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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: 18.09.2023

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 का कार्यवृत्त |
Subject: Minutes of 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 गयी थी | उक्त बैठक का कार्यवृत्त संलग्न है। यह उत्तर क्षेत्रीय विद्युत् समिति की वेबसाइट (http://164.100.60.165/) पर भी उपलब्ध है |

The 47th meeting of Protection Sub-Committee was held on 23.06.2023 at 11:00 Hrs through Video Conferencing. The minutes of the meeting is attached herewith. The same is also available on NRPC website (http://164.100.60.165/).

Signed by Santosh Kumar
Date: 18-09-2023 17:48:37
Reason: Approved
(संतोष कुमार)
अधीक्षण अभियंता (संरक्षण)

18-ए, शहीद जीत सिंह मार्ग कटवारिया सराय, नई दिल्ली - 110016 फोन:011-26513265 ई-मेल: seo-nrpc@nic.in वेबसाईट: www.nrpc.gov.in
18-A, Shaheed Jeet Singh Marg, Katwaria Sarai, New Delhi-110016 Phone: 011-26513265 e- mail: seo-nrpc@nic.in Website: www.nrpc.gov.in

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Minutes of the

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. Confirmation of minutes of the 46th meeting of Protection Sub-Committee

A.1.1 EE (P), NRPC apprised that the 46th PSC meeting was held on 22.12.2022. Gist of decisions were issued vide letter dated 09.01.2023. Minutes of the meeting were issued vide letter dtd. 27.02.2023. No comments have been received till the date.

Decision of the Forum:

Forum approved the minutes of the 46th PSC meeting as issued.

A.2. Implementation of recommendations of Task Force on Power System Analysis under Contingencies (agenda by NRPC Sectt.)

A.2.1. Database of protection settings

A.2.1.1 EE (P), NRPC apprised that one of the recommendations of 'Task Force on Power System Analysis under Contingencies (i.e. Ramakrishna Committee Report)' was to maintain a data base of protection settings with RPCs.

A.2.1.2 He added that as per decision taken in the 43rd PSC meeting held on 30.09.2020, a committee was constituted vide letter dtd. 06.04.2021 which was reconstituted vide letter dated 27.01.2022 due to the change in the nominations of few members. The 1st meeting of the committee was held on 10.02.2022 and 2nd meeting of the committee was held on 14.06.2022. In these meetings, committee has finalized scope of work (**Annexure-I**) which was deliberated and accepted in 45th Protection sub-committee meeting (held on 24.06.2022).

A.2.1.3 In the 46th PSC meeting held on 22.12.2022, it was deliberated that as per protection code in draft CERC (Indian Electricity Grid Code) Regulations, 2022 issued by CERC on 07.06.2022, additional responsibilities have been added for RPCs regarding protection setting approval and its database. Hence, it was decided that database work may be taken up further only after notification of final IEGC by

Hon'ble CERC as scope of tender may vary as per requirement.

A.2.1.1 He informed that CERC (Indian Electricity Grid Code) Regulations, 2023 has been published on 29.05.2023, however it is yet to be notified by the commission. The clauses regarding protection setting are as below:

Quote

14. PROTECTION SETTINGS

(2) All users connected to the grid shall:

(a) furnish the protection settings implemented for each element to respective RPC in a format as prescribed by the concerned RPC;

(b) obtain approval of the concerned RPC for (i) any revision in settings, and (ii) implementation of new protection system;

(c) intimate to the concerned RPC about the changes implemented in protection system or protection settings within a fortnight of such changes;

(d) ensure correct and appropriate settings of protection as specified by the concerned RPC.

(e) ensure proper coordinated protection settings.

(3) RPCs shall:

(a) 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 (132 kV and above in NER). RLDCs shall also maintain such database.

(b) carry out detailed system studies, once a year, for protection settings and advise modifications / changes, if any, to the CTU and to all users and STUs of their respective regions. The data required to carry out such studies shall be provided by RLDCs and CTU.

(c) provide the database access to CTU and NLDC and to all users, RLDC, SLDCs, and STUs of the respective regions. The database shall have different access rights for different users.

(4) The changes in the network and protection settings of grid elements connected to 220kV and above (132 kV and above in NER) shall be informed to RPCs by CTU and STUs, as the case may be.

(5) The elements of network below 66kV and radial in nature which do not impact the National Grid may be excluded as finalized by the respective RPC.

Unquote

A.2.1.2 He highlighted that in the 64th NRPC meeting held on 24.03.2023, NRPC approved the scope of website and agreed for expenditure from NRPC Fund and POWERGRID was requested to initiate the modalities.

A.2.1.3 However, due to changes in IEGC, he proposed that database work may be taken up as per published IEGC by Hon'ble CERC. Accordingly, scope of work may be modified to accommodate provisions of code no. 14 of IEGC 2023. Following major changes are required in scope:

i. In the finalized scope, only line, ICT, and Reactor has been considered. Now, each element is required to be considered such as Generator, GT, Bus-bar, SVC, STATCOM, HVDC, SPS etc.

ii. Now, facilities for approval of settings may be incorporated in scope.

A.2.1.4 Accordingly, it was proposed that the committee constituted vide letter dated 27.01.2022, may be allowed to review the scope approved in the 64th NRPC meeting held on 24.03.2023

Decision of the Forum:

Forum approved the proposal to allow committee to review the finalized scope of work to accommodate requirements mandated in IEGC 2023.

A.3. Protection Philosophy of NR (agenda by NRPC Sectt.)

A.3.1 EE (P), NRPC stated that in compliance of decisions of the 42nd (held on 31.07.2020) and 45th PSC meeting (held on 24.06.2022), an expert group has been constituted by NRPC vide letter dtd. 08.12.2022, comprising members from NRPC Sectt, NRLDC, BBMB, POWERGRID, STUs, State GENCOs, NTPC, NHPC, and RE Generator to study various recommendations related to Protection setting as well as adopted philosophy in other regions/utilities and further, to propose updated protection philosophy in time bound manner.

A.3.2 The 1st meeting of the committee has been held on 20.01.2023, where members were requested to either share protection guidelines followed in their organization or any other protection to be added in philosophy along with supporting document.

A.3.3 He added that BBMB has submitted guidelines followed by them. However, other members may submit the same on priority. Practice followed for HVDC, STATCOM, SVC, Cable, RE Inverter, may also be shared for inclusion in philosophy.

A.3.4 POWERGRID representative stated that data related to STATCOM, and HVDC are proprietary. Although, he assured to send data within a week.

A.3.5 NRLDC representative stated that members from renewable generators may be added in committee.

A.3.6 Forum requested expert members to submit inputs for protection philosophy at the earliest so that it may be finalized accordingly.

Decision of the Forum:

Expert members may submit inputs for protection philosophy at the earliest so that it may be finalized accordingly.

A.4. Frequent tripping of Meja-Bara line (agenda by MEJA)

A.4.1 Representative of MEJA (thermal plant) informed that on 11.06.2023 01:29hrs, B-phase fault was sensed by the relay in Meja-Bara ckt-1 at a distance of 32.3km (100%) from Meja with 8.3kA current. The Circuit Breaker went into auto reclose. Subsequently, the line tripped due to SOTF with fault current of approx. 13kA.

A.4.2 Such faults lead to heavy stress on all equipment at Generating station including Transformers and Generators. Frequent faults were observed in both Meja-Bara Ckt-1 &2 in January this year wherein UPPTCL was advised to take corrective action in meetings dtd. 07.01.2023 and 16.01.2023 with UPSLDC.

A.4.3 EE (P), NRPC apprised that the issue was discussed in the 203rd OCC meeting (held on 18.01.2023), wherein, following were discussed:

i. Pre-winter maintenance of MEJA-BARA transmission lines was not done and there are some protection related issues at generating station end. A joint committee has been formed having officials of Meja, Bara generating utilities and UPPTCL to study the protection related issues at generating station end.

ii. There are cement factories near Bara generating plant and due to the pollution, dust accumulation was observed till tower no. 13 and subsequently shutdown was taken and porcelain insulators on the cited line were cleaned.

iii. There is no maintenance of PLCC at the generating station due to ownership issues, henceforth issues of delayed fault clearance are being currently reported. Further, in the meeting held on 16.01.2023, the generating stations have agreed to maintain the PLCC, however, commercial aspects are yet to be sorted out.

iv. Concerned stakeholders were asked to expeditiously resolve the commercial issues related to PLCC maintenance as it is a serious issue and detrimental to the machines. Further, UPPTCL was requested to explore the possibility for replacement of porcelain insulators with polymer insulators for Meja-Bara lines.

A.4.4 SE, UPPTCL informed that tripping in January 2023 month was due to damage of Corona rings. Now, insulator cleaning has been done. Line has been checked thoroughly and no issue has been found in line. There may be some issue at Bara end.

A.4.5 NRLDC stated that a protection group may be formed to understand the issue at both ends and may recommend the solution.

A.4.6 UPSLDC stated that Bara has protection related issues and Bara is in process of relay replacement.

A.4.7 MEJA stated that PLCC issue has not been resolved yet. UPPTCL is not maintaining PLCC.

A.4.8 SE, UPPTCL stated that maintenance of PLCC is not in their scope.

Decision of the Forum:

MEJA, UPPTCL and Bara shall jointly take up the issue and shall intimate findings to NRPC Secretariat.

A.5. Non-availability & un-healthiness of PLCC (Agenda by IndiGrid)

A.5.1 Representative of IndiGrid raised issue of non-availability & un-healthiness of PLCC, installed on the downstream networks of IndiGrid associated SPVs viz. Gurgaon Palwal Transmission Ltd. (GPTL), Patran Transmission Company Ltd. (PTCL), NRSS XXIX Transmission Ltd.(NTL) and Jhajjar KT Transco Private Ltd.(JKTTPL).

A.5.2 Due to non-availability/un-healthiness of the Tele-protection system in the

downstream network lines, there is a risk to associated IndiGrid substations' elements & Grid security as well. In this regard IndiGrid has sent communication to the concerned office (PSTCL, HVPN) but have not received any response for the resolution.

A.5.3 The details pertaining to the said PLCC/ Tele-protection system is mentioned below:

i. PTCL associated Line -220kV Patran- Patran Ckt-1&2 (PLCC unhealthy)

ii. GPTL associated Line - 220kV Prithala- Ranglarajpur Ckt-1&2. (PLCC not commissioned)

iii. JKTTPL associated Line- 220kV Dipalpur-Sector 6 Ckt-1&2. (PLCC unhealthy)

iv. NTL associated Line- 220kV Amargarh- Zainakote Ckt-1&2 and 220kV Amargarh- Delina Ckt-1&2 (PLCC not commissioned)

A.5.4 Punjab stated that they have not received any communication regarding PTCL. However, as issue has been raised, it shall be taken up and shall be resolved within 30 days.

A.5.5 Regarding GPTL, HVPN stated that PLCC panels are under procurement. Issue shall be resolved by December 2023 accordingly. For, JKTTPL, HVPN stated that they have not received any communication yet.

Decision of the Forum:

IndiGrid was requested to send communication to PSTCL, and HVPN again for their issues. HVPN and PSTCL was requested to take up the issue without any delay.

A.6. Status of remedial actions recommended during 46th PSC meeting (Agenda by NRLDC)

A.6.1 Remedial action points, for trippings discussed in the 46th PSC meeting, was discussed and attached as **Annexure-II**.

Decision of the Forum:

Constituents were requested to submit status of remedial actions taken.

A.7. Status of Bus bar protection (Agenda by NRLDC)

A.7.1 NRLDC representative highlighted Clause – 4, Schedule - V of Central Electricity Authority (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations, 2010 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.7.2 He stated that 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.7.3 Constituents were requested vide NRLDC letter dated 28th Dec 2022 to furnish status of Busbar protection in the prescribed format in their control area. However, details are yet to be received from Delhi & J&K. Constituent wise status of bus bar protection where bus bar protection is either not installed or installed but not operational is attached as **Annexure-III**.

A.7.4 Deliberation on the same subject is continued in OCC meetings. Constituents agreed in the last (207th) OCC meeting to share the current status of the bus bar protection, however no details received as of now.

A.7.5 NRLDC representative asked members to apprise the status of bus bar protection in their respective control areas.

A.7.6 Uttarakhand representative informed that work is under tendering stage at 400KV Kashipur (220kV side). Proposal has been made and submitted for approval for 220kV Pantnagar. Further, at 220kV Haldwani, 220kV Rishikesh & 220kV Chamba, process will be completed by end of FY 2023-24.

A.7.7 Haryana representative informed that bus bar protection at 220kV S/Stn Badshahpur has been commissioned on 20.02.2023 and at 220kV S/Stn Sec-1 Manesar has been commissioned on 26.02.2023, process has also started at other stations to expedite the commissioning of bus bar protection. Status of the same has been shared with NRLDC.

A.7.8 BBMB representative informed that bus bar protection at 220kV Charkhi Dadri has been commissioned on 31.01.2023. Status of other stations will be shared.

A.7.9 UP representative stated that process has been started to expedite the commissioning of bus bar protection. Status of the same has been shared with NRLDC.

A.7.10 HP representative informed that issue w.r.t. bus bar protection at 220kV Chamba has been taken up with OEM, feedback from OEM is yet to be received. At remaining 04 stations, ABB has started the review work and all the bus bar protection will be made operational by 15th September, 2023.

A.7.11 Punjab representative informed that bus bar panels have been procured, and cabling has also been done. ABB has started commissioning work and the same would be completed by September 2023.

A.7.12 Delhi representative appraised that only 220kV Sabjimandi & Rajghat S/s don't have bus bar protection scheme. At 220kV Sabjimandi S/s, elements are connected at single point only and at 220kV Rajghat S/s, line and transformer bay are connected together so bus bar protection is not feasible at both these S/s as of now. Rest of the stations have bus bar protection operational.

A.7.13 NRLDC representative requested Rajasthan to share the present status of the bus bar protection and to take necessary actions to expedite the commissioning/restoration of bus bar protection at 220kV & above substations. Rajasthan agreed for the same.

Decision of the Forum:

Forum requested all the constituents to update the status of bus bar protection at S/s of their control area and to expedite the commissioning and implementation work of bus bar protection system.

A.8. Replacement of electromechanical relays with numerical relays (Agenda by NRLDC)

A.8.1 NRLDC representative stated that Clause-5.2(r) 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.8.2 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 recorder are not available there which accounts for violation of Clause-5.2(r) of IEGC, clause-15(4) of CEA Grid Standards and clause 48(4) CEA Construction Standards 2022.

A.8.3 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.8.4 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.8.5 Deliberation on same subject has also been done during 207th OCC meeting. During the meeting, all the constituents/SLDC/STU were requested to review the same in their control area and to expedite actions to replace electromechanical relays with numerical relays.

A.8.6 Members were asked to apprise the availability status of electromechanical relays in their respective control areas.

A.8.7 Delhi representative expressed that they have already replaced all electromechanical relays with numerical relays.

A.8.8 UP representative expressed that they have some electromechanical relays installed at their substations and status of same has been asked from transmission division. It will be shared accordingly.

A.8.9 NRLDC representative asked UP about Panki, Anpara and sultanpur having electromechanical relays installed and requested for retrofitting same with numerical relays.

A.8.10 Punjab representative expressed that all relays at 132 kV and above are numerical. 66 kV and below stations are having some electromechanical relays and same are under process of retrofitting.

A.8.11 Haryana apprised that some 220 kV and many 132 kV and below stations are having electromechanical relays. Process of retrofitting has been started. NRLDC representative asked Haryana to submit exact status and number of stations having electromechanical relays.

A.8.12 Himachal Pradesh apprised that it will be submitting the status of stations having electrometrical relays as soon as possible to NRLDC.

A.8.13 Uttarakhand apprised that all 132 kV and above stations are having numerical relays.

A.8.14 BBMB apprised that all 132 kV and above stations have numerical relays. Only some 66 kV stations are having electromechanical relays, which will be changed in due course.

A.8.15 Rajasthan expressed that at some locations have electromechanical relays. NRLDC asked whether Rajasthan has identified stations. Rajasthan assured to send same as soon as possible. KTPS representative apprised that they are in process of retrofitting relays for their units.

Decision of the Forum:

All the constituents were requested to update the status of type of protection relays at S/s of their control area and to expedite the replacement work of static/electromechanical type protection relays with numerical relays.

A.9. Unsatisfactory status of submission of DR/EL & tripping report (Agenda by NRLDC)

A.9.1 NRLDC representative highlighted that as per IEGC provision under clause 5.2 (r), *''all the Users, STU/SLDC and CTU shall send information/data including disturbance recorder/sequential event recorder output to RLDC within 24 hours for purpose of analysis of any grid disturbance/event. No Users, SLDC/STU or CTU shall block any data/information required by the RLDC and RPC for maintaining reliability and security of grid and for analysis of an event.''*

A.9.2 DR/EL are very much important in detailed and conclusive analysis of any tripping event. In addition, these data are also base for the availability verification. Unavailability of these details delays the availability verification process also. Hence, timely submission of DR/EL & tripping report is very much necessary.

A.9.3 It has been observed that, reporting status of J&K, Punjab & Delhi is unsatisfactory. Almost in 60-90% cases details are not received from these states. Reporting status from other states/users/utilities also need further improvement. Reporting status of J&K, Punjab & Delhi since Nov-23 is attached as **Annexure-IV**.

A.9.4 Continuous follow-ups on event to event basis and on monthly basis are done by NRLDC on this subject. However, progress is minimal.

A.9.5 Punjab representative expressed that they do not have any centralized DR extraction facility available. NRLDC expressed that other states also have same situation but their submission status is much better. Punjab assured that they would be taking corrective action to improve the submission.

A.9.6 J&K representative was not available in the meeting.

A.9.7 Delhi representative expressed that due to false trippings of 220 kV BTPS-Alawar, their submission status is deteriorating. NRLDC representative suggested to mark said false trippings as N/A.

A.9.8 Uttarakhand shared that they have established communication link over FO with relays of remote stations such as Pithoragarh, which has improved their reporting status a lot. Punjab was also requested to adopt same.

A.9.9 EE (P), NRPC emphasized the importance of DR/EL & tripping report data for analysis of the trippings. He stated that these data are also base for the availability verification. Unavailability of these details, delays the availability verification process also. Hence, timely submission of DR/EL & tripping report is very much necessary.

Decision of the Forum:

Members were requested to comply IEGC clause 5.2(r) and to submit DR/EL details in time.

A.10. Frequent tripping of 800kV HVDC Champa-Kurukshetra inter-regional link (Agenda by NRLDC)

A.10.1 NRLDC representative raised issue that frequency of tripping of HVDC Champa-Kurukshetra has increased. 13 nos of trippings has been observed in this link since May 2023. List of all the tripping of HVDC Champa-Kurukshetra is enclosed as **Annexure-V.** The tripping of this high capacity link may cause overloading of other parallel transmission lines and further tripping may cause cascade tripping.

A.10.2 As paddy season is on the verge of start in Haryana & Punjab and 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.10.3 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.10.4 POWERGRID apprised that 13 trippings have occurred in clusters and weather has been harsh during month of June 2023. Pole – 1&3 tripped due to software issues in GE firmware. He expressed that POWERGRID is taking up matter with GE and has formed a joint task force with GE.

A.10.5 NLDC representative brought issue of pole tripping on lane change over during blocking of a pole. POWERGRID expressed that DC CTs are having issues, same has been taken up with GE. GE is working on patches and will upgrade it in July 2023.

A.10.6 NLDC representative expressed concern over overvoltage situation at Kurukshetra substation during winter night hours, also due to over voltage TOVC is enabled in HVDC which inhibits any power order changes between 426 to 434 kV. POWERGRID representative expressed that TCR is scheduled to be commissioned in July 23, which will control the voltage to a great extant.

Decision of the Forum:

POWERGRID was requested to take up the issues on top priority to cater grid requirements.

A.11. Instantaneous Trip Setting in Chandak-Pithoragarh & Chandak-Almora line (agenda by PTCUL)

A.11.1 EE (P), NRPC apprised issue raised by PTCUL that 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.11.2 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.11.3 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.11.4 Ensuring the reliability and stability of the power transmission network in the 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.

A.11.5 POWERGRID stated that they will submit their views after scrutiny on settings proposed.

Decision of the Forum:

POWERGRID was requested to submit views on change of settings proposed by PTCUL.

A.12. Carrier aided protection of 220kV Pantnagar – Baikunthapur line (agenda by PTCUL)

A.12.1 EE (P), NRPC highlighted issue raised by PTCUL that 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.12.2 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.12.3 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.12.4 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.12.5 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 operation and reliable performance of the carrier-added protection scheme.

