss, the new configuration of their network along with line lengths, conductor configuration etc. and their existing zone reaches and timings. It is then the responsibility of all the utilities, to apply the reaches (as per the guidelines provided in “*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*” and the CBIP guidelines on protection

system relaying. Revise time settings so that it is coordinated for lines from their S/S for the changed configuration. They shall follow the proposer/approver model as per Protocol (1).

Roles and Responsibilities:

- (i) Utility/Utilities incidental to the network changes:
 - should consult the settings with the remote end Utilities and get it agreed among themselves.
 - Should submit the proposed settings of their end to all the remote end utilities.
 - Should get the settings agreed among all the remote end utilities. This shall be treated as interim settings. The agreement shall be conveyed to WRLDC/WRPC.
 - The settings adopted and change in remote end settings along with all the parameters considered for the settings be conveyed to WRPC before the next PCM for including it as agenda point in PCM.
- (ii) WRLDC:
 - After receipt of agreement of all the remote end Utilities and relevant data (as given under (i) above), WRLDC shall allow change of configurations in the system.
- (iii) WRPC:
 - In case of disagreement of the settings, after receipt of such communication from the new entity shall arrange meeting of all the stake holders to resolve the issue.

7) Protocol 7 :

- a) The Protocol 5 & 6, envisages in a detailed manner what data shall be provided and by whom. The responsibility of adopting a setting in line with *“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” and the CBIP guidelines on protection system relaying*, rests with the utility, for which the Utility should be provided

with the required data. The utility shall accordingly set the relays and convey the settings along with relevant data considered for arriving at the settings be conveyed to WRLDC/WRPC CTU & STU/SLDC. The settings/revision of settings adopted by the Utilities be agreed among themselves and the settings are only for the interim period (from the time the new element/network changes of the new utility or existing utility, till the next PCM). The final settings will be approved in the PCM.

- b) Further if it is not a new utility, then existing STU/SLDC/CTU/WRLDC/utilities are responsible for their jurisdictions. The main purpose is to establish a procedure for coordination of the settings among utilities of WR regarding the protection relay settings.
- c) In case of complicated settings changes or disagreement among the Utilities concerned, then a small group of PCM members can meet and decide the interim settings and put up in the next PCM. Once the PCM vets these settings the settings approved in PCM shall be a permanent arrangement.
- d) The whole idea is to guide a new utility to adopt the settings as per guidelines provided in “*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*” and the CBIP guidelines on protection system relaying for the flow of information.

8) Protocol 8: Vetting of the settings:

- a) All the Utilities whose setting are getting because of integration of new element, changes in network shall be responsible putting up an agenda point to PCM.
- b) PCM shall vet the settings and recommend for final setting implementation.
- c) Utilities concerned shall submit all the relevant data assumed for arriving the interim setting and final setting.

- d) They shall also submit the Raw Relay setting files of interim and final settings immediately after implementation of the same to WRPC and WRLDC for updating the relay setting database of WRPC & WRLDC.

Roles and Responsibilities:

All Utilities concerned.

HPPTCL-PLG-79/2023-Planning Cell-HPPTCL HQ/374853/2024



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Date 27/03/2024

The

Member Secretary,
NRPC,
18-A, Shaheed Jeet Singh Marg, Katwaria Sarai,
New Delhi-110016

Sub: Review of SPS scheme No. SPS/NR/GEN/01 SPS for reliable evacuation of power from NJPS, Rampur, Sawra Kuddu, Baspa Sorang and Karcham Wangtoo HEP- Regarding agenda for 49TCC & 72nd NRPC.

Sir,

HPPTCL had submitted the subject cited agenda for inclusion in 216th OCC committee vide email dated- 06.02.2024. The agenda item was not included in 216th OCC meeting. It is requested that matter may please be placed in upcoming **49TCC & 72nd NRPC for deliberations and discussions. The agenda item is attached along with for necessary action at your end please.**

Yours Faithfully

DGM (Plg & IT)
HPPTCL, Himfed Bhawan
Panjari, Shimla -05
dgmplgit.tcl@hpmail.in

Agenda: Review of SPS scheme No. SPS/NR/GEN/01 SPS for reliable evacuation of power from NJPS, Rampur, Sawra Kuddu, Baspa Sorang and Karcham Wangtoo HEP.

BACKGROUND:

The System Protection Scheme is currently in operation i.r.o. reliable evacuation of the generation of Sawra Kuddu, Rampur, Karcham, Baspa, Sorang & Jhakri HEP, six outgoing circuits two from Jhakri/ Gumma, two from Rampur and two from Karcham Wangtoo are being used to evacuate power of these projects , which is adequate to take care of 'N-1' contingency of outgoing lines from Karcham/Jhakri/ Gumma & Rampur. The total injection of complex is as follows-

Sr. No.	Name of Project	Capacity including 10% O/L
1.	Baspa	330
2.	Karcham Wangtoo	1200
3.	Sorang	110
4.	Nathpa Jhakri	1650
5.	Rampur	453
6.	Sawra Kuddu	122
7.	Natwar Mori	66
8.	Small IPPs replecting at Gumma	55
9.	Max injection Wangtoo	150
10.	Total	4136

The modelling of SPS under operation is as follows-

- 1. Case-1:** Load on any of the lines at Jhakri, Rampur or Gumma towards Nalagarh or Panchkula exceeds 850 MW.

Action: Trip 1 unit of Karcham Wangtoo HPS, 1 unit of Jhakri HEP, 1 unit of Rampur HEP and 1 unit of Sawra Kuddu (Gumma) HEP.

2. Case-2: 400 kV bus voltage at Karcham Wangtoo drops below 395 kV.

Action : Trip 2 units of Karcham Wangtoo HPS.

3. Case-3: Any two outgoing lines of Jhakri (Jhakri-Rampur or Jhakri Gumma) or Rampur HPS (Rampur-Nalagarh D/C) or Gumma (Gumma-Panchkula) trip except in case of tripping of one ckt of 400 kV Jhakri-Gumma and one ckt of Gumma-Panchkula ckt or one ckt of Jhakri-Rampur and one ckt of RampurNalagarh ckt.

Action-1: Trip 2 units of Jhakri

Action-2: 2 units of Rampur HPS and

Action-3: 2 units of Karcham Wangtoo HPS

Action-4: 2 units of Sawra Kuddu (Gumma) HPS

No need to trip 2 units of Sawra-Kuddu HEP in case of tripping of 400kV JhakriGumma D/C as Sawra Kuddu generation will evacuate easily through 400 kV Gumma-Panchkula D/C.

4. Case-4: Both Karcham Wangtoo-Wangtoo(HP) lines trip or 400 kV Wangtoo(HP)-Kala Amb and 400kV Wangtoo(HP)-Sorang trip.

Action: Trip 2 units of Karcham Wangtoo HPS.

5. Case-5: Power Flow of any outgoing line of Rampur or Jhakri or Gumma Substation exceed by 800MW.

Action: Initiate the Alarm to the operators at Jhakri, Rampur, Karcham Wangtoo, Sorang HEP & Sawra Kuddu HEP.

6. Case-6: Both 400kV Kala Amb-Abdullapur lines trip or 400 kV Wangtoo(HP)- Kala Amb and 400kV Sorang HEP- Kala Amb trip.

Action: Trip 2 units of Karcham Wangtoo HPS & 1 unit of Sorang HEP.

The three corridors are as follows-

1. 400 kV D/C Jhakhri-Gumma-Panchkula- Abdullapur (Triple Snowbird)
2. 400 kV D/C Jhakri- Rampur- Nalagarh (Triple Snowbird)

3. 400 kV Karcham Wangtoo- Wangtoo-Kala Amb- Abdullapur (Quad Moose)
4. 400 kV interconnecting line between Nathpa Jhakhri and Karcham Wangtoo (Triple Snowbird).

As such there are two 400 kV D/C triple snowbird corridors to Nalagarh and Panchkula respectively and One 400 kV Quad Moose Corridor to Abdullapur/Kala Amb from Karcham Wangtoo interconnected with Jhakhri through 400 kV D/C triple snowbird line. The triple snowbird lines under N-1 contingency shall be sufficient to carry around **1500 to 1600 MVA power at 45 Degree Ambient Temperature and 85 Degree conductor temperature**. The 400 kV Quad Moose has capacity to transfer 2100 MVA to 2200 MVA at **45 Degree Ambient Temperature and 85 Degree conductor temperature** power under N-1 contingency. The limit of 850 MW load on any of the 400 kV triple Snowbird line from Jhakhri, Rampur or Gumma towards Nalagarh or Panchkula seems to be on highly conservative side. It is therefore proposed that these limits may be got reviewed keeping in view the overall transmission system. Review of these limits can result in-

1. Removal/Revision of SPS from the generation complex of various HEPs in the region thereby ensuring no loss of generation.
2. Avoiding construction of 400 kV Transmission line from 400/220 kV Wangtoo Substation to Panchkula. (Planned for evacuation of Hydro projects in upper Satluj Basin). This apart from savings on account of Capital investment shall also save valuable R.O.W.

Proposal- Considering above it is proposed that SPS scheme No. SPS/NR/GEN/01 for reliable evacuation of power from NJPS, Rampur, Sawra Kuddu, Baspa Sorang and Karcham Wangtoo HEP in state of Himachal Pradesh may be got reviewed keeping in view present system conditions.

Status of actions points recommended during 49 PSC meeting (to be discussed in 50 PSC meeting)

Agenda No.	Agenda	Remdial actions recommended/agreed during 49 PSC meeting	Status of remedial ations taken (to be shared by concerned utility)
A.12	Multiple elements tripping at 400/220kV Rosa (UP) on 07th Sept 2023, 12:37 hrs	UP-SLDC may share the report of third-party protection review conducted at 220kV Rosa (UP).	
	Multiple elements tripping at 220kV Kunihar(HP) on 06th Sept 2023, 06:44 hrs	HP shall expedite the conduct of third-party protection audit of 220kV Kunihar, Baddi S/s and submit the report to NRPC/NRLDC. Necessary corrective action needs to be taken to minimise occurrence of such events	
	Multiple elements tripping at 220kV Hissar_IA(Har) Station on 05th October 2023, 09:28 hrs	Haryana & BBMB shall expedite the implementation of line differential protection in 220kV Hissar_IA- Hissar(BBMB) ckt-1&2.	
	Multiple elements tripping at 400kV Uri-I & Uri-II (NHPC) on 14th October 2023, 04:23 hrs	POWERGRID and NHPC shall review the over current protection in 400kV Uri-II-Uri-I ckt. As per NR protection philosophy, phase over current protection shouldn't be kept in 220kV & above line.	
	Multiple elements tripping at 400kV Dadri (NTPC) and Dadri HVDC on 04th November 2023, 04:03 hrs	NTPC shall review the nomenclature of bus name in PMU & SCADA in coordination with POWERGRID	
	Multiple elements tripping at 220kV Ropar GGSTP (Guru Gobind Singh TPS) on 30th November 2023, 06:51 hrs	Single phase autorecloing need to be enabled at Ropar end to avoid undesired tripping of line during transient fault.	

