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

No. उ.क्षे.वि.स./प्रचालन/107/01/2024/ दिनांक: 17.01.2024

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

विषय: संरक्षण उप-समिति की 49 वीं बैठक की कार्यसूची |
Subject: Agenda for 49th Protection Sub-Committee Meeting.

संरक्षण उप-समिति की **49 वीं बैठक, दिनांक 25.01.2024 को 10:30 बजे** से **एनआरपीसी सचिवालय, कटवारिरया सराय, नई दिल्ली** में आयोजित की जाएगी | उक्त बैठक की कार्यसूची संलग्न है । यह उत्तर क्षेत्रीय विद्युत् समिति की वेबसाइट (http://164.100.60.165/) पर भी उपलब्ध है | कृपया बैठक मे उपस्थिति सुनिश्चित करें।

The **49th meeting** of Protection Sub-Committee is scheduled to be held on **25.01.2024** at **10:30 Hrs** at **NRPC Secretariat, Katwaria Saarai, New Delhi**. The agenda for the meeting is attached herewith. The same is also available on NRPC website (http://164.100.60.165/). Kindly make it convenient to attend the same.

Signed by Reeturaj Pandey
Date: 17-01-2024 17:54:22
Reason: Approved

(ऋतुराज पाण्डेय)
(Reeturaj Pandey)
कार्यपालक अभियंता (संरक्षण)

Contents

Agenda for 49th Meeting of Protection Sub-Committee (PSC) of Northern Regional Power Committee

Date and time of meeting : ***25.01.2024 10.30 Hrs.***

Venue : ***Conference Hall, NRPC Secretariat, Katwaria Sarai, New Delhi***

A.1. Confirmation of minutes of 48th meeting of Protection Sub-Committee

A.1.1 48th PSC meeting was held on 11.10.2023. Minutes of the meeting were issued vide letter dtd. 15.11.2023. No comment has been received till the date.

Decision required from Forum:

Forum may approve the minutes of 48th PSC meeting.

A.2. Protection Philosophy of Northern Region (agenda by NRPC Secretariat)

A.2.1. Revised Protection philosophy (**Annexure-I**) of NR was discussed and finalized in 48th Protection Sub-Committee Meeting (held on 11th October, 2023). The same was presented in the 48th TCC/ 70th NRPC meeting held on 17-18 November 2023 wherein POWEGRID submitted comments for discussion. CTUIL also raised concern over differential protection on LILO lines. Accordingly, agenda was deferred for discussion in separate meeting.

A.2.2. Later, BBMB and UPPTCL have also submitted their comments. Comments of POWEGRID, BBMB and UPPTCL are attached as **Annexure-II.**

Decision required from Forum:

Forum may discuss draft of revised philosophy in view of suggestions received from POWERGRID, CTUIL, BBMB and UPPTCL. Accordingly, revised philosophy may be finalized.

A.3. Furnishing and approval of protection setting by NRPC (agenda by NRPC Secretariat)

A.3.1 The agenda was discussed in 48th PSC meeting held on 11.10.2023. Followings were decided in the 48th PSC meeting:

(a) To send nomination(s) of nodal officer to NRPC Secretariat for furnishing the protection settings implemented for each element.

(b) To intimate NRPC Secretariat two weeks advance about proposal for revision in existing setting as well as new settings.

(c) To inform NRPC Secretariat about implementation of approved settings within a fortnight.

A. Furnishing the protection settings implemented for each element.

A.3.2 As per clause 14 (2) of IEGC 2023:

All users connected to the grid shall:

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

A.3.3 Further, as per clause 14 (3) (a) of IEGC 2023:

- *RPCs shall maintain a centralized database and update the same on periodic basis in respect of their respective region containing details of relay settings for grid elements connected to 220 kV and above (132 kV and above in NER).*

A.3.4 Some of the utilities have sent the nominations of nodal officers to NRPC Secretariat for furnishing of protection settings data. List of received nomination till date is attached as **Annexure-III.**

A.3.5 Further, Status of Protection Settings Data received from utilities at NRPC Secretariat is attached as **Annexure-IV.**

B. Approval of protection settings by RPC

A.3.6 As per clause 14 (2) of IEGC 2023:

All users connected to the grid shall:

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

- *intimate to the concerned RPC about the changes implemented in protection system or protection settings within a fortnight of such changes;*

A.3.7 NRPC Secretariat has received no application for approval of settings till the date.

A.3.8 It is germane to mention here that compliance of these clauses of IEGC 2023 are to be submitted to the Honourable CERC. It is supposed that utilities must adhere to the same.

Decision required from Forum:

Utilities may send the details of nodal officer and data of protection settings to NRPC Secretariat.

A.4. Procedure and flow chart for approval of Protection Settings by NRPC Secretariat (agenda by NRPC Secretariat)

A.4.1 As per clause 14 (2) of IEGC 2023:

All users connected to the grid shall:

- *obtain approval of the concerned RPC for (i) any revision in settings, and (ii) implementation of new protection system;*
- *intimate to the concerned RPC about the changes implemented in protection system or protection settings within a fortnight of such changes;*

A.4.2 The agenda for approval of protection settings was discussed in 48th PSC meeting held on 11.10.2023 wherein it was decided that utilities may send their application 2 weeks in advance to NRPC Secretariat.

A.4.3 In view of above, a draft of the procedure and flow chart for getting approval of protection settings is attached as **Annexure-V.**

A.4.4 The formats to intimate NRPC Secretariat two weeks advance about proposal for revision in existing setting as well as new settings and to inform NRPC Secretariat about implementation of approved settings within a fortnight, have already been issued in the minutes of 48th PSC meeting.

Decision required from Forum:

Forum may finalize procedure for approval of protection settings.

A.5. Annual internal protection audit plan for FY 2024-25 (agenda by NRPC Secretariat)

A.5.1 As per clause 15 of IEGC 2023;

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

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

A.5.2 The agenda was discussed in 48th PSC meeting held on 11.10.2023 wherein utilities were requested to submit annual audit plan for FY 2024-25 latest by 31.10.2023 to NRPC Secretariat. The same was also discussed in 48th TCC/ 70th NRPC meeting held on 17-18 November 2023 and requested each utility to submit the same latest by 30.11.2023.

A.5.3 In view of above, some utilities have submitted their annual audit plans (enclosed as **Annexure-VI**). Others may submit annual audit plan for FY 2024-25 at the earliest.

Decision required from Forum:

Utilities may submit annual audit plan for FY 2024-25 at the earliest.

A.6. Furnishing of details of non-compliant Disturbance Recorder (agenda by NRPC Secretariat)

A.6.1 As per clause 17 of IEGC 2023;

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

A.6.2 In the 48th PSC meeting, it was decided that concerned utilities shall do the needful for time synchronization of disturbance recorders with PMU data or SCADA event

loggers and shall share the list of DRs which are non-complaint within one month's time.

A.6.3 In view of above, only BBMB has provided the required data. Utilities are again requested to share list of DRs which are non-complaint.

Decision required from Forum:

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

A.7. Furnishing requirements of number of licenses by utilities for protection setting calculation tool (agenda by NRPC Secretariat)

A.7.1 In 48th TCC & 70th NRPC Meeting (held on 17-18 Nov 2023), NRPC Committee has approved for development of a portal through PSDF for Centralized database containing details of relay settings for grid elements connected to 220 kV and above. Portal shall have other features including protection setting calculation tool. Approved scope of portal is attached as **Annexure-VII**.

A.7.2 In above meeting, utilities were requested to give their requisition for number of licenses latest by 30.11.2023 required for calculation tool for preparation of estimate of work as project cost will depend on number of licenses required in Northern Region.

A.7.3 The same was discussed in the 215th OCC held in Varanasi on 12.01.2024 wherein utilities were apprised that there are two modules of the project:

i. **Database module** (shall be used for storage of protection settings, audit reports, DR/EL etc): License is not required for this module and login shall be made available to utilities based on requirement

ii. **Protection Setting Calculation Tool** (shall be used for protection settings co-ordination study based on database available): License is required for this tool.

A.7.4 A draft of tentative number of licenses (**Annexure-VIII**) was presented in above OCC meeting and utilities were requested to send their comments/requirement regarding number of licenses for finalization in next PSC meeting.

Decision required from Forum:

Utilities are requested to give their requisition for number of licenses latest by 23.01.2024 so that same can be finalized in 49th PSC meeting.

A.8. Status of remedial actions recommended during 48th PSC meeting (agenda by NRLDC)

A.8.1 As per the discussion in the 48th PSC meeting, necessary remedial actions were recommended based on the analysis and discussion of the grid events. Details of the event analysis and recommended points is attached as **Annexure-IX.**

A.8.2 It is expected that necessary actions would have taken place. In view of the same, constituents are requested to share the status of remedial actions taken. Constituents can email the details via mail to NRLDC and NRPC latest by 23.01.2024.

Decision required from Forum:

Members may please like to discuss.

A.9. Status of Bus bar protection (agenda by NRLDC)

A.9.1 Clause - 4 in schedule - V of Central Electricity Authority (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations, 2022 reads as

"Bus bar protection and local breaker backup protection shall be provided in 220kV and higher voltage interconnecting sub- stations as well as in all generating station switchyards".

A.9.2 During analysis of many grid incidents/disturbances, it has been found that the Busbar protection at the affected substation was not present or non-operational which resulted in considerably increasing both the number of affected elements and fault clearance time. Accordingly, it becomes critical to monitor and keep Busbar protection at all the 220 kV and above voltage level substations healthy and operational.

A.9.3 Continuous follow-ups have been done to expedite the commissioning of bus bar

protection at 220kV & above stations and also to ensure their healthiness. On the basis of details received till date, it is observed that status of bus bar protection has been improved however, further improvement is desired.

A.9.4 Constituent wise status of bus bar protection, where bus bar protection is either not installed, or installed but not operational, along with present status as per detail received from constituents is attached as **Annexure-X**.

A.9.5 Constituents are requested to share the present status of remedial action taken/to be taken regarding commissioning and healthiness of bus bar protection at 220kV & above substations and also expedite the implementation of bus bar protection.

Decision required from Forum:

Concerned Utilities may be addressed to expedite the implementation of bus bar protection.

A.10. Replacement of electromechanical relays with numerical relays (agenda by NRLDC)

A.10.1 Clause-37.2(c) of IEGC, clause-15(4) of CEA Grid standards and clause-48(4) of CEA Construction Standards 2022 mandates that

"Each line or transformer or reactor or any other bay shall be provided with facility for disturbance recording, event logging and time synchronizing equipment".

A.10.2 During analysis of grid incidents/disturbances, it has been found that there are few stations where electromechanical relays are still in use and thus disturbance recorders are not available there which accounts for violation of Clause-37.2(c) of IEGC, clause-15(4) of CEA Grid Standards and clause 48(4) CEA Construction Standards 2022.

A.10.3 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.10.4 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.10.5 Deliberation on same subject has also been done during 48th PSC. During the meeting, all the constituents/SLDC/STU were requested to review the same in their control area and take/expedite actions to replace electromechanical relays with numerical relays.

A.10.6 Constituent wise details of static/electromechanical type protection relays at their respective substations along with its present status per detail received from constituents is attached as **Annexure-XI**.

A.10.7 Constituents are requested to share the status of remedial action taken/to be taken regarding replacement of static/electromechanical relay with numerical relays at 220kV & above substations and also expedite the process of replacement of static/electromechanical relay with numerical relays.

Decision required from Forum:

Concerned constituents may expedite the process of replacement of static/electromechanical relay with numerical relays.

A.11. SPS for 2X315 MVA, 400/220kV ICTs at Suratgarh Thermal Power Station (Agenda by RVPN)

A.11.1 RVPN vide letter dated 21.12.2023 has proposed a SPS for 2X315 MVA, 400/220kV ICTs at Suratgarh Thermal Power Station attached as **Annexure-XII.**

A.11.2 Further, RVPN vide letter dated 10.01.2024 has proposed a revised scheme based on suggestions of NRLDC. The same is attached as **Annexure-XIII.**

A.11.3 Above proposal was discussed in 215th OCC meeting held on 12.01.2024 and it was decided to discuss it separately after scrutiny by NRLDC.

A.11.4 Comments of NRLDC on SPS proposal is attached as **Annexure-XIV.**

Decision required from Forum:

Forum may discuss SPS proposal and approve accordingly.

A.12. Analysis of the tripping events occurred during September-2023 to December-2023 and status of remedial action taken (agenda by NRLDC)

A.12.1 The list of major tripping events occurred during September-2023 to December-2023 is attached as **Annexure-XV**.

A.12.2 Concerned constituents/utilities are requested to share the detailed analysis of the tripping elements along with status of remedial action taken/to be taken.

Decision required from Forum:

Forum may decide remedial measure on issues faced by utilities.

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List of addressee

Members of Protection Sub-Committee*

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

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Draft of Revised Protection Philosophy/Protocol of Northern Region

S.N.	Protection Setting/Protocol	Mandated Setting
1	**Protection Scheme**	**220kV and above:** Independent Main-I and Main-II protection (of different make OR different type/different algorithm) of non-switched numerical type is to be provided with carrier aided scheme. **132kV and below:** One non-switched distance protection scheme and, directional over current and earth fault relays, should be provided as back up.
2	**Distance Protection Zone-1**	80% of the Protected line; Time Setting: Instantaneous.
3	**Distance Protection Zone-2**	0.35 second *(considering LBB time of 200mSec, CB open time of 60ms, resetting time of 30ms and safety margin of 60ms)* For a long line followed by a short line: 0.6 second
4	**Distance Protection Zone-3**	Zone-3 should overreach the remote terminal of the longest adjacent line by an acceptable margin (typically 20% of highest impedance seen) for all fault conditions. Time Setting: 800-1000 msec
5	**Distance Protection Zone- 4**	The Zone-4 reverse reach must adequately cover expected levels of apparent bus bar fault resistance. Time may be coordinated accordingly.

		Where Bus Bar protection is not available, time setting: 160 msec
6	**Lines with Series and other compensations in the vicinity of Substation**	• Zone-1: 80% of the protected line with 100ms-time delay. POR Communication scheme logic is modified such that relay trips instantaneously in Zone-1 on carrier receive. • Zone-2: 120 % of uncompensated line impedance for single circuit line. For Double circuit line, settings may be decided on basis of dynamic study in view of zero sequence mutual coupling. • Phase locked voltage memory is used to cope with the voltage inversion. Alternatively, an intentional time delay may be applied to overcome directionality problems related to voltage inversion. • over-voltage stage-I setting for series compensated double circuit lines may be kept higher at 113%.
7	**Power Swing Blocking**	Block tripping in all zones, all lines. Out of Step tripping to be applied on all inter regional tie lines. Deblock time delay = 2s
8	**Protection for broken conductor**	Negative Sequence current to Positive Sequence current ratio more than 0.2 (i.e. $I2/I1 \geq 0.2$) Only for alarm: Time delay = 3-5 sec
9	**Switch on to fault (SOTF)**	Switch on to fault (SOTF) function to be provided in distance relay to take care of line energization on fault

10	**VT fuse fail detection function**	VT fuse fail detection function shall be correctly set to block the distance function operation on VT fuse failure.
11	**Carrier Protection**	To be applied on all 220kV and above lines with the only exception of radial feeders.
12	**Back up Protection**	On 220kV and above lines with 2 Main Protections: • Back up Earth Fault protections alone to be provided. • No Over current protection to be applied. At 132kV and below lines with only one Main protection: • Back up protection by IDMT O/C and E/F to be applied.
13	**Auto Re-closing with dead time.**	AR shall be enabled for 220 kV and above lines for single pole trip and re-closing. Dead time = 1.0s. Reclaim time = 25.0s Auto-recloser shall be blocked for following: • faults in cables. • Breaker Fail Relay • Line Reactor Protections • O/V Protection • Received Direct Transfer trip signals • Busbar Protection • Zone 2/3 of Distance Protection • Circuit Breaker Problems.
14	**Busbar protection**	To be applied on all 220kV and above sub stations with the only exception of 220kV radial fed bus bars.

15	**Local Breaker Backup (LBB)**	For 220 kV and above level substations as well as generating stations switchyards, LBB shall be provided for each circuit breaker. LBB Current sensor I > 20% In LBB time delay = 200ms
16	**Line Differential**	For cables and composite lines, line differential protection with built in distance back up shall be applied as Main-I protection and distance relay as Main-II protection. For very short line (less than 10 km), line differential protection with distance protection as backup (built-in Main relay or standalone) shall be provided mandatorily as Main-I and Main-II.
17	**Over Voltage Protection**	FOR 765kV LINES/CABLE: Low set stage (Stage-I): 106% - 109% (typically 108%) with a time delay of 5 seconds. High set stage (Stage-II): 140% - 150% with a time delay of 100 milliseconds. 400kV LINES/CABLE: Low set stage (Stage-I): 110% - 112% (typically 110%) with a time delay of 5 seconds. High set stage (Stage-II): 140% - 150% with a time delay of 100 milliseconds. FOR 220 KV LINES: No over-voltage protection shall be used. FOR 220 KV CABLE: Low set stage (Stage-I): 110% - 112% (typically 110%) with a time delay of 5 seconds.

		High set stage (Stage-II): 140% - 150% with a time delay of 100 milliseconds. Drop-off to pick-up ratio of overvoltage relay: better than 97% Grading: Voltage as well as time grading may be done for multi circuit lines/cable.
18	**Resistive reach / blinder setting to prevent load point encroachment**	Following criteria may be considered for deciding load point encroachment: • Maximum load current (Imax) may be considered as 1.5 times the thermal rating of the line or 1.5 times the associated bay equipment current rating (the minimum of the bay equipment individual rating) whichever is lower. (Caution: The rating considered is approximately 15minutes rating of the transmission facility). • Minimum voltage (Vmin) to be considered as 0.85pu (85%).
19	**Direct Inter-trip**	To be sent on operation of following: Overvoltage Protection LBB Protection Busbar Protection Reactor Protection Manual Trip
20	**Permissive Inter-trip**	To be sent on operation of Distance Protection

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Sr. No.	Protection Setting/Protocol	Mandate Setting	Observations
1.	Protection Scheme	220KV and above: Independent Main-1 and Main-2 protection (of different make or different algorithm) of non-switched type is to be provided with carrier aided scheme.	As per **MOM of Point No. A2.13 of 48th PSC Meeting (11th October 2023)** it was decided to include Polygon Characteristics for Protection scheme in case of 220KV and above. The same may be included in the mandated setting.
5.	Distance Protection Zone 4	The Zone-4 reverse reach must be adequately cover expected levels of apparent bus bar fault resistance. Time may be coordinated accordingly. When Bus Bar protection is not available time setting: 160 msec.	All Numerical Distance Protection Schemes with Polygon Characteristics have two types of setting for each zone: 1.) **Zone Reach setting:** Line Impedance setting along the line angle 2.) **Resistive Reach Setting:** This consists of Ph to Ph and Ph to Earth Resistive Reach Settings along the X-axis to cover Fault resistance, Tower Footing Resistance and Arc Resistance. "Rama Krishna Committee Report" has very clearly provided both settings for Zone -4 along with Zone-4 time settings (Appendix 9.1/Page 4/7) as given below : **(i a.)Zone 4 Reach (Impedance Setting):** Less than Zone 1 of the shortest line connected to the local bus. **(i b.)Zone 4 Resistive Reach:** The Zone 4 Reverse Reach must adequately cover expected levels of apparent Bus Bar Fault Resistance when allowing for multiple in feed from other circuits. **For this reason, its Resistive Reach setting is to be kept identical to Zone 3 Resistive Reach setting.** **(i c.)Time Setting:** The Zone-4 time delay would only need to coordinate with bus bar main fault clearance and with Zone-1 fault clearance for lines out of the same sub-station. For this reason this can be set according to the Zone 2 setting guidelines. With the above available guidelines of "Ramakrishna Committee Report", we can summarize Zone-4 setting as follows and mandate setting may be revised accordingly : **(i.) Zone 4 (Impedance Setting) < Zone-1 of the shortest line connected to the local bus.** **(ii.) Zone 4 Resistive Reach = Zone-3 Resistive Reach (for Rp & Rp-E both)** **(iii.) Zone-4 Time Setting to be coordinated with Zone -2 time.** **(iv.) Where no Bus-Bar protection is not available** **Zone-4 Time setting = 160msec** **[As per A.10 of MOM PSC No. 25 dt. 12.02.2014]**

7.	Power Swing Blocking	Blocking in all zones, all lines Out of Stop Tripping to be applied on all inter regional tie line. Deblock time delay = 2s	1.) Setting for Power Swing Detection Band has not been provided in mandate setting. 2.) In general Power swing Detection Band Setting may be provided as: (i.) $\Delta R = \Delta X = 20\%$ of R3 Ph-Ph [20% of Zone -3 Phase to Phase Resistive Reach] or (ii) as suggested by OEM Relay Manual
18(a)	Resistive Reach/Blinder Setting to prevent load point encroachment	Following criteria may be considered for deciding load point encroachment. • Maximum load current (I_{max}) may be considered as 1.5 times the thermal rating of the line or 1.5 times the associated bay equipment. Current rating (the minimum of the bay equipment rating) which was in lower (Caution: The rating considered is approximately 15 minutes rating of the transmission facility) • Minimum Voltage ($V_{min.}$) to be considered as 0.85 as 0.85pu (85%)Δ	1.) Nomenclature of Numerical Distance Protection Scheme with Polygonal characteristics Resistive Reach setting is sufficient. Blinder setting is applicable for Distance Protection Scheme with **Mho characteristics** which are obsolete now and may be omitted. 2.) As mentioned in the observation at Sr. No.5 and Sr. No. 7, Power Swing Blocking and Zone -4 Resistive Reach setting also depends upon Zone-3 Resistive Reach setting. 3.) As per latest available guidelines of **"Manual on transmission planning Criteria 2023" (published by CEA), 6.4.1 (Annexure-I)**: **Zone-3 Settings**: The transmission utilities shall ensure that zone-3 relay setting of the transmission lines is such that they do not trip at extreme loading of line. For this purpose, the extreme loading may be taken as 120% of thermal current loading limit and assuming 0.9 per unit voltage. Accordingly, the mandate setting may be revised at Sr. No. 18 of Draft of Protection Philosophy of load point encroachment. The **per phase value** of load point encroachment obtained with $\mathbf{(Z_{min.} = \frac{0.9\ V_{ph}}{\sqrt{3} \times (1.2\ I_{max})}}$ has to be applied for calculating Zone-3 Resistive Reach setting after giving allowance to Power Swing Detection Band setting and also it should avoid Load Encroachment Point Z_{min} by a suitable margin.