A.12.6 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.12.7 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.12.8 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.

A.12.9 UPSLDC stated that concerned division of UPPTCL may give comment on proposal of PTCUL. However, UPPTCL was not present in the meeting.

Decision of the Forum:

UPPTCL was requested to give comment on proposal of PTCUL.

A.13. Standard Operating Procedure (SOP) for Protection System Audit (PSA) & Over Voltage Grading (agenda by NRPC Sectt.)

A.13.1 EE (P), NRPC stated that NPC Division, CEA vide letter dtd. 15.05.2023 has issued minutes of meeting held on 28.04.2023 to discuss best practices among RPCs for protection.

A.13.2 As per decisions of above meeting, SOP is required to be formulated for:

i. Protection System Audit (PSA)
ii. Over Voltage Grading

A.13.3 He added that NPC division has attached a draft SOP prepared by SRPC. The same may also be adopted by NRPC. He highlighted that recently, NPC division has asked input from all RPCs on SOP for protection audit. Accordingly, NPC Division is in process of issuing a common SOP for protection audit.

A.13.4 Further, he stated that over voltage protection is already a part of protection philosophy of NRPC. Hence, separate SOP may not be required.

Decision of the Forum:

Forum agreed that SOP under consideration by NPC Division, CEA may be discussed in next PSC meeting and may be adopted accordingly.

A.14. Analysis of the tripping events occurred during Nov-22 to May-23 and status of remedial action taken (standing agenda)

A.14.1 The list of major tripping events occurred during Nov-22 to May-23 was discussed and is attached as **Annexure-VI.**

A.14.2 Concerned constituents/utilities were requested to share the details of the tripping elements along with status of remedial action taken/to be taken.

A.14.3 Tripping-wise discussion held in the meeting are as below:

A. Multiple elements tripping at 220/66 kV Baddi(HP) Station at 06th November 2022, 13:53 hrs

1. Discussion during the meeting:

a. NRLDC representative raised following points during the meeting :

- During antecedent condition, bus coupler at 220kV Baddi(HP) was in open condition and 220kV circuit to Upper Nangal & Mandhala, 220/66kV 100MVA transformer-1&3 were connected at 220kV Bus-1 and 220kV circuit to Kunihar, Pinjore & Wardhman, 220/66kV 100 MVA transformer-2&4 were connected at 220kV Bus-2 at Baddi(HP).
- As reported at 13:53 hrs, R-phase insulator string of 220kV Bus-2 burst which created bus fault on 220kV Bus-2. All the elements connected at 220kV Bus-2 tripped on this fault.
- As per PMU, R-N phase to earth fault with delayed clearance of approx. 400ms is observed.
- As per SCADA, change in load of approx. 75MW occurred in HP control area.

b. HPSEBL representative and others informed the following:

- HPSEBL representative asked for more time for analysis of event. HPSEBL assured to furnish analysis within 15 days.
- Haryana representative was asked about time sync issues in their relays. He assured to take up and correct same.

2. *PSC Recommendations:*

- *Status of bus bar protection needs to be checked.*
- *Representatives needs to come prepared with event analysis to meeting.*

B. Multiple elements tripping at 400/220 kV Muzaffarnagar(UP) Station at 08th November 2022, 07:04 hrs

1. Discussion during the meeting:

a. NRLDC representative raised following points during the meeting :

- At 06:18hrs, 220kV Muzaffarnagar-Jansath ckt tripped on Y-N phase to earth fault.
- As reported at 07:04 hrs, while charging of 220kV Muzaffarnagar Jansath ckt, Y N phase to earth fault occurred. However line didn't not trip.
- As fault was still persisting, all four ICTs tripped on over current earth fault protection operation. At the same time, 220kV feeders to Nara

tripped on distance protection operation in Z1, 220kV feeder to Shamliin Z-4 and 220kV feeders to Modipuram & Charla tripped in Z-3.

- As per PMU at Muzaffarnagar(UP), Y-N phase to earth fault with delayed clearance in 1000ms is observed.
- As per SCADA, change in load of approx.
- 115MW is observed in UP control area.
- As reported, after inspection and patrolling, earth wire of double ckt. tower of 220kV Muzaffarnagar-Nara line & 220kV Muzaffarnagar Jansath line found broken between tower 32-33 which led to the persisted YN fault and status of breaker contact of 220kV Jansath linewas not available to relay panel due to whic h protection of line did not operate.
- Major observations:
  - Exact location and nature of fault?
  - Reason of delayed clearance of fault?
  - Status of Bus bar protection at 400/220kV Muzaffarnagar (UP)?
  - Healthiness of protection system need to be ensured at
  - Muzaffarnagar (UP).
  - DR/EL & tripping report of tripped elements need to be shared.
  - Remedial action taken report to be shared.

b. UP representative and others informed the following:

- 220 kV Muzaffarnagar – Jansath line tripped at 06:18 on 08.11.2022. Line got AR but tripped due to persistent fault.
- At 07:04 hrs when charging attempt was taken fault was still persisting but line failed to trip due to faulty SOTF protection.
- On investigation, it was found that CB status was not coming to relay due to which relay not sense CB open and SOTF couldn't operate.
- CB contact has been replaced and SOTF function has been tested and found healthy.

2. *PSC Recommendations:*

- *CB contacts may be monitored regularly for spurious status. Alarm may be configured for detecting faulty CB status.*
- *CSC 101 & CSC 211 relays needs replacement.*
- *DR of all the tripped elements should to submitted to NRLDC. DR for lines tripped from remote end have not been submitted.*

C. Multiple elements tripping at 400/220 kV Bareilly(UP) Station at 14th November 2022, 13:21 hrs

1. Discussion during the meeting:

a. NRLDC representative raised following points during the meeting :

- As reported at 13:21 hrs, telemetry data verification of 220 KV Amariya ckt-1 was being done. Bus-2 isolator of the Amariya line was closed for the same purpose, at the same time, a Monkey jumped on B-ph Bus-1 isolator (Bus-1 isolator jumpers were not connected to bus-1 and were grounded) which created B-N phase to earth bus fault on 220kV Bus-2 at 400/220kV Bareilly.
- As 220 KV Bus Bar protection is out of service due to its exhausted capacity at 400 KV Bareilly, fault cleared after the tripping of 220kV feeders CB to Ganj2-1&2, Shahjhanpur, Pilibhit-2, Dohna-1, Pantnagar and Pithoragarh on distance protection operation at Bareilly end in Z-4, tripping of 220kV feeder to Dohna-2 & Pilibhit-1 from remote end and tripping of 400/220kV 315MVA ICT-1, 2 & 3 on directional earth fault overcurrent protection operation.
- As per PMU, B-N phase to earth fault with delayed clearance in 840ms is observed.
- As per SCADA, no change in load is observed in UP & Uttarakhand control area.
- Major observations:
  - Why did 220kV Pilibhit-1 & Dohna-2 ckt not trip from Bareilly end in Z-4?
  - Commissioning work of Bus bar protection at 220kV side of 400/22 kV Bareilly (UP) need to be expedited.
  - DR/EL & tripping report of all the tripped elements need to be share d.
  - Remedial action taken report to be shared.

b. UP representative and others informed the following:

- 220 kV Bus bar protection is out at Bareilly UP.
- Both ICTs tripped on OC/EF.
- Lines which didn't trip in Z-4 were tested later and were found healthy.

2. *PSC Recommendations:*

- *Test report for lines, which didn't trip in Z-4 need to be submitted to NRLDC/NRPC.*

D. Multiple elements tripping at 220/66 kV Pong(BBMB) Station at 06th December 2022, 15:03 hrs

1. Discussion during the meeting:

a. NRLDC representative raised following points during the meeting :

- During antecedent condition, 210MW Unit-2&3 were running and generating ~66MW each. Unit-2 & 220kV feeders to Jalandhar ckt-2, Jessore, Dasuya ckt-2 were connected at 220kV Bus-2 and Unit-3, 220/66kV 40MVA Transformer & 220kV feeders to Jalandhar ckt-1, Dasuya ckt-1 were connected at 220kV Bus-1.
- As reported at 15:03 hrs, during synchronizing 66MW Unit-6 at Pong (BBMB) at 220kV Bus-1, B-phase pole of SF6 circuit breaker of the unit-6 got burst, it also damaged isolators/accessories of adjacent bays/circuits. On this fault bus bar protection of 220kV Bus-2 operated and elements i.e., 66MW Unit-2 & 220kV feeders to Jalandhar ckt-2, Jessore, Dasuya ckt-2 tripped. However, bus coupler didn't open and so fault cleared with the tripping of 66MW Unit-3, 220/66kV 40MVA transformer and 220kV feeders to Jalandhar ckt-1, Dasuya ckt-1 in Z-2 from remote end.
- As per PMU at Jalandhar (PG), B-N fault with delayed clearance in 480ms is observed.
- As per SCADA, total generation loss of approx. 132MW is observed at Pong HEP(BBMB).
- Major observations:
  - Mechanical healthiness of CB need to be ensured.
  - Why did bus coupler breaker not open on bus bar protection operation?
  - DR/EL & tripping report of all the tripped elements need to be shared.
  - Remedial action taken report to be shared.

b. BBMB representative and others informed the following:

- 220 kV Bus bar protection was out of service due to erection going on.
- 220 kV lines tripped from remote end and Z-4 did not operate at Pong.
- CBs for 02 nos units at pong have been replaced with C2M2 type in place of C1M1 type. C2M2 CBs are rated for more number of operations.
- Copy of PSC meeting notice may also be sent to protection division of UP.

2. *PSC Recommendations:*

- *200 kV bus bar protection needs to be made operational and tested.*
- *CB of unit – 5 needs to be replaced.*
- *BBMB needs to do detailed analysis and share report with NRLDC/ NRPC.*
- *DR and event loggers may be sent within stipulated time.*

E. Multiple elements tripping at 220/kV Panipat(BBMB) Station on 20th December 2022, 00:29 hrs

1. Discussion during the meeting:

a. NRLDC representative raised following points during the meeting :

- As reported, at 00:29hrs on 20th Dec 2022, all the elements connected at 220kV Panipat (BBMB) tripped on bus bar protection operation at BBMB end.
- As per the details received from Narela (DTL) end, fault was in its Z-2.
- As per PMU at Dadri Thermal (NTPC) end, R-N & Y-N fault with delayed clearance of approx. 1080msec is observed.
- As per SCADA, change in demand of approx. 150MW is observed in Haryana control area.

- Major observations:
  - Exact location and nature of fault?
  - Reason of delayed clearance of fault?
  - DR, EL & tripping report of any of the tripped elements are not shared yet. BBMB must ensure the timely uploading of the details on tripping portal.
  - Remedial action taken report to be shared.

b. BBMB representative and others informed the following:

- Fault was on chajpur line and its distance protection (CSC make relay) failed to operate.
- All lines tripped from remote end on Z-2.
- The distance relay has been changed since then. Main-1 is EPEC make and Main-2 is Micom make.

2. *PSC Recommendations:*

- DR have not been received for this event, BBMB is requested to send DR and EL timely.

- Details tripping report along with remedial action taken report also need to be shared.

F. Multiple elements tripping at 220kV Ballabhgarh(BBMB) and 220kV Samaypur(BBMB) stations on 12th January 2023, 16:56 hrs

1. Discussion during the meeting:

a. NRLDC representative raised following points during the meeting :

- Multiple elements tripping occurred at Samaypur(BB) while charging of Bus-4 at 220 kV Samaypur S/S which was under planned outage.
- As per SCADA, approx. 400 MW Load Loss occurred in Haryana.
- As per PMU at Ballabhgarh(PG), B-N phase to earth fault with fault clearing time of 520 msec is observed.
- Major observations:
  - Exact location and nature of fault? Sequence of event?
  - Reason of delayed clearance of fault?
  - DR, EL & tripping report of any of the tripped elements are not received yet. BBMB must ensure the timely uploading of the details on tripping portal.
  - Status of remedial action?
  - Analysis details and major findings of the tripping event?

b. BBMB representative and others informed the following:

- Bus fault occurred at 220kV Samaypur due to wrong operation of isolator during switching operation. Bus bar protection was not in service at Samaypur as it was sent for repair of CU & PU. Fault cleared with the tripping of all the elements from remote end in Z-2.
- Bus bar protection will be restored back as soon CU & PU get repaired.

2. *PSC Recommendations:*

- DR have not been received for this event, BBMB is requested to send DR and EL timely.
- Expedite the repair and restoration work of bus bar protection at 220kV Samaypur S/s.

G. Multiple elements tripping at 220kV Hissar(BBMB) on 14th February 2023, 11:19 hrs

1. Discussion during the meeting:

a. NRLDC representative raised following points during the meeting :

- As reported, at 11:19hrs, Y- phase conductor (from terminal tower to gantry) of 220kV Hissar_IA-Hissar_PG ckt-1 snapped from gantry end, due to which 220KV CVT & 220KV LA of Y- phase snapped out, thereby causing damage to 01 no. of 220KV CVT & 3 no. 220KV LA's.
- LBB protection operated causing tripping of all 220 kV feeders at 220kV Hissar_IA(Har) S/s.
- As per PMU, Y-B fault with clearance time of 120 msec and B-N fault converted to Y-B fault with delayed clearance time of 840 msec are observed.
- Due to tripping of all the 220kV feeders, 220kV Hissar_IA(Har) & 220kV Hissar(BB) S/s became dead.
- As per SCADA, change in demand of approx. 220MW in Haryana control area (as per SCADA data)
- Major observations:
  - Fault clearance time is 840msec. Reason of delayed clearance of fault? Sequence of event?
  - Protection coordination between 220kV S/s in the Hissar region need to be reviewed.
  - DR of Hissar_IA(Har) are not time synced, time syncing of all the recording devices/software need to be ensured.
  - DR/EL of all the tripped elements along with tripping report of the event need to be shared.
  - Frequent event of equipment failure are being reported at Haryana & BBMB S/s, similar event occurred on 12th Feb23. Proper maintenance of equipment and their healthiness need to be ensured.
  - Status of differential protection in line?
  - Analysis details and major findings of the tripping event?

b. BBMB, Haryana representative and others informed the following:

- Fault occurred on 220kV Hissar_IA-Hissar_PG ckt-1, this fault was sensed in Z-2 at Hissar_BB end.
- Due to incorrect wiring of LBB relay, tripping command initiated by LBB relay to bus bar and elements connected at both the bus tripped.
- Issue related to wiring of LBB relay has been corrected and protection system is healthy at Hissar_BB.
- The same fault was sensed by Hissar_IA –Hissar_PG ckt-1 (at Hissar_IA end) in Z-1 and line tripped, line didn't trip from Hissar_PG end instanteously and thus back up protection of Hissar_IA –Hissar_PG ckt-2 at Hissar_IA end initiated tripping command. However, CB of ckt-2 didn't open and therefore LBB protection operated at Hissar_IA

end. As both 220kV buses were in tied condition due to incorrect isolator status, both the 220kV bus at 220kV Hisaar_IA tripped.

- Issues at Hissar_IA have been corrected.
- Regarding implementation of differential protection in 220kV Hisaar_BB-Hissar_IA ckts, BBMB representative stated that protection in the line belongs to HVPNL.
- HVPNL representative informed that proposal of replacing distance protection relay with differential protection in 220kV Hisaar_BB-Hissar_IA ckts have already been raised and purchase of differential relay have been considered in tendering. Relays at both the ends will be replaced after relay procurement.

2. *PSC Recommendations:*
   - HVPNL need to expedite the replacement work of distance protection relay with differential protection relay in 220kV Hisaar_BB-Hissar_IA ckt-1&2
   - DR have not been received for this event, BBMB is requested to send DR and EL timely.
   - Old isolators also may be replaced with new one to avoid frequent issues related of isolator contacts.
   - Healthiness of protection system need to be ensured by BBMB & HVPNL.

H. Multiple elements tripping at 400/220kV Panki(UP) on 23rd March 2023, 13:07 hrs

1. Discussion during the meeting:
   a. NRLDC representative raised following points during the meeting :
   - During antecedent condition, 400kV Bus-1 at Kanpur(PG) was under shutdown and 400kV Kanpur-Fatehpur ckt-1&2 were connected at same dia with 400kV Kanpur-Panki ckt-1&2 (line length approx. 6km) (Main CB of Kanpur-Fatehpur ckt was in open condition).
   - As reported, at 13:07hrs, R & Y ph pole of CB of at Panki end of 220kV Panki-Kanpur South ckt damaged. On this fault, bus bar protection at 220kV Panki(UP) operated.
   - As per SCADA, elements connected at both the 220kV bus at Panki(UP) tripped. As fault didn't clear in time, 400/220kV 315MVA ICT-1&2 at Panki(UP) and 400kV Kanpur-Panki D/C also tripped with delay.
   - As per SOE, PMU data & DR/EL received, sequence of the event is as follows:

- At 13:06:18:680hrs, fault occurred in R-ph which cleared within 100msec. At the same time, line CB at Kanpur South end of 220kV Panki-Kanpur South ckt opened (as per SOE).
- At 13:07:37:360hrs, again fault occurred in R-phase which didn't clear at that moment. At the same time, line CB at Panki end of 220kV Panki-Kanpur South ckt opened (as per SOE).
- At 13:07:39:880hrs, fault occurred in Y-ph also.
- At 13:07:42:760hrs, fault in R & Y phase cleared and fault in R phase started, R phase fault cleared with the delay of 5.4sec and Y phase fault cleared with the delay of 2.8sec. At the same time, 400/220kV 315MVA ICT-2 at Panki(UP) tripped on directional O/C protection operation at 400kV side (as per SOE & DR).
- At 13:07:45:560hrs, fault in B phase cleared with the delay of 2.8sec. At the same time, 400kV Kanpur-Panki D/C tripped on O/C E/F protection operation at Kanpur end and 400/220kV 315MVA ICT-1 at Panki(UP) tripped on directional O/C protection operation at 400kV side(as per SOE & DR).

➢ As per fault locator detail of 400kV Kanpur-Panki D/C at Kanpur(PG) end, B phase fault distance was approx. ~200km from Kanpur(PG) end. It shows that fault was at 220kV side of Panki(UP).

➢ As 400kV Bus-1 at Kanpur(PG) was under shutdown, 400kV Kanpur-Fatehpur D/C tripped with the tripping of 400kV Kanpur-Panki D/C.

➢ Major observations:

- Status of bus bar protection at 220kV Panki?
- Status of replacement of electromechanical bus coupler relay with numerical relay.
- Review of protection coordination to minimise the fault clearance time.
- Status of remedial action?
- Analysis details and major findings of the tripping event?

b. UP representative and others informed the following:

➢ 400/220kV 315MVA ICT-1 at Panki(UP) tripped on over current earth fault protection operation and ICT-2 tripped on highset O/C E/F operation.

➢ Pick up and TMS setting of over current earth fault protection of 400/220kV ICTs at Panki(UP) will be reviewed and necessary corrective action will be taken if required.

➢ At 220kV side, bus bar protection operated but due to some issue in bus bar relay, elements didn't open. Issues related to isolator contacts are also there as they are very old.

➢ Review of bus bar protection at 220kV Panki is in process, follow-ups are being done with relay engineer.

2. *PSC Recommendations:*
   - Review of setting of O/C E/F protection in 400/220kV ICTs at Panki(UP) and bus bar protection at 220kV side need to be done.
   - Old isolators also may be replaced with new one to avoid frequent issues related to faulty isolator contacts.