Status of Bus bar protection					
Constituent Name	Name of Station	Status of Bus bar protection(as reported)	Expected date of revival(as reported)	Present Status	
Uttarakhand	220 KV Substation, Ramnagar, Roorkee	Blocked due to more elements added at 220 KV Voltage level.			
	220 KV Sub Station, SIDCUL, Haridwar				
	220KV Jhajhra, Dehradun	Not commissioned yet			
	400KV Kashipur (220KV side)	Available but Non operational	31-Mar-24	Work is under process.	
	220kv Haldwani	Not Available	31 December 2024	Budget for FY 2023-24.	
	220kv Pantnagar	Available but Non operational	31-Mar-24	Work is under process.	
	220KV Rishikesh	Available but Non operational	31 December 2024	It has been Taken in Budget for FY 2023-24.	
220KV Chamba	Not commissioned yet	31 December 2024	It has been Taken in Budget for FY 2023-24.		
Haryana	220KV S/Stn Badshahpur	Installed and Operational		Commissioned on 20.02.2023	
	220KV S/Stn Sec-52A, Gurgaon	Not Installed	31.03.2024	Panel has been installed. Commissioning pending due to non-availability of shutdown.	
	220KV S/Stn Sec-1 Manesar	Installed and Operational		Commissioned on 26.02.2023	
	220KV S/Stn Panchgaon	Installed and Operational		Commissioned on 05.01.2024	
	220KV S/Stn Rewari	Not Installed	31.03.2024	Material is not allocated so far. Installation will be carried out after allocation of material.	
	220KV S/Stn Narnaul	Not Installed	31.03.2024	Panel has been installed. Work in progress on turnkey basis. Isolators of 220 KV TFs have to be replaced thereafter the work shall be completed.	
	220KV S/Stn Mohinder Garh	Installed and Operational		Commissioned on 28.10.2023	
	220 KV S/Stn Palwal	Not Installed	30.06.2024	Panel has been installed. Commissioning is pending.	
	220 KV S/Stn Rangala Rajpur	Installed and Operational		Commissioned on 22.06.2023	
	220 KV Unispur	Installed but Non-Operational	31.03.2024	5 Nos. Peripheral relay of bus bar protection are defective. The same shall be made operational by 31.03.2024.	
	220 KV Nissing	Installed but Non-Operational	31.03.2024	Existing bus bar panel is of old and obsolete design. New bus bar protection scheme panel has been drawn from the store & Commissioning & installation are pending. The same shall be made operational by 31.03.2024.	
	220KV Pehowa	Installed but Non-Operational	31.03.2024	Old & Obsolete, Allocation of New BBP and allied material awaited.	
	220KV Kaithal	Not Installed	31.03.2024	Control Cable for Bus-Bar Protection Scheme has been drawn from DD Stores, 220KV Bus-Bar Protection panel is awaited.	
	220 KV Sonapat	Not Installed	31.05.2024	220 KV Bus Bar Protection Scheme will be installed / commissioned within 45 days after the availability of the necessary material i.e. 220KV Duplex, Directional, Bus Bar Cum B Coupler C and R Panel, Auxiliary Voltage 220V DC (without SAS) required for commissioning. It has been gathered from the P&M wing that the material is likely to be available in DD stores by April 2024.	
	220 KV REGC, Sonapat	Not Installed	15.03.2024	The 220KV C&R panel for bus bar protection has been drawn from DD store on dated 20.04.2023 and the work for installation of Bus Bar protection scheme is under progress. Erection work & wiring work completed with all respect. Testing of relays is pending at the end of Firm M/s Shifang and Bus Bar protection scheme will be commissioned dt 15.03.2024.	
	220KV Jind	Installed and Operational		Commissioned on dated 27.06.23.	
	220 KV Fatehabad	Installed and Operational		Commissioned on dated 22.07.23	
	220 KV Hukmawali	Installed but Non-Operational	30.10.2023	Bus-coupler CB defective & new panel withdrawn from DD store. Erection work under progress & the same will be completed 31.08.23.	
	220 KV Bhuna	Installed but Non-Operational	31.12.2024	The Siemens make Bus Bar protection Scheme installed at the time of commissioning of the substation went out of order. The higher authority decided to replace with new one. M/s Schneider make new Scheme was then allocated and drawn from DDS Ballabgarh and installed at site, but while testing of same, three out of four relays of the Bus Bar Panel found faulty for which matter is under pursuance with firm.	
	220 KV Sirsa	Not Installed		Not required being single source of supply	
	220 KV Rania	Not Installed	31.03.2024	Estimate for Bus Bar Protection is sanctioned but C&R panel is not available in store.	
	220 KV Bhiwani	Not Installed	31.03.2024	Bus Bar Protection scheme has been proposed in integrated planning meeting and requirement of material have been generated in PR.	
	220KV Madanpur	Not Installed	31.03.2024	Material is not allocated so far. Installation will be carried out after allocation of material.	
	220KV Tepla	Installed but Non-Operational	31.03.2024	material allocation is awaited.	
	220KV Rajokheri	Installed but Non-Operational	31.03.2024	The S/Stn. is being constructed on turnkey, BBP has been installed. Commissioning is yet to be completed by the firm. Matter is taken up with bus-bar protection firm engineer for commissioning.	
	BBMB	220kv Charkhi Dadri	Installed and Operational		commissioned on 31.01.2023
		220KV Samaypur	Installed and Operational		made operational on 23.12.2023
220kv Dhulkote		Not Installed		Not feasible	
220KV Jagadhari		Not Installed			
UP	220KV Barnala	Not Installed			
	220KV Parichha	Installed but Non-Operational	30.06.2023		
	220KV Partapur	Installed but Non-Operational	Jan-23		
	220KV Bareilly (400/220KV Bareilly)	Installed but Non-Operational	Dec-23	Old panel capacity exhausted. New relay panel supplied & need to be	
	220KV Pilibhit	Not Installed	Dec-23	New Relay panel supplied & need to be commissioned by Service Engineer	
	220KV Amariya	Installed and Operational		commissioned on 15th July 2023	
	220KV Sultanpur	Installed but Non-Operational		isolator contact status are not received due to damage of contacts on every	
	220KV New Tanda	Not Installed		Busbar protection panel available on 03.03.2023 but not commissioned	
	220KV Shahjhanpur	Installed but Non-Operational		NC/No switch status of bus isolator were improper & require control cable for	
	220KV Ajjipur	Installed but Non-Operational		1. HV side 220KV CT of 160MVA T/F-I & II has bot proper ratio for bus bar	
	220KV Nirpura	Installed but Non-Operational	Jan-23		
	220KV IITGNL	Installed but Non-Operational	Mar-23		
	220KV Rampur	Installed but Non-Operational	31.03.2024		
	220KV Barahua	Installed but Non-Operational		As Per Ex-En Transmission Approval is Pending at HQ Level As Per Ex-En	
	220KV Bansi	Installed and Operational		commissioned on 10th August 2023	
	220 KV S/S Azamgarh-2(Bargahan)	Installed but Non-Operational			
	220KV Chandausi	Installed and Operational		made operational on 13.10.2023	
	220KV Rampur	Installed but Non-Operational	30.04.2024	Main relay of bus bar protection is not working. Firm engineer visit is awaited	
	220KV Sec - 148, Noida	Installed but Non-Operational	31.01.2024	Work has been completed. Testing is due.	
	220KV sec. 38A, Botanicla Garden	Not installed	31.03.2024	Bus Bar protection panel not allotted	
	220KV sec.-62, Noida	Installed and Operational		made operational on 12.10.2023	
	220KV Dadri	Installed but Non-Operational	28.02.2024	Wiring work is in process.	
	400KV S/S Agra	Installed and Operational		commissioned on 13th September 2023	
	220KV S/S Bah	Not Installed			
	220KV Sirsaganj	Not Installed			
	220KV S/S Farrukhabad (New)	Installed and Operational		commissioned on 25th August 2023	
	220KV Boner	Not Installed	31.03.2024	Tender under process	
	220KV Kasgani (Soroni)	Installed and Operational			
	220KV Khair	Installed but Non-Operational	31.03.2024	Tender under process; (New ICT-3 is not configured in bus bar relay)	

