



सत्यमेव जयते

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

No. उ.क्षे.वि.स./प्रचालन/107/01/2022/8237-8275

दिनांक: 13.09.2022

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

**विषय:** संरक्षण उप-समिति की 45<sup>वीं</sup> बैठक के कार्यवृत्त।  
**Subject:** Minutes of 45<sup>th</sup> Protection Sub-Committee Meeting.

संरक्षण उप-समिति की 45<sup>वीं</sup> बैठक दिनांक 24.06.2022 को 11:00 बजे से वीडियो कॉन्फ्रेंसिंग के माध्यम से आयोजित की गई थी। बैठक में लिए गए निर्णयों का सार दिनांक 11.07.2022 को जारी किया गया था। उक्त बैठक की कार्यवृत्त उत्तर क्षेत्रीय विद्युत समिति की वेबसाइट (<http://164.100.60.16>) पर उपलब्ध है।

The 45<sup>th</sup> meeting of Protection Sub-Committee was held on 24.06.2022 at 11:00 hrs at through Video Conferencing. Gist of decisions was issued on 11.07.2022. The minutes of the aforesaid meeting are available on NRPC website <http://164.100.60.16>.

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(सौमित्र मजूमदार)  
अधीक्षण अभियंता (प्रचालन)

**List of Members of PSC**

<b>S.No.</b>	<b>Designation</b>	<b>Organization</b>	<b>Fax No.</b>
1	Director (P&C)	BBMB	0172-2652054
2	General Manager (SLDC)	DTL	011-23236462
3	GM (O&M)	DTL	011-23236462
4	GM (T)	IPGCL	23370247
5	Chief Engineer (TS)	HVPNL	0172-2591244
6	SE (M&P)	HVPNL	0172-2540014
7	SE (SO & SLDC)	HVPNL	0172-2560622
8	SE (SLDC)	PTCUL	0135-2763570/2451160
9	SE(T&C)	PTCUL	0135-2451826
10	Chief Engineer (SLDC)	UPPTCL	0522-2287880/2288736
11	SE(Tech)	HPGCL	0172-5022436
12	SE(O&M-VI)	HPGCL	0180-2566768
13	Chief Engineer (Transmission)	HPSEB	01972-223435
14	SE (PR& ALDC)	HPSEB	0177-2837143
15	DGM(Protection)	HPPTCL	0177-2832384
16	Chief Engineer (Trading)	JKPTCL	0191-2474233
17	Chief Engineer (SLDC)	PSTCL	0175-2365340
18	Chief Engineer (P&M)	PSTCL	0161-2741280/2451491
19	CE (M&P)	RRVNL	0141-2291891
20	SE (Electrical)	RRVUNL	01509-245299
21	Chief Engineer (LD)	RRVNL	0141-2740920
22	Superintending Engineer (T&C)	UPPTCL	0121-2666062
23	Chief Engineer, (L-2)	UPRVUNL	0522-2287822/2287880
24	DGM (T&C)	PTCUL	0135-2760331
25	Chief Engineer (O&M)	NHPC	0129-2272413
26	GM (O&M) NR – I	PGCIL	011-26601079
27	GM (O&M), NR-II	PGCIL	01951-237186
28	GM (O&M), NR-III	PGCIL	
29	Chief Manager (TS)	N.R.L.D.C	011-26852747
30	GM(OS-NR)	NTPC	0522-2305848
31	GM (OS)	NTPC Ltd	0120-2410082/2410068
32	DGM (Maintenance)	SJVNL	0177-2673283
33	DGM (O&M)	THDC India Ltd	01376-236305
34	Director (GM & NPC division)	CEA	011-26109750
35	General Manager	APCPL	01251-266326
36	Director	JPPVL	0120-4516201/4609464/4609496
37	Addl. CE(M&P-IT)	JVVNL	-
38	GM (Production)	Jhajjar Power Ltd	01251-270155
39	GM(P&M)	APL	7925557176
40	Sh. Tarun Tanwar, Sr. Engineer	JSW	022- 42863000
41	President (Power Systems)	LPGCL	+91-22- 22048681
42	NPCIL		
	1.Maintenance Superintendent	NAPS	05734-222167
	2.Maintenance Superintendent	RAPS	01475-242060

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## ***Minutes of 45<sup>th</sup> Meeting of Protection Sub-committee***

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***Time of meeting*** : 11.00 Hrs.

***Date of meeting*** : 24.06.2022

### **A.1. Confirmation of minutes of 44<sup>th</sup> meeting of Protection sub-committee**

Minutes of 44<sup>th</sup> meeting of Protection Sub-committee were issued vide letter dated 10.08.2021. No comment has been received.

**Sub-Committee confirmed 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 30<sup>th</sup> and 31<sup>st</sup> 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 may be given wide circulation and its recommendations may 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**

- 2.1 Members were apprised that as per decision taken in 43<sup>rd</sup> PSC meeting, a committee was constituted by NRPC Sectt. vide letter dtd. 06.04.2021 which was reconstituted vide letter dated 27.01.2022 subsequent to the change in the nominations of few members.
- 2.2 The 1<sup>st</sup> 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 the scope of work. The same was attached in the agenda.
- 2.3 Members were informed about methodology of data seeding, flow, architecture, access control and basic design of the web-based software.
- 2.4 Regarding space for server for hosting the software, NRLDC and POWERGRID informed that there are many internal software due to which there is already space constraint at their servers and hosting additional software may not be possible. Accordingly, it was deliberated that option of hosting at NIC cloud may be explored. Other related works may be done through tender.

- 2.5 NRLDC representative highlighted that involving different agencies may delay the project implementation and hence complete project along with server may be invited in a single tender similar to SRPC.
- 2.6 SE, NRPC highlighted that method adopted by SRPC has already been explored by NRPC Secretariat in the past and tender was invited on three occasions, but they got cancelled due to lack of competition.
- 2.7 MS, NRPC mentioned that physical servers need to be maintained as per standard cyber security guidelines which may be difficult considering strength at NRPC. NIC, being a government body may handle security protocols in adequate manner.
- 2.8 Further, it was agreed that hosting at NIC may be beneficial considering safety and security of the data. It was decided that a meeting with NIC may be scheduled for exploring the possibility and cost estimate considering quantum of data.
- 2.9 Issue of funding for the project was discussed wherein it was highlighted that there may be CAPEX as well OPEX for the project; however, cost may be significantly lesser compared to earlier tendered project as scope of work has been reduced. It was deliberated that project may be funded from NRPC fund after due approval of NRPC forum.
- 2.10 It was discussed that budgetary quotation/EOI may be requested from suitable vendors. Further, price quotation may be requested from NIC as well. Considering all, estimated cost may be calculated which can be taken up in the NRPC meeting for approval.
- 2.11 POWERGRID requested that data to be uploaded by utilities need to be verified as wrong data will defeat the purpose of this project.
- 2.12 It was decided that one additional layer of check may be included. Utilities may designate approving officer(s) for this purpose. Nodal officer, responsible for uploading data at portal, shall take approval from approving officer(s) within their utility and then upload it on database portal.
- 2.13 Further, issue of deputation of officer from other utilities at NRPC was also discussed. It was discussed that deputation of officers/expert in Protection may be required as many issues may be faced while development of this website. It was decided that long deputation may be difficult; however, officers from NRLDC, POWERGRID, DTL, Delhi SLDC and any other such offices in Delhi NCR may be requested for providing support.

### **A.3. Protection Philosophy of NR**

- 3.1 Members were apprised that in 42<sup>nd</sup> PSC meeting, 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, that may study various recommendations related to Protection setting as well as adopted philosophy in other regions/utilities and may further propose an updated protection philosophy in time bound manner.

- 3.2 The status of nomination received for the same was discussed.
- 3.3 POWERGRID was requested to update the nomination in view of transfer of earlier nominated officer.
- 3.4 NRLDC and other utilities were requested to send the nominations at the earliest so that meeting of the committee can be held.
- 3.5 It was also decided that Adani and NTPC may be requested for nominating renewable generation related protection experts.

#### **A.4. Reviewing the Time Delay setting for Special Protection Scheme (SPS) installed at 400 kV S/S Deepalpur. (Additional Agenda by HVPNL)**

- 4.1 HVPNL apprised the issue faced by them due to time delay setting for Special Protection Scheme (SPS) installed at 400 kV S/S Deepalpur and requested that these setting may be reviewed as SPS is getting operated in case of line fault.
- 4.2 After deliberation, it was suggested that time delay may be set as 1500 msec for case-3 of SPS considering fault in zone – 3 and operation of auto reclosure. It was also mentioned that similar time delay is being used in UP and POWERGRID.
- 4.3 NRLDC stated that they will internally discuss the setting and will confirm by e-mail to Haryana.

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

- 5.1 NAPS informed 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). The matter was discussed with designer, NPCIL, Mumbai and additional protection for the 220kV lines has been suggested which was presented by NAPS in the meeting.
- 5.2 The issue was deliberated at length wherein NRLDC, UPSLDC, POWERGRID highlighted that these settings need to be analyzed technically in depth before any decision. Accordingly, 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.

## A.6. Tripping Events (Agenda by NRLDC)

- 6.1 NRLDC representative informed that Event closing information (Remedial measures taken and to be taken along with completion time) is yet to be reported for most of the tripping discussed in PSC meetings. Utilities should also submit the event closing information to the NRPC/ NRLDC in stipulated time frame approved in various PSC meeting.
- 6.2 MS, NRPC also expressed concern about non-submission of event closing information by the utilities despite of discussion in various PSC meeting and suggested to all the NR utilities for timely submission of the information.
- 6.3 It was decided that all the NR utilities shall share the Event closing information (Remedial measures taken and to be taken along with completion time) for last three PSC (40<sup>th</sup> PSC meeting onwards) meetings. The final report shall also be prepared by the constituents and to be shared with NLRDC/NRPC within a week.
- 6.4 As approved in 39<sup>th</sup> PSC meeting, NRPC suggested to all the utilities to prepare the presentation for all the tripping events shared in PSC agenda for deliberation in PSC meeting. Representative from the utilities shall collect all the information for its control area and share the details. At least one representative from each SLDC shall also be present during the meeting. Detailed presentation given by NRLDC and different entities is attached at **Annexure-I**.
- 6.5 It was also deliberated that Numerical protection, Disturbance Recorder and Station event logger (SAS based or standalone event logger) are very important for detailed analysis of any tripping and helps in preventing those repetitive tripping. CEA technical standard of construction also mandate all these requirements for 220 kV and above voltage level. Utilities shall take corrective action to ensure healthiness of DR/EL, time synchronization of DR/EL and also ensure numerical protection in the system as per technical standard.
- 6.6 As per the IEGC provision under clause 5.2 (r), "all the Users, STU/SLDC and CTU shall send information/data including disturbance recorder/sequential event recorder output to RLDC within 24 hours for purpose of analysis of any grid disturbance/event. No Users, SLDC/STU or CTU shall block any data/information required by the RLDC and RPC for maintaining reliability and security of grid and for analysis of an event".
- 6.7 Hence, it was intimated that DR of the tripped elements needs to be extracted within 24hrs of the occurring of events and further to be uploaded on NR tripping portal, so that proper analysis of events can be done.

