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

No. उ.क्षे.वि.स./प्रचालन/107/01/2022/12333 - 12371 दिनांक: 19.12.2022

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 46 वीं बैठक की कार्यसूची।
Subject: Agenda for 46th Protection Sub-Committee Meeting.

संरक्षण उप-समिति की 46वीं बैठक, **22.12.2022** को **11:00** बजे से **वीडियो कॉन्फ्रेंसिंग** के माध्यम से आयोजित की जाएगी। उक्त बैठक की कार्यसूची उत्तर क्षेत्रीय विद्युत् समिति की वेबसाइट (https://www.nrpc.gov.in) पर उपलब्ध है। ऑनलाइन बैठक में शामिल होने के लिए लिंक और अपेक्षित जानकारी नियत समय पर सदस्यों को दी जाएगी।

The 46th meeting of Protection Sub-Committee is scheduled to be held on **22.12.2022** at **11:00 Hrs** through **Video Conferencing**. The agenda for the meeting is available on NRPC website and same can be downloaded from https://www.nrpc.gov.in. The link and requisite information for joining the online meeting will be shared with the members in due course.

19/12/22
(संतोष कुमार)
अधीक्षण अभियंता

Agenda for

46th Meeting of Protection Sub-committee of Northern Regional Power Committee

Date and time of meeting : 22.12.2022 11.00 Hrs.
Venue : Video-conferencing

A.1. Confirmation of minutes of 45th meeting of protection sub-committee

Gist of decisions of 45th meeting of Protection Sub-committee (held on 24.06.2022) were issued vide letter dated 11.07.2022. Minutes of the meeting were issued vide letter dtd. 13.09.2022. No comment has been received.

Sub-Committee may confirm the Minutes.

A.2. Implementation of Recommendations of Task Force

As a follow up of one of the recommendations of Enquiry Committee headed by the Chairperson, CEA on grid disturbances that took place on 30th and 31st July 2012, Ministry of Power had constituted a 'Task Force on Power System Analysis under Contingencies' in December 2012. The Task Force had submitted its report in August 2013. In a meeting taken by Union Power Secretary on 11.03.2014, it was decided that the report be given wide circulation and its recommendations be implemented in a time bound manner. Issue arising out of the recommendations of the Task Force is as under:

A.2.1. Database of protection settings

A.2.1.1 In 39th (held on 18.12.2019) and 40th PSC (held on 02.03.2020) meetings, it was decided to start data collection in phased manner by initially collecting protection setting data for 400 kV & above lines as well as ICTs including nomination of Nodal officer from each utility/state who will co-ordinate for submitting new as well as updating the settings. Utilities may intimate if there is any change in Nodal officer details.

A.2.1.2 In 42nd PSC meeting (held on 31.07.2020), NTPC, POWERGRID, UPPTCL, HVPNL, RRVPNL and other utilities were requested to submit the protection setting data for lines, ICTs and Reactors by 15.08.2020. Those utilities which have not yet submitted the data are again requested to share Protection setting details for 400 kV and above Transmission lines, ICTs and Reactors. Further, all SLDCs were requested to share the protection setting data for IPPs and other generators in their control area by 15.08.2020.

A.2.1.3 In 43rd PSC meeting (held on 30.09.2020), JKPTCL and NTPC representative informed that Protection setting data is being collected and will be submitted by 20.10.2020. JKPTCL and NTPC representative informed that protection setting data is being collected and will be submitted by 20.10.2020. SLDCs were also requested to share the protection setting data for IPPs and other generators in their control area by 20.10.2020.

A.2.1.4 In the 44th PSC meeting (held on 12.04.2021), representative of NTPC stated that they will submit their remaining protection setting database within a week. Further, SLDCs were again requested to share the protection setting data for IPPs and other generators in their control area by 30.04.2021. Furthermore, as decided in 42nd PSC meeting, SLDCs of HP, PTCUL and JKPTCL were requested to submit protection setting data for the network at 132 kV by 30.04.2021. The updated status of protection setting data submission and Nodal Officer details are attached as **Annexure – 1A and 1B.** Utilities may intimate if there is any change in Nodal officer details.

A.2.1.5 In the 44th PSC meeting, it was also deliberated that since majority of data for 400 kV and above Transmission lines, ICTs and reactors has been collected, the process of Web based Protection setting database may be initiated in parallel manner. Hence, it was decided to first constitute a committee for preparing comprehensive specifications for relay setting parameters for Web based database. Thereafter, cost estimation for the work and funding options may be explored. It was also decided that nomination letter with ToR of the committee may be issued by NRPC Sectt.

A.2.1.6 As per decision taken in 43rd PSC meeting, a committee was constituted vide letter dtd. 06.04.2021 which was reconstituted vide letter dated 27.01.2022 due to the change in the nominations of few members. The 1st meeting of the committee was held on 10.02.2022 and 2nd meeting of the committee was held on 14.06.2022. In these meetings, committee has finalized scope of work which was deliberated and accepted in 45th Protection sub-committee meeting (held on 24.06.2022). The following was decided in 45th PSC meeting:

i. A meeting with NIC to be scheduled for exploring the possibility and cost estimate for hosting of portal considering quantum of data.

ii. Budgetary quotation/EOI to be requested from suitable vendors.

A.2.1.7 It has been observed that as per protection code in draft CERC (Indian Electricity Grid Code) Regulations, 2022 issued by CERC on 07.06.2022, some responsibilities have been added for RPCs regarding protection setting approval and its database. The same are:

Quote

14. PROTECTION SETTINGS

(1) RPCs shall undertake review of the protection settings, assess the requirement of revisions in protection settings and revise protection settings in consultation with the stakeholders of the respective region, from time to time and at least once in a year. The necessary studies in this regard shall be carried out by the respective RPC.

(2) All users connected to the grid shall:

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

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

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

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

(e) ensure proper coordinated protection settings.

(3) RPCs shall:

(a) maintain a centralized database 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).

(b) carry out detailed system studies, twice a year, for protection settings and advise modifications / changes, if any, to the CTU and to all users and STUs of their respective regions.

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

Unquote

A.2.1.8 Therefore, it is proposed that database work may be taken up further only after notification of final IEGC by Hon'ble CERC as scope of tender may vary as per requirement.

Members may deliberate.

A.3. Protection Philosophy of NR

A.3.1 Task Force on Power System Analysis under Contingencies was constituted by Ministry of Power in December 2012 as a follow up of one of the recommendations of Enquiry Committee headed by Chairperson, CEA on grid disturbances that took place on 30th and 31st July 2012. The report of the Task Force on Power System Analysis made various recommendations including protection system audit, protection relay setting etc. Considering the same and Grid conditions at that time NRPC Protection Philosophy was agreed for implementation in Northern Region.

A.3.2 In 42nd PSC meeting (held on 31.07.2020), it was decided to constitute expert group comprising members from NRPC Sectt, NRLDC, POWERGRID, STUs, APL, NTPC, NHPC, RE Generator and other experts such as CBIP, expert from other RPCs which group may study various recommendations related to Protection setting as well as adopted philosophy in other regions/utilities and further, propose updated protection philosophy in time bound manner.

A.3.3 In 45th PSC meeting (held on 24.06.2022), it was decided that Adani and NTPC may be requested for nominating renewable generation related protection experts.

A.3.4 Nomination from ADANI has been received. NTPC has not submitted nomination even after various follow-up vide letters dtd. 14.07.2022, 07.09.2022, & 01.11.2022.

A.3.5 On basis of nomination received, a committee has been constituted (Letter dtd. 08.12.2022 enclosed as **Annexure – II**) with ToR to study various recommendations related to Protection setting as well as adopted philosophy in other regions/utilities and to recommend changes in existing NR Protection Philosophy.

A.3.6 This expert group is to submit recommendations within 03 months which will be deliberated in Protection sub-committee meeting. The group may include any other member as deemed suitable.

Members may note.

A.4. Non-functional carrier Inter-trip feature (Agenda by BBMB)

A.4.1 BBMB vide mail dtd. 25.11.2022 has intimated following:

i. Carrier aided protection on Jalandhar-Dasuya ckt-4 is defective since June, 2012 and is not being rectified by PSTCL in spite of repeated correspondences.

ii. New PLC Terminals along with Protection couplers have been installed on 220 kV Barnala-Lehra Mohabbat Ckt. by BBMB at both ends on 24.11.2020. Inter-connection wiring between Protection Coupler to Distance Protection relays has been completed by BBMB at Barnala end. But at Lehra Mohabbat end, wiring of Protection Coupler to Distance Protection relays has not been completed till date by PSTCL in spite of repeated requests. So the carrier inter-trip feature (Carrier aided protection of transmission line) is non-functional on 220 kV Barnala-Lehra Mohabbat Line.

PSTCL may update.

A.5. Proposal to implement additional protection in 220KV lines at NAPS (Agenda by NAPS)

A.5.1 NAPS vide email dated 06.10.2021 had submitted that on 11.08.2021 at 13:25 hrs, both units (NAPS-1 and NAPS-2) had tripped subsequent to isolation of NAPS switchyard from grid due to fault caused by R-phase CVT of 220kV Line-1(Narora-Sambhal). In view of above incident, matter was discussed with designer, NPCIL, Mumbai and additional protection for the 220kV lines has been suggested. (Letter enclosed **Annexure – III**)

A.5.2 The issue was also deliberated in 188th OCC meeting held on 22.10.2021 wherein it was decided that the matter shall be referred to protection sub-committee group for scrutiny and comment on the proposed scheme. (Presentation by NAPS enclosed as **Annexure – IV**)

A.5.3 Accordingly, issue was deliberated in 45th PSC meeting held on 24.06.2022 it was decided that a committee may be constituted comprising members from NAPS, NRLDC, NRPC Sectt., POWERGRID and UPSLDC to look into the issue and submit its recommendation at the earliest.

Members may deliberate.

A.6. Tripping in 400kV Uri – Amargarh line of NRSS XXIX (Agenda by Indigrid)

A.6.1 M/s IndiGrid vide mail dtd. 21.11.2022 has intimated that 400kV Uri – Amargarh line of NRSS XXIX is facing intermittent rise of voltage during AR Operations leading to tripping of line on overvoltage issue. Three such tripping occurred in the past & their detail is as follows:

i. Amargarh Uri line-1 AR_B phase on 5th April 2021
ii. Amargarh Uri line-2 AR_R phase on11th June 2021
iii. Amargarh Uri line-1 AR_B phase on 19th June 2021

A.6.2 Few DR were studied on both the circuits to understand the severity of the voltage rise. In view of the same IndiGrid had requested Uri- substation (NHPC) twice to look into the matter but yet to receive any response from NHPC.

Members may deliberate.

A.7. Third Party Protection audit of PTCUL and UJVN stations (Agenda by NRPC Sectt.)

A.7.1 As per decisions of 199th OCC meeting (held on 16.09.2022), 2 group of officers were formed for protection audit of PTCUL sub-station.

A.7.2 Audit was conducted by one group during 12-13 October 2022 at 220 kV SIDCUL (Haridwar) s/s of PTCUL. However, two officers (THDC, and NRLDC) of 2nd group denied for audit as per schedule intimated to them and they requested for re-scheduling the dates.

A.7.3 In this regard, it has been observed that organization are not comfortable in engaging officers for the said audit.

A.7.4 It is proposed that PTCUL and UJVN may explore hiring third party agencies (such as CPRI) for the said audit.

Members may deliberate.

A.8. Installation of PLCC in transmission lines and protection audit of substations in J&K(UT) control area (Agenda by NRLDC)

A.8.1 NRLDC/GRID-INDIA has intimated that frequent events of multiple elements tripping leading to load loss has been observed in J&K (UT) control area. Majorly affected substation are 220kV Ziankote, Udhampur, Barn, Hiranagar, Alusteng, Jammu (Gladini) & Pampore. Details of tripping events occurred at aforementioned sub stations during period of May'22-Dec'22 are enclosed in **Annexure-V**. Such frequent grid events are very detrimental to the safety and security of the state grid as well as to that of regional and national grid.

A.8.2 Issues which need to be addressed for remedial actions to minimize the frequency of tripping and its extent are as follows:

i. PLCC with carrier aided protection in most of the 220kV lines owned by PDD are not functional due to which A/R does not operate during single phase to earth fault. Besides, carrier aided accelerated clearance of fault is also not possible.

ii. Protection system are also not well coordinated with remote substations. During most of the tripping event, delayed clearance of fault also observed. Hence, reviewing of protection settings of transmission elements at J&K (UT) substations and ensuring its optimal coordination with the nearby substation is need to be ensured.