	220KV Kidwainagar	Installed but Non-Operational		
	220KV Chhata	Installed but Non-Operational	31.03.2024	Tender under process; (New ICT-3 is not configured in bus bar relay)
	220KV Harduaganj	Installed but Non-Operational	31.12.2023	
	220KV Lalitpur	Not Installed	23-Apr	INSTALLATION IS NOT DONE DUE TO UNAVAILABLE OF CABLES. CABLE REQUEST HAS BEEN SENT TO LUCKONW HQ.
	220KV Sarnath	Installed but Non-Operational	Nov-23	
	220KV Sirathu, Kaushambi	Not Installed	Mar-23	
	220KV substation Fatehpur	Installed but Non-Operational	Mar-23	
	220KV S/S Bhelupur	Not installed	Mar-23	
	220KV Hardoi Road, Lucknow	Installed and Operational		commissioned on 08th October 2023
	220KV CG City, Lucknow	Installed but Non-Operational	31.08.2023	Configurational error
	220KV Barabanki	Installed but Non-Operational	30.09.2023	Relay configuration is required for additional 220KV Jehta 1 & 2 bays
	220KV Kursi Road, Lucknow	Installed but Non-Operational	30.09.2023	1- 87BB Auxilliary busbar relay at 160MVA T/F not available
	220KV BKT, Lucknow	Installed but Non-Operational	31.08.2023	Mlan bus bar relay defective
	220KV Gomti Nagar, Lucknow	Installed but Non-Operational		Mal opoerating
	400 KV Substation Sarnath	Installed and Operational		Now operational
	220KV S/S Raja Talab	Installed but Non-Operational	15.11.2023	RELAY DEFECTIVE
	20KV S/S Harahua	Installed but Non-Operational	31.11.2023	NOT COMMISSIONED
	220KV S/S Sahupuri	Installed but Non-Operational	Requirement for panel has been raised,not received from	Defective
	220KV S/S Mirzapur	Not Installed	3 Month	-
				commissioned in Jan-2024
HP	220KV Chamba	Installed and Operational		
	220KV MattaSidh	Installed but Non-Operational	31.03.2024	Work in under progress
	220KV kangoo	Installed but Non-Operational		
	220KV Nangal	Installed but Non-Operational		
	220KV Katha Baddi	Installed but Non-Operational		
Punjab	220 KV S/S Kotlisurat Malhi	Not Installed		
	220 KV S/S Maur	Not Installed		
	220 KV S/S Science city	Not Installed		
	220 KV S/S Banga	Not Installed		
	220 KV S/S Hoshiarpur	Not installed	31.03.2024	There is delay due to availability of OEM engineer
	220 KV S/S Goraya	Not installed		
	220 KV S/S Badhni kalan	Not installed		
	220 KV S/S Bhari	Not installed		
	220 KV S/S Bhawanigarh	Not installed		
		765 KV GSS Phagi	Installed but non operational	
	220 KV GSS Vatika	Not installed		
	220 KV GSS Niwana	Not installed	Dec-23	To be commissioned shortly
	220 KV GSS Alwar	Not installed		CU defective in existing ABB make Bus bar Scheme. Matter has been taken up with firm
	220 KV GSS Bansur	Not installed		To be commissioned shortly
	220 KV GSS Behror	Not installed		To be commissioned shortly
	220KV GSS Hindaun	Not installed		To be commissioned shortly
	220KV GSS Dooni	Not installed		To be commissioned shortly
	220KV GSS Bhawanimandi	Not installed		commissioned
	220 KV GSS Sakatpura, Kota	Not installed		Work is pending on the part of M/S GE and S.E. (T&C), RVPN, Kota due to defective Central Control Unit. CU will be send to firm for repair
	400 KV GSS Ajmer (220 KV BUS)	Installed but non operational		Isolator status of in 87BB of respective 220 KV bay No. 213,214, 215 & 216 was not available due to this 220 KV Main Bus-bar-II is out of ckt. work under progress
	220 KV GSS, Beawar	Not installed		New Bus Bar protection commissioning work is ongoing of M/S Danish. Case has been taken up with firm
	220 KV GSS Jethana	Not installed		New Bus Bar protection commissioning work is ongoing of M/S Danish. To be commissioned shortly
	220 KV GSS Kuchaman City	Installed but non operational	Dec-23	due to problem in Central Unit Relay (87CU) Since 28.01.2022 , CU has been removed due to defective & replacement / repair under process at GSS Part. Case has been taken up with firm
	220 KV GSS Bherunda	Not installed		New Bus Bar protection commissioning work is ongoing of M/S Danish. To be commissioned shortly
	220 KV GSS Kuchera	Not installed		New Bus Bar protection commissioning work is ongoing of M/S Danish. To be commissioned shortly
	220 KV GSS Reengus	Installed but non operational		New Bus Bar Scheme has been proposed and approved for replacement from defective Bus-Bar Scheme. The Replacement work will be carried out by firm shortly
Rajasthan	220 KV GSS Laxmangarh	Not installed		Commissioned
	220KV GSS Khetri Nagar	Installed but non operational		The newly Bus bar protection scheme has been proposed and approved for replacement of defective bus bar scheme. hence the work of replacement will be carried out by the firm shortly
	400 KV GSS, Babai	Installed but non operational	Dec-23	PU of 315 MVA ICT-III is defective with error code 0X83720007. Matter has been taken up with firm
	220 KV GSS Chittorgarh	Installed but non operational		All bay units of the BUS BAR scheme are defective. Matter has been taken up with firm
	400 KV GSS BHILWARA(220 KV BUS)	Installed but non operational		BAY UNIT OF 220 KV TBC DEFECTIVE. Matter has been taken up with firm
	220 KV GSS MANDALGARH	Not installed		commissioned
	220KV GSS Debari	Not installed		Going to be install / commission new bus bar protection scheme supply by Danish.
	220KV GSS Amberi	Not installed		Going to be install / commission new bus bar protection scheme supply by Danish.
	220KV GSS Madri	Not installed		Going to be install / commission new bus bar protection scheme supply by Danish.
	400 KV GSS Surapura (Jodhpur) 220 KV	Installed but non operational		Allotted & Panel Received
	400 KV GSS Akal (Jaisalmer) 220 KV	Installed but non operational		One PU defective. Case has been taken up with firm
	220 KV GSS Jodhpur	Installed but non operational		A&FS and TS issued. Case has been send for approval
	220 KV GSS NPH Jodhpur	Not installed		To be commissioned shortly
	220 KV GSS Badsid	Not installed		Allotted & Panel Received. To be commissioned shortly
	220 KV GSS Bhadia	Not installed	Dec-23	Allotted & Panel Received. To be commissioned shortly
	220 KV GSS Pali	Installed but non operational		New bays to be incorporated and GPS defective. work under progress
	220 KV GSS Ramgarh	Not installed		Allotted & Panel Received. To be commissioned shortly
	220 KV GSS Balotra	Installed but non operational		Isolator status issue. work under progress
	220 KV GSS Sayla	Not installed		Allotted & Panel Received. To be commissioned shortly
	400 KV GSS Bikaner 400 KV BUS	Installed but non operational		Not operational (Areva Make) Communication fiber error. Matter has been
220 KV GSS Ratangarh	Not installed		Allotted & Panel Received. To be commissioned shortly	
220 KV GSS Sujangarh	Not installed		Allotted & Panel Received. To be commissioned shortly	
220 KV GSS Halasar	Not installed		Allotted & Panel Received. To be commissioned shortly	
220 KV GSS Tehandesar	Not installed		Allotted & Panel Received. To be commissioned shortly	
220 KV GSS Rawatsar	Not installed		Allotted & Panel Received. To be commissioned shortly	

Status of protection relay type				
Constituent Name	Name of Station	Element Name	Present Status	Remark
Uttarakhand	220kV Rishikesh	SIDCUL line	Main-II is not installed	
		Chamba line		
		Dharasu line-2		
	220kV Chamba	Rishikesh line		
HP	220kV MattaSidh	220kV transformer bank-1 & 2	Static relay	
Rajasthan	220 kV GSS Sanganer	220 kV HEERAPURA	Static	
	220 kV GSS Phulera	220 KV HEERAPURA	Static	
		220 kV Makrana	Static	
	220 KV GSS CHOMU	220 kV Heerapura	Static	
		220 kV Reengus Line	Static	
	220 kV GSS Kukas	220 kV Manoharpur Line	Static	
		220 kV Alwar Line	Static	
	220kV GSS Dausa	220 kV SawailMadhopur Line	Static	
		220 kV Bassi-I Line	Static	
		220 kV Bassi-II Line	Static	
		220 kV Alwar Line	Static	
	220KV BHARATPUR GSS	220 KV DHOLPUR	Static	
	220 KV GSS SAKATPURA	220 kV ANTA(NTPC)	Static	
	220 KV DAHRA	220 kV BARAN	Static	
		220 kV SAKATPURA	Static	
	220KV GSS MODAK	220 kV RANPUR	Static	
		220 kV Jhalawar	Static	
	220 KV GSS JHALAWAR	220 kV Modak	Static	
	220KV GSS HINDAUN	220KV Sikrai Line	Static	relay defective
	220KV GSS DHOLPUR	220 kV DCPD	Static	
	220 KV GSS Reengus	220 KV Laxmangarh	Static	
	220 KV GSS Nagour	220KV NOKHA	Static	
		220KV KUCHERA	Static	
	220KV GSS Kankroli	220 KV PGCIL-I	Static	
	220 KV GSS SIROHI	220 KV (400) KV PGCIL Bhinmal	Static	
	220 KV GSS SIROHI	220 KV Jalore	Static	
	220 KV GSS BHINMAL	220 KV (400) KV PGCIL Bhinmal-I	Static	
	220 KV GSS BALI	220kV Sirohi	Static	
	220 KV GSS Suratgarh	220 KV STPS-I	Static	
		220 KV STPS-II	Static	
		220 KV Hanumangarh Line	Static	
	220 KV GSS Sri Ganganagar	220 KV Hanumangarh Line	Static	
	220 KV GSS Hanumangarh	220 KV Suratgarh	Static	
	220KV GSS Ratangarh	220KV Rawatsar	Static	
	220KV GSS Ratangarh	220KV Halasar	Static	
	220KV GSS Ratangarh	220KV InterConnector-I	Static	
	220KV GSS Ratangarh	220KV InterConnector-II	Static	
	220KV GSS Sujangarh	220KV Ratangarh	Static	
	220 KV GSS Bikaner	220 KV Badnu Line	Static	
	220 KV GSS Bikaner	220 KV Interconnector-I Line	Static	
220 KV GSS Bikaner	220 KV Spare Line	Static		
	220kV Madanpur	220/66kV 100 MVA PTF T-1	Electromechanical	Working properly, need to be replace with numerical relay
		220/66kV 100 MVA PTF T-1 A	Electromechanical	Working properly, need to be replace with numerical relay
		220kV Bus-Coupler	Backup relay -Numerical all other relays are Electromechanical	Working properly, need to be replace with numerical relay
		220/66kV 100 MVA PTF T-1 A	Electromechanical Except Differential relay (Numerical)	Working properly, need to be replace with numerical relay
	220 KV S/Stn Shahbad	100 MVA 220/66 KV T/F T-1	Electrostatic	Working properly, need to be replace with numerical relay
		220 KV Bus Coupler	Electrostatic	Working properly, need to be replace with numerical relay
		Incomer of 220/66 KV T/F T-1	Electrostatic	Working properly, need to be replace with numerical relay
		Incomer of 220/66 KV T/F T-2	Electrostatic	Working properly, need to be replace with numerical relay
	220 KV S/StnTepla	220KV Bus Coupler	Electromechanical	Working properly, need to be replace with numerical relay
	220KV S/Stn Jorian	220KV Jorian -DCRTPP Ckt-1	Main-1 & Main-2 = Numerical all other Electromechanical	Working properly, need to be replace with numerical relay
		220KV Jorian -DCRTPP Ckt-2	Main-1 & Main-2 = Numerical all other Electromechanical	Working properly, need to be replace with numerical relay
		220KV Jorian -Shahbad Ckt-1	Main-1 & Main-2 = Numerical all other Electromechanical	Working properly, need to be replace with numerical relay
		220KV Jorian -Shahbad Ckt-2	Main-1 & Main-2 = Numerical all other Electromechanical	Working properly, need to be replace with numerical relay
220KV Jorian -Abdullapur Ckt-1		Main-1 & Main-2 = Numerical all other Electromechanical	Working properly, need to be replace with numerical relay	