The discussion and recommendations of PSC are as follows:

**A. Multiple Element tripping at 400/220 kV Jaisalmer (Bhainsra) (Raj) Station at 18:31hrs of 28<sup>th</sup> April 2021**

1. Discussion during the meeting:

- a. NRLDC representative raised following points during the meeting:
  - i. Reason of delayed clearance of fault?
  - ii. 400 KV Akal-Jaisalmer (RS) Ckt-1 and 400 KV Jaisalmer – Barmer Ckt-2 tripped on Zone-2 from remote end what was the zone -2-time delay?
  - iii. DR and EL of tripping not submitted yet.
  - iv. Whether any protection had operated at Jaisalmer end or not?
  - v. SoE data of tripped elements at 400/220kV Jaisalmer end not recorded at NRLDC SCADA SOE.
- b. RVPNL representative informed the following:
  - i. 400/220kV Jaisalmer (Bhainsra) (Raj) station have one and half breaker scheme at 400kV level. (SLD diagram of 400/220kV Jaisalmer is shown below in figure 1)
  - ii. At 18:31hrs, Y-N phase to earth fault occurred on 400kV Jaisalmer-Kankani ckt, fault distance was ~39km from Jaisalmer end and ~108km from Kankani end.
  - iii. On this fault, distance protection relay operated and tripping command initiated at both ends however, tie CB at Jaisalmer end didn't trip as breaker pole got stuck. LBB of Tie CB also didn't operate because it was left disabled inadvertently after routing testing.
  - iv. Later fault cleared with the tripping of 400 KV Akal-Jaisalmer ckt in Z-2 distance protection with the delay of 300ms and 400 KV Barmer-Jaisalmer ckt on earth fault protection operation with delay of 670ms.
  - v. LBB of Tie CB of 400kV Jaisalmer-Kankani ckt at Jaisalmer end was enabled after the event.

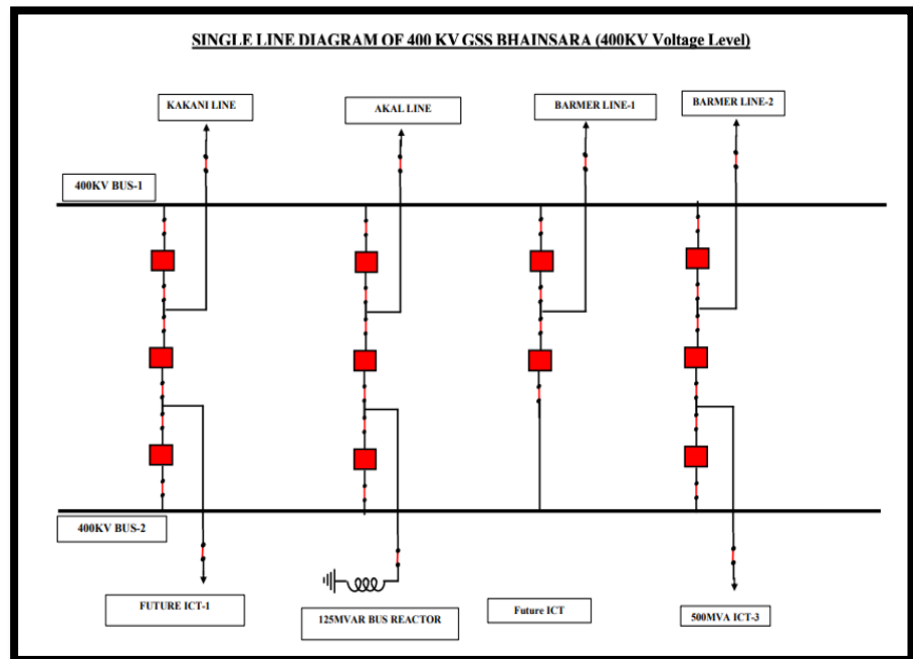


Fig. 1: SLD of 400/220kV Jaisalmer(Raj)

- c. NRLDC representative raised concerned of non-adherence to standard operating procedure during any testing work at sub stations which leads to mal-operation of protection many a times. It was again requested to all the constituents to strictly follow the standard operating procedure during any testing work. Concern of delay in submission / non submission of DR/EL of Rajasthan control area was also raised.

2. PSC Recommendations:

- a. *Standard operating procedure to be followed during any testing work at sub stations.*
- b. *DR of the tripped elements needs to be extracted within 24hrs of the occurring of events and to be uploaded on NR tripping portal, so that proper analysis of events can be done.*

**B. Multiple Element tripping at 400/220 kV Muzaffarnagar (UP) Station at 22:30hrs of 28<sup>th</sup> Apr 2021**

1. Discussion during the meeting:

- a. NRLDC representative raised following points during the meeting:

- i. Reason of delayed clearance of fault?
- ii. What was the exact nature and location of fault?
- iii. Why did 400 KV Alaknanda GVK (UPC)-Vishnuprayag (JP) (UP) Ckt-1 trip? DR of this line not submitted.



- iv. As per Event logger at Muzaffarnagar end, bus bar operated after approx. 350-400ms of occurrence of fault which should be instantaneous operation. Reason of delayed operation?
  - v. Whether PLCC communication is healthy or not.
  - vi. Details of remedial measures taken?
- b. UPPTCL representative informed the following:
- i. At 22:30 hrs, Y Phase CT of 400KV Bus Coupler blast, resulted into bus bar protection operation in zone 1 and Zone 2. All elements connected to both the buses were tripped on bus bar protection and DT command send to remote end of all the connected lines.
  - ii. 400kV Vishnuprayag -Alaknanda line was hand tripped from 400kV Vishnuprayag end at 22:34 hrs as 400kV Alaknanda station became dead due to tripping of all the units on loss of evacuation path.
  - iii. Damaged CT has been replaced
- c. NRLDC representative asked reason of delayed clearance of fault (approx. 400ms) as bus bar protection operates instantaneously. It was also stated that as per DR submitted from remote end, lines tripped from remote end in Z-2 distance protection.
- d. On above issues, UPPTCL representative informed that they couldn't able to extract DR of bus bar protection operation at Muzaffarnagar end because whole TNC team was COVID positive during that time.
- e. UPPTCL representative further informed that Bus bar relay was checked thereafter and no issue was found in relay. And it had operated correctly in future events.

2. PSC Recommendations:

- a. *DR of the tripped elements needs to be extracted within 24hrs of the occurring of events and to be uploaded on NR tripping portal, so that proper analysis of events can be done.*

**C. Multiple Element tripping at 400 KV Nathpa Jhakri HEP Station at 03:49hrs of 04<sup>th</sup> May 2021**

1. Discussion during the meeting:

- a. NRLDC representative raised following points during the meeting:
  - i. Exact reason of Bus Bar protection operation.

- ii. Exact location of Y-N fault and reason of occurrence of fault.
- b. NJPC representative informed the following:
- i. Bus bar protection operated at Nathpa Jhakri (Bus 2 & Bus 4) which led to tripping of all elements connected to Bus 2 & Bus 4.
  - ii. During initial inspection, it was found that bus bar operated might be due to Bus Bar CT wiring problem. But status of bus bar showing fault in Y-ph connected with Bus Bar 2. 400kV Nathpa Jhakri-Rampur Ckt-1 & CKt-2 tripped from Rampur end on DT received. 400kV Nathpa Jhakri-Panchkula Ckt-1 tripped from Panchkula end on DT received.
  - iii. As during the event, all the lines from Nathpa Jhakri tripped, Case 3 of SPS installed at Nathpa Jhakri complex got triggered.
  - iv. As per the action, 37MW Sawara Kuddu Unit 1 tripped. And all the generating units at Karcham, Nathpa Jhakri and Baspa were at standstill condition.

2. PSC Recommendations:

- a. Inspection needs to be done to check the healthiness of Bus Bar protection. NJPC shall share the report within 30 days.  
(**Action:** NJPC; **Time:**30 days)

**D. Multiple element tripping at 400kV Alaknanda GVK (UPCL) & 400/220kV Srinagar(UK) at 24-May-2021 17:20 hrs**

1. Discussion during the meeting:

- i. NRLDC representative raised following points during the meeting:
- ii. Reason of occurrence of fault?
- iii. Complete DR/EL & tripping report not uploaded on tripping portal by  
SLDC-UP & SLDC-UK.
- iv. Reason of delayed clearance of fault?
- v. DR of 400kV Alaknanda (end)-Muzaffarnagar line not submitted.
- vi. Whether distance Protection operated at Alaknanda end?
- vii. Reason for tripping of 220 KV Singoli Bhatwari(Singoli(LTUHP))-Srinagar(UK) (PTCUL) Ckts not clear?

- viii. Remedial action taken report needs to be shared.
- ix. DRs of Alaknanda and Singoli HEP units not shared.
- a. UPPTCL representative informed the following:
  - i. At 17:20hrs, R-Y phase to phase fault occurred on 400kV Alaknanda-Vishnuprayag line at distance of approx. 367 meter from Alaknanda end and distance protection sensed fault in Z-4 (reverse zone).
  - ii. Same fault was sensed by Alaknanda end distance relay of 400kV Alaknanda-Muzaffarnagar line in Z-4 (reverse zone) with distance of fault as 2.2km.
  - iii. Both the lines tripped from Alaknanda end with the delay of 560ms (time delay setting of Z-4 is 500ms).
  - iv. Muzaffarnagar end distance relay sensed the same fault in Z-2 and subsequently line tripped from Muzaffarnagar within ~500ms.
  - v. Later due to loss of evacuation path generating units at Alaknanda HEP tripped.

PSC Recommendations:

- b. DR of the tripped elements at Alaknanda end need to be send to NRLDC. (**Action:** UPPTCL; **Time:** 7days)
- c. After every tripping DRs and event logger of all the tripped elements should be extracted and analysed properly.

## **E. Multiple Element tripping at 400/220 kV Akal(Raj) at 01:25hrs of 17<sup>th</sup> June 2021**

### 1. Discussion during the meeting:

- a. NRLDC representative raised following points during the meeting:
  - i. What was the issue in DC supply to relay coil? If same DC supply is available to all relay coils, then why did CB of Ckt-2 not open if CB of ckt-1 opened in time?
  - ii. If CB of ckt-2 at Akal end didn't open in time, then how fault would have cleared. Whether any other line at Akal S/s also tripped? If not, then how did fault clear finally? Protection coordination needs to be reviewed at 400kV Akal S/s.
  - iii. As per SCADA SOE, CB at Ramgarh S/s also opened after 1500-1600ms which indicates delayed clearance of fault from Ramgarh end too. Root cause of delayed clearance at

Ramgarh S/s needs to be identified and to be shared with NRLDC.

- iv. Reason of delayed clearance of fault?
  - v. Exact sequence of events?
  - vi. DR, EL from 400/220kV Akal S/s & 400kV Ramgarh S/s and tripping report needs to be shared.
  - vii. Healthiness of DC supply at 400kV Akal S/s needs to be ensured.
- b. RVPNL representative informed the following:
- i. At 01:25 hrs, Y-N phase to phase fault occurred on 400 KV Akal-Ramgarh ckt-1&2 as both the lines are on same tower, fault was in Z-1 from Ramgarh end.
  - ii. On this fault, both the lines tripped from Ramgarh end after unsuccessful A/R operation however, from Akal end, 400 KV Akal-Ramgarh ckt-1 tripped in Z-2 with delay of around 600ms and tripping command to 400 KV Akal-Ramgarh ckt-2 didn't initiate due to DC supply issue.
- c. NRLDC representative stated that DR of all the tripped elements are not submitted. It was asked that why did carrier not receive at Akal end? Whether PLCC is healthy or not?
- d. On above issues, RVPNL representative informed that carrier communication is not healthy at Akal S/s. It was further informed that RVPNL have started carrier protection scheme test drive wherein testing of carrier communication in each and every 220kV & above voltage level transmission lines are being done and healthiness of same is being ensured. Hence, issues w.r.t. carrier communication will be resolved within a month tentatively.
- e. NRLDC representative further asked about the status of redundant DC supply during the event. And how did fault clear? Whether 400/220kV ICTs tripped?
- f. On above issues, RVPNL representative informed that DC source-1 was already out during antecedent condition due to battery cell issue and DC source-2 also failed during the event due to issue in battery charger contactor due to which sufficient dc current did not pump to the breaker trip coil to operate the breaker. It was further informed that issue with the DC sources have been resolved and both the DC source are healthy. On query of ICTs tripping, RVPNL representative informed that they were not able to extract the DR of ICTs. He assured to share the details w.r.t. tripping of ICTs.

