



भारत सरकार

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

No. उ.क्षे.वि.स./प्रचालन/107/01/2023/

दिनांक: 21.06.2023

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 47 वीं बैठक की अतिरिक्त कार्यसूची ।

Subject: Additional Agenda for 47th Protection Sub-Committee Meeting.

संरक्षण उप-समिति की 47 वीं बैठक, **23.06.2023** को **11:00** बजे से **वीडियो कॉन्फ्रेंसिंग** के माध्यम से आयोजित की जाएगी । उक्त बैठक की अतिरिक्त कार्यसूची संलग्न है । यह उत्तर क्षेत्रीय विद्युत् समिति की वेबसाइट (<http://164.100.60.165/>) पर भी उपलब्ध है । ऑनलाइन बैठक में शामिल होने के लिए लिंक और अपेक्षित जानकारी नियत समय पर सदस्यों को दी जाएगी। कृपया बैठक में उपस्थिति सुनिश्चित करें ।

The 47th meeting of Protection Sub-Committee is scheduled to be held on **23.06.2023** at **11:00 Hrs** through **Video Conferencing**. The additional agenda for the meeting is attached herewith. The same is also available on NRPC website (<http://164.100.60.165/>). The link and requisite information for joining the online meeting will be shared with the members in due course. Kindly make it convenient to attend the same.

Signed by Santosh Kumar

Date: 21-06-2023 11:22:38

Reason: Approved

(संतोष कुमार)

अधीक्षण अभियंता (संरक्षण)

Additional Agenda of 47th Protection Sub-Committee Meeting (23rd June, 2023)

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***Additional Agenda for
47th Meeting of Protection Sub-Committee (PSC) of
Northern Regional Power Committee***

Date and time of meeting : 23.06.2023 11.00 Hrs.
Venue : Video-Conferencing

**A.1. Instantaneous Trip Setting in Chandak-Pithoragarh & Chandak-Almora line
(agenda by PTCUL)**

- A.1.1** PTCUL has intimated that currently, the instantaneous setting of the Chandak-Pithoragarh line is set at 900 Ampere, which is deemed inadequate considering the fault level of the 132 kV Bus at 3938 Ampere. Consequently, occasional tripping of the Chandak-Pithoragarh line has been observed when faults occur in the 33 kV line nearer to the substation.
- A.1.2** Attention is drawn to the most recent tripping incident that took place on 14.06.2023. During this event, the fault current in the R-Phase reached 1019 Ampere, surpassing the instantaneous setting of the line. It is crucial to address this issue promptly in order to ensure reliable and uninterrupted power transmission.
- A.1.3** Based on the aforementioned circumstances, two potential solutions are proposed by PTCUL to mitigate the problem:
- **The instantaneous current setting may be increased:** One option is to raise the instantaneous current setting to 1500 Ampere in both the Chandak-Pithoragarh and Chandak-Almora lines. This adjustment would provide a more appropriate margin of safety, enabling the lines to endure fault currents without unnecessary tripping.
 - **Disabling the instantaneous trip function:** Another viable solution is to disable the instantaneous trip function entirely. Instead, reliance would be placed on other protective measures, such as backup overcurrent settings, to offer adequate fault protection. It is worth noting that instantaneous setting in backup overcurrent is not recommended for 132 kV lines. Nevertheless, under the given circumstances, it could prove to be more reliable than the current configuration.
- A.1.4** Ensuring the reliability and stability of the power transmission network in the

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Chandak-Pithoragarh and Chandak-Almora lines is crucial. By addressing the instantaneous setting issue, the occurrence of unnecessary tripping can be minimized, thereby improving the overall efficiency of the power transmission system.

Decision required from Forum:

Forum is requested to discuss the proposal of PTCUL and approve accordingly.