18 (b)	Resistive Reach for Zone 3	---	1.) In view of above Zone Resistive Reach of Zone 3 may be set as : (i.) Zone 3 Phase to Earth Resistive Reach (Per Loop) $R3G = 80\% \times Z_{min}$ (= R4G) $= 0.8\ Z_{min}$ (ii.) Zone 3 Phase to Phase Resistive Reach (Per Loop) $R3Ph = 2x[60\%\ Z_{min}]$ (= R4Ph) $= 1.2\ Z_{min}$ 2.) Per Phase or Per Loop value may be carefully selected for Relay Setting as suggested by OEM Relay manual.
18 (c)	Resistive Reach for Zone 1	---	**1.)** Resistive Reach Setting of Zone 1 & Zone 2 (i.e. R1PH/ R1G & R2Ph/R2G) may be set in accordance with OEM Relay Manual or as per **"Model setting calculations for typical IEDs", a protection sub-committee report published by NRPC in March 2014.** In general for Zone 1, Phase to Phase resistive reach(Per Loop) 2 * Arc Resistance ≤ R1 Ph ≤ 3 * (X1) or 30 Ω ≤ R1 Ph ≤ 3 * (X1) (Taking 15 Ω as Arc resistance for 220 KV and above Voltage level) and Phase to Ground resistive reach: 2 * (Arc Resistance + tower footing resistance) ≤ R1 G ≤ 4.5 * (X1) 50 Ω ≤ R1 G ≤ 3 * (X1) (Taking 15 Ω as Arc resistance and 10Ω tower footing resistance for 220 KV and above Voltage level) where X1=Zone1 Positive Sequence Reactance of the Line.
18 (d)	Resistive Reach for Zone 2		In general for Zone2 , Phase to Ground resistive reach (Per Loop) 1.5 * R1G ≤ R2G ≤ 80% of R3G Phase to Phase resistive reach (Per Loop) 2.0 * R1Ph ≤ R2Ph ≤ 80% of R3Ph

20	Permissive Inter Trip	To be sent on operation of Distance Protection	1. **Permissive under Reach Trip : (For all the lines above 10Km length)** Carrier Signal to be sent on the operation of distance protection in Zone1 2. **Permissive over Reach Trip: (For all the lines upto 10Km length, operating in distance protection mode):** Carrier Signal to be sent on the operation of Distance Protection by overreaching Zone2. This is applicable for Main2, presuming Main1 is having Line Differential Protection otherwise it may be applied for Main1 and Main2 both.
21	Standardization of Disturbance Record (DR)	-	Basic standard setting of Disturbance Record (DR) is attached in Annexure-II

12/12/2023

(Er. Ravi Lal)
Addl.SE/Tech, O & M Circle
BBMB Jamalpur

UPPTCL Comments on Draft of Revised Protection Philosophy / Protocol of Northern Region

S. N.	Protection Setting/Protocol	Mandated Setting	UPPTCL comments
1	**Protection Scheme**	**220kV and above:** Independent Main-I and Main-II protection (of different make OR different type/different algorithm) of non-switched numerical type is to be provided with carrier aided scheme. **132kV and below:** One non-switched distance protection scheme and, directional over current and earth fault relays, should be provided as back up.	O.K.
2	**Distance Protection Zone-1**	80% of the Protected line length; Time Setting: Instantaneous.	O.K.
3	**Distance Protection Zone-2**	0.35 second *(considering LBB time of 200mSec, CB open time of 60ms, resetting time of 30ms and safety margin of 60ms)* For a long line followed by a short line: 0.6 second	Reach of protected line for single circuit and double circuit line has not mentioned which needs to be mentioned. For Single circuit line : 120% of protected line and for Double circuit line :150%
4	**Distance Protection Zone-3**	Zone-3 should overreach the remote terminal of the longest adjacent line by an acceptable margin (typically 20% of highest impedance seen) for all fault conditions. Time Setting: 800-1000 msec	O.K.

5	**Distance Protection Zone- 4**	The Zone-4 reverse reach must adequately cover expected levels of apparent bus bar fault resistance. Time may be coordinated accordingly. Where busbar protection is not functional, time setting 160 ms.	Zone – 4 reverse reach setting shall be considered as 50% of shortest line connected to the local bus. Zone-4 time delay would only need to co-ordinate with busbar main protection fault clearance and with Zone-1time of line i.e.350 ms. Similarly Zone-4 impedance when BBP is not functional be taken as 02 km.
6	**Lines with Series and other compensations in the vicinity of Substation**	• Zone-1: 80% of the protected line with 100ms-time delay. POR Communication scheme logic is modified such that relay trips instantaneously in Zone-1 on carrier receive. • Zone-2: 120 % of uncompensated line impedance for single circuit line. For Double circuit line, settings may be decided on basis of dynamic study in view of zero sequence mutual coupling. • Phase locked voltage memory is used to cope with the voltage inversion. Alternatively, an intentional time delay may be applied to overcome directionality problems related to voltage inversion. • over-voltage stage-I setting for series compensated double circuit lines may be kept higher at 113%.	O.K.
7	**Power Swing**	Block tripping in all zones, all lines.	

8	**Protection for broken conductor**	Negative Sequence current to Positive Sequence current ratio more than 0.2 (i.e. I2/I1 ≥ 0.2) Only for alarm: Time delay = 3-5 sec	Tripping may be considered for radial lines to protect single phasing of transformer.
9	**Switch on to fault (SOTF)**	Switch on to fault (SOTF) function to be provided in distance relay to take care of line energization on fault	O.K.
10	**VT fuse fail detection function**	VT fuse fail detection function shall be correctly set to block the distance function operation on VT fuse failure.	
11	**Carrier Protection**	To be applied on all 220kV and above lines with the only exception of radial feeders.	O.K.
12	**Back up Protection**	On 220kV and above lines with 2 Main Protections: • Back up Earth Fault protections alone to be provided. • No Over current protection to be applied. At 132kV and below lines with only one Main protection: • Back up protection by IDMT O/C and E/F to be applied.	Back up O/C may be applied on 132 kV Radial line. Non-directional E/F feature be operative in case directional feature is not functional.
	Blocking	Out of Step tripping to be applied on all inter regional tie lines. De block time delay = 2s	

13	**Auto Re-closing with dead time.**	AR shall be enabled for 220 kV and above lines for single pole trip and re-closing. Dead time = 1.0s. Reclaim time = 25.0s Auto-recloser shall be blocked for following: • faults in cables. • Breaker Fail Relay • Line Reactor Protections • O/V Protection • Received Direct Transfer trip signals • Busbar Protection • Zone 2/3 of Distance Protection • Circuit Breaker Problems.	CB Pole discrepancy relay time as 1.0 s and 2.5 s for Tie breaker.
14	**Busbar protection**	To be applied on all 220kV and above sub stations with the only exception of 220kV radial fed bus bars.	O.K.
15	**Local Breaker Backup (LBB)**	For 220 kV and above level substations as well as generating stations switchyards, LBB shall be provided for each circuit breaker. LBB Current sensor I > 20% In LBB time delay = 200ms	O.K.
16	**Line Differential**	For cables and composite lines, line differential protection with built in distance back up shall be applied as Main-I protection and distance relay as Main-II protection. For very short line (less than	O.K.

		10 km), line differential protection with distance protection as backup (built-in Main relay or standalone) shall be provided mandatorily as Main-I and Main-II.	

17	**Over Voltage Protection**	FOR 765kV LINES/CABLE: Low set stage (Stage-I): 106% - 109% (typically 108%) with a time delay of 5 seconds. High set stage (Stage-II): 140% - 150% with a time delay of 100 milliseconds. 400kV LINES/CABLE: Low set stage (Stage-I): 110% - 112% (typically 110%) with a time delay of 5 seconds. High set stage (Stage-II): 140% - 150% with a time delay of 100 milliseconds. FOR 220 KV LINES: No over-voltage protection shall be used. FOR 220 KV CABLE: Low set stage (Stage-I): 110% - 112% (typically 110%) with a time delay of 5 seconds. High set stage (Stage-II): 140% - 150% with a time delay of 100 milliseconds. Drop-off to pick-up ratio of overvoltage relay: better than 97% Grading: Voltage as well as time grading may be done for multi circuit lines/cable.	In second circuit of Double circuit lines, slightly higher setting may be considered as: For 765kV lines 109% with time delay of 6ms. For 400kV lines 112% with time delay of 6ms.
18	**Resistive reach / blinder setting to prevent load point encroachment**	Following criteria may be considered for deciding load point encroachment: • Maximum load current (Imax) may be considered as 1.5 times the thermal rating of the line or 1.5 times the associated bay equipment current rating (the minimum of the bay equipment individual rating)	O.K.

		whichever is lower. (Caution: The rating considered is approximately 15minutes rating of the transmission facility). • Minimum voltage (Vmin) to be considered as 0.85pu (85%).	

19	**Direct Inter-trip**	To be sent on operation of following: • Overvoltage Protection • LBB Protection • Busbar Protection • Reactor Protection • Manual Trip	
20	**Permissive Inter-trip**	To be sent on operation of Distance Protection	

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Pankaj Malviya

Chief Engineer (A) to Director (Operation)

POWERGRID's Comment in 48th TCC/ 70th NRPC meeting held on 17-18 November 2023

POWERGRID Viewpoint on Protection Philosophy:

3. "Distance Protection Zone-2, For a long line followed by a short line: 0.6 second." :- **0.5 to 0.6 sec may be adopted.**

4. "Distance Protection Zone-3," :- **For long line- 1.5 sec may be adopted due to proper protection coordination – encroachment in other voltage level**

6. "Line with Series & other compensations in the vicinity of the substation":- **at local end – Z1- 60%, Instantaneous trip**

8. "Protection for broken conductor Negative Sequence current to Positive Sequence current ratio more than 0.2 (i.e. I2/I1 ≥ 0.2) Only for alarm: Time delay = 3-5 sec" **As per Ramkrishna model setting guideline the typical setting is 20 sec. Hence time delay may be adopted 3-20sec.**

15. "Local Breaker Backup (LBB):- For 220 kV and above level substations as well as generating stations switchyards, LBB shall be provided for each circuit breaker. LBB Current sensor I > 20% In LBB time delay = 200ms" As per Ramkrishna **model setting guideline the typical setting is 0.2A. However, due to variation of CT ratio, 0.1A-0.2A may be adopted.**

16. "Line Differential":- **For replacement of Main-1 & Main-2 protection in existing short line PSDF fund may be utilized**

Annexure-III

Nodal Officers for furnishing of Protection settings

Sr. NO.	Utility	Name	Designation	E-mail id	Posting
1	Koteshwar HEP, THDC	Ashutosh Gairola	Sr. Mgr.	ashutoshgairola@thdc.co.in	Koteshwar HEP
2	Tehri, HEP	Jaiveer Singh	Mgr. (O&M)	jaiveersingh@thdc.co.in	Tehri HEP
3	DTL	Ms. Ramneet Chanana	Dy.Mgr.	chanana.ramneet@gmail.com	220kV S/s PARKSTREET
4	APL-Kawai	Ashish Baviskar	General Manager	ashish.baviskar@adani.com	
5	Adani Transmission Limited	Sunil Rawal	Head Protections	sunil.raval@adani.com	
6	Nabha Power Limited	Chandresh Saxena	Joint General Manger	chandresh.saxena@larsentoubro.c	HQ
7	NHPC	S K Das	GSM	onm-protection@nhpc.nic.in	HQ
8		Jaganath Pani	SM		HQ
9	LPGCL	Rudra Narayan Bedi	President& Head Maintenence	rnbedi.ltp@lpgcl.com	Lalitpur
10	LPDD	Sh. Tundup Spalzang	Superintending Engineer	sepddladakh@gmail.com	Leh
11	PSTCL	Er. Rajbir Singh Walia	ASE/P&OS		Ludhiana
12	UPPTCL (West, South west, south Central)	Pramod Kumar Mishra	SE (T&C), Meerut	setncmrt@upptcl.org	Meerut
13	UPPTCL (Central, south east, North East)	Praveen Rastogi	SE (T&C), lucknow	setnclko@upptcl.org	Lucknow
14	RPSCL	Kesarinandan Pandey	GM	kesarinandan.pandey@relianceada.com	
15	RVUN	SH. Raman Jain	EE (KSTPS)	raman_49559@rvun.in	KSTPS, Kota
16	PTCUL	Mr. Asim Baig	Executive Engineer		
17	UJVNL	Er. Anup Deepak	Executive Engineer	testdakpathar@gmail.com	Dakpathar, Dehradun
18		Er. Uma Shankar	Executive Engineer	eetestdph@gmail.com	Chinayalisaur, Uttrakashi
19	KWHEP	Mr. Hunny Kalia	Manager	hunny.kalia@ jsw.in	KWHEP
20		Mr. Amandeep Kumar	Deputy Manager	amandeep.kumar@jsw.in	KWHEP
21	PPGCL	Mr. Dhanjay Singh	EMD Deptt.	dhananjay.singh@ppgcl.co.in	PPGCL, Bara Plant
22	NPCIL RAPS	Sh. R.D.Yadav	STE(E&I)	rdyadav@npcil.co.in	RAPS-3&4
23	BBMB	Er. Inderjit Singh Bajwa	Director/P&C	dirpc@bbmb.nic.in	

Annexure-IV

Protection Setting Data Submitted by Utilities of NR

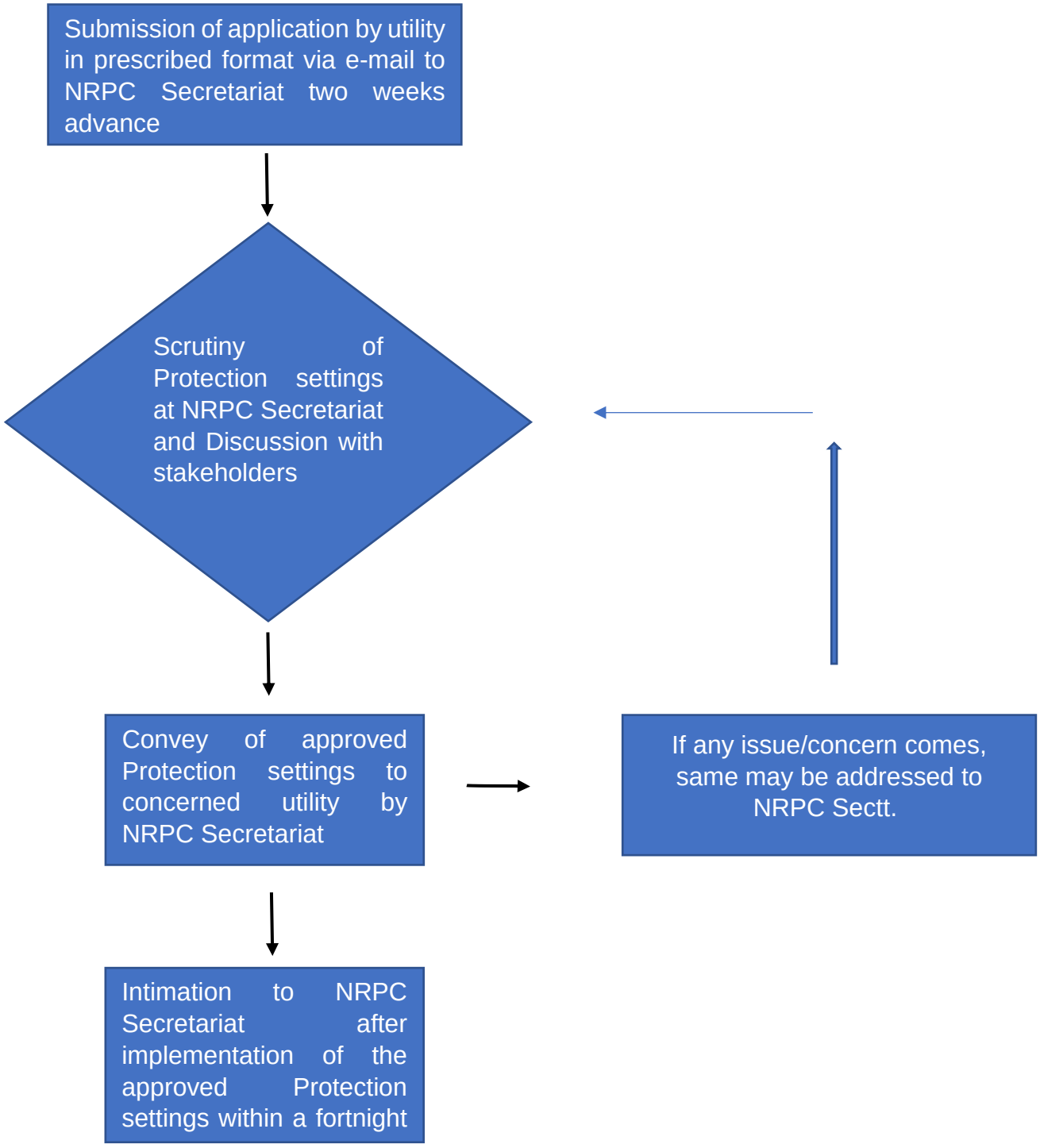
Sr. No.	Utility	400 kV and above Transmission lines	400 kV and above ICTs	400 kV and above Reactors
1	APCPL	Yes	Yes	Yes
2	BBMB	Yes	Yes	Yes
3	DTL	Yes	Yes	Yes
4	HVPNL (Panchkula TS)	Yes	Yes	Yes
	HVPNL (Hissar TS) (Except for 400 kV Nuhiyawali S/s	Yes	Yes	Yes
5	MEJA	Yes	Yes	Yes
6	NHPC	Yes	No	No
7	NPCIL			
	RAPP D	Yes	No	No
	NAPS	Yes	No	No
8	NTPC	No	No	No
	Only Dadri Coal	Yes	Yes	Yes
9	PPCL	Yes	No	No
10	PSTCL	Yes (Not in Format)	No	No
11	RVPNL	Yes	No	No
12	SJVN	Yes	NA	Yes
13	THDC	No	No	No
	Koteshwar HEP	Yes	NA	NA
14	South East UPPTCL	Yes	Yes	Yes
15	WUPPTCL	Yes	Yes	Yes
16	UPPTCL			
	Central Zone	Yes	Yes	Yes
	South Central Zone (Jhansi/ Banda and Orai)	Yes	Yes	Yes
	West Zone	Yes	Yes	Yes
	South West Zone (Fatehabad & Agra	Yes	Yes	Yes
	North West	Yes	Yes	Yes
	North East Zone	Yes	Yes	Yes
17	POWERGRID NR 1	Yes	Yes	Yes
18	POWERGRID NR 2	Yes	Yes	Yes
19	POWERGRID NR 3	Yes	Yes	Yes
20	HPPTCL (132 kV and above)	Yes	Yes	Yes
21	JKPTCL	No	No	No
22	PTCUL (132 kV and above)	Yes	Yes	Yes
23	UPRVUNL			
	Obra TPS and Parichha TPS	Yes	Yes	Yes
	Anpara ATPS and Harduaganj	Yes	Yes	Yes
	Anpara DTPS	Yes	Yes	Yes
24	HPGCL	No	No	No
25	UPSLDC			
	Alaknanda	Yes	NA	NA
	PPGCL Bara	Yes	Yes	Yes
	Lanco Anpara	Yes	Yes	NA
	LPGCL	Yes	Yes	Yes
	Vishnuprayag	Yes	NA	NA
	Rosa TPS	Yes	Yes	NA
26	RRVUNL	Yes	Yes	Yes

Approval of Protection Settings by NRPC Secretariat

A. Steps:

1. Nominated nodal officer shall apply for revision or approval of new Protection settings via e-mail at seo-nrpc@nic.in in the prescribed formats in 2 weeks advance.
2. Further, NRPC will scrutinize and discuss with stakeholders, if required.
3. Subsequently, NRPC Secretariat will provide the approved Protection settings to the concerned stakeholder.
4. On approved settings, if any issue or concern arises, the same can be address to the NRPC Secretariat.
5. After the implementation of approved settings, stakeholder will intimate to NRPC Secretariat via e-mail at seo-nrpc@nic.in within a fortnight.

B. Flow Chart:


Submission of application by utility in prescribed format via e-mail to NRPC Secretariat two weeks advance
Scrutiny of Protection settings at NRPC Secretariat and Discussion with stakeholders
Convey of approved Protection settings to concerned utility by NRPC Secretariat
If any issue/concern comes, same may be addressed to NRPC Sectt.
Intimation to NRPC Secretariat after implementation of the approved Protection settings within a fortnight

Annexure-VI

Status of Protection Audit Plan for FY 2024-25

S. No.	NRPC Member	Category	Status
1	PGCIL	Central Government owned Transmission Company	
2	NTPC	Central Generating Company	
3	BBMB		
4	THDC		Received
5	SJVN		
6	NHPC		Received
7	NPCIL		
8	DTL	State Transmission Utility	Received
9	HVPNL		
10	RRVPNL		
11	UPPTCL		Received for Agra, Jhansi, Lucknow zone
12	PTCUL		
13	PSTCL		
14	HPPTCL		
15	IPGCL	State Generating Company	
16	HPGCL		
17	RRVUNL		
18	UPRVUNL		
19	UJVNL		
20	HPPCL		
21	PSPCL	State Generating Company & State owned Distribution Company	
22	HPSEBL	Distribution company having Transmission connectivity ownership	
23	Prayagraj Power Generation Co. Ltd.	IPP having more than 1000 MW installed capacity	
24	Aravali Power Company Pvt. Ltd		
25	Apraava Energy Private Limited		
26	Talwandi Sabo Power Ltd.		
27	Nabha Power Limited		
28	Lanco Anpara Power Ltd		
29	Rosa Power Supply Company Ltd		
30	Lalitpur Power Generation Company Ltd		Received
31	MEJA Urja Nigam Ltd.		
32	Adani Power Rajasthan Limited		

33	JSW Energy Ltd. (KWHEP)		
34	Greenko Group	Other IPP	
35	Sravanthi Energy Private Ltd		
36	NTPC Renewable Energy wing		
37	RENEW POWER		
38	Adani Power Ltd		
39	Avaada Energy		
40	Mahindra Solar		
41	ACME Heeragarh Powertech Pvt. Ltd.		
42	Tata Power Renewable Energy Ltd.		
43	Azure Power Pvt. Ltd.		
44	Thar Surya Pvt. Ltd.		
45	Ayana Renewable Power Pvt. LTd.		
46	CSP(J)PL, Hero Future Energies		
47	ABC Renewable Energy(RJ-01) Pvt. Ltd.		
48	Eden Renewable Cite Pvt. Ltd.		
49	UT of J&K	UT of Northern Region	
50	UT of Ladakh		
51	UT of Chandigarh		
52	ATIL	Other transmission licensee in NR	
53	INDIGRID		
54	POWERLINK		
55	ADHPL		Received
56	Sekura Energy Limited		

Scope of work for

Centralized Database containing details of relay settings for grid elements connected to 220 kV and above

Scope of software shall be broadly as below for all elements in Northern Region connected to 220 kV and above voltage level:

A. **Protection Settings Database Management System.**
B. **Protection Setting Calculation and Study Tool.**
C. **Repository of DR/EL and analysis.**
D. **Application of protection settings by utilities and its approval by NRPC.**
E. **Reporting of performance indices by utilities.**
F. **Repository of protection audit reports.**

A. Protection Settings Database Management System

1. To create facility to store all types of relay settings of all power system elements (connected to 220 kV and above in Northern Region such as lines, cable, ICT, Reactor/Capacitor, generator, GT, STATCOM/SVC, FSC/TCSC, HVDC) in one system irrespective of the manufacturer and relay type and controlled access to users.
2. Complete modeling of elements with relevant system parameters **based on data received from utilities** for transmission lines, generators, transformers, reactors, substation layouts, and associated protective relays in the substations. The model should include CT, PT, Isolator, Breaker and other bay equipment's ratings along with rating of the BUS and the type of conductor used for the BUS. The modeling should be done as per bus-breaker philosophy instead of node-oriented model.
3. Creation of necessary relay templates of all make and model existing in grid. **Template for electro-mechanical relay shall also be required to be created. Users shall have option to provide settings of electro-mechanical relay.**
4. Option to users to upload relay setting files (downloaded from relay) directly.
5. To capture the life cycle of protection settings and template.
6. To create an interface with Protection Setting Calculation and Study Tool.