Haryana

	220KV Jorian -Abdullapur Ckt-2	Main-1 & Main-2 = Numerical all other Electromechanical	Working properly, need to be replace with numerical relay
	220/66, 160MVA T/F T-1	Defferntial Relay = Numerical all other Electromechanical	Working properly, need to be replace with numerical relay
	220/66, 100MVA T/F T-2	All Electromechanical	Working properly, need to be replace with numerical relay
	220/66, 100MVA T/F T-3	Defferntial & REF Relay = Numerical all other Electromechanical	Working properly, need to be replace with numerical relay
220 kv Salempur	220 KV BAKANA-SALEMPUR CKT-I	All electromechanical type,except DPR relays	Working properly, need to be replace with numerical relay
	220 KV BAKANA-SALEMPUR CKT-II	All electromechanical type,except DPR relays	Working properly, need to be replace with numerical relay
	220 KV SALEMPUR-NISSING CKT-I	All electromechanical type,except DPR relays	Working properly, need to be replace with numerical relay
	220 KV SALEMPUR-NISSING CKT-II	All electromechanical type,except DPR relays	Working properly, need to be replace with numerical relay
	220 KV BUS-COUPLER	All electromechanical type	Working properly, need to be replace with numerical relay
	220/66 KV 100MVA T/F T-1	All electromechanical type,except Differential relays	Working properly, need to be replace with numerical relay
	220/66 KV 100MVA T/F T-2	All electromechanical type,except Differential relays	Working properly, need to be replace with numerical relay
TS Division Karnal	220kv Nissing-PTPS Ckt-I	All electromechanical type,except DPR relays	
	100 MVA 220/132kv T-8	All electromechanical type,except Differential relay	Differential relay replcaed with Numerical type
	220 kv Bus-coupler	All electromechanical type	C&R panel will be replaced soon
	220 KV DCRTPP-UNISPUR CKT-I	All electromechanical type,except DPR relays	
	220 KV DCRTPP-UNISPUR CKT-II	All electromechanical type,except DPR relays	
	220 KV KARNAL-UNISPUR LINE	All electromechanical type,except DPR relays	
	220/132 KV 100 MVA T/F T-1	All electromechanical type,except R.E.F & Differential relay	
	220/132 KV 100 MVA T/F T-2	All electromechanical type,except R.E.F & Differential relay	
220/132 KV 160 MVA T/F T-4	All electromechanical type,except R.E.F & Differential relay		
220KV S/Stn Palla	100MVA 220/66kv T-1	REF & backup Electromechanical	
	100MVA 220/66kv T-2	REF & backup Electromechanical	
	100MVA 220/66kv T-7	Diff & Backup lectromechanical and REF static	
	220kv Palla - Sector 78	backup Electromechanical	
	220kv Palla - FGPP ckt-II	backup Electromechanical	
220 kv S/Stn. Pali	100 MVA 220/66 kv T-1	REF & backup Electromechanical	
	100 MVA 220/66 kv T-3	REF & backup Electromechanical	
	220 kv Pali-BBMB Samaypur Ckt 1	backup Electromechanical	
	220 kv Pali-BBMB Samaypur Ckt 2	backup Electromechanical	
	220 kv Pali-Sector 46 Ckt 1	backup Electromechanical	
	220 kv Pali-Sector 46 Ckt 2	backup Electromechanical	
	220 kv Pali-Sector 65 Ckt 1	backup Electromechanical	
	220 kv Pali-Badshahpur Ckt 2	backup Electromechanical	
	220 kv Pali-Sector 56 Ckt 1	backup Electromechanical	
220 kv Pali-Sector 56 Ckt 2	backup Electromechanical		
220KV S/Stn Palwal	220/66kv 160MVA T-1 T/F	REF & backup Electromechanical	
	220/66kv 100MVA T-2 T/F	Diff, REF & Backup Electromechanical	
	220kv Prithala Palwal Ckt I	backup Electromechanical	
	220kv Prithala Palwal Ckt II	backup Electromechanical	
220kv S/Stn. Sector 52A GGM	Sec 56-Sec 52A ckt 1	NUMERICAL RELAY qty 02 and electromechanical qty 01 (backup)	LINE IS PROVIDED WITH 2 MAIN NUMERICAL DPR AND 01 ELECTROMECHANICAL FOR BACKUP
	Sec 56-Sec 52A ckt 2	NUMERICAL RELAY qty 02 and electromechanical qty 01 (backup)	LINE IS PROVIDED WITH 2 MAIN NUMERICAL DPR AND 01 ELECTROMECHANICAL FOR BACKUP
	Sec 72-Sec 52A	NUMERICAL RELAY qty 02 and electromechanical qty 01 (backup)	LINE IS PROVIDED WITH 2 MAIN NUMERICAL DPR AND 01 ELECTROMECHANICAL FOR BACKUP
	Sec 57-Sec 52A	NUMERICAL RELAY qty 02 and electromechanical qty 01 (backup)	LINE IS PROVIDED WITH 2 MAIN NUMERICAL DPR AND 01 ELECTROMECHANICAL FOR BACKUP
220KV S/Stn. Sonepat 220KV Rohtak		(Diff.-3 , REF-3, O/C/E/F-4 , Electromechanical Relays (REF-2, O/C/E/F-12) Electromechanical Relays	The electromechanical differential and DPR are not available in the store. However, the same shall be replaced after availability in the store.
400 KV S/S Moradabad	400 KV MORADABAD - RAMPUR LINE	LBB- ABB(RAICA) / STATIC	UNDER PGCIL
	400 KV MORADABAD - KASHIPUR LINE	LBB- English Electric(CTIG) / Electromechanical	
	400 KV, TRANSFER BUS	LBB- English Electric(CTIG) / Electromechanical	
	400 KV, BUS COUPLER	LBB- English Electric(CTIG) / Electromechanical	
220kv S/S BARAUT	220/132kv 200MVA TRANSFORMER-1	REF Protection - Electromechanical	
220kv S/S BAGHPAT	220/132kv 160MVA TRANSORMER-1	Backup (L.V. Side) - Electromechanical	
220 kv KHURJA	220/132kv 200MVA Transformer-I	REF-Static	
220 kv DEBAI	220/132kv 100MVA Transformer-I	Numerical	
220 kv Jahangirabad	220/132kv 160MVA Transformer-I	REF-Static	Will be replaced by July24
400KV S/S MURAD NAGAR	220KV LONI LINE	O/C & E/F RELAY IS ELECTROMECHANICAL.	
	220KV FARID NAGAR LINE	O/C & E/F RELAY IS ELECTROMECHANICAL.	
	220KV INTER CONNECTOR-I MURAD NAGAR LINE	O/C & E/F RELAY IS ELECTROMECHANICAL.	
	220KV INTER CONNECTOR-II MURAD NAGAR LINE	O/C & E/F RELAY IS ELECTROMECHANICAL.	
	220KV SAHIBABAD LINE	O/C & E/F RELAY IS ELECTROMECHANICAL.	

UP		220KV PRATAP VIHAR LINE	O/C & E/F RELAY IS ELECTROMECHANICAL.		
		220KV TBC	O/C & E/F RELAY IS ELECTROMECHANICAL.		
		400KV TBC	O/C & E/F RELAY IS ELECTROMECHANICAL.		
		400KV ALIGARH LINE	LBB RELAY IS ELECTROMECHANICAL.		
		400KV ATOUR LINE	LBB RELAY IS ELECTROMECHANICAL.		
		220KV BUS COUPLER	O/C RELAY IS ELECTROMECHANICAL		
		220KV S/S MURAD NAGAR			
		400KV S/S Gorakhpur	400KV TBC 220KV TBC	Electromechanical Electromechanical	
		220KV S/S Barahua	220KV PGCIL	Back up relay electromechanical	
		220KV S/S Basti	220 KV Basti Tanda line 63MVA Transformer-II	67N(2TJM12)(Electromechanical) HV Side directional o/c&e/f(Electromechanical)	
		400 KV SS Kasara,Mau	200MVA, 400/132KV ICT-1st 200MVA, 400/132KV ICT-2nd	REF & Over flux relay Electromechanical REF & Over flux relay Electromechanical	
		220 KV SS Substation Hafizpur Azamgarh	160 MVA ICT -1	Electromechanical(EE Make)	Replaced with Siemens make numerical relay on 16.10.2023
		220kv Khara		Electromechanical	process of replacing electrochemical relay with numerical relay has been started, it will be completed within 2-3 months.
		220kv Gokul	160MVA ICT-1	Electromechanical (Diff and O/C)	
		220kv Meetai	200MVA ICT-1 200MVA ICT-2	Electromechanical (E/F and O/C), Diff:Static Electromechanical (E/F and O/C), Diff:Static	New panels are available at S/s and replacement work is under process
		220kv Atrauli	160MVA ICT-1 160MVA ICT-2	Electromechanical + Numerical Electromechanical + Numerical	Tender process is complete.
		220kv Mainpuri	160MVA ICT-1 160MVA ICT-2	Electromechanical(REF) + Numerical Electromechanical(REF) + Numerical	New panels are available at S/s and replacement work is under process
		220kv Panki	220kv Bus coupler	Electromechanical	Under process
		400KV S/S Sultanpur	240 MVA ICT-II	Non Numerical	
			50 MVAR Obra Line Reactor	Non Numerical	
		220kv S/S Sultanpur	220kv B/C	Non Numerical	
			160 MVA T/F-I	Non Numerical	
	NPCIL	220kv RAPP	220KV Anta line	Backup relay: Static relay(RAPDK3)	Procurement of Numerical relay is in progress for replacement of Static relay (Backup protection).
		220kv NAPP	NAPP-SAMBHAL		Main-2 distance protection is under procurement. ECD- June2024
			NAPP-SIBHOLI		Main-2 distance protection is under procurement. ECD- June2024
			NAPP-DIBAI		Main-2 distance protection is under procurement. ECD- June2024
NAPP-KHURJA					
NAPP-ATRAULI				Main-2 distance protection is under procurement. ECD- June2024	