A.2. Carrier aided protection of 220kV Pantnagar – Baikunthapur line (agenda by PTCUL)

- A.2.1. The 220kV Pantnagar – Baikunthapur transmission line is a critical infrastructure connecting the 400kV Baikunthapur Substation of UPPTCL with the 220kV Pantnagar Substation of PTCUL. This transmission line plays a crucial role in supplying a significant load of approximately 200MW for PTCUL's operations.
- A.2.2. In recent times, there have been multiple disturbances on this transmission line, resulting in disruptions and stress on various grid elements of PTCUL's infrastructure. Specifically, transformers at the 400kV Kashipur Substation and the 132kV Pantnagar – Rudrapur transmission line have been subjected to undue strain.
- A.2.3. To address these challenges and mitigate the stress on the grid, PTCUL has decided to implement a Special Protection Scheme (SPS) that focuses on safeguarding different elements under various scenarios. As part of this SPS scheme, PTCUL recognizes the need to implement a carrier-added protection scheme on the aforementioned transmission line.
- A.2.4. It is to mention that while the 400kV Baikunthapur Substation belongs to UPPTCL, the ownership of the transmission line lies with PTCUL since they are the primary beneficiary of the line's functionality.
- A.2.5. To successfully implement the carrier-added protection scheme, PTCUL requires specific guidelines to be followed:
- i. Installation of two PLCC cabinets, manufactured by M/s ABB (ETL 41), is essential. These cabinets will provide the main 1 and main 2 protection functionalities at the 400kV Baikunthapur Substation, which is owned by UPPTCL but directly impacts PTCUL's operations.
 - ii. The installation of Wave Traps and Line Matching Units (LMUs) within the switchyard of the 400kV Baikunthapur Substation is necessary to ensure the effective operation of the PLCC links.
 - iii. Provision of a dedicated 48 Volt DC power supply is crucial to power up the aforementioned equipment. This power supply will ensure continuous

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operation and reliable performance of the carrier-added protection scheme.

- A.2.6. PTCUL takes responsibility for relocating and installing all the required equipment at their own expense. By implementing these measures, PTCUL aims to enhance the overall reliability, stability, and efficiency of the Pantnagar – Baikunthapur transmission line, ultimately improving the power supply to the region.
- A.2.7. Additionally, it should be noted that PTCUL has also planned to lay Optical Ground Wire (OPGW) on the same transmission line under the Power System Development Fund (PSDF) scheme. This initiative will further improve the transmission line's performance and ensure reliable communication capabilities.
- A.2.8. In conclusion, the implementation of the carrier-added protection scheme and the associated guidelines is a crucial step for PTCUL to mitigate stress on their grid elements, improve operational efficiency, and enhance the overall reliability of the 220kV Pantnagar – Baikunthapur transmission line.

Decision required from Forum:

Forum is requested to discuss the proposal of PTCUL and approve accordingly.

A.3. Standard Operating Procedure (SOP) for Protection System Audit (PSA) & Over Voltage Grading (agenda by NRPC Sectt.)

- A.3.1 NPC Division, CEA vide letter dtd. 15.05.2023 (**Annexure-I**) has issued minutes of meeting held on 28.04.2023 to discuss best practices among RPCs for protection.
- A.3.2 As per decisions of above meeting, SOP may be formulated for:
- i. Protection System Audit (PSA)
 - ii. Over Voltage Grading
- A.3.3 In view of above, it is proposed to form an expert group to prepare draft SOPs. The draft may be put up to PSC forum for approval.

Decision required from Forum:

Forum is requested to discuss the proposal of NRPC Sectt. and approve accordingly.



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.4/MTGS/SG/NPC/CEA/2023/

Date: 15.05.2023

To
(As per list of participants)

Subject: Minutes of 1st Meeting for Best Practices among RPCs in respect of Protection held on 28.04.2023 - reg.

The 1st meeting of Best practices among RPCs in respect of **Protection** was held on 28.04.2023 at 11 A.M. via Online Mode. The minutes of the meeting is enclosed herewith for your kind information and necessary action.

Enclosure: As above

Yours faithfully,


15.05.23

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

MoM of 1st meeting for Best Practices among RPCs in respect of Protection held on 28.04.2023