7. To provide Role based access control.
8. Building the entire Northern region network data for load flow and fault calculation, Protection database and substation SLD preparation.
9. Hardware setup and software package capable of meeting the above objectives. Associated servers for installation and Deployment of application and database software along with standard Operating System –With Main and Back up.
10. Work flow Management.
11. Availability of historical fault data for predicting nature of fault.
12. The tool should be capable of analyzing, storing, and handling all fault records (Disturbance record, Event Logger, COMTRADE files, etc.) for a minimum period of prescribed years; and the updated database to be used for fault analysis should be permanently available.
13. Reports:
    a. Feature to generate reports as per user requirement.
    b. User can generate report in standard format like .xls, .pdf.
14. History log: All user activities such as user operations, data management, template management, configuration management and workflow shall be logged to track the user activities.
15. Import and Export: There shall be an option to import template and data from any third party application in standard formats like .xml and .xls
16. Relay characteristics curve can be drawn from the setting data.
17. Provision to attach documents to relay template and relay data can be made available. Option to accept setting data as per the audit and verify/compare the field setting with protection database setting and generate error report.
18. Provision to store and retrieve audit reports.
    c. Provision to store and retrieve relay tripping incidence report.
    d. Facility to store and retrieve setting guidelines as per various committees.
    e. Automatic Reconciliation Tool should be available which will generate automatic reconciliation requests for relay settings in the database.
    f. Up-to-date application guides and user manuals of all relays is a part of the relay library.
19. A user-friendly interface with features such as
    a) Web based System.

b) Role based access control
c) Flexible customization of user roles, grants, actions from Master control panel
d) User Access Monitor
e) Relay Template Management
f) Create\Edit\Delete relay templates
g) Viewing relay template
h) Locking and Unlocking templates
i) Copy & Edit templates from the existing template
j) Import and Export templates
k) Relay Data management
l) Create\Edit\Delete relay data
m) Viewing relay data
n) Locking and Unlocking relay data
o) Copy & Edit relay data from the existing data
p) Import and Export relay data

20. Built with standard relays library data for different manufacturers, including but not restricted to the following protection features:

i. **Transmission Line & cable (including compensated):**
Distance, over current, earth fault, over voltage, Line Differential protection.

ii. **Power Transformer:**
Differential Protection, Under Impedance protection, Over fluxing Protection, Thermal Overload Protection, Low Impedance Restricted Earth Fault Protection, High Impedance Restricted Earth Fault Protection, back-up over current (Directional/ Non-Directional) and earth fault protection (Directional/ Non-Directional).

iii. **Shunt Reactors:**
Differential protection, Restricted Earth Fault, Back Up Protection (Impedance / overcurrent)

iv. **Generator:**
Differential Protection, Stator Earth Fault Protection (Both 95% and 100% protection), Inter – Turn Differential Protection, Backup impedance, Voltage Controlled O/C, Negative Sequence, Field Failure,

Reverse Power/Low forward Power, Pole Slipping, Overload, Over voltage, Under Frequency, Dead Machine, Rotor Earth Fault, Over Fluxing.

v. **Generator Transformer/ Unit Auxiliary Transformer:**

Differential Protection, Back up Earth Fault Protection, Back up over current, Restricted Earth Fault.

vi. **HVDC:**

- Converter Protection: Valve Short Circuit Protection, DC Differential Protection, DC Harmonic Protection, DC Under voltage Protection, DC Overvoltage Protection, AC Over voltage Protection, AC Under voltage Protection, AC Voltage Stress Protection of Converter, Group Differential Protection, Bridge Differential Protection, Overcurrent Protection, Sub-Synchronous Resonance Protection, AC Valve Winding Ground Fault Supervision,
- DC Filter Protection: Capacitor Differential Over current Protection, Capacitor Unbalance Supervision, Inverse Overcurrent Time Protection, DC Filter Differential Protection,
- DC Line Protection: Travelling Wave Front Protection, Under voltage Sensing Protection, Under voltage Operation Protection, DC Line Differential Protection, AC-DC Conductor Contact Protection.
- Electrode Line Protection: Electrode Bus Differential Protection, Electrode Current Balance Protection, Electrode Over Current Protection, Electrode line open circuit Over voltage Protection, Station Ground Overcurrent Protection, Open Conductor Electrode Line Protection
- DC Busbar Protection: HV Side DC Bus bar Differential Protection, Neutral Side DC Busbar Differential Protection, DC Differential Backup Protection, Valve Protection
- Converter Transformer Protection: differential protection, high impedance, restricted earth fault protection, ground earth fault overcurrent protection, thermal overload protection, over-fluxing protection, directional definite time / inverse-time overcurrent protection and directional earth fault overcurrent protection.

- AC Filter Sub-bank Protection (Shunt/Capacitor/Resistor): Differential, overcurrent, overload, unbalance supervision, Zero Sequence Overcurrent.

vii. STATCOM:

- Transformer Protection: Differential protection, REF protection, Directional Overcurrent protection, Ground Overcurrent, over flux protection, Transformer mechanical trips.
- STATCOM (MV) Bus protection: Bus Differential protection, Ground over current protection, used with neutral Grounding Transformer, Under/ Over Voltage protection, Over voltage (Open Delta) protection.
- STATCOM Branch Protection: Differential protection and/or O/C protection, Ground over current protection , Valve Overcurrent protection (in Controls), DC overvoltage protection (in Controls)
- MSR/TCR Branch Protection: Differential protection, Ground over current protection, Reactor branch unbalance protection, Thermal Overload protection.
- MSC/TSC Branch Protection: Differential protection, Ground over current protection, Capacitor Overvoltage (Using current signal) protection, Capacitor unbalance protection, over current protection.
- Harmonic Filter Protection: Ground over current protection, Capacitor Overload (Using current signal) protection, over current protection, Neutral Voltage shift.
- Auxiliary Transformer Protection: Over current, open delta voltage protection.

viii. SVC:

- Coupling Transformer (HV & MV) Protection: Differential protection, REF protection, Directional Overcurrent protection, Ground Overcurrent, over flux protection, Transformer mechanical trips.
- SVC Bus Bar protection: Bus Differential protection, Ground over current protection, used with neutral Grounding Transformer, Under/ Over Voltage protection, Over voltage (Open Delta) protection.

- TCR Protection: Differential protection, Ground over current protection, Reactor branch unbalance protection, Thermal Overload protection.
- TSC Protection: Differential protection, Ground over current protection, Capacitor Overvoltage (Using current signal) protection, Capacitor unbalance protection, over current protection.
- Harmonic Filter Protection: Differential protection, Ground over current protection, Capacitor Overvoltage (Using current signal) protection, Capacitor unbalance protection, over current protection, Neutral Voltage shift.
- Auxiliary Transformer Protection: Over current, open delta voltage protection.

ix. **FSC & TCSC:** Capacitor unbalance, Capacitor overload, Line current supervision, MOV overload, MOV short term energy protection, MOV high current protection, MOV high temperature protection, MOV failure protection, Flashover to platform protection, Spark Gap protection, Trigger circuit supervision, Sub-harmonic protection, Pole disagreement protection, Bypass switch failure protection,

x. **BUSBAR & LBB**: Differential protection, Beaker Failure Protection

21. Protection Settings Database Management System shall be suitable for integration with other portals, software of protection. It shall be able to integrate any third party application to share data between protection database management software and calculation engine/tool and vice versa.
22. Training of utilities.
23. AMC.

B. Protection Setting Calculation and Study Tool.

This module shall be capable of giving recommendation of Protection Setting for protections of elements as mentioned under point no. 20 of para A. Calculation Tool should be capable of performing the following:

1. Relay co-ordination for power system elements. Co-ordination check shall be conducted for relays of all make.
2. Primary/back-up relay pairs generation.
3. Fault calculation will be a part of relay co-ordination program.

4. Transparent Fault calculation results.
5. Simulation engines for protection co-ordination, power flow analysis, fault calculation, transient stability studies, electromagnetic transient analysis, and protection relay operation post-mortem analysis. There should be features to study low frequency oscillations, 3rd zone tripping, PSS tuning support and Voltage collapse prediction feature.
6. The protection calculation tool should be capable of interacting with the relay data in the database.
7. Tool for simulating the performance/ behavior of the protection system under all possible normal and abnormal operating conditions of the power system, including effect of changing one or more parameter setting of the relays.
8. Diagnostics Tool for verifying proper coordination among various protective relays.
9. Computation of critical clearing time.
10. Plotting Log-Log grid and graphs.
11. Option to check existing relay settings with respect to field or vice versa.
12. Computation of Out of Step Tripping Protection Settings.
13. Display of sequence operation of relays with respect to tripping time.
14. Switching status for all relays elements from the screen.
15. Association of relays to power system elements.
16. Disturbance analysis can be done on mapping of disturbances files with corresponding relay.
17. It shall have standard power system components and relay symbols.
18. Automatic computation of zone setting for distance protection.
19. Feature for viewing existing and newly computed relay settings.
20. Pre-loaded standard relay curves.
21. Directional and non-directional feature for relays.
22. Overload factor, unbalance factor and discrimination time (user defined/selectable) for each relay.
23. Inbuilt discrimination time calculator for grading of relays.
24. Facility to model the back-up protection settings of generating units / GTs.

C. Repository of DR/EL and analysis.

a) Platform for upload of DR/EL by utilities and access to all.

b) Tracking of non-compliance in uploading.

c) Tool for analysis of DR/EL.

d) Tool shall be integrated with outage portal of NRLDC so that it can capture details of outages of elements automatically from NRLDC portal so that users can upload DR, EL, FIR, tripping report, analysis report.

D. Application of protection settings by utilities and its approval by NRPC.

a) Platform for application of protection setting by utilities.

b) Hierarchical role for scrutiny and approval of setting by NRPC.

c) Intimation of approval of settings by NRPC.

d) Intimation of implementation of settings by utilities.

E. Reporting of performance indices by utilities.

a) Platform for reporting of performance indices by utilities.

b) Feature for scrutiny and intimation of errors to utilities by NRPC.

c) Recording of justification note for non-compliance.

F. Repository of protection audit reports.

a) Platform for reporting of internal and external audit report of all utilities.

b) Tracking non-compliance and next due date.

c) Web-based Checklist for protection audit should be made available for Constituents to self-auditing.

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Draft of tentative no of License required for Protection Setting Calculation Tool				
S. No.	**NRPC Member**	**Category**	**No. of License Key Required**	**Remarks**
1	NRPC	Secretariat	2	
2	PGCIL	Central Government owned Transmission Company	3	3 zones in NR
3	NLDC	National Load Despatch Centre	1	
4	NRLDC	Northern Regional Load Despatch Centre	1	
5	NTPC	Central Generating Company	1	
6	BBMB		1	
7	THDC		1	
8	SJVN		1	
9	NHPC		1	
10	NPCIL		1	
11	Delhi SLDC	State Load Despatch Centre	1	
12	Haryana SLDC		1	
13	Rajasthan SLDC		1	
14	Uttar Pradesh SLDC		1	
15	Uttarakhand SLDC		1	
16	Punjab SLDC		1	
17	Himachal Pradesh SLDC		1	
18	DTL	State Transmission Utility	1	
19	HVPNL		1	
20	RRVPNL		1	
21	UPPTCL		6	Six zones in NR
22	PTCUL		1	
23	PSTCL		1	
24	HPPTCL		1	
25	IPGCL	State Generating Company	1	
26	HPGCL		1	
27	RRVUNL		1	
28	UPRVUNL		1	
29	UJVNL		1	
30	HPPCL		1	
31	PSPCL	State Generating Company & State owned Distribution Company	1	
32	HPSEBL	Distribution company having Transmission connectivity ownership	1	
33	Prayagraj Power Generation Co. Ltd.	IPP having more than 1000 MW	1	
34	Aravali Power Company Pvt. Ltd		1	
35	Apraava Energy Private Limited		1	
36	Talwandi Sabo Power Ltd.		1	
37	Nabha Power Limited		1	
38	Lanco Anpara Power Ltd		1	

39	Rosa Power Supply Company Ltd	installed capacity	1	
40	Lalitpur Power Generation Company Ltd		1	
41	MEJA Urja Nigam Ltd.		1	
42	Adani Power Rajasthan Limited		1	
43	JSW Energy Ltd. (KWHEP)		1	
44	Greenko Group	Other IPP	1	
45	Sravanthi Energy Private Ltd		1	
46	NTPC Renewable Energy wing		1	
47	RENEW POWER		1	
48	Adani Power Ltd		1	
49	Avaada Energy		1	
50	Mahindra Solar		1	
51	ACME Heeragarh Powertech Pvt. Ltd.		1	
52	Tata Power Renewable Energy Ltd.		1	
53	Azure Power Pvt. Ltd.		1	
54	Thar Surya Pvt. Ltd.		1	
55	Ayana Renewable Power Pvt. LTd.		1	
56	CSP(J)PL, Hero Future Energies		1	
57	ABC Renewable Energy(RJ-01) Pvt. Ltd.		1	
58	Eden Renewable Cite Pvt. Ltd.		1	
59	UT of J&K	UT of Northern Region	1	
60	UT of Ladakh		1	
61	UT of Chandigarh		1	
62	ATIL	Other transmission licensee in NR	1	
63	INDIGRID		1	
64	POWERLINK		1	
65	ADHPL		1	
66	Sekura Energy Limited		1	

Annexure-IX

Status of actions points recommended during 48 PSC meeting (to be discussed in 49 PSC meeting)

Agenda No.	Agenda	Remdial actions recommended/agreed during 47 PSC meeting	Status of remedial ations taken (to be shared by concerned utility)
A.11	Status of Bus bar protection	PSC forum requested all the constituents to update the status of bus bar protection at S/s of their control area and also expedite the commissioning and implementation work of bus bar protection system. Members agreed for the same	
A.12	Replacement of electromechanical relays with numerical relays	PSC forum requested all the constituents to update the status of type of protection relays at S/s of their control area and also expedite the replacement work of static/electromechanical type protection relays with numerical relays. Members agreed for the same	
A.13	Frequent tripping events in J&K(UT) control area (multiple events of load loss)	PSC forum requested J&K to expedite the work related to PLCC/DTPC installation and implementation of A/R function in relays. J&K was also requested to conduct the third party protection audit of substation of their control area.	
A.15	Multiple elements tripping at 400/220 kV Daulatabad(HV) & 400kV Gurgaon(PG) Station at 06th June 2023, 00:10 hrs	Expedite the replacement of bay unit of ICT-4 at Daulatabad(Haryana) and ensure healthiness of protection system at 400/220kV Daulatabad(Haryana).	
	Multiple elements tripping at 220 kV Mohana(Har) Station at 09th June 2023, 21:09 hrs	i) Healthiness of protection system need to be ensured to avoid delayed clearance of faults. ii) Haryana is requested to ensure the timely submission of DR of all the tripped elements during grid event.	
	Multiple elements tripping at 400/220 kV Bahadurgarh(PG) Station at 25th July 2022, 14:44 hrs	i) Proper coordination of protection system need to be ensured. ii) Healthiness of protection system need to be ensured to avoid delayed clearance of faults.	
	Multiple elements tripping at 220/132 kV Verpal(Punjab) Station at 18th June 2023, 00:07 hrs	i) Proper monitoring and maintenance of protection system need to be ensured. ii) Review of protection settings, their healthiness and protection coordination need to be done. iii) Punjab is requested to ensure the timely submission of DR of all the tripped elements during grid event.	
	Multiple elements tripping at 220kV Verpal(Punjab) Station on 22nd August 2023, 21:51 hrs	i) Proper monitoring and maintenance of protection system need to be ensured. ii) Review of protection settings, their healthiness and protection coordination need to be done. iii) Punjab is requested to ensure the timely submission of DR of all the tripped elements during grid event.	
	Multiple elements tripping at 400/220kV Moga(PG) & 220kV Mogan(Punjab) stations on 29th June 2023, 21:07 hrs	i) Commissioning of new bus bar protection at Moga(PG) need to be expedited. ii) Healthiness of differential protection in 220kV lines need to be ensured. iii) Proper monitoring and maintenance of protection system need to be ensured. iv) Timely submission of DR of all the tripped elements during grid event need to be ensured.	
	Multiple elements tripping at 220kV Pong(BBMB) on 18th August 2023, 12:29 hrs	i) BBMB was requested to share to recommendation proposal to keep head flashover protection for unit protection at their power houses. ii) Proper monitoring and maintenance of protection system need to be ensured. iii) Timely submission of DR of all the tripped elements during grid event need to be ensured.	
	Multiple elements tripping at 400/220kV Bareilly(UP) on 01st July 2023, 06:39 hrs	i) UP is requested to expedite the commissioning and implementation of numerical type bus bar relay at Bareilly(PG) ii) DR time window at Bareilly(UP) need to be standardised.	
	Multiple elements tripping at 400/220kV Gr. Noida(UP) on 26th July 2023, 04:46 hrs	i) Proper monitoring, healthiness and maintenance of protection system need to be ensured. ii) Healthiness and monitoring of DC supply also need to be ensured. iii) Timely submission of DR need to be ensured.	
	Multiple elements tripping at 220kV Nara(UP) on 26th July 2023, 05:30 hrs	i) Both Main-1 & Main-2 relay of 220kV Nara-Roorkee ckt is healthy now. A/R is functional in Main-1 relay and A/R function is not available in Main-2.	
	Multiple elements tripping at 220/132kV Shahjhanpur(UP) on 22th August 2023, 12:39 hrs	i) Replacement of Ajijpur line electromechanical relay with numerical relay and repair work of GPS clock to rectify time sync issue haven't been done yet. Feedback for the same has already been sent to headquarter.	
	Multiple elements tripping at 400kV Bhadla(RS) on 18th July 2023, 19:56 hrs	i) Expedite the commissioning of Bus bar panel along with GPS panel at Bhadla(Rajasthan) S/s. ii) Proper monitoring, healthiness and maintenance of protection system need to be ensured. iii) DR time window need to be standardised.	
	Multiple elements tripping at 220/132kV Bhiwadi(RS) on 24th July 2023, 03:29 hrs	i) Proper monitoring, healthiness and maintenance of protection system need to be ensured. ii) DR of the tripping event also not received yet. Timely submission of DR/EL and tripping details need to be ensured.	
	Multiple elements tripping at 400/220kV Ratangarh(RS) on 20th June 2023, 05:21 hrs	i) Expedite the commissioning of Bus bar panel along with GPS panel at Ratangarh S/s. ii) Issue related to phase sequence also observed at Ratangarh S/s. Uniformity of phase sequence in all the feeders need to be ensured. iii) Proper monitoring, healthiness and maintenance of protection system need to be ensured. iv) DR time window need to be standardised. v) Rajasthan is further requested to review the time syncing and standardisation of DR time window at all the stations of their control area.	
	Multiple elements tripping at 220kV Khodri(Utt) & 220kV Majri(HP) on 26th July 2023, 07:07 hrs	i) Analysis report of the events need be shared. ii) Proper monitoring, healthiness and maintenance of protection system need to be ensured.	

	Multiple elements tripping at 400/220kV Gumma(HP) on 18th August 2023, 10:59 hrs	i) In view of large number of maloperation incidents at Gumma S/s which is directly connected to major hydro generation complex, HP is requested to conduct an internal protection audit of 400/220kV Gumma S/s. ii) Proper monitoring, healthiness and maintenance of protection system need to be ensured.	
	Multiple elements tripping at 220kV Kunihar(HP) on 21st August 2023, 11:27 hrs	i) In view of large number of incidents at Kunihar S/s and non-availability of proper details of disturbance recording devices, HP is requested to conduct a third party audit of 220kV Kunihar S/s. ii) Proper monitoring, healthiness and maintenance of protection system need to be ensured.	

Status of Bus bar protection				
Constituent Name	**Name of Station**	**Status of Bus bar protection(as reported)**	**Expected date of revival(as reported)**	**Present Status**
Uttarakhand	220 KV Substation, Ramnagar, Roorkee	Blocked due to more elements added at 220 KV Voltage level.		
	220 KV Sub Station, SIDCUL, Haridwar			
	220kV Jhajhra, Dehradun	Not commissioned yet		
	400KV Kashipur (220kV side)	Available but Non operational	31 December 2023	process.
	220kv Haldwani	Not Available	31 December 2024	Budget for FY 2023-24.
	220kv Pantnagar	Available but Non operational	31 December 2023	and submitted for approval.
	220kV Rishikesh	Available but Non operational	31 December 2024	It has been Taken in Budget for FY 2023-24.
	220kV Chamba	Not commissioned yet	31 December 2024	It has been Taken in Budget for FY 2023-24.
Haryana	220kV S/Stn Badshahpur	Not Installed	15.01.2023	**Commissioned on 20.02.2023**
	220kV S/Stn Sec-52A, Gurgaon	Not Installed	31.12.2023	Due to summer season, auxiliary switch connection in Isolators can not be made. shutdown will be required to connect each ckt in Bus bar panel
	220kV S/Stn Sec-1 Manesar	Installed, Non-Operational		**Commissioned on 26.02.2023**
	220kV S/Stn Panchgaon	Not Installed	31.10.2023	• Matter was taken up with the firm for commissioning of Busbar. Now, the firm i.e. M/s Siemens has submitted the offer for commissioning of Bus Bar at 220kV substation Panchgaon and work order for the same is in process of approval. • Likely to be completed by 15.09.2023.
	220kV S/Stn Rewari	Not Installed	31.03.2024	Requirement of protection panel submitted in IMS. Not availalble in DD store.
	220kV S/Stn Narnaul	Not Installed	31.12.2023	work awarded to M/s Absolute Projects.
	220kV S/Stn Mohinder Garh	Not Installed	15.09.2023	**Commissioned on 28.10.2023**
	220 KV S/Stn Palwal	Not Installed	31.11.2023	Case for administrative approval for cabling, wiring, configuration, and testing of bus b panel has been mooted in e-office. The same is in process of approval. Some observation has been raised and same shall be addressed at earliest.
	220 KV S/Stn Rangala Rajpur	Installed but Non-Operational	31.10.2023	**Commissioned on 22.06.2023**
	220 kV Unispur	Installed but Non-Operational	31.11.2023	
	220 kV Nissing	Installed but Non-Operational	31.11.2023	Panel withdrawn from DD store. Matter has been taken with M/s Ziv automation for necessary relay setting.
	220KV Pehowa	Installed but Non-Operational	31.03.2024	
	220kV Kaithal	Not Installed	31.03.2024	II. Demand Raised for 220kV Bus-Bar Protection panel. Yet to be allocated. **Note**:-Already 220kV Bus-bar Protection Panel shifted from 220kV Kaithal to 220kv
	220 KV Sonepat	Not Installed	31.03.2024	The estimate for Bus Bar Protection Scheme is under sanctioning process from the competent authority. After sanctioning of the estimate & allocation of material, the work will be completed within 45 days.
	220 KV REGC, Sonepat	Not Installed	31.11.2023	Panel withdrawn from DD store.
	220KV Jind	Installed but Non-Operational	15.06.2023	**Commissioned on dated 27.06.23.**
	220 KV Fatehabad	Installed but Non-Operational	01.06.2023	**Commissioned & made operational on dated 22.07.23**
	220 KV Hukmawali	Installed but Non-Operational	30.10.2023	Bus-coupler CB defective & new panel withdrawn from DD store. Errection work under progress & the same will be completed 31.08.23.
	220 KV Bhuna	Installed but Non-Operational	30.10.2023	
	220 KV Sirsa	Not Installed		Not required being single source of supply
	220 KV Rania	Not Installed	31.03.2024	Bus bar protection panel is under procurement by Purchase wing
	220 KV Bhiwani	Not Installed	30.10.2023	Equipment requirement raised in PR, busbar protection is proposed in integrated planning likely to be completed in FY 2023-24.
	220kV Madanpur	Not Installed	31.03.2024	
	220kV Tepla	Installed but Non-Operational	31.03.2024	
	220kV Rajokheri	Installed but Non-Operational	30.10.2023	The contract no. HDP-2351/REC-224/XEN/Tr.(P) dated 30-07-2018 awarded to M/s IKE Electric Pvt. Ltd. JV Deesan Agrotech Pvt. Ltd. was terminated vide CE/PD&C, HVPNL, Panchkula office memo no. Ch- 122/HDP-2351/Vol-II/Xen/Tr.(P) Dated – 24.02.2023. Matter is taken up with bus-bar protection firm engineer for commissioning.
BBMB	220kV Charkhi Dadri	Installed, under commissioing yet	15.01.2023	**commissioned on 31.01.2023**
	220kV Samaypur	Installed but Non-Operational	31.12.2023	
	220kV Dhulkote	Not Installed		Not feasible
	220kV Jagadhari	Not Installed		
	220kV Barnala	Not Installed		
UP	220kV Parichha	Installed but Non-Operational	30.06.2023	
	220kV Partapur	Installed but Non-Operational	Jan-23	
	220kV Bareilly (400/220kV Bareilly)	Installed but Non-Operational	Dec-23	Old panel capacity exhausted. New relay panel supplied & need to be
	220kV Pilibhit	Not Installed	Dec-23	New Relay panel supplied & need to be commissioned by Service Engineer
	220kV Amariya	Installed but Non-Operational	Dec-23	**commissioned on 15th July 2023**
	220kV Sultanpur	Installed but Non-Operational		Isolator contact status are not received due to damage of contacts on every
	220kV New Tanda	Not Installed		Busbar protection panel available on 03.03.2023 but not commissioned
	220kV Shahjhanpur	Installed but Non-Operational		NC/No switch status of bus isolator were improper & require control cable for
	220kV Ajijpur	Installed but Non-Operational		1. HV side 220kV CT of 160MVA T/F-I & II has bot proper ratio for bus bar
	220kV Nirpura	Installed but Non-Operational	Jan-23	
	220kV IITGNL	Installed but Non-Operational	Mar-23	
	220kV Rampur	Installed but Non-Operational	31.03.2024	
	220kV Barahua	Installed but Non-Operational		As Per Ex-En Transmission Approvel is Pending at HQ Level As Per Ex-En
	220kV Bansi	Not Installed	to be declared by transmission wing	**commissioned on 10th August 2023**
	220 KV S/S Azamgarh-2(Bargahan)	Installed but Non-Operational		
	220kV Chandausi	Not Installed	to be declared by transmission wing	220kV Chandausi on 13th September 2023
	220kV Rampur	Installed but Non-Operational	Jul-23	Main relay of bus bar protection is not working.
	220kV Sec. - 148, Noida	Installed but Non-Operational	Jan-23	
	220kV sec. 38A, Botanicla Garden	Not Installed	31.03.2024	Bus Bar protection panel not alloted
	220kV sec.-62, Noida	Not Installed	Aug-23	Relay and wiring Work Pending
	220kV Dadri	Not Installed	Sep-23	Relay and wiring Work Pending
	400kV S/S Agra	Installed but Non-Operational		**commissioned on 13th September 2023**
	220kV S/S Bah	Not Installed		
	220kV Sirsaganj	Not Installed		
	220kV S/S Farrukhabad (New)	Not Installed		**commissioned on 25th August 2023**
	220kV Boner	Not Installed		SINGLE BUS
	220kV Kasganj (Soron)	Installed but Non-Operational		
	220kV Khair	Installed but Non-Operational		
	220kV Kidwainagar	Installed but Non-Operational		
	220kV Chhata	Installed but Non-Operational		
	220kV Harduaganj	Installed but Non-Operational	31.12.2023	
	220kV Lalitpur	Not Installed	23-Apr	INSTALLATION IS NOT DONE DUE TO UNAVAILABLE OF CABLES. CABLE REQUEST HAS BEEN SENT TO LUCKONW HQ.
	220kV Sarnath	Installed but Non-Operational	Nov-23	
	220kV Sirathu, Kaushambi	Not Installed	Mar-23	