## 2. PSC Recommendations:

- a. *DR of the tripped elements needs to be extracted within 24hrs of the occurring of events and to be uploaded on NR tripping portal, so that proper analysis of events can be done. DR of ICTs needs to be shared. (Action: RVPNL, Time: 7days)*
- b. *RVPNL may expedite the process to testing of carrier communication in transmission lines of their control area.*
- c. *Healthiness of DC source and its redundancy needs to be ensured by each and every constituent at their respective sub stations.*
- d. *Details need to share w.r.t. tripping of ICTs*

## **F. Multiple elements tripping at 220kV Tanakpur(NHPC) at 14:02 hrs of 21/06/2021**

### 1. Discussion during the meeting:

- a. NRLDC representative raised following points during the meeting:
  - i. Why AR under Lockout in spite of Carrier receive from remote end in 220 kV Tanakpur-Sitarganj -1.
  - ii. Why carrier is fail at Tanakpur for Ckt-1?
  - iii. 220 kV CB Ganj – Tanakpur (end) – 1 DR channels not configured properly.
  - iv. Why 220 kV Tanakpur – CB Ganj tripped from CB Ganj end?
- b. NHPC representative informed the following:
  - i. Tanakpur-Sitarganj Line#2 Relay sensed the fault in Z2 at 14:02:31.209 Hrs and tripped after Z2 time delay i.e. at 14:02:31.559 Hrs. Auto reclose did not operate due to carrier failure at Tanakpur end.
  - ii. From the DR of Tanakpur-CB Ganj Line#1 Distance protection relay, no fault on the Line observed. Line #1 remains closed from Tanakpur end. However as reported, line tripped from remote end. Mahendranagar Line also remained in closed condition from Tanakpur end.
  - iii. During the event Tanakpur-Sitarganj Line#2 was carrying 50 MW (approx.) and Tanakpur-CB Ganj Line#1 was carrying 11 MW (approx.). Upon tripping of Line#2 & Line#1, due to huge load mismatch, all the three running units tripped on operation of over speed protection.

- iv. Carrier fail indication persisted during the fault. Accordingly, AR did not happen and line tripped after Zone-2-time delay.
- v. Maintenance of PLCC is being looked after by M/s PGCIL. The problem was already communicated to M/s PGCIL.

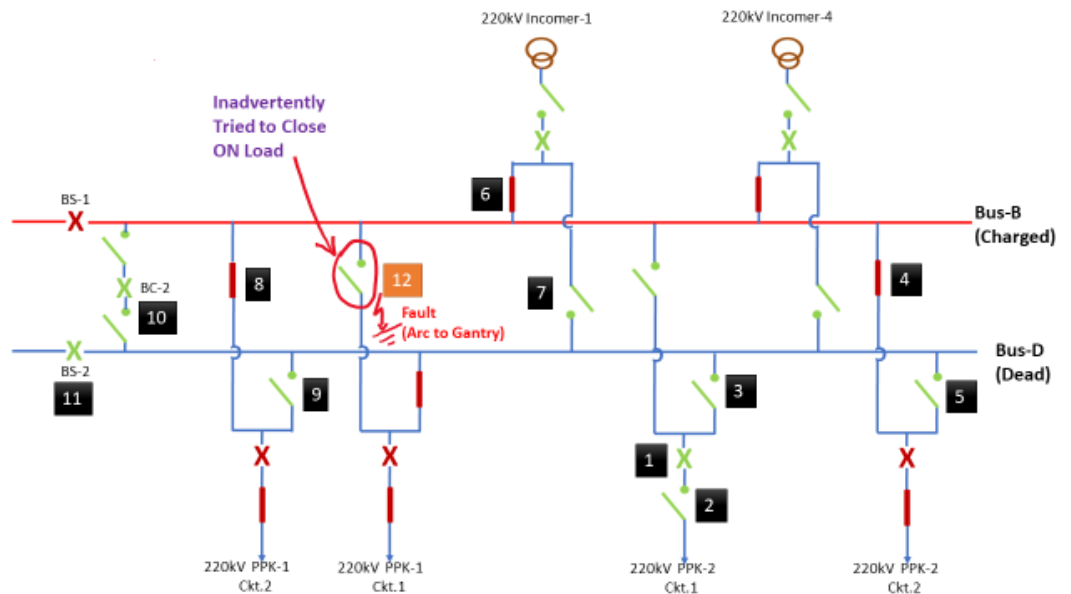
2. PSC Recommendations:

- a. Healthiness of PLCC system needs to be ensured. (**Action:** PGCIL/NHPC; **Time:**30 days)

**G. Multiple elements Tripping Incident at 400kV DTL S/s Bamnoli on 09.07.21 at 10:25 hrs**

1. Discussion during the meeting:

- a. NRLDC representative raised following points during the meeting:
  - i. Reason of delayed clearance of fault?
  - ii. Why did 220kV Bamnoli-DIAL-1 & DIAL-2 tripped before 400/220 kV 315 MVA ICT 1 at Bamnoli (DV)? (as per SOE obtained at NRLDC)
  - iii. Exact sequence of tripping of elements and detailed tripping report needs to be shared with remedial action taken.
- b. DTL representative informed the following:
  - i. Fault occurred due to inadvertent on load operation of Bus-B Isolator of 220kV Pappankalan-1 Ckt-1.
  - ii. Fault occurred was of high resistance nature. On this fault, 220kV Bamnoli- DIAL-1 & 2 tripped from DIAL end in Zone-2 and then ICTs tripped.
  - iii. The bus-bar protection was blocked due to un-defined position of auxiliary contacts of isolator because of sticking of isolator mid-way.
  - iv. Old bus-bar protection scheme has been replaced by GE make centralized numerical bus-bar protection scheme B-90.



**Observation:**

- i. In 315 MVA ICT-1 at Bamnauli REF trip is visible in DR.
- ii. In 500 MVA MVA ICT-2 at Bamnauli PRV trip is visible from DR.
- iii. In 500 MVA MVA ICT-3 at Bamnauli Differential protection start visible. No trip signal visible from DR.

2. PSC Recommendations:

- a. MS, NRPC emphasized that Numerical protection, Disturbance Recorder and Station event logger (SAS based or standalone event logger) are very important for detailed analysis of any tripping and helps in preventing those repetitive tripping. CEA technical standard of construction also mandate all these requirements for 220 kV and above voltage level. Utilities shall take corrective action to ensure healthiness of DR/EL, time synchronization of DR/EL and also ensure numerical protection in the system as per technical standard.

**H. Multiple Element tripping at 220 kV Samaypur (BBMB) at 04:58hrs of 13<sup>th</sup> July 2021**

1. Discussion during the meeting:

- a. NRLDC representative raised following points during the meeting:
  - i. Exact nature and location of fault?
  - ii. Reason of occurrence of fault?
  - iii. Reason of delayed clearance of fault?

- iv. DR channels are not properly configured in 220 kV Ballabgarh – Samaypur – 1.
  - v. DR of 220 kV Faridabad-Samaypur ckt-1 is faulty.
  - vi. Status of Bus bar protection at 220 kV Samaypur?
- b. BBMB representative informed the following:
- i. At 04:58 hrs, heavy spark observed at R phase bus side isolator of 400/220kV 500MVA ICT-2 at 220kV side which created R-ph bus fault.
  - ii. Bus bar protection at 220kV Samaypur was not in service during the event. It was out from June'2021 due to defects in CU. As bus bar protection was not in service, Z-4 protection setting was kept with delay of 160ms. However, as fault was of high impedance nature, Z-4 started and became reset three times during the fault.
  - iii. 220kV feeders to Charkhi Dadri and Ballabhgarh tripped in Z-2 from remote end with time delay of 500ms and 400/220kV 500MVA ICT-1,2,3 & 4 tripped on back-up earth fault protection operation in approx. 600ms.
- c. NRLDC representative asked about the current status of bus bar protection at 220kV Samaypur (BBMB).
- d. On above issue, BBMB representative informed that bus bar protection was recommissioned on 23<sup>rd</sup> July, 2021 but it again got faulty due to double DC source mixing. Later, during SAS implementations at 220kV Samaypur, it was found that breakers of few feeders of Haryana state were not supporting double DC source which was leading to damage of CU/PU due to double DC source mixing. Now, the issue of double DC source mixing has been resolved. Replacing work of defective CU/PU is in process. Meanwhile till bus bar protection become healthy, they will keep definite minimum time characteristic overcurrent protection in bus coupler with pick up current as 3A (6kA at primary side) and time delay of 300ms.

## 2. PSC Recommendations:

- a. *DR of the tripped elements needs to be extracted within 24hrs of the occurring of events and to be uploaded on NR tripping portal, so that proper analysis of events can be done.*
- b. *BBMB may expedite the process to recommissioning of bus bar protection at 220kV Samaypur (BBMB).*



## I. Multiple Element tripping at 400/220 kV Bareilly (UP) Station at 16:36hrs of 23<sup>rd</sup> July 2021

### 1. Discussion during the meeting:

- a. NRLDC representative raised following points during the meeting:
  - i. Exact location of fault & reason of occurrence of fault?
  - ii. Reason of delayed clearance of fault?
  - iii. Whether SPS operated correctly?
  - iv. Reason of tripping of all 220kV lines?
  - v. DR of elements tripped at Bareilly end not received.
  - vi. DR submitted by Bareilly (UP) are not time synced.
- b. UPPTCL representative informed the following:
  - i. At 16:36hrs, flashover observed between CT & Bus at 220kV side of 400/220kV 315MVA ICT-3 at Bareilly(UP).
  - ii. Fault was of high impedance nature, on this fault 220kV lines tripped from remote end in Z-2 & Z-3. Due to high impedance nature of fault, it didn't sense by Z-4 distance protection of 220kV Bareilly end.
  - iii. On this same fault, 400/220kV 315MVA ICT-3 at Bareilly(UP) tripped on earth fault protection operation and 400/220kV 315MVA ICT-1 & ICT-2 tripped on Over current protection operation.
- c. UPPTCL representative informed that DRs got deleted during testing work that's why they couldn't able to extract DR. On time syncing issue of DR, UPPTCL representative agreed to ensure the time syncing of DR at Bareilly(UP). On status of bus bar protection, it was informed that allotment process of bus bar panel has been completed and tendering process is in progress.
- d. NRLDC representative asked UPPTCL representative to expedite the process of installation of bus bar panel at 220kV Bareilly(UP) on priority.

### 2. PSC Recommendations:

- a. *DR of the tripped elements needs to be extracted within 24hrs of the occurring of events and to be uploaded on NR tripping portal, so that proper analysis of events can be done.*
- b. *UPPTCL must ensure the time syncing of disturbance recorders/event loggers and other recording devices. (Action: UPPTCL, Time: 7days)*

- c. UPPTCL may expedite the process of installation of bus bar panel at 220kV Bareilly(UP).