A.8.3 As it is known that most of the J&K (UT) 220kV substations are connected to ISTS network via POWERGRID (NR-2) substations. So, POWERGRID may assist PDD, J&K in resolving above mentioned protection system related issue. Protection audit of 220/132kV substations in J&K (UT) control area may also be conducted. An early action for resolving the above mentioned issues is earnestly solicited from PDD J&K, for reliable operation of J&K power system.

Member may deliberate.

A.9. Tripping Events (Agenda by NRLDC)

A.9.1 The list of tripping events which shall be discussed during 46th PSC meeting is enclosed **Annexure – VI**.

A.9.2 All the utilities are requested to submit DR/EL and other tripping related data to NRPC/NRLDC and submit the same before the 46th PSC meeting scheduled to be held on 22.12.2022.

A.9.3 **All the utilities are requested to make presentation highlighting cause of the event, actions taken and remedial measure to be taken in future for avoidance of similar instances and share the same with NRPC/NRLDC at mail ID: nrldcso2@posoco.in, nrldcso2@gmail.com, & seo-nrpc@nic.in.**

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Annexure - 1A

Sr. No.	Utility	400 kV and above Transmission lines	Date of Submission	400 kV and above ICTs	Date of Submission	400 kV and above Reactors	Date of Submission
1	APCPL	Yes	13.06.2020	Yes	13.06.2020	Yes	13.06.2020
2	BBMB	Yes	13.01.2020	Yes	03.07.2020	Yes	03.07.2020
3	DTL	Yes	16.06.2020	Yes	16.06.2020	Yes	16.06.2020
4	HVPNL (Panchkula TS)	Yes	04.07.2020	Yes	04.07.2020	Yes	04.07.2020
	HVPNL (Hissar TS) (Except for 400 kV Nuhiyawali S/s	Yes	10.08.2020	Yes	10.08.2020	Yes	10.08.2020
5	MEJA	Yes	13.06.2020	Yes	13.06.2020	Yes	13.06.2020
6	NHPC	Yes	02.03.2020	No		No	
7	NPCIL						
	RAPP D	Yes	05.03.2020	No		No	
	NAPS	Yes	18.12.2019	No		No	
8	NTPC	No		No		No	
	Only Dadri Coal	Yes	24.06.2020	Yes	24.06.2020	Yes	24.06.2020
9	PPCL	Yes	06.06.2020	No		No	
10	PSTCL	Yes (Not in Format)	13.03.2020	No		No	
11	RVPNL	Yes	28.02.2020	No		No	
12	SJVN	Yes	12.06.2020	NA		Yes	12.06.2020
13	THDC						
	Koteshwar HEP	Yes	22.07.2020	NA		NA	
14	South East UPPTCL	Yes	15.06.2020	Yes	15.06.2020	Yes	15.06.2020
15	WUPPTCL	Yes	10.08.2020	Yes	10.08.2020	Yes	10.08.2020
16	UPPTCL						
	Central Zone	Yes	20.06.2020	Yes	20.06.2020	Yes	20.06.2020
	South Central Zone (Jhansi/ Banda and Orai)	Yes	13.02.2020/11.09 .2020.	Yes	11.09.2020	Yes	11.09.2020
	West Zone	Yes	29.07.2020	Yes	29.07.2020	Yes	29.07.2020
	South West Zone (Fatehabad & Agra	Yes	29.07.2020	Yes	29.07.2020	Yes	29.07.2020
	North West	Yes	11.09.2020	Yes	11.09.2020	Yes	11.09.2020
	North East Zone	Yes	17.02.2020	Yes	17.02.2020	Yes	17.02.2020
17	POWERGRID NR 1	Yes	22.02.2020	Yes	18.09.2020	Yes	18.09.2020
18	POWERGRID NR 2	Yes	24.09.2020	Yes	24.09.2020	Yes	24.09.2020
19	POWERGRID NR 3	Yes	26.02.2020	Yes	28.09.2020	Yes	28.09.2020
20	HPPTCL (132 kV and above)	Yes	09.11.2020	Yes	09.11.2020	Yes	09.11.2020
21	JKPTCL	No		No		No	
22	PTCUL (132 kV and above)	Yes	31.07.2020	Yes	31.07.2020	Yes	31.07.2020
23	UPRVUNL						
	Obra TPS and Parichha TPS	Yes	06.08.2020	Yes	06.08.2020	Yes	06.08.2020
	Anpara ATPS and Harduaganj	Yes	11.08.2020	Yes	11.08.2020	Yes	11.08.2020
	Anpara DTPS	Yes	14.08.2020	Yes	14.08.2020	Yes	14.08.2020
24	HPGCL	No		No		No	
25	UPSLDC						
	Alaknanda	Yes	13.08.2020	NA		NA	
	PPGCL Bara	Yes	10.09.2020	Yes	10.09.2020	Yes	10.09.2020
	Lanco Anpara	Yes	10.09.2020	Yes	10.09.2020	NA	
	LPGCL	Yes	10.09.2020	Yes	10.09.2020	Yes	10.09.2020
	Vishnuprayag	Yes	10.09.2020	NA		NA	
	Rosa TPS	Yes	28.07.2020	Yes	28.07.2020	NA	
26	RRVUNL	Yes	23.11.2020	Yes	23.11.2020	Yes	23.11.2020

~~**Annexure – II**~~

Status of Nodal Officer details:

Sr. No.	Name of the utility	Name and no. of the Nodal officer
1.	BBMB	Er. Vijay Singh Mob No. 9466120870
2.	POWERGRID NR - 1	Sh. Mahendra Singh Hada, DGM(AM), NR-I, mshada@powergridindia.com, 09650555997
3.	POWERGRID NR - 2	Sh. Sushil, Ch. Mgr. (AM), NR-II, sushil.sharma@powergridindia.com, 9419210437
4.	POWERGRID NR - 3	Sh. Nitin Verma, DGM(AM), NR-III, nverma@powergridindia.com, 08005499952
5.	NAPS	Sh. H.S.Singh , Senior Technical Engineer (E&I) Mobile No. 9412768059
6.	NHPC	Sh. S. K. Das , Sr. manager (E) Mob No. 9717786721
7.	PSTCL	Er Rajbir Singh Walia, Adll S.E, P&M
8.	DTL	Sh. Paritosh Joshi, Manager, 9999533933
9.	MUNPL	Sh. Arun Kumar, Sr. Mgr. (Technical Maintenance)
10.	PPCL	Sh. Arif Rehman, Sr. Mgr. 9717694928
11.	APCPL	Sh. Abhishek Jain, Mgr EMD, 9416212489 abhishekjain01@ntpc.co.in
12.	HVPNL	Er. Deepak Bharadwaj, XEN(M&P), Faridabad 9315315640, xenmpccfbd@hvpn.org.in Er. Y.S Gulia XEN M&P Rohtak. , 9354194830 xenmpccrtk@hvpn.org.in
13.	SJVNL	Sh. Soni Kumar, DGM (Electrical Maintenance) 9418450875 soni.kumar@sjvn.nic.in, Sh. Vinay Kumar, Deputy Manager, 9418436838, Email id:- rhpsmaintenance@gmail.com

14.	PTCUL	Sh. Asim Baig, EE (T&C) 9412087885 asim_baig@ptcul.org
15.	NTPC	Sh. R. K. Singh, Sr. Mgr. (OS), 7651821612, 9450963079, rameshsingh@ntpc.co.in
16.	THDC	Sh. Ashutosh Gairola, Koteshwarr HEP; Sh. Laxman Rao, Tehri HEP
17.	UPPTCL	Sh. Pankaj Malviya, SE(T&C), setnclko@upptcl.org
18.	SOUTH EAST UPPTCL	Sh. Prashant Kumar Chauhan, Manager (765kV Mainpuri) 9720490066; Sh. Mukesh Kumar, Manager (400kV Gonda) 7704969000
19.	UPRVUNL	Sh. Ramgyan Singh, EE, Parichha TPS; 9415609722
20.	WUPPTCL	Sh. Kavin, Sr. Engineer, 8122289836, kavinkumar.wupptcl@gmail.com
21.	JKPTCL	Er. Kamal Kishore Thappa (Jammu Region), SE, O&M circle – 1, sesandocr1jmu@gmail.com, 9419112827; Er. Nisar Ahmad Lone (Kashmir Region), EE TLMD – II Pampore; xentlmd2@gmail.com; 9419079578
22.	HPPTCL	DGM(Protection & Communication), Hamirpur Email id: dgmprot@hpptcl.in

Annexure - II

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

No. उ.क्षे.वि.स./प्रचालन/107/01/2022/11991-12000 दिनांक: 08.12.2022

Sub: Constitution of expert group to study and recommend changes in existing NR Protection Philosophy - reg.

In compliance of decisions of 42nd & 45th Protection Sub-committee (PSC) meeting for constitution of expert group, and on basis of nominations received from utilities, an expert group to study and recommend changes in existing NR Protection Philosophy is constituted with following members: -

1. Sh. Reeturaj Pandey, EE (Protection), NRPC Sectt.
2. EE, EMD-I, UPRVUNL, Harduaganj CTPS, Aligarh
3. Sh. Vijay Pal Yadav, XEn (MPT&S), RVPN, Alwar
4. Sh. B. L. Gujar, AGM, DTL
5. Sh. Paritosh Joshi, Mgr, DTL
6. Er. Ravi Lal, Deputy Director, BBMB
7. Sh. Sandeep Yadav, Chief Manager (AM), RHQ, NR-1, POWERGRID
8. Sh. Shahshank Tyagi, Chief manager, NRLDC
9. Sh. NP Dewangan (DGM-EMD), NTPC Singrauli
10. Sh. Abhishek Kumar singh, Manager-EMD, NTPC, Tanda
11. Sh. Vivek Pushpakar, Sr Manager-EMD, NTPC, Tanda
12. Sh. Rajat Sharma, SM (E), HPPTCL
13. Sh. Ashish Kumar Kausal, DM (Protection), HPPTCL
14. Sh. Swarup Kumar Das, SM (E), NHPC
15. Sh. Sunil Desai, Adani Renewable

Terms of Reference of the committee is to study various recommendations related to protection setting as well as adopted philosophy in other regions/utilities and to recommend changes in existing NR Protection Philosophy.

This expert group may submit recommendations within 03 months and the same may be deliberated in Protection sub-committee meeting.

The expert group may induct any other member as deemed suitable.
This issues with approval of Member Secretary, NRPC.

8/12/22
(संतोष कुमार)
अधीक्षण अभियंता (संरक्षण)

सेवा में,

As per list attached

18-ए, शहीद जीत सिंह मार्ग, कटवारिया सराय, नई दिल्ली- 110016 फोन:011-26511211 ई-मेल: seo-nrpc@nic.in वेबसाईट: www.nrpc.gov.in
18-A, Shaheed Jeet Singh Marg, Katwaria Sarai, New Delhi-110016 Phone: 011-26511211 e- mail: seo-nrpc@nic.in Website: www.nrpc.gov.in

List of addressee:

S.N.	Name	E-mail
1	EE, EMD-I, UPRVUNL, Harduaganj CTPS, Aligarh	eeemd1htps@gmail.com
2	Sh. Vijay Pal Yadav , XEn (MPT&S), RVPN, Alwar	xen.prot.alwar@rvpn.co.in
3	Sh. B. L. Gujar, AGM, DTL	bl.gujar@dtl.gov.in
4	Sh. Paritosh Joshi, Mgr, DTL	paritosh.joshi@dtl.gov.in
5	Er. Ravi Lal, Deputy Director, BBMB	ravilal348@gmail.com , ddpntjmp@bbmb.nic.in
6	Sh. Sandeep Yadav, Chief Manager (AM), RHQ, NR-1, POWERGRID	sandeepyadav@powergrid.in
7	Sh. Shahshank Tyagi, Chief manager, NRLDC	shashank@posoco.in
8	Sh. NP Dewangan (DGM-EMD), NTPC Singrauli	npdewangan@ntpc.co.in
9	Sh. Abhishek Kumar singh, Manager-EMD, NTPC, Tanda	abhishekkumarsingh02@ntpc.co.in
10	Sh. Vivek Pushpakar, Sr Manager-EMD, NTPC, Tanda	vivekpushpakar@ntpc.co.in
11	Sh. Rajat Sharma, SM (E), HPPTCL	smprot1.tcl@hpmail.in
12	Sh. Ashish Kumar Kausal, DM (Protection), HPPTCL	Ashish.ku.tcl@hpmail.in
13	Sh. Swarup Kumar Das, SM (E), NHPC	onm-protection@nhpc.nic.in
14	Sh. Sunil Desai, Adani Renewable	SUNIL.DESAI3@adani.com

न्यूक्लियर पॉवर कॉरपोरेशन ऑफ इंडिया लिमिटेड
Nuclear Power Corporation of India Limited
(भारतसरकारकाउद्यम A Govt. of India Enterprise)
नरौरा परमाणु विद्युत केंद्र Narora Atomic Power Station
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No. : NAPS/51300/TSU-E&I)/2021/124 **दिनांक:** 06.10.2021

To,

Sh. S. Mazumdar
SE (Operation)
NRLDC, New Delhi

Sub: Review for provision of **additional protection to 220kV lines** emanating from NAPS.