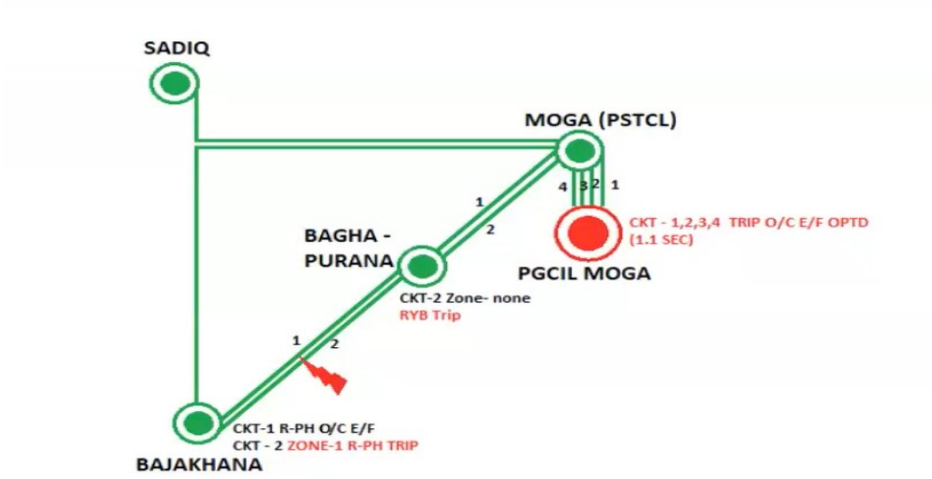
I. Multiple elements tripping at 220kV Moga(PG) and 220kV Mogan(PS) on 24th March 2023, 19:07 hrs

1. Discussion during the meeting:

a. NRLDC representative raised following points during the meeting :

- As reported, at 19:07hrs, 220kV Moga(PG)-Mogan(PS) (PSTCL) ckt-1,2,3&4 (line length ~400meter) tripped from Moga(PG) end only. No CB opened from Mogan(PS) end.
- As per DR submitted of Moga(PG) end, over-current earth-fault protection operated in all four lines at Moga(PG) end. Fault current in all the lines were in the range of 750A and cleared after approx. 1-1.5sec. It seems that probably fault was outside the line in the Punjab network.
- There is differential protection in line which is in blocked condition due to absence of fibre optics.
- As per PMU at Jalandhar(PG), R-N phase to earth fault with delayed clearance in 1560msec is observed.
- As per SCADA, no load loss has been observed in Punjab control area as Mogan(PS) has alternate connectivity from 220kV Firoz & Botia feeders.
- Major observations:
  - Exact location and nature of fault need to be identified. SLDC Punjab may confirm whether any fault occurred in downward network?
  - Reason for delayed clearance of fault?
  - SLDC-Punjab is requested to share the details of protection implemented at Mogan(PS) S/s in lines along with their protection settings. Whether bus bar protection is healthy at Mogan(PS) S/s?
  - DR, EL status along with tripping report need to be shared.
  - Remedial action taken report to be shared.
  - Analysis details and major findings of the tripping event?

b. Punjab representative and others informed the following:



- R-ph fault occurred on 220kV Baghapurana-Bajakhana ckt. Line tripped from Bajakhana end in Z-1 however, line didn't trip from Baghapurana end as distance protection was blocked due to damage of VT control cable.
- Line tripped from Baghapurana end with the delay of 1500msec on backup directional earth fault protection.
- During that time, all four ckts of 220kV Moga(PG)-Mogan(PS) also tripped on backup O/C E/F protection operation.
- Regarding line protection in 220kV Moga(PG)-Mogan(PS) ckts, it was informed that distance protection is in service in the line and differential protection is not in service yet due to pending work of installation of fibre cables.

2. *PSC Recommendations:*
   - Review of setting of O/C E/F protection at Moga(PG) and its coordination with Mogan(PS) and its downwards network.
   - Timely submission of DR/EL & tripping details need to be ensured by Punjab.
   - Healthiness of protection system also need to be ensured.

J. Multiple elements tripping at 220kV Safidon(HR) on 11th April 2023, 18:32 hrs

1. Discussion during the meeting:

a. NRLDC representative raised following points during the meeting :

- As reported, at 18:32 hrs, CTs of 220/132kV ICT-1 & 2 blasted at 220kV Safidon(HS) which resulted in busbar protection operation. Hence, all elements connected to bus-1 & 2 at 220kV Safidon(HS) tripped and S/s became dead.
- Due to tripping of 220kV Panipat TPS(HS)-Safidon(HS) ckt-1, 2 & 3 fault transferred to 220kV Panipat TPS(HS) which resulted in tripping of 250MW unit-6, 7 & 8 at Panipat TPS(HS) due to heavy jerk.

- As per DR, 220/132kV ICT-1 at Safidon(HS) tripped on differential protection operation with differential current of approx. 25A in R & Y phase and 50A in B-phase. 220kV Safidon(HS)-Mund(HS) ckt-2 tripped on zone-1 distance protection operation.
- As per PMU at 400kV Panipat(HS), multiple faults are observed in the system (R-N fault followed by B-N fault followed by R-Y-B 3-phase fault with delayed fault clearance time of 440 ms).
- As per SCADA, generation loss of approx. 610MW is observed in Haryana control area.

- Major observations:
  - Exact nature and location of fault? Reason of occurrence of fault?
  - Bus-wise arrangement of elements at 220kV Safidon(HS) need to be shared.
  - Reason of delayed clearance of fault need to be shared.
  - SCADA data was not healthy at Safidon(HS) during the event. Healthiness of SCADA data need to be ensured.
  - DR/EL of all the tripped elements along with tripping report of the event need to be shared.
  - DR at 220 kV Safidon end of 220kV Safidon-Mund Ckt-2 is not time synced. The same need to be ensured.
  - Remedial action taken report to be shared.
  - Analysis details and major findings of the tripping event?

b. Haryana representative and others informed the following:

- CT of 220/132kV ICT-2 damaged followed by damage of 2 poles of its breaker and B-ph CT of 220/132kV ICT-1 also.
- Bus bar protection at 220kV Safidon(HR) was in blocked condition due to issue in isolator contacts and thus fault cleared with the tripping of elements from remote end in Z-2.
- Station event logger is also not available and therefore alarm of the block of bus bar protection also not received.
- Status of isolator contacts were corrected and bus bar protection is in service.
- As station is not SAS based, common facility is not available to ensure time syncing of the relays and recording devices.

2. *PSC Recommendations:*

- Process to upgrade station with SAS based may be initiated to ensure the availability of station event logger.
- Time sync of the relays and recording devices need to be ensured.

K. Multiple elements tripping at 220kV Mau(HR) on 14th April 2023, 01:43 hrs

1. Discussion during the meeting:

a. NRLDC representative raised following points during the meeting :

- As reported, at 01:43 hrs, B-phase CT of 220 KV Bhiwadi(PG)-Mau(HV) (HVPNL) Ckt blasted at Mau end. 220 KV Bhiwadi(PG)-Mau(HV) (HVPNL) Ckt tripped on B-N fault, (Zone-2 distance protection operated) with fault current of 11.5kA and fault distance of 13.69km from Bhiwadi(end).
- Rest of the 220kV lines connected at Mau S/s tripped on Zone-2 from remote end only. Hence, Mau S/s became dead.
- As per DR at Bhiwadi(PG) end of 220kV Bhiwadi(PG)-Mau(HS) Ckt, earth fault protection relay operated.
- As per DR at Manesar(PG) end of 220 KV Manesar(PG)-Mau(HS) Ckt-2, line tripped on zone-3 from Manesar(PG) end only.
- As per PMU at 400kV Bhiwadi(PG), B-N phase to ground fault converted to 3-phase fault is observed in the system with delayed fault clearance time of 1280ms.
- As per SCADA, No change in demand is observed in Haryana control area (as per SCADA). Approx. 128 MW load loss occurred as per communication with SLDC-Haryana.
- Major observations:
  - Details of protection operation?
  - As per PMU, fault clearing time was 1280 ms. Reason of delayed clearance of fault need to be ensured.
  - Healthiness of SCADA data need to be ensured.
  - DR/EL of all the tripped elements along with tripping report of the event need to be shared.
  - Remedial action taken report to be shared.
  - Analysis details and major findings of the tripping event?

b. Haryana representative and others informed the following:

- Bus bar protection at Mau S/s was not in service as it was during commissioning stage during the event time.
- Fault cleared with the tripping of lines from remote end in Z-2.
- 220kV Manesar-Mau ckt-2 sensed fault in Z-3 at Manesar end due to T section in the line at Panchgaon(HR) S/s whose LILO is to be done within next 03 months. Therefore, fault cleared with the Z-3 time delay.
- Bus bar protection at 220kV Mau S/s has been commissioned now and will be made operational in few days.

2. *PSC Recommendations:*

- Protection setting of Z-2/Z-3 at Manesar (PG) end need to be reviewed w.r.t. Mau S/s.

- Timely submission of DR/EL need to be ensured by Haryana.

L. Multiple elements tripping at 220kV Dasuya(Punjab) on 15th April 2023, 17:15 hrs

1. Discussion during the meeting:

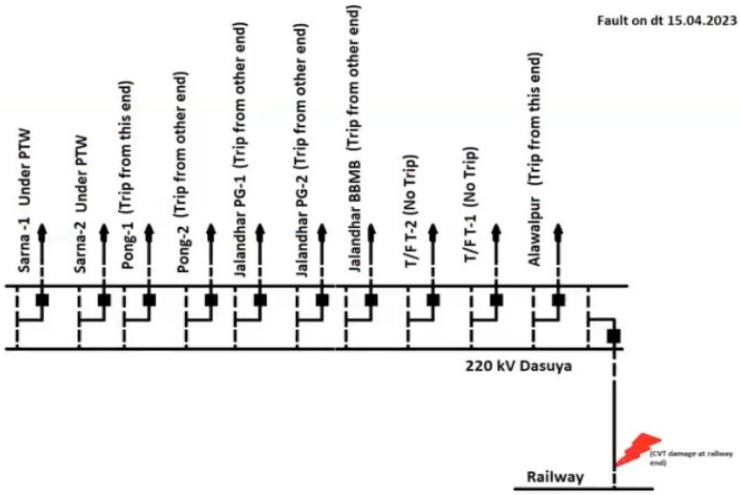
a. NRLDC representative raised following points during the meeting :

As per the information received and communication with 220kV Dasuya S/s, brief of the event are as follows:

- 220 kV Dasuya(PS) S/s has double bus scheme.
- At 17:15hrs on 15th April'23, Y-ph CVT at Railway end of 220kV Dasuya-Railwat ckt (~2km) damaged.
- On this fault, Railway ckt didn't trip from Dasuya end and thus adjacent feeders tripped on back up protection.
- 220 KV Dasuya(PS)-Jalandhar(PG) (PG) Ckt-1 & 2 tripped from Jalandhar(PG) end only, fault was in Z-2 (64.25km) from Jalandhar(PG) end.
- 220 KV Dasuya(PS)-Jalandhar(BB) (BBMB) Ckt tripped from Jalandhar(BB) end only in Z-2 (76.8km).
- 220 KV Dasuya-Alawalpur (PS) Ckt and 220 KV Pong(BB)-Dasuya(PS) (BBMB) Ckt-1 tripped from Dasuya end only and 220 KV Pong(BB)-Dasuya(PS) (BBMB) Ckt-2 tripped from Pong end in Z-3 (~70km).
- As per PMU at 400kV Jalandhar(PG), R-B-N double phase to ground fault with delayed clearance of fault in 680 ms is observed.
- As reported by SLDC-Punjab, load loss of approx. 60MW occurred in Punjab control area.
- Major observations:
  - Exact nature and location of fault? Whether fault was in reverse zone (Z-4) of other feeders at Dasuya end?
  - Reason of delayed clearance of fault? Why did Railway line didn't trip from Dasuya end? Healthiness of protection system need to be ensured.
  - Details of protection operated at Dasuya end need to be shared.
  - DR/EL of all the tripped elements along with tripping report of the event need to be shared from Rajasthan end.
  - Remedial action taken report to be shared.
  - Analysis details and major findings of the tripping event?

b. Punjab representative and others informed the following:

- Line Mian-1 protection was not available during the event as it was sent for repair. Main-2 relay and backup relay were under blocked condition due to CT control cable short due to damage done by wild reptile.
- Fault cleared with the tripping of lines from remote end in Z-2.
- Defected CT



cable has been replaced and Main-1 relay will also be restored soon.

2. *PSC Recommendations:*
   - Expedite the restoration of Main-1 relay in Railway ckt.
   - Timely submission of DR/EL need to be ensured by Punjab.

M. Multiple elements tripping at 400kV Anpara(UP) on 18th April 2023, 08:56 hrs

1. Discussion during the meeting:

a. NRLDC representative raised following points during the meeting :

- During antecedent condition, 400 KV Anpara-Sarnath (UP) Ckt-1, 400 KV Singrauli(NT)-Anpara(UP) (PG) Ckt-1, 210MW Unit-1 at Anpara TPS & 400/132 kV 100 MVA ICT 2 at Anpara(UP) were connected at 400kV Bus-2 at Anpara (UP) and rest of the elements were connected at 400kV Bus-1.
- As reported at 08:49hrs, 210 MW Anpara TPS - UNIT 1 tripped due to damage of bushing of GT1. Further at 08:56hrs, busbar protection operated at 400kV Bus-2 at Anpara(UP) and all the elements connected at 400kV Bus-2 tripped and bus-2 became dead. DT received at Sarnath end.
- As per PMU at Allahabad(UP), B-N phase to ground fault with fault clearance time of 80msec is observed at 08:49hrs and no fault in system observed at 08:56hrs.

- As per SCADA SOE, 132 KV Rihand(NT)-Anpara(UP) Ckt-1 & 2 tripped at 08:56hrs.
- As per SCADA, generation loss of approx. 155MW in UP control area is observed (210MW Unit-1 at Anpara TPS tripped)..
- Major observations:
  - Bus-wise arrangement of elements need to be shared.
  - Healthiness of SCADA data and element status need to be ensured.
  - At 08:56hrs, bus bar protection operated at Anpara(UP), however no fault observed in system. Reason of the same need to be shared.
  - Reason of tripping of 132 KV Rihand(NT)-Anpara(UP) Ckt-1 & 2 need to be shared.
  - DR & EL of all the tripped elements along with tripping report of the event need to be shared.
  - Remedial action taken report to be shared.
  - Analysis details and major findings of the tripping event?

b. UP representative and others informed the following:

- Reason of bus bar protection couldn't be ascertained yet. Bus bar protection relay is of electromechanical type and therefore DR is also not available.
- Process of replacement of bus bar relay with numerical relay is in process. Relay has been procured and further process are being done.
- Line protection relays have already been replaced with numerical relays. In case of units, protection relays in Unit-3 & 5 have been replaced with numerical relay, numerical relay for Unit-4 has been ordered and same will be installed at the earliest and for unit-1&2, it is in proposal stage.

2. *PSC Recommendations:*
   - Expedite the implementation of numerical bus bar protection relay at Anpara(UP).

N. Multiple elements tripping at 400kV Noida Sec 148(UP) on 18th April 2023, 13:24 hrs

1. Discussion during the meeting:

a. NRLDC representative raised following points during the meeting :

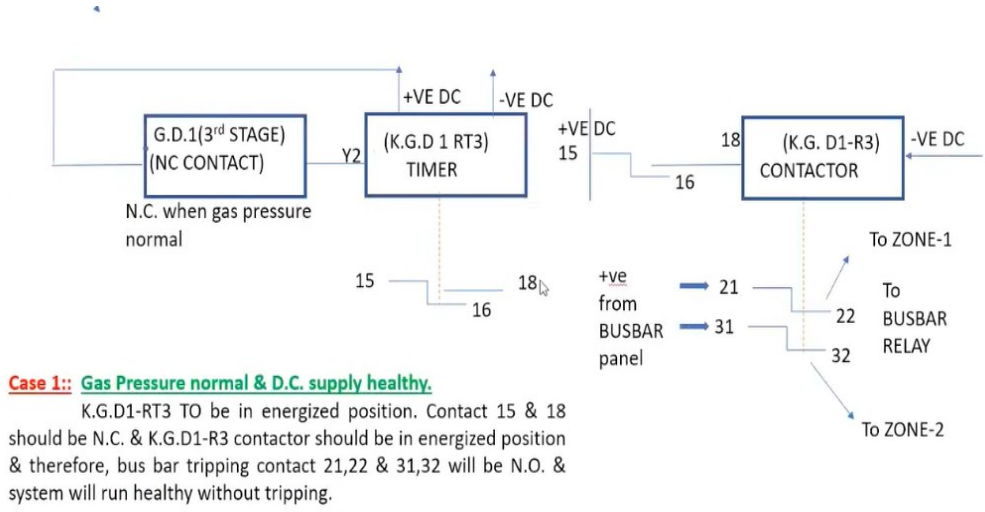
- 400/220/33kV Noida Sec148 GIS has double main single breaker bus scheme. Power comes from 400 KV Gr.Noida_2(UPC)-Noida Sec 148 (UP) D/C and feeds Noida Sec 123 via 400 KV Noida Sec 148-Noida Sec 123 (UP) D/C and feeders connected at 220kV level at Noida Sec

148. There are 2*500MVA ICT at Noida Sec148, during antecedent condition, both were in service. There is 1*160MVA 220/132kV ICT and 2*100MVA 220/33kV transformer.

- As reported, brief detail of the event are as follows:
  - There are two (no.) DC source i.e., I & II with automatic changeover mechanism via mechanical changeover relay which takes more than 100msec to changeover the DC source.
  - There is a logic for initiation of bus bar protection with the delay of 100msec in the case of gas detector stage-3 (GD-3).
  - In addition, there is an issue related to arrangements of contacts of DC source that whenever DC source is not available then it raises flag as gas detector stage-3 (GD-3) which further initiates bus bar tripping as DC source changeover takes more than 100msec.
  - There is also a pre-existing issue related to cards of battery charger which lead to DC source failure during any fluctuation in AC supply.
  - So, at 13:24hrs on 18th Apr23, DC source-I voltage dropped as two battery cells became dead and battery charger was also not catering load.
  - Before DC source changeover could have occurred, bus bar tripping initiated with the flag of GD-3.
  - Due to bus bar protection operation, all the feeders and elements connected at both the 400kV bus tripped.
  - Issue related to logic of bus bar protection is yet to be resolved, follow up has been taken up to resolve the same.
- As per PMU at 400kV Agra(PG), no fault is observed in the system.
- As per SCADA, load loss of approx. 140MW occurred in UP control area.
- Major observations:
  - The issues related to battery charger and logic of initiation of Bus bar tripping during DC source changeover had been discussed in 45th PSC meeting. Remedial actions were recommended and agreed to complete it within 30 days. However, recent frequent tripping triggered due to similar issue. Status of remedial actions to avoid such further trippings need to be shared.
  - Time syncing of the DR need to be ensured.
  - SCADA data of 400kV Noida Sec 148 S/s was not healthy during the event timing, healthiness of the same need to be ensured.
  - Remedial action taken report to be shared.
  - Similar event occurred on 06th, 08th & 9th of March 2023.
  - Analysis details and major findings of the tripping event?

b. UP representative and others informed the following:

- Battery set and charger replacement tender has been rolled out and both will be replaced by the end of July 2023.



- Proposal to remove K.G.D 1 RT3 timer has been sent to relay engineer to avoid operation of bus bar protection during DC supply changeover. Issue related to unwanted operation of bus bar protection will be resolved after this.

2. *PSC Recommendations:*
   - Expedite the replacement work of battery set and charger.
   - Necessary corrective action need to be taken to avoid unwanted operation of bus bar protection.

O. Multiple elements tripping at 400/220kV Sultanpur(UP) on 26th April 2023, 08:56 hrs

1. Discussion during the meeting:

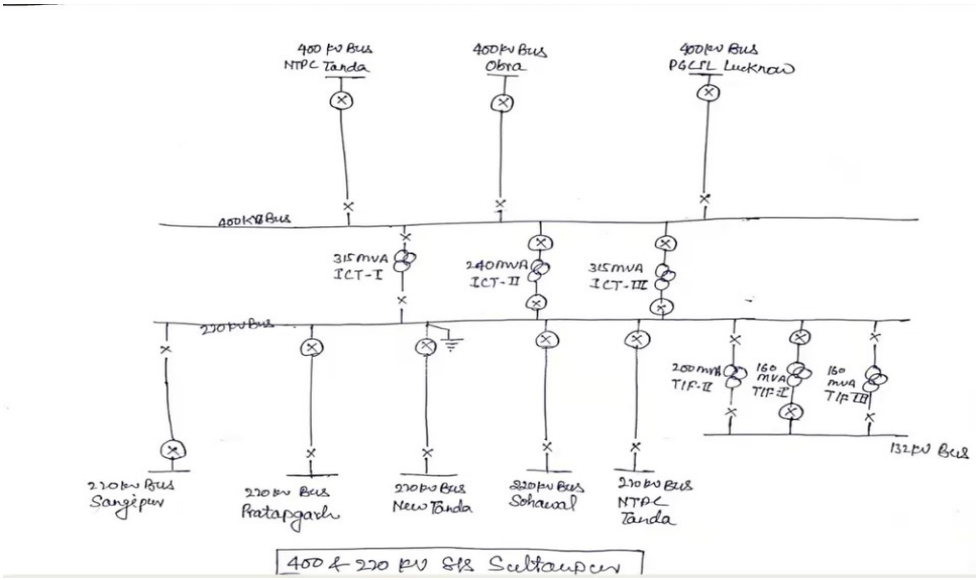
a. NRLDC representative raised following points during the meeting :

- As per the information received and communication with 400/220kV Sultanpur(UP), brief of the event are as follows:
- As reported, switching operations was being done to shift all the elements to 220kV Bus-1 at Sultanpur to avail the shutdown of 220kV bus-2 at Sultanpur.
- At 08:56hrs, Y-ph bus isolator of 220kV Sultanpur-Tanda New ckt damaged during switching operation and created Y-N bus fault.
- As bus bar protection at 220kV side of 400/220kV Sultanpur(UP) is not healthy, 220kV lines to Tanda, New Tanda, Sohawal & Pratapgarh tripped on Z-4 distance protection operation with 160msec time delay. 220kV lines to Amethi and Sangipur tripped from remote end in Z-2/Z-3 distance protection operation.
- Further after 600msec, 400/220kV 315MVA ICT-3 at Sultanpur tripped on over current earth fault protection operation.
- As remaining ICTs didn't trip yet, fault was still persisting which led to the tripping of 400kV lines to Tanda, Lucknow and Obra_B from re-

mote end in Z-3 (~1sec time delay) distance protection operation further after 200msec of ICT-3 tripping.