## **J. Multiple Element tripping at 400/220 kV Muzaffarnagar (UP) Station at 03:02hrs of 07<sup>th</sup> Aug 2021**

### 1. Discussion during the meeting:

- a. NRLDC representative raised following points during the meeting:
- i. Why did (As per PMU), R-B fault cleared with delay of 760ms. Reason of delayed clearance of fault?
  - ii. Exact location and nature of fault?
  - iii. Nature of B-N fault, was it bus fault or line fault?
  - iv. SoE data of elements tripped at 400/220kV Muzaffarnagar sub station is not available at NRLDC SCADA SOE.
  - v. Reason of tripping of 220kV Singoli Bhatwari-Srinagar ckt-1 &2?
  - vi. Why did bus bar protection of Bus 1 operate? (as fault was in ICT 3 which was connected to bus 2)?
  - vii. DR of bus bar relay not submitted.
- b. UPPTCL representative informed the following:
- i. In antecedent condition, 400kV lines to Vishnuprayag, Matore, Attore, & 400/220kV 500MVA ICT-4, 400/220kV 315MVA ICT-1 were connected to bus-1 and 400kV lines to Alaknanda, Roorkee & 400/220kV 315MVA ICT-2 & ICT-3 were connected to bus-2 and bus reactor was connected to bus-3 (transfer bus).
  - ii. At 03:02 hrs, R phase CT of 400 /220 KV ICT 3 blast, resulting into differential protection operation of this ICT 3. Due to blast of R phase CT, R ph CT got fire and caused damages to the adjacent B phase CT of 400 KV Muzaffarnagar – Alaknanda line resulting B-N fault 400 KV Muzaffarnagar – Alaknanda at distance of approx. 0.2km from Muzaffarnagar end.
  - iii. Fire flame caused by blast of R-h CT, touched the transfer bus. And transfer Bus was charged through the bus 1 so Bus bar protection operated in Zone 1 and Zone 3.
  - iv. Damaged CTs were replaced with new CTs.

- c. NRLDC representative stated that as per PMU, 400kV Muzaffarnagar-Alaknanda ckt tripped without A/R operation on B-N phase to earth fault. It was also stated that CB status of tripped elements at Muzaffarnagar substation are not recorded in SCADA SOE.
- d. On above issues, UPPTCL representative informed that A/R of 400kV Muzaffarnagar-Alaknanda ckt is healthy. UPPTCL representative also agreed that they will check and correct the issue of non-availability of SCADA SOE data of elements of Muzaffarnagar substation.

2. PSC Recommendations:

- a. *DR of the tripped elements needs to be extracted within 24hrs of the occurring of events and to be uploaded on NR tripping portal, so that proper analysis of events can be done. UPPTCL shall share the DR of tripped elements at Muzaffarnagar substation. (Action: UPPTCL, Time: 7days)*
- b. *UPPTCL must check and ensure the healthiness of SCADA SOE data of element of 400/220kV Muzaffarnagar substation. (Action: UPPTCL, Time: 7days)*

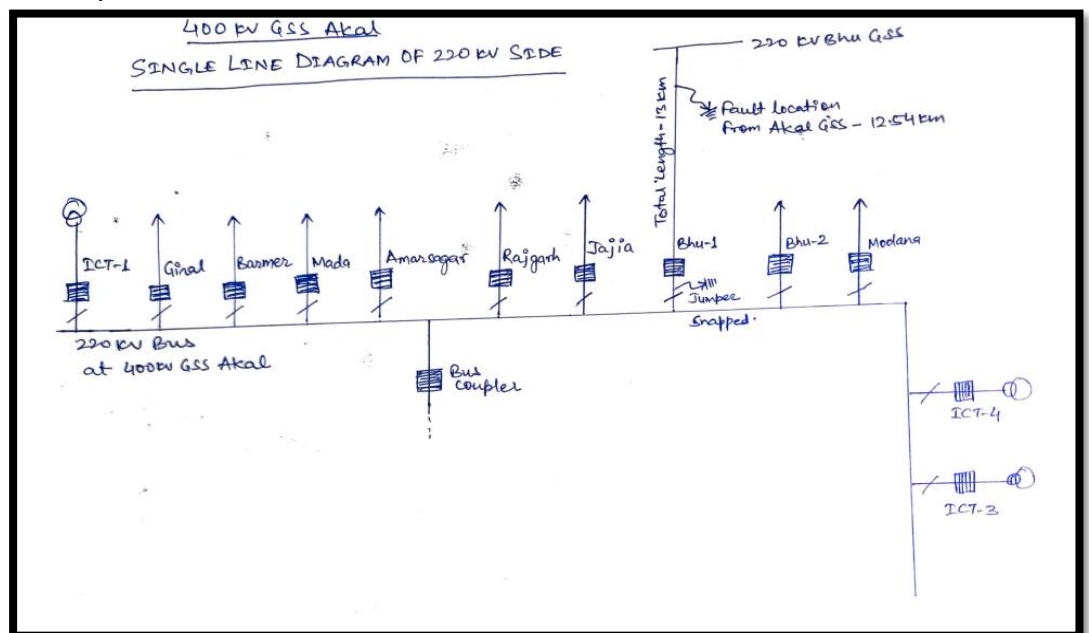
**K. Multiple Element tripping at 400/220 kV Akal(Raj) at 16:47hrs of 02<sup>nd</sup> Sept 2021**

1. Discussion during the meeting:

- a. NRLDC representative raised following points during the meeting:
  - i. Exact location and nature of fault?
  - ii. Why did 220kV feeders to Bhu-2, Jajiya, Rajgarh and Mulana not trip in Z-4?
  - iii. Relay time sync issue found.
  - iv. Status of 220 kV busbar protection at Akal.
  - v. What was the time delay setting of Z-4 distance protection?
- b. RVPNL representative informed the following:
  - i. At 16:47 hrs, Y-B phase to phase fault occurred due to snapping of jumper of 220 KV Akal-Bhu ckt-1 at distance ~12.5km from Akal end (line length-13 km).
  - ii. On this fault, distance relay at Akal end issued tripping command in Z-2 with time delay of 300ms and line CB opened after 350ms of fault.

- iii. At the same time, Y-phase bus side jumper of 220 KV Akal-Bhu ckt-1 snapped and created Y-phase bus fault.
- iv. On this bus fault, 220kV lines to Giral, Amarsagar, Mada & Barmer tripped on Z-4 distance protection operation with time delay of 160ms as bus bar protection was not in service. Other 220kV feeders to Bhu-2, Jajiya, Ramgarh & Mulana were manually opened as they were radially connected at 220kV Akal and didn't had source to feed the fault.
- v. Further after approx. 300ms, 400/220kV 315MVA ICT-3 & 500MVA ICT-1&4 tripped on earth fault protection operation and fault cleared.

F



k

S

SLD diagram of 220kV side of 400/220kV Akal(Raj)

- c. RVPNL representative informed that bus bar protection was out of service during the event because PU of 220kV Amarsagar ckt was defective. It was intimated to the forum that defective PU has been replaced and bus bar protection at 220kV Akal is healthy and is in service and Z-4-time delay setting has been revised to 1sec. On issue of time sync it was informed that time synchronization issue has not yet been resolved as some of the ethernet switches are still defective. It was further informed that most of the hardware system of SCADA at Akal is outdated due to which SCADA goes out/in frequently which leads to time sync issue. Further, it was informed that they have taken up the issue with management and

management has decided to upgrade the SCADA at Akal S/s during smart network automation work at Akal S/s.

2. PSC Recommendations:

- a. *RVPNL may expedite the process to resolve the issues related to Ethernet switches and must ensure the time syncing of disturbance recorders/event loggers and other recording devices.*
- b. *Share the timeline for upgradation of SCADA and respective time sync issues at Akal.*

**L. Multiple Element tripping at 400/220 kV Bareilly (UP) Station at 16:27hrs of 23<sup>rd</sup> Oct 2021**

1. Discussion during the meeting:

- a. NRLDC representative raised following points during the meeting:
  - i. Exact location & nature of fault?
  - ii. Why DR of other 220kV lines & ICTs at Bareilly not submitted.
  - iii. Why did 220kV feeders to Dohna-1&2, CB Ganj-2 and Pilibhit-1&2 not trip in Z-4?
  - iv. Why 220 kV busbar protection is out of service at 400/220 kV Bareilly.
- b. UPPTCL representative informed the following:
  - i. During antecedent condition, 220kV Bareilly-Pantnagar feeder was charged through transfer bus as its main breaker was in shutdown.
  - ii. At 16.27 hrs. R-phase jumper along with disc insulator string of 220 kV Bareilly- Pantnagar line snapped and fell down on 220kV transfer bus making two phase faults (R & Y).
  - iii. 220 kV Bareilly- Pantnagar line was being fed through transfer bus coupler breaker. Distance protection of 220kV Bareilly- Pantnagar line operated but TBC circuit breaker did not trip and fault converted into 220 kV bus fault. As bus bar protection at 220kV side of 400/220kB Bareilly (UP) is not in service, it resulted into tripping of 3\*315 MVA, ICTs on PRV and Buchholz protection and some 220 kV lines in reverse zone Z4 while remaining lines from remote end in zone-2.

- iv. On checking, tripping wires in 220 kV Dohna-1 relay panel were found open which is installed between 220 kV Pantnagar and 220 kV TBC relay panel.
  - v. 220 kV Dohna-1&2, CB Ganj-2 and Pilibhit-1&2 did not operate in reverse zone Z4. During testing, impedance setting of Z-4 was changed from 0.83 $\Omega$  to 2.4 $\Omega$  thereafter Z-4 protection is working properly.
  - vi. Integration of seven (07) numbers 220 kV lines i.e. Pithoragarh, Dhauliganga, Dohna-1&2, Shahjahanpur, CB Ganj-2 and Pilibhit-1 lines and 315 MVA, ICT-2&3 is yet to be done with event logger which has to be re –configured.
  - vii. Bus bar protection is yet to be commissioned at 220kV Barielly (UP).
- c. UPPTCL representative informed that there is some issue in software due to which they don't able to extract the DR.

2. PSC Recommendations:

- a. *DR of the tripped elements needs to be extracted within 24hrs of the occurring of events and to be uploaded on NR tripping portal, so that proper analysis of events can be done. UPPTCL must resolve the issue with their software and ensure the timely extraction and submission of DR.*
- b. *UPPTCL must expedite the process of integration of all the 220kV feeders with the event logger.*
- c. *UPPTCL may expedite the process of installation of bus bar panel at 220kV Bareilly (UP).*

**M. Multiple elements tripping at 220/66kV Narela (DV) 27th Nov 2021 at 09:24 hrs**

1. Discussion during the meeting:

- a. NRLDC representative raised following points during the meeting:
  - i. Why 220 kV Mandola – Narela DRs not submitted by utility.
  - ii. What was the reason for fault?
  - iii. Why delayed clearance of fault was there?
  - iv. Z-4-time delay may be confirmed.
  - v. Why alarm of DC fault was persisting?
  - vi. What was the Bus bar status?

b. DTL representative informed the following:

- i. The Y-B phase to phase fault occurred on bus isolator of 220kV Narela-Rohtak Road Ckt-2, which later on converted into RYB three phase fault.
- ii. This fault was sensed by distance relays of 220kV Narela-Panipat Ckt-1, 2, 3 and Mandola Ckt-1&2 at Narela end in Zone-4 & at remote ends in Z-2 and cleared in Zone-2 timings from remote end.
- iii. The fault magnitude was approx. 20kA (2.5kA+2.5kA+2.6kA+6.3kA+6.3kA) and was cleared in approx. 450ms from remote end i.e. Panipat and Mandola.
- iv. Fault cleared from remote end because DC MCB of bus bar protection at Narela end got tripped just before the event due to some DC leakage to earth in switchyard. Hence, bus bar protection was not in service during the event.
- v. DC leakage might have occurred due to Bus Isolator Motor box replacement work being carried out by BBMB in their switchyard.

**Observation:**

- i. For 220 kV Narela(End)-Panipat the fault was in Y-B phase.
- ii. Fault sensed in Z-4 reverse.