On 11.08.2021 at 13:25 hrs, both units (NAPS-1 and NAPS-2) had tripped subsequent to isolation of NAPS switchyard from grid due to fault caused by R-phase CVT of 220kV Line-1 (Narora-Sambhal).

In view of above incident, matter was discussed with designer, NPCIL, Mumbai and following additional protection for the 220kV lines were suggested. Detail along with technical justification is given below:-

SN	Additional protection	Technical basis
1	Non directional phase over current: To detect close up faults. Pickup>15times CT rated current. Time delay=160msec	The non-directional phase over current does not require a voltage input, so faults in CVT that can result in providing wrong input to distance protection relay (as happened in recent NAPS CVT failure event) are take care by this protection. Time delay of 160 msec is properly co-ordinated such that. a) It gives first change to line distance protection Zone-1 to operate. Current setting is such that this protection does not interface for faults beyond Zone-1 b) If the line distance protection doesn't operate in Zone-1 then this protection operates before other lines trip on remote end Zone-2 or our end Zone-4 protection operates. Thus avoiding 220kV switchyard isolation from grid. c) And it won't interfere with bus bar protection.

SN	Additional protection	Technical basis
2	Over voltage protection: To detect early failure of CVT. Stage-1: Pickup>1.25 times rated voltage with time delay 5sec. Stage-2 : Pickup> 1.45 times rated voltage with time delay 160msec	Over voltage protection will help in early detection of faults in CVT. CVT failures that result in shattering of CVT mostly develop in capacitor (as per grid feedback) that is towards phase side of CVT HV and in IVT HV winding of CVT (as inter-turn faults). Both results in over voltage in CVT secondary. This developing fault can be detected in early stages by providing over voltage protection. Setting well beyond normal operating voltage of 220kV transmission line. This early detection avoids shattering and in minimizes post-fault damage.

In view of above, NRPC is requested to review the NAPS proposal for implementation of additional protection (ref:-Ann-1) to 220kV lines emanating from NAPS.

Regards,

H.S.Singh 6/10/24,
STE-E&I

CC:-

NRPC, New Delhi	NRLDC, New Delhi	UPSLDC, Lucknow	NAPS
Sh. Naresh Bhandari, MS	Sh. M.M. Hasan, GM Sh. Mavavir Prasad singh, DGM Sh. Neetin Yadav, CM Sh. Amit Gupta SO-II	A.J. Siddiqui, SE-SC	SD: -for kind information please. CS: -for kind information please. TSS/MS/OS Sh. S.K. Goyal, SO/G (TSU-E&I) Smt. Arpita Chakravorty, SO/E (TSU-E&I)

ANN-1

Following changes proposed in distance protection relay (MICOM P442) to initiate tripping as per designer recommendations for all 220KV line feeders:-

(A1) Configuration section (relay settings)

SN	Protection function as given by Designer	Purpose	Protection function description in the numerical relay	Present Configuration in the relay	Proposed change in Configuration
1	**Non directional phase over current**	Provided to detect close up faults	Back-up I>	Disabled	**Enabled**
2	**Over voltage Stage-I & Stage-II**	Provided to detect early failure of CVT	Volt Protection	Disabled	**Enabled**

(A2) Group-1 section (relay settings)

SN	Protection function as given by Designer	Protection function description in numerical relay	Present setting in the numerical relay	Proposed setting in the relay	CT /PT Ratio	Tripping configuration in PSL
1	**Non directional phase over current**	Group-1 Back-up I> **(I>3 is fixed as non-directional)**				
		I>1 function	Disabled	Disabled	800/1	3-phase trip on I>3 (To trip 86T-Line trip & lockout relay)
		I>2 function	Disabled	Disabled		
		I>3 status	Disabled	**Enabled**		
		I>3 Current Set	-	**15A**		
		I>3 Time delay	-	**160 ms**		
		I>4 status	Disabled	Disabled		
2	**Over voltage**	Group-1 Over Voltage Protection (V>1 Function not chosen as it has options of DT and IDMT. Voltage setting step size is **1 Volt**)				
		V> Measur't mode	-	Phase_Neutral		
		V>1 Function	Disabled	Disabled		
	O/Voltage Stage-I	**V>2 status**	Disabled	**Enabled**	220KV/ 110V	3-phase trip on V>2 and V>3 (To trip 86T-Line trip & lockout relay)
		V>2 Voltage set	-	**79 V**		
		V>2 Time delay	-	**5 sec**		
	O/Voltage Stage-II	**V>3 status**	Disabled	**Enabled**		
		V>3 Voltage set	-	**92 V**		
		V>3 Time delay	-	**150 ms**		
		V>4 status	Disabled	Disabled		

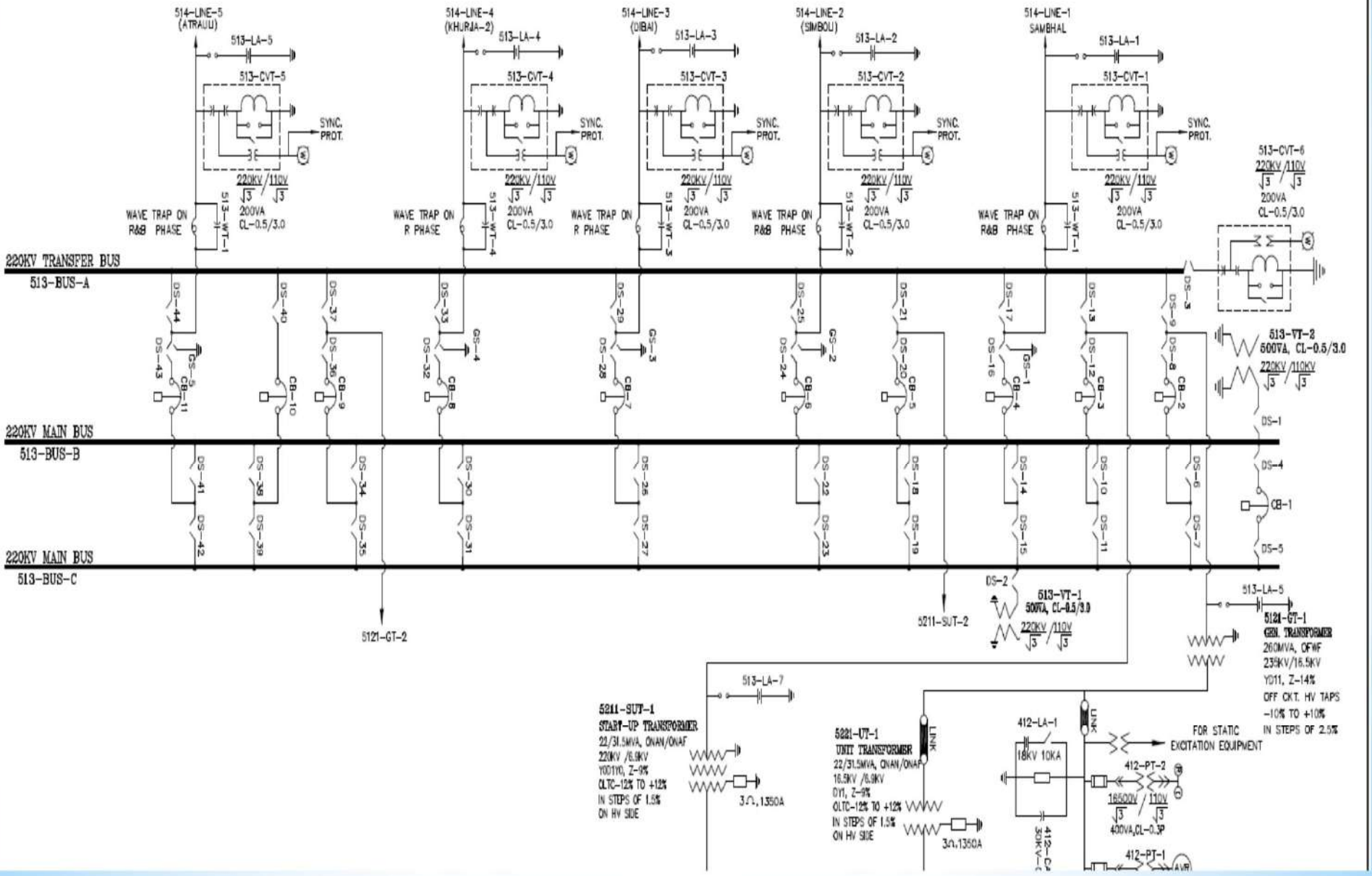
(B) Programmable Scheme Logic: - PSL will be modified to include tripping on above protection functions.

Proposal for provision of additional protection to 220kV lines emanating from NAPS.

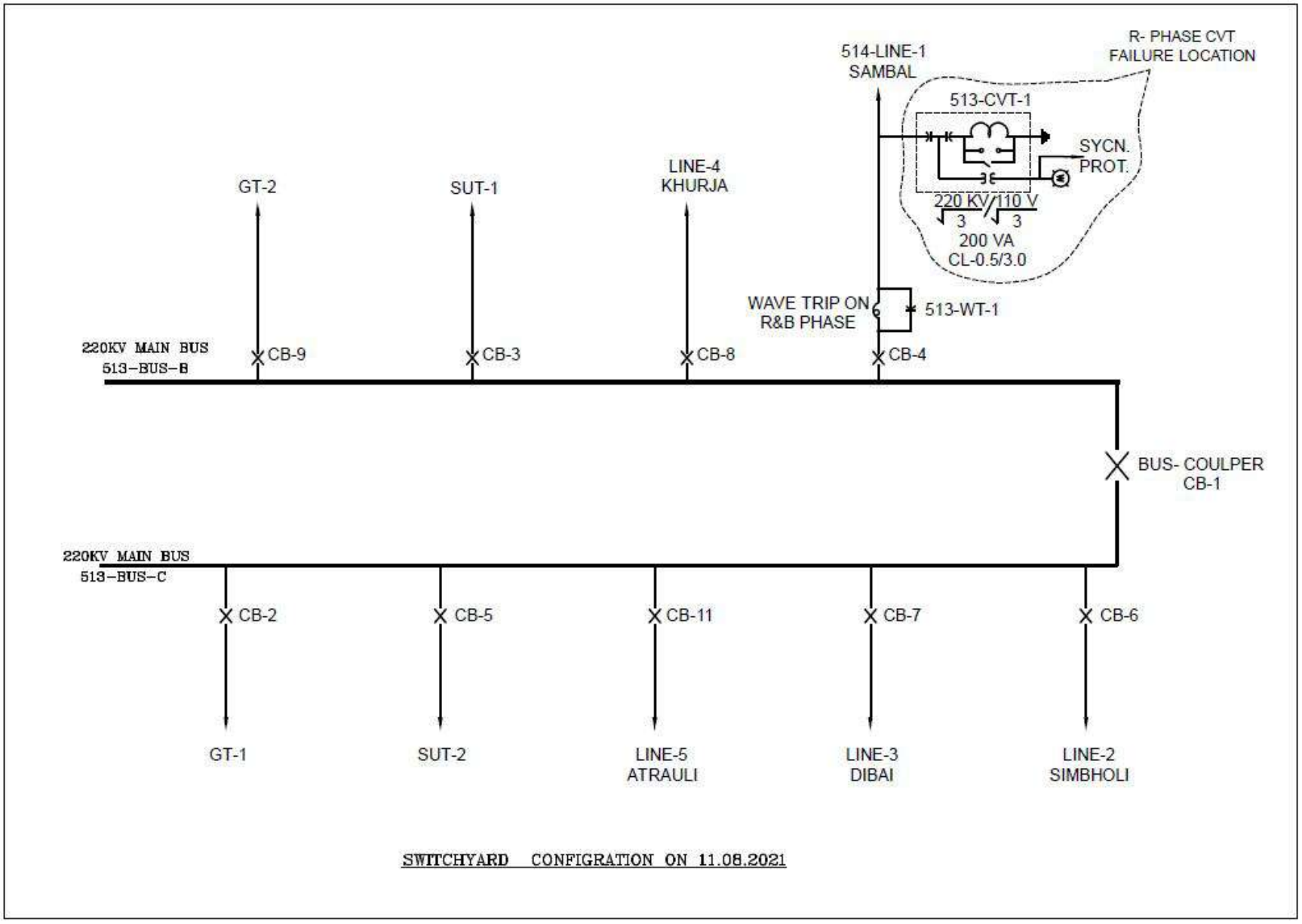
Proposal is based on event faced by NAPS on 11.08.2021

Event:-

Tripping of NAPS-1 and NAPS-2 unit subsequent to isolation of NAPS switchyard from grid due to fault caused by bursting of R-phase CVT of 513-Line-1 (220 kV Narora-Sambhal Line) .