- With the tripping of 400kV lines, fault got cleared.
- Thereafter, 400/220kV 315MVA ICT-3 at Sultanpur was hand tripped.
- As per PMU, Y-N fault which further converted into R-Y and then R-Y-B fault with delayed clearance of 1560msec is observed.
- As per SOE, tripping of 400/220kV 315MVA ICT-2 not recorded.
- As per SCADA, change in load loss of approx. 280MW occurred in Uttar Pradesh control area.
- Major observations:
  - Status of bus bar protection at 220kV Sultanpur?
  - Status of replacement of electromechanical relays?
  - Review of protection coordination to minimise the fault clearance time.
  - Status of remedial action?
  - Analysis details and major findings of the tripping event?

b. UP representative and others informed the following:



- Bus bar protection at 220kV side is not functional and OEM service is also not available.
- Follow-up has been taken to allot new bus bar protection relay panel for 220kV Sultanpur(UP).
- 220/132kV 160MVA Transformer-1 differential relay is of electromechanical type and it sometimes initiate false tripping.
- Issues related to isolator contacts are also there as they are very old.
- 220kV Sangipur ckt tripped from remote end in Z-2. Testing for operation of Z-4 distance protection will be done on opportunity basis.
- Station event logger will also be installed as soon it get allotted.

2. *PSC Recommendations:*
   - Expedite the process of replacement of bus bar protection, electromechanical relay in 220/132kV Transformer and isolators at 220kV level.
   - Station event logger at both 400 & 220kV side need to be installed.

P. Multiple elements tripping at 220kV Sakatpura(RS) and 220kV KTPS on 08th May 2023, 19:11 hrs

1. Discussion during the meeting:

a. NRLDC representative raised following points during the meeting :

- 220/132kV Sakatpura(Raj) S/s have double main & transfer bus scheme. Station is connected with 220kV Kota TPS via 220kV KTPS-Sakatpura ckt-1, 2, 3 & 4.
- As reported at 19:11 hrs, R & Y ph CT at Sakatpura end of 220kV Sakatpura-Mandalgarh ckt burst and bus fault occurred.
- As per information received, bus bar protection is not healthy at 220kV Sakatpura S/s and Z-4(reverse) distance protection time delay setting is kept as 160msec.
- On this bus fault, 220kV line from RAPP_A & Anta(NTPC) tripped in Z-4 distance protection operation at Sakatpura end and 220kV KTPS-Sakatpura ckt-1,2,3&4 tripped on distance protection in Z-2 from KTPS end. 220kV KTPS-Kota(PG) ckt-1 also tripped from KTPS end.
- At the same time, 210MW Unit-4 at Kota TPS tripped followed by tripping of 210MW Unit-3 & 5 at 19:15 hrs & 19:21 hrs respectively due to tripping of auxiliary components (boiler, pulveriser etc.)
- As per PMU at Kota(PG), R-N fault converted into R-Y-N fault with delayed clearance of 240msec is observed.
- As per SCADA, change in load of approx. 220MW in Rajasthan control area and loss in generation of approx. 230MW at 19:11hrs due to tripping of 210MW unit-4 at KTPS. Further at 19:15hrs, 210MW unit-3 at KTPS tripped followed by tripping of 210MW unit-5 at KTPS 19:21hrs is observed.
- Major observations:
  - DR of KTPS units not received as relays are of electromechanical nature. KTPS & SLDC-Rajasthan are requested to replace the electromechanical relays with numerical relays so that proper analysis of events can be done.
  - Why did 220kV KTPS-Kota(PG) ckt-1 trip? Details of protection operation need to be shared.
  - Bus wise arrangement of 220kV elements at 220kV Sakatpura S/s during antecedent condition of the tripping event need to be shared (isolator status data was not healthy).
  - Remedial action taken report to be shared.

- Analysis details and major findings of the tripping event?

b. Rajasthan representative and others informed the following:

- Bus bar protection is not available at 220kV Sakatpura. Therefore, Z-4 setting of distance protection relay is kept as 160msec and O/C E/F relays (electromechanical type) in bus coupler / bus sectionalizer are kept as 20% plus setting and 0.05 TMS.
- 220kV line from KTPS tripped in Z-2. Time delay of Z-2 at KTPS end is kept as 160msec after approval of RVPNL to avoid fault feeding during delayed clearance of fault.
- Process of implementation of bus bar protection at Sakatpura has been taken up.
- KTPS has also started the process of replacement of electromechanical relay with numerical relays in their Units.

2. *PSC Recommendations:*
   - Expedite the process of implementation of bus bar protection at 220kV Sakatpura(RS), replacement of electromechanical relays at 220kV Sakatpura and KTPS.

Q. Multiple elements tripping at 220kV Ballabhgarh(BBMB) on 16th May 2023, 01:52 hrs

1. Discussion during the meeting:

a. NRLDC representative raised following points during the meeting :

- As reported, at 01:52 hrs, Y-phase PT and R and Y phase breaker poles of 220 KV Ballabhgarh(BB)-Badarpur(NT) (BB) Ckt-2 burst at Ballabhgarh(BB) end.
- This resulted in LBB protection operation and all the elements connected to Bus-1 and Bus-2 tripped and 220/66/33kV Ballabhgarh(BB) S/s became dead.
- As per DR of 220 KV Ballabhgarh(BB)-Badarpur(NT) Ckt-1, zone-2 distance protection operated at Badarpur(NT) end (Y-B fault, fault current of approx. 6.9kA) and zone-4 distance protection operated at Ballabhgarh(BB) end (R-Y-N fault, fault current of approx. 12kA in each phase followed by R-N fault, fault current of approx. 17kA).
- As per DR of 220KV Bus 1 at Ballabhgarh(BB), LBB protection operated (Y-N fault converted to 3-phase fault followed by R-N fault followed by R-Y-N fault were observed)
- As per PMU at Ballabhgarh(BB), multiple faults (Y-N fault converted to 3-phase fault followed by R-N fault followed by R-Y-N fault) were observed in system with delayed fault clearing time of 1400 ms.

- As per SCADA, load loss of approx. 300MW is observed in Haryana control area.
- Major observations:
  - Bus-wise arrangement of elements need to be shared (Isolator status of elements are not clear from SCADA).
  - Why did elements connected at both the bus trip?
  - Reason of delayed clearance of fault need to be shared.
  - DR/EL along with tripping report need to be shared for all the elements from both ends.
  - Remedial action taken report to be shared.
  - Analysis details and major findings of the tripping event?

b. BBMB representative and others informed the following:

- Delayed clearance of fault occurred due to occurrence of subsequent faults. On first fault, all three poles got opened and fault got cleared. However, SF6 gas also started leaking, after further ~800msec due to leakage of SF6 gas, flashover occurred. On this fault, current increased and LBB protection got operated.
- Fault was of through fault nature of bus bar therefore bus bar protection didn't operate.
- Issue related to breaker has been resolved.

2. *PSC Recommendations:*
   - Timely submission of DR/EL & tripping report need to be ensured by BBMB.

R. Multiple elements tripping at 400/220kV Jodhpur(RS) on 24th May 2023, 20:14 hrs

1. Discussion during the meeting:

a. NRLDC representative raised following points during the meeting :

- 400/220kV Jodhpur(RS) has one and half breaker bus scheme at 400kV side.
- As reported at 20:10 hrs, Isolator of 220 kV Jodhpur to Bilara line and the IPS tube of 400 kV main bus-A got damaged due to heavy storm at 400 kV GSS, Jodhpur.
- On this fault, Bus bar protection operated at 400kV Bus-A (as reported and as verified from DR).
- As reported, at the same time, all the elements connected to 400kV Bus-A & Bus-B tripped and substation became dead.
- As per PMU at Bhadla(PG), R-N phase to earth fault which further converted into three phase fault with delayed clearance of 2080ms is observed.

- As per DR of 400 KV Jodhpur-Kankani (end) (RS) Ckt-1, at 20:14 hrs, line tripped on R-N phase to earth fault (zone-3 distance protection) with fault current of 1.16kA from Kankani(RS) end and fault clearance time of ~800msec. As reported, fault distance was 211km from Kankani(RS) end.
- As per DR of 400 KV Kankroli(PG) (end)-Jodhpur(RS) (PG) Ckt, at 20:14 hrs, line tripped on R-N phase to earth fault later converted into R-Y-N fault is observed. Fault current was ~1.38kA from Kankroli(PG) end. Fault clearing time was ~1560ms. As reported, fault distance was 187.5km from Kankroli(PG) end.
- As per DR of 400/220 kV 315 MVA ICT 1 & 2 at Jodhpur(RS), ICTs tripped on directional over current protection operation with the delay of approx. ~1300msec. Fault in R-phase which converted into R-Y-B is observed.
- As per SCADA, change in demand of approx. 275MW in Rajasthan control area
- The damaged IPS tube of 400kV main bus-A has been fixed.
- Major observations:
  - Bus wise arrangement of 400kV elements during antecedent condition of the tripping event need to be shared.
  - Reason of delayed clearance of fault?
  - Time sync issue in DR of 400/220 kV 315 MVA ICT 1 & 2 and 400kV Bus-A at Jodhpur(RS) (end) is observed. The same need to be rectified.
  - Details of trippings at 220kV side also need to be shared.
  - Remedial action taken report to be shared.
  - Analysis details and major findings of the tripping event?

b. Rajasthan representative and others informed the following:

- 400kV Kankroli, Bhadla and Akal were connected at 400kV Bus-1. 400kV Kankani ckt-1 was charged through Tie CB only.
- Bus bar protection at 220kV side was out of service due to defective CU & PU. Z-4 time delay setting is kept as 160msec. New bus bar panel has been procured and allotted.
- On bus fault at 220kV side, all the 220kV feeders tripped in Z-4, 400kV line tripped in Z-3 and 400/220kV ICTs tripped on O/C E/F protection operation.
- Issue related to time sync has also been taken and will be resolved in due time course.

2. *PSC Recommendations:*

- Expedite the process of implementation of new bus bar protection at 220kV side of Jodhpur(RS).

- Time syncing of the DR and recording devices need to be ensured.

Decision of the Forum:

Constituents were requested to submit ATR (action taken report) on recommendations decided as above.

*****

Members of Protection Sub-Committee*

S. No.	NRPC Member Organization	Designation	Email-ID
1	Member (GO&D), CEA	Director, NPC Division	skdotancea@nic.in
2	CTUIL	Sr.GM	schakraborty@powergrid.in
3	PGCIL	SrGM-AM	DevanandKushwaha@powergrid.in
4	NLDC*	Executive Director	scsaxena@grid-india.in
5	NRLDC*	Executive Director	rk.porwal@grid-india.in
6	NTPC	GM(OS-NR)	dmandal@ntpc.co.in
7	BBMB	Director (P&C)	ddpntjmp@bbmb.nic.in
8	THDC*	ED (PSP&APP)	lpjoshi@thdc.co.in
9	SJVN	Additional General Manager	prakash_chand@sjvn.nic.in
10	NHPC	General Manager (O&M)	hod-om-co@nhpc.nic.in
11	NPCIL*	Director (Finance)	df@npcil.co.in
12	Delhi SLDC	General Manager	gmsldc@delhisldc.org
13	Haryana SLDC	Chief Engineer (SO&C)	cesocomm@hvpn.org.in
14	Rajasthan SLDC	Chief Engineer (LD)	ce.ld@rvpn.co.in
15	Uttar Pradesh SLDC	Chief Enginner attached to Dir (O)	director_op@upptcl.org
16	Uttarakhand SLDC	Chief Engineer	anupam_singh@ptcul.org
17	Punjab SLDC	Chief Engineer	ce-sldc@punjabsldc.org
18	Himachal Pradesh SLDC	Chief Engineer	cehpsldc@gmail.com
19	DTL	AGM-Protection	bharatgujardtl@gmail.com
20	HVPNL	Chief Engineer (TS)	cetspk@hvpn.org.in
21	RRVPNL	CE (M&P)	ce.mps@rvpn.co.in
22	UPPTCL*	Managing Director	md@upptcl.org
23	PTCUL	SE(T&C)	setandchld@gmail.com
24	PSTCL	Chief Engineer (P&M)	ce-pm@pstcl.org
25	HPPTCL*	Managing Director	md.tcl@hpmail.in
26	IPGCL	GM-T	satyendrap@ipgcl-ppcl.nic.in
27	HPGCL	SE(Tech)	setech@hpgcl.org.in
28	RRVUNL*	CMD	cmd@rrvun.com
29	UPRVUNL	Chief Engineer, (L-2)	ce.ppmm@uprvunl.org
30	UJVNL*	Managing Director	md@ujvnl.com
31	HPPCL*	Managing Director	md@hppcl.in
32	PSPCL*	CMD	cmd-pspcl@pspcl.in
33	DHBVN	CTO, DHBVN, Hisar	cto@dhbvn@org.in
34	Jaipur Vidyut Vitran Nigam Ltd.*	Managing Director	md@jvvnl.org
35	Madhyanchal Vidyut Vitaran Nigam Ltd.*	Managing Director	mdmvvnl@gmail.com
36	UPCL*	Managing Director	md@upcl.org
37	HPSEB*	Managing Director	md@hpseb.in
38	Prayagraj Power Generation Co. Ltd.*	Head (Commercial & Regulatory)	sanjay.bhargava@tatapower.com
39	Aravali Power Company Pvt. Ltd*	CEO	SRBODANKI@NTPC.CO.IN
40	CLP Jhajjar Power Ltd.*	GM-Electrical	navin.chaturvedi@apraava.com
		DGM-Commercial	rajneesh.setia@apraava.com
41	Talwandi Sabo Power Ltd. *	COO	Vibhav.Agarwal@vedanta.co.in
42	Nabha Power Limited*	CEO	sk.narang@larsentoubro.com
43	Lanco Anpara Power Ltd*	President	sudheer.kothapalli@lancogroup.com
44	Rosa Power Supply Company Ltd	GM-ELECTRICAL	kesarinandan.pandey@relianceada.com
45	Lalitpur Power Generation Company Ltd	President	rnbedi.ltp@lpgcl.com
46	MEJA Urja Nigam Ltd.	DGM-EMD	rajeevpandey@ntpc.co.in
47	Adani Power Rajasthan Limited*	COO, Thermal, O&M	jayadeb.nanda@adani.com
48	JSW Energy Ltd. (KWHEP)*	Head Regulatory & Power Sales	jyotiprakash.panda@jsw.in
49	RENEW POWER*	CEO	sumant@renew.com
50	UT of J&K*	Chief Engineer, JKPTCL	sojpdd@gmail.com
51	UT of Ladakh*	Chief Engineer, LPDD	cepdladakh@gmail.com
52	UT of Chandigarh	Executive Engineer	elop2-chd@nic.in
53	BYPL	GM-SO	Som.Dutt@relianceada.com
54	Bikaner Khetri Transmission Limited	AGM- Protection and Metering	ashish.baviskar@adani.com
55	Adani Enterprises	Manager	mayursinhd.gohil@adani.com

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

Annexure-I

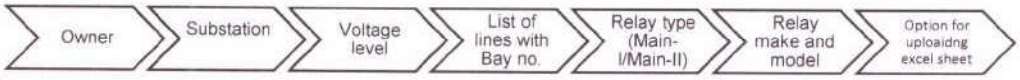
Annexure - II

Finalized Scope of Work to be incorporated for the web-based protection setting database tender

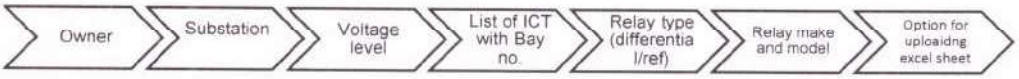
The committee decided scope of work for tender as below: -

1. Publication of website may be on NIC cloud, in case server of PGCIL/NRLDC is not available.
2. Uploading of Protection settings already received in NRPC Secretariat on database portal shall be in scope of tender. For rest of the equipment, utility may upload their settings. In case of change in existing settings, utility shall upload excel sheet on portal.
3. The website shall have facility to upload relay settings excel sheet by utilities for Line, ICT, and Reactor.
4. Following sequence may be facilitated for upload of protection setting excel sheet: -

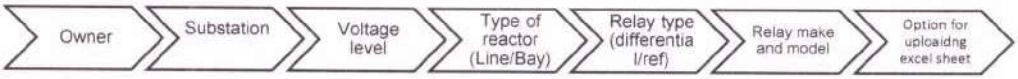
   a) Line:



   b) ICT:



   c) Reactor:



5. Same flow may be facilitated for download/retrieve of already uploaded excel sheet also.
6. Database will comprise of master list of all elements required for fields as mentioned in flow diagram at point no. 4 above. Editing rights in database will be with admin/NRPC Secretariat only. On request from utilities for addition/alteration in network, database shall be modified accordingly.
7. Login IDs are required to be facilitated to utilities who will upload excel sheet. Only owner of element shall have right to upload excel sheet for concerned equipment. Rest of the users shall have viewing rights only.
8. Log report of activities is required for getting information of time and date of upload of excel sheet.
9. Some major parameters of protection setting may be displayed on screen itself in addition to uploaded excel sheet as below: -

   a) Line:

      i. Line length, CT Ratio, PT Ratio
      ii. R, X values

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iii. SOTF (Enable/Disable status) of both ends of line
iv. Power Swing (Enable/Disable status) of both ends of line
v. Zone reach settings and corresponding time delay of both ends of line
vi. Over-voltage settings (Stage-1 & Stage-2) of both ends of line
vii. Earth Fault O/C

b) ICT:

i. Rating, CT Ratio, PT Ratio, percentage impedance, thermal overload
ii. Differential protection settings (pick up & slopes)
iii. REF protection (pick up and stabilizing resistance)
iv. Over-voltage settings
v. Earth Fault O/C/ Backup O/C

c) Reactor:

i. MVAR rating, CT ratio
ii. Differential protection settings (pick up & slopes)
iii. REF protection (pick up and stabilizing resistance)
iv. Earth fault (pick up and time delay)