HVDC Champa-Kurukshetra Outages during 2024										
S.No.	Category of Grid Disturbance (GD-I to GD-V)	Name of Elements (Tripped/Manually opened)	Affected Area	Owner/ Agency	Outage		Event (As reported)	Loss of generation / loss of load during the Grid Disturbance		Fault Clearance time (in ms)
					Date	Time		Generation Loss(MW)	Load Loss (MW)	
1	GI-2	1) 800 KV HVDC Kurukshetra(PG) Pole-01 2) 800 KV HVDC Kurukshetra(PG) Pole-02 3) 800 KV HVDC Kurukshetra(PG) Pole-03 4) 800 KV HVDC Kurukshetra(PG) Pole-04	Haryana	PGCIL	9-Jan-24	14:01	i) During antecedent condition, 800KV HVDC Champa-Kurukshetra Bipole was carrying total 2500MW (625MW each pole). ii) As reported at 14:00:20hrs, "commutation failure detected" and "Pole 4 Instability Detected by SSAD" protection latched in Pole 4 which initiated CAT A2 sequence for blocking of Pole 4 and isolated Pole 4 from parallel Pole 2. iii) Further after ~800msec of initiation of CAT A2 sequence by Pole 4 on Instability protection, opening sequence to HVHS at both ends didn't initiate which led to failure of protective isolation of faulty Pole 4 and generated CAT B alarm leading to tripping of parallel Pole 2 also. iv) Further at 14:01:17 hrs, "Instability detected" protection latched in Pole 1 also which initiated CAT A2 sequence for protective isolation from Pole 3. v) Further at 14:01:18hrs, like Pole 4, CAT A2 sequence in Pole 1 also failed to initiate HVHS opening leading to protective sequence failure which generated CAT B alarm that resulted in tripping of parallel Pole 3. vi) Due to tripping of all four (04) poles, power order reduced from 2500MW to 0MW. vii) As per PMU, fluctuation in power order was observed.	0	0	NA
2	GI-2	1) 800 KV HVDC Kurukshetra(PG) Pole-2 2) 800 KV HVDC Kurukshetra(PG) Pole-4	Haryana	PGCIL	2-Mar-24	19:24	i) During antecedent condition, 800KV HVDC Champa-Kurukshetra was carrying total 600MW (approx. 150MW by each Pole). ii) As reported at 19:24hrs, 800 KV HVDC Kurukshetra (PG) Pole-02 and Pole-04 tripped due to DC differential protection operated at Kurukshetra(PG) end (further details yet to be received form PowerGrid). iii) Due to tripping of two poles (Pole-01 and Pole-03), power shifted to other two Poles(Pole-02 and Pole-04) and power order remained same 600MW. iv) As per PMU, fluctuation in voltage was observed. v) As per SCADA, no change in demand is observed in Haryana control area.	0	0	NA
3	GI-2	1) 800 KV HVDC Kurukshetra(PG) Pole-02 2) 800 KV HVDC Kurukshetra(PG) Pole-04	Haryana	PGCIL	21-Mar-24	18:19	i) During antecedent condition, 800KV HVDC Champa-Kurukshetra was carrying total 1440MW (Pole 01- 490MW, Pole 02- 490MW, Pole 03- 230MW, Pole 04- 230MW). ii) As reported at 18:19hrs, 800 KV HVDC Kurukshetra (PG) Pole-02 and Pole-04 tripped due to DC supply failure from Champa end (further details yet to be received form PowerGrid). iii) Due to tripping of two poles (Pole-02 and Pole-04), power order reduced from 1440MW to 1370MW and shifted to the other two Poles. iv) As per PMU, fluctuation in voltage was observed. v) As per SCADA, no change in demand is observed in Haryana control area.	0	0	NA
4	GI-2	1) 800 KV HVDC Kurukshetra(PG) Pole-02 2) 800 KV HVDC Kurukshetra(PG) Pole-04	Haryana	PGCIL	27-Mar-24	15:04	i) During antecedent condition, 800KV HVDC Champa-Kurukshetra was carrying total 1460MW (approx. 365MW by each Pole). ii) As reported at 15:04hrs, 800 KV HVDC Kurukshetra (PG) Pole-02 and Pole-04 were blocked due to unavailability of Lane-1 and 2 caused by software issue at Champa end (further details yet to be received form PowerGrid). iii) Due to tripping of two poles (Pole-02 and Pole-04), power order slightly reduced from 1460MW to 1400MW and shifted to the other two Poles. iv) As per PMU, fluctuation in voltage was observed. v) As per SCADA, no change in demand is observed in Haryana control area.	0	0	NA
5	GI-2	1) 800 KV HVDC Kurukshetra(PG) Pole-02 2) 800 KV HVDC Kurukshetra(PG) Pole-04	Haryana	PGCIL	29-Mar-24	20:26	i) During antecedent condition, 800KV HVDC Champa-Kurukshetra was carrying total 1450MW (Pole 01- 725MW, Pole 02- 365MW, Pole 03- 0MW, Pole 04- 360MW). ii) As reported at 20:26hrs, 800 KV HVDC Kurukshetra(PG) Pole-02 and Pole-04 tripped due to unavailability of Lane-1 and 2 caused by software issue at Champa end. Further details yet to be received form PowerGrid. iii) Due to tripping of two poles (Pole-02 and Pole-04), power order reduced from 1450MW to 1370MW and shifted to the Pole-01. iv) As per PMU, fluctuation in voltage was observed. v) As per SCADA, no change in demand is observed in Haryana control area.	0	0	NA
6	GI-2	1) 800 KV HVDC Kurukshetra(PG) Pole-01 2) 800 KV HVDC Kurukshetra(PG) Pole-03	Haryana	PGCIL	7-Apr-24	18:07	i) During antecedent condition, 800KV HVDC Champa-Kurukshetra was carrying total 1940MW (approx. 485MW by each Pole). ii) As reported at 18:07hrs, 800 KV HVDC Kurukshetra (PG) Pole-01 blocked on T-zone protection operation at Kurukshetra end. iii) During the same time, 800 KV HVDC Kurukshetra (PG) Pole-03 also blocked on CAT-B sequence initiated by parallel Pole-01 due to latching of T-zone protection. iv) As further reported, sequence of event is as follows: a.17:52:34:291 - Pole-1 lane 2 to Bipole1 Lane 1 and Lane 2 Optic link was toggling (This link is used to transmit parallel pole data between Pole-1 and Pole-3) b.17:52:34:290 - Pole-1 lane 2 become unavailable c.17:57:48:481 - Pole-1 lane 2 Main 1 and Main 2, T-Zone protection got latched due to toggling of optic between Pole-1 Lane-2 and Bipole-1 d.18:07:13:502 - Pole-1 lane 2 become available automatically, due to already latched T-Zone protection, 2 out of 4 logic got satisfied after availability of Pole-1 Lane-2 and it initiated CAT B protection. e.18:07:13:502 - CAT-B got latched in Pole-1 lane 2 because of T-Zone protection f.18:07:13:639 - Pole-1 blocked g.18:07:13:594 - Pole-3 blocked v) Due to tripping of two poles (Pole-01 and Pole-03), power order reduced from 1940MW to 1855MW and shifted to the other two Poles. vi) As per PMU, fluctuation in voltage was observed. vii) As per SCADA, no change in demand is observed in Haryana control area. viii) As toggling of optics can be due to several reasons, so the 5003 card of Pole-1 Lane-2 where both the fiber were connected was replaced and Pole-1 Lane-2 was kept in maintenance mode for observation.	0	0.000	80