	220kV substation Fatehpur	Installed but Non-Operational	Mar-23	
	220kV S/S Bhelupur	Not Installed	Mar-23	
	220kV Hardoi Road, Lucknow	Installed but Non-Operational	30.09.2023	**commissioned on 08th October 2023**
	220kV CG City, Lucknow	Installed but Non-Operational	31.08.2023	Configurational error
	220kV Barabanki	Installed but Non-Operational	30.09.2023	Relay configuration is required for addtitional 220kV Jehta 1 &2 bays
	220kV Kursi Road, Lucknow	Installed but Non-Operational	30.09.2023	1- 87BB Auxilliary busbar relay at 160MVA T/F not available
	220kV BKT, Lucknow	Installed but Non-Operational	31.08.2023	Mian bus bar relay defective
	220kV Gomti Nagar, Lucknow	Installed but Non-Operational		Mal opoerating
	400 KV Substation Sarnath	Installed but Non-Operational		**Now operational**
	220kV S/S Raja Talab	Installed but Non-Operational	15.11.2023	RELAY DEFECTIVE
	20kV S/S Harahua	Installed but Non-Operational	31.11.2023	NOT COMMISSIONED
	220kV S/S Sahupuri	Installed but Non-Operational	Requirement for panel has been raised,not received from	Defective
	220kV S/S Mirzapur	Not Installed	3 Month	-
HP	220kV Chamba	Main-2 non operational	Dec-23	relay has been sent to OEM for repair
	220kV MattaSidh	Installed but Non-Operational		ABB has started the review work and within 02 months all the bus bar
	220kV kangoo	Installed but Non-Operational		
	220kV Nangal	Installed but Non-Operational		
	220kV Katha Baddi	Installed but Non-Operational		
Punjab	220 KV S/S Kotlisurat Malhi	Not Installed	Dec-23	within next 06 months (by Dec 2023) bus bar protection will be commissioned at these 09 substations
	220 KV S/S Maur	Not Installed		
	220 KV S/S Science city	Not Installed		
	220 KV S/S Banga	Not Installed		
	220 KV S/S Hoshiarpur	Not Installed		
	220 KV S/S Goraya	Not Installed		
	220 KV S/S Badhni kalan	Not Installed		
	220 KV S/S Bhari	Not Installed		
	220 KV S/S Bhawanigarh	Not Installed		
Rajasthan	765 KV GSS Phagi	Installed but non operational	Dec-23	CU of Alstom make Bus-Bar is defective. Purchas case will be taken up
	220 kV GSS Vatika	Not installed		As M/s ER did not finished the project, so it was awarded to M/s Kaycee infra on risk-cost basis , however the bus bar scheme has not been commissioned yet. Matter has been taken up with firm
	220 kV GSS Niwana	Not installed		To be commissioned shortly
	220 kV GSS Alwar	Not installed		CU defective in existing ABB make Bus bar Scheme. Matter has been taken up with firm
	220 kV GSS Bansur	Not installed		To be commissioned shortly
	220 kV GSS Behror	Not installed		To be commissioned shortly
	220KV GSS Hindaun	Not installed		To be commissioned shortly
	220KV GSS Dooni	Not installed		To be commissioned shortly
	220KV GSS Bhawanimandi	Not installed		**commissioned**
	220 KV GSS Sakatpura, Kota	Not installed	Dec-23	Work is pending on the part of M/s GE and S.E. (T&C), RVPN, Kota due to defective Central Control Unit. CU will be send to firm for repair
	400 KV GSS Ajmer (220 KV BUS)	Installed but non operational		Isolator status of in 87BB of respective 220 KV bay No. 213,214, 215 & 216 was not avaliable due to this 220 KV Main Bus-bar-II is out of ckt. work under progress
	220 kV GSS, Beawar	Not installed		New Bus Bar protection commissioning work is ongoing of M/S Danish. Case has been taken up with firm
	220 KV GSS Jethana	Not installed		New Bus Bar protection commissioning work is ongoing of M/S Danish. To be commissioned shortly
	220 KV GSS Kuchaman City	Installed but non operational		due to problem in Central Unit Relay (87CU) Since 28.01.2022 , CU has been removed due to defective & replacement / repair under process at GSS Part. Case has been taken up with firm
	220 KV GSS Bherunda	Not installed		New Bus Bar protection commissioning work is ongoing of M/S Danish. To be commissioned shortly
	220 KV GSS Kuchera	Not installed		New Bus Bar protection commissioning work is ongoing of M/S Danish. To be commissioned shortly
	220 KV GSS Reengus	Installed but non operational		New Bus Bar Scheme has been proposed and approved for replacement from defective Bus-Bar Scheme. The Replacement work will be carried out by firm shortly
	220 KV GSS Laxmangarh	Not installed		**Commissioned**
	220KV GSS Khetri Nagar	Installed but non operational	Dec-23	The newly Bus bar protection scheme has been proposed and approved for replacement of deffective bus bar scheme. hence the work of replacement will be carried out by the firm shortly
	400 KV GSS, Babai	Installed but non operational		PU of 315 MVA ICT-III is defective with error code 0X83720007. Matter has been taken up with firm
	220 KV GSS Chittorgarh	Installed but non operational		All bay units of the BUS BAR scheme are defective. Matter has been taken up with firm
	400 KV GSS BHILWARA(220 KV BUS)	Installed but non operational		BAY UNIT OF 220 KV TBC DEFECTIVE. Matter has been taken up with firm
	220 KV GSS MANDALGARH	Not installed		**commissioned**
	220KV GSS Debari	Not installed	Dec-23	Going to be install / commission new bus bar protection scheme supply by Danish.
	220KV GSS Amberi	Not installed		Going to be install / commission new bus bar protection scheme supply by Danish.
	220KV GSS Madri	Not installed		Going to be install / commission new bus bar protection scheme supply by Danish.
	400 KV GSS Surpura (Jodhpur) 220 KV	Installed but non operational		Allotted & Panel Received
	400 KV GSS Akal (Jaisalmer) 220 KV	Installed but non operational		One PU defective. Case has been taken up with firm
	220 KV GSS Jodhpur	Installed but non operational		A&FS and TS issued. Case has been send for approval
	220 KV GSS NPH Jodhpur	Not installed		To be commissioned shortly
	220 KV GSS Badisid	Not installed		Allotted & Panel Received. To be commissioned shortly
	220 KV GSS Bhadla	Not installed		Allotted & Panel Received. To be commissioned shortly
	220 KV GSS Pali	Installed but non operational		New bays to be incorporated and GPS defective. work under progress
	220 KV GSS Ramgarh	Not installed		Allotted & Panel Received. To be commissioned shortly
	220 KV GSS Balotra	Installed but non operational		Isolator status issue. work under progress
	220 KV GSS Sayla	Not installed		Allotted & Panel Received. To be commissioned shortly
	400 KV GSS Bikaner 400 KV BUS	Installed but non operational		Not operational (Areva Make) Communication fiber error. Matter has been
	220 KV GSS Ratangarh	Not installed		Allotted & Panel Received. To be commissioned shortly
	220 KV GSS Sujangarh	Not installed		Allotted & Panel Received. To be commissioned shortly
	220 KV GSS Halasar	Not installed		Allotted & Panel Received. To be commissioned shortly
	220 KV GSS Tehandesar	Not installed		Allotted & Panel Received. To be commissioned shortly
	220 KV GSS Rawatsar	Not installed		Allotted & Panel Received. To be commissioned shortly

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

Haryana	220KV S/Stn Jorian	220KV Jorian -Abdullapur Ckt-1	Main-1 & Main-2 = Numerical all other Electromechanical	Working properly, need to be replace with numerical relay
		220KV Jorian -Abdullapur Ckt-2	Main-1 & Main-2 = Numerical all other Electromechanical	Working properly, need to be replace with numerical relay
		220/66, 160MVA T/F T-1	Defferntial Relay = Numerical all other Electromechanical	Working properly, need to be replace with numerical relay
		220/66, 100MVA T/F T-2	All Electromechanical	Working properly, need to be replace with numerical relay
		220/66, 100MVA T/F T-3	Defferntial & REF Relay = Numerical all other Electromechanical	Working properly, need to be replace with numerical relay
	220 kv Salempur	220 KV BAKANA–SALEMPUR CKT-I	All electromechanical type,except DPR relays	Working properly, need to be replace with numerical relay
		220 KV BAKANA–SALEMPUR CKT-II	All electromechanical type,except DPR relays	Working properly, need to be replace with numerical relay
		220 KV SALEMPUR-NISSING CKT-I	All electromechanical type,except DPR relays	Working properly, need to be replace with numerical relay
		220 KV SALEMPUR-NISSING CKT-II	All electromechanical type,except DPR relays	Working properly, need to be replace with numerical relay
		220 KV BUS-COUPLER	All electromechanical type	Working properly, need to be replace with numerical relay
		220/66 KV 100MVA T/F T-I	All electromechanical type,except Differential relays	Working properly, need to be replace with numerical relay
		220/66 KV 100MVA T/F T-2	All electromechanical type,except Differential relays	Working properly, need to be replace with numerical relay
	TS Division Karnal	220kV Nissing-PTPS Ckt-I	All electromechanical type,except DPR relays	
		100 MVA 220/132kV T-8	All electromechanical type,except Differential relay	Differential relay replcaed with Numerical type
		220 kV Bus-coupler	All electromechanical type	C&R panel will be replaced soon
		220 KV DCRTPP–UNISPUR CKT-I	All electromechanical type,except DPR relays	
		220 KV DCRTPP–UNISPUR CKT-II	All electromechanical type,except DPR relays	
		220 KV KARNAL–UNISPUR LINE	All electromechanical type,except DPR relays	
		220/132 KV 100 MVA T/F T-1	All electromechanical type,except R.E.F & Differential relay	
		220/132 KV 100 MVA T/F T-2	All electromechanical type,except R.E.F & Differential relay	
		220/132 KV 160 MVA T/F T-4	All electromechanical type,except R.E.F & Differential relay	
	220kV S/Stn Palla	100MVA 220/66kV T-1	REF & backup Electromechnical	
		100MVA 220/66kV T-2	REF & backup Electromechnical	
		100MVA 220/66kV T-7	Diff & Backup lectromechnical and REF static	
		220kV Palla - Sector 78	backup Electromechnical	
		220kV Palla - FGPP ckt-II	backup Electromechnical	
	220 kV S/Stn. Pali	100 MVA 220/66 kV T-1	REF & backup Electromechnical	
		100 MVA 220/66 kV T-3	REF & backup Electromechnical	
		220 kV Pali-BBMB Samaypur Ckt 1	backup Electromechnical	
		220 kV Pali-BBMB Samaypur Ckt 2	backup Electromechnical	
		220 kV Pali-Sector 46 Ckt 1	backup Electromechnical	
		220 kV Pali-Sector 46 Ckt 2	backup Electromechnical	
		220 kV Pali-Sector 65 Ckt 1	backup Electromechnical	
		220 kV Pali-Badshahpur Ckt 2	backup Electromechnical	
		220 kV Pali-Sector 56 Ckt 1	backup Electromechnical	
		220 kV Pali-Sector 56 Ckt 2	backup Electromechnical	
	220kV S/Stn Palwal	220/66kV 160MVA T-1 T/F	REF & backup Electromechnical	
		220/66kV 100MVA T-2 T/F	Diff, REF & Backup Electromechnical	
		220kV Prithala Palwal Ckt I	backup Electromechnical	
		220kV Prithala Palwal Ckt II	backup Electromechnical	
	220kv S/Stn. Sector 52A GGM	Sec 56-Sec 52A ckt 1	NUMERICAL RELAY qty 02 and electromechanical qty 01 (backup)	LINE IS PROVIDED WITH 2 MAIN NUMERICAL DPR AND 01 ELECTROMECHANICAL FOR BACKUP
		Sec 56-Sec 52A ckt 2	NUMERICAL RELAY qty 02 and electromechanical qty 01 (backup)	LINE IS PROVIDED WITH 2 MAIN NUMERICAL DPR AND 01 ELECTROMECHANICAL FOR BACKUP
		Sec 72-Sec 52A	NUMERICAL RELAY qty 02 and electromechanical qty 01 (backup)	LINE IS PROVIDED WITH 2 MAIN NUMERICAL DPR AND 01 ELECTROMECHANICAL FOR BACKUP
		Sec 57-Sec 52A	NUMERICAL RELAY qty 02 and electromechanical qty 01 (backup)	LINE IS PROVIDED WITH 2 MAIN NUMERICAL DPR AND 01 ELECTROMECHANICAL FOR BACKUP
	220KV S/Stn. Sonepat		(Diff.-3 , REF-3, O/C/E/F-4 , Electromechnical Relays	The electromechanical differential and DPR are not available in the store. However, the same shall be replaced after availability in the store.
	220kV Rohtak		(REF-2, O/C/E/F-12) Electromechnical Relays	
	400 KV S/S Moradabad	400 KV MORADABAD - RAMPUR LINE	LBB- ABB(RAICA) / STATIC	UNDER PGCIL
		400 KV MORADABAD - KASHIPUR LINE	LBB- English Electric(CTIG) / Electromechnical	
		400 KV, TRANSFER BUS	LBB- English Electric(CTIG) / Electromechnical	
		400 KV, BUS COUPLER	LBB- English Electric(CTIG) / Electromechnical	
	220kV S/S BARAUT	220/132kV 200MVA TRANSFORMER-1	REF Protection - Electromechanical	
	220kV S/S BAGHPAT	220/132kV 160MVA TRANSORMER-1	Backup (L.V. Side) - Electromechanical	Electromechanical (Back-up) relay commissioned on 05/03/2023 on LV side of 160MVA T/F-I as temporary measure as Numerical Back-up (Make-ZIV) relay failed to issue tripping command during testing.
	220 kV KHURJA	220/132Kv 200MVA Transformer-I	REF-Static	
	220 kV DEBAI	220/132Kv 100MVA Transformer-I	Numerical	LV BackUp relay is faulty

UP	220 kV Jahangirabad	220/132Kv 160MVA Transformer-I	REF-Static	
	400KV S/S MURAD NAGAR	220KV LONI LINE	O/C & E/F RELAY IS ELECTROMECHANICAL.	
		220KV FARID NAGAR LINE	O/C & E/F RELAY IS ELECTROMECHANICAL.	
		220KV INTER CONNECTOR-I MURAD NAGAR LINE	O/C & E/F RELAY IS ELECTROMECHANICAL.	
		220KV INTER CONNECTOR-II MURAD NAGAR LINE	O/C & E/F RELAY IS ELECTROMECHANICAL.	
		220KV SAHIBABAD LINE	O/C & E/F RELAY IS ELECTROMECHANICAL.	
		220KV PRATAP VIHAR LINE	O/C & E/F RELAY IS ELECTROMECHANICAL.	
		220KV TBC	O/C & E/F RELAY IS ELECTROMECHANICAL.	
		400KV TBC	O/C & E/F RELAY IS ELECTROMECHANICAL.	
		400KV ALIGARH LINE	LBB RELAY IS ELECTROMECHANICAL.	
		400KV ATOUR LINE	LBB RELAY IS ELECTROMECHANICAL.	
	220KV S/S MURAD NAGAR	220KV BUS COUPLER	O/C RELAY IS ELECTROMECHANICAL	
	400KV S/S Gorakhpur	400KV TBC	Electromechanical	
		220KV TBC	Electromechanical	
	220KV S/S Barahua	220KV PGCIL	Back up relay electromechenical	
	220KV S/S Basti	220 KV Basti Tanda line	67N(2TJM12)(Electromechanical)	
		63MVA Transformer-II	HV Side directional o/c&e/f(Electromechanical)	
	400 KV SS Kasara,Mau	200MVA, 400/132KV ICT-1st	REF & Over flux relay Electromechanical	
		200MVA, 400/132KV ICT-2nd	REF & Over flux relay Electromechanical	
	220 KV SS Substation Hafizpur Azamgarh	160 MVA ICT -1	Electromechanical(EE Make)	Tendering is under process
	220kV Khara		Electromechanical	process of replacing electrochemical relay with numerical relay has been started, it will be completed within 2-3 months.
	400kV S/S Sultanpur	240 MVA ICT-II	Non Numerical	
		50 MVAR Obra Line Reactor	Non Numerical	
	220kV S/S Sultanpur	220kV B/C	Non Numerical	
		160 MVA T/F-I	Non Numerical	
NPCIL	220kV RAPPC	220KV Anta line	Backup relay: Static relay(RAPDK3)	Procurement of Numerical relay is in progress for replacement of Static relay (Backup protection).
	220kV NAPP	NAPP-SAMBHAL		Main-2 distance protection is under procurement. ECD- June2024
		NAPP-SIBHOLI		Main-2 distance protection is under procurement. ECD- June2024
		NAPP-DIBAI		Main-2 distance protection is under procurement. ECD- June2024
		NAPP-KHURJA		Main-2 distance protection is under procurement. ECD- June2024
		NAPP-ATRAULI		

Annexure-XII

RAJASTHAN RAJYA VIDYUT PRASARAN NIGAM LTD

[Corporate Identity Number CIN: U40109RJ2000SGC016485]
(AN ISO 9001:2015 CERTIFIED COMPANY)
Regd. Office: VidyutBhawan, Janpath ,Jyoti Nagar, Jaipur 302005

OFFICE OF THE SUPERINTENDING ENGINEER (Automation, N/M &SP)
Rom No.323, VidyutBhawan, Janpath ,Jyoti Nagar, Jaipur (Tel.No. 2740752 / Fax No. 2740794)
Email: se.pp@rvpn.co.in, website: www.http://emergy.rajasthan.gov.in/rvpnl

No. RVPN/ SE(AUTOMATION)/ XEN(PP&D)/ AE-2(P&P)/ D.116 Jaipur Date 21.12.2023

The General Manager (NRLDC)
Grid Controller of India Limited,
18-A, ShaheedJeet Singh SansanwalMarg, KatwariaSarai
New Delhi-110016.

Sub:-Proposed SPS for 2x315MVA, 400/220 kV ICTs at Suratgarh Thermal Power Station.

On the above captioned subject, please find attached the proposed SPS for 2x315 MVA, 400/220 KV ICTs at Suratgarh Thermal Power Station with request to please include in the next meeting of OCC for discussion and necessary approval of the OCC forum. This SPS has been finalized after detailed deliberations with the officers of RVPN, RVUN and Rajasthan SLDC in a meeting held on dated 12.12.2023.

Encl: As above

Yours sincerely,

(S.C. Meena)
Chief Engineer (PP & D)

Copy to the following for information and necessary action please-

1. The Member Sceratry (NRPC), 18-A, ShaheedJeet Singh Marg, KatwariaSarai, New Delhi-110016
2. The Chief Engineer (LD/T&C/MPT&S/O&M), RVPN, Jaipur/Jodhpur/Jodhpur/RVUN-STPS-Suratgarh.
3. The Chief Engineer, Power System Planning & Appraisal-I Division, CEA, Sewa Bhawan, RK Puram-I, New Delhi-110066
4. The Superintending Engineer (Operation), NRPC, 18-A, ShaheedJeet Singh Marg, Katwaria Sarai, New Delhi-110016.
5. The System Operator-2, NRLDC, 18-A, ShaheedJeet Singh Marg, Katwaria Sarai, New Delhi-110016

Encl: As above

Chief Engineer (PP & D)

Signature valid
Digitally signed by Suresh Chand Meena
Designation : Chief Engineer
Date: 2023.12.20 16:10:35 IST
Reason: Approved

Proposed SPS for 2x315 MVA, 400/220 kV ICTs at SURATGARH THERMAL POWER STATION

1. Generation Details at STPS

- There is generation on the 220 kV voltage level and 400 kV voltage level at Suratgarh Thermal Power Station (STPS).
- There are 6 generating units at STPS. Each unit is rated at 250MW. Two generators are connected on the 220 kV bus and four generators are connected on the 400 kV bus. Details of the generating units at STPS are included in Table 1.