1. Director (NPC), CEA stated that as desired by the Chairperson, CEA four sub-groups for sharing best practices among RPCs were created for Operation, Commercial, Protection, and Communication & other subjects. The best practices/ procedures which are being followed by RPCs will be discussed in these meetings of Sub-group for uniformity for all RPCs at national level. After deliberation in the Sub-group meeting, the best practice/procedure would be discussed in NPC meeting. Any issues specific to only regional level may not be considered in Sub-group meetings as best practice/procedure in RPCs. List of Participants is attached as **Annexure I.**
2. In view of the above decisions, 1st meeting for best practice/procedure which are being followed among RPCs in respect of **Protection** was held on 28.04.2023 in which officers from NRPC, ERPC, SRPC, NERPC and GM Division of CEA participated in the meeting.
3. The following agenda points were discussed during the meeting:
 - I. Protection System Audit (PSA) conducted by RPCs
 - II. Protection Coordination Sub Committee
 - III. Over voltage Grading
 - IV. Protection Database Management System
4. **Protection System Audit (PSA) conducted by RPCs:** The comments of RPCs on Protection System Audit conducted by RPCs in respect to following points:
 - i. Periodicity of the Protection System Audit.
 - ii. Identification of critical substation based on criteria.
 - iii. S.O.P for conducting a Protection System Audit
 - iv. Timeline of compliance of recommendation of Protection System Audit.

RPC	Comments
SRPC	1) Physical Protection Audits are conducted within 6 months as per the request from utilities. 2) Critical Substations are considered based on the frequency of tripping of substations. 3) SOP for conducting Protection System Audit will be completed in coming week. 4) No timelines for compliance of recommendation of Protection system audit. However, it has been regularly follow up by RPC.
ERPC	1) Protection Audits are conducted in span of 2-3 years, however, no such particular guidelines are present for conducting protection audits. 2) As of now, there is no such criterion for identifying Critical substation. Newly commissioned 765kV and 400kV substations are monitored to ensure correctness of relay settings.

	3) No timelines for compliance of recommendation of PSA. However, it has been regularly follow up by RPC.
NRPC	1) No list for critical substations is available, however, any substations where faults and disturbances (GD1 & GD2) are frequent are considered as critical substations. 2) Presently no SOP is available, however NRPC is in process of making SOP. 3) No timelines for compliance of recommendation of PSA. However, it has been regularly follow up by RPC.
NERPC	1) After the grid disturbance of 2012, Protection audits are conducted in span of 5 yrs. Apart from this, Protection audits are conducted as per the request from utilities and as decided in PCC and Subgroup meetings. 2) Substations which have been connected to ISTS entry points are considered Critical Substations. 3) No SOP is available as of now, however NERPC is in process of preparing a SOP for Protection Audits. 4) No timelines for compliance of recommendation of PSA. However, it has been regularly follow up by RPC.

Best Practices derived from the above discussion:

- i. Periodicity of the Protection System Audit - **6 months**.
- ii. Identification of critical substation based on criteria - **Based on the frequency of tripping and ISTS Substations**.
- iii. S.O.P for conducting a Protection System Audit – **SRPC SOP for conducting Protection System Audit**.
- iv. Compliance of recommendation of Protection System Audit shall be **regularly followed up by RPC**.

As, it was suggested that SRPC shall finalize and submit the SOP to NPC, CEA so that the same may be circulated to other RPCs for bringing best practices in conducting Protection System Audits among RPCs. Therefore, the SOP of SRPC has been attached herewith as **Annexure II for reference**. It is suggested that all RPCs may prepare their SOP.

5. Protection Coordination Committee RPCs: The comments of RPCs on Protection Coordination Committee RPCs in respect to following points:

- i. Periodicity of the meetings of Protection Coordination Sub Committee.
- ii. S.O.P to address Grid Disturbances/Grid Incidents/Trippings.
- iii. Timeline of compliance of recommendation of Protection Coordination Committee.

RPC	Comments
SRPC	1) PCC meetings are conducted on bimonthly basis. 2) As such SOP is not available however, Utility-wise protection philosophy is adopted.

	3) No timelines for compliance of recommendation of PCC. The recommendation are regularly followed up in bi-monthly meetings.
ERPC	1) PCC meetings are conducted on monthly basis. 2) SOP will be prepared in consultation with states. 3) No timelines for compliance of recommendation of PCC.
NRPC	1) PCC meetings are conducted on half-yearly basis. 2) No SOP is available presently. 3) Timelines may be prepared based on recommendations from higher authorities of ERPC and in consultation with RLDC.
NERPC	1) PCC meetings are conducted on Quarterly basis. 2) No written SOP is available. However, the procedures are written. 3) No timelines for compliance of recommendation of PCC.