Tripping events to be discussed in 50th PSC Meeting

S.No.	Category of Grid Disturbance	Name of Elements (Tripped/Manually opened)	Affected Area	Owner/ Agency	Outage		Event (As Reported)	Loss of generation / Loss of load during the Grid Disturbance		Fault Clearance time (in ms)	Remarks
					Date	Time		Generation Loss(MW)	Load Loss (MW)		
1	Gr-2	1) 400/220 kv 500 MVA ICT 3 at Akal(RS) 2) 400/220 kv 500 MVA ICT 2 at Akal(RS) 3) 400/220 kv 315 MVA ICT 3 at Akal(RS) 4) 400/220 kv 500 MVA ICT 4 at Akal(RS)	Rajasthan	RVPNL	7-Jan-24	07:28	i) 400/220kv Akal(RS) has one and half breaker scheme at 400kv level and double main transfer bus scheme at 220kv level. ii) As reported, at 07:28hrs, 220 kv Akal(RS) B-phase CT-1 tripped on R-phase to earth fault due to heavy fog. iii) At the same time, 400/220 kv 500 MVA ICT-1, 2 & 4 and 315MVA ICT-3 at Akal(RS) also tripped. (Exact reason yet to be shared, but it is suspected that there is delay in CB opening due to which ICTs also got tripped. Also O/C protection settings of ICTs need to be shared.) iv) As per DR of 400/220 kv 500 MVA ICT-2 at Akal(RS), O/C E/F protection operated and fault current was 18~15.7kA. v) As per DR of 400/220 kv 315 MVA ICT 3 at Akal(RS), O/C E/F protection operated and fault current was 18~2.288kA. vi) As per SCADA SOE, 220kv Akal(RS) B-arm(RS) CT also tripped during the same time. (Exact reason yet to be shared) vii) As per PMU at Jodhpur(RS), two consecutive B-R phase to earth faults are observed with delayed fault clearance time of 320ms and 1400ms respectively. viii) As per SCADA, change in demand of approx. 160MW is observed in Rajasthan control area. ix) As per SCADA, change in Rajasthan wind generation of approx. 690MW is observed.	690	160	1400	i) Fault was in 220 kv Akal(RS)-Bhu(RS) Ckt-1, but all four ICTs at Akal(RS) also tripped on this fault. Hence it is suspected that there is delay in CB opening due to which ICTs also got tripped. Exact reason of tripping along with O/C protection settings of ICTs need to be shared. ii) Reason of delayed clearance of fault need to be shared. iii) Exact reason of tripping of 220kv Akal(RS) B-arm(RS) CT need to be shared. (Tripped as per SCADA SOE) iv) SCADA data was freedzed during the event. Availability and healthiness of SCADA data need to be ensured. v) DR/EL of each element along with tripping report need to be shared from both the ends. DR of only ICT-2 & 4 have been submitted which are also not time synced. Detail report also not received. DR time sync issue also observed on submitted DR. vi) Remedial action taken report to be shared.
2	Gr-2	1) 400/220 kv 315 MVA ICT 1 at Ratnagar(RS) 2) 220 kv Ratnagar(RS)-Sikar(PG) (PG) Ckt-1 3) 220 kv Ratnagar(RS)-Sri Durganagar (RS) Ckt 4) 220kv Ratnagar-Ratnagar20 (RS) Ckt-1 5) 220kv Ratnagar-Ratnagar20 (RS) Ckt-2	Rajasthan	RVPNL, PGCL	28-Jan-24	14:58	i) As reported, at 14:58hrs, 220kv Isolator (4898) B-phase jumper of 220kv Bus Coupler-1 broke and the fault reflected on the 220kv bus bar at Ratnagar(RS). ii) Due to this fault, 400/220 kv 315 MVA ICT 1 at Ratnagar(RS), 220 kv Ratnagar(RS)-Sikar(PG) (PG) Ckt-1, 220 kv Ratnagar(RS)-Sri Durganagar (RS) Ckt, 220kv Ratnagar-Ratnagar20 (RS) Ckt-1 & 2 tripped (Bus-while arrangement of elements yet to be shared). iii) As per SCADA SOE, 220kv Ratnagar20-Jhunjhunu (RS) Ckt also tripped during the same time. (Exact reason yet to be shared). iv) As per PMU at Sikar(PG), Y-N phase to earth fault is observed with delayed fault clearance time of 280 ms (Phase sequence issue is observed). v) As per SCADA, load loss of approx. 540MW is observed in Rajasthan control area. vi) Further as reported, broken 220kv Isolator (4898) B-phase jumper of 220kv Bus Coupler-1 was already replaced.	0	540	280	i) Exact nature and location of fault need to be shared. ii) Reason of delayed clearance of fault need to be shared. iii) Phase sequence issue at Sikar(PG)/Ratnagar(RS) need to be resolved at the earliest. iv) Exact reason of tripping of 220kv Ratnagar20-Jhunjhunu (RS) Ckt need to be shared. v) DR/EL of all the tripped elements are not received. Detail report also not received. DR time sync issue also observed on submitted DR. vi) Remedial action taken report need to be shared.
3	GD-1	1) 220 kv Ballabgarh(BB)-BTPS(DTL) (BB) Ckt-1 2) 220 kv Ballabgarh(BB)-BTPS(DTL) (BB) Ckt-2 3) 220 kv Tughlakabad(PG) BTPS(DTL) Ckt-1 4) 220 kv Tughlakabad(PG) BTPS(DTL) Ckt-2 5) 220 kv BTPS(DTL)-Okhla Ckt-1 6) 220 kv BTPS(DTL)-Okhla Ckt-2 7) 220 kv BTPS(DTL)-Santia Vihar Ckt-1 8) 220 kv BTPS(DTL)-Santia Vihar Ckt-2 9) 220 kv BTPS(DTL)-Alwar Ckt 10) 220 kv BTPS(DTL) Noida Sec-38 Ckt	Delhi	BBMB, DTL, PGCL	31-Jan-24	21:22	i) During antecedent condition, 220 kv Ballabgarh(BB)-BTPS(DTL) (BB) Ckt-1 & 2 and 220 kv Tughlakabad(PG)-BTPS(DTL) Ckt-1 & 2 were catering the part load of 220kv Okhla and 220kv Santia Vihar through 220 kv BTPS(DTL)-Okhla Ckt-1 & 2 and 220 kv BTPS(DTL)-Santia Vihar Ckt-1 & 2. 220 kv BTPS(DTL)-Noida Sec-38 Ckt were on no-load. 220kv Bus coupler at BTPS was in closed condition. ii) As reported, at 21:22 hrs, 220 kv Ballabgarh(BB)-BTPS(DTL) (BB) Ckt-1 tripped on Y-N phase to ground fault with fault distance of 17.01 km and fault current of 4.2 kA from Ballabgarh end; zone-1 distance protection operated at Ballabgarh end and zone-4 distance protection operated at BTPS end. On inspection, 220kv Bus 2 PI Isolator Y-ph LA jumper was found broken but bus protection yet to be shared. iii) At the same time, all other 220kv cts connected at BTPS(DTL) tripped on zone-4 distance protection operation at BTPS end (reason of non-operation of bus bar protection yet to be shared). iv) Due to tripping of all 220kv cts, both the 220kv buses became dead at 220kv BTPS(DTL) S/Ls. v) As reported by SDC/Delhi, the load of Okhla, Bata, Malkya Nagar, Shivalk, Surlon, DC Saket, Select City mall, Santia Vihar, Meethapur, Jamia, Saral Julema, Jasola got affected. vi) As per SCADA, change in demand of approx. 220MW is observed in Delhi control area out of which approx. 90MW is restored within 10 minutes. Bus as reported by SDC/Delhi, load loss of approx. 160MW is observed. vii) As per PMU, Y-N phase to ground fault with delayed fault clearing time of 160ms is observed. viii) Further as reported, at 21:29 hrs, load of Okhla was normalized through 220kv Tughlakabad-Okhla Ckt-1 & 2. At 21:45 hrs, load of 220kv Santia Vihar was attempted to normalize through 220kv Maharambagh-Santia Vihar ckt at Santia Vihar, but line could not hold and a blast occurred in 220kv Bus coupler CB at Santia Vihar; R-ph pole was found damaged. Later at 23:20 hrs, load of 220kv Santia Vihar was normalized through 220kv Maharambagh-Santia Vihar ckt.	0	160	160	i) Status of bus bar protection at 220kv BTPS(DTL)? ii) Reason of delayed clearance of fault need to be shared. iii) SCADA data of 220kv BTPS(DTL) was freedzed during the event. Healthiness of the SCADA data need to be ensured. iv) DR/EL of all the tripped elements along with tripping report of the event need to be shared. v) Remedial action taken report to be shared.
4	GD-1	1) 220kv Baddi(BP)-Pinjre(W) (HPPTCL) Ckt-1 2) 220kv Baddi(BP)-Pinjre(W) (HPPTCL) Ckt-2 3) 220 kv Baddi-Kunihar(HP) Ckt-1 4) 220 kv Baddi-Kunihar(HP) Ckt-2 5) 220 kv Baddi-Upper Nangal(HP) Ckt 6) 220 kv Baddi-Madhala(HP) Ckt 7) 220 kv Baddi-Wardman(HP) Ckt 8) 220 kv Madhala -Upper Nangal(HP) Ckt 9) 220 kv Bhabha-Kunihar(HP) Ckt 10) 220 kv Jeori-Kunihar(HP) Ckt	Himachal Pradesh	HPPTCL, HVPNL	2-Feb-24	15:27	i) As reported, at 15:27 hrs, 220kv Baddi(BP)-Pinjre(W) (HPPTCL) Ckt-1 & 2 tripped on R-Y phase to phase fault; zone-1 distance protection operated at Pinjre end. (Exact reason, nature and location of fault yet to be shared) ii) Due to tripping of aforementioned lines, 220 kv Baddi-Kunihar(HP) Ckt-1 & 2, 220 kv Baddi-Upper Nangal(HP) Ckt, 220 kv Baddi-Madhala(HP) Ckt and 220 kv Baddi-Wardman(HP) Ckt tripped due to over-loading and 220/66kV Baddi(HP) S/L became dead. iii) During the same time, 220 kv Madhala -Upper Nangal(HP) Ckt, 220 kv Bhabha-Kunihar(HP) Ckt and 220 kv Jeori-Kunihar(HP) Ckt also tripped on over-loading. iv) Further, at 15:34 hrs, all 132kV lines from Kunihar(HP) tripped on over-loading and 220/132kv Kunihar(HP) S/L became dead. v) As per PMU, R-Y phase to phase fault is observed with delayed fault clearing time of 400ms. vi) As per SCADA, total change in demand of approx. 785MW in HP control area is observed.	0	785	400	i) Exact location and nature of fault? ii) Reason of delayed clearance of fault? iii) Sequence of tripping? iv) DR/EL of all the tripped elements need to be shared. v) Remedial action taken report to be shared