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Annexure-II

List of Grid events to be discussed in 46th PSC meeting of NRPC

S.No.	Category of Grid Disturbance (GD-I to GD-V)	Name of Elements (Tripped/Manually opened)	Affected Area	Owner/ Agency	Outage Date	Remdial actions recommended/agreed during 46 PSC meeting	Status of remediala ations taken (to be shared by concerned utility)
	NA	Installation of PLCC in transmission lines and protection audit of substations in J&K(UT) control area				i) In next financial year, work of installation of OPGW in all the transmission lines will be started and follow-up actions are being done regarding the same. ii) OPGW work will be followed by installation of PLCC. iii) J&K will intitate follow-up action to conduct protection audit of J&K S/s with the help of POWERGRID. J&K agreed to check & correct the protection settings at frequently affected S/s.	
1	GD-1	1) 400/220 kV 315 MVA ICT 3 at Muzaffarnagar(UP) 2) 400/220 kV 315 MVA ICT 1 at Muzaffarnagar(UP) 3) 400/220 kV 315 MVA ICT 2 at Muzaffarnagar(UP)	UTTAR PRADESH	UPPTCL	5-May-22	i) Scheme and logic of the bus bar relay needs to be corrected as soon as possible. UP assured that this point would be attended up to Jan-2023. ii) The problem of faulty time sync in protection relays of UP control area is coming up frequently during tripping analysis. UP assured to take some concrete action in this regard and will intimate the same to NRLDC and NRPC. iii) UP was requested to report SPS operations in its control area promptly to NRLDC for onward analysis at NRLDC end. UP assured for the same in future.	
2	GD-1	1) 220 KV Hissar(BB)-Chirawa(RS) (BB) Ckt-1 2) 220 KV Hissar(BB)-Jindal Steel(HR) (HVPNL) Ckt-1 3) 220 KV Hissar-Sangrur (BB) Ckt-2 220 KV Hissar-Sangrur (BB) Ckt-1 4) 220KV Bus 2 at Hissar(BB), 220 KV 5) Bhiwani-Hissar (BB) Ckt-2 6) 220 KV Hissar(PG)-Hissar IA(HV) (PG) Ckt-2 7) 220 KV Hissar(BB)-Hissar IA(HV) (BBMB) Ckt-2 8) 220 KV Bhiwani-Hissar (BB) Ckt-1 9) 220 KV Hissar(BB)-Hissar IA(HV) (HVPNL) Ckt-1 10) 220 KV Hissar(PG)-Hissar IA(HV) (PG) Ckt-1	HARYANA	BBMB, HVPNL, POWERGRID	10-May-22	i) BBMB and Haryana were requested to coordinate and replace distance protection on line Hissar (BB)-Hissar IA (HV) with Differential protection. ii) BBMB was requested to send DR and event logger along with tripping report promptly for every tripping to NRLDC within time stipulated as per IEGC.	
3	GD-1	1) 400/220 kV 315 MVA ICT 1 at Gr.Noida(UPC) 2) 400/220 kV 315 MVA ICT 2 at Gr.Noida(UPC) 3) 400/220 kV 500 MVA ICT 5 at Gr.Noida(UPC) 4) 400/220 kV 500 MVA ICT 6 at Gr.Noida(UPC)	UTTAR PRADESH	UPPTCL	20-May-22	i) Distance protection relay (CSC make) of 220kV Gr. Noida-RC Green ckt. -I am susceptible to faulty operation and needs to be changed. UP assured, that correspondence for the same has already been done with transmission wing and it will be replaced shortly. ii) Follow-up actions for the same may be intimated by UP.	
4	GD-1	1) 220 KV Sohna Road (GPTL)-Badshahpur(HV) (HVPNL) Ckt-2 2) 220 KV Sohna Road (GPTL)-Badshahpur(HV) (HVPNL) Ckt-1 3) 400 KV Gurgaon(PG)-Sohna Road (GPTL) (GPTL) Ckt-1 4) 220 KV Sohna Road (GPTL)-GurgaonSec72(HV) (HVPNL) Ckt-1	HARYANA	HVPNL, POWERGRID	30-May-22	NA (Tripping couldn't be discussed, Haryana represenatives were not present in the meeting)	

S.No.	Category of Grid Disturbance (GD-I to GD-V)	Name of Elements (Tripped/Manually opened)	Affected Area	Owner/ Agency	Outage Date	Remdial actions recommended/agreed during 46 PSC meeting	Status of remediala ations taken (to be shared by concerned utility)
5	GD-1	1) 132 KV Pithoragarh(PG)-Almora(PTCUL) (PTCUL) Ckt-1, 2) 70 MW Dhauliganga HPS - UNIT 2 3) 70 MW Dhauliganga HPS - UNIT 1	UTTRAKHAND	NHPC, PTCUL	15-Jun-22	NRLDC representative pointed out that the network has changed now and SPS can be disabled now.	
6	GI-2	1) 400 KV Bikaner-Bhadla (RS) Ckt-1 2) 400 KV Bikaner(RS)-Sikar(PG) (RS) Ckt-1 3) 400 KV Bikaner(PG)-Bikaner(RS) (PG) Ckt-1 4) 400 KV Bikaner(RS)-Deedwana(MTS) (RS) Ckt-1 5) 400 KV Suratgarh SCTPS(RVUN)-Suratgarh(RS) (RS) Ckt-1 6) 400 KV Suratgarh SCTPS(RVUN)-Suratgarh(RS) (RS) Ckt-2 7) 400 KV Suratgarh(RVUN)-Bikaner(RS) (RS) Ckt-1 8) 400 KV Bikaner-Merta (RS) Ckt-1 9) 400/33 kV 125 MVA ICT 1 at Bikaner RENEW Solar(RENEW) 10) 400/220 kV 315 MVA ICT 2 at Bikaner(RS) 11) 125 MVAR Bus Reactor No 2 at 400KV Bikaner(RS) 12) 400/220 kV 315 MVA ICT 1 at Bikaner(RS) 13) 400 KV Suratgarh SCTPS(RVUN)-Bikaner(RS) (RS) Ckt-1 14) 400 KV Suratgarh SCTPS(RVUN)-Bikaner(RS) (RS) Ckt-2 15)400 KV Suratgarh(RVUN)-Ratangarh(RS) (RS) Ckt-2	RAJASTHAN	RRVPNL	21-Jun-22	NA (Tripping couldn't be discussed, Rajasthan represenatives were not present in the meeting)	
7	GD-1	1) 132 KV Pilibhit(UP)-Sitarganj(PTCUL) (PTCUL) Ckt-1 2) 220/132 kV 100 MVA ICT 3 at Sitarganj(PG) 3) 220/132 kV 100 MVA ICT 2 at Sitarganj(PG) 4) 220/132 kV 100 MVA ICT 1 at Sitarganj(PG) 5) 132 KV Sitarganj(PG)-Sitarganj(PTCUL) (PTCUL) Ckt-2 6) 132 KV Sitarganj(PG)-Sitarganj(PTCUL) (PTCUL) Ckt-3 7) 132 KV Sitarganj(PG)-Sitarganj(SIDCUL) (PTCUL) Ckt-1 8) 220 KV Tanakpur(NH)-Sitarganj(PG) (PG) Ckt-1	UTTRAKHAND	POWERGRID, PTCUL	17-Jul-22	i) PTCUL representative was requested to take the issue of bus bar protection at 132 kV level. PTCUL informed that it has been included in upcoming budget and will take some time. ii) As an interim measure, PTCUL was requested to install O/C relay as backup protection to take care of Bus faults. PTCUL agreed for the same and assured that O/C relay will be installed within a months' time.	
8	GD-1	1) 220 KV Moga(PG)-MOGAN(PS) (PSTCL) Ckt-2 2) 220 KV Moga(PG)-MOGAN(PS) (PSTCL) Ckt-3 3) 220 KV Moga(PG)-MOGAN(PS) (PSTCL) Ckt-4 4) 220 KV Moga(PG)-MOGAN(PS) (PSTCL) Ckt-1 5) 220kV Mogan-Baghapurana(PS) ckt-1 6) 220kV Mogan-Baghapurana(PS) ckt-2 7) 220kV Mogan-Bajakhanna(PS) ckt 8) 220kV Mogan-Ferozpur(PS) ckt 9) 132kV Mogan-Dhale (PS) ckt	PUNJAB	PSTCL	30-Jul-22	NA (Tripping couldn't be discussed, Punjab represenatives were not present in the meeting)	

S.No.	Category of Grid Disturbance (GD-I to GD-V)	Name of Elements (Tripped/Manually opened)	Affected Area	Owner/ Agency	Outage Date	Remdial actions recommended/agreed during 46 PSC meeting	Status of remediala ations taken (to be shared by concerned utility)
9	GD-1	1) 400 KV Alaknanda GVK(UPC)-Srinagar(UK) (UK) Ckt-1 2) 220 KV Singoli Bhatwari(Singoli(LTUHP))-Srinagar(UK) (PTCUL) Ckt-1 3) 400 KV Alaknanda GVK(UPC)-Muzaffarnagar (UP) Ckt-1 4) 220 KV Singoli Bhatwari(Singoli(LTUHP))-Srinagar(UK) (PTCUL) Ckt-2 5) 400 KV Alaknanda GVK(UPC)-Vishnuprayag(JP) (UP) Ckt-1 6) 33 MW Singoli Bhatwari HEP - UNIT 2, 33 MW Singoli Bhatwari HEP - UNIT 3	UTTAR PRADESH ; UTTRAKHAND	PTCUL, Singoli(LTUHP), UPPTCL	23-Aug-22	i) GVK representative explained that they have different scheme in with main and tie circuit breakers open simultaneously in case of a fault. UPSLDC and NRLDC representative expressed that this scheme in itself defeats the purpose of having one and a half breaker scheme. ii) GVK expressed that they have planned for third party protection audit through PRDC after which they will go for scheme modification. NRLDC requested for the detailed action plan along with progress report. GVK assured to share the same. iii) GVK was intimated that they are deviating from the already in place approved NR protection philosophy. MS, NRPC and NRLDC representative expressed that the required modifications can be done without going for any third party protection audit as the same can be carried out taking basis of the already approved protection philosophy in place. GVK agreed for the same and assured to go ahead with the modification without waiting for the third party protection audit from PRDC side.	
10	GD-1	1) 40 MW Sewa-II HPS - UNIT 1 2) 40 MW Sewa-II HPS - UNIT 3 3) 40 MW Sewa-II HPS - UNIT 2 4) 220 KV Samba(PG)-Hiranagar(PDD) (PG) Ckt-1 5) 220 KV Samba(PG)-Hiranagar(PDD) (PDD JK) Ckt-2	J & K	NHPC, PDD JK, POWERGRID	29-Aug-22	i) J&K representative informed that bus-bar protection would be made operational at all the substations of JKPTCL by March-2023. NRLDC asked for detailed plan may please be shared. ii) J&K was requested to carryout protection audit as soon as possible as protection system in J&K jurisdiction is having a number of serious issues and needs immediate audit and rectification. MS, NRPC also stressed for the immediate protection audit and instructed all to take promising steps for same.	
11	GD-1	1) 220 KV Hissar(PG)-Fatehabad(HV) (HVPNL) Ckt-2 2) 220 KV Fatehabad(PG)-Fatehabad(HV) (HVPNL) Ckt-2 3) 220 KV Fatehabad(PG)-Fatehabad(HV) (HVPNL) Ckt-1 4) 220 KV Hissar(PG)-Fatehabad(HV) (HVPNL) Ckt-1	HARYANA	HVPNL	3-Sep-22	NA (Tripping couldn't be discussed, Haryana represenatives were not present in the meeting)	

S.No.	Category of Grid Disturbance (GD-I to GD-V)	Name of Elements (Tripped/Manually opened)	Affected Area	Owner/ Agency	Outage Date	Remdial actions recommended/agreed during 46 PSC meeting	Status of remediala ations taken (to be shared by concerned utility)
12	GD-1	1) 125 MVAR Bus Reactor No 1 at 400KV Koteswar(TH) 2) 400 KV Koteswar(TH)-Koteshwar(PG) (PG) Ckt-1 3) 400 KV Koteswar(TH)-Koteshwar(PG) (PG) Ckt-2 4)100 MW Koteshwar HPS - UNIT 4	UTTRAKHAND	POWERGRID, THDC	4-Sep-22	i) The work of replacement of distance protection with differential protection may be taken up on fast pace.	
13	GI-2	1) 400/220 kV 240 MVA ICT 3 at Muradnagar_2(UP) 2) 400 KV Muradnagar_2-Mathura (UP) Ckt-1 3) 400 KV Dadri(NT)-Muradnagar_2(UP) (PG) Ckt-1 4) 400KV Bus 2 at Muradnagar_2(UP) 5) 400/220 kV 240 MVA ICT 1 at Muradnagar_2(UP) 6) 400/220 kV 315 MVA ICT 2 at Muradnagar_2(UP) 7) 400KV Bus 1 at Muradnagar_2(UP)	UTTAR PRADESH	POWERGRID, UPPTCL	7-Sep-22	i) Control room staff to be sensitized to intimate SLDC and maintenance staff if any critical alarms such as circuit breaker lockout, Busbar out of service etc. are observed. ii) UP representative assured that issues related to time sync at Muradnagar station have been taken up and will be solved. iii) NRLDC representative requested to send DRs in native .cfg and .dat format. iv) UP requested to remove compulsory upload of pdf format in tripping portal. NRLDC representative agreed for the same.	
14	GD-1	1) 765 KV Fatehgarh_II(PG)-Bhadla(PG) (FBTL) Ckt-1 2) 220 KV Fatehgarh_II(PG)-AHEJ2L PSS HB_FGRAH_PG (AHEJ2L) (AHEJ2L) Ckt-1 3) 220 KV Fatehgarh_II(PG)-AHEJ3L PSS HB_FGRAH_PG (AHEJ3L) (AHEJ3L) Ckt-1	Rajasthan	POWERGRID, AHEJ2L, AHEJ3L	17-Sep-22	i) The protection system operated as desired and no anomalies were observed as such.	
15	GD-1	1) 220 KV Sarsawan(UP)-Khodri(UK) (UP) Ckt-1 2) 220 KV Saharanpur(UP) -Khodri(UK) (UP) Ckt-1 3) 60 MW UNIT 1 at Khodri HEP 4) 60 MW UNIT 2 at Khodri HEP 5) 60 MW UNIT 4 at Khodri HEP	Uttarakhand	UPPTCL, PTCUL	6-Oct-22	i) 220 KV Saharanpur (UP) -Khodri (UK) (UP) Ckt-1, sharanpur end disturbance record is not getting triggered on DEF protection. UP representative assured to rectify the same and map DEF for trigger of DR.	

S.No.	Category of Grid Disturbance (GD-I to GD-V)	Name of Elements (Tripped/Manually opened)	Affected Area	Owner/ Agency	Outage Date	Remdial actions recommended/agreed during 46 PSC meeting	Status of remediala ations taken (to be shared by concerned utility)
16	GD-1	1) 220 KV Samba(PG)-Hiranagar(PDD) (PG) Ckt-1 2) 220 KV Samba(PG)-Hiranagar(PDD) (PDD JK) Ckt-2 3) 220kV Bishna – Hiranagar ckt 4) 220kV Ghatti – Hiranagar ckt 5) 220kV BUS 1 Hiranagar(JK PDD) 6) 220/132kV 200 MVA ICT 1 7) 220/132kV 120 MVA ICT2	J&K(UT) & Ladakh(UT)	POWERGRID,JKPTCL	16-Oct-22	i) J&K representative informed that bus-bar protection would be made operational at all the substations of JKPTCL by March-2023. NRLDC asked for detailed plan may please be shared. ii) J&K was requested to carryout protection audit as soon as possible as protection system in J&K jurisdiction is having a number of serious issues and needs immediate audit and rectification. MS, NRPC also stressed for the immediate protection audit and instructed all to take promising steps for same.	
17	GD-1	1) 220kV Hapur_765- Simbholi (UP) Ckt-2 2) 220kV Hapur_765- Simbholi(UP) Ckt-2 3) 220 KV Meerut(PG)-Simbholi(UP) (PG) Ckt-1 4) 220 KV NAPP(NP)-Simbholi(UP) (UP) Ckt-1 5) 220kV Hapur- Simbholi (UP) Ckt	Uttar Pradesh	UPPTCL, POWERGRID, NAPP	20-Oct-22	i) UP intimated that protection audit of 220 kV Simbholi substation was carried out in 2020 and no audit has been there since then. MS, NRPC stressed on the point that protection audit of each substation is very important and should be conducted regularly without any fail. ii) On issue of carrier fail alarm coming in 220 kV NAPP – Simbholi line. UP expressed that testing has been done and LMU has been found to be faulty. New LMU has been received at site and will be replaced up to 31.12.2022.	
18	GD-1	1) 400/220 kV 315 MVA ICT 1 at Kashipur(UK) 2) 400/220 kV 315 MVA ICT 2 at Kashipur(UK) 3) 220 KV Pantnagar(UK)-Bareilly(UP) (UP) Ckt-1 4) 220 KV Kashipur-Pantnagar(UK) Ckt 5) 220 KV Kashipur-Jafarpur(UK) Ckt 6) 132 KV Almora-Bhowali(UK) Ckt	Uttarakhand	PTCUL, UPPTCL	24-Oct-22	i) Commissioning work of bus bar protection at 400/220kV Kashipur S/s need to be expedite. Upto its coming in service reverse zones may be put at 160 ms. ii) Zone-3 time delay setting at Bareilly(UP) end of 220 KV Pantnagar(UK)-Bareilly(UP) (UP) Ckt-1 may be revised to 1200 ms from 800ms for better protection coordination.	

Annexure-III

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**	**Remark**
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	Available but Non operational			
	220kv Haldwani	Not Available			
	220kv Pantnagar	Available but Non operational			
	220kV Rishikesh	Available but Non operational			
	220kV Chamba	Not commissioned yet			
Haryana	220kV S/Stn Badshahpur	Not Installed	15.01.2023		
	220kV S/Stn Sec-52A, Gurgaon	Not Installed	31.03.2023		
	220kV S/Stn Sec-1 Manesar	Installed, Non-Operational	31.01.2023		Additional 100MVA, 220/66kV TF T-4 is required to be added in the existing Bus Bar Protection scheme. Further, testing of the scheme is pending and will be done by 31.01.2023.
	220kV S/Stn Panchgaon	Not Installed	31.03.2023		The firm i.e., M/s ETA has left the work. Now the leftover work is being carried out departmentally. The matter has been taken up with the firm i.e. M/s Siemens for providing offer regarding commissioning of Bus-bar. Presently, one no. 220kV Busbar and 220kV Bus Coupler is not commissioned. So, the Bus Bar protection will be commissioned with all pending work.
	220kV S/Stn Rewari	Not Installed	31.08.2023		Estimate stands sanctioned. Bus Bar will be commissioned subject to the complete allocation of material.
	220kV S/Stn Narnaul	Not Installed	31.03.2023		Till date, busbar protection was not required as the substation is radially fed. However, a new transmission line viz. 220 kV D/C Deroli Ahir-Narnaul line is under construction on turnkey mode. Thus, the work of providing 220 kV take-in bays(02 no.) alongwith the work of providing the requisite busbar protection stands also awarded to other turnkey contractor
	220kV S/Stn Mohinder Garh	Not Installed	01.06.2023		Estimate stands sanctioned. Bus Bar will be commissioned subject to the complete allocation of material.
	220 KV S/Stn Palwal	Not Installed	30.06.2023		Earlier, the necessity of bus bar protection had not been comprehended, however, expanded transmission network with establishment of new substations/transmission elements in synchronism mode, there was call for introduction of Bus Bar Protection Scheme.
	220 KV S/Stn Rangala Rajpur	Installed but Non-Operational	31.03.2023		Defective. Work order has been issued for restoration of bus bar protection at the substation
	220 kV Unispur	Installed but Non-Operational	Mar-23		Relay Mal-functioning
	220 kV Mund	Installed but Non-Operational	Feb-23		Isolator status Ambigous
	220 kV Nissing	Installed but Non-Operational	May-23		New scheme is being installed at place of old Bus Bar Protection Scheme
	220KV Pehowa	Installed but Non-Operational	BBP will be commissioned within 2 Months after receiving of material		Old & Obsolete, Allocation of New BBP and allied Material awaited.
	220kV Kaithal	Not Installed	Within 2month After Allocation of Bus-Bar Protection Panel		
	220 KV Sonepat	Not Installed	220 KV Bus Bar Protection Scheme will be installed within a month after the availability of the necessary material required for commissioning		
	220 KV REGC, Sonepat	Not Installed	220 KV Bus Bar Protection Scheme will be installed within a month after the availability of the necessary material required for commissioning		
	220KV Jind	Installed but Non-Operational	31.01.2023		Existing Bus bar panel is of old and obsolete design. New Bus Bar protection scheme panel has been drawn from the store. New Panel will be commissioned at earliest.
	220 KV Fatehabad	Installed but Non-Operational			
	220 KV Bhuna	Installed but Non-Operational			
	220 KV Sirsa	Not Installed			
	220 KV Rania	Not Installed	31.03.2023		
	220 KV Bhiwani	Not Installed	Work likely to be completed in FY 2023- 24.		
	220kV Madanpur	Not Installed			The existing BBP was shifted to 220 kV S/Stn. Salempur. The requirement has been sent to CE/ PDF, vide this office letter no Ch-85/W-312/Vol-Vf dt- 28.12.2022
	220kV Tepla	Installed but Non-Operational			The existing BBP is out being old and obsolete. The requirement replacement of existing BBP has been sent to CE/PM, vide thjs office letter no Ch-85/W-3 12/Vol-VI dt- 28.12.2022