**2. PSC Recommendations:**

- a. *Z-4 time settings/timer of 220 kV Narela (End)-Panipat CKT-1 need to be checked.*
- b. *Standard operating procedure must be ensured during any testing and maintenance*

**N. Multiple elements tripping at 400/220kV Obra\_B(UP) at 06th Dec 2021, 18:27 hrs 06th Dec 2021, 18:27 hrs**

**1. Discussion during the meeting:**

- a. NRLDC representative raised following points during the meeting:
  - i. Proper operation of bus bar protection and healthiness of circuit breaker at Obra\_B (UP) to be ensured.
  - ii. Have Bus coupler breaker replaced or not?
  - iii. Why DRs of tripped elements not submitted?
  - iv. Remedial action taken report to be shared.

- b. UPPTCL representative informed the following:
  - i. At 18:13 hrs, during Voltage build process, 400kV B-phase breaker blasted and created bus fault which led to the operation of bus bar protection of bus-1.
  - ii. On bus bar protection operation, one pole of Bus coupler breaker didn't open which led to the operation of LBB protection of bus coupler bay which further extended the tripping to all the elements connected to bus-2 also.
  - iii. 400kV BHEL make SF6 breaker of Unit-13 has been replaced with new GE make SF6 Spring Operated circuit breaker
  - iv. Process of replacement of 400kB Bus coupler existing ABB circuit breaker with new SF6 Spring Operated circuit breaker is under pipeline.

2. PSC Recommendations:

- a. 400 KV Bus-Coupler CB replacement needs to be expedited and CB needs to be replaced at the earliest. (**Action:** UPPTCL)

**O. Multiple elements tripping at 400/220kV Sultanpur(UP) at 05th Jan 2022, 02:58 hrs**

1. Discussion during the meeting:

- a. NRLDC representative raised following points during the meeting:
  - i. As per DR, 400kV Sultanpur-Lucknow line tripped on SOTF operation then why did fault persisted later also?
  - ii. Reason of delayed clearance of fault?
  - iii. Did busbar protection trip/operate at Sultanpur?
- b. UPPTCL representative informed the following:
  - i. At 01:34hrs, 400kV Sultanpur- Lucknow (PG) line tripped from both the ends on Y-N phase to earth fault in reclaim time after successful A/R operation.
  - ii. At 02:58, charging attempt of line was taken from Sultanpur end. At the same time, distance protection relay issued SOTF trip command. On patrolling, Y ph suspension string found damaged at location no. 101.
  - iii. However, due to defective DO contact of Main1 & Main2 relays used for SOTF (3 ph trip), trip command was not



issued to 86 Trip relay leading to non-auto tripping of CB 92 & non initiation of LBB relay.

- iv. Later, fault cleared with the tripping of 400kV Sultanpur-Obra line in Z-3 from Obra end in 1000ms, ICT-1 & ICT-3 from LV side on E/F protection in 850ms and ICT-2 on LV side on E/F protection in 1200ms.
- v. This fault was also not sensed by Z-4 distance protection of lines at Sultanpur end as fault was just out of the range of Z-4. Hence, no tripping of line occurred at Sultanpur end.
- vi. Distance protection relays of lines were found ok at Sultanpur end during annual relay testing conducted on 28.09.2021.
- vii. To ensure the reliability, two spare DO contacts have been configured in parallel for all 1 Ph & 3 ph trip commands in both Main-1 & Main-2 relay. Moreover, DO card of Main 2 relay has been replaced with the one of spare relay with same configuration on 24 May 2022.

**Observation:**

- i. Measures to be taken in future: Replacement of electromechanical type relays of 400/220kV 240 MVA ICT-2 with numerical type relay and replacement of same make & type Main1 & 2 distance protection relay of 400kV Obra line with relays of different make.

2. PSC Recommendations:

- a. *Replacement work of electrochemical relays with numerical relays and of same make relays with different make needs to be expedite. (Action: UPPTCL; Time:30 days)*

**P. Multiple Element tripping at 220 kV Pong (BBMB) at 08:34hrs of 17<sup>th</sup> Mar 2022**

1. Discussion during the meeting:

- a. NRLDC representative raised following points during the meeting:
  - i. Exact nature and location of fault?
  - ii. Reason of occurrence of fault?
  - iii. Reason of delayed clearance of fault?
  - iv. Why DR of Pong (BBMB) end not submitted from.
  - v. Status of Bus bar protection at 220 kV Pong?

- b. BBMB representative informed the following:
  - i. At 08:34 hrs, wave trap of Y-phase of 220kV Pong-Jalandhar ckt-1 burst.
  - ii. On this fault, line tripped from Jalandhar end. At Pong end, distance protection of line initiated tripping command and master trip relay 86B & 86C operated, but DC supply from Trip Transfer Switch TTS (Normal, Inter & Transfer switch) did not extend to breaker due to loose wire strand in thimble of TTS switch of this feeder/panel.
  - iii. As fault was still persisting, other 220kV lines tripped from remote end in Z-2.
- c. On above explanation, NRLDC enquired whether LBB protection at Pong end operated or not?
- d. On above query, BBMB representative informed that as LBB protection was of electromagnetic type and is very old & sluggish, it didn't operate during the event. It was further informed that they are replacing it with numerical relay, panel has been procured and it will be replaced during next planned shutdown.

2. PSC Recommendations:

- a. *DR of the tripped elements needs to be extracted within 24hrs of the occurring of events and to be uploaded on NR tripping portal, so that proper analysis of events can be done. BBMB shall submit the DRs of tripped elements at Pong end. (Action: BBMB, Time: 7days)*
- b. *BBMB may expedite the process of replacing electromagnetic LBB relay with numerical relay. BBMB agreed for same.*
- c. *Routing inspection needs to be done to ensure tight wiring connections in protection equipment.*
- d. *Constituents may also conduct protection audits at substations of their respective control area to ensure the healthiness of protection equipment, DC sources, mechanical components etc.*

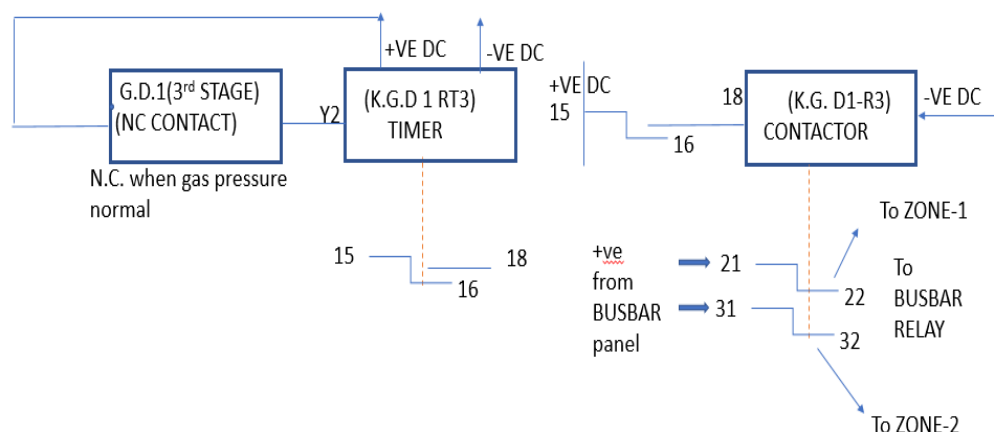
**Q. Multiple element tripping at 400 KV Noida Sec 148(UP) at 06th April 2022, 21:22 hrs**

1. Discussion during the meeting:

- a. NRLDC representative raised following points during the meeting:
  - i. Status of changeover of DC source? If not automatic, then why?

- ii. What is the Bus bar protection scheme adopted?
  - iii. In GIS gas detectors whether NO (Normally open) or NC (Normally close) contact is used?
  - iv. Was 400 kV Noida Sec-148 – Noida Sec – 123 Line already out?
  - v. What remedial measures have been taken?
  - vi. Frequent LBB high and low. Why?
- b. UPPTCL representative informed the following:
- i. There are two DC sources at Noida Sec-148 S/S.
  - ii. At 21:22 hrs, DC source-1 got failed. And as DC source changeover relay is of mechanical type, it changes the DC supply with some delay.
  - iii. As per logic of Bus Bar protection, it operates on three conditions, one, on Bus differential/LBB operation, second, on Gas Detector Stage-3 detection and third, on both DC source failures.
  - iv. NO & NC are used and in normal condition, it remain in close condition.
  - v. So, during changeover time delay, as both the DC source were not available, bus bar protection got triggered. And subsequently elements connected to both the bus tripped.
  - vi. Defective cards in battery charger have been replaced and both the DC source are healthy.

**Observation:**



K.G.D1-RT3 to be in energized position. Contact 15 & 18 should be NC & K.G.D1-R3 contactor should be in energized position & therefore, bus bar tripping contact 21, 22 & 31,32 will be NO & system will run healthy and tripping can be avoided.

## 2. PSC Recommendations:

- a. Automatic fail safe change-over to be ensured from both the DC sources. (**Action:** UPPTCL; **Time:**30 days)

## R. Multiple Element tripping at 765 kV Fatehgarh2(PG) at 16:45hrs of 13<sup>th</sup> April 2022

### 1. Discussion during the meeting:

- a. NRLDC representative raised following points during the meeting:
  - i. RSBPL side DR has not been submitted.
  - ii. Exact location of fault from Fatehgarh2 end?
  - iii. Reason of delayed clearance of fault?
  - iv. Why did A/R operation not observe at Fatehgarh2 end?
  - v. Reason of tripping of 220kV Fatehgarh2-Renew Sunbright Solar Ckt-1 from RENEW Sunbright end?
  - vi. Why did 220kV Adani Solar Park - PSS-3 & PSS-4-line trip?
  - vii. Why DR/EL & tripping report not submitted.
  - viii. Remedial action taken report to be shared.
- b. POWERGRID representative informed the following:
  - i. At 16:45:28 hrs, during inclement weather condition, R-ph to earth fault occurred on 765kV Fatehgarh2-Bhadla2 ckt-2 which tripped after unsuccessful A/R operation from both end. Line tripped due to permanent nature of fault.
  - ii. Further after approx. 2sec, R-ph to earth fault occurred on 765kV Fatehgarh2-Bhadla2 ckt-1 at Bhadla2 end. On this fault, line tripped from Bhadla2 end instantaneously and tripped from Fatehgarh2 end in Z-2 with 350ms time delay. A/R operation didn't observe because both analog and digital PLCC channel were faulty during the event.
- c. NRLDC informed that as per DR of Fatehgarh2 end of 765kV Fatehgarh2-Bhadla2 ckt-2, it seems that line CB of all three phase again closed after three phase trip. What was the reason for such trip?
- d. On above query, POWERGRID NR-1 representative informed that it happened because anti pumping relay of CB at Fatehgarh2 end didn't work during the event. Later, issue with the anti-pumping relay was corrected.