SLD of NAPS switchyard



Switchyard configuration on 11.08.2021


BUS-A
CLAMP
ML-3
Y
R
11.08.2021 14:22

Spark mark on Y-Phase CVT of Line-1 (Narora –Sambhal)

Damage on Porcelain portion of on Y-Phase CVT of Line-1 (Narora –Sambhal)

220KV line protections

At NAPS, M/s AREVA make numerical distance protection relay (MICOM-P442) are provided for 220kV lines. The Main Protection scheme consists of: -

Zone-1 : 80% of line impedance of protected line without Time Delay.

Zone-2: 120% of line impedance of protected line with Time Delay of 350 msec.

Zone-3: 120% of (100% of protected line + 100% of the longest adjacent line) with Time Delay of 1000 msec.

Zone-4: 25% of line impedance of protected line (back-up to bus-bar differential protection) with Time Delay of 800 msec.

LBB protection : 250m Sec.

Brief Description of event:-

- On 11-08-2021, NAPS-1 and NAPS-2 were operating at full power.
- Station transformers (SUT and UT) were supplying their respective 6.6 KV buses.
- Line-1 (Narora-Sambhal), Line-4 (Narora-Khurja), SUT-1 and GT-2 were connected on 220 KV Bus-B.
- Line-2 (Narora-Simbholi), Line-3(Narora-Dibai), Line-5(Narora-Atrauli), SUT-2 and GT-1 were connected on Bus-C.
- Both Bus-B & C were connected through Bus coupler CB-1.
- Fault location is shown in SLD was outside the Zone of 220 KV bus bar differential protection hence, bus bar differential protection did not operate and also bus coupler CB-1 did not trip.
- At 13:26:07 hrs, R-phase CVT of 220 KV Line-1 got burst,oil of CVT spilled to nearby area and caused Ph-Ph fault (R and Y). This fault was sensed by remote end CBs (all five lines) and all CBs tripped on R-Y phase zone-2 protection. **This caused isolation of NAPS switchyard from grid.**

Brief Description of event:-

- Due to full load throw-off, TG frequency and terminal voltage increased and NAPS-1 TG tripped at 13:26:16 hrs on Class-A protection (over fluxing).
- 6.6 KV Auto transfer took place successfully. In NAPS-1 & supply from switch-yard was available for a short duration from NAPS-2 TG.
- After some time, NAPS-2 TG also tripped on 'Over Frequency' at 13:26:27 hrs .
- As a result both unit tripped on 'No PCP running in either bank' .
- EMTR got initiated as per design & DG-1&2 restored the auxiliary supply.
- Switch-yard was charged at 14:15 hrs from 220 KV Line-2 and electrical power supply resumed at 14:21 hrs after taking SUT in service.

Actions taken:-

All CVT has been replaced by new CVT.

Zone-4 setting reviewed with designer & set to 350m Sec.

CVT R / Y / B phase voltage high alarm at 142KV (115%) & low alarm at 105KV (80%) provided.

Additional protection on High voltage & non direction overcurrent for 220KV lines

In view of above incident, matter was discussed with designer, NPCIL, Mumbai and following additional protection for the 220kV lines were suggested to avoid switchyard isolation from grid on CVT failure. This proposal was discussed in OCC on 22.10.2021.

SN	Additional protection
1.	Non directional phase over current: To detect close up faults. Pickup>15times CT rated current. Time delay=160msec
2.	Over voltage protection: To detect early failure of CVT. Stage-1: Pickup>1.25 times rated voltage with time delay 5sec. Stage-2 : Pickup> 1.45 times rated voltage with time delay 160msec

Basis of additional protection

SN	Additional protection	Technical basis
1	Non directional phase over current: To detect close up faults. Pickup>15times CT rated current. Time delay=160 msec	The non-directional phase over current does not require a voltage input, so faults in CVT that can result in providing wrong input to distance protection relay (as happened in recent NAPS CVT failure event) are take care by this protection. Time delay of 160msec is properly co-ordinated such that. a) It gives first change to line distance protection Zone-1 to operate. Current setting is such that this protection does not interface for faults beyond Zone-1 b) If the line distance protection doesn't operate in Zone-1 then this protection operates before other lines trip on remote end Zone-2 or our end Zone-4 protection operates. Thus avoiding 220kV switchyard isolation from grid. c) And it won't interfere with bus bar protection.

Basis of additional protection

SN	Additional protection	Technical basis
2	Over voltage protection: To detect early failure of CVT. Stage-1: Pickup>1.25 times rated voltage with time delay 5sec. Stage-2 : Pickup> 1.45 times rated voltage with time delay 160msec	Over voltage protection will help in early detection of faults in CVT. CVT failures that result in shattering of CVT mostly develop in capacitor (as per grid feedback) that is towards phase side of CVT HV and in IVT HV winding of CVT (as inter-turn faults). Both results in over voltage in CVT secondary. This developing fault can be detected in early stages by providing over voltage protection. Setting well beyond normal operating voltage of 220kV transmission line. This early detection avoids shattering and in minimizes post-fault damage.

Thank You

S.No	Name of Elements (Tripped/Manually opened)	Affected Area	Owner/ Agency	Outage		Revival		Duration	Event (As reported)	Loss of generation / loss of load during the Grid Disturbance		Fault Clearance time (in ms)
				Date	Time	Date	Time			Generation Loss(MW)	Load Loss (MW)	
1	1) 220 KV Kishenpur(PG)-Udhampur(PDD) (PG) Ckt-2 2) 220 KV Kishenpur(PG)-Udhampur(PDD) (PG) Ckt-1 3) 220 KV Sarna(PS)-Udhampur(PDD) (PDD) Ckt-1	J & K	PDD JK, POWERGRID	4-May-22	12:49	4-May-22	13:51	01:02	As reported at 12:48 Hrs, 220 KV Kishenpur(PG)-Udhampur(PDD) (PG) Ckt-1 & Ckt-2 and 220 KV Sarna(PS)-Udhampur(PDD) (PDD) Ckt-1 tripped on B-N phase to earth fault. As per PMU B-N phase to earth fault is observed. As per SCADA SOE, it seems that 220 KV Kishenpur(PG)-Udhampur(PDD) (PG) Ckt-1 successfully autoreclosed from Kishenpur end. As per SCADA, change in load of approx. 75MW is observed. In antecedent condition, 220 KV Kishenpur(PG)-Udhampur(PDD) (PG) Ckt-1 & Ckt-2 were carrying 70MW each.	0	75	80
2	1) 220 KV Amargarh(NRSS XXIX)-Ziankote(JK) (PDD JK) Ckt-2 2) 220 KV Wagoora(PG)-Ziankote(JK) (PDD JK) Ckt-1 3) 220 KV Amargarh(NRSS XXIX)-Ziankote(JK) (PDD JK) Ckt-1	J & K	PDD JK, POWERGRID, INDIGRID	6-Jun-22	17:51	6-Jun-22	19:06	01:15	1.) In antecedent condition, 220 KV Wagoora(PG)-Ziankote(JK) (PDD JK) Ckt-1 & Ckt-2 and 220 KV Amargarh(NRSS XXIX)-Ziankote(JK) (PDD JK) Ckt-1 & Ckt-2 were carrying 27MW, 19MW, 102MW & 102MW respectively. 2.) As reported, at 17:51hrs, 220 KV Wagoora(PG)-Ziankote(JK) (PDD JK) Ckt-1 tripped on B-N phase to earth fault, fault was in Z-1 with distance 1.5km & 9.5kA from Ziankote end. 3.) At the same time, 220 KV Amargarh(NRSS XXIX)-Ziankote(JK) (PDD JK) Ckt-1 tripped from both ends and 220 KV Amargarh(NRSS XXIX)-Ziankote(JK) (PDD JK) Ckt-2 tripped from Ziankote end only. 4.) During patrolling, disc string of 220kV Wagoora-Ziankote ckt-1 was found damaged. 5.) As per PMU, B-N phase to earth fault which cleared within 120ms is observed. As per SCADA, change in load of approx. 80MW is observed in J7K control area.	0	80	120
3	1) 220 KV Kishenpur(PG)-Barn(JK) (PDD JK) Ckt-1 2) 220 KV Kishenpur(PG)-Barn(JK) (PDD JK) Ckt-2	J & K	PDD JK	18-Jun-22	15:11	18-Jun-22	16:01	00:50	1. During antecedent condition, 220 KV Kishenpur(PG)-Barn(JK) (PDD JK) Ckt-1 & Ckt-2 were carrying 19MW each. 2. At 15:27 hrs, 220 KV Kishenpur(PG)-Barn(JK) (PDD JK) Ckt-1 tripped on R-N phase to earth fault during inclement weather condition, fault distance was 4.1km & fault current was 4.7kA from Barn ened. 3. At the same time, 220 KV Kishenpur(PG)-Barn(JK) (PDD JK) Ckt-2 also tripped from Barn end only. 4. As reported by SLDC-JK, load loss of approx. 90MW occurred, which was restored by charging 220 KV Kishenpur(PG)-Barn(JK) (PDD JK) Ckt-2 at 16:01hrs.	0	90	80
4	1) 220 KV Salal(NH)-Jammu(PDD) (PG) Ckt-2 2) 220 KV Salal(NH)-Jammu(PDD) (PG) Ckt-1	J & K	POWERGRID, JK PDD	7-Jul-22	20:46	7-Jul-22	22:30	01:44	1. At 20:46 hrs, flashover in Y-ph jumper between isolator and breaker of transformer bay at 132kV occurred. As per PMU, Y-N phase to earth followed by R-N fault with delayed clearance in 1040ms is observed. 2. On this fault, 220kV Salal-Jammu ckt-2 tripped from Salal end in Z-3 and 220kV Salal-Jammu ckt-1 tripped from jammu end only. 3. Due to tripping of both line, load loss of approx. 300MW is observed J&K control area.	0	300	1040
5	1) 220 KV Wagoora(PG)-Pampore(PDD) (PG) Ckt-1 2) 220 KV Wagoora(PG)-Pampore(PDD) (PG) Ckt-2	J & K	PDD JK POWERGRID	17-Jul-22	14:05	17-Jul-22	14:43	00:38	1. In antecedent condition, 220 KV Wagoora(PG)-Pampore(PDD) (PG) Ckt-1 & Ckt-2 were carrying approx. 111MW each. 2. As reported, at 14:05hrs, 220 KV Wagoora(PG)-Pampore(PDD) (PG) Ckt-1 & Ckt-2 both tripped from Pampore end only on over current protection operation. 3. As per PMU at New Wanpoh(PG), R-N phase to earth fault with delayed clearance in 440ms is observed. 4. Due to tripping of both the line, load loss of approx. 170MW occurred in J&K control area (as per SCADA).	0	170	440
6	1) 220 KV Samba(PG)-Jammu(PDD) (PG) Ckt-1 2) 220 KV Salal(NH)-Jammu(PDD) (PG) Ckt-1 3) 220KV Salal(NH)-Jammu(PDD) (PG) Ckt-2	J & K	POWERGRID, PDD JK	24-Jul-22	10:30	24-Jul-22	11:20	00:50	1. As reported, at 10:30hrs, PT of 132kV Bus at Gladni switchyard burst. 2. This fault didn't clear from 132kV Gladni(jammu) end and hence 220 KV Samba(PG)-Jammu(PDD) (PG) Ckt-1 tripped from Sambha end in Z-3. 3. As per PMU at Kishenpur(PG), R-N & B-N fault is observed in system which cleared with delay of approx. 1480ms. 4. At the same time, 220 KV Salal(NH)-Jammu(PDD) (PG) Ckt-1 & Ckt-2 both tripped from Gladni(Jammu) end only. 5. Due to tripping of aforementioned three lines to Gladini(Jammu), load loss occurred at Gladini(Jammu). As per SCADA, load loss of approx. 315MW is observed in J&K(UT) control area which recovered after approx. 50min.	0	315	1480
7	1) 220 KV Ziankote(JK)-Alusteng(PG) (PG) Ckt-1 2) 220 KV Amargarh(INDIGRID)-Ziankote(JK) (PDD JK) Ckt-2 3) 220 KV Amargarh(INDIGRID)-Ziankote(JK) (PDD JK) Ckt-1 4) 220 KV Ziankote(JK)-Alusteng(PG) (PG) Ckt-2	J & K	PDD JK, POWERGRID	29-Jul-22	11:19	29-Jul-22	12:17	00:58	1. In antecedent condition, 220 KV Amargarh(INDIGRID)-Ziankote(JK) (PDD JK) Ckt-1 & 2 were carrying ~128MW each. 2. As reported, at 11:18hrs, Y-N phase to earth fault occurred on 220 KV Ziankote(JK)-Alusteng(PG) (PG) Ckt-2 at distance approx. 0.9km (Z-1) from Ziankote end. 3. As per the information received, bus bar protection operated at 220kV Ziankote end on same fault and 220 KV Ziankote(JK)-Alusteng(PG) (PG) Ckt-1 & 2 and 220 KV Amargarh(INDIGRID)-Ziankote(JK) (PDD JK) Ckt-1 & 2 tripped. 4. As per PMU, Y-N phase to earth fault which cleared within 80ms is observed. 5. As per DR of Main-2 relay of 220 KV Amargarh(INDIGRID)-Ziankote(JK) (PDD JK) Ckt-1 & 2 of Amargarh end, fault distance was 23.1km (100%, Z-2) from Amargarh end and Z-2 operated instantaneously. 6. As per SCADA, load loss of approx. 340MW is observed in J&K control area.	0	340	80