	220kV Rajokheri	Installed but Non-Operational			The substation is being constructed in turnkey, BBP has been installed. Commissioning is yet to be completed by me firm.
BBMB	220kV Charkhi Dadri	Installed, under commissioing yet	15.01.2023		Old high impedence Charkhi Dadri (SAS) Bus Bar Protection has been replaced with low impedence Bus Bar Protection during SAS. Testing is under process and will be Commissioned shortly
	220kV Samaypur	Installed but Non-Operational	30.04.2023		Failure of modules
	220kV Barnala	Not Installed			
	220kV Dhulkote	Not Installed			
	220kV Jagadhari	Not Installed			
	220kV Narela	Not Installed			
UP	220kV Parichha	Installed but Non-Operational	30.06.2023		Due to 10 to 15% differential current error, busbar protection was not taken in srvice, an order has been placed to M/s Tirupati Industrial Agency authorized channel partner M/s AB for rectification and of same.
	220kV Partapur	Installed but Non-Operational	Jan-23		Busbar relya configuration problem to be rectified by firm engineer
	220kV Nirpura	Installed but Non-Operational	Jan-23		Bus bar protection has been made out of service by maintenance wing due to defective module for 220kV Baraut line
	220kV IITGNL	Installed but Non-Operational	Expected to be commissioned by Apr-23		commissioning work pending
	220kV Rampur	Installed but Non-Operational			01 no. of 220kV feeder (Rampur -CB Ganj) not configured
	220kV Chandausi	Not Installed			Bus bar protection pane l not alloted
	220kV Rampur	Installed but Non-Operational			01 no. of 220kV feeder (Rampur -CB Ganj) not configured
	220kV Sec. - 148, Noida	Installed but Non-Operational	Jan-23		Communication card defective
	220kV sec. 38A, Botanicla Garde	Not Installed			Bus Bar protection panel not alloted
	220kV sec.-62, Noida	Not Installed	Feb-23		
	220kV Dadri	Not Installed	Sep-23		
	400kV S/S Agra	Installed but Non-Operational	2023		Old and out dated
	220kV S/S Bah	Not Installed			
	220kV Sirsaganj	Not Installed			
	220kV S/S Farrukhabad (New)	Not Installed			
	220kV Boner	Not Installed			
	220kV Kasganj (Soron)	Installed but Non-Operational			Error alarm in busbar
	220kV Khair	Installed but Non-Operational			New IIIrd 160MVA T/F is not configured with busbar protection
	220kV Kidwainagar	Installed but Non-Operational			
	220kV Chhata	Installed but Non-Operational			New IIIrd 160MVA T/F is not configured with busbar protection
	Harduaganj	Installed but Non-Operational	31.12.2023		Due to 4 to 7 % differential current error the busbar protection was not taken in srvice. O.E.M M/s Siemens is being pursued to rectify it.
	220kV Lalitpur	Not Installed	Apr-23		Due to non availability of pannel & cable
	220kV Sarnath	Installed but Non-Operational	Apr-23		Old & defective Electorstatic panel (ABB Make)
	220kV Sirathu, Kaushambi	Not Installed	Apr-23		Relay Panel is not availabe
	220kV substation Fatehpur	Installed but Non-Operational	Apr-23		Brekaer status not available
	220kV S/S Raja Talab	Installed but Non-Operational	Apr-23		relay defective
	220kV S/S Bhelupur	Not Installed	Apr-23		Not required due to radial substation
	20kV S/S Harahua	Installed but Non-Operational	Apr-23		Not commissioned
	220kV S/S Sahupuri	Installed but Non-Operational	Apr-23		Defective
	220kV S/S Mirzapur	Installed but Non-Operational	Apr-23		
HP	220kV Chamba	Main-2 non operational	30.04.2023		Relay faulty
	220kV MattaSidh	Installed but Non-Operational			Relay faulty
	220kV kangoo	Installed but Non-Operational			Commissioning awaited from firm
	220kV Nangal	Installed but Non-Operational	Jun-23		
	220kV Katha Baddi	Installed but Non-Operational	Jun-23		

Annexure-IV

Status of submission of FIR/DR/EL/Tripping Report of Jammu & Kashmir on NR Tripping Portal

S. No.	Month	Total No. of tripping	First Information Report (Not Received)		Disturbance Recorder (Not Received)	Disturbance Recorder (NA) as informed by utility	Disturbance Recorder (Not Received)	Event Logger (Not Received)	Event Logger (NA) as informed by utility	Event Logger (Not Received)	Tripping Report (Not Received)	Tripping Report (NA) as informed by utility	Tripping Report (Not Received)
			Value	%	Value		%	Value		%	Value		%
1	**Nov-22**	10	0	**0**	10	0	**100**	10	0	**100**	10	0	**100**
2	**Dec-22**	6	0	**0**	6	0	**100**	6	0	**100**	6	0	**100**
3	**Jan-23**	6	0	**0**	6	0	**100**	6	0	**100**	6	0	**100**
4	**Feb-23**	7	0	**0**	7	0	**100**	7	0	**100**	7	0	**100**
5	**Mar-23**	7	6	**86**	7	0	**100**	7	0	**100**	7	0	**100**
6	**Apr-23**	8	0	**0**	8	0	**100**	8	0	**100**	8	0	**100**

As per the IEGC provision under clause 5.2 (r), detailed tripping report along with DR & EL has to be furnished within 24 hrs of the occurrence of the event

Status of submission of FIR/DR/EL/Tripping Report of Punjab on NR Tripping Portal

S. No.	Month	Total No. of tripping	First Information Report (Not Received)		Disturbance Recorder (Not Received)	Disturbance Recorder (NA) as informed by utility	Disturbance Recorder (Not Received)	Event Logger (Not Received)	Event Logger (NA) as informed by utility	Event Logger (Not Received)	Tripping Report (Not Received)	Tripping Report (NA) as informed by utility	Tripping Report (Not Received)
			Value	%	Value		%	Value		%	Value		%
1	**Nov-22**	8	0	**0**	7	0	**88**	7	0	**88**	7	0	**88**
2	**Dec-22**	62	27	**44**	31	7	**56**	33	6	**59**	39	2	**65**
3	**Jan-23**	19	2	**11**	11	1	**61**	12	1	**67**	14	0	**74**
4	**Feb-23**	25	3	**12**	10	4	**48**	9	2	**39**	16	0	**64**
5	**Mar-23**	16	3	**19**	11	3	**85**	12	1	**80**	15	0	**94**
6	**Apr-23**	41	4	**10**	16	6	**46**	22	6	**63**	38	0	**93**

As per the IEGC provision under clause 5.2 (r), detailed tripping report along with DR & EL has to be furnished within 24 hrs of the occurrence of the event

Status of submission of FIR/DR/EL/Tripping Report of Delhi on NR Tripping Portal

S. No.	Month	Total No. of tripping	First Information Report (Not Received)		Disturbance Recorder (Not Received)	Disturbance Recorder (NA) as informed by utility	Disturbance Recorder (Not Received)	Event Logger (Not Received)	Event Logger (NA) as informed by utility	Event Logger (Not Received)	Tripping Report (Not Received)	Tripping Report (NA) as informed by utility	Tripping Report (Not Received)
			Value	%	Value		%	Value		%	Value		%
1	**Nov-22**	4	1	**25**	3	0	**75**	3	0	**75**	3	0	**75**
2	**Dec-22**	25	2	**8**	7	5	**35**	8	4	**38**	10	0	**40**
3	**Jan-23**	9	0	**0**	5	1	**63**	6	1	**75**	6	0	**67**
4	**Feb-23**	4	0	**0**	3	1	**100**	3	1	**100**	3	0	**75**
5	**Mar-23**	14	2	**14**	4	6	**50**	4	6	**50**	5	5	**56**
6	**Apr-23**	25	3	**12**	8	12	**62**	8	11	**57**	13	1	**54**

As per the IEGC provision under clause 5.2 (r), detailed tripping report along with DR & EL has to be furnished within 24 hrs of the occurrence of the event

~~-Annexure-III--~~

List of trippings of 800kV HVDC Champa-Kurukshetra inter-regional link occurred since May 2023

S. No	Element Name	Outage Date	Outage Time	Reason
1	800 KV HVDC Kurukshetra(PG) Pole-2	10-May-23	22:24	Blocked due to software malfunction.
2	800 KV HVDC Kurukshetra(PG) Pole-4	10-May-23	22:24	
3	800 KV HVDC Kurukshetra(PG) Pole-3	18-May-23	00:59	Blocked due to DC line fault in DMR-II.
4	800 KV HVDC Kurukshetra(PG) Pole-1	18-May-23	00:58	External blocked due to detection of smoke from switchyard during heavy windstorm in the area.
5	800 KV HVDC Kurukshetra(PG) Pole-2	18-May-23	00:59	Blocked due to DC line fault in DMR-II.
6	800 KV HVDC Kurukshetra(PG) Pole-4	18-May-23	00:59	
7	800 KV HVDC Kurukshetra(PG) Pole-3	25-May-23	09:25	Pole-3 blocked due to DMR-2 transient fault.
8	800 KV HVDC Kurukshetra(PG) Pole-1	25-May-23	09:25	
9	800 KV HVDC Kurukshetra(PG) Pole-2	25-May-23	09:25	Pole-2 blocked by CAT B from Pole-4
10	800 KV HVDC Kurukshetra(PG) Pole-4	25-May-23	09:25	Pole-4 blocked due to issue in measurement panel DCCT.
11	800 KV HVDC Kurukshetra(PG) Pole-3	28-May-23	15:59	Block command received from Champa due to DC Filter Overload Protection
12	800 KV HVDC Kurukshetra(PG) Pole-1	28-May-23	16:00	
13	800 KV HVDC Kurukshetra(PG) Pole-2	07-June-23	21:55	Blocked due to TEED protection operated at Champa end. Contactor got burnt at Champa end.

Annexure-VI

S.No.	Category of Grid Disturbance (GD-I to GD-V)	Name of Elements (Tripped/Manually opened)	Affected Area	Owner/ Agency	Outage		Revival		Outage Duration (hh:mm)	Event (As reported)	Energy Unserved due to Generation loss (MU)	Energy Unserved due to Load loss (MU)	Loss of generation / loss of load during the Grid Disturbance		Fault Clearance time (in ms)	Remarks
					Date	Time	Date	Time					Generation Loss(MW)	Load Loss (MW)		
1	GD-1	1) 220KV Bus 2 at Baddi(HP) 2) 220 KV Baddi(HP)-Pinjore (HV) (HPPTCL) Ckt-2 3) 220 KV Baddi(HP)-Pinjore (HV) (HPPTCL) Ckt-1 4) 220 KV Baddi-Kunihar Ckt-1 5) 220 KV Baddi-Kunihar Ckt-2 6) 220 KV Baddi-Wardhman Ckt	Himachal Pradesh	HPPTCL	6-Nov-22	13:53	6-Nov-22	14:25	00:32	1. During antecedent condition, bus coupler at 220kV Baddi(HP) was in open condition and 220kV circuit to Upper Nangal & Mandhala, 220/66kV 100MVA transformer-1&3 were connected at 220kV Bus-1 and 220kV circuit to Kunihar, Pinjore & Wardhman, 220/66kV 100 MVA transformer-2&4 were connected at 220kV Bus-2 at Baddi(HP). 2. As reported at 13:53 hrs, R-phase insulator string of 220kV Bus-2 burst which created bus fault on 220kV Bus-2. All the elements connected at 220kV Bus-2 tripped on this fault. 3. As per PMU, R-N phase to earth fault with delayed clearance of approx. 400ms is observed. 4. As per SCADA, change in load of approx. 75MW occurred in HP control area.	0	0.041	0	75	400	i) Details of protection operation at 220kV Baddi(HP)? ii) Reason of delayed clearance of fault? iii) DR, EL of all the tripped elements need to be shared. iv) Status of remedial action? v) Analysis deails and major findings of the tripping event?
2	GD-1	1) 400/220 kV 315 MVA ICT 1 at Muzaffarnagar(UP) 2) 400/220 kV 315 MVA ICT 2 at Muzaffarnagar(UP) 3) 400/220 kV 315 MVA ICT at Muzaffarnagar(UP) 4) 400/220 kV 500 MVA ICT 4 at Muzaffarnagar(UP) 5) 220 KV Muzaffarnagar-Shamli(UP) ckt 6) 220 KV Muzaffarnagar-Nara(UP) ckt 7) 220 KV Muzaffarnagar-Charla(UP) ckt 8) 220 KV Muzaffarnagar-Modipuram(UP) ckt	UP	UPPTCL	8-Nov-22	07:04	8-Nov-22	08:00	00:56	1. At 06:18hrs, 220kV Muzaffarnagar-Jansath ckt tripped on Y-N phase to earth fault. 2. As reported at 07:04 hrs, while charging of 220kV Muzaffarnagar-Jansath ckt, Y-N phase to earth fault occurred. However line didn't not trip. 3. As fault was still persisting, all four ICTs tripped on over current earth fault protection operation. At the same time, 220kV feeders to Nara tripped on distance protection operation in Z-1, 220kV feeder to Shamli in Z-4 and 220kV feeders to Modipuram & Charla tripped in Z-3. 4. As per PMU at Muzaffarnagar(UP), Y-N phase to earth fault with delayed clearance in 1000ms is observed. 5. As per SCADA, change in load of approx. 115MW is observed in UP control area. 6. As reported, after inspection and patrolling, earth wire of double ckt. tower of 220kV Muzaffarnagar-Nara line & 220kV Muzaffarnagar-Jansath line found broken between tower 32-33 which led to the persisted Y-N fault and status of breaker contact of 220kV Jansath line was not available to relay panel due to which protection of line did not operate.	0	0.107	0	115	1000	i) Reason of delayed clearance of fault? ii) Healthiness of protection system need to be ensured at Muzaffarnagar(UP). iii) DR, EL of all the tripped elements need to be shared. iv) Status of remedial action? v) Analysis deails and major findings of the tripping event?
3	GI-2	1) 400/220 kV 315 MVA ICT 1 at Bareilly(UP) 2) 400/220 kV 315 MVA ICT 2 at Bareilly(UP) 3) 400/220 kV 315 MVA ICT 3 at Bareilly(UP) 4) 220 KV Pithoragarh(PG)-Bareilly(UP) (PG) Ckt 5) 220 KV Bareilly-CB Ganj2(UP) ckt-1&2 6) 220 KV Bareilly-Pilibhit(UP) ckt-1&2 7) 220 KV Bareilly-Shahjhanpur(UP) ckt 8) 220 KV Pantnagar(UK)-Bareilly(UP) (UP) Ckt-1 9) 220 KV Bareilly-Dohna(UP) ckt-1	UP	UPPTCL	14-Nov-22	13:21	14-Nov-22	14:00	00:39	1. As reported at 13:21 hrs, telemetry data verification of 220 KV Amariya ckt-1 was being done. Bus-2 isolator of the Amariya line was closed for the same purpose, at the same time, a Monkey jumped on B-ph Bus-1 isolator (Bus-1 isolator jumpers were not connected to bus-1 and were grounded) which created B-N phase to earth bus fault on 220kV Bus-2 at 400/220kV Bareilly. 2. As 220 KV Bus Bar protection is out of service due to its exhausted capacity at 400 KV Bareilly, fault cleared after the tripping of 220kV feeders CB to Ganj2-1&2, Shahjhanpur, Pilibhit-2, Dohna-1, Pantnagar and Pithoragarh on distance protection operation at Bareilly end in Z-4, tripping of 220kV feeder to Dohna-2 & Pilibhit-1 from remote end and tripping of 400/220kV 315MVA ICT-1, 2 & 3 on directional earth fault overcurrent protection operation. 3. As per PMU, B-N phase to earth fault with delayed clearance in 840ms is observed. 4. As per SCADA, no change in load is observed in UP & Uttarakhand control area.	0	0	0	0	840	i) Why did 220kV Pilibhit-1 & Dohna-2 ckt not trip from Bareilly end in Z-4? ii) Status of Bus bar protection at 220kV side of 400/220kV Bareilly(UP)? iii) DR/EL of all the tripped elements need to be shared. iv) Status of remedial action? v) Analysis deails and major findings of the tripping event?
4	GD-1	1) 220kV Bus-1 at Pong(BB) 2) 220kV Bus-2 at Pong(BB) 3) 220 KV Jalandhar-Pong (BB) Ckt-1 4) 220 KV Jalandhar-Pong (BB) Ckt-2 5) 220 KV Jalandhar(BB)-Dasuya(PS) (BB) Ckt-1 6) 220 KV Jalandhar(BB)-Dasuya(PS) (BB) Ckt-2 7) 220 KV Jalandhar(BB)-Jessore(HP) (BB) Ckt 8) 66 MW Pong HPS - UNIT 2 9) 66 MW Pong HPS - UNIT 3 10) 220/66kV 40MVA Transformer-1 at Pong(BB)	Punjab	BBMB	6-Dec-22	15:03	6-Dec-22	18:57	03:54	1. During antecedent condition, 210MW Unit-2&3 were running and generating ~66MW each. Unit-2 & 220kV feeders to Jalandhar ckt-2, Jessore, Dasuya ckt-2 were connected at 220kV Bus-2 and Unit-3, 220/66kV 40MVA Transformer & 220kV feeders to Jalandhar ckt-1, Dasuya ckt-1 were connected at 220kV Bus-1. 2. As reported at 15:03 hrs, during synchronizing 66MW Unit-6 at Pong(BBMB) at 220kV Bus-1, B-phase pole of SF6 circuit breaker of the unit-6 got burst, it also damaged isolators/accessories of adjacent bays/circuits. On this fault bus bar protection of 220kV Bus-2 operated and elements i.e., 66MW Unit-2 & 220kV feeders to Jalandhar ckt-2, Jessore, Dasuya ckt-2 tripped. However, bus coupler didn't open and so fault cleared with the tripping of 66MW Unit-3, 220/66kV 40MVA transformer and 220kV feeders to Jalandhar ckt-1, Dasuya ckt-1 in Z-2 from remote end 3. As per PMU at Jalandhar (PG), B-N fault with delayed clearance in 480ms is observed. 4. As per SCADA, total generation loss of approx. 132MW is observed at Pong HEP(BBMB).	0	0	132	0	480	i) Mechanical healthiness of CB need to be ensured. ii) Why did bus coupler breaker not open on bus bar protection operation? iii) Reason of delayed clearance of fault? iv) DR/EL & tripping report of all the tripped elements need to be shared. v) Remedial action taken report to be shared. vi) Analysis deails and major findings of the tripping event?
5	GD-1	1) 400/220 kV 500 MVA ICT 2 at Panipat(BB) 2) 220 KV Panipat-Dhulkote (BB) Ckt-1 3) 220 KV Panipat-Dhulkote (BB) Ckt-2 4) 220 KV Panipat-Kurukshetra (BB) Ckt-1 5) 220KV Bus 1, 2 & 3 at Panipat(BB) 6) 220 KV Panipat(BB)-Chajpur(HV) (HVPNL) Ckt-2 7) 220 KV PanipatTH(HV)-Panipat(BB) (HVPNL) Ckt-2 8) 220 KV Panipat-Charkhi Dadri (BB) Ckt-1 9) 400/220 kV 450 MVA ICT 1 at Panipat(BB) 10) 220 KV PanipatTH(HV)-Panipat(BB) (HVPNL) Ckt-4 11) 220 KV Panipat(BB)-Chajpur(HV) (HVPNL) Ckt-1 12) 220 KV PanipatTH(HV)-Panipat(BB) (HVPNL) Ckt-3 13) 220 KV Panipat(BB)-Narela(DV) (BBMB) Ckt-2 14) 220 KV PanipatTH(HV)-Panipat(BB) (HVPNL) Ckt-1 15) 220 KV Panipat(BB)-Narela(DV) (BBMB) Ckt-1 16) 220 KV Panipat(BB)-Narela(DV) (BBMB) Ckt-3	Haryana	HVPNL	20-Dec-22	00:29	20-Dec-22	03:55	03:26	1. As reported, at 00:29hrs on 20th Dec 2022, all the elements connected at 220kV Panipat(BBMB) tripped on bus bar protection operation at BBMB end. 2. As per the details received from Narela(DTL) end, fault was in its Z-2. 3. As per PMU at Dadri Thermal(NTPC) end, R-N & Y-N fault with delayed clearance of approx. 1080msec is observed. 4. As per SCADA, change in demand of approx. 150MW is observed in Haryana control area.	0	0.49	0	150	1080	i) Exact location and nature of fault? ii) Reason of delayed clearance of fault? iii) DR, EL & tripping report of any of the tripped elements are not received yet. BBMB must ensure the timely uploading of the details on tripping portal. iv) Status of remedial action? v) Analysis deails and major findings of the tripping event?
6	GD-1	1) 220 KV Ballabhgarh(BB)-Badarpur(NT) (BB) Ckt-1 2) 220 KV Samaypur(BB)-Palli(HV) (HVPNL) Ckt-1&2 3) 220KV Bus 3&4 at Samaypur(BB) 4) 220 KV Ballabhgarh-Samaypur (BB) Ckt-2 5) 400/220 kV 500 MVA ICT 1,2,3&4 at Ballabhgarh(PG) 6) 220 KV Palwal(HV)-Samaypur(BB) (HVPNL) Ckt-2 7) 220 KV Samaypur(BB)-Badshahpur(HV) (HVPNL) Ckt-1 &2 8) 220 KV Ballabhgarh-Charkhi Dadri (BB) Ckt-1 9) 220 KV Faridabad Sec-58 (HV)-Faridabad(NT) (HVPNL) Ckt-1	Haryana	BBMB	12-Jan-23	16:56	12-Jan-23	23:47	06:51	1. Multiple elements tripping occurred at Samaypur(BB) while charging of Bus-4 at 220 kV Samaypur S/S which was under planned outage. 2. As per SCADA, approx. 400 MW Load Loss occurred in Haryana. 3. As per PMU at Ballabhgarh(PG), B-N phase to earth fault with fault clearing time of 520 ms is observed.	0	2.74	0	400	520	i) Exact location and nature of fault? Sequence of event? ii) Reason of delayed clearance of fault? iii) DR, EL & tripping report of any of the tripped elements are not received yet. BBMB must ensure the timely uploading of the details on tripping portal. iv) Status of remedial action? v) Analysis deails and major findings of the tripping event?
7	GD-1	1) 220kV Hissar_IA(Har)-Narwana ckt 2) 220kV Hissar_IA(Har)-Masudpur ckt-1 3) 220kV Hissar_IA(Har)-Masudpur ckt-2 4) 220kV Hissar(BB)-Bhiwani(BB) ckt-1 5) 220kV Hissar(BB)-Bhiwani(BB) ckt-2 6) 220kV Hissar(BB)-Hissar_IA(Har) ckt-1 7) 220kV Hissar(BB)-Hissar_IA(Har) ckt-2 8) 220kV Hissar_IA(Har)-Hissar(PG) ckt-1 9) 220kV Hissar_IA(Har)-Hissar(PG) ckt-2 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) 13) 220kV Hissar(BB)-Chirawa(RS) ckt-2 14) 220 KV Hissar(BB)-Jindal Steel(HR)(HVPNL) Ckt-1 15) 220 KV Hissar-Sangrur (BB) Ckt-1 16) 220KV Bus 1 at Hissar(BB) 17) 220KV Bus 2 at Hissar(BB)	Haryana	HVPNL, BBMB, POWERGRID	14-Feb-23	11:19	14-Feb-23	12:16	00:57	1. As reported, at 11:19hrs, Y- phase conductor (from terminal tower to gantry) of 220kV Hissar_IA-Hissar_PG ckt-1 snapped from gantry end, due to which 220KV CVT & 220KV LA of Y- phase snapped out, thereby causing damage to 01 no. of 220KV CVT & 3 no. 220KV LA's. 2. LBB protection operated causing tripping of all 220 kV feeders at 220kV Hissar_IA(Har) S/s. 3. As per PMU, Y-B fault with clearance time of 120 msec and B-N fault converted to Y-B fault with delayed clearance time of 840 msec are observed. 4. Due to tripping of all the 220kV feeders, 220kV Hissar_IA(Har) & 220kV Hissar(BB) S/s became dead. 5. As per SCADA, change in demand of approx. 220MW in Haryana control area (as per SCADA data)	0	0.21	0	220	840	i) Fault clearance time is 840msec. Reason of delayed clearance of fault? Sequence of event? ii) Protection coordination between 220kV S/s in the Hissar region need to be reviewed. iii) DR of Hissar_IA(Har) are not time synced, time syncing of all the recording devices/software need to be ensured. iv) DR/EL of all the tripped elements along with tripping report of the event need to be shared. v) Frequent event of equipment failure are being reported at Haryana & BBMB S/s.(Similar event occurred on 12th Feb23. Proper maintenance of equipment and their healthiness need to be ensured. vi) Status of remedial action? vii) Analysis deails and major findings of the tripping event?