## 2. PSC Recommendations:

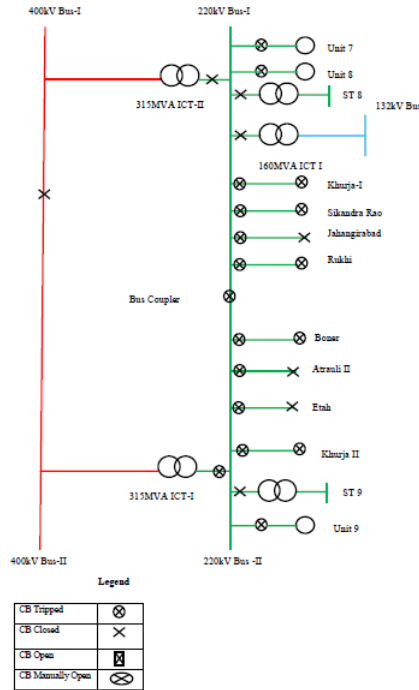
- a. RE developers should also analyse the event at their end and may share the DR, EL & tripping report of their respective end.
- b. What was the issue observed at Anti-pumping relay and what corrective actions were taken to rectify the issue (Action: POWERGRID)

## **S. Multiple elements tripping at 400/220kV Harduaganj(UP) Station at 25th April 2022, 22:38 hrs**

### 1. Discussion during the meeting:

- a. NRLDC representative raised following points during the meeting:
  - i. DRs of the events are not submitted.
  - ii. Reason of occurrence of fault?
  - iii. Status of 220 kV Bus bar protection at Harduaganj.
  - iv. Why ICT-2 did not trip on O/C, E/F?
  - v. Weather 400 kV Harduaganj – Aligarh also tripped during the event.
  - vi. Why fault is coming in Zone-1 for Harduaganj-Khurja from Khurja end.
  - vii. Why Harduaganj - Atroli and Hraduaganj – Jhangirabad did not trip. PMU showing HDJ-ATRL tripped.
  - viii. What are O/C E/F settings of ICTs?
  - ix. Time sync and relay nomenclature issues.
  - x. DR to be sent in \*.dat / \*.cfg format only.
- b. UPPTCL representative informed the following:
  - i. Fault occurred on 220kV main Bus- II during inclement weather condition. On patrolling, no physical damage was found.
  - ii. As bus bar protection is not installed at Harduaganj S/s, all connected 220kV lines of both the 220kV buses tripped in reverse zone (Z-4) and 400kV/220kV 315MVA ICT- I tripped on Back up E/F causing 220kV Bus-II to become dead.
  - iii. At the same time, Unit 8 & 9 (2X250MW) tripped on GT over current protection and Unit#7 tripped on Master Fuel Trip as both ID Fans tripped due to tripping of Station Transformer 132kV/6.6kV, 20MVA R1 on REF protection.

- iv. 220kV/132kV, 160MVA ICT-I & 400kV /220kV, 315MVA ICT-II remained intact & 220kV Bus - I remained charged.
- v. On site visit, no physical damage of equipment & conductor found, so it was decided to charge 220kV Bus-II. Bus Circuit Breaker of 220kV Bus Coupler did not hold and oil leakage was found from all three CTs of 220kV Bus Coupler



## 2. PSC Recommendations:

- a. There seems to be time synchronization issue between event loggers and DRs, same needs to be corrected. (**Action:** UPPTCL; **Time:** 7days)
- b. Bus-bar protection is not available at Bareilly and Harduaganj stations. Same needs to be expedited on priority.
- c. Detail analysis of event with supporting DRs needs to be shared. (Action: UPPTCL; Time: 7days)

# Multiple elements tripping at 400 KV Jaisalmer(RS)

28<sup>th</sup> April 2021, 18:32 hrs

# Tripped elements & Antecedent condition (As reported)

## **Antecedent Condition:**

- Weather Conditions: Normal
- Grid Frequency (Hz): 50.10
- Total IR Import (MW): 8156
- Northern Region Demand (MW): 44551
- Load Loss: Nil

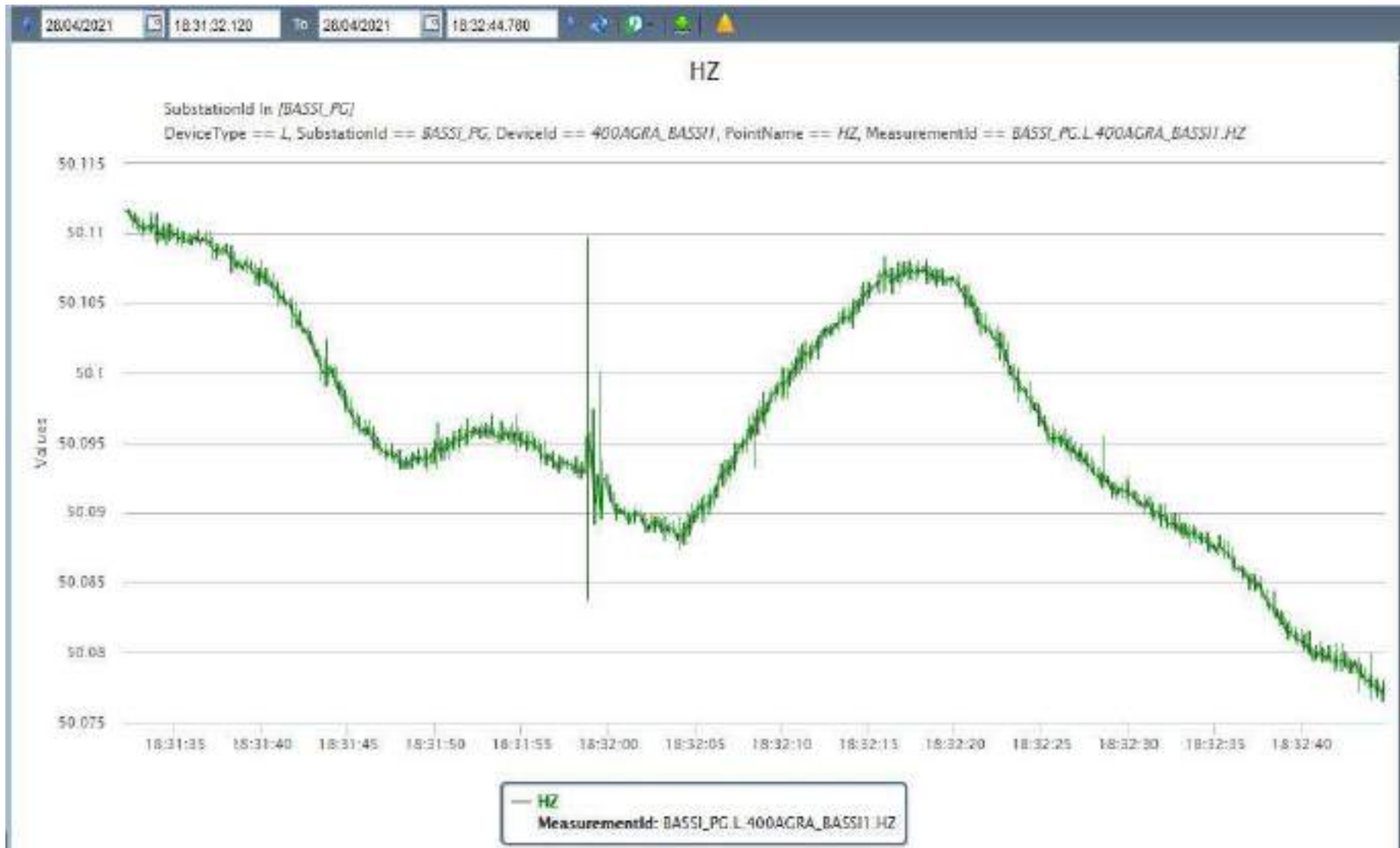
## **Tripped Elements:**

- 400 KV Jaisalmer-Barmer (RS) Ckt-2
- 400 KV Akal-Jaisalmer (RS) Ckt-1
- 400 KV Kankani-Jaisalmer (RS) Ckt-2



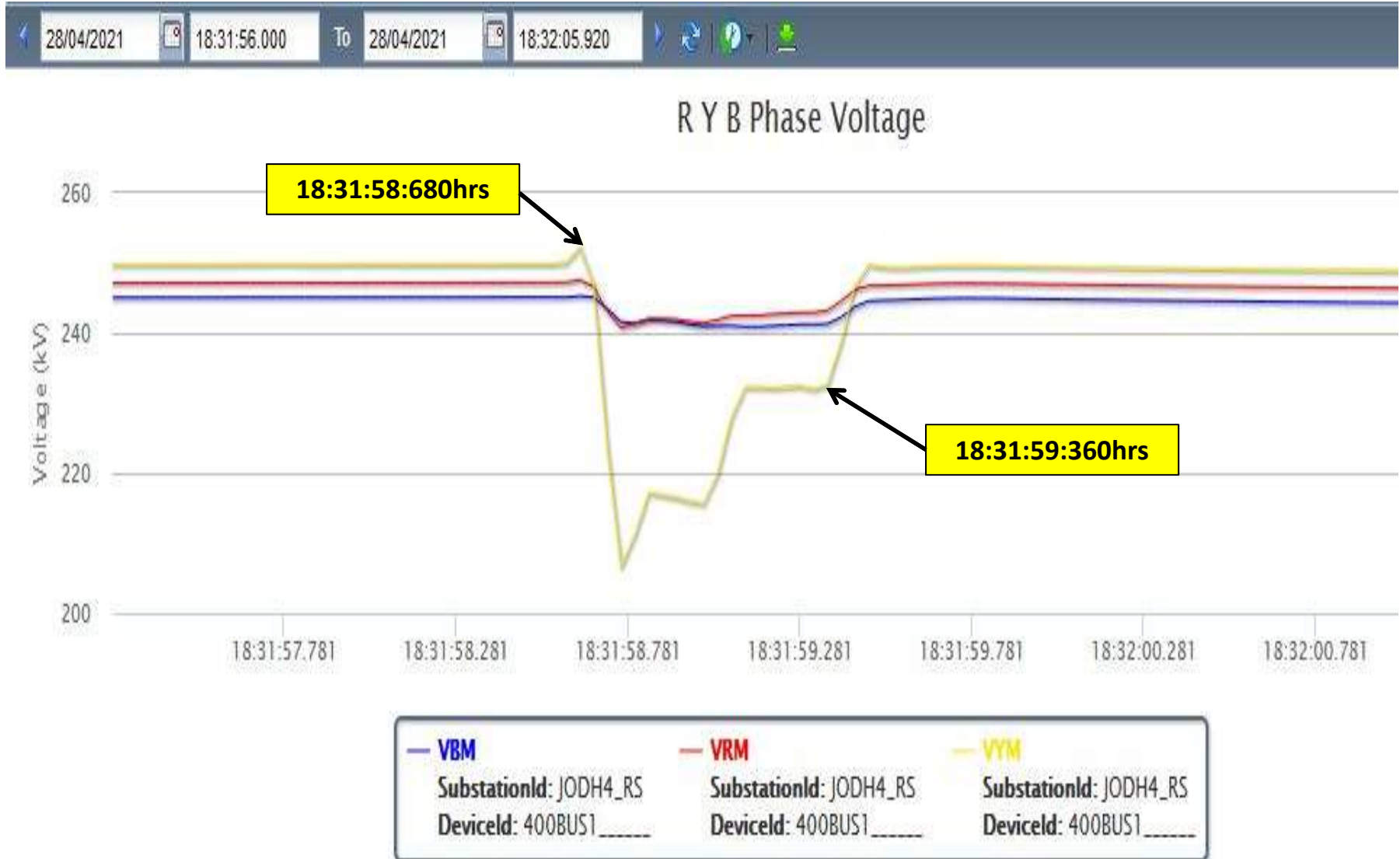
# PMU Plot of frequency at Bassi(RS)