Table 1: Generation Capacity at STPS

S. No.	Name of Generating Unit	Rated MW Capacity	Ex-bus Generation	Rated Generation Voltage (kV)	Voltage of Bus to which Generating unit is connected
1	Unit-1	250 MW	225MW	16.5kV	220 kV
2	Unit-2	250 MW	225MW	16.5kV	220 kV
3	Unit-3	250 MW	225MW	16.5kV	400 kV
4	Unit-4	250 MW	225MW	16.5kV	400 kV
5	Unit-5	250 MW	225MW	16.5kV	400 kV
6	Unit-6	250 MW	225MW	16.5kV	400 kV

2. Details of Installed ICTs and Transmission Lines

- There are 2x315MVA, 400/220 kV ICTs at Suratgarh Thermal Power Station (STPS).
- These ICTs are used to step down the power from 400kV voltage level to 220 kV voltage level to meet load demand in Halasar, Bhadra, Rawatsar, Suratgarh, Hanumangarh, Padmapur and Sriganganagar region.
- Loading on these ICTs is maximum during off-RE hours.
- Load sharing on both the ICTs is almost equal.
- 220 kV GSS at Halasar, Bhadra, Rawatsar and Udyogvihar are connected to STPS through 220 kV S/C lines. These GSS are further connected in ring system.
- 220 kV GSS Suratgarh is connected to STPS through 220 kV D/C line.
- 220 kV GSS Suratgarh, 220 kV GSS Padampur, 220 kV GSS Hanumangarh and 220 kV GSS Udyogvihar are connected in ring system.
- Power map of transmission system in Suratgarh and nearby region is shown in Figure 1.

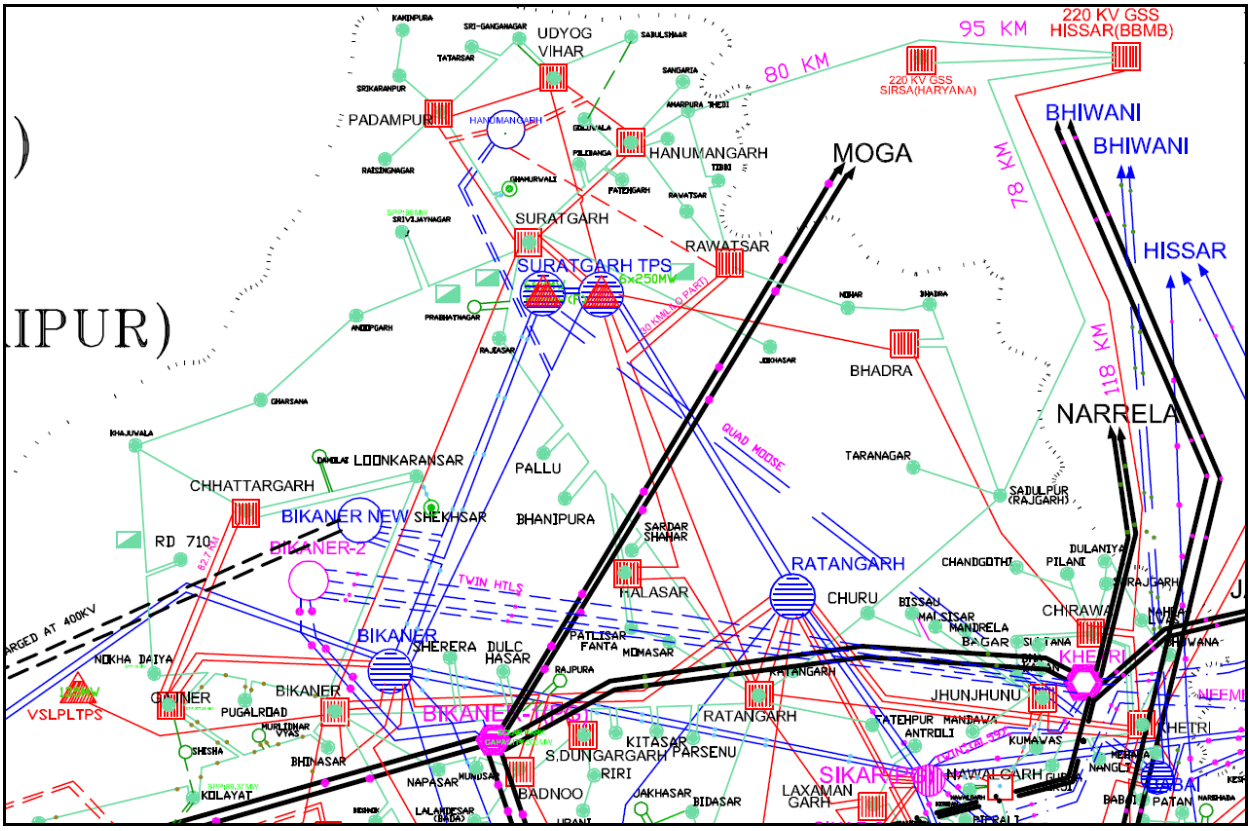


Fig. 1 Power map of Suratgarh region

3. Load Details on ICTs and Transmission Lines Associated with STPS

- The 2x315MVA, 400/220 kV ICTs at STPS are used to cater load demand in the Halasar, Bhadra, Rawatsar, Suratgarh, Hanumangarh, Padmapur and Sriganganagar region.
- Peak Loads recorded on the 400/220 kV ICTs, 400 kV lines and 220 kV lines associated with STPS are detailed below in Table 2.
- Peak loads and average loads recorded on the 220/132 kV Transformers on the 220 kV GSS in the region is also mentioned in the Table 1.

Table 1: Load Details on ICTs and Transmission Lines Associated with STPS and GSS fed from STPS

S. No.	Name of Element	Recorded Peak Load (MW)	Average Load (MW)
1	315MVA, 400/220 kV ILT-I at STPS	297MW	260 MW
2	315MVA, 400/220 kV ILT-II at STPS	297MW	260 MW
3	400 kV STPS-Ratangarh Line-I	640MW	
4	400 kV STPS-Ratangarh Line-II	640MW	
5	400 kV STPS-Bikaner Line	225MW (Bidirectional Power flow)	
6	400 kV STPS-SCSTPS Line-I	550MW (Import)	
7	400 kV STPS-SCSTPS Line-II	550MW (Import)	
8	220 kV S/C STPS-Halasar line	196 MW	106 MW
9	220 kV S/C STPS-Rawatsar line	174MW	120MW
10	220 kV S/C STPS-Bhadra line	209.6MW	174.8MW

11	220 kV S/C STPS-Udyogvihar (Sriganganagar) line	206MW	144MW
12	220 kV STPS-Suratgarh line Ckt-I	246MW	201MW
13	220 kV STPS-Suratgarh line Ckt-II	246MW	200MW
14	220 kV S/C Halasar-Ratangarh line	196 MW	106 MW
15	220 kV S/C Rawatsar-Ratangarh line	134MW	90MW
16	220 kV Suratgarh-Hanumangarh line	246MW	138MW
17	220 kV Suratgarh-Padampur line	191MW	113MW
18	220 kV Suratgarh-Bikaner line	119MW	65MW
19	220 kV Padampur-Udyogvihar line	136MW	70MW
20	220 kV Udyogvihar-Hanumangarh line	145MW	92.75MW
21	100MVA, 220/132 kV transformer-I at Bhadra	87.21MW	74.48MW
22	100MVA, 220/132 kV transformer-II at Bhadra	87MW	64.3MW
23	160MVA, 220/132 kV transformer at Rawatsar	143MW	100MW
24	160MVA, 220/132 kV transformer-I at Halasar	160MW	124MW
25	100MVA, 220/132 kV transformer-II at Halasar	100MW	58MW
26	100MVA, 220/132 kV transformer-I at Suratgarh	105MW	87MW
27	100MVA, 220/132 kV transformer-II at Suratgarh	98MW	78MW
28	50MVA, 220/132 kV transformer-III at Suratgarh	53MW	47MW
29	100MVA, 220/132 kV transformer-I at Hanumangarh	91.10MW	71.37MW
30	160MVA, 220/132 kV transformer-II at Hanumangarh	154MW	122.20MW
31	160MVA, 220/132 kV transformer at Udyog Vihar	148MW	103MW
32	100MVA, 220/132 kV transformer-I at Padampur	60MW	42MW
33	160MVA, 220/132 kV transformer-II at Padampur	82MW	63MW

4. Proposed SPS for ILTs at Suratgarh Thermal Power Station

- Communication channels are available on the following transmission lines which can be used to communicate the trip command from STPS to the transformers installed on the respective 220 kV GSS:-
  - 220 kV S/C STPS-Rawatsar line line
  - 220 kV S/C STPS-Bhadra line
  - 220 kV S/C STPS-Udyogvihar (Sriganganagar) line
- 220 kV GSS Rawatsar is fed from STPS sometimes and sometimes it is also fed from ratangarh depending on the load and grid conditions. Hence, 220 kV GSS Rawatsar cannot be included in the SPS for ICTs at STPS. 220 kV GSS Halasar can be considered for SPS after shifting of a PLCC panel from 220 kV GSS Ratangarh to STPS.
- After detailed analysis of loading conditions, power injection, available communication channels & grid interconnection issues, following universal logic is proposed for the 2x315MVA, 400/220 kV ICTs at Suratgarh Thermal Power Station (STPS) which will work for all the operating scenarios:-

SPS Logic: Overloading of the ILTs due to tripping of generating units on the 220 kV Bus or increased load in the region or tripping of one 315 MVA, 400/220 kV ICT. These overload settings with time delays will be implemented for both the ICTs.

Trip command for the Transformers at 220 kV GSS will be generated from both the ILTs at 100% loading.

- Trip 2x100MVA, 220/132 kV Transformer at 220 kV GSS Bhadra with time delay of 1.0s (**Load curtailment: 138.78MW**)
- Trip 1x160MVA, 220/132 kV Transformer and 1x100MVA, 220/132 kV Transformer at 220 kV GSS Halasar with time delay of 1.2s (**Load curtailment: 182 MW**)
- Trip 1x160MVA, 220/132 kV Transformer at 220 kV GSS Udyogvihar and 132 kV S/C Udyogvihar-Sriganganar line with time delay of 1.4s (**Load curtailment: 103MW**)

- Tripping commands for the transformers installed at the identified 220 kV GSS will be generated from the overload/Over current relays of both the 315MVA, 400/220 kV ILTs at STPS during the condition of overloading of ILTs at STPS. The overloading may be observed due to tripping of generators connected on 220 kV Bus, increased load in the region or tripping of any one of 315MVA, 400/220 kV ICT at STPS. Schematic diagram for implementation of proposed SPS Logic-1 is elaborated in Figure 2.

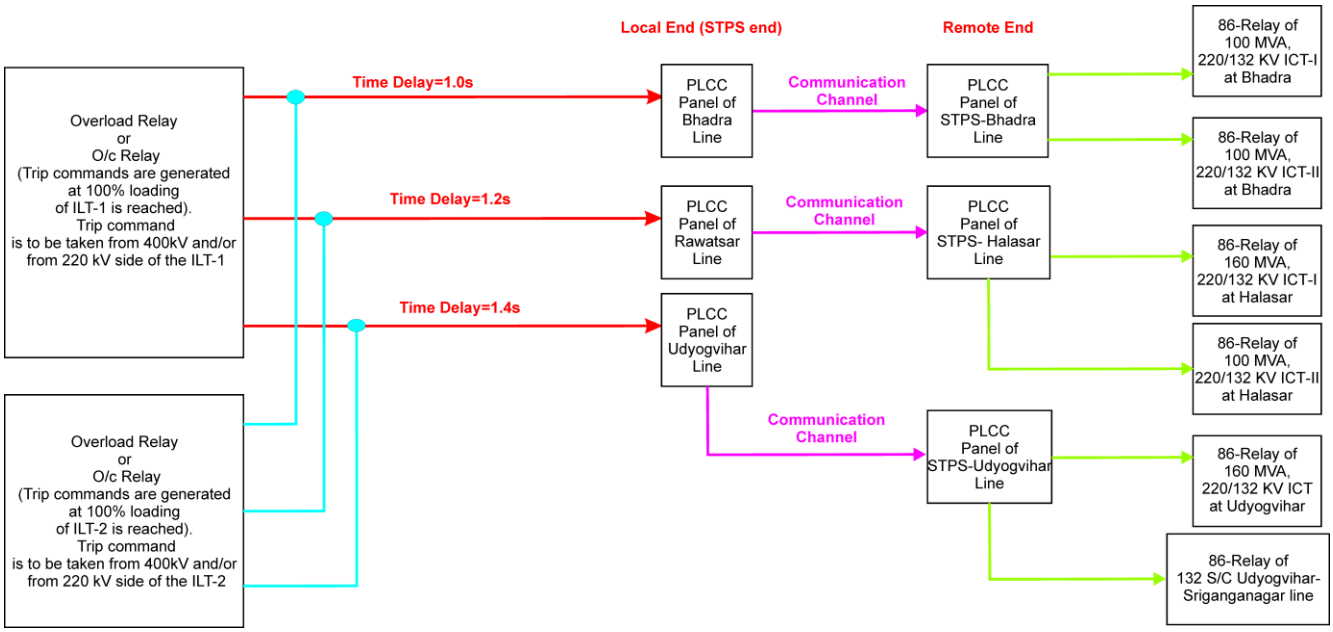


Fig. 2 Schematic diagram for implementation of proposed SPS Logic

- To maintain supply of critical loads connected to all the GSS in the region, tripped 220/132 kV Transformers at the identified 220 kV GSS may be re-connected after applying load shedding on all the GSS in the region in such a quantum to maintain loadings on the 2x315MVA, 400/220 kV ILTs at STPS within permissible limits. Same

procedure will be adopted in the event of tripping of any one of the 315MVA, 400/220 kV ILT at STPS to maintain loadings on the healthy ILT at STPS within permissible limits.

Annexure-XIII

RAJASTHAN RAJYA VIDYUT PRASARAN NIGAM LTD

[Corporate Identity Number CIN: U40109RJ2000SGC016485]
(AN ISO 9001:2015 CERTIFIED COMPANY)
Regd. Office: VidyutBhawan, Janpath ,Jyoti Nagar, Jaipur 302005

OFFICE OF THE SUPERINTENDING ENGINEER (Automation, N/M &SP)
Rom No.323, VidyutBhawan, Janpath ,Jyoti Nagar, Jaipur (Tel.No. 2740752 / Fax No. 2740794)
Email: se.pp@rvpn.co.in, website: www.http://emergy.rajasthan.gov.in/rvpnl

No. RVPN/ SE(AUTOMATION)/ XEN(PP&D)/ AE-2(P&P)/ D. 131 Jaipur Date 10.01.2024

The General Manager (NRLDC)
Grid Controller of India Limited,
18-A, ShaheedJeet Singh SansanwalMarg, KatwariaSarai
New Delhi-110016.

Sub:-Proposed SPS for 2x315MVA, 400/220 kV ICTs at Suratgarh Thermal Power Station.

On the above captioned subject, please find attached the revised proposed SPS for 2x315 MVA, 400/220 KV ICTs at Suratgarh Thermal Power Station after incorporating the comments of Grid-India with request to please consider for discussion and necessary approval of the OCC forum.

Encl: As above

(S.C. Meena)
Chief Engineer (PP&D)
RVPNL, Jaipur.

Copy to the following for information and necessary action please-

1. The Member Sceratry (NRPC), 18-A, ShaheedJeet Singh Marg, KatwariaSarai, New Delhi-110016
2. The Chief Engineer (LD/T&C/MPT&S/O&M), RVPN, Jaipur/Jodhpur/Jodhpur/RVUN-STPS-Suratgarh.
3. The Chief Engineer, Power System Planning & Appraisal-I Division, CEA, SewaBhawan, RK Puram-I, New Delhi-110066
4. The Superintending Engineer (Operation), NRPC, 18-A, ShaheedJeet Singh Marg, KatwariaSarai, New Delhi-110016.
5. The System Operator-2, NRLDC, 18-A, ShaheedJeet Singh Marg, KatwariaSarai, New Delhi-110016

Encl: As above

Chief Engineer (PP&D)
RVPNL, Jaipur

Signature valid
RajKaj Ref 5320207
Digitally signed by S[illegible]sh Chand Meena
Designation : [illegible]Engineer
Date: 2024.01.[illegible]8:00:35 IST
Reason: Approved

Proposed SPS for 2x315 MVA, 400/220 kV ICTs at SURATGARH THERMAL POWER STATION

1. Generation Details at STPS

- There is generation on the 220 kV voltage level and 400 kV voltage level at Suratgarh Thermal Power Station (STPS).
- There are 6 generating units at STPS. Each unit is rated at 250MW. Two generators are connected on the 220 kV bus and four generators are connected on the 400 kV bus. Details of the generating units at STPS are included in Table 1.

Table 1: Generation Capacity at STPS

S. No.	Name of Generating Unit	Rated MW Capacity	Ex-bus Generation	Rated Generation Voltage (kV)	Voltage of Bus to which Generating unit is connected
1	Unit-1	250 MW	225MW	16.5kV	220 kV
2	Unit-2	250 MW	225MW	16.5kV	220 kV
3	Unit-3	250 MW	225MW	16.5kV	400 kV
4	Unit-4	250 MW	225MW	16.5kV	400 kV
5	Unit-5	250 MW	225MW	16.5kV	400 kV
6	Unit-6	250 MW	225MW	16.5kV	400 kV

2. Details of Installed ICTs and Transmission Lines

- There are 2x315MVA, 400/220 kV ICTs at Suratgarh Thermal Power Station (STPS).
- These ICTs are used to step down the power from 400kV voltage level to 220 kV voltage level to meet load demand in Halasar, Bhadra, Rawatsar, Suratgarh, Hanumangarh, Padmapur and Sriganganagar region.
- Loading on these ICTs is maximum during off-RE hours.
- Load sharing on both the ICTs is almost equal.
- 220 kV GSS at Halasar, Bhadra, Rawatsar and Udyogvihar are connected to STPS through 220 kV S/C lines. These GSS are further connected in ring system.
- 220 kV GSS Suratgarh is connected to STPS through 220 kV D/C line.
- 220 kV GSS Suratgarh, 220 kV GSS Padampur, 220 kV GSS Hanumangarh and 220 kV GSS Udyogvihar are connected in ring system.
- Power map of transmission system in Suratgarh and nearby region is shown in Figure 1.

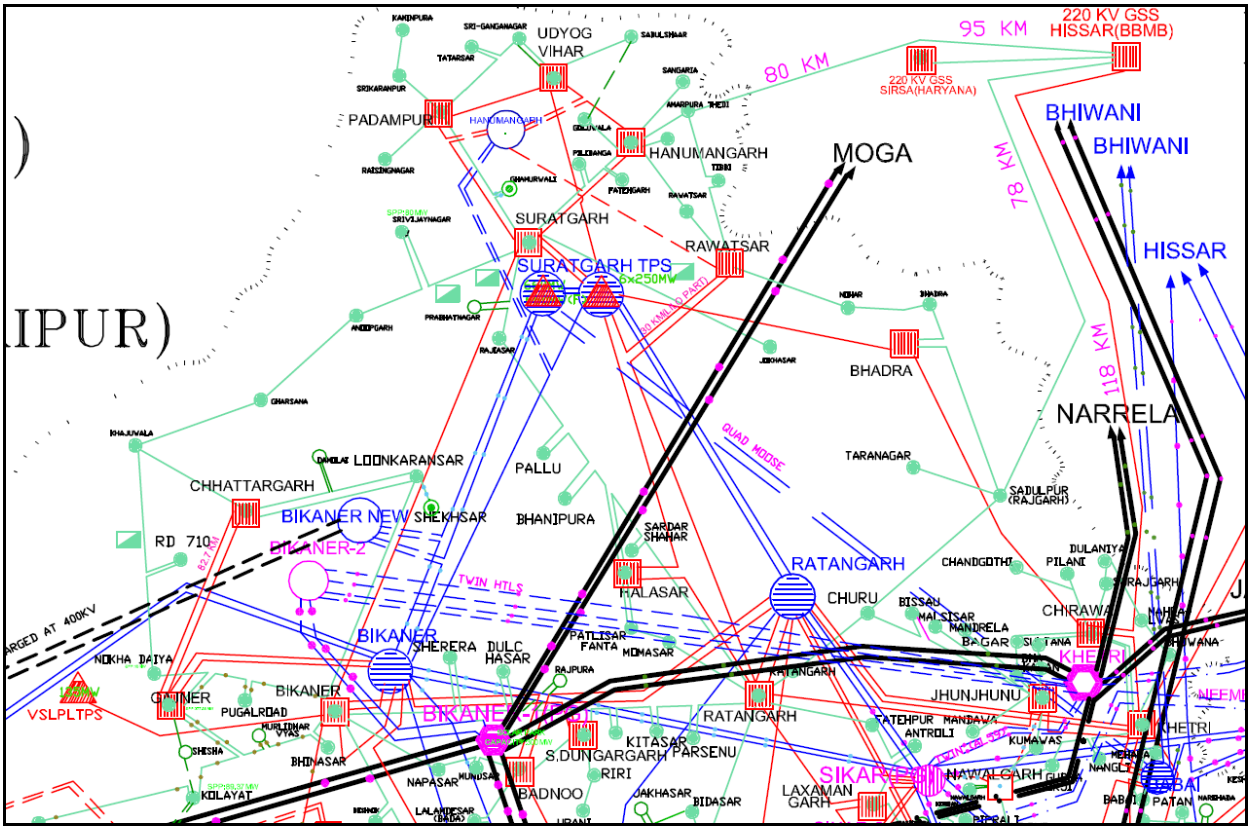


Fig. 1 Power map of Suratgarh region

3. Load Details on ICTs and Transmission Lines Associated with STPS

- The 2x315MVA, 400/220 kV ICTs at STPS are used to cater load demand in the Halasar, Bhadra, Rawatsar, Suratgarh, Hanumangarh, Padmapur and Sriganganagar region.
- Peak Loads recorded on the 400/220 kV ICTs, 400 kV lines and 220 kV lines associated with STPS are detailed below in Table 2.
- Peak loads and average loads recorded on the 220/132 kV Transformers on the 220 kV GSS in the region is also mentioned in the Table 1.