8	1) 220 KV Wagoora(PG)-Pampore(PDD) (PG) Ckt-2 2) 220 KV Wagoora(PG)-Pampore(PDD) (PG) Ckt-1	J & K	PDD JK	7-Aug-22	13:46	7-Aug-22	14:55	01:09	1. 220/132kV Pampore have double main single breaker scheme. Substation is having three (3) 220/132kV 150MVA ICTs. 2. During antecedent condition, double circuit to Wagoora (carrying ~105MW) & Mirbazar and all three ICTs were charged through single bus only at 220kV side and another 220kV Bus was not in service. 3. As reported at 13:43hrs, R-N phase to earth fault occurred on 220kV Mirbazar-Pampore ckt-2. 4. As per telephonic communication with AEE Pampore S/s, on this fault, 220kV Mirbazar-Pampore ckt-2 tripped from Mirbazar end but didn't trip from Pampore end. Hence, later fault cleared with the tripping of 220 KV Wagoora(PG)-Pampore(PDD) (PG) Ckt-1 & Ckt-2 and 220kV Mirbazar-Pampore ckt-2 from Pampore end on over current earth fault protection oepration. 5. As per PMU at New Wanpoh(PG), R-N phase to earth fault with delayed clearance in 880ms is observed. 6. As per SCADA, load loss of approx. 175MW occurred in J&K control area.	0	175	880
9	1) 220 KV Kishenpur(PG)-Barn(JK) (PDD JK) Ckt-2 2) 220 KV Kishenpur(PG)-Barn(JK) (PDD JK) Ckt-1	J & K	PDD JK	17-Aug-22	05:52	17-Aug-22	07:03	01:11	1. In antecedent condition, 220kV Kishenpur-Barn ckt-1&2 were carrying ~118MW each. 2. As reported at 05:49hrs, main bus isolator to reserve bus isolator dropper of 132 side of 220/132kV 160 MVA ICT-3 at Barn(JK) damaged. As per PMU, Y-N phase to earth fault with delayed clearance in ~2sec is observed. 3. On this fault, 220kV Kishenpur-Barn ckt-1&2 both tripped from Barn end only on over current earth fault protection operation. 4. As per SCADA, change in load of approx. 200MW is observed in J&K control area.	0	200	2220
10	1) 40 MW Sewa-II HPS - UNIT 1 2) 40 MW Sewa-II HPS - UNIT 3 3) 40 MW Sewa-II HPS - UNIT 2 4) 220 KV Samba(PG)-Hiranagar(PDD) (PG) Ckt-1 5) 220 KV Samba(PG)-Hiranagar(PDD) (PDD JK) Ckt-2	J & K	NHPC, PDD JK, POWERGRID	29-Aug-22	18:00	29-Aug-22	19:41	01:41	1. In antecedent condition, 220kV Sambha-Hirangar ckt-1 & Ckt-2 were carrying 79MW & 75MW respectively and 40MW Unit-1, 2 & 3 at Sewa-2 HEP were carrying 30MW , 21MW & 30MW respectively. 2. As reported at 18:00hrs, R-N phase to earth fault occurred in 220kV Hiranagar-Ghatti ckt, fault distance was ~8.45km & fault current was 7.38kA from Hiranagar end. As per PMU at Sambha(PG), R-N phase to earth fault with delayed clearance in 760ms is observed. 3. CB of 220kV Hiranagar-Ghatti ckt didn't open on this fault and after approx. 750ms other 220kV feeders at Hiranagar tripped and 220kV side of Hiranagar S/s became dead. 220kV Sambha-Hirangar ckt-1 tripped from both end & DT received at Sambha(PG) end and 220kV Sambha-Hirangar ckt-2 tripped from Hiranagar end only. 4. As 220kV side of Hiranagar S/s became dead, island formed with Sewa-2 HEP generation & load at 132kv side of 220/132 Hiranagar(J&K). However, further after approx. 2secs, all three(03) 40MW units of Sewa-2(NHPC) tripped on over current protection operation and 132kV side of Hiranagar S/s also became dead due to loss of power supply. 5. As per SCADA, load loss of approx. 250MW observed in J&K control area & generation loss of approx. 80MW is observed at Sewa-2(NHPC) HEP.	80	250	760
11	1) 40 MW Sewa-II HPS - UNIT 1 2) 40 MW Sewa-II HPS - UNIT 2 3) 220 KV Hiranagar(PDD)-Sarna(PS) (PG) Ckt-1 4) 40 MW Sewa-II HPS - UNIT 3 5) 220 KV Samba(PG)-Hiranagar(PDD) (PDD JK) Ckt-2 6) 220 KV Samba(PG)-Hiranagar(PDD) (PG) Ckt-1 7) 132 KV Hiranagar(PDD)-Sewa_2(NH) (PG) Ckt-2 8) 132 KV Hiranagar(PDD)-Sewa_2(NH) (PG) Ckt-1	J & K	NHPC, PDD JK, POWERGRID	1-Sep-22	17:12	1-Sep-22	20:44	03:32	1. In antecedent condition, 220kV Sambha-Hirangar ckt-1 & Ckt-2 were carrying 103 MW & 97MW respectively and 40MW Unit-1, 2 & 3 at Sewa-2 HEP were carrying 37MW , 38MW & 41MW respectively. 2. As reported at 17:12hrs, R-ph PT of 132 kV main Bus at Hiranagar blast and bus bar protection operated. As per PMU at Sambha(PG), R-N fault with delayed clearance in ms is observed. phase to earth fault with delayed clearance in 760ms is observed. 3. All 220kV & 132kV elements tripped at Hiranagar S/s. 4. Due to loss of evacuation path, all three(03) 40MW units of Sewa-2(NHPC) also tripped. 5. As per SCADA, load loss of approx. 4758MW observed in J&K control area & generation loss of approx. 116MW is observed at Sewa-2(NHPC) HEP.	116	475	1280
12	1) 220KV Amargarh(INDIGRID) – Ziankote(JK)(PDD JK) ckt 1 2) 220KV Amargarh(INDIGRID) – Ziankote(JK)(PDD JK) ckt 2	J&K	JKPTCL	3-Nov-22	13:02	3-Nov-22	14:07	01:05	1. During antecedent condition, 220KV Amargarh(INDIGRID) – Ziankote(JK)(PDD JK) ckt-1 & ckt-2 were carrying ~185MW each. 2. As reported at 13:02 hrs, 220KV Amargarh(INDIGRID) – Ziankote(JK)(PDD JK) ckt 2 tripped on B-N phase to earth fault, fault distance was ~13.39km from Ziankote end. At the same time, 220KV Amargarh(INDIGRID) – Ziankote(JK)(PDD JK) ckt 1 also tripped from Amargarh end only. 3. As per PMU, B-N phase to earth fault which cleared within 120ms is observed. 4. As per SCADA, change in load of approx. 315MW occurred in J&K control area.	0	315	120
13	1) 220KV Amargarh(INDIGRID) – Ziankote(JK)(PDD JK) ckt 1 2) 220KV Amargarh(INDIGRID) – Ziankote(JK)(PDD JK) ckt 2	J&K	JKPTCL	3-Dec-22	21:19	3-Dec-22	22:50	01:31	1. 220/132kV Ziankote S/s have two bus at 220kV side i.e., main bus & reserve bus. 2. During antecedent condition, 220kV Wagoora-Ziankote ckt-1&2 and 220kV Ziankote-Alustang ckt were connected at reserve bus and 220kV Amargarh-Ziankote-Ckt-1&2 along with 220/132kV 150MVA Transformer-1,2&3 were connected at main bus. Both the bus were running in split mode. 3. During antecedent condition, 220KV Amargarh(INDIGRID) – Ziankote(JK)(PDD JK) ckt-1 & ckt-2 were carrying ~140MW each. 4. As reported at 21:19 hrs, R-N phase to earth fault occurred on 220KV Amargarh(INDIGRID) – Ziankote(JK)(PDD JK) ckt 2, fault distance was ~12.05km and fault current was ~5.24kA from Amargarh end. At the same time, 220KV Amargarh(INDIGRID) – Ziankote(JK)(PDD JK) ckt 1 also tripped. 5. As per PMU, R-N phase to earth fault which cleared within 120ms is observed. 6. As per SCADA, change in load of approx. 200MW occurred in J&K control area.	0	200	120

14	1) 220kV Hiranagar-Ghatti (PDD JK) ckt-2 2) 220kV Hiranagar-Ghatti (PDD JK) ckt-1 3) 220kV Hiranagar-Bishna (PDD JK) ckt 4) 220 KV Samba(PG)-Hiranagar(PDD) (PG) Ckt-1 5) 220 KV Samba(PG)-Hiranagar(PDD) (PDD JK) Ckt-2	J&K	JKPTCL	4-Dec-22	20:57	4-Dec-22	22:36	01:39	1. 220/66kV Hiranagar S/s have two bus at 220kV side i.e., main bus & reserve bus. 2. During antecedent condition, 220kV Hiranagar (PDD)-Sarna(PS) (PG) ckt was under planned shutdown for HTLS conductor rewiring work. All the other elements i.e., 220kV Hiranagar-Ghatti (PDD JK) ckt-1 & ckt-2, 220 KV Samba(PG)-Hiranagar(PDD) (PG) ckt-1 & ckt-2, 220kV Hiranagar-Bishna (PDD JK) ckt and 220/132kV 200MVA Transformer-1&2 were connected at 220kV Main bus. 3. As reported at 20:57 hrs, R-N phase to earth fault occurred on 220kV Hiranagar-Ghatti (PDD JK) ckt-2, fault distance and fault current were 7.1km & 6.3kA from Hiranagar end. On this fault, distance protection of 220kV Hiranagar-Ghatti (PDD JK) ckt-2 operated in Z-1 but due to pole discrepancy, line CB didn't open properly and thus fault didn't clear. As fault didn't clear and bus bar protection is also not available at Hiranagar S/s, 220kV Hiranagar-Ghatti (PDD JK) ckt-1, 220kV Hiranagar-Bishna (PDD JK) ckt, 220 KV Samba(PG)-Hiranagar(PDD) (PG) Ckt-1 & Ckt-2 all tripped from Hiranagar end only on earth fault overcurrent protection. 4. As per PMU at Kishenpur(PG), no fault is observed in system. 5. As per DR submitted by Samba(PG), R-N phase to earth fault with delayed clearance in 680ms is observed. Samba end sensed fault in Zone-3. 6. As per SCADA, load loss of approx. 110MW observed in J&K(UT) & Ladakh(UT) control area. 7. As reported, after revival of 220kV Hiranagar (PDD)-Sarna(PS) (PG) ckt, both bus are running in split mode and 220kV Hiranagar (PDD)-Sarna(PS) (PG) ckt with 220kV Hiranagar-Ghatti (PDD JK) ckt-1 & ckt-2 are kept at Main Bus and remaining elements are kept at reserve bus.	0	110	680