5	GD-1	1) 220 kv Bhabha-Kunihar(HP) ckt 2) 220 kv Jeori-Kunihar(HP) Ckt 3) 220 kv Baddi-Kunihar(HP) Ckt-1 4) 220 kv Baddi-Kunihar(HP) Ckt-2 5) 220 kv Baddi-Upper Nangal(HP) Ckt 6) 220 kv Baddi-Madhala(HP) Ckt 7) 220 kv Baddi-Wardman(HP) Ckt	Himachal Pradesh	HPPTCL	8-Feb-24	10:41	i) During antecedent condition, as per SCADA, power was flowing towards Kunihar through 220 kv Bhabha-Kunihar(HP) Ckt and 220 kv Baddi-Kunihar(HP) Ckt-1 & 2 carrying approx. 143MW, 115MW and 115MW. Approx. 31MW was going from Kunihar to Jeori through 220 kv Jeori-Kunihar(HP) Ckt and 220/132kv 80/100MVA ICT-1 & 2 at Kunihar(HP) were carrying approx. 170MW each. Bus coupler was in off position at 220kv Baddi(HP). ii) As reported, at 10:41 hrs, 220 kv Bhabha-Kunihar(HP) Ckt tripped due to earth fault. (Exact reason, nature and location of fault yet to be shared) iii) Due to tripping of this line, 220 kv Baddi-Kunihar(HP) Ckt-1 & 2 and 220 kv Jeori-Kunihar(HP) Ckt tripped due to over-loading and 220/66kV Kunihar(HP) S/L became dead. iv) During this time, 220 kv Baddi-Upper Nangal(HP) Ckt, 220 kv Baddi-Madhala(HP) Ckt and 220 kv Baddi-Wardman(HP) Ckt also tripped due to over-loading and 220kv Bus-1 at Baddi(HP) became dead. v) As per SCADA SOE, 220/66kV 31.5MVA ICT-1 at Jeori(HP) tripped during the same time. (Exact reason yet to be shared) vi) As per PMU, B-N phase to earth fault is observed with fault clearing time of 80ms. vii) As per SCADA, change in demand of approx. 525MW in HP control area is observed.	0	525	80	i) Exact reason of tripping of 220/66kV 31.5MVA ICT-1 at Jeori(HP) need to be shared. ii) Sequence of tripping? iii) Exact reason, nature and location of fault need to be shared. iv) Over-current protection settings of tripped elements need to be shared. v) DR/EL need to be shared for all the tripped elements for both ends. vi) Remedial action taken report need to be shared.
6	GD-1	1) 220kv DCRTPP(HR)-Jorah(HR) ckt-2 2) 220kv DCRTPP(HR)-Jorah(HR) ckt-1 3) 220kv Kamal(HR)-Unisup(HR) ckt-1 4) 220kv Salempur(HR)-Bakana(HR) ckt-2 5) 220kv DCRTPP(HR)-Unisup(HR) ckt-1 6) 220kv DCRTPP(HR)-Unisup(HR) ckt-2 7) 220kv Salempur(HR)-Bakana(HR) ckt-1 8) 220kv DCRTPP(HR)-Bakana(HR) ckt-1 9) 220kv DCRTPP(HR)-Bakana(HR) ckt-2 10) 300 MW DCRTPP (Yamuna Nagar) - UNIT 1 11) 300 MW DCRTPP (Yamuna Nagar) - UNIT 2	Haryana	HVPNL	8-Feb-24	16:22	i) During antecedent condition, 220kv DCRTPP-Rampur Ckt-1 was under construction (ILD in place of DCRTPP-Abdullapur Ckt) and 220kv DCRTPP-Rampur Ckt-2 was under shutdown. 220kv DCRTPP(HR)-Jorah(HR) ckt-1 & 2, 220kv DCRTPP(HR)-Bakana(HR) ckt-1 & 2 and 220kv DCRTPP(HR)-Unisup(HR) ckt-1 & 2 were carrying approx. 189MW, 183MW, 47MW, 56MW, 30MW and 31MW respectively. ii) As reported, at 16:22hrs, 220kv DCRTPP(HR)-Jorah(HR) ckt-2 tripped due to snapping of R-ph jumper at tower location no. 8. Simultaneously, 220kv DCRTPP(HR)-Jorah(HR) ckt-1 tripped on over-loading. iii) After this, load shifted to remaining four cts. 220kv DCRTPP(HR)-Bakana(HR) ckt-1 & 2 and 220kv DCRTPP(HR)-Unisup(HR) ckt-1 & 2 were carrying approx. 192MW, 202MW, 74MW and 74MW respectively. Power was flowing from 220kv DCRTPP(HR) to Bakana(HR) through 220kv DCRTPP(HR)-Bakana(HR) ckt-1 & 2 and 220kv DCRTPP(HR)-Unisup(HR) ckt-1 & 2. iv) During the same time, 220kv Kamal(HR)-Unisup(HR) ckt-1 carrying ~13MW tripped on transient fault (exact nature and location of fault yet to be shared). v) After this, 220kv DCRTPP(HR)-Bakana(HR) ckt-1 & 2 and 220kv Bakana(HR)-Salempur(HR) ckt-1 & 2 were carrying approx. 253MW, 263MW, 239MW and 238MW respectively. vi) During the same time, 220kv Salempur(HR)-Bakana(HR) ckt-2 also tripped due to breaking of Y-ph conductor at tower location no. 83. vii) Due to this tripping, DCRTPP(HR)-Bakana(HR) ckt-1 & 2, 220kv Bakana(HR)-Salempur(HR) ckt-1 & 2 and 220kv DCRTPP(HR)-Unisup(HR) ckt-1 & 2 tripped on over-loading. Complete blackout occurred at 220kv Bakana(HR) and Unisup(HR) S/L. viii) Due to tripping of all the evacuating lines at DCRTPP, 300 MW DCRTPP (Yamuna Nagar) - UNIT 1 & 2 also tripped and complete blackout occurred at 220kv DCRTPP(HR) S/L. ix) As per PMU at Abdullapur(PG), R-Y phase to phase fault is observed with fault clearing time of 80ms. x) As per SCADA, load loss of approx. 160 MW in Haryana control area and generation loss of approx. 547 MW at 220kv DCRTPP Yamunaganj(HR) are observed. xi) Supply at 220kv DCRTPP(HR) and Unisup(HR) was restored within 23 minutes and Supply at Bakana(HR) was restored within 30 minutes.	547	160	80	i) Exact reason, nature and location of fault need to be shared for each instance. ii) Sequence of tripping? iii) Over-current protection settings of all the lines need to be shared. iv) DR/EL along with tripping report need to be submitted for all the tripped elements from both the ends. v) Remedial action taken report to be shared.
7	GD-1	1) 220 kv Bhabha-Kunihar(HP) ckt 2) 220 kv Jeori-Kunihar(HP) Ckt 3) 220 kv Baddi-Kunihar(HP) Ckt-1 4) 220 kv Baddi-Kunihar(HP) Ckt-2 5) 220 kv Baddi-Upper Nangal(HP) Ckt 6) 220 kv Baddi-Madhala(HP) Ckt 7) 220 kv Baddi-Wardman(HP) Ckt 8) 220 kv Jeori-Bhabha(HP) Ckt	Himachal Pradesh	HPPTCL	16-Feb-24	11:30	i) During antecedent condition, as per SCADA, power was flowing towards Kunihar through 220kv Jeori-Kunihar(HP) Ckt, 220 kv Wangtoo-Bhabha-Kunihar(HP) ckt (T-connection) and 220 kv Baddi-Kunihar(HP) Ckt-1 & 2 carrying approx. 91MW, 99MW, 57MW and 58MW. 220/132kv 80/100MVA ICT-1 & 2 at Kunihar(HP) were carrying approx. 150MW each. Bus coupler was in off position at 220kv Baddi(HP). ii) As reported, at 11:30 hrs, 220kv Jeori-Kunihar(HP) Ckt tripped on R-N phase to earth fault with fault current of 1.537kA and fault distance of 9.7km from Jeori end. (Exact reason of fault yet to be shared). At the same time, 220kv Jeori-Bhabha(HP) Ckt also tripped on load resulting into blackout at 220/66kV Jeori(HP) S/L. iii) On inspection it was found that a stone curbside cable near Bajal below tower no. 110 span, due to which 220kv Jeori-Kunihar(HP) Ckt came in induction zone of the line and the line tripped. It was also reported that a genset also reported that a genset and rotor by construction office was served to the deflating part. iv) As further reported, bus coupler was in on position at that time at Bhabha(HP). Hence fault was sensed by 220 kv Wangtoo-Bhabha-Kunihar(HP) ckt (T-connection) and line tripped from Wangtoo end. v) Due to tripping of these two lines, 220 kv Baddi-Kunihar(HP) Ckt-1 & 2 tripped due to over-loading and 220/66kV Kunihar(HP) S/L became dead. vi) During this time, 220 kv Baddi-Upper Nangal(HP) Ckt, 220 kv Baddi-Madhala(HP) Ckt and 220 kv Baddi-Wardman(HP) Ckt also tripped due to over-loading and 220kv Bus-1 at Baddi(HP) became dead. vii) As per SCADA SOE, 220/66kV 31.5MVA ICT-1 at Jeori(HP) and 220/132kv 3X13MVA ICT-2 at Mo(HP) tripped during the same time. (Exact reason yet to be shared) viii) As per PMU, R-N phase to earth fault is observed with delayed fault clearing time of 500ms. ix) As per SCADA, change in demand of approx. 510MW and change in generation of approx. 50MW in HP control area is observed. But as reported by, SDC-HP, load loss of ~400MW (320MW at Kunihar feeding load of Solan and Shimla) and generation loss of ~40MW (20MW in Bhaba and 20MW in Giri) occurred in HP control area.	40	400	560	i) Exact reason, nature and location of fault need to be shared. ii) Exact reason of tripping of 220/66kV 31.5MVA ICT-1 at Jeori(HP) and 220/132kv 3X13MVA ICT-2 at Mo(HP) need to be shared. iii) SCADA data freedzed at 220kv Bhaba(HP) and 220/66kV Baddi(HP) during the event. Availability and healthiness of SCADA data need to be ensured. iv) Reason of delayed clearance of fault also need to be shared. v) DR/EL need to be shared for all the tripped elements for both ends. vi) Remedial action taken report need to be shared.
8	Gr-2	1) 400 kv Agra-Unnao (UP) Ckt 2) 400 kv Unnao-Ludhiana (UP) Ckt 3) 400 kv Bareilly-Unnao (UP) Ckt-2 4) 400 kv Unnao(UP) Jetha_Hardoi Road (UP) (PG) Ckt-2 5) 400/220 kv 315 MVA ICT 3 at Unnao(UP) 6) 765/400 kv 1000 MVA ICT 2 at Unnao(UP) 7) 765/400 kv 1000 MVA ICT 3 at Unnao(UP) 8) 400kv Bus 1 at Unnao(UP)	Uttar Pradesh	UPPTCL, PGCL	20-Feb-24	21:47	i) 765/400/220kv Unnao(UP) has double main and transfer bus scheme at 400kv level. ii) During antecedent condition, 400 kv Agra-Unnao (UP) Ckt, 400 kv Unnao-Ludhiana (UP) Ckt, 400 kv Bareilly-Unnao (UP) Ckt-2, 400 kv Unnao(UP) Jetha_Hardoi Road (UP) (PG) Ckt-2, 400/220 kv 315 MVA ICT 1 at Unnao(UP), 765/400 kv 1000 MVA ICT 2 and 3 at Unnao(UP) were connected to 400kv Bus 1 at Unnao(UP) and rest of the elements were connected to 400kv Bus 2 at Unnao(UP). iii) As per SCADA, 400/220 kv 315 MVA ICT 2 and 3 at Unnao(UP), 765/400 kv 1000 MVA ICT 2 and 3 at Unnao(UP) were carrying approx. 151MW, 518MW and 535MW respectively. iv) As reported, at 21:47 hrs, ILL operated due to fault at Main CB of 400 kv Bareilly-Unnao (UP) Ckt-2. Hence all the elements connected to 400kv Bus 1 at Unnao(UP) tripped and 400kv Bus 1 at Unnao(UP) became dead. v) As per DR of 400 kv Bareilly-Unnao (UP) Ckt-2, R-N phase to earth fault is observed with fault current of 6300A from Unnao(UP) and 2.197kA from Bareilly(UP). Fault was sensed in zone-1 at Unnao(UP) end. Fault was cleared within 280ms from Unnao(UP) end and 130ms from Bareilly(UP) end. vi) As per PMU at Unnao(UP), B-N phase to earth fault is observed with fault clearing time of 280ms. vii) As per SCADA, no change in demand is observed in UP control area.	0	0	280	i) Exact reason of fault at Main CB of 400 kv Bareilly-Unnao (UP) Ckt-2 need to be shared and resolved at the earliest. ii) Reason of delayed clearance of fault need to be shared. iii) SCADA data at 765/400kv Unnao(UP) was freedzed during the event. Availability and healthiness of SCADA data need to be ensured. iv) DR/EL need to be shared for all the elements from both the ends. v) Remedial action taken report need to be shared.