Table 1: Load Details on ICTs and Transmission Lines Associated with STPS and GSS fed from STPS

S. No.	Name of Element	Recorded Peak Load (MW)	Average Load (MW)
1	315MVA, 400/220 kV ILT-I at STPS	297MW	260 MW
2	315MVA, 400/220 kV ILT-II at STPS	297MW	260 MW
3	400 kV STPS-Ratangarh Line-I	640MW	
4	400 kV STPS-Ratangarh Line-II	640MW	
5	400 kV STPS-Bikaner Line	225MW (Bidirectional Power flow)	
6	400 kV STPS-SCSTPS Line-I	550MW (Import)	
7	400 kV STPS-SCSTPS Line-II	550MW (Import)	
8	220 kV S/C STPS-Halasar line	196 MW	106 MW
9	220 kV S/C STPS-Rawatsar line	174MW	120MW
10	220 kV S/C STPS-Bhadra line	209.6MW	174.8MW

11	220 kV S/C STPS-Udyogvihar (Sriganganagar) line	206MW	144MW
12	220 kV STPS-Suratgarh line Ckt-I	246MW	201MW
13	220 kV STPS-Suratgarh line Ckt-II	246MW	200MW
14	220 kV S/C Halasar-Ratangarh line	196 MW	106 MW
15	220 kV S/C Rawatsar-Ratangarh line	134MW	90MW
16	220 kV Suratgarh-Hanumangarh line	246MW	138MW
17	220 kV Suratgarh-Padampur line	191MW	113MW
18	220 kV Suratgarh-Bikaner line	119MW	65MW
19	220 kV Padampur-Udyogvihar line	136MW	70MW
20	220 kV Udyogvihar-Hanumangarh line	145MW	92.75MW
21	100MVA, 220/132 kV transformer-I at Bhadra	87.21MW	74.48MW
22	100MVA, 220/132 kV transformer-II at Bhadra	87MW	64.3MW
23	160MVA, 220/132 kV transformer at Rawatsar	143MW	100MW
24	160MVA, 220/132 kV transformer-I at Halasar	160MW	124MW
25	100MVA, 220/132 kV transformer-II at Halasar	100MW	58MW
26	100MVA, 220/132 kV transformer-I at Suratgarh	105MW	87MW
27	100MVA, 220/132 kV transformer-II at Suratgarh	98MW	78MW
28	50MVA, 220/132 kV transformer-III at Suratgarh	53MW	47MW
29	100MVA, 220/132 kV transformer-I at Hanumangarh	91.10MW	71.37MW
30	160MVA, 220/132 kV transformer-II at Hanumangarh	154MW	122.20MW
31	160MVA, 220/132 kV transformer at Udyog Vihar	148MW	103MW
32	100MVA, 220/132 kV transformer-I at Padampur	60MW	42MW
33	160MVA, 220/132 kV transformer-II at Padampur	82MW	63MW

4. Proposed SPS for ILTs at Suratgarh Thermal Power Station

- Communication channels are available on the following transmission lines which can be used to communicate the trip command from STPS to the transformers installed on the respective 220 kV GSS:-
  - 220 kV S/C STPS-Rawatsar line line
  - 220 kV S/C STPS-Bhadra line
  - 220 kV S/C STPS-Udyogvihar (Sriganganagar) line
- 220 kV GSS Rawatsar is fed from STPS sometimes and sometimes it is also fed from ratangarh depending on the load and grid conditions. Hence, 220 kV GSS Rawatsar cannot be included in the SPS for ICTs at STPS. 220 kV GSS Halasar can be considered for SPS after shifting of a PLCC panel from 220 kV GSS Ratangarh to STPS.
- After detailed analysis of loading conditions, power injection, available communication channels & grid interconnection issues, following universal logic is proposed for the 2x315MVA, 400/220 kV ICTs at Suratgarh Thermal Power Station (STPS) which will work for all the operating scenarios:-

SPS Logic: Overloading of the ILTs due to tripping of generating units on the 220 kV Bus or increased load in the region or tripping of one 315 MVA, 400/220 kV ICT. These overload settings with time delays will be implemented for both the ICTs.

Trip command for the Transformers at 220 kV GSS will be generated from both the ILTs at 100% loading.

- Trip 2x100MVA, 220/132 kV Transformer at 220 kV GSS Bhadra and 220kV S/C Bhadra-Chirawa line with time delay of 1.0s (**Load curtailment: 138.78MW**)
- Trip 1x160MVA, 220/132 kV Transformer and 1x100MVA, 220/132 kV Transformer at 220 kV GSS Halasar and 220kV S/C Halasar-Ratangarh line with time delay of 1.2s (**Load curtailment: 182 MW**)
- Trip 1x160MVA, 220/132 kV Transformer at 220 kV GSS Udyogvihar and 132 kV S/C Udyogvihar-Sriganganar line with time delay of 1.4s (**Load curtailment: 103MW**)

- Tripping commands for the transformers installed at the identified 220 kV GSS will be generated from the overload/Over current relays of both the 315MVA, 400/220 kV ILTs at STPS during the condition of overloading of ILTs at STPS. The overloading may be observed due to tripping of generators connected on 220 kV Bus, increased load in the region or tripping of any one of 315MVA, 400/220 kV ICT at STPS. Schematic diagram for implementation of proposed SPS Logic-1 is elaborated in Figure 2.

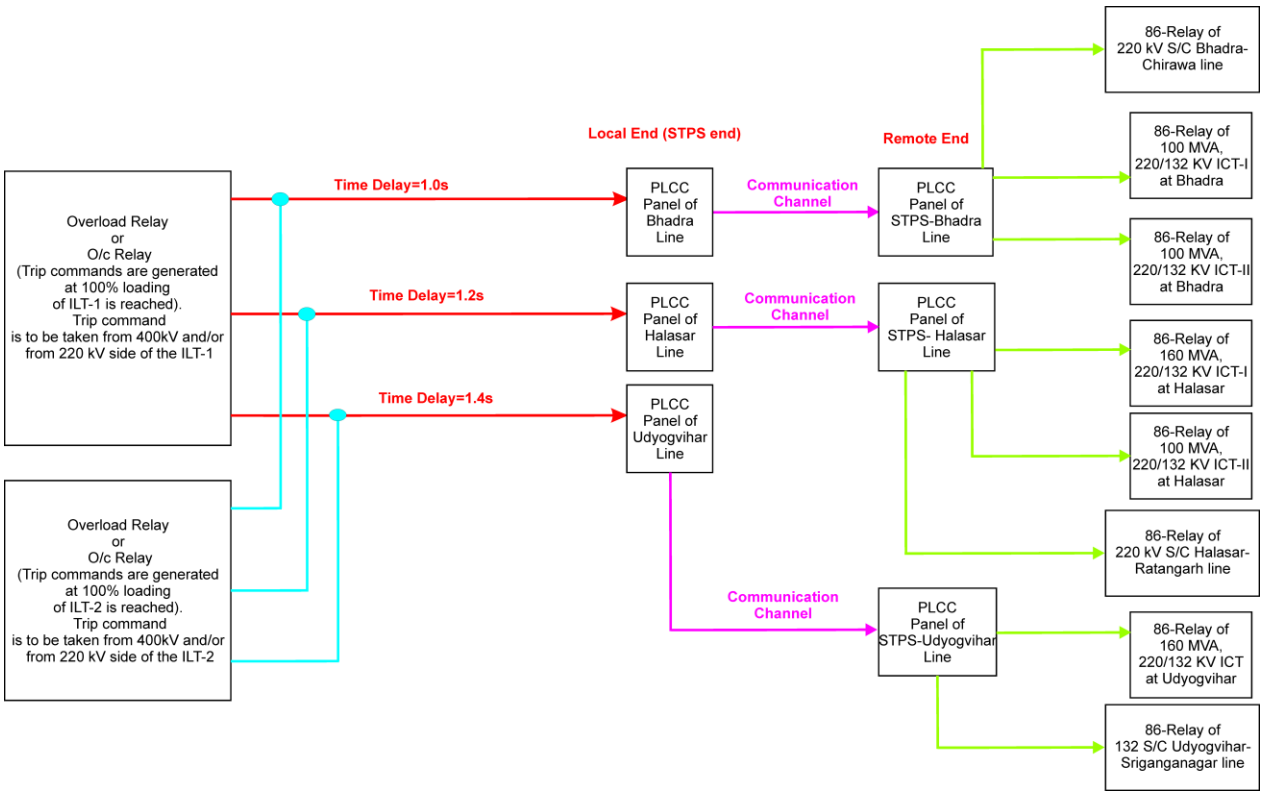


Fig. 2 Schematic diagram for implementation of proposed SPS Logic

- To maintain supply of critical loads connected to all the GSS in the region, tripped 220/132 kV Transformers at the identified 220 kV GSS may be re-connected after applying load shedding on all the GSS in the region in such a quantum to maintain loadings on the 2x315MVA, 400/220 kV ILTs at STPS within permissible limits. Same procedure will be adopted in the event of tripping of any one of the 315MVA, 400/220 kV ILT at STPS to maintain loadings on the healthy ILT at STPS within permissible limits.

Annexure-XIV

Email **Reeturaj Pandey**

Re: Agenda for Proposed SPS at STPS Suratgarh switchyard-regd.

From : nrldcso2@grid-india.in Wed, Jan 17, 2024 12:47 PM

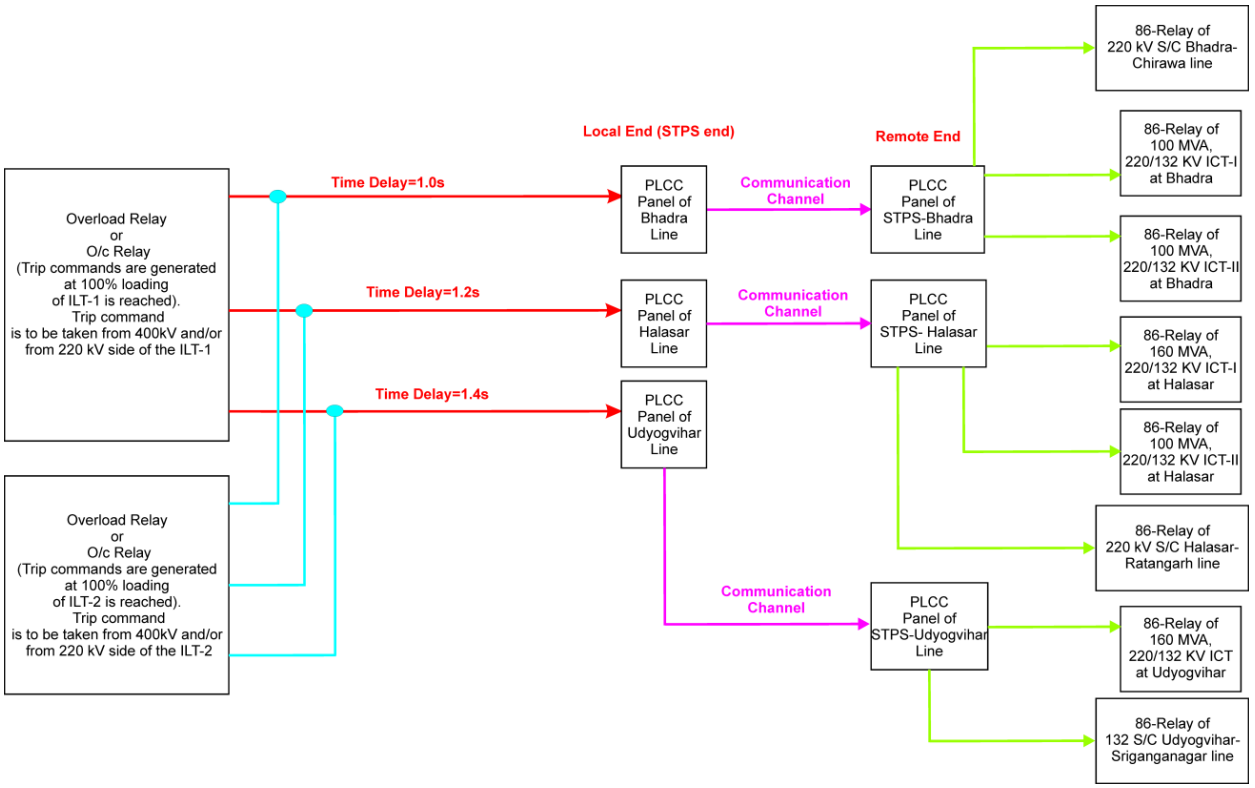
Subject : Re: Agenda for Proposed SPS at STPS Suratgarh switchyard-regd. 76 attachments

To : se ldrvpnl <se.ldrvpnl@rvpn.co.in>, se pp <se.pp@RVPN.CO.IN>, seelectricalsstps@gmail.com, Reeturaj Pandey <pandeyr.cea@gov.in>

Cc : ce ld <ce.ld@RVPN.CO.IN>, Sh V K Singh <ms-nrpc@nic.in>, Santosh Kumar <seo-nrpc@nic.in>, alok kumar <alok.kumar@grid-india.in>, bikaskjha@grid-india.in, deepak kr <deepak.kr@grid-india.in>

Sir,

As per the revised SPS logic submitted by RVPN:



Following are comments from NRLDC side:

- The SPS seems to provide relief of 50-100MW as seen in simulation studies, therefore if ICTs are loaded beyond 400MW (on both ICTs), the SPS relief may not be able to provide the required relief.
- RVPN may confirm that there is no possibility of tripping any other feeders nearby for SPS operation i.e. 220kV Suratgarh-Suratgarh D/C and 220kV Suratgarh-

Rawatsar etc.

- RVPN may make sure that the transformer overcurrent settings have delay of atleast 1.4 sec (as per logic proposed by RVPN) even if it is loaded to 150-180% of rated capacity.
- Since the signal is being transferred to other 220kV /132kV substations such as Udyogvihar/Halasar/Bhadra etc. it is requested to make sure that the signal is reaching and activating trip signal within the permitted time i.e. time required for communication of signal may be checked and it may be ensured that load relief is provided before tripping of ICTs on overloading.

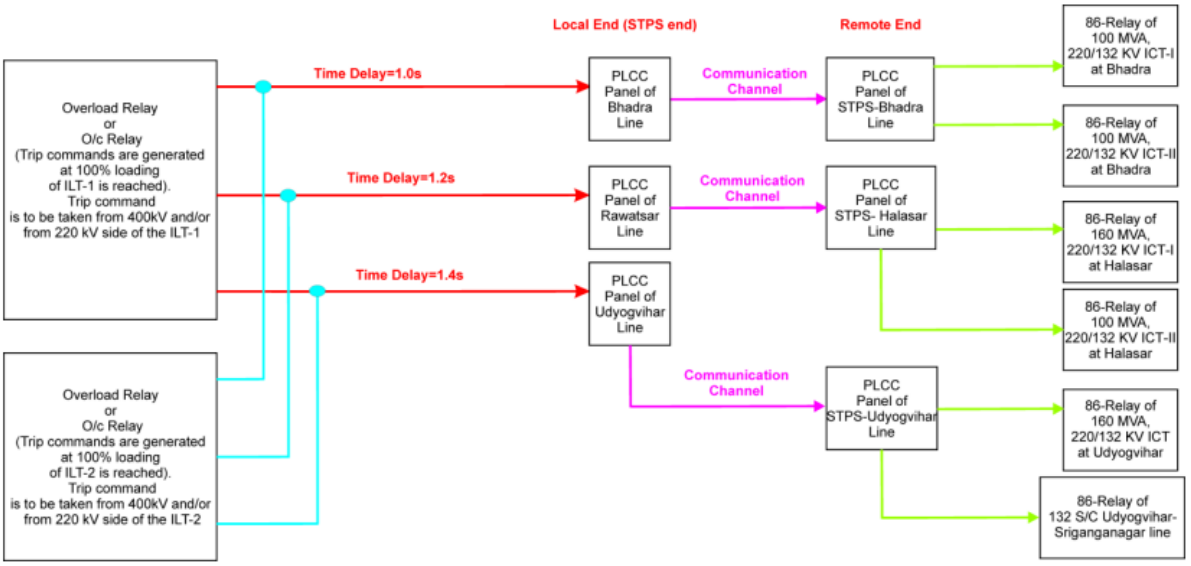
RVPN is requested to confirm on above points and as agreed in 215 OCC meeting, the SPS logic may be discussed/finalised in upcoming Protection subcommittee meeting.

Regards
Gaurav Malviya

From: NRLDC SO 2
Sent: Wednesday, January 10, 2024 11:16:39 AM
To: SE.LDRVPNL@RVPN.CO.IN; se.pp@rvpn.co.in; seelectricalsstps@gmail.com
Cc: Chief Engineer(LD); NARESH BHANDARI; seo-nrpc; Alok Kumar (आलोक कुमार)
Subject: Re: Agenda for Proposed SPS at STPS Suratgarh switchyard-regd.

Sir,

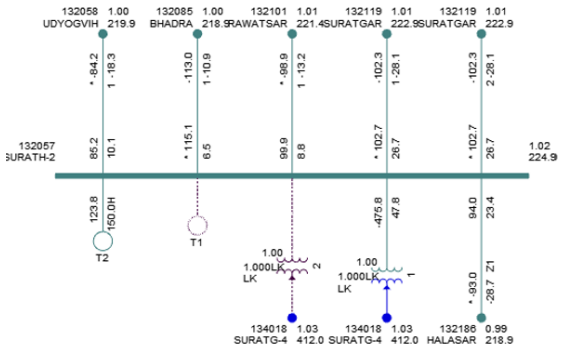
In continuation to the mail and revised SPS logic submitted by RVPN as agenda in 215 OCC meeting,



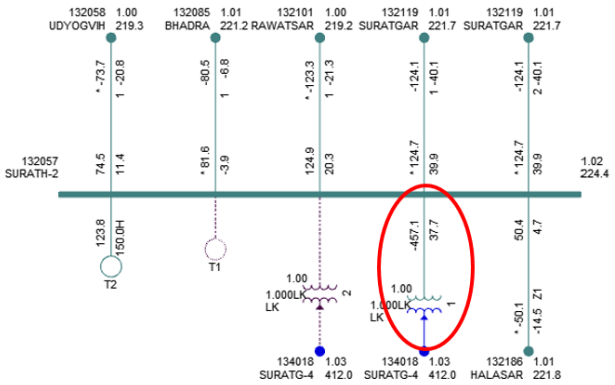
Following are few comments from NRLDC side.

- Tripping of 220/132kV Bhadra may not help, as power will continue to flow to Chirawa.
- Further, on carrying out simulation studies for the logic proposed, it is seen that the SPS operation is not able to provide the relief to save one ICT as shown below:

Before SPS operation

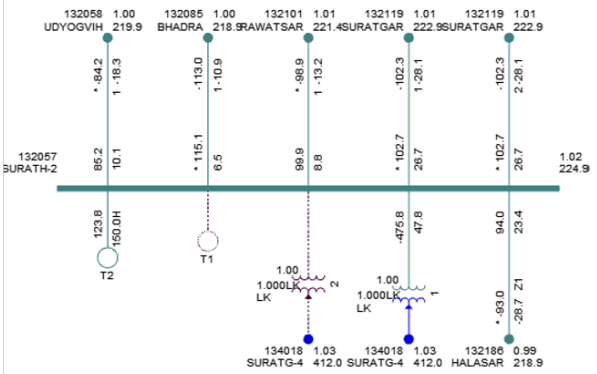


after SPS operation

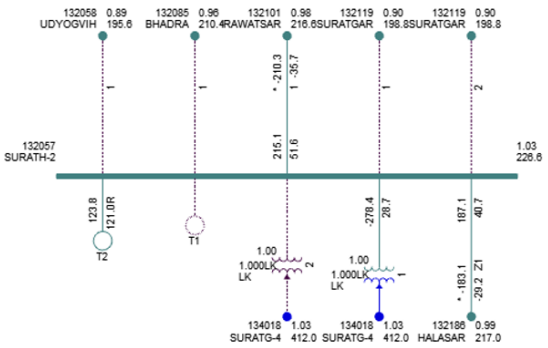


Further, another option was studied by NRLDC which may help to provide the required relief as shown below:

Before SPS operation



Other option



In this case, 4 no.s 220kV lines have been opened, namely.

- 220kV Suratgarh-Bhadra
- 220kV Suratgarh-UdyogVihar
- 220kV Suratgarh-Suratgarh D/C

It is requested that simulation studies may also be done at your end for the SPS logic proposed from your side to check for its feasability beforehand.

It is also requested to review the logic as suggested by NRLDC for any issues at DISCOM/transmission level.

Regards
Gaurav Malviya

From: SE.LDRVPNL@RVPN.CO.IN <SE.LDRVPNL@RVPN.CO.IN>
Sent: Tuesday, November 7, 2023 12:56:59 PM
To: se.pp@rvpn.co.in; seelectricalsstps@gmail.com
Cc: Chief Engineer(LD); NRLDC SO 2
Subject: Agenda for Proposed SPS at STPS Suratgarh switchyard-regd.

In reference to NRLDC comments in trailing email on SPS proposed by STPS, Suratgarh, kindly arrange to design SPS scheme in such a way that feeders can be tripped automatically instead of manually.

Further, before operational study of SPS proposed by STPS / RVPN, addressing of more outage combinations among ILT-1, ILT-2, STPS unit-1 and STPS unit-2 in different operation conditions are required to be added in proposed SPS scheme for ensuring uninterrupted power supply at STPS, Suratgarh.

1. when ILT-1, ILT-2, STPS unit-1 and STPS unit-2 are connected with grid then if any one machine or ILT is tripped
2. When ILT-1, ILT-2 are connected with grid and any one machine out of STPS unit-1 and STPS unit-2 are not connected with grid then any one ILT/another machine is tripped.
3. When ILT-1, ILT-2 are connected with grid and both STPS unit-1 and STPS unit-2 are not connected with grid then any one ILT is tripped.

In view of above, you are requested to arrange to re-design the SPS scheme accordingly and arrange the necessary approval from NRPC and NRLDC for implementation.

Superintending Engineer (SOLD)
SLDC Building, RVPN, Heerapura
Jaipur - 302024
Phone - 0141-2250403

From: se.pp@rvpn.co.in
Sent: Monday, November 6, 2023 5:13 PM
To: Chief Engineer(LD)
Cc: SE.LDRVPNL@RVPN.CO.IN
Subject: Fw: Agenda for Proposed SPS at STPS Suratgarh switchyard-regd.

As per the trailing mail, operational study is required for the above SPS for submission to NRPC to be discussed in the next meeting.