18:32hrs/28-Apr-21



# PMU Plot of phase voltage magnitude at Jodhpur(RS)

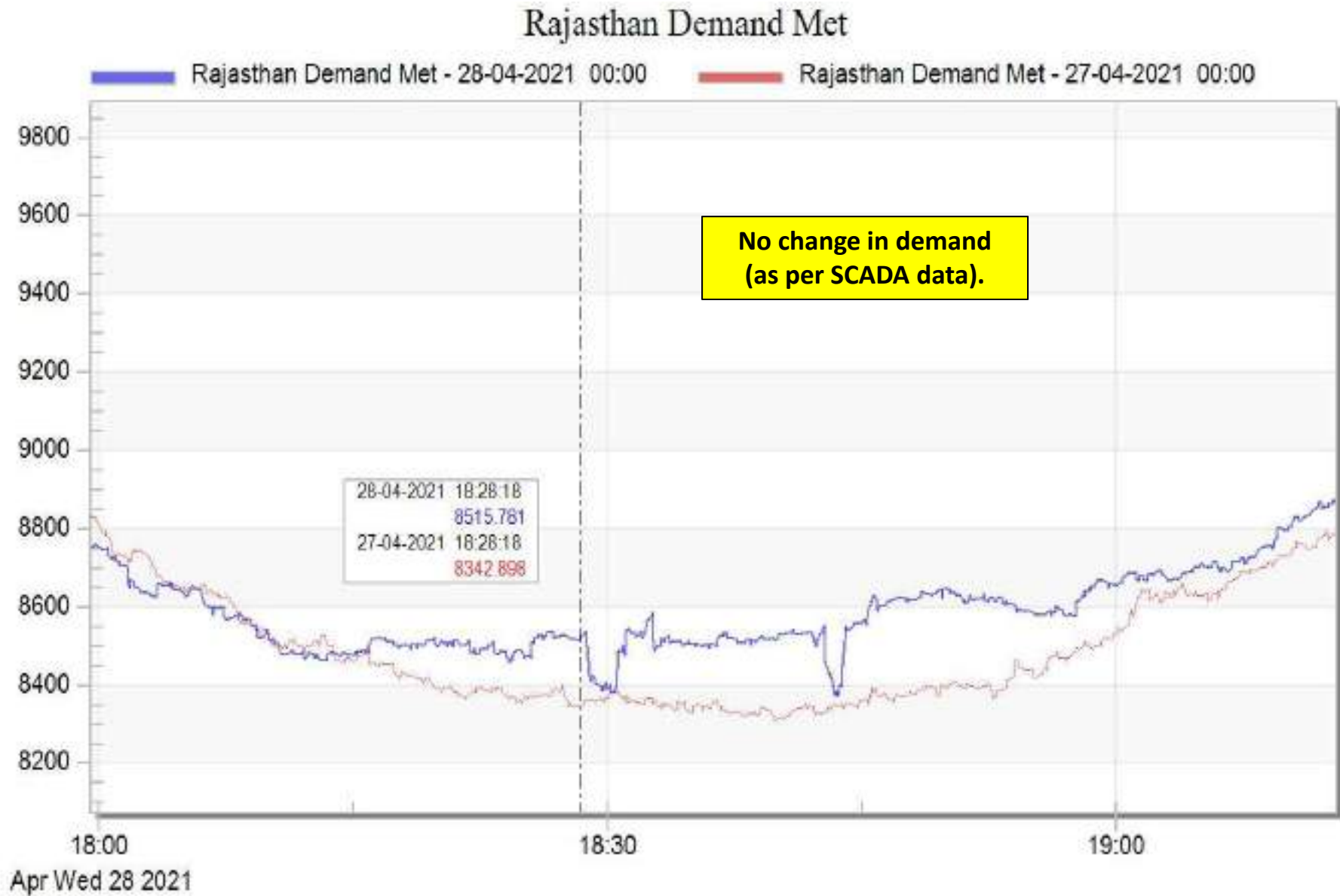
18:32hrs/28-Apr-21



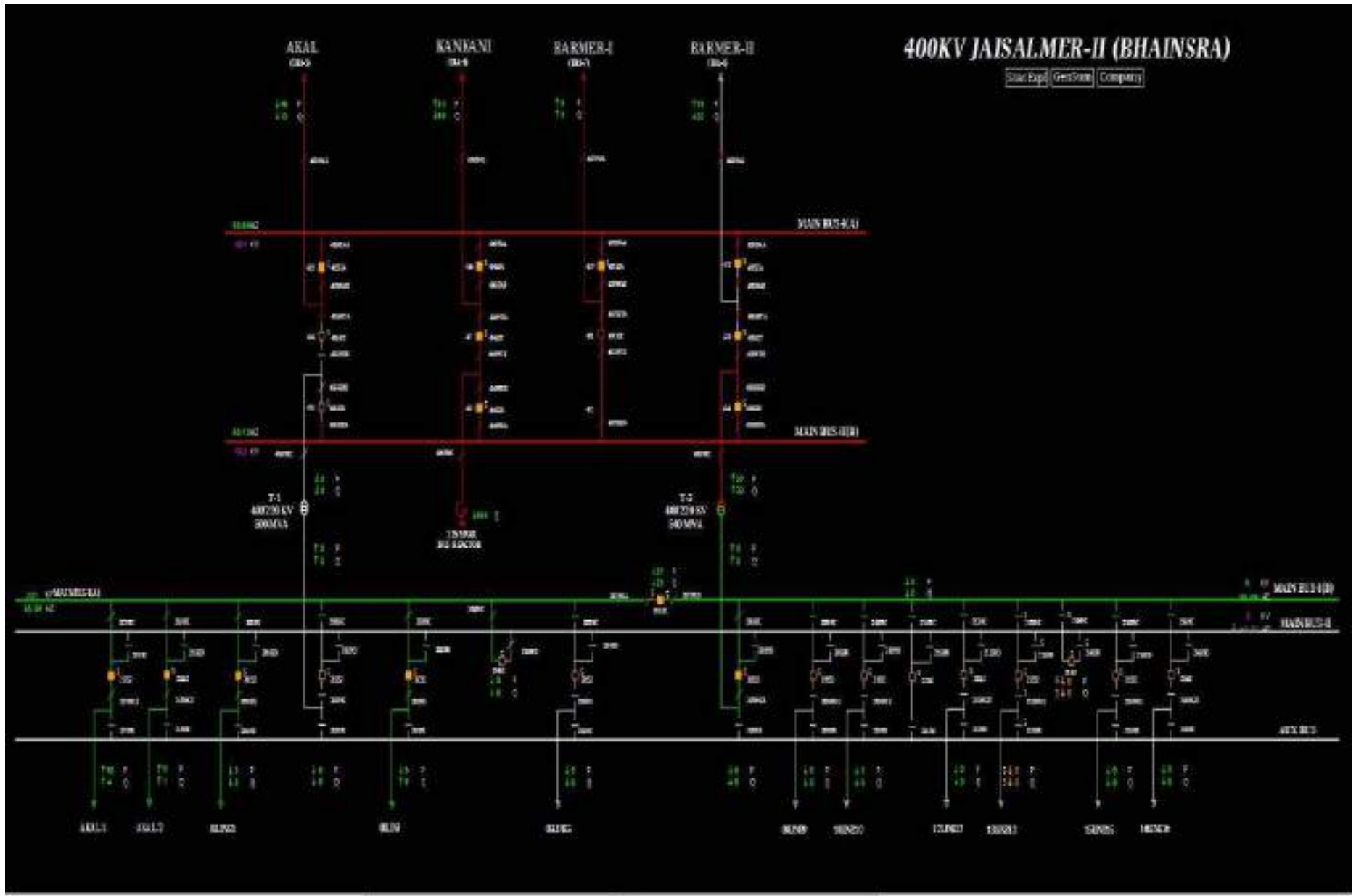
## Rajasthan SCADA SOE

Time	Station Name	Voltage	Element Name	Element Type	Element Status
18:31:58,768	KNKNI_R	400	19BHSRA	Circuit Breaker	disturbe
18:31:59,056	JASL4_R	400	05KNKBR	Circuit Breaker	disturbe
18:31:59,092	KNKNI_R	400	19BHSRA	Circuit Breaker	Open
18:31:59,949	AKAL400	400kV	06BHSRA	Circuit Breaker	Open
18:32:01,984	BARMER	400kV	13BHNR2	Circuit Breaker	Open

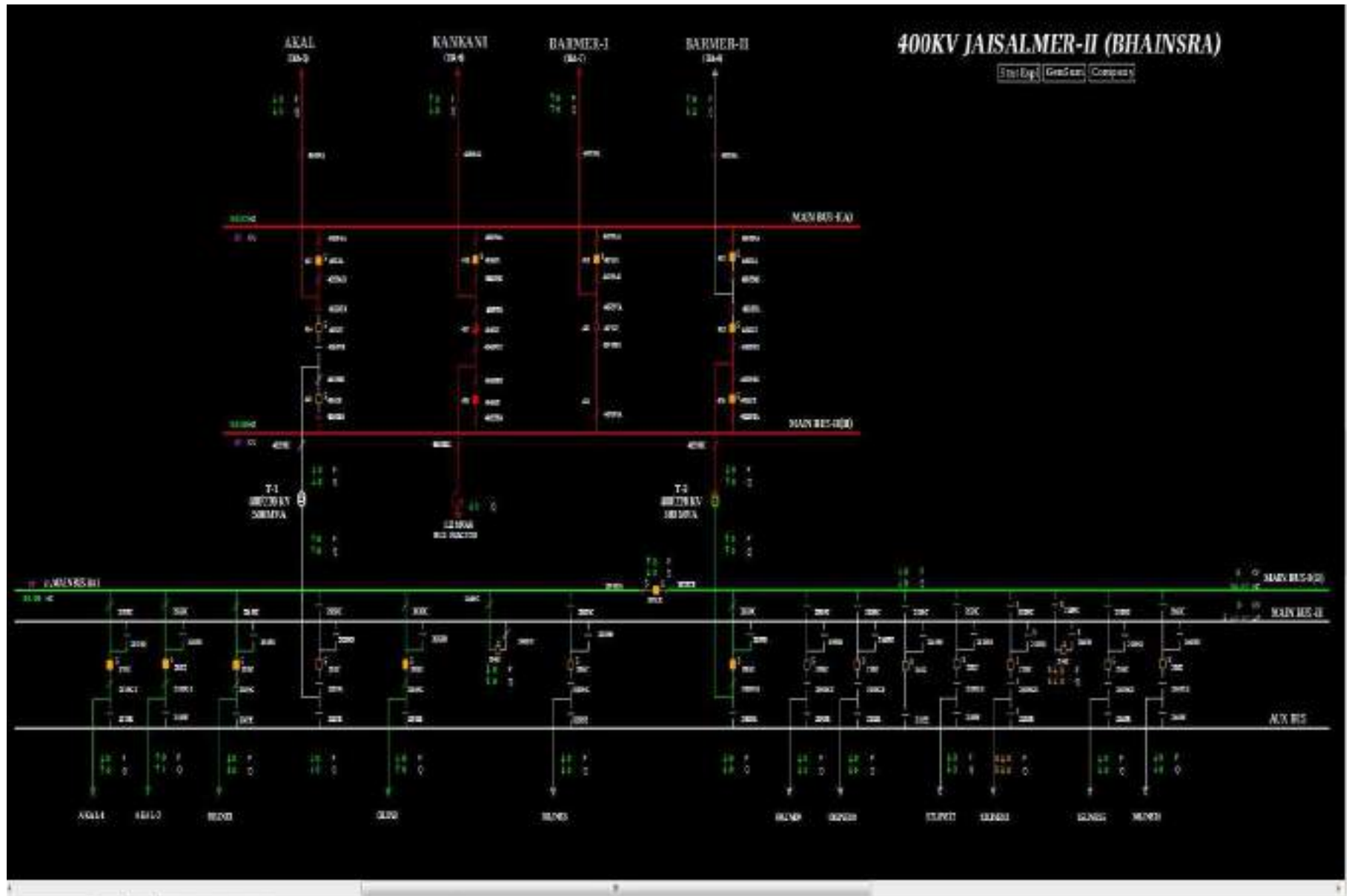
# Rajasthan Demand during tripping



# SLD before tripping



# SLD after tripping



# Event description

- As reported:
  - At 18:32hrs, 400 KV Kankani-Jaisalmer (RS) Ckt-2 tripped on Y-N phase to earth fault, fault distance: 107.5km from Kankani end and 38.9km from Jaisalmer end.
  - At the same time, 400 KV Akal-Jaisalmer (RS) Ckt-1 and 400 KV Jaisalmer-Barmer (RS) Ckt-2 both tripped in Z-2 from remote end only.
- As per PMU, Y-N phase to earth fault with delayed clearance of 680ms is observed.
- As per SOE, line didn't trip from Jaisalmer end and later fault cleared in Z-2 tripping of 400 KV Akal-Jaisalmer (RS) Ckt-1 and 400 KV Jaisalmer-Barmer (RS) Ckt-2 from remote end only.
- In antecedent condition, 400 KV Kankani-Jaisalmer (RS) Ckt-2, 400 KV Akal-Jaisalmer (RS) Ckt-1 and 400 KV Jaisalmer-Barmer (RS) Ckt-2 carrying 53MW, 46MW and 19MW respectively.