S.No.	Category of Grid Disturbance (GD-1 to GD-V)	Name of Elements (Tripped/Manually opened)	Affected Area	Owner/ Agency	Outage		Event (As reported)	Loss of generation / loss of load during the Grid Disturbance		Fault Clearance time (in ms)	Remarks
					Date	Time		Generation Loss(MW)	Load Loss (MW)		
9	GD-2	1) 400/220 kv 500 MVA ICT 1 at Bhadla(RS) 2) 400/220 kv 500 MVA ICT 2 at Bhadla(RS) 3) 400/220 kv 500 MVA ICT 3 at Bhadla(RS)	Rajasthan	RVPNL	25-Feb-24	12:55	i) During antecedent condition, MVA power flows of 400/220 kv 500 MVA ICT 1, 2 & 3 at Bhadla(RS) were 417MW, 452MW and 454MW respectively as per SCADA. ii) As reported, at 12:55hrs, 400/220 kv 500 MVA ICT 1 at Bhadla(RS) tripped due to burning of isolator (exact reason, nature and location of fault yet to be shared) iii) Due to this tripping, 400/220 kv 500 MVA ICT 2 and 3 at Bhadla(RS) got over-loaded and tripped due to over-current protection operation. iv) As per PMU at Bikaner(PG), R-Y phase to earth fault converted to 3-phase fault is observed with delayed fault clearance time of 880 ms. v) As per SCADA, change in demand of approx. 545MW is observed in Rajasthan control area. vi) As per SCADA, change in NR total solar generation of approx. 1890MW is observed.	1890	545	880	i) Exact reason, nature and location of fault need to be shared. ii) Reason of delayed clearance of fault need to be shared. iii) DR/EL along with tripping report need to be submitted from both the ends. DR not received yet. iv) Remedial action taken report need to be shared.
10	GD-1	1) 765 KV Anpara_D(LUP) - Bus 1 2) 765 KV Anpara_D(LUP) - Bus 2 3) 765/400 KV 1000 MVA ICT 1 at Anpara_D(LUP) 4) 765 KV Obra_C_TPS-Anpara_D(LUP) Ckt 5) 765 KV Anpara_CL(AN)-Anpara_D(LUP) (LUP) Ckt-1 6) 500 MW Anpara-D TPS - UNIT 1 7) 500 MW Anpara-D TPS - UNIT 2 8) 400 KV Anpara-Anpara_D (LUP) Ckt-1 9) 400 KV Anpara-Anpara_D (LUP) Ckt-2	Uttar Pradesh	UPPTCL	27-Feb-24	13:57	i) During antecedent condition, 500MW Anpara-D TPS Unit-1&2 were generating approx. 285MW & 295MW respectively and evacuating from 765KV Anpara-D-Obra_C ckt carrying approx 582MW. ii) As reported, at 13:57hrs, R-N phase to earth fault occurred on 765KV Anpara_D-Obra_C ckt. Fault distance was ~8.5km from Obra_C_end, Z-1 from Obra_C_end and Z-2 from Anpara_D_end. On this fault, 765KV Anpara_D-Obra_C ckt tripped from both ends however, delayed clearance occurred at Anpara_D_end. iii) At the same time, 765 KV Anpara_CL(AN)-Anpara_D(LUP) (LUP) Ckt-1 tripped from Anpara_end and 400 KV Anpara-Anpara_D (LUP) Ckt-1&2 tripped from Anpara_end on O/C/E/F protection operation. Protection setting of O/C/E/F protection in these lines need to be reviewed. iv) With the tripping of aforementioned lines, 500MW Unit-1&2 at Anpara_D TPS tripped due to loss of evacuation path. v) As per PMU at Anpara TPS, R-N phase to earth fault with delayed clearance of 480ms is observed. vi) As per SCADA, loss of generation of approx. 580MW is observed at Anpara_D TPS in LUP control area.	580	0	480	i) Exact reason of fault need to be shared. ii) Reason of delayed clearance of fault need to be shared. iii) As per SCADA, delayed clearance from Anpara_D is observed. Reason of the same need to be shared. iv) DR(dat./ctg) file of all the tripped elements need to be shared. v) Remedial action taken report to be shared.
11	GD-2	1) 400 KV Bareilly-Unnao (LUP) Ckt-2 2) 400 KV Agra-Unnao (LUP) Ckt 3) 400 KV Unnao(LUP)Jehta_Hardoi Road (LUP) (PG) Ckt-2 4) 400/220 kv 315 MVA ICT 2 at Unnao(LUP) 5) 765/400 kv 1000 MVA ICT 2 at Unnao(LUP) 6) 765/400 kv 1000 MVA ICT 3 at Unnao(LUP) 7) 400KV Bus 1 at Unnao(LUP)	Uttar Pradesh	UPPTCL, PGCL	11-Mar-24	01:56	i) During antecedent condition, 400/220 kv 315 MVA ICT 1 & 2 and 765/400kv 1000 MVA ICT 1, 2 & 3 at Unnao(LUP) were carrying 138MW, 140MW, 549MW, 551MW and 570MW respectively. 400/220 kv 315 MVA ICT 2 at Unnao(LUP) was not in service. ii) As reported, at 01:56 hrs, R-N phase to earth fault occurred at 400 KV Bareilly-Unnao (LUP) Ckt-2 with fault location of 85 km from Unnao(LUP) end. Bus line CB at Unnao(LUP) end of 400 KV Bareilly-Unnao (LUP) Ckt-2 failed to clear the fault, hence LBB operated. iii) Due to LBB operation, 400 KV Agra-Unnao (LUP) Ckt, 400 KV Unnao(LUP)Jehta_Hardoi Road (LUP) (PG) Ckt-2, 400/220 kv 315 MVA ICT 1 at Unnao(LUP), 765/400 kv 1000 MVA ICT 2 & 3 at Unnao(LUP) also tripped and 400KV Bus 1 at Unnao(LUP) became dead. iv) As per DR of 400 KV Bareilly-Unnao (LUP) Ckt-2, zone-1 distance protection operated at Unnao end and fault was sensed in zone-1 (carrier-aided trip) at Bareilly end. Fault was cleared within 245ms at Unnao end and 170ms at Bareilly end. R-N phase to earth fault was observed with fault current of 6.329KA from Unnao end and 2.122KA from Bareilly end. v) As per DR of 400 KV Unnao(LUP)Jehta_Hardoi Road (LUP) (PG) Ckt-2, DT received at Jehta_Hardoi Road end. vi) As per SCADA SOE, CB of FSC at Unnao(LUP) end connected to 400KV Bareilly-Unnao (LUP) Ckt-2 closed during the same time. (It is suspected that fault may have initiated due to this. Exact reason of fault need to be shared). vii) As per PMU at Agra(PG), R-N phase to earth fault is observed with delayed fault clearing time of 280ms. viii) As per SCADA, no load loss of is observed in LUP control area.	0	0	280	i) Exact reason, nature and location of fault need to be shared. ii) Reason of delayed clearance of fault need to be shared. iii) SCADA data at 765/400KV Unnao(LUP) freed during the event. Availability and healthiness of SCADA data need to be ensured. iv) Remedial action taken report to be shared.
12	GD-2	1) 400/220 kv 315 MVA ICT 1 at Merta(RS) 2) 400/220 kv 315 MVA ICT 2 at Merta(RS) 3) 120KV Merta(RS) Bhopalgarh(RS) Ckt 4) 220KV Merta(RS) Kushthara(RS) Ckt 5) 220KV Merta(RS) Jehtwa(RS) Ckt 6) 220/132kv 100MVA ICT-1 at Merta(RS) 7) 220/132kv 100MVA ICT-2 at Merta(RS) 8) 220/132kv 100MVA ICT-3 at Merta(RS)	Rajasthan	RVPNL	14-Mar-24	12:55	i) During antecedent condition, MVA power flows of 400/220 kv 315 MVA ICT 1 & 2 and 220/132kv 100MVA ICT-1, 2 & 3 at Merta(RS) were 275MVA, 261MVA, 60MVA, 55MVA and 54MVA respectively as per SCADA. 220KV Merta(RS)-Makrana(RS) Ckt was not in service. ii) As reported, at 12:55hrs, R-phase jumper of 220KV Merta(RS)-Bhopalgarh(RS) Ckt snapped and this broken jumper fell on conductor of ICT 1. As per DR, 400/220 kv 315 MVA ICT 1 at Merta(RS) tripped on O/C/E/F protection operation with $t_{trip}=5.26A$. iii) Due to tripping of ICT-1, 400/220 kv 315 MVA ICT 2 at Merta(RS) got over-loaded. As per DR, 400/220 kv 315 MVA ICT 2 at Merta(RS) tripped on phase directional O/C protection operation with $t_{trip}=5.83KA$. iv) During the same time, LBB of 220KV Merta(RS)-Bhopalgarh(RS) Ckt operated (exact reason for line CB at Merta(RS) end unable to clear the fault yet to be shared). v) Due to LBB operation, all the elements connected to 220KV Bus 1 & 2 at Merta(RS) tripped and both the buses became dead. vi) As per PMU at Merta(RS), R-N phase to earth fault is observed with delayed fault clearance time of 880 ms. vii) As per SCADA, change in demand of approx. 335MW is observed in Rajasthan control area.	0	335	880	i) Exact reason of LBB operation need to be shared. ii) Reason of delayed clearance of fault need to be shared. iii) DR time sync issue is observed in DR of 400/220 kv 315 MVA ICT 1 & 2 at Merta(RS). Issue need to be resolved at the earliest. iv) DR/EL along with tripping report need to be submitted from both the ends. v) Remedial action taken report need to be shared.
13	GD-1	1) 220 KV Nallagarh(PG)-Uperlanangal (HP) (HPSEB) Ckt-1 2) 220 KV Nallagarh(PG)-Uperlanangal (HP) (HPSEB) Ckt-2 3) 220 KV Uperlanangal(HP)-Wardhaman (HPSEB) Ckt 4) 220/66KV 80/100MVA ICT-1 at Uperlanangal(HP) 5) 220/66KV 80/100MVA ICT-2 at Uperlanangal(HP)	Himachal Pradesh	PGCIL, HPPTCL	19-Mar-24	19:18	i) 220/66KV Uperlanangal(HP) S/s have double main bus scheme at 220KV level. ii) During antecedent condition, 220 KV Nallagarh(PG)-Uperlanangal (HP) (HPSEB) Ckt 1 & 2 were carrying 260MW each. 220 KV Badli-Uperlanangal (HP) Ckt was not in service (as per SCADA). iii) As reported, at 19:18 hrs, 220 KV Nallagarh(PG)-Uperlanangal (HP) (HPSEB) Ckt 1 & 2 tripped on R-N phase to earth fault. (Exact reason, nature and location of fault yet to be shared) iv) As further report, 220 KV Uperlanangal(HP)-Wardhaman (HPSEB) Ckt, 220/66KV 80/100MVA ICT-1 & 2 at Uperlanangal(HP) also tripped during the same time (Exact reason, nature and location of fault yet to be shared). Complete blackout occurred at 220/66KV Uperlanangal(HP) S/s. v) As per PMU at Nallagarh(PG), R-N phase to earth fault is observed with fault clearing time of 120ms. vi) As per SCADA, change in demand of approx. 380MW is observed in HP control area.	0	380	120	i) Exact reason, nature and location of fault need to be shared. ii) DR, EL & tripping report need to be shared from both the ends. iii) Remedial action taken report to be shared.
14	GD-1	1) 220 KV Hissar(BB)-Hissar (AHV) (HVPNL) Ckt-1 2) 220 KV Hissar(BB)-Hissar (AHV) (HVPNL) Ckt-2 3) 220 KV Bhiwani-Hissar (BB) Ckt-1 4) 220 KV Bhiwani-Hissar (BB) Ckt-2 5) 220 KV Hissar(BB)-Chowah(RS) (BB) Ckt 6) 220 KV Hissar-Sangur (BB) Ckt-1 7) 220 KV Hissar-Sangur (BB) Ckt-2 8) 220 KV Hissar(BB)-Jind-Sonepur (HVPNL) Ckt 9) 220 KV Hissar(BB)-Chowah(RS) (BB) Ckt 10) 220/132kv 100MVA ICT-1 at Hissar(BB) 11) 220/132kv 100MVA ICT-2 at Hissar(BB) 12) 220/132kv 100MVA ICT-3 at Hissar(BB)	Haryana	BMBB, HVPNL	23-Mar-24	00:58	i) 220/132/33KV Hissar(BB) S/s have double main bus scheme at 220KV level. ii) As reported, at 00:58hrs, bursting of B-ph Ckt of 220/132kv 100MVA ICT-2 at Hissar(BB) occurred. iii) During the same time, all the lines and 220/132kv ICTs connected at 220KV Hissar(BB) also tripped (Exact reason, nature and location of fault yet to be shared). iv) Due to tripping of all the elements connected to both the buses, both 220KV Bus-1 & 2 at Hissar(BB) and eventually the complete 220/132/33KV Hissar(BB) S/s became dead. v) As per PMU at Hissar(PG), two consecutive B-N phase to earth faults with fault clearing time of 80ms and 80ms (delayed) are observed. vi) As per SCADA, change in demand of approx. 170MW is observed in Haryana control area.	0	170	360	i) Exact reason, nature and location of fault need to be shared. ii) Reason of delayed clearance of fault need to be shared. iii) DR/EL of all the tripped elements along with tripping report of the event need to be shared. iv) Remedial action taken report to be shared.
15	GD-1	1) 220 KV Khetri (PKTSL)-Bhivadi(PG) (PKTSL) Ckt-2 2) 220 KV Bhivadi(PG)-Bhivadi(RS) (RS) Ckt-1 3) 220 KV Bhivadi(PG)-Bhivadi(RS) (RS) Ckt-2 4) 220/132kv 160MVA ICT-1 at Bhivadi(RS) 5) 220/132kv 160MVA ICT-2 at Bhivadi(RS) 6) 220/132kv 100MVA ICT-3 at Bhivadi(RS) 7) 220 KV Bhivadi(PG)-Kushthara(RS) (RS) Ckt	Rajasthan	PKTSL, PGCL, PTSL, RVPNL	29-Mar-24	17:22	i) 220/132kv Bhivadi(RS) has double main bus scheme at 220KV side. ii) As reported, at 17:10hrs, 400 KV Khetri (PKTSL)-Bhivadi(PG) (PKTSL) Ckt-2 tripped on Y-N phase to earth fault during heavy swing storm with fault distance of 123.3km from Khetri and fault current of 2.34KA from Khetri and 39.7KA from Bhivadi. iii) As per PMU at Bhivadi(PG), at 17:10 hrs, Y-N phase to earth fault with unsuccessful A/R followed by R-N fault is observed with fault clearing time of 80ms and 80ms respectively. iv) As per SCADA SOE, 132 KV Bhivadi(RS)-Bhivadi(132)(RS) (RS) Ckt-2 tripped at 17:17hrs (exact reason, nature and location of fault yet to be shared). As per PMU, Y-N phase to earth fault with fault clearing time of 80ms is observed during the same time. v) Further, bus bar protection operated at 220KV Bhivadi(RS) due to failure of B-phase CVT of 220KV Main Bus -II. Due to this, both 220 KV Bhivadi(PG)-Bhivadi(RS) (RS) Ckt-1 & 2 tripped from Bhivadi(RS) end only. vi) 220/132kv 160MVA ICT-1 & 2 and 100MVA ICT-3 at Bhivadi(RS) also tripped and supply to 132KV feeders connected to Bhivadi(RS) lost. Complete blackout occurred at 220/132kv Bhivadi(RS) S/s. vii) As per PMU at Bhivadi(PG), at 17:22hrs, B-N phase to earth fault is observed with fault clearing time of 120ms. viii) Again, at 17:26 hrs, 220 KV Bhivadi(PG)-Kushthara(RS) (RS) Ckt tripped on R-N phase to earth fault with fault distance of 0.860km from Bhivadi(PG) end. ix) As per DR at Bhivadi(RS) end of 220 KV Bhivadi(PG)-Kushthara(RS) (RS) Ckt, fault current was 24.43KA from Bhivadi(PG), fault was sensed in zone-1, line was successfully auto-restored from Bhivadi(PG) end and tripped only from Kushthara end. x) As per PMU at Bhivadi(PG), at 17:26 hrs, R-N fault followed by R-N fault with unsuccessful A/R is observed with fault clearing time of 120ms and 80ms respectively. xi) As per SCADA, change in demand of approx. 120MW in Rajasthan control area is observed.	0	120	120	i) As per PMU, one R-N fault is observed at 17:10 hrs. Exact reason and location of fault need to be shared. ii) As per SCADA SOE, 132 KV Bhivadi(RS)-Bhivadi(132)(RS) (RS) Ckt-2 tripped at 17:17hrs. Exact reason, nature and location of fault need to be shared. iii) DR/EL along with tripping report for each element need to be shared from both the ends. iv) Remedial action taken report to be shared.

Utilities are requested to prepare detailed analysis report and present the event details during 50th PSC meeting. Events involving more than one utility may be jointly prepared and presented.