Annexure - VI

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

S.No.	Category of Grid Disturbance (GD-I to GD-V)	Name of Elements (Tripped/Manually opened)	Affected Area	Owner/ Agency	Outage		Revival		Duration	Event (As reported)	Loss of generation / loss of load during the Grid Disturbance		Fault Clearance time (in ms)
					Date	Time	Date	Time			Generation Loss(MW)	Load Loss (MW)	
1	GD-1	1) 400/220 kV 315 MVA ICT 3 at Muzaffarnagar(UP) 2) 400/220 kV 315 MVA ICT 1 at Muzaffarnagar(UP) 3) 400/220 kV 315 MVA ICT 2 at Muzaffarnagar(UP)	UTTAR PRADESH	UPPTCL	5-May-22	0:35	5-May-22	1:35	1:00	As reported at 00:35 Hrs, B-N phase to earth fault occurred on 220kV Muzaffarnagar-Charla ckt in Z-1 with distance of 33km from Muzaffarnagar end. As CB of this line didn't open, fault kept persisting and later this CB got damage. Further after 3 sec, 400/220 kV 315 MVA ICT 1 & ICT 2 at Muzaffarnagar(UP) tripped on backup O/C, E/F protection operation. Further after 2sec, 220kV Muzaffarnagar-Shamli ckt and 220kV Muzaffarnagar-Jansath ckt tripped on SPS operation. Further after 300ms, 400/220 kV 315 MVA ICT 3 at Muzaffarnagar(UP) also tripped. At the same time, 220kV Muzaffarnagar-Modipuram ckt was hand tripped. 132kV line to Purqazi, Jolly Road and Jeneseth also tripped during same time. As per PMU, B-N phase to earth fault with delayed clearance in 5120ms is observed. As reported by SLDC-UP, load loss of around 19MW occurred during the event. In antecedent condition, 400/220 kV 315 MVA ICT 1,ICT 2 & ICT 3 at Muzaffarnagar(UP) were carrying 62MW, 69MW & 67MW respectively.	0	19	5120
2	GD-1	1) 220 KV Hissar(BB)-Chirawa(RS) (BB) Ckt-1 2) 220 KV Hissar(BB)-Jindal Steel(HR) (HVPNL) Ckt-1 3) 220 KV Hissar-Sangrur (BB) Ckt-2 220 KV Hissar-Sangrur (BB) Ckt-1 4) 220KV Bus 2 at Hissar(BB), 220 KV 5) Bhiwani-Hissar (BB) Ckt-2 6) 220 KV Hissar(PG)-Hissar IA(HV) (PG) Ckt-2 7) 220 KV Hissar(BB)-Hissar IA(HV) (BBMB) Ckt-2 8) 220 KV Bhiwani-Hissar (BB) Ckt-1 9) 220 KV Hissar(BB)-Hissar IA(HV) (HVPNL) Ckt-1 10) 220 KV Hissar(PG)-Hissar IA(HV) (PG) Ckt-1	HARYANA	BBMB, HVPNL, POWERGRID	10-May-22	16:09	10-May-22	17:15	1:06	As reported at 16:09 Hrs, Bus fault occurred due to bursting of Y-Ph CT of 220 KV Hissar(BB)-Hissar IA(HV) (HVPNL) Ckt-1 at Hissar IA end. During same time, bus bar protection at Hissar_BB operated which resulted into tripping of all 220kV lines i.e, 220 KV Hissar(BB)-Chirawa(RS) (BB) Ckt-1, 220 KV Hissar(BB)-Jindal Steel(HR) (HVPNL) Ckt-1, 220 KV Hissar-Sangrur (BB) Ckt-1 & Ckt-2, 220 KV Bhiwani-Hissar (BB) Ckt-2, 220 KV Hissar(BB)-Hissar IA(HV) (HVPNL) Ckt-1 & Ckt-2. At the same time, 220 KV Hissar(PG)-Hissar IA(HV) (PG) Ckt-1 & Ckt-2 also tripped from Hissar IA end and 220kV Hissa IA-Masudpur ckt-1 & Ckt-2, 220kV Hissa IA-Narwana ckt-1 tripped from remote end only. As per PMU, Y-N fault which later converted into three phase fault with delayed clearance in 840ms is observed. As per SCADA, change in load of approx. 700MW in Haryana control area is observed. In antecedent condition, 220 KV Hissar(BB)-Hissar IA(HV) (HVPNL) Ckt-1 & Ckt-2, 220 KV Hissar(PG)-Hissar IA(HV) (PG) Ckt-1 & Ckt-2 were carrying 144MW, 119MW, 101MW & 110MW respectively.	0	700	840
3	GD-1	1) 400/220 kV 315 MVA ICT 1 at Gr.Noida(UPC) 2) 400/220 kV 315 MVA ICT 2 at Gr.Noida(UPC) 3) 400/220 kV 500 MVA ICT 5 at Gr.Noida(UPC) 4) 400/220 kV 500 MVA ICT 6 at Gr.Noida(UPC)	UTTAR PRADESH	UPPTCL	20-May-22	22:46	20-May-22	23:40	0:54	I. As per information received from Executive Engineer (T&C) Gr. Noida, R-N fault occurred on 220kV Gr. Noida-RC Green ckt.-I. 2. Auto Recloser attempt was taken by circuit breaker and got unsuccessful due to persistent fault. 3. After this, 3 phase tripping command did not issue by relay. 4. Due to this all ICTs at 400kV Gr. Noida tripped on E/F protection. As per PMU, R-B double phase to earth fault with delayed clearance in 1280ms is observed. As per SCADA, change in load of approx. 750MW observed in UP control area.	0	750	1280
4	GD-1	1) 220 KV Sohna Road (GPTL)-Badshahpur(HV) (HVPNL) Ckt-2 2) 220 KV Sohna Road (GPTL)-Badshahpur(HV) (HVPNL) Ckt-1 3) 400 KV Gurgaon(PG)-Sohna Road (GPTL) (GPTL) Ckt-1 4) 220 KV Sohna Road (GPTL)-GurgaonSec72(HV) (HVPNL) Ckt-1	HARYANA	HVPNL, POWERGRID	30-May-22	16:22	30-May-22	18:15	1:53	As reported at 16:22hrs, 220 KV Sohna Road (GPTL)-Badshahpur(HV) (HVPNL) Ckt-1 & Ckt-2 both tripped on R-N & B-N phase to earth fault respectively. As information received from SLDC-HR through verbal communication, fault occurred due to damage of wave trap of both the lines during thunderstorm/windstorm (inclement weather condition). At the same time, 220 KV Sohna Road (GPTL)-GurgaonSec72(HV) (HVPNL) Ckt-1 also tripped on R-Y phase to phase fault. Further after approx. 20secs(as per SCADA SOE at NRLDC), 400 KV Gurgaon(PG)-Sohna Road (GPTL) (GPTL) Ckt-1 also tripped on R-N phase to earth fault. Due to tripping of 220 KV Sohna Road (GPTL)-Badshahpur(HV) (HVPNL) Ckt-1 & Ckt-2, load loss of approx. 100MW occurred which later restored through Samaypur after approx. 15-20mins. As per PMU at Gurgaon(PG), at 16:22:30, R-Y-B three phase to earth fault with delayed clearance in 2240ms occurred followed by R-N phase to earth fault with unsuccessful A/R operation at 16:22:50. In antecedent condition, 220 KV Sohna Road (GPTL)-Badshahpur(HV) (HVPNL) Ckt-1 & Ckt-2 were carrying approx. 55MW each.	0	100	2240
5	GD-1	1) 132 KV Pithoragarh(PG)-Almora(PTCUL) (PTCUL) Ckt-1, 2) 70 MW Dhauliganga HPS - UNIT 2 3) 70 MW Dhauliganga HPS - UNIT 1	UTTRAKHAND	NHPC, PTCUL	15-Jun-22	10:19	15-Jun-22	11:59	1:40	1. In antecedent condition, 70MW Dhauliganga Unit-3 & 4, 220kV Dhauliganga-CB Ganj ckt (carrying 110MW) were connected to 220kV Bus-1 at Dhauliganga HEP and 70MW Dhauliganga Unit-1 & 2, 220kV Dhauliganga – Pithoragarh ckt (carrying 167MW) were connected to 220kV Bus-2 at Dhauliganga HEP. 220kV Pithoragarh-Almora ckt was carrying 67MW during antecedent condition. 2. At 10:18:52:990 (as per SOE), 220kV Pithoragarh-CB Ganj ckt was opened to avail shutdown. At the same time, oscillations also observed (as per PMU plot of frequency and voltage at Pithoragarh). 3. With the opening of 220kV Pithoragarh-CB Ganj ckt, MW loading of 220kV Dhauliganga-CB Ganj ckt & 220kV Pithoragarh- Almora ckt rose to 145MW & 137MW respectively (as per SCADA). 4. Further after approx. 16secs, at 10:19:09:161(as per SOE,), 132kV Pithoragarh- Almora ckt tripped on over current protection. (approx. loading during antecedent condition was 137MW (~600A) as per SCADA. As per PMU, no fault is observed. 5. With the tripping of 132kV Pithoragarh- Almora ckt, path of evacuation of Dhauliganga generation from Pithoragarh side lost. 6. Further after approx. 4secs at 10:19:13 (as per SOE), bus coupler breaker at Dhauliganga opened (on SPS operation) and 70MW Dhauliganga Unit-1 & 2 tripped on loss of evacuation path.	140	0	11893
6	GI-2	1) 400 KV Bikaner-Bhadla (RS) Ckt-1 2) 400 KV Bikaner(RS)-Sikar(PG) (RS) Ckt-1 3) 400 KV Bikaner(PG)-Bikaner(RS) (PG) Ckt-1 4) 400 KV Bikaner(RS)-Deedwana(MTS) (RS) Ckt-1 5) 400 KV Suratgarh SCTPS(RVUN)-Suratgarh(RS) (RS) Ckt-1 6) 400 KV Suratgarh SCTPS(RVUN)-Suratgarh(RS) (RS) Ckt-2 7) 400 KV Suratgarh(RVUN)-Bikaner(RS) (RS) Ckt-1 8) 400 KV Bikaner-Merta (RS) Ckt-1 9) 400/33 kV 125 MVA ICT 1 at Bikaner RENEW Solar(RENEW) 10) 400/220 kV 315 MVA ICT 2 at Bikaner(RS) 11) 125 MVAR Bus Reactor No 2 at 400KV Bikaner(RS) 12) 400/220 kV 315 MVA ICT 1 at Bikaner(RS) 13) 400 KV Suratgarh SCTPS(RVUN)-Bikaner(RS) (RS) Ckt-1 14) 400 KV Suratgarh SCTPS(RVUN)-Bikaner(RS) (RS) Ckt-2 15)400 KV Suratgarh(RVUN)-Ratangarh(RS) (RS) Ckt-2	RAJASTHAN	RRVPNL	21-Jun-22	15:24	21-Jun-22	17:26	2 Hours 2 Minutes	1. 400/220kV Bikaner(RS) have one and half breaker bus scheme. 2. During antecedent condition, 400 KV Bikaner(RS)-Deedwana(MTS) (RS) Ckt-1, 400/220 kV 315 MVA ICT 1 & ICT 2 at Bikaner(RS) and 125 MVAR Bus Reactor No 2 at 400KV Bikaner(RS) were connected to 400kV Bus-2 and 400kV lines to Merta, Sikar-ckt-1&2, Bhadla(PG), SCTPS ckt-1&2 and STPS were connected to 400kV Bus-1. 3. At 15:24 hrs, during wind storm/sand storm, Tower no 91 & 92 of 400 KV Bikaner(RS)-Deedwana(MTS) (RS) Ckt-1 collapsed followed by blast of R-ph pole of CB of 400 KV Bikaner(RS)-Deedwana(MTS) (RS) Ckt-1. As per PMU, Y-N phase to earth fault with delayed clearance in 1600ms followed by R-N fault is observed. 4. As per details received from SLDC-RS, bus bar protection of bus-2 operated which resulted in tripping of 400 KV Bikaner(RS)-Deedwana(MTS) (RS) Ckt-1, 400/220 kV 315 MVA ICT 1 & ICT 2 at Bikaner(RS) and 125 MVAR Bus Reactor No 2 at 400KV Bikaner(RS). 5. At the same time, elements connected at 400kV Bus-1 of Bikaner(RS) also tripped on protection operation at remote end and DT received at Bikaner. 6. 400/33 kV 125 MVA ICT 1 at Bikaner RENEW Solar(RENEW) also tripped during same time on LV SEF (stand by earth fault) protection operation.	0	0	1600
7	GD-1	1) 132 KV Pilibhit(UP)-Sitarganj(PTCUL) (PTCUL) Ckt-1 2) 220/132 kV 100 MVA ICT 3 at Sitarganj(PG) 3) 220/132 kV 100 MVA ICT 2 at Sitarganj(PG) 4) 220/132 kV 100 MVA ICT 1 at Sitarganj(PG) 5) 132 KV Sitarganj(PG)-Sitarganj(PTCUL) (PTCUL) Ckt-2 6) 132 KV Sitarganj(PG)-Sitarganj(PTCUL) (PTCUL) Ckt-3 7) 132 KV Sitarganj(PG)-Sitarganj(SIDCUL) (PTCUL) Ckt-1 8) 220 KV Tanakpur(NH)-Sitarganj(PG) (PG) Ckt-1	UTTRAKHAND	POWERGRID, PTCUL	17-Jul-22	20:27	17-Jul-22	21:47	1:20	1. 220/132kV Sitarganj(PG) substation feeds load of Uttarakhand through 132kV feeders. It is having three 220/132kV 100MVA ICTs. 2. As reported, at 20:27hrs, one snake climbed on R-phase main bus isolator of 132kV Kichha line at Sitarganj. It caused R-ph bus fault at 132kV Sitarganj. As per PMU at CB Ganj(UP), R-N phase to earth fault with delayed clearance in 1080ms is observed. 3. On this bus fault, three 132kV feeders to Sitarganj(PTCUL), three 220/132kV 100MVA ICTs at Sitarganj(PG) tripped and 132kV Sitarganj(PG) became dead. At the same time, 220 KV Tanakpur(NH)-Sitarganj(PG) (PG) Ckt-1 tripped on Z-3 distance protection operation. 4. As per SCADA, load loss of approx. 55MW occurred in Uttarakhand control area.	0	55	1080