Narottam Vyas
Superintending Engineer (Project & Planning)
Rajasthan Rajya Vidyut Prasaran Nigam Limited
Room #323, Vidyut Bhawan, Jaipur
+91-9414061108

From: *NRLDC SO 2 <nrldcso2@grid-india.in>*
Sent: *06 November 2023 05:07 PM*
To: *Omkishor; se.pp@rvpn.co.in*
Cc: *SE.LDRVPNL@RVPN.CO.IN; Sh V K Singh; Santosh Kumar; Anzum Parwej; Reeturaj Pandey; Somara*

Lakra (सोमारा लाकरा); Alok Kumar (आलोक कुमार); Bikas Kumar Jha (बिकास कुमार झा); Akash Tomar (आकाश तोमर); Ibtesam Asif; Gaurav Singh (गौरव सिंह); Rahul Negi; Deepak Kumar

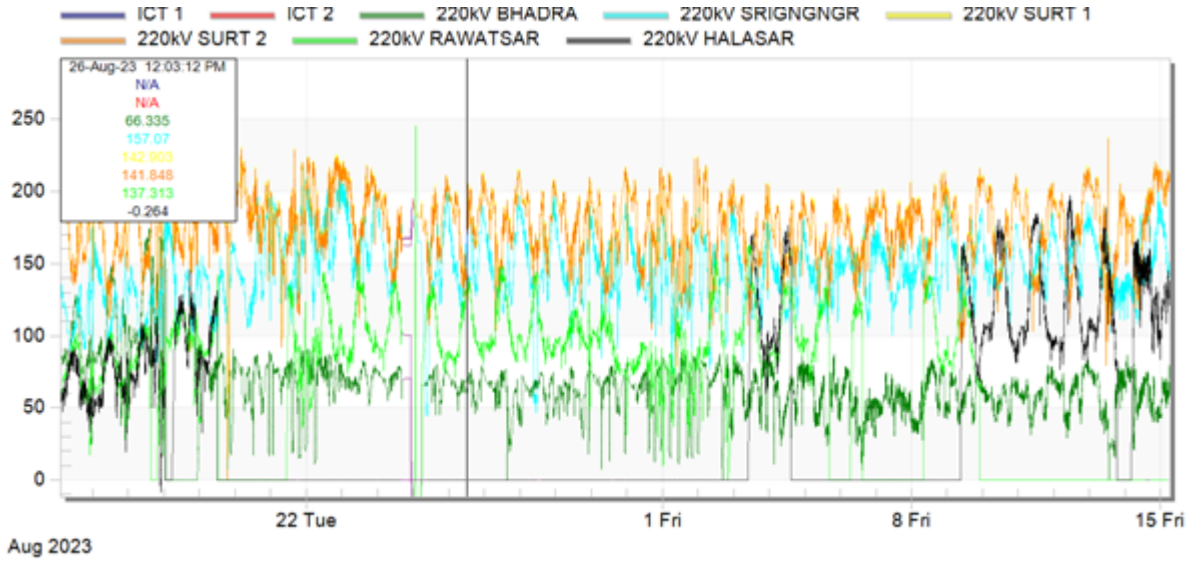
Subject: *Re: Agenda for Proposed SPS at STPS Suratgarh switchyard-regd.*

Sir,

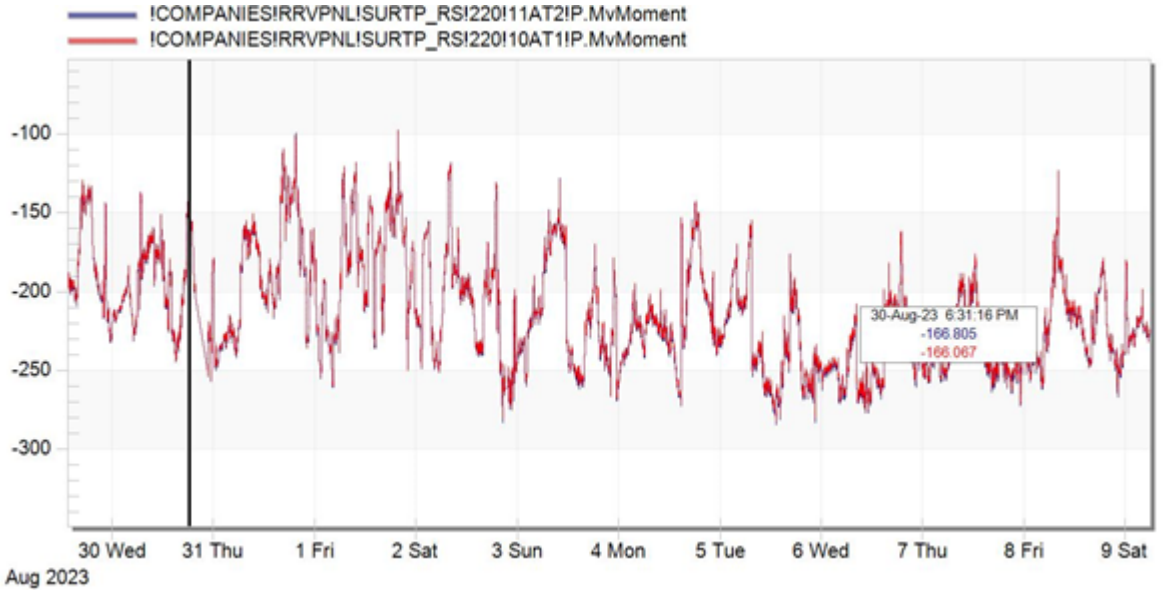
In continuation to the mail, following are few comments from NRLDC side:

In the logic shared it is mentioned that, SPS shall be taken manually in service at 220kV STPS-Bhadra line when loading on each 315MVA ICT is greater than 175MW by using two In-Out switches. Given that loading of transmission elements changes very rapidly, it is recommended that SPS action is automatic and any manual action requirement should be avoided to make sure that SPS is able to provide relief in all cases.

*Loading of 2*315MVA 400/220kV ICTs at STPS & 220kV STPS-Bhadra/220kV STPS-Rawatsar/220kV STPS-Udyog Vihar/ 220kV STPS-Suratgarh lines for last 2-3 months (high demand period) is shown below:*



Loading of 400/20kV ICTs remains in range of 200-250MW each during peak solar generation as shown below:



Considering above, it seems that tripping of 220kV STPS-Bhadra (loaded in range of 50-80MW) may not be able to provide the required relief.

In addition to 220kV STPS-Bhadra, another 220kV feeder needs to be selected for the required loading relief. The other feeder may be tripped after some delay , say 3-4 sec, so that in case the loading of ICT is manageable, second 220kV feeder tripping is avoided.

Regards
Gaurav Malviya

From: *Omkishor <omkishor.sahu@gov.in>*
Sent: *Wednesday, November 1, 2023 3:06:38 PM*
To: *se pp*
Cc: *se ldrvpnl; Sh V K Singh; Santosh Kumar; Anzum Parwej; Alok Kumar (आलोक कुमार); Reeturaj Pandey; Gaurav Singh (गौरव सिंह); NRLDC SO 2*
Subject: *Fwd: Agenda for Proposed SPS at STPS Suratgarh switchyard-regd.*

महोदय/ महोदया

In reference to the trailing mail, RVPN is advised to approach SLDC Rajasthan and submit the study carried out at their end for further review at NRLDC/NRPC.

भवदीय,
ओमकिशोर, कार्यपालक अभियंता (प्रचालन),
उत्तर क्षेत्रीय विद्युत समिति सचिवालय
18-ए, शहीद जीत सिंह मार्ग,
नई दिल्ली - 16

From: *nrldcso2@grid-india.in*
To: *"Vipul Kumar" <vipul.cea@gov.in>, "Omkishor" <omkishor.sahu@gov.in>*
Cc: *"Sh V K Singh" <ms-nrpc@nic.in>, "Santosh Kumar" <seo-nrpc@nic.in>, "Anzum Parwej" <anjum.parwej@nic.in>, "alok kumar" <alok.kumar@grid-india.in>, "Reeturaj Pandey" <pandeyr.cea@gov.in>, gauravsingh@grid-india.in*
Sent: *Wednesday, November 1, 2023 2:44:58 PM*
Subject: *Re: Agenda for Proposed SPS at STPS Suratgarh switchyard-regd.*

Sir,

STU may please be advised to approach SLDC Rajasthan and submit the study carried out at their end for further review at NRLDC/NRPC.

सादर धन्यवाद/ Thanks & Regards
प्रणाली संचालन-II/ System Operation-II
उ॰क्षे॰भा॰प्रे॰के॰/ NRLDC
ग्रिड कंट्रोलर ऑफ इंडिया लिमिटेड/ Grid Controller of India Limited
Formerly known as
पोसोको / POSOCO

From: *Vipul Kumar <vipul.cea@gov.in>*
Sent: *Tuesday, October 31, 2023 4:05:48 PM*
To: *NRLDC SO 2*
Cc: *Sh V K Singh; Santosh Kumar; Anzum Parwej; Alok Kumar (आलोक कुमार); Omkishor; Reeturaj Pandey*
Subject: *Agenda for Proposed SPS at STPS Suratgarh switchyard-regd.*

महोदय/महोदया,

In reference to the trailing mail, NRLDC is requested to kindly give its observations on

the proposed SPS for 2X315 MVA, 400/220 kV ICTs at STPS Suratgarh.

The cited matter is likely to be deliberated in the upcoming TCC meeting of NRPC.

सादर
विपुल कुमार
सहायक कार्यपालक अभियंता
उत्तर क्षेत्रीय विद्युत् समिति
नई दिल्ली

From: *seelectricalsstps@gmail.com*
To: *"Sh V K Singh" <Ms-nrpc@nic.in>*
Cc: *"se pp" <se.pp@rvpn.co.in>, "Santosh Kumar" <seo-nrpc@nic.in>, "Reeturaj Pandey" <pandeyr.cea@gov.in>*
Sent: *Tuesday, October 31, 2023 12:41:22 PM*
Subject: *Fwd: Fw: Agenda for the upcoming 70th NRPC meeting SPS at STPS yard-Regd.*

Sir,

In reference to trailing mail, it is intimated that our ILT-1 is under shutdown and the retrofitting work of new numerical Relays (ABB make) are going on in protection panels of ILT-1. ***The shutdown may be returned by 5/6 Nov.*** *So, you are requested to please study and approve (if suitable) our proposed SPS scheme timely sothat same may be hook up in protection panels of ILT-1 .We want to avail this opportunity of shutdown of ILT-1. The complete details of SPS scheme alongwith all the annexures sent vide our letter no 2156 dtd 29.08.23 to SE(PP), RVPN, Jaipur is again enclosed for your ready reference. In case of any query, please call/discuss.*

Regards
Sonal Gupta
Executive Engineer(Elec)
RRVUNL,SSTPS, Suratgarh
Mob: 9413349576

---------- Forwarded message ---------
From: ***se.pp@rvpn.co.in*** *<se.pp@rvpn.co.in>*
Date: Tue, 31 Oct 2023 at 11:29
Subject: Fw: Agenda for the upcoming 70th NRPC meeting SPS at STPS yard-Regd.
To: seelectricalsstps@gmail.com <seelectricalsstps@gmail.com>

KFA

Narottam Vyas
Superintending Engineer (Project & Planning)
Rajasthan Rajya Vidyut Prasaran Nigam Limited
Room #323, Vidyut Bhawan, Jaipur

+91-9414061108

From: se.pp@rvpn.co.in
Sent: 31 October 2023 11:27 AM
To: Ms-nrpc@nic.in
Cc: seo-nrpc@nic.in; seelecticalsstps@gmail.com
Subject: Agenda for the upcoming 70th NRPC meeting SPS at STPS yard-Regd.

For inclusion in the agenda of 70th NRPC.

Narottam Vyas
Superintending Engineer (Project & Planning)
Rajasthan Rajya Vidyut Prasaran Nigam Limited
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SPS STPS Revised (1).pdf
882 KB

Annexure-XV

Tripping events to be discussed in 49th PSC Meeting

S.No.	Category of Grid Disturbance (GD-I to GD-V)	Name of Elements (Tripped/Manually opened)	Affected Area	Owner/ Agency	Outage		Event (As reported)	Loss of generation / loss of load during the Grid Disturbance		Fault Clearance time (in ms)	Remarks
					Date	Time		Generation Loss(MW)	Load Loss (MW)		
1	GD-1	1) 220 KV Amberi(RS)-Kankroli(PG) (RS) Ckt 2) 400/220 kV 315 MVA ICT 1 at Chittorgarh(RS) 3) 400/220 kV 315 MVA ICT 2 at Chittorgarh(RS)	Rajasthan	RVVPNL	4-Sep-23	12:37	i) 220/132kV Debari(RS) has connectivity from 220kV Amberi and 400/220kV Chittorgarh(RS). ii) During antecedent condition, 187MW was coming to 220/132kV Amberi(RS) through 220kV Amberi(RS)-Kankroli(PG) ckt and 121MW was going out from 220/132kV Amberi(RS) through 220kV Amberi(RS)-Debari(RS) ckt and rest of the power was flowing through 220/132kV 160MVA ICT 1 & 2 at Amber(RS) feeding 132kV feeders. At 400/220kV Chittorgarh(RS) 400/220kV 315MVA ICT-1&2 were carrying approx. 266MW each. iii) As reported, at 12:37hrs, 220 KV Amberi(RS)-Kankroli(PG) (RS) Ckt tripped due to O/C E/F relay operation at Amberi(RS) end. (Exact reason and location of fault yet to be shared) iv) As per PMU at Kankroli(PG), B-N phase to earth fault is observed with delayed fault clearance time of 1360ms. v) Due to loss of supply, complete blackout occurred at 220/132kV Amberi(RS). vi) With this, only source left for Debari was 400/220kV Chittorgarh. Loading of 400/220 kV 315 MVA ICT 1 & 2 at Chittorgarh(RS) increased further and then both the ICTs tripped due to overloading. (Exact value of increase in loading is yet to be received from Rajasthan). vii) As per SCADA, change in demand of approx. 585MW is observed in Rajasthan control area.	0	585	1360	i) Exact reason and location of fault need to be shared. ii) Reason of delayed clearance of fault need to be shared. iii) DR/EL, sequence of event along with tripping report need to be shared from both the ends. iv) Remedial action taken report to be shared.
2	GD-1	1) 220 kV Wangtoo –Bhabha-Kunihar(HP) ckt (Tconnection) 2) 220 kV Jeori-Kunihar(HP) Ckt 3) 220 kV Baddi-Kunihar(HP) Ckt-1 4) 220 kV Baddi-Kunihar(HP) Ckt-2 5) 220/132kV ICT-1 at Kunihar(HP) 6) 220/132kV ICT-2 at Kunihar(HP) 7) 220/132kV ICT-3 at Kunihar(HP)	HP	HPPTCL	6-Sep-23	06:44	i) As reported, at 06:44 hrs, 220 KV Kunihar-Baddi ckt-1&2 tripped on over current earth fault protection operation. (Exact reason and location of fault yet to be shared) ii) At the same time, 220 kV Jeori-Kunihar(HP) Ckt, 220 kV Kunihar-Pinjore(HP) Ckt also tripped on overvoltage. iii) With the tripping of aforementioned elements load of 220/132kV Kunihar(HP) got affected. iv) As per PMU, Y-B fault converted into three phase fault with delayed clearance in 880msec is observed. v) As per SCADA, change in demand of approx. 150MW in HP control area and and HP hydro generation loss of approx. 40MW (Bhabha HEP) is observed. vi) Further at 07:22 hrs, while restoration again multiple elements tripping occurred at Kunihar S/s and 220/132kV Kunihar S/s became dead. vii) As per PMU & DR, no fault was in system at 07:22hrs. viii) As per SCADA, change in demand of approx. 250MW in HP control area and is observed at 07:22hrs.	40	150	880	i) Exact nature and location of fault need to be shared. ii) Reason of delayed clearance of fault also need to be shared. iii) Over voltage protection in 220kV lines need to be kept disabled. iv) Details of protection operation at remote susbstation also need to be shared. v) SCADA data at 220kV Bhaba(HP) was freezed during the event. Availability and healthiness of SCADA data need to be ensured. vi) DR/EL need to be shared for all the tripped elements for both ends. vii) Remedial action taken report need to be shared.
3	GI-2	1) 400/220kV 200MVA ICT-1 at Rosa(UP) 2) 400/220kV 200MVA ICT-2 at Rosa(UP) 3) 300 MW Rosa TPS - UNIT 2 4) 220kV Shahjahanpur(UP)-Rosa TPS(UP) Ckt-1 5) 220kV Shahjahanpur(UP)-Rosa TPS(UP) Ckt-2 6) 220kV Rosa-Badaun(UP) Ckt-1 7) 220kV Rosa-Badaun(UP) Ckt-2 8) 220kV Rosa-Dohna(UP) Ckt-1 9) 220kV Shahjahanpur(PG)-Shahjhanpur(UP) Ckt	Uttar Pradesh	UPPTCL	7-Sep-23	12:37	i) 400/220kV Rosa(UP) S/s has double main transfer bus scheme as 400 & 220kV level. ii) During antecedent condition, 300 MW Rosa TPS – UNIT-2 (connected at 220kV side) was carrying approx. 282MW and 400/220kV 200MVA ICT-1&2 were carrying approx. 65MW each. iii) As reported, at 12:37 hrs, R-Y fault occurred on 220kV Rosa-Badaun(UP) Ckt-2. Rosa end distance protection sensed fault in Z-2 (93km). Line CB at Rosa end didn't open and LBB also failed to operate. iv) Further, adjacent 220kV feedres at Rosa and tripped from remote end and 400/220kV 200MVA ICTs at Rosa tripped on O/C E/F protection operation. v) At the same time, 300 MW Rosa TPS - UNIT 2 tripped on standby earth fault protection operation and 220kV Shahjahanpur(PG)-Shahjhanpur(UP) Ckt also tripped from Shajhanpur(PG) end only. (as per SOE). vi) As per PMU at Bareilly(PG), R-Y phase to phase fault with delayed clearance in 1280msec is observed. vii) Generation loss of approx. 282MW occurred due to tripping of 300 MW Rosa TPS - UNIT 2.	282	0	1280	i) Reason of occurrence of fault? ii) Why did breaker of the 220kV Rosa-Badaun(UP) Ckt-2 not open from Rosa end? Mechanical healthiness of CB need to be ensured. iii) Why did LBB of 220kV Rosa-Badaun(UP) Ckt-2 not operate? Necessary corrective actions need to be taken to avoid such events in future. iv) On which protection 220kV Shahjahanpur(PG)-Shahjhanpur(UP) Ckt tripped from Shahjhanpur(PG) end? v) DR/EL of all the elements need to be shared for both the ends. vi) Remedial action taken report need to be shared.
4	GD-1	1) 220 kV Tuglakabad-Badarpur (DTL) Ckt-1 2) 220 kV Tuglakabad-Badarpur (DTL) Ckt-2 3) 220 kV Ballabhgarh(BB)-Badarpur (DTL) Ckt-1 4) 220 kV Ballabhgarh(BB)-Badarpur (DTL) Ckt-2 5) 220kV Badarpur-Okhla ckt-1 6) 220kV Badarpur-Okhla ckt-2	Delhi	DTL/BBMB	10-Sep-23	17:08	i) 220kV Badarpur(DTL) has double main single breaker bus scheme. It has source from 220 kV Tuglakabad-Badarpur (DTL) Ckt-1&2 and 220 kV Ballabhgarh(BB)-Badarpur (DTL) Ckt-1&2. ii) During antecedent condition, part load of 220kV Okhla and 220kV Sarita Vihar was fed from 220kV Badarpur(DTL) via 220kV Badarpur-Okhla ckt-1&2 and 220kV Badarpur-Sarita Vihar ckt-1&2 respectively. iii) As reported, at 17:08hrs, R-ph conductor near wavetrap of 220 kV Ballabhgarh(BB)-Badarpur (DTL) Ckt-2 at Badarpur end damaged and created R-N fault. iv) As per DR of Ballabhgarh(BB) end, R-N fault followed by Y-N & B-N fault with total fault clearance time of ~800msec is observed. Fault distance recorded at Ballabhgarh end was ~24.7km. v) As reported, on this fault, 220 kV Ballabhgarh(BB)-Badarpur (DTL) Ckt-1&2 tripped from Ballabhgarh(BB) end only, 220 kV Tuglakabad-Badarpur (DTL) Ckt-1&2 tripped from Badarpur end in Z-4 and 220kV Badarpur-Okhla ckt-1&2 tripped on O/C E/F protection operation. vi) As per PMU at Ballabhgarh(PG), R-N fault which later converted into three phase fault with fault clearance time of ~1240msec is observed. vii) With the tripping of aforementioned lines, 220kV Badarpur S/s became dead and load feeding from Badarpur to 220kV Okhla and 220kV Sarita Vihar affected. viii) As reported by SLDC-Delhi, load loss of approx. 125MW is occurred in Delhi control area. ix) At 17:13 hrs, 220kV bus coupler breaker at Sarita Vihar S/s and Okhla S/s was closed and load was normalized.	0	125	1240	i) Exact location and nature of fault? ii) Reason of delayed clearance of fault? iii) DR/EL of all the tripped elements need to be shared. iv) Remedial action taken report to be shared
5	GD-1	1) 400/220 kV 500 MVA ICT 1 at Azamgarh1(UP) 2) 400/220 kV 500 MVA ICT 2 at Azamgarh1(UP) 3) 220/132 kV 160 MVA ICT 1 at Azamgarh2(UP) 4) 220/132 kV 200 MVA ICT 2 at Azamgarh2(UP) 5) 220/132 kV 160 MVA ICT 3 at Azamgarh2(UP) 6) 220kV Azamgarh2-Haraua(UP) Ckt 7) 220kV Azamgarh2-Jaunpur(UP) Ckt	Uttar Pradesh	UPPTCL	11-Sep-23	05:36	i) 220/132kV Azamgarh2(UP) S/s has double main transfer bus scheme at both 220 & 132 kV level. ii) As reported, at 05:36 hrs, 220kV Bus-bar protection operated at Azamgarh2(UP) which resulted into tripping of all the elements connected to 220kV Bus-1 & 2 at Azamgarh2(UP). (Exact reason of busbar protection operation yet to be shared) iii) Due to loss of supply at 132kV level of Azamgarh2(UP), both 132kV Bus-1 & 2 at Azamgarh2(UP) also became dead which resulted into total blackout of 220/132kV Azamgarh2(UP) S/s. iv) As per PMU at Varanasi(PG), Y-N phase to earth fault with fault clearance time of 80ms is observed. v) As per SCADA, change in demand of approx. 465MW is observed in UP control area.	0	465	80	i) Excat nature and location of fault? ii) Exact reason of busbar protection operation need to be shared. iii) DR/EL of all the elements need to be shared for both the ends. iv) Remedial action taken report need to be shared.
6	GI-2	1) 400/220 KV 315 MVA ICT-1 at Obra-B(UP) 2) 400/220 KV 315 MVA ICT-2 at Obra-B(UP) 3) 400/220 KV 240 MVA ICT-3 at Obra-B(UP) 4) 200 MW Obra TPS - UNIT 12 5) 220kV Obra-A(UP)-Rewa Road(UP) Ckt-1 6) 220kV Obra-A(UP)-Rewa Road(UP) Ckt-2 7) 220kV Obra-A(UP)-Mirzapur(UP) Ckt	Uttar Pradesh	UPPTCL	13-Sep-23	07:50	i) During antecedent condition, 200 MW Obra TPS - UNIT 12 was running through station transformer and generating approx. 124MW. ii) As reported, at 07:50 hrs, 400/220 KV 315 MVA ICT-1 at Obra-B(UP) tripped on R-ph differential protection operation due to blast of 220kV R phase bushing of transformer. Firefighting system installed to protect ICT from fire, operated automatically and protected the complete transformer from the spreading of fire and further damage to other equipment and ICT itself. iii) At the same time, 400/220 KV 315 MVA ICT-2 and 240 MVA ICT-3 at Obra-B(UP) also tripped on over-current earth-fault protection operation. iv) During the same time, "SPS related to overloading of remaining ICT after tripping of any ICT at Obra TPS" operated and 220kV Obra-A(UP)-Rewa Road(UP) Ckt-1 & 2 and 220kV Obra-A(UP)-Mirzapur(UP) Ckt tripped. v) As per PMU at Allahabad(PG), R-N phase to earth fault with fault clearance time of 80ms is observed. vi) As per SCADA, change in demand of approx. 345MW is observed in UP control area. vii) As reported by SLDC-UP, load loss of approx. 308MW is observed in UP control area and generation loss of approx. 124MW is observed at Obra-B(UP) .	308	124	80	i) As per SCADA, loading of ICTs before the incident were within permissible limit. Hence, it is suspected that loading of ICT-2 and 3 increased above 70% of rated current after tripping of ICT-1 and due to tripping of ICT-3 (as per SCADA SOE) SPS Case-3 operated. Exact sequence of the event need to be shared. ii) Why did 400/220kV ICT-2&3 trip as fault was in ICT-1? iii) DR/EL of all the elements need to be shared for both the ends. iv) Remedial action taken report need to be shared.
7	GD-1	1) 220 KV Khuskhera(RS)-Neemrana(PG) Ckt 2) 220 KV Khuskhera(RS)-Bhiwadi(PG) Ckt 3) 220 KV Khuskhera(RS)-Alwar(RS) Ckt 4) 220 KV Khuskhera(RS)-Kishangarh-Bas(RS) Ckt 5) 220/132kV 160 MVA ICT-1 at Khuskhera(RS) 6) 220/132kV 160 MVA ICT-2 at Khuskhera(RS)	Rajasthan	RVPNL, PGCIL	21-Sep-23	21:14	i) 220/132kV Khuskhera(RS) has double main bus scheme at both 220kV and 132kV level. ii) As reported, at 00:51hrs, Y phase CT blast occured at Khuskhera(RS) end of 220 KV Khuskhera(RS)-Neemrana(PG) Ckt. iii) As per DR at Khuskhera(RS) end of 220 KV Khuskhera(RS)-Neemrana(PG) Ckt, line tripped on Y-N phase to earth fault with fault current of ~11.94kA from Khuskhera(RS) end and fault clearing time of ~310ms; fault sensed in zone-4 at Khuskhera(RS) end. iv) At the same time, bus bar protection operated at Khuskhera(RS) and all the elements connected to both 220kV Bus-1 and 2 at Khuskhera(RS) tripped. v) Due to loss of supply to 132kV level also 220/132kV Khuskhera(RS) S/s became dead. vi) As per PMU at Bhiwadi(PG), Y-N phase to earth fault converted to R-Y-N double phase to earth fault is observed with delayed fault clearance time of 600ms. vii) As per SCADA, change in demand of approx. 190MW is observed in Rajasthan control area.	0	190	600	i) Reason of delayed clearance of fault need to be shared. ii) DR/EL of each element along with tripping report need to be shared from both the ends. iii) Remedial action taken report to be shared.
8	GD-1	1) 220kV Hissar_IA(Har)-Narwana ckt 2) 220kV Hissar(BB)-Hissar_IA(Har) ckt-1 3) 220kV Hissar(BB)-Hissar_IA(Har) ckt-2 4) 220kV Hissar_IA(Har)-Hissar(PG) ckt-1 5) 220kV Hissar_IA(Har)-Hissar(PG) ckt-2 7) 220/132kV 100MVA ICT-1 at Hissar_IA(Har)	Haryana	HVPNL, BBMB, PGCIL	5-Oct-23	09:28	i) During antecedent condition, 220kV Hissar_IA(Har)-Masudpur Ckt 1 & 2 and 220/132kV 100MVA ICT-1 at Hissar_IA(Har) were already in open condition. ii) As reported, at 09:28hrs, sparking was observed on the B-phase of 220 kV Bus Isolator of 220kV Hissar_IA(Har)-Hissar(PG) ckt-1 at Hissar_IA(Har) end. iii) As per DR at Hissar_IA(Har), Bus Bar differential protection operated at 220kV level of Hissar_IA(Har) which led to tripping of all the elements connected to both the buses. (Exact reason of tripping of both the buses yet to be shared) iv) Due to tripping of all the elements connected to both the buses, both 220kV Bus-1 & 2 at Hissar_IA(Har) and eventually the complete 220kV Hissar_IA(Har) S/s became dead. v) As per PMU at Hissar(PG), B-N phase to earth fault with fault clearing time of 80ms is observed. vi) As per SCADA, change in demand of approx. 90MW is observed in Haryana control area. But as reported by SLDC-Haryana, change in demand of approx. 300MW is observed in Haryana control area.	0	300	80	i) Exact reason of tripping of both the buses need to be shared. Whether bus bar protection operated in both the buses? If yes, then why? Whether there is any issue with bus coupler opening? ii) DR of Hissar_IA(Har) are not time synced, time syncing of all the recording devices/software need to be ensured. iii) DR/EL of all the tripped elements along with tripping report of the event need to be shared from BBMB and PGCIL end. iv) Proper maintenance of protection equipments and their healthiness need to be ensured. v) Remedial action taken report to be shared.