S.No.	Category of Grid Disturbance (GD-I to GD-V)	Name of Elements (Tripped/Manually opened)	Affected Area	Owner/ Agency	Outage		Revival		Outage Duration (hh:mm)	Event (As reported)	Energy Unserved due to Generation loss (MU)	Energy Unserved due to Load loss (MU)	Loss of generation / loss of load during the Grid Disturbance		Fault Clearance time (in ms)	Remarks
					Date	Time	Date	Time					Generation Loss(MW)	Load Loss (MW)		
8	GI-2	1) 400 KV Kanpur(PG)-Panki(UP) (PG) Ckt-1 2) 400 KV Kanpur(PG)-Panki(UP) (PG) Ckt-2 3) 400/220 kV 315 MVA ICT 1 at Panki(UP) 4) 400/220 kV 315 MVA ICT 2 at Panki(UP) 5) 400 KV Fatehpur-Kanpur (PG) Ckt-1 6) 400 KV Fatehpur-Kanpur (PG) Ckt-2 7) 220kV Bus-1 at Panki2(UP) 8) 220kV Bus-2 at Panki2(UP) 9) 220kV Panki-Kanpur South ckt 10) 220kV Panki-Kidwai ckt 11) 220kV Panki-BTHOR ckt 12) 220kV Panki-RPH ckt 13) 220kV Panki-CHIBM ckt	Uttar Pradesh	UPPTCL, PGCIL	23-Mar-23	13:07	23-Mar-23	14:45	01:38	i) During antecedent condition, 400kV Bus-1 at Kanpur(PG) was under shutdown and 400kV Kanpur-Fatehpur ckt-1&2 were connected at same dia with 400kV Kanpur-Panki ckt-1&2 (line length approx. 6km) (Main CB of Kanpur-Fatehpur ckt was in open condition). ii) As reported, at 13:07hrs, R & Y ph pole of CB of at Panki end of 220kV Panki-Kanpur South ckt damaged. On this fault, bus bar protection at 220kV Panki(UP) operated. iii) As per SCADA, elements connected at both the 220kV bus at Panki(UP) tripped. As fault didn't clear in time, 400/220kV 315MVA ICT-1&2 at Panki(UP) and 400kV Kanpur-Panki D/C also tripped with delay. iv) As per SOE & PMU data & DR/EL received, sequence of the event is as follows: a) At 13:06:18:680hrs, fault occurred in R-ph which cleared within 100msec. At the same time, line CB at Kanpur South end of 220kV Panki-Kanpur South ckt opened (as per SOE). b) At 13:07:37:360hrs, again fault occurred in R-phase which didn't clear at that moment. At the same time, line CB at Panki end of 220kV Panki-Kanpur South ckt opened (as per SOE). c) At 13:07:39:880hrs, fault occurred in Y-ph also. d) At 13:07:42:760hrs, fault in R & Y phase cleared and fault in R phase started, R phase fault cleared with the delay of 5.4sec and Y phase fault cleared with the delay of 2.8sec. At the same time, 400/220kV 315MVA ICT-2 at Panki(UP) tripped on directional O/C protection operation at 400kV side (as per SOE & DR). e) At 13:07:45:560hrs, fault in B phase cleared with the delay of 2.8sec. At the same time, 400kV Kanpur-Panki D/C tripped on O/C E/F protection operation at Kanpur end and 400/220kV 315MVA ICT-1 at Panki(UP) tripped on directional O/C protection operation at 400kV side(as per SOE & DR). f) As per fault locator detail of 400kV Kanpur-Panki D/C at Kanpur(PG) end, B phase fault distance was approx. ~200km from Kanpur(PG) end. It shows that fault was at 220kV side of Panki(UP). v) As 400kV Bus-1 at Kanpur(PG) was under shutdown, 400kV Kanpur-Fatehpur D/C tripped with the tripping of 400kV Kanpur-Panki D/C. vi) As per SCADA, load loss of approx. 300MW occurred in Uttar Pradesh control area.	0	0.49	0	300	5400	i) Status of bus bar protection at 220kV Panki? ii) Status of replacement of electromechanical bus coupler relay with numericla relay. iii) Review of protection coordination to minimise the fault clearance time. vi) Status of remedial action? V) Analysis deails and major findings of the tripping event?
9	GI-1	1) 220 KV Moga(PG)-MOGAN(PS) (PSTCL) Ckt-1 2) 220 KV Moga(PG)-MOGAN(PS) (PSTCL) Ckt-2 3) 220 KV Moga(PG)-MOGAN(PS) (PSTCL) Ckt-3 4) 220 KV Moga(PG)-MOGAN(PS) (PSTCL) Ckt-4	Punjab	PSTCL, PGCIL	24-Mar-23	19:07	24-Mar-23	20:18	01:11	i) As reported, at 19:07hrs, 220kV Moga(PG)-Mogan(PS) (PSTCL) ckt-1,2,3&4 (line length ~400meter) tripped from Moga(PG) end only. No CB opened from Mogan(PS) end. ii) As per DR submitted of Moga(PG) end, over-current earth-fault protection operated in all four lines at Moga(PG) end. Fault current in all the lines were in the range of 750A and cleared after approx. 1-1.5sec. It seems that probably fault was outside the line in the Punjab network. iii) There is differential protection in line which is in blocked condition due to absence of fiber optics. iv) As per PMU at Jalandhar(PG), R-N phase to earth fault with delayed clearance in 1560msec is observed. v) As per SCADA, no load loss has been observed in Punjab control area as Mogan(PS) has alternate connectivity from 220kV Firoz & Botia feeders.	0	0.00	0	0	1560	i) Exact location and nature of fault need to be identified. SLDC Punjab may confirm whether any fault occurred in downward network? ii) Reason for delayed clearance of fault? iii) SLDC-Punjab is requested to share the details of protection implemented at Mogan(PS) S/s in lines along with their protection settings. Whether bus bar protection is healthy at Mogan(PS) S/s? iv) DR, EL status along with tripping report need to be shared. v) Remedial action taken report to be shared. vi) Analysis deails and major findings of the tripping event?
10	GD-1	1) 220kV Bus-1 at Safidon(HS) 2) 220kV Bus-2 at Safidon(HS) 3) 220/132kV ICT-1 at Safidon(HS) 4) 220/132kV ICT-2 at Safidon(HS) 5) 220kV Panipat TPS(HS)-Safidon(HS) ckt-1 6) 220kV Panipat TPS(HS)-Safidon(HS) ckt-2 7) 220kV Panipat TPS(HS)-Safidon(HS) ckt-3 8) 250 MW Unit-6 at Panipat TPS(HS) 9) 250 MW Unit-7 at Panipat TPS(HS) 10) 250 MW Unit-8 at Panipat TPS(HS)	Haryana	HVPNL, PGCIL	11-Apr-23	18:32	11-Apr-23	20:25	01:53	i) As reported, at 18:32 hrs, CTs of 220/132kV ICT-1 & 2 blasted at 220kV Safidon(HS) which resulted in busbar protection operation. Hence, all elements connected to bus-1 & 2 at 200kV Safidon(HS) tripped and S/s became dead. ii) Due to tripping of 220kV Panipat TPS(HS)-Safidon(HS) ckt-1, 2 & 3 fault transferred to 220kV Panipat TPS(HS) which resulted in tripping of 250MW unit-6, 7 & 8 at Panipat TPS(HS) due to heavy jerk. iii) As per DR, 220/132kV ICT-1 at Safidon(HS) tripped on differential protection operation with differential current of approx. 25A in R & Y phase and 50A in B-phase. 220kV Safidon(HS)-Mund(HS) ckt-2 tripped on zone-1 distance protection operation. iv) As per PMU at 400kV Panipat(HS), multiple faults are observed in the system (R-N fault followed by B-N fault followed by R-Y-B 3-phase fault with delayed fault clearance time of 440 ms). v) As per SCADA, generation loss of approx. 610MW is observed in Haryana control area.	0	1.15	0	610	440	i) Exact nature and location of fault? Reason of occurrence of fault? ii) Bus-wise arrangement of elements at 220kV Safidon(HS) need to be shared. iii) Reason of delayed clearance of fault need to be shared. iv) SCADA data was not healthy at Safidon(HS) during the event. Healthiness of SCADA data need to be ensured. v) DR/EL of all the tripped elements along with tripping report of the event need to be shared. vi) DR at 220 kV Safidon end of 220kV Safidon-Mund Ckt-2 is not time synced. The same need to be ensured. vii) Remedial action taken report to be shared. vii)Analysis deails and major findings of the tripping event?
11	GD-1	1) 220 KV Manesar(PG)-Mau(HV) (HVPNL) Ckt-1 2) 220 KV Manesar(PG)-Mau(HV) (HVPNL) Ckt-2 3) 220 KV Bhiwadi(PG)-Mau(HV) (HVPNL) Ckt 4) 220 KV Bus-1 at Mau(HS) 5) 220 KV Bus-2 at Mau(HS) 5) 220 KV Daulatabad-Mau(HS) Ckt 6) 220 KV MSIL-Mau(HS) Ckt 7) 220 KV HS Bawal-Mau(HS) Ckt	Haryana	HVPNL, PGCIL	14-Apr-23	01:43	14-Apr-23	03:24	01:41	i) As reported, at 01:43 hrs, B-phase CT of 220 KV Bhiwadi(PG)-Mau(HV) (HVPNL) Ckt blasted at Mau end. 220 KV Bhiwadi(PG)-Mau(HV) (HVPNL) Ckt tripped on B-N fault, (Zone-2 distance protection operated) with fault current of 11.5kA and fault distance of 13.69km from Bhiwadi(end). ii) Rest of the 220kV lines connected at Mau S/s tripped on Zone-2 from remote end only. Hence, Mau S/s became dead. iii) As per DR at Bhiwadi(PG) end of 220kV Bhiwadi(PG)-Mau(HS) Ckt, earth fault protection relay operated. iv) As per DR at Manesar(PG) end of 220 KV Manesar(PG)-Mau(HS) Ckt-2, line tripped on zone-3 from Manesar(PG) end only. v) As per PMU at 400kV Bhiwadi(PG), B-N phase to ground fault converted to 3-phase fault is observed in the system with delayed fault clearance time of 1280ms. vi) As per SCADA, No change in demand is observed in Haryana control area (as per SCADA). Approx. 128 MW load loss occurred as per communication with SLDC-Haryana.	0	0.22	0	128	1280	i) Details of protection operation? ii) As per PMU, fault clearing time was 1280 ms. Reason of delayed clearance of fault need to be ensured. iii) Healthiness of 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. vi) Analysis deails and major findings of the tripping event?
12	GD-1	1) 220 KV Dasuya(PS)-Jalandhar(BB) (BBMB) Ckt 2) 220 KV Dasuya(PS)-Jalandhar(PG) (PG) Ckt-1 3) 220 KV Dasuya(PS)-Jalandhar(PG) (PG) Ckt-2 4) 220 KV Pong(BB)-Dasuya(PS) (BBMB) Ckt-1 5) 220 KV Pong(BB)-Dasuya(PS) (BBMB) Ckt-2 6) 220 KV Dasuya-Alawalpur (PS) Ckt	Punjab	PSTCL, BBMB, PGCIL	15-Apr-23	17:15	15-Apr-23	18:57	01:42	i) As per the information received and communication with 220kV Dasuya S/s, brief of the event are as follows: a) 220 kV Dasuya(PS) S/s has double bus scheme. b) At 17:15hrs on 15th April'23, Y-ph CVT at Railway end of 220kV Dasuya-Railwat ckt (~2km) damaged. c) On this fault, Railway ckt didn't trip from Dasuya end and thus adjacent feeders tripped on back up protection. d) 220 KV Dasuya(PS)-Jalandhar(PG) (PG) Ckt-1 & 2 tripped from Jalandhar(PG) end only, fault was in Z-2 (64.25km) from Jalandhar(PG) end. e) 220 KV Dasuya(PS)-Jalandhar(BB) (BBMB) Ckt tripped from Jalandhar(BB) end only in Z-2 (76.8km). f) 220 KV Dasuya-Alawalpur (PS) Ckt and 220 KV Pong(BB)-Dasuya(PS) (BBMB) Ckt-1 tripped from Dasuya end only and 220 KV Pong(BB)-Dasuya(PS) (BBMB) Ckt-2 tripped from Pong end in Z-3 (~70km). ii) As per PMU at 400kV Jalandhar(PG), R-B-N double phase to ground fault with delayed clearance of fault in 680 ms is observed. iii) As reported by SLDC-Punjab, load loss of approx. 60MW occurred in Punjab control area.	0	0.10	0	60	680	i) Exact nature and location of fault? Whether fault was in reverse zone (Z-4) of other feeders at Dasuya end? ii) Reason of delayed clearance of fault? Why did Railway line didn't trip from Dasuya end? Healthiness of protection system need to be ensured. iii) Details of protection operated at Dausya end need to be shared. iv) DR/EL of all the tripped elements along with tripping report of the event need to be shared from Rajasthan end. v) Remedial action taken report to be shared. vi) Analysis deails and major findings of the tripping event?
13	GI-2	1) 210 MW Anpara TPS - UNIT 1 2) 400KV Bus 2 at Anpara(UP) 3) 400 KV Singrauli(NT)-Anpara(UP) (PG) Ckt-1 4) 400/132 kV 100 MVA ICT 2 at Anpara(UP) 5) 400 KV Anpara-Sarnath (UP) Ckt-1 6) 132 KV Rihand(NT)-Anpara(UP) Ckt-1 7) 132 KV Rihand(NT)-Anpara(UP) Ckt-2	Uttar Pradesh	UPPTCL, NTPC	18-Apr-23	08:56	18-Apr-23	10:36	01:40	i) During antecedent condition, 400 kV Anpara-Sarnath (UP) Ckt-1, 400 KV Singrauli(NT)-Anpara(UP) (PG) Ckt-1, 210MW Unit-1 at Anpara TPS & 400/132 kV 100 MVA ICT 2 at Anpara(UP) were connected at 400kV Bus-2 at Anpara (UP) and rest of the elements were connected at 400kV Bus-1. ii) As reported at 08:49hrs, 210 MW Anpara TPS - UNIT 1 tripped due to damage of bushing of GT1. Further at 08:56hrs, busbar protection operated at 400kV Bus-2 at Anpara(UP) and all the elements connected at 400kV Bus-2 tripped and bus-2 became dead. DT received at Sarnath end. iii) As per PMU at Allahabad(UP), B-N phase to ground fault with fault clearance time of 80msec is observed at 08:49hrs and no fault in system observed at 08:56hrs. iv) As per SCADA SOE, 132 KV Rihand(NT)-Anpara(UP) Ckt-1 & 2 tripped at 08:56hrs. v) As per SCADA, generation loss of approx. 155MW in UP control area is observed (210MW Unit-1 at Anpara TPS tripped).	0	0.00	155	0	80	i) Bus-wise arrangement of elements need to be shared. ii) Healthiness of SCADA data and element status need to be ensured. iii) At 08:56hrs, bus bar protection operated at Anpara(UP), however no fault observed in system. Reason of the same need to be shared. iv) Reason of tripping of 132 KV Rihand(NT)-Anpara(UP) Ckt-1 & 2 need to be shared. v) DR & EL of all the tripped elements along with tripping report of the event need to be shared. vi) Remedial action taken report to be shared. vii) Analysis deails and major findings of the tripping event?
14	GD-1	1) 400 KV Gr.Noida_2(UPC)-Noida Sec 148 (UP) Ckt-1 2) 400 KV Gr.Noida_2(UPC)-Noida Sec 148 (UP) Ckt-2 3) 400KV Bus 1 at Noida Sec 148(UP) 4) 400/220 kV 500 MVA ICT 1 at Noida Sec 148(UP) 5) 400/220 kV 500 MVA ICT 2 at Noida Sec 148(UP) 6) 400 KV Noida Sec 148-Noida Sec 123 (UP) Ckt-1	Uttar Pradesh	UPPTCL	18-Apr-23	13:24	18-Apr-23	14:22	00:58	i) 400/220/33kV Noida Sec148 GIS has double main single breaker bus scheme. Power comes from 400 KV Gr.Noida_2(UPC)-Noida Sec 148 (UP) D/C and feeds Noida Sec 123 via 400 KV Noida Sec 148-Noida Sec 123 (UP) D/C and feeders connected at 220kV level at Noida Sec 148. There are 2*500MVA ICT at Noida Sec148, during antecedent condition, both were in service. There is 1*160MVA 220/132kV ICT and 2*100MVA 220/33kV transformer. ii) As reported, brief detail of the event are as follows: ‼ There are two (no.) DC source i.e., I & II with automatic changeover mechanism via mechanical changeover relay which takes more than 100msec to changeover the DC source. ‼ There is a logic for initiation of bus bar protection with the delay of 100msec in the case of gas detector stage-3 (GD-3). ‼ In addition, there is an issue related to arrangements of contacts of DC source that whenever DC source is not available then it raises flag as gas detector stage-3 (GD-3) which further initiates bus bar tripping as DC source changeover takes more than 100msec. ‼ There is also a preexisting issue related to cards of battery charger which lead to DC source failure during any fluctuation in AC supply. ‼ So, at 13:24hrs on 18th Apr23, DC source-I voltage dropped as two battery cells became dead and battery charger was also not catering load. ‼ Before DC source changeover could have occurred, bus bar tripping initiated with the flag of GD-3. ‼ Due to bus bar protection operation, all the feeders and elements connected at both the 400kV bus tripped. ‼ Issue related to logic of bus bar protection is yet to be resolved, follow up has been taken up to resolve the same. iii) As per PMU at 400kV Agra(PG), no fault is observed in the system. iv) As per SCADA, load loss of approx. 140MW occurred in UP control area.	0	0.14	0	140	NA	i) The issues related to battery charger and logic of initiation of Bus bar tripping during DC source changeover had been discussed in 45PSC meeting. Remedial actions were recommended and agreed to complete it within 30days. However, observing recent frequent tripping triggered due to similar issue. Status of remedial actions to avoid such further trippings nedd to be shared. ii) Time syncing of the DR need to be ensured. iii) SCADA data of 400kV Noida Sec 148 S/s was not healthy during the event timing, healthiness of the same need to be ensured. iv) Remedial action taken report to be shared. v) Similar event occurred on 06th, 08th & 9th of March 2023. vi) Analysis deails and major findings of the tripping event?
15	GD-1	1) 400 KV Sultanpur(UP)-Lucknow_1(PG) (PG) ckt 2) 400 KV Obra_B-Sultanpur (UP) Ckt 3) 400 KV Tanda(NT)-Sultanpur(UP) (UP) Ckt 4) 400/220 kV 315 MVA ICT 1 at Sultanpur(UP) 5) 400/220 kV 315 MVA ICT 2 at Sultanpur(UP) 6) 400/220 kV 315 MVA ICT 3 at Sultanpur(UP) 7) 220/132kV 160MVA ICT-1 at Sultanpur(UP) 8) 220kV Sultanpur-Pratapgarh ckt 9) 220kV Sultanpur-Tanda New ckt 10) 220kV Sultanpur-Tanda ckt 11) 220kV Sultanpur-Sohawal ckt 12) 220kV Sultanpur-Sangipur ckt 13) 220kV Sultanpur-Amethi ckt	Uttar Pradesh	UPPTCL, PGCIL, NTPC	26-Apr-23	08:56	26-Apr-23	10:36	01:40	i) As per the information received and communication with 400/220kV Sultanpur(UP), brief of the event are as follows: a) As reported, switching operations was being done to shift all the elements to 220kV Bus-1 at Sultanpur to avail the shutdown of 220kV bus-2 at Sulanpur. b) At 08:56hrs, Y-ph bus isolator of 220kV Sultanpur-Tanda New ckt damaged during switching operation and created Y-N bus fault. c) As bus bar protection at 220KV side of 400/220kV Sultanpur(UP) is not healthy, 220kV lines to Tanda, New Tanda, Sohawal & Pratapgarh tripped on Z-4 distance protection operation with 160msec time delay. 220kV lines to Amethi and Sangipur tripped from remote end in Z-2/Z-3 distance protection operation. d) Further after 600msec, 400/220kV 315MVA ICT-3 at Sultanpur tripped on over current earth fault protection operation. e) As remaining ICTs didn't trip yet, fault was still persisting which led to the tripping of 400kV lines to Tanda, Lucknow and Obra_B from remote end in Z-3 (~1sec time delay) distance protection operation further after 200msec of ICT-3 tripping. f) With the tripping of 400kV lines, fault got cleared. g) Thereafter, 400/220kV 315MVA ICT-3 at Sultanpur was hand tripped. ii) As per PMU, Y-N fault which further converted into R-Y and then R-Y-B fault with delayed clearance of 1560msec is observed. iii) As per SOE, tripping of 400/220kV 315MVA ICT-2 not recorded. iv) As per SCADA, change in load loss of approx. 280MW occurred in Uttar Pradesh control area.	0	0.46	0	280	1560	i) Status of bus bar protection at 220kV Sultanpur? ii) Status of replacement of electromechanical relays? iii) Review of protection coordination to minimise the fault clearance time. vi) Status of remedial action? v) Analysis deails and major findings of the tripping event?
16	GI-1	1) 220kV Sakatpura-Mandalgarh ckt 2) 220 KV Kota(PG)-KTPS(RVUN) (RS) Ckt-1 3) 220 KV Anta(NT)-Sakatpura(RS) (RS) Ckt-1 4) 220 KV RAPS_A(NP)-Sakatpura(RS) (RS) Ckt-2 5) 220kV KTPS-Sakatpura ckt-1 6) 220kV KTPS-Sakatpura ckt-2 7) 220kV KTPS-Sakatpura ckt-3 8) 220kV KTPS-Sakatpura ckt-4 9) 210MW Unit-3 at KTPS 10) 210MW Unit-4 at KTPS 11) 210MW Unit-5 at KTPS	Rajasthan	PGCIL, RVPNL, NTPC, NPCIL	8-May-23	19:11	8-May-23	22:32	03:21	i) 220/132kV Saktapura(Raj) S/s have double main & transfer bus scheme. Station is connected with 220kV Kota TPS via 220kV KTPS-Sakatpura ckt-1, 2, 3 & 4. ii) As reported at 19:11 hrs, R & Y ph CT at Sakatpura end of 220kV Sakatpura-Mandalgarh ckt burst and bus fault occurred. iii) As per information received, bus bar protection is not healthy at 220kV Saktapura S/s and Z-4(reverse) distance protection time delay setting is kept as 160msec. iv) On this bus fault, 220kV line from RAPP_A & Anta(NTPC) tripped in Z-4 distance protection operation at Sakatpura end and 220kV KTPS-Sakatpura ckt-1,2,3&4 tripped on distance protection in Z-2 from KTPS end. 220kV KTPS-Kota(PG) ckt-1 also tripped from KTPS end. v) At the same time, 210MW Unit-4 at Kota TPS tripped followed by tripping of 210MW Unit-3 & 5 at 19:15 hrs & 19:21 hrs respectively due to tripping of auxiliary components (boiler, pulveriser etc.) vi) As per PMU at Kota(PG), R-N fault converted into R-Y-N fault with delayed clearance of 240msec is observed. vii) As per SCADA, change in load of approx. 220MW in Rajasthan control area and loss in generation of approx. 230MW at 19:11hrs due to tripping of 210MW unit-4 at KTPS. Further at 19:15hrs, 210MW unit-3 at KTPS tripped followed by tripping of 210MW unit-5 at KTPS 19:21hrs is observed.	0	0.737	230	220	240	i) DR of KTPS units not received as relays are of electromechanical nature. KTPS & SLDC-Rajasthan are requested to replace the electromechanical relays with numerical relays so that proper analysis of events can be done. ii) Why did 220kV KTPS-Kota(PG) ckt-1 trip? Details of protection operation need to be shared. iii) Bus wise arrangement of 220kV elements at 220kV Sakatpura S/s during antecedent condition of the tripping event need to be shared (isolator status data was not healthy). iv) Remedial action taken report to be shared. v) Analysis deails and major findings of the tripping event?