Best Practices derived from the discussion

- i. Periodicity of the meetings of Protection Coordination Sub Committee – **1 Month basis.**
- ii. S.O.P to address Grid Disturbances/Grid Incidents/Trippings – **RPCs to prepare SOP regarding this.**
- iii. Timeline of compliance of recommendation of Protection Coordination Committee – **Timelines may be prepared in consultation with RLDCs.**

6. Over Voltage Grading by RPCs: The comments of RPCs on Over Voltage Grading RPCs in respect to following points:

- i. Periodicity of the Over voltage Grading.
- ii. S.O.P for Over voltage Grading.
- iii. Philosophy for Over voltage Grading

RPC	Comments
SRPC	1) 765 kV and 400 kV Transmission lines are presently considered on priority basis for over voltage grading. 2) SOP for Over Voltage Grading is in process of preparation. 3) Regarding the philosophy, generally the length of the line, loading of the line and whether Reactor is connected to the line are considered to examine the over voltage of the line. System studies are conducted by SRLDC.
ERPC	1) No SOP is available. 2) The over voltage grading of lines discussed in the PCC meetings. PCC decides the over voltage grading of a line based on line length, type of substation, network configuration etc.
NRPC	1) No SOP is available. 2) The over voltage grading of lines discussed in the PCC meetings. PCC decides the settings of over voltage grading.

NERPC	<ol style="list-style-type: none">1) No SOP is available as such, however certain guidelines are followed for over voltage grading.2) No periodicity for reviewing settings of over voltage grading. The settings are revised if grid disturbances/trippings occur, any network addition/ new substation commissioned etc.
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It was suggested that Over Voltage Grading is a region specific issue, hence, Periodicity, SOP and Philosophy regarding the Over Voltage Grading may be decided on Regional level by RPCs.

List of Participants for Meeting of best practice/procedures being followed in respect of Protection held on 28.04.2023 -reg.

Central Electricity Authority (CEA)

1. Satyendra Kr. Dotan, Director, NPC
2. Himanshu Lal, Dy. Director, NPC
3. Ravi Shankar Singh, Dy. Director, NPC
4. Nikul Rohin, Asstt. Director, NPC
5. Sakil Ahmad, Asstt. Director, GM

Eastern Regional Power Committee (ERPC)

1. Sh. P.P.Jena, EE
2. Sh. Sourav Joshi, AEE

Southern Regional Power Committee (SRPC)

1. Smt Betsy Sebastian, EE

North Eastern Regional Power Committee (NERPC)

1. Sh. Saishav Ranjan, EE
2. Sh. Vikash Shankar, AEE

North Regional Power Committee (NRPC)

1. Sh. Kaushik Panditrao, AEE

Background:

The grid disturbances on the 30th and the 31st July 2012 had affected large parts of the Indian Electricity Grid. Ministry of Power, had constituted a Committee under the Chairmanship of Chairperson CEA to investigate the same. Several measures had been suggested by the committee to ensure secure grid operation after the grid disturbances. One major step was 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.

As per the recommendations of Enquiry Committee on Grid Disturbances of 2012 in Indian Grid, a third party protection audit (regional protection audit) in Southern Region was carried out for nearly 200 plus stations of various Utilities spread across all states & UT in SR by regional teams comprising members from different SR-Constituents in 2012-13. That exercise covered all 400 kV & above level stations and all important 220 kV level stations in operation. The main focus in these audits was to verify whether required protection systems have been put in place at those stations by the concerned Utility, and to recommend suitable measures to provide for the same. The compliance status of these protection audit remarks (PAR) is being regularly monitored by SRPC Secretariat, and a bi-monthly report is being furnished to Hon'ble CERC in line with their Order dated 15.12.2016 in respect of Petitions filed by KSEB (88/MP/2016) and KPTCL (135/MP/2016).