S.No.	Category of Grid Disturbance (GD-I to GD-V)	Name of Elements (Tripped/Manually opened)	Affected Area	Owner/ Agency	Outage		Revival		Duration	Event (As reported)	Loss of generation / loss of load during the Grid Disturbance		Fault Clearance time (in ms)
					Date	Time	Date	Time			Generation Loss(MW)	Load Loss (MW)	
8	GD-1	1) 220 KV Moga(PG)-MOGAN(PS) (PSTCL) Ckt-2 2) 220 KV Moga(PG)-MOGAN(PS) (PSTCL) Ckt-3 3) 220 KV Moga(PG)-MOGAN(PS) (PSTCL) Ckt-4 4) 220 KV Moga(PG)-MOGAN(PS) (PSTCL) Ckt-1 5) 220kV Mogan-Baghapurana(PS) ckt-1 6) 220kV Mogan-Baghapurana(PS) ckt-2 7) 220kV Mogan-Bajakhanna(PS) ckt 8) 220kV Mogan-Ferozpur(PS) ckt 9) 132kV Mogan-Dhale (PS) ckt	PUNJAB	PSTCL	30-Jul-22	11:50	30-Jul-22	14:20	2:30	1. As reported, at 11:50hrs, R-phase conductor of 220kV Mogan-Bajakhanna(PS) ckt snapped at Mogan end. On this fault, bus bar protection operated at Mogan(PSTCL) end. 2. Due to bus bar protection operation, all 220kV lines connected at Mogan(PSTCL) tripped. Line tripped due to bus bar protection operation are 220 KV Moga(PG)-MOGAN(PS) (PSTCL) Ckt-1,2,3 & 4, 220kV Mogan-Baghapurana(PS) ckt-1 & 2, 220kV Mogan-Ferozpur(PS) ckt, 220kV Mogan-Bajakhanna(PS) ckt and 132kV Mogan-Dhale (PS) ckt. 3. As per PMU, R-N phase to earth fault with the delayed clearance of 720ms is observed. 4. As per SCADA, change in load of approx. 130MW is observed in Punjab control area. 5. 220 KV Moga(PG)-MOGAN(PS) (PSTCL) Ckt-1,2,3 & 4 were restored at 14:20hrs.	0	130	720
9	GD-1	1) 400 KV Alaknanda GVK(UPC)-Srinagar(UK) (UK) Ckt-1 2) 220 KV Singoli Bhatwari(Singoli(LTUHP))-Srinagar(UK) (PTCUL) Ckt-1 3) 400 KV Alaknanda GVK(UPC)-Muzaffarnagar (UP) Ckt-1 4) 220 KV Singoli Bhatwari(Singoli(LTUHP))-Srinagar(UK) (PTCUL) Ckt-2 5) 400 KV Alaknanda GVK(UPC)-Vishnuprayag(JP) (UP) Ckt-1 6) 33 MW Singoli Bhatwari HEP - UNIT 2, 33 MW Singoli Bhatwari HEP - UNIT 3	UTTAR PRADESH ; UTTRAKHAND	PTCUL, Singoli(LTUHP), UPPTCL	23-Aug-22	1:12	23-Aug-22	5:54	4:42	1. 400kV Alaknanda (UP) have one and half breaker bus scheme. 2. During antecedent condition, 400 KV Alaknanda GVK(UPC)-Muzaffarnagar (UP) Ckt & 400 KV Alaknanda GVK(UPC)-Vishnuprayag(JP) (UP) Ckt were carrying 457MW & -85MW respectively. 3. As reported, at 01:12hrs, R-N phase to earth fault occurred on 400 KV Alaknanda GVK(UPC)-Muzaffarnagar (UP) Ckt, fault distance was 20.3km & fault current was ~10.5kA from Muzaffarnagar end. As per PMU at Muzaffarnagar(UP), R-N phase to earth fault with delayed clearance in 680ms is observed. 4. As per DR received of 400 KV Alaknanda GVK(UPC)-Muzaffarnagar (UP) Ckt, A/R operation started at Muzaffarnagar end but after approx. 500ms Y & B phase also tripped and at Alaknanda end, R-ph didn't open even after trip command was sent by relay, later three phase tripped after approx. 500ms. 5. As informed by Alaknanda HEP, R-ph Main CB didn't open on tripping command by relay as it was stuck and later line tripped on LBB protection operation. 5. At the same time, 400 KV Alaknanda GVK(UPC)-Vishnuprayag(JP) (UP) Ckt & 400kV Alaknanda-Sringar ckt-1 & Ckt-2 also tripped on LBB protection operation at Alaknanda end. Due to tripping of both the lines, all for (04) 82.5MW units at Alaknanda HEP also tripped on loss of evacuation path. 6. At the same time, 220 KV Singoli Bhatwari(Singoli(LTUHP))-Srinagar(UK) (PTCUL) Ckt-1 & Ckt-2 also tripped on over voltage stage-1 protection operation at Srinagar end followed by tripping of 33 MW Singoli Bhatwari HEP - UNIT 2 & 3 on loss of evacuation path. 7. As per SCADA, change in load of approx. 25MW in Uttarakhand control area, loss in generation of ~342MW at Alaknanda HEP & ~72MW at Singoli Bhaywari HEP occurred.	414	25	680
10	GD-1	1) 40 MW Sewa-II HPS - UNIT 1 2) 40 MW Sewa-II HPS - UNIT 3 3) 40 MW Sewa-II HPS - UNIT 2 4) 220 KV Samba(PG)-Hiranagar(PDD) (PG) Ckt-1 5) 220 KV Samba(PG)-Hiranagar(PDD) (PDD JK) Ckt-2	J & K	NHPC, PDD JK, POWERGRID	29-Aug-22	18:00	29-Aug-22	19:41	1:41	1. In antecedent condition, 220kV Sambha-Hirangar ckt-1 & Ckt-2 were carrying 79MW & 75MW respectively and 40MW Unit-1, 2 & 3 at Sewa-2 HEP were carrying 30MW , 21MW & 30MW respectively. 2. As reported at 18:00hrs, R-N phase to earth fault occurred in 220kV Hiranagar-Ghatti ckt, fault distance was ~8.45km & fault current was 7.38kA from Hiranagar end. As per PMU at Sambha(PG), R-N phase to earth fault with delayed clearance in 760ms is observed. 3. CB of 220kV Hiranagar-Ghatti ckt didn't open on this fault and after approx. 750ms other 220kV feeders at Hiranagar tripped and 220kV side of Hiranagar S/s became dead. 220kV Sambha-Hirangar ckt-1 tripped from both end & DT received at Sambha(PG) end and 220kV Sambha-Hirangar ckt-2 tripped from Hiranagar end only. 4. As 220kV side of Hiranagar S/s became dead, island formed with Sewa-2 HEP generation & load at 132kv side of 220/132 Hiranagar(J&K). However, further after approx. 2secs, all three(03) 40MW units of Sewa-2(NHPC) tripped on over current protection operation and 132kV side of Hiranagar S/s also became dead due to loss of power supply. 5. As per SCADA, load loss of approx. 250MW observed in J&K control area & generation loss of approx. 80MW is observed at Sewa-2(NHPC) HEP.	80	250	760
11	GD-1	1) 220 KV Hissar(PG)-Fatehabad(HV) (HVPNL) Ckt-2 2) 220 KV Fatehabad(PG)-Fatehabad(HV) (HVPNL) Ckt-2 3) 220 KV Fatehabad(PG)-Fatehabad(HV) (HVPNL) Ckt-1 4) 220 KV Hissar(PG)-Fatehabad(HV) (HVPNL) Ckt-1	HARYANA	HVPNL	3-Sep-22	19:26	3-Sep-22	22:37	3:11	1. 220/132kV Fatehabad(Har) substation have double main single breaker bus scheme. 2. During antecedent condition, 220/132kV 100MVA Transformer-4, 220kV lines to Fatehabad(PG)ckt-2, Hissar(Har)ckt-2 & Mehna Khera ckt-2 were connected to 220kV Bus-1 and 220/132kV 100MVA Transformer-1&2, 220kV lines to Fatehabad(PG)ckt-1, Hissar(Har)ckt-1 & Mehna Khera ckt-1 were connected to 220kV Bus-2. 3. As reported, Bus bar protection was not in service at 220kV Fatehabad(Har) since 15.07.2021 due to defective I/P & O/P extension device (P849). The relay was got repaired & configuration of same is pending from firm. 4. At 19:26hrs, 220kV B-ph CT of 220/132kV 100MVA Transformer-1 damaged and blast. The transformer tripped on differential protection operation and fault cleared. 5. Further after ~500ms, 220 kV B phase LA also damaged due to fire. 220kV B-ph Jack Bus also damaged and fell on 220kV Bus Bar-1 at Fatehabad(Har) which created bus fault. 6. As per PMU, B-N fault followed by Y-B ph-ph fault with delayed clearance in 400ms is observed. 7. As bus bar protection was not in service, all the 220kV lines except Mehna Khera ckt-2 tripped from Fatehabad(Har) end in Z-4. 220kV Fatehabad-Mehna Khera ckt-2 tripped from remote end in Z-2. 8. As per SCADA, change in demand of approx. 380MW is observed in Haryana control area	0	380	400
12	GD-1	1) 125 MVAR Bus Reactor No 1 at 400KV Koteswar(TH) 2) 400 KV Koteswar(TH)-Koteshwar(PG) (PG) Ckt-1 3) 400 KV Koteswar(TH)-Koteshwar(PG) (PG) Ckt-2 4)100 MW Koteshwar HPS - UNIT 4	UTTRAKHAND	POWERGRID, THDC	4-Sep-22	17:38	4-Sep-22	20:57	3:19	1. 400kV Koteshwar(THDC) & 400kV Koteshwar(PG) have double main transfer bus scheme. 400 KV Koteshwar(TH)-Koteshwar(PG) (PG) Ckt-1 & Ckt-2 are on same tower and line length are ~2km. 2. During antecedent condition, 400 KV Koteshwar(TH)-Koteshwar(PG) (PG) Ckt-2 was connected at 400kV Bus-2 and 400 KV Koteshwar(TH)-Koteshwar(PG) (PG) Ckt-1, 100 MW Koteshwar HPS - UNIT 4 & 125 MVAR Bus Reactor No 1 were connected at 400kV Bus-1. 3. As reported at 17:37hrs, B-ph LA at Koteshwar(THDC) end of 400 KV Koteshwar(TH)-Koteshwar(PG) (PG) Ckt-2 burst and line tripped. As per PMU at Koteshwar(PG), line tripped from Koteshwar(THDC) end after unsuccessful A/R operation. However, B-ph tripped at Koteshwar(PG) end with 440ms delay after A/R operation. 4. At the same time, 400 KV Koteshwar(TH)-Koteshwar(PG) (PG) Ckt-1 tripped on pole discrepancy relay operation at Koteshwar(THDC) end. As per PMU at Koteshwar(PG), line successfully autoreclosed from both end and then R-ph tripped from Koteshwar(THDC) end. Further after 2sec, pole descripency relay operated at Koteshwar(THDC) end and line tripped. 5. Due to tripping of both the evacuating lines, 100 MW Koteshwar HPS - UNIT 4 also tripped. 6. As per SCADA, change in generation of approx. 100MW at Koteshwar HEP is observed.	100	0	440