S.No.	Category of Grid Disturbance (GD-I to GD-V)	Name of Elements (Tripped/Manually opened)	Affected Area	Owner/ Agency	Outage		Event (As reported)	Loss of generation / loss of load during the Grid Disturbance		Fault Clearance time (in ms)	Remarks
					Date	Time		Generation Loss(MW)	Load Loss (MW)		
9	GI-2	1) 220 KV Akal(RS)-Jaisalmer(RS) Ckt 2) 400/220 kV 500 MVA ICT 1 at Akal(RS) 3) 400/220 kV 500 MVA ICT 2 at Akal(RS)	Rajasthan	RVPNL	10-Oct-23	10:21	i) 400/220kV Akal(RS) has one and half breaker scheme at 400kV level and double main transfer bus scheme at 220kV level. ii) As reported, at 10:21hrs, 220 KV Akal(RS)-Jaisalmer(RS) Ckt tripped on phase to earth fault (Y-N fault as per PMU at Bhadla(PG)). iii) At the same time, 400/220 kV 500 MVA ICT 1 & 2 at Akal(RS) also tripped. (Exact reason yet to be shared, but it is suspected that there is delay in CB opening due to which ICTs also got tripped. Also O/C protection settings of ICTs need to be shared.) iv) As per SCADA SOE, 220kV Akal(RS)-Barme(RS) Ckt also tripped during the same time. (Exact reason yet to be shared) v) As per PMU at Bhadla(PG), Y-N phase to earth fault is observed with delayed fault clearance time of 720ms. vi) As per SCADA, change in demand of approx. 70MW is observed in Rajasthan control area. vii) As per SCADA, change in Rajasthan wind generation of approx. 110MW is observed.	110	70	720	i) Fault was in 220 KV Akal(RS)-Jaisalmer(RS) Ckt, but 400/220 kV 500 MVA ICT 1 & 2 at Akal(RS) also tripped on this fault. Hence it is suspected that there is delay in CB opening due to which ICTs also got tripped. Exact reason of tripping along with O/C protection settings of ICTs need to be shared. ii) Reason of delayed clearance of fault need to be shared. iii) Exact reason of tripping of 220kV Akal(RS)-Barme(RS) Ckt need to be shared. (Tripped as per SCADA SOE) iv) SCADA data was freezed during the event. Availability and healthiness of SCADA data need to be ensured. v) DR/EL of each element along with tripping report need to be shared from both the ends. vi) Remedial action taken report to be shared.
10	GD-1	1) 765kV Koteshwar(PG)-Meerut(PG) Ckt-1 2) 765kV Koteshwar(PG)-Meerut(PG) Ckt-2 3) 400kV Koteshwar(PG)-Tehri(TH) (PG) Ckt-1 4) 400kV Koteshwar(PG)-Tehri(TH) (PG) Ckt-2 5) 400kV Koteshwar(PG)- Koteshwar (TH) (PG) Ckt-1 6) 400kV Koteshwar(PG)- Koteshwar (TH) (PG) Ckt-2 7) 100 MW Unit-1 at Koteshwar(TH)	Uttarakhand	PGCIL, THDC	12-Oct-23	15:36	i) 765/400kV Koteshwar(PG) has one and half breaker scheme at 765kV level and double main bus scheme at 400kV level. During antecedent condition, only 100MW Unit-1 at Koteshwar HEP was in running condition and was generating approx. 90MW and active power loading on 765kV Koteshwar(PG)-Meerut(PG) Ckt-1 & 2 was approx. 45MW each. ii) As reported, at 15:36hrs, "Protection operated in FSC" signal came at Meerut(PG) end which tripped group relays and sent DT to Koteshwar(PG). 765kV Koteshwar(PG)-Meerut(PG) Ckt-1 & 2 tripped due to DT received at Koteshwar(PG) end. iii) During the same time, 100MW Unit-1 at Koteshwar(TH) tripped on over-excitation due to loss of evacuation path. iv) CBs from both the ends of 400kV Koteshwar(PG)-Tehri(TH) (PG) Ckt-1 & 2 and 400kV Koteshwar(PG)- Koteshwar (TH) (PG) Ckt-1 & 2 opened due to safety purpose. v) Due to this tripping, complete blackout occurred at 765/400kV Koteshwar(PG) & 400kV Koteshwar(TH). vi) Although no generation was there at Tehri(TH) during the event time, but Tehri(TH) generation was affected from 16:00hrs to 17:14hrs. vii) As per PMU Meerut(PG), no fault is observed in the system. viii) As per SCADA, change in generation of approx. 90MW is observed at Koteshwar(TH).	90	0	NA	i) DR/EL of all the tripped elements, sequence of event along with tripping report of the event need to be shared. ii) Reason of DT sent from Koteshwar(THDC) end need to be shared. iii) Remedial action taken report to be shared.
11	GD-1	1) 400 KV Uri_2(NH)-Uri_1(NH) (PG) Ckt 2) 400 KV Uri_2(NH)-Wagoora(PG) (PG) Ckt 3) 60 MW Unit-2 at Uri-2(NH) 4) 60 MW Unit-2 at Uri-3(NH)	Jammu and Kashmir	PGCIL, NHPC	14-Oct-23	04:23	i) During antecedent condition, 60 MW Unit-2 & 3 at Uri-2(NH) were running and generating approx. 36MW each and total MW generation of 72MW was evacuating through 400 KV Uri_2(NH)-Uri_1(NH) (PG) Ckt and 400 KV Uri_2(NH)-Wagoora(PG) (PG) Ckt. ii) As reported, at 04:23hrs, 400 KV Uri_2(NH)-Wagoora(PG) (PG) Ckt tripped on B-N phase to ground fault with fault current of approx. 1.89kA and fault distance of 11.87km from Wagoora(PG) end due to heavy wind and storm in the area. iii) As per DR, 400 KV Uri_2(NH)-Uri_1(NH) (PG) Ckt also tripped on B-N phase to ground fault at the same time with delayed fault clearance time of approx. 690ms and fault current of approx. 2.53kA from Uri-2(NH) end. Over-current protection operated at both Uri-1(NH) and Uri-2(NH) end as per DR. iv) Due to tripping of both the lines, 60 MW Unit-2 & 3 at Uri-2(NH) tripped on over-excitation due to loss of evacuation path. v) On this, complete blackout occurred at 400kV Uri-2(NH). vi) As per PMU at Wanpoh(PG), two consecutive B-N phase to ground fault is observed in the system with delayed fault clearance time of 720ms and 440ms respectively. vii) As per SCADA, generation loss of approx. 72MW is observed at Uri-2(NH).	72	0	720	i) According to Protection Philosophy of Northern region, no over-current protection should be applied on 400kV lines. Then why 400 KV Uri_2(NH)-Uri_1(NH) (PG) Ckt tripped on over-current protection operation? ii) Reason of delayed clearance of fault need to be shared. iii) DR/EL of all the tripped elements along with tripping report of the event need to be shared for both the ends for proper analysis of the event. iv) Remedial action taken report to be shared.
12	GD-1	1) 220 KV Auraiya(NT)-Agra2(UP) (PG) Ckt-1 2) 220 KV Auraiya(NT)-Agra2(UP) (PG) Ckt-2 3) 220kV Agra1(UP)-Agra2(UP) Ckt-1 4) 220kV Agra1(UP)-Agra2(UP) Ckt-2 5) 220kV Agra2(UP)-Kirawali Ckt 6) 220/132kV 160MVA ICT-1 at Agra2(UP) 7) 220/132kV 160MVA ICT-2 at Agra2(UP) 8) 220/132kV 100MVA ICT-3 at Agra2(UP) 9) 220/33kV 60MVA ICT-6 at Agra2(UP)	Uttar Pradesh	UPPTCL, NTPC	22-Oct-23	06:00	i) 220/132kV Sikandra (Agra2) (UP) S/s has double main transfer bus scheme at 220kV level. However, during antecedent condition, all the elements were connected to 220kV Bus-1 only. 220kV Bus-2 and transfer were not in service consition. ii) As reported, at 06:00 hrs, 220 KV Auraiya(NT)-Agra2(UP) (PG) Ckt-1&2 tripped. At the same time, bus bar protection of 220kV Bus-1 at 220kV Agra2(UP) operated and as all eleemnts at Agra2(UP) were connected to 220kV Bus-1 only, all 220kV element at Agra2(UP) tripped. Details related to exact location and nature of fault yet to be received from UP. iii) As per PMU at Agra(PG), B-N phase to earth fault with unsuccessful A/R operation is observed. As per SCADA SOE at NRLDC, it seems that A/R operation occurred in 220kV Agra1(UP)-Agra2(UP) ckt-1. UP has been communicated to share the DR/EL to ascertain the exact sequende of the event. iv) Due to tripping of 220kV Bus-1, supply to 132kV side of Sikandra (Agra2) (UP) also lost which resulted into total blackout of 220/132kV Sikandra (Agra2) (UP) S/s. v) As per SCADA, change in demand of approx. 100MW is observed in UP control area.	0	100	80	i) Exact location and nature of fault? ii) Why did bus bar protection operate at 220kV Agra2(UP)? iii) Why did 220kV Bus-2 and tramsfer bus at Agra-2(Sikandra) were not in service? iv) DR/EL of all the elements need to be shared for both the ends. v) Exact sequence of the event need to be shared. vi) Remedial action taken report need to be shared.
13	GI-2	1) 400 KV Dadri(NT)-Mandola(PG) (PG) Ckt-1 2) 400 KV Dadri(NT)-Mandola(PG) (PG) Ckt-2 3) 400 KV Dadri(NT)-Loni Harsh Vihar(DV) (NT) Ckt-2 4) 490 MW Dadri-II TPS - UNIT 2 5) 500 kV HVDC Rihand-Dadri (PG) Ckt-1 6) 500 kV HVDC Rihand-Dadri (PG) Ckt-2	Uttar Pradesh	PGCIL, NTPC, DTL	4-Nov-23	04:03	i) 400kV Dadri TPS(NTPC) has one and half breaker bus scheme. There are 04 buses at 400kV side. Bus-I, II and Bus III, IV are separated via interconnector. 490MW Unit-5&6 are connected at Bus-III, IV side. ii) During antecedent condition, interconnectors were in opened condition. 490MW Unit-5 was not running and 490MW Unit-6 was generating approx. 455MW. HVDC Rihand-Dadri Bipole was carrying total ~600MW. iii) As reported, at 04:03:05:240 hrs, B-N phase to earth fault occurred on 400kV Dadri-Mandola ckt-1. Fault distance was approx. 100meter from Dadri TPS end. This fault was sensed by both the ends in Z-1. After ~160msec (08 cycles) of fault, B-ph pole of CB at both then ends opened and A/R started. Further after ~1sec (dead time), line successfully autoreclosed due to transient nature of fault. Delayed tripping initiation in Z-1 was due to Z-1 time delay setting which was kept as 100msec instead of instantaneous. As informed by NTPC Dadri, Z-1 time delay has been set as 0 sec (instantaneous). iv) As per PMU & DR of 400kV Dadri-Mandola ckt-1, B-N phase to earth fault with successful A/R operation is observed. Steady state fault current was approx. 35kA, during transient fault current magnitude was ~52kA. v) On this fault, commutation failure at HVDC Rihand-Dadri occurred and power order dropped to zero (0). vi) Distance protection relay at Harshvihar end of 400kV Dadri-Harshvihar ckt-2 sensed the fault on 400kV Dadri-Mandola ckt in Z-1 and successful autoreclosed from Harshvihar end. Dadri end relay sensed fault in Z-4 as fault was in reverse direction however as informed by Dadri, instant three phase tripping occurred on DT received from Harshvihar end. Reason of DT received at Dadri end is yet to be identified. vii) During fault time, over voltage of the magnitude of approx. 723kV in 400kV Dadri-Mandola ckt-2 and Dadri end and approx. 560kV in 400kV Bus-2 at Dadri TPS is observed (as per PMU at Dadri TPS). Over voltage sustained for approx. 100msec viii) On this over voltage, 400kV Dadri-Mandola ckt-2 tripped on over voltage stage-2 protection operation at Dadri end. ix) At the same time, all three filter banks connected at Dadri HVDC tripped on over voltage protection operation. As reported by POWERGRID, over voltage protection of filter banks is 489.89kV with 20msec pickup time delay. x) Due to tripping of filter banks, HVDC Rihand-Dadri Bipole got blocked. xi) From DR & PMU voltage plots, over voltage didn't occur in other 400kV elements at Dadri TPS. xii) On overvoltage in Mandola ckt-2, Dadri TPS informed that neutral of CVT at Main 1 relay found opened at Dadri end which led to rise in voltage at secondary side. Reason of over voltage in 400kV Bus and Dadri HVDC bus is yet to be identified.	455	0	160	i) Reason of over voltage in 400kV Bus need to be identified. ii) Reason of Z-1 over reach at Harshvihar end and DT received at Dadri end from Harshvihar end also need be reviewed. iii) Mismatch is suspected in nomenclature of 400kV Bus at Dadri TPS in SCADA & PMU, it need to be checked. iv) DR at Dadri TPS end are not time synced. Time sync of DR with GPS need to be ensured. v) Remedial action taken report to be shared.
14	GI-1	1) 210 MW Guru Gobind Singh TPS (Ropar) - UNIT 4 2) 210 MW Guru Gobind Singh TPS (Ropar) - UNIT 5 3) 210 MW Guru Gobind Singh TPS (Ropar) - UNIT 6 4) 220kV GGSTP-Kharar Ckt 5) 220kV GGSTP-Mohali Ckt 6) 220kV GGSTP-Bassi Pathana Ckt 7) 220kV GGSTP-Gobindgarh Ckt-1 8) 220kV GGSTP-Gobindgarh Ckt-2	Punjab	PSTCL	30-Nov-23	06:51	i) 220/132kV Ropar GGSTP(PS) has main and transfer bus scheme at 220kV level. ii) During antecedent condition, 210 MW Guru Gobind Singh TPS (Ropar) - UNIT 4 (carrying ~164MW), UNIT 5 (carrying ~148MW) & UNIT 6 (carrying ~151MW) and 220kV feeders to Kharar, Mohali & Gobindgarh-2 were connected to 220kV main Bus section-III. Rest of the elements were connected to main Bus section-I & II. iii) As reported, at 06:51 hrs, 220kV GGSTP-Kharar Ckt tripped on R-N phase to earth fault (zone-1 distance protection operated) with fault current of 4.071kA and fault distance of 33.91km from GGSTP end. Fault occurred due to heavy lightening. iv) On this fault, all other elements connected to 220kV main Bus section-III tripped. (Exact reason yet to be shared) v) As reported by GGSTP Ropar, 220kV GGSTP-Bassi Pathana Ckt (connected to 220kV main Bus section-I) and 220kV GGSTP-Gobindgarh Ckt-1 (connected to 220kV main Bus section –II) also tripped during the same time. (Exact reason yet to be shared) vi) As per SCADA SOE, 66kV Morinda-Kharar(PS) ckt also tripped at the same time. (Exact reason yet to be shared) vii) As per PMU at Jalandhar(PG), R-N phase to earth fault is observed with delayed fault clearance time of 440ms. viii) As per SCADA, generation loss of approx. 463MW occurred at Ropar GGSTP. ix) As per SCADA load loss of approx. 60MW is observed in Punjab control area.	463	60	440	i) Details of protection operated in all other elements connected to 220kV main Bus section-III need to be shared. ii) Exact reason of tripping of 220kV GGSTP-Bassi Pathana Ckt (connected to 220kV main Bus section-I) and 220kV GGSTP-Gobindgarh Ckt-1 (connected to 220kV main Bus section –II) need to be shared. iii) Reason of delayed clearance of fault need to be shared. iv) DR/EL of each tripped element along with tripping report of the event need to be shared from both the ends. v) Remedial action taken report to be shared.

S.No.	Category of Grid Disturbance (GD-I to GD-V)	Name of Elements (Tripped/Manually opened)	Affected Area	Owner/ Agency	Outage		Event (As reported)	Loss of generation / loss of load during the Grid Disturbance		Fault Clearance time (in ms)	Remarks
					Date	Time		Generation Loss(MW)	Load Loss (MW)		
15	GD-1	1) 400kV Ramgarh(RS)-Bhadla(RS) Ckt-1 2) 400kV Ramgarh(RS)-Bhadla(RS) Ckt-2 3) 400kV Ramgarh(RS)-Akal(RS) Ckt-1 4) 400kV Ramgarh(RS)-Akal(RS) Ckt-2	Rajasthan	RVPNL	31-Dec-23	09:29	i) During antecedent condition, MVA loadings of 400/220 kV 500 MVA ICT- 2 & 3 at Ramgarh(RS) were 188 and 191 MVA respectively. 400/220 kV 500 MVA ICT- 1 at Ramgarh(RS) was not under working condition. ii) As reported by SLDC-Rajasthan (Bhadla(RS) end), at 09:29 hrs, 400kV Ramgarh(RS)-Bhadla(RS) Ckt-1 tripped on R-Y phase to phase fault with fault clearing time of 332ms, fault distance of 152.1km and fault current of ~3.25kA and ~3.13kA in R and Y phase respectively from Bhadla(RS) end (Phase sequence issue at Bhadla(RS) end); fault was observed in zone-2 at Bhadla(RS) end. 400kV Ramgarh(RS)-Bhadla(RS) Ckt-2 tripped from Ramgarh(RS) end only, no tripping occured at Bhadla(RS) end. iii) As per DR at Ramgarh(RS) end, bus bar protection operated at Ramgarh(RS) end during the same time (exact reason yet to be shared). iv) As per DR, 400 KV Akal-Ramgarh(end) (RS) Ckt-1 tripped on Y-B phase to phase fault with fault clearing time of 520ms and fault current of ~3.63kA and ~3.46kA in Y and B phase respectively from Ramgarh(RS) end; fault was observed in zone-4 at Ramgarh(RS) end. v) As per DR, 400 KV Akal-Ramgarh(end) (RS) Ckt-2 tripped on Y-B phase to phase fault with fault clearing time of 220ms and fault current of ~3.72kA and ~3.52kA in Y and B phase respectively from Ramgarh(RS) end; fault was observed in zone-4 at Ramgarh(RS) end. vi) Due to tripping of all the elements, 400/220kV Ramgarh(RS) S/s became dead. vii) As per PMU, Y-B phase to phase fault with delayed fault clearance time of 520ms is observed. viii) As per SCADA, change in demand of approx. 310 MW is observed in Rajasthan control area. ix) As per SCADA, loss of wind generation of approx. 315 MW is observed in Rajasthan control area.	315	310	520	i) Exact reason of tripping need to be shared. ii) Reason of delayed clearance of fault need to be shared. iii) Zone-4 settings of lines and bus bar protection settings at Ramgarh(RS) end need to be shared. iv) Phase sequence issue need to be resolved at Bhadla(RS). v) DR/EL for each of the tripped element along with tripping report need to be shared from both the ends. vi) Details of affected wind plants along with details of event logs at plant level need to be shared. vii) Remedial action taken report to be shared.
16	GI-2	1) 800 KV HVDC Kurukshetra(PG)-Champa(PG) (PG) Ckt-1 2) 800 KV HVDC Kurukshetra(PG)-Champa(PG) (PG) Ckt-2 3) 800 KV HVDC Kurukshetra(PG)-Champa(PG) (PG) Ckt-3 4) 800 KV HVDC Kurukshetra(PG)-Champa(PG) (PG) Ckt-4	Haryana	POWERGRID	9-Jan-24	14:00	i) During antecedent condition, 800kV HVDC Champa-Kurukshetra Bipole was carrying total 2500MW (625MW each pole). ii) As reported at 14:00:20hrs, "commutation failure detected" and "Pole4 Instability Detected by SSAD" protection latched in Pole4 which initiated CATA2 sequence for blocking of Pole4 and isolated Pole4 from parallel Pole2. iii) Further after ~800msec of initiation of CATA2 sequence by Pole4 on Instability protection, opening sequence to HVHS at both ends didn't initiate which led to failure of protective isolation of faulty Pole4 and generated CATB alarm leading to tripping of parallel Pole2 also. iv) Furtehr at 14:01:17 hrs, 17hrs, "Instability detected" protection latched in Pole1 also which initiated CATA2 sequence for protective isolation from Pole3. v) Further at 14:01:18hrs, like Pole4, CATA2 sequence in Pole1 also failed to initiate HVHS opening leading to protective sequence failure which generated CATB alarm that resulted in tripping of parallel Pole3. vi) Due to tripping of all four (04) poles, power order redcued from 2500MW to 0MW. vii) As per PMU, fluctuation in power order was observed.	0	0	NA	i) Corrective actions taken/planned to be taken to minimise the frequent tripping of HVDC Chmapa-Kurukshetra Bipole and ensure its reliability?

Utilities are requested to prepare detailed report and present the event details during 49th PSC meeting. Events involving more than one utility may be jointly prepared and presented.