MoP vide their Order dated 16.07.2014 had directed POWERGRID to appoint Consultants to follow up certain recommendations of Task Force on Power System Analysis under Contingencies constituted in the aftermath of Grid Disturbances in July, 2012. Accordingly, M/s Tractabel Engineering had been appointed as the Consultant for Package-A to carry out the following two Tasks:

Task-I: To study and review the status of implementation of Recommendations of the Enquiry Committee

Task-II: To study the protection audit report of 762 substations across the country carried out after grid failure of July 2012 and conduct on site Protection audit check of the works already carried out, for 10% (i.e. 76 nos.) of 762 Substations. Later the consultant M/s Tractebel Engineering S.A., Romania introduced a protection audit format in the year 2014 and the same was used for Protection audit of stations.

Subsequently CERC vide Order dated 27.04.2015 in respect of APTRANSCO Petition No.95/MP/2015 and Order dated 14.05.2015 in respect of TSTRANSCO's Petition NO:83/MP/2015, had directed SRPC to submit a bi-monthly report of periodic protection audit details to the Hon'ble Commission. Accordingly the protection audit was conducted as a Bimonthly exercise in SR region.

However, since the total no. of stations (Substations as well as Generation Switchyards) in southern region connected at 220 kV & above voltage levels was in the order of 500 – 600, the necessity to carry out protection audit of the remaining stations had been pointed out by

Ramakrishna Task Force and higher bodies. In the 8th Meeting of NPC held on 30.11.2018 (MOM issued on 28.1.2019) regarding periodicity of Third Party Protection Audit, it had been decided that each RPC could have its own arrangements for carrying out the Third Party Protection Audit. They may use the audit format template in the reports of Consultant M/s Tractabel Engineering. Further, Chairperson, CEA and NPC advised that all RPCs may update the status of implementation of the recommendations of the Enquiry Committee on a quarterly basis and furnish the same to NPC Secretariat.

The issue of conducting large-scale protection audit of remaining stations connected at the level of 220 kV & above was discussed in detail by the Protection Coordination Sub-Committee (PCSC) of SRPC in their 80th Meeting held on 20.12.2018 and approved in 35th meeting of SRPC. Accordingly it was decided to conduct Protection audit of number of substations at 220kV and above voltage level by drawing regional teams.

Draft IEGC also emphasizes on Annual Protection Audit (Internal/Third Party).

Criteria for choosing substations for protection audit:

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

- (i) Substations/ Generating 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.
- (ii) Based on request received from SR constituents for arranging protection audit in certain stations for availing PSDF funding for R & M.
- (iii) Important 400kV and 765kV substations (SS) / Generating stations (GS) including newly commissioned SS/ GS.
- (iv) Substations/ Generating stations already audited in last 5 years are generally not considered.

Protection audit Procedure:

- After identification of candidate stations for protection audit, the same is communicated to the owner utility seeking nomination of one nodal officer for each Station.
- The nodal officer shall provide the list of elements in the substation for preparation of protection audit format.
- Meanwhile nominations are sought from all utilities to form regional teams for audit. Regional teams comprising of engineers from various utilities of the region are formed based on the no of SS to be audited. (Each team consists of 3 or 4 engineers from utilities other than the host utility and at the maximum a team will be able to audit 2 stations in 5 days or so)
- 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.
- Based on the inputs received from nodal officer regarding the list of elements in the substation to be audited, protection audit formats are prepared by RPC 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 is given in the covering page of audit format.

- The filled in audit format along-with the received annexures are then forwarded to the audit team and any further clarification regarding the format or attachments is taken up by the audit team with the nodal officer under intimation to RPC.
- The SS/ GS is then 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, and amendments to the same, approved guidelines of RPC, best practices in industry etc.
- After conduct of audit, the shortcomings observed in the audit is discussed in detail with the nodal officer and substation engineers and recommendations are finalised.
- The filled in audit format along-with the recommendations and attachments is finalised and final protection audit report is compiled.
- Final protection audit report is discussed in PCSC (special meeting) and recommendations are accepted/deleted/modified as per the scope of audit and compliance of various regulations/guidelines etc.
- The recommendations of all SS audited are inserted into audit recommendations database and update regarding recommendations is sought from respective utilities.
- Action plan for rectification of deficiencies detected, if any, shall be submitted to the respective RPC and RLDC and monthly progress will be submitted.
- The travel expense from place of duty to Substation/Generating Station to be audited is borne by respective Auditor (Parent Organisation). The expense for boarding, lodging any travel of the team during the audit period is borne by the organisation owning the Substation/Generating Station.