S.No.	Category of Grid Disturbance (GD-I to GD-V)	Name of Elements (Tripped/Manually opened)	Affected Area	Owner/ Agency	Outage		Revival		Outage Duration (hh:mm)	Event (As reported)	Energy Unserved due to Generation loss (MU)	Energy Unserved due to Load loss (MU)	Loss of generation / loss of load during the Grid Disturbance		Fault Clearance time (in ms)	Remarks
					Date	Time	Date	Time					Generation Loss(MW)	Load Loss (MW)		
17	GD-2	1) 765kV Bhadla-Bikaner ckt-1 2) 400kV Bikaner-Azure43 ckt 3) 400kV Fatehgarh1-Fatehgarh2 ckt-1 4) 400kV Bhadla-Bhadla2 ckt-1 5) 400kV Bhadla-Bhadla_Raj ckt-2 6) 765kV Fatehgarh2-Bhadla ckt-1 7) 400kV Bhadla-Bhadla2 ckt-2 8) 400kV Bhadla-Bhadla_Raj ckt-1 9) 765kV Bhadla2-Bikaner ckt-1 10) 765kV Ajmer-Phagi ckt-1 11) 765kV Fatehgarh2-Bhadla2 ckt-1 12) 765kV Bhadla-Bikaner ckt-2 13) 400kV Bhadla_Raj-Merta ckt 14) 400kV Bhadla_Raj-Jodhpur ckt 15) 400kV Bhadla_Raj-Ramgarh ckt-1 16) 400kV Bhadla_Raj-Ramgarh ckt-2	Rajasthan	PGCIL, RVPNL, Azure Power	15-May-23	11:51	15-May-23	14:38	02:47	i) As reported, at 11:51:55 hrs, 765kV Bhadla-Bikaner ckt-1 tripped on Y-B phase to phase fault during inclement weather condition (wind/dust storm), fault distance was ~111.6km from Bikaner end (line length is ~169km). ii) On this fault during voltage dip, significant dip in RE generation observed. Voltage dipped up to 0.65pu (as per PMU at Fatehgarh2). iii) Due to significant dip in RE generation and de-loading of 765kV EHV lines (as RE generation failed to recover 90% of pre-fault active power within 1 sec and further Inverters tripping on OV, LVRT/HVRT Non-compliant), over voltage (>1.1pu at 765kV & 400kV level at RE Pooling stations) scenario triggered immediately after the fault that led to multiple element tripping in the RE complex. iv) As per PMU & SCADA, total RE generation drop/loss was approx.7120MW (~6410MW ISTS RE generation and ~710MW Rajasthan RE generation). Due to significant dip in RE generation frequency dropped by 0.58Hz (from 49.98Hz to 49.4Hz). v) As frequency hit 49.40Hz, total all India load relief of approx. 4016MW is observed on operation of UFR & df/dt. Load relief of approx. 1635MW observed in NR region (as per details received from states). Region wise summary of load relief along with state wise details of UFR & df/dt operation is attached in Annexure-II. vi) After the fault, following 765 & 400 kV lines in RE complex tripped on high voltage: 765kV Fatehgarh2-Bhadla ckt-1, 765kV Bhadla2-Bikaner ckt-1, 765kV Ajmer-Phagi ckt-1, 765kV Fatehgarh2-Bhadla2 ckt-1 , 765kV Bhadla-Bikaner ckt-2, 400kV Fatehgarh1-Fatehgarh2 ckt-1, 400kV Bhadla-Bhadla2 ckt-1&2, 400kV Bhadla-Bhadla_Raj ckt-1&2, 400kV Bhadla_Raj-Merta ckt, 400kV Bhadla_Raj-Jodhpur ckt, 400kV Bhadla_Raj-Ramgarh ckt-1&2 vii) Multiple 220kV lines dedicated to RE stations also tripped on over voltage during same time. viii) Further at 12:08 hrs, 765kV Fatehgarh2-Bhadla2 ckt-1 was charged.			7120	1635	80	i) 220kV line from Azure41 & Azure Mapple tripped on OV protection operation. OV setting is kept as 1.1pu with 2sec delay, which is uncoordinated over voltage protection setting. OV protection at both the RE stations need to be reviewed. ii) In few of the lines, OV stage-1 protection didn't reset even when voltage dropped to 1.0825pu. Reason of the same need to be identified. Whether implemented flexi logic to increase drop off to pick up ratio is working properly or not. POWERGRID may analyse w.r.t. the same. iii) Voltage prior to the tripping at Ajmer end of 765kV Ajmer-Phagi ckt-1 is 1.06pu however, OV stage-1 pickup setting is 1.08pu. OV stage-1 setting of the line need to be reviewed. iv) Reason of tripping of 220kV Bhadla2(PG)-NTPC Nokhra is not clear from DR. The same need to be shared. v) DR received from Rajasthan end are not time synced. Time syncing of the same need to be ensured. vi) Analysis deails and major findings of the tripping event?
18	GD-1	1) 220 KV Ballabhgarh(BB)-Badarpur(NT) (BB) Ckt-1 2) 220 KV Ballabhgarh(BB)-Badarpur(NT) (BB) Ckt-2 3) 220 kV Ballabhgarh-Charkhi Dadri (BB) ckt-1 4) 220 KV Ballabhgarh-Samaypur (BB) Ckt-1 5) 220 KV Ballabhgarh-Samaypur (BB) Ckt-2 6) 220 KV Ballabhgarh-Samaypur (BB) Ckt-3 7) 220KV Bus 1 at Ballabhgarh(BB) 8) 220KV Bus 2 at Ballabhgarh(BB) 9) 220/66kV 100MVA ICT1 at Ballabhgarh(BB) 10) 220/66kV 100MVA ICT2 at Ballabhgarh(BB) 11) 220/66kV 100MVA ICT3 at Ballabhgarh(BB)	Haryana	BBMB, NTPC	16-May-23	01:52	16-May-23	04:23	02:31	i) As reported, at 01:52 hrs, Y-phase PT and R and Y phase breaker poles of 220 KV Ballabhgarh(BB)-Badarpur(NT) (BB) Ckt-2 burst at Ballabhgarh(BB) end. ii) This resulted in LBB protection operation and all the elements connected to Bus-1 and Bus-2 tripped and 220/66/33kV Ballabhgarh(BB) S/s became dead. iii) As per DR of 220 KV Ballabhgarh(BB)-Badarpur(NT) Ckt-1, zone-2 distance protection operated at Badarpur(NT) end (Y-B fault, fault current of approx. 6.9kA) and zone-4 distance protection operated at Ballabhgarh(BB) end (R-Y-N fault, fault current of approx. 12kA in each phase followed by R-N fault, fault current of approx. 17kA). iv) As per DR of 220KV Bus 1 at Ballabhgarh(BB), LBB protection operated (Y-N fault converted to 3-phase fault followed by R-N fault followed by R-Y-N fault were observed) v) As per PMU at Ballabhgarh(BB), multiple faults (Y-N fault converted to 3-phase fault followed by R-N fault followed by R-Y-N fault) were observed in system with delayed fault clearing time of 1400 ms. vi) As per SCADA, load loss of approx. 300MW is observed in Haryana control area.	0	0.755	0	300	1400	i) Bus-wise arrangement of elements need to be shared (Isolator status of elements are not clear from SCADA). ii) Why did elements connected at both the bus trip? iii) Reason of delayed clearance of fault need to be shared. iv) DR/EL along with tripping report need to be shared for all the elements from both ends. v) Remedial action taken report to be shared. vi) Analysis deails and major findings of the tripping event?
19	GD-1	1) 400KV Bus 1 at Jodhpur(RS) 2) 400KV Bus 2 at Jodhpur(RS) 3) 400 kV Akal-Jodhpur (RS) Ckt 4) 400 KV Rajwest(RW)-Jodhpur (RS) Ckt 5) 400/220 kV 315 MVA ICT 1 at Jodhpur(RS) 6) 400/220 kV 315 MVA ICT 2 at Jodhpur(RS) 7) 400 KV Jodhpur-Kankani (RS) Ckt-1 8) 400 KV Kankroli(PG)-Jodhpur(RS) (PG) Ckt	Rajasthan	RVPNL, PGCIL	24-May-23	20:14	24-May-23	23:40	03:26	i) 400/220kV Jodhpur(RS) has one and half breaker bus scheme at 400kV side. ii) As reported at 20:10 hrs, Isolator of 220 kV Jodhpur to Bilara line and the IPS tube of 400 kV main bus-A got damaged due to heavy storm at 400 kV GSS, Jodhpur. iii) On this fault, Bus bar protection operated at 400kV Bus-A (as reported and as verified from DR). iv) As reported, at the same time, all the elements connected to 400kV Bus-A & Bus-B tripped and substation became dead. v) As per PMU at Bhadla(PG), R-N phase to earth fault which further converted into three phase fault with delayed clearance of 2080ms is observed. vi) As per DR of 400 KV Jodhpur-Kankani (end) (RS) Ckt-1, at 20:14 hrs, line tripped on R-N phase to earth fault (zone-3 distance protection) with fault current of 1.16kA from Kankani(RS) end and fault clearance time of ~800msec. As reported, fault distance was 211km from Kankani(RS) end. vii) As per DR of 400 KV Kankroli(PG) (end)-Jodhpur(RS) (PG) Ckt, at 20:14 hrs, line tripped on R-N phase to earth fault later converted into R-Y-N fault is observed. Fault current was ~1.38kA from Kankroli(PG) end. Fault clearing time was ~1560ms. As reported, fault distance was 187.5km from Kankroli(PG) end. viii) As per DR of 400/220 kV 315 MVA ICT 1 & 2 at Jodhpur(RS), ICTs tripped on directional over current protection operation with the delay of approx. ~1300msec. Fault in R-phase which converted into R-Y-B is observed. ix) As per SCADA, change in demand of approx. 275MW in Rajasthan control area x) The damaged IPS tube of 400kV main bus-A has been fixed.	0	0.944	0	275	2080	i) Bus wise arrangement of 400kV elements during antecedent condition of the tripping event need to be shared. ii) Reason of delayed clearance of fault? iii) Time sync issue in DR of 400/220 kV 315 MVA ICT 1 & 2 and 400kV Bus-A at Jodhpur(RS) (end) is observed. The same need to be rectified. iv) Details of trippings at 220kV side also need to be shared. v) Remedial action taken report to be shared. vi) Analysis deails and major findings of the tripping event?
20	GD-1	1) 220 KV Dasuya(PS)-Jalandhar(BB) (BBMB) Ckt 2) 220 KV Dasuya(PS)-Jalandhar(PG) (PG) Ckt-1 3) 220 KV Dasuya(PS)-Jalandhar(PG) (PG) Ckt-2 4) 220 KV Pong(BB)-Dasuya(PS) (BBMB) Ckt-1 5) 220 KV Pong(BB)-Dasuya(PS) (BBMB) Ckt-2 6) 220 KV Dasuya-Alawalpur (PS) Ckt 7) 220 KV Sarna(PS)-Dasuya(PS) (PG) Ckt-1 8) 220 KV Sarna(PS)-Dasuya(PS) (PG) Ckt-2 9) 220kV Dasuya-Railwat ckt	Punjab	PSTCL, PGCIL, BBMB	31-May-23	04:48	31-May-23	07:08	02:20	i) 220 kV Dasuya(PS) S/s has double bus scheme. ii) As reported, brief of the event is as follows: a) At 04:48hrs on 31st May'23, 220 KV Dasuya-Alawalpur (PS) Ckt tripped on R-N phase to earth fault from Alawalpur end only; fault sensed in zone-1 from Alawalpur end. This fault was not sensed from Dasuya end. Hence distance protection did not operate and line did not trip from Dasuya end on this fault. b) On this fault, other lines from 200kV Dasuya(PS) tripped on back-up protection (Z-2/Z-3/directional E/F) operation from remote end only. c) Back up over current earth fault protection of 220 KV Dasuya-Alawalpur (PS) Ckt also didn't operate. iii) As per DR of 220 KV Dasuya(PS)-Jalandhar(PG) (end) (PG) Ckt-1 & 2, directional E/F protection operated at Jalandhar(PG) end. Fault current in R-phase were 700A and 950A respectively for Ckt-1 & 2 from Jalandhar(PG) end. iv) As per PMU at 400kV Jalandhar(PG), R-N phase to earth fault with delayed clearance of fault in 3520 ms is observed. v) As per SCADA change in demand of approx. 90MW is observed in Punjab control area.	0	0.21	0	90	3520	i) Exact reason and location of fault? ii) Reason of delayed clearance of fault? iii) Why did 220 KV Dasuya-Alawalpur (PS) Ckt not trip from Dasuya end? Main & backup protection in 220 KV Dasuya-Alawalpur (PS) Ckt didn't sense the fault. Healthiness of protection system 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. vi) Analysis deails and major findings of the tripping event?

Utilities are requested to prepare and present the event details in 46th PSC meeting. Events involving more than one utility may be jointly prepared and presented.