S.No.	Category of Grid Disturbance (GD-I to GD-V)	Name of Elements (Tripped/Manually opened)	Affected Area	Owner/ Agency	Outage		Revival		Duration	Event (As reported)	Loss of generation / loss of load during the Grid Disturbance		Fault Clearance time (in ms)
					Date	Time	Date	Time			Generation Loss(MW)	Load Loss (MW)	
13	GI-2	1) 400/220 kV 240 MVA ICT 3 at Muradnagar_2(UP) 2) 400 KV Muradnagar_2-Mathura (UP) Ckt-1 3) 400 KV Dadri(NT)-Muradnagar_2(UP) (PG) Ckt-1 4) 400KV Bus 2 at Muradnagar_2(UP) 5) 400/220 kV 240 MVA ICT 1 at Muradnagar_2(UP) 6) 400/220 kV 315 MVA ICT 2 at Muradnagar_2(UP) 7) 400KV Bus 1 at Muradnagar_2(UP)	UTTAR PRADESH	POWERGRID, UPPTCL	7-Sep-22	21:25	7-Sep-22	22:58	1:33	1. 400/220kV Muradnagar_2(UP) have one & half breaker bus scheme at 400kV side. During antecedent condition, 400kV line to Mathura & Dadri(NTPC) were connected to 400kV Bus-1 and 400/220kV 240MVA ICT-1 & 3, 400/220kV 315MVA ICT-2 and 63MVAr bus reactor were connected at 400kV bus-2. 2. At 21:25:51hrs, B-N phase to earth fault occurred on 400 KV Muradnagar_2-Mathura (UP) Ckt, fault distance & fault current were ~60km & ~3.9kA from Muradnagar_2(UP) end and ~79km & ~3.2kA from Mathura end. As per PMU at Dadri Thermal(NTPC), B-N phase to earth fault with delayed clearance in 320ms is observed. 3. On this fault, line CB from Mathura end and Tie CB at Muradnagar_2 end opened but Main CB at Muradnagar_2 end didn't open. 4. As Main CB at Muradnagar_2 end of 400 KV Muradnagar_2-Mathura (UP) Ckt didn't open, its LBB operated and all the Main CBs connected at 400kV Bus-1 opened. 5. At the same time, Bus bar protection of 400kV Bus-2 at Muradnagar_2(UP) also operated. As reported, current in PU1 & PU2 of both the 400/220kV 240MVA ICT-3 increased which led to the operation of bus bar-2 protection. 6. As both the 400kV Bus tripped, 400kV Muradnagar_2(UP) became dead. 7. As per SCADA, no change in demand of UP is observed.	0	0	320
14	GD-1	1) 765 KV Fatehgarh_II(PG)-Bhadla(PG) (FBTL) Ckt-1 2) 220 KV Fatehgarh_II(PG)-AHEJ2L PSS HB_FGRAH_PG (AHEJ2L) (AHEJ2L) Ckt-1 3) 220 KV Fatehgarh_II(PG)-AHEJ3L PSS HB_FGRAH_PG (AHEJ3L) (AHEJ3L) Ckt-1	Rajasthan	POWERGRID, AHEJ2L, AHEJ3L	17-Sep-22	10:14	17-Sep-22	10:58	0:44	1. At 10:14:29:840hrs, R-N phase to phase fault occurred on 220kV Fatehgarh2- AHEJ2L ckt due to blast of R-ph CT at Fatehgarh2 end. As per PMU, R-N phase to earth fault which cleared within 120ms is observed. 2. On this fault, 220 KV Fatehgarh_II(PG)-AHEJ2L PSS HB_FGRAH_PG (AHEJ2L) (AHEJ2L) Ckt-1 tripped. At the same time, 220 KV Fatehgarh_II(PG)-AHEJ3L PSS HB_FGRAH_PG (AHEJ3L) (AHEJ3L) Ckt-1 tripped from AHEJ3L end only. 3. Due to tripping of aforementioned lines, RE generation of AHEJ2L & AHEJ3L total 560MW lost. 4. During the fault, phase voltage at other RE stations went below 0.85pu. As voltage dropped below 0.85pu, almost all the RE stations dropped their MW on LVRT operation. However, active power (MW) of few of the RE stations didn't recover after clearance of fault within defined time(as per LVRT). 5. As per SCADA, total drop in solar generation of approx. 1566MW(including AHEJ2L & AHEJ3L generation) is observed during the event. 6. Due to significant drop in MW, rise in voltage is observed at ISTS RE pooling stations and further after 5sec, 765KV Fatehgarh_II(PG)-Bhadla(PG) (FBTL) Ckt-1 tripped from Bhadla end on over voltage stage-1 protection.	1566	0	120
15	GD-1	1) 220 KV Sarsawan(UP)-Khodri(UK) (UP) Ckt-1 2) 220 KV Saharanpur(UP) -Khodri(UK) (UP) Ckt-1 3) 60 MW UNIT 1 at Khodri HEP 4) 60 MW UNIT 2 at Khodri HEP 5) 60 MW UNIT 4 at Khodri HEP	Uttarakhand	UPPTCL, PTCUL	6-Oct-22	2:27	6-Oct-22	2:56	0:29	1. As reported, at 02:27 hrs, 220 KV Sarsawan (UP)-Khodri (UK) (UP) Ckt-1 tripped from both ends on B-N phase to earth fault. Fault distance was ~52km from Khodri end. 2. At the same time, 220 KV Saharanpur (UP) -Khodri (UK) (UP) Ckt-1 tripped from Saharanpur end only followed by tripping of 60MW unit-1, 2 & 4 at Khodri HEP carrying total ~60MW. 3. As per PMU at Roorkee (PG), B-N phase to earth fault with delayed clearance in 1160ms is observed. 4. As per SCADA, change of approx. 60MW in Uttarakhand generation is observed.	60	0	1160
16	GD-1	1) 220 KV Samba(PG)-Hiranagar(PDD) (PG) Ckt-1 2) 220 KV Samba(PG)-Hiranagar(PDD) (PDD JK) Ckt-2 3) 220kV Bishna – Hiranagar ckt 4) 220kV Ghatti – Hiranagar ckt 5) 220kV BUS 1 Hiranagar(JK PDD) 6) 220/132kV 200 MVA ICT 1 7) 220/132kV 120 MVA ICT2	J&K(UT) & Ladakh(UT)	POWERGRID,JKPTCL	16-Oct-22	4:31	16-Oct-22	5:38	1:07	1. At 04:31 hrs, R-N phase to earth fault occurred on 220kV Hiranagar-Ghatti ckt, fault distance was ~6.94km from Hiranagar end. As reported by NR-2 POWERGRID, fault distance was ~14km (~100%) from Sambha(PG) end. 2. On this fault, all the elements connected at 220kV Hiranagar(JK) tripped from Hiranagar end. 220 KV Samba(PG)-Hiranagar(PDD) (PG) Ckt-1 tripped from Sambha end on DT received from Hiranagar end and 220 KV Samba(PG)-Hiranagar(PDD) (PG) Ckt-2 didn't trip from Sambha end. 3. As per PMU at Sambha(PG), R-N phase to earth fault with delayed clearance in 320ms is observed. 4. As per SCADA, load loss of approx. 130MW observed in J&K(UT) & Ladakh(UT) control area.	0	130	320
17	GD-1	1) 220kV Hapur_765- Simbholi (UP) Ckt-2 2) 220kV Hapur_765- Simbholi(UP) Ckt-2 3) 220 KV Meerut(PG)-Simbholi(UP) (PG) Ckt-1 4) 220 KV NAPP(NP)-Simbholi(UP) (UP) Ckt-1 5) 220kV Hapur- Simbholi (UP) Ckt	Uttar Pradesh	UPPTCL, POWERGRID, NAPP	20-Oct-22	10:17	20-Oct-22	10:50	0:33	1. As reported at 10:17 hrs, B-N phase to earth fault occurred on 220kV Hapur-Simbholi (UP) ckt due to damage of polymer insulator of line, fault distance was 54.19km & ~5km and fault current was 2.4kA & 9.8kA from Simbholi & Hapur end respectively. 2. On this fault, distance protection operated at both ends. Line tripped from Hapur end but due to failure of mechanical mechanism of breaker at Simbholi end, B-ph pole of breaker got stuck and hence line didn't trip from Simbholi end. 3. As breaker of 220kV Hapur-Simbholi (UP) ckt at Simbholi end didn't open, LBB of this CB operated. However, due to defective wiring between busbar protection & LBB line protection, the CBF (Circuit Breaker Failure) initiation wasn't detected by busbar protection and busbar could not operate. Hence all 220 kV lines emanating from Simbholi S/s tripped from remote end in zone 2. 4. As per PMU, B-N phase to earth fault with delayed clearance in 640msec is observed. 5. As per SCADA, change in demand of approx. 50MW is observed in UP control area.	0	65	640
18	GD-1	1) 400/220 kV 315 MVA ICT 1 at Kashipur(UK) 2) 400/220 kV 315 MVA ICT 2 at Kashipur(UK) 3) 220 KV Pantnagar(UK)-Bareilly(UP) (UP) Ckt-1 4) 220 KV Kashipur-Pantnagar(UK) Ckt 5) 220 KV Kashipur-Jafarpur(UK) Ckt 6) 132 KV Almora-Bhowali(UK) Ckt	Uttarakhand	PTCUL, UPPTCL	24-Oct-22	13:39	24-Oct-22	14:16	0:37	1. As reported at 13:39 hrs, Y-phase conductor of 220 KV Kashipur-Jafarpur(UK) Ckt (220 KV Kashipur-Pantnagar(UK) Ckt-2 LILO at Jafarpur) broke from gantry at Kashipur end and got in contact with top cover of CT hence created bus fault on 220kV Bus at Kashipur(UK). 2. As per PMU, Y-B fault which further converted into R-Y-B fault with delayed clearance of 1800ms is observed. 3. On this fault, 220 KV Kashipur-Jafarpur(UK) Ckt tripped on distance protection operation in Z-1 but as fault had converted into bus fault and bus bar protection is not in service at 400/220kV Kashipur S/s, 400/220 kV 315 MVA ICT 1 & ICT 2 at Kashipur(UK) tripped on overcurrent protection operation. At the same time, 220 KV Pantnagar(UK)-Bareilly(UP) (UP) Ckt-1 (Z-3 time delay 800ms) and 220 KV Kashipur-Pantnagar(UK) Ckt (Z-3 time delay 1000ms) tripped from remote end on distance protection operation in Z-3. 4. As reported, bus bar protection is not in service at 400/220kV Kashipur(Utt) S/s. 5. With the tripping of aforementioned elements, all load of Haldwani and Pantnagar shifted on 132kV Almora-Bhowali due to which it got overloaded and tripped on over-current protection after approx. 5sec of occurrence of fault. 6. As per SCADA, change in demand of approx. 210MW is observed in Uttarakhand control area.	0	210	1800

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