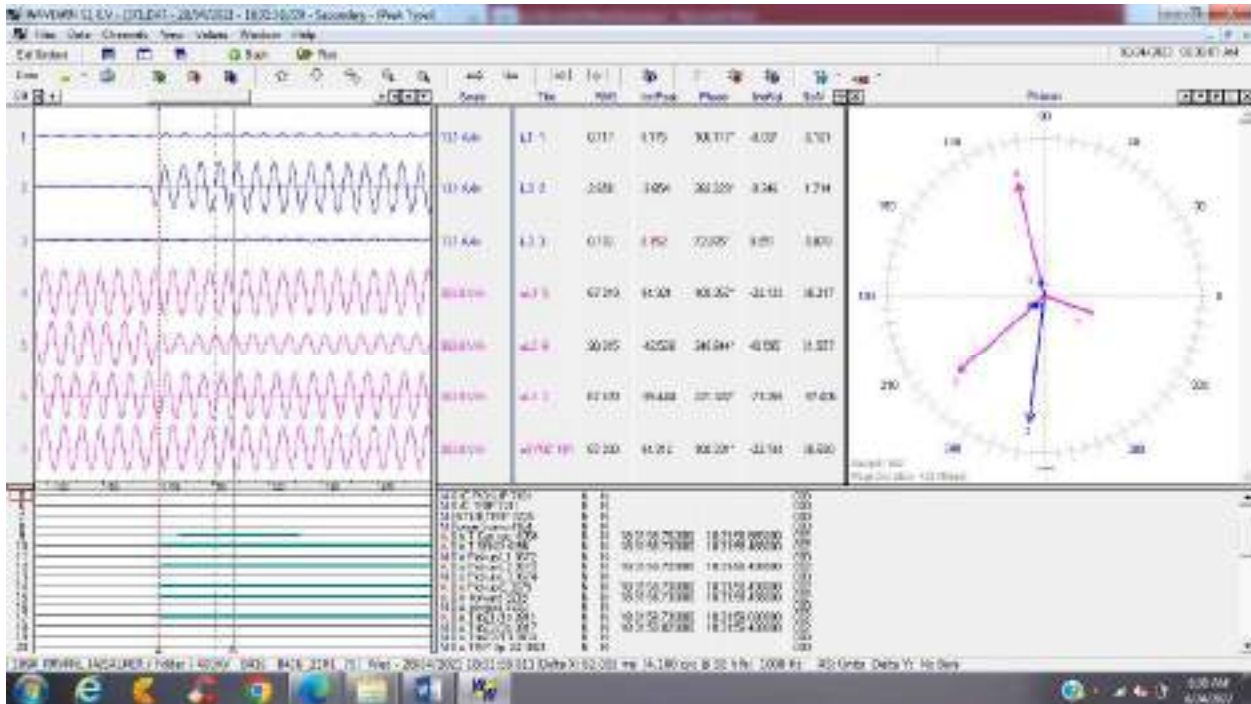
# Observations

1. No DR and Event logger submitted by Rajasthan.
2. As reported 400 KV Kankani-Jaisalmer (RS) Ckt-2 tripped on Y-N phase to earth fault, what was the fault clearing time?
3. 400 KV Akal-Jaisalmer (RS) Ckt-1 and 400 KV Jaisalmer – Barmer Ckt-2 tripped on Zone-2 from remote end what was the zone -2 timing?
4. Why delayed clearance of 680ms is there?
5. SOE data of Jaisalmer end not recorded.

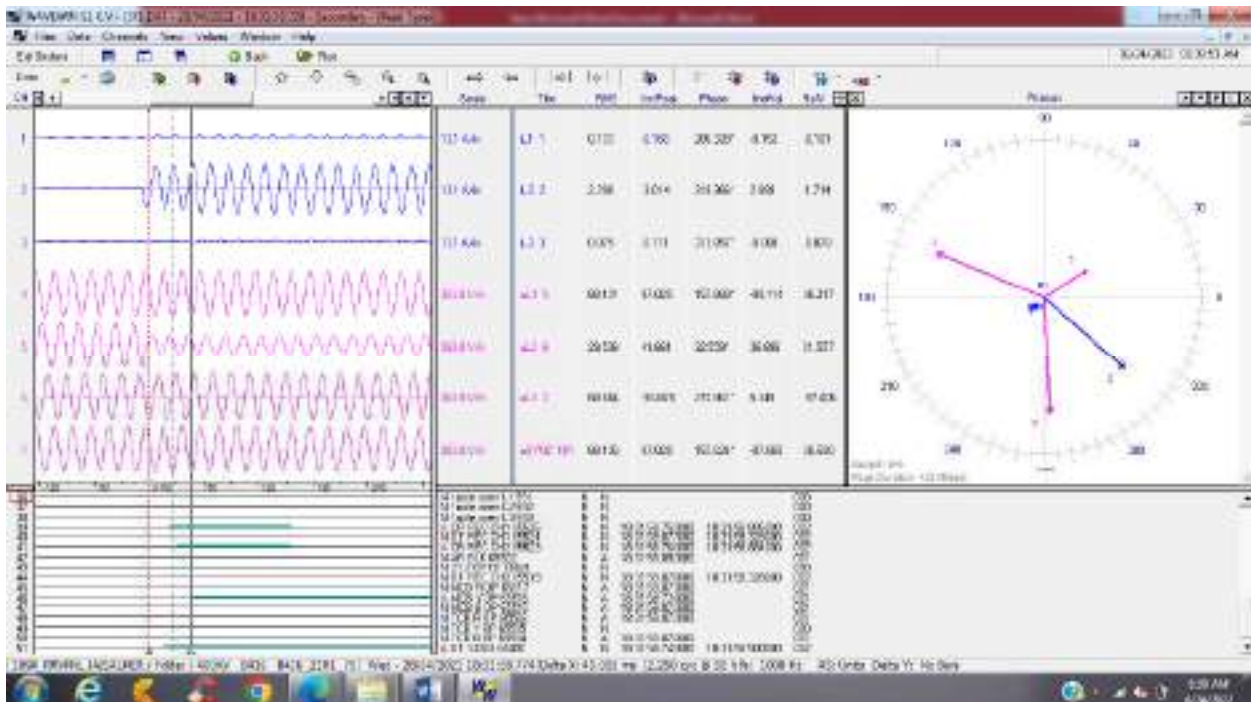


**Tripping occurred on 400 KV Jaisalmer-Kankani line at 400 KV GSS Jaisalmer on date 28.04.2021.**

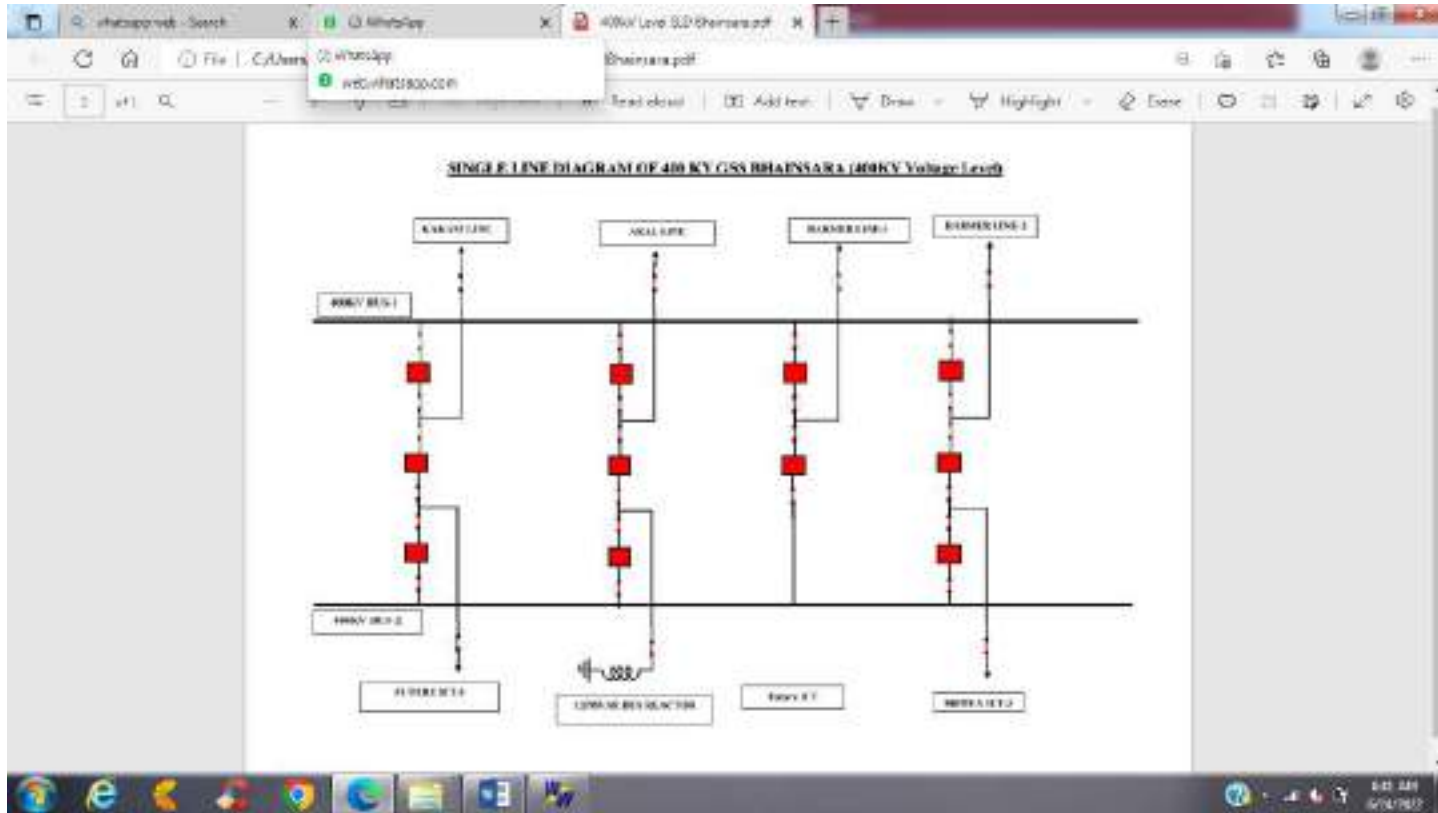
1. A fault on Y phase to earth occurred on 400 KV Jaisalmer-Kankani line at 38.9 km distance from Jaisalmer end and 107.5 km from Kankani end at 18:31:58:729.
2. Distance relay at Jaisalmer end picked up in zone 1 and initiated tripping of breakers at 18:31:58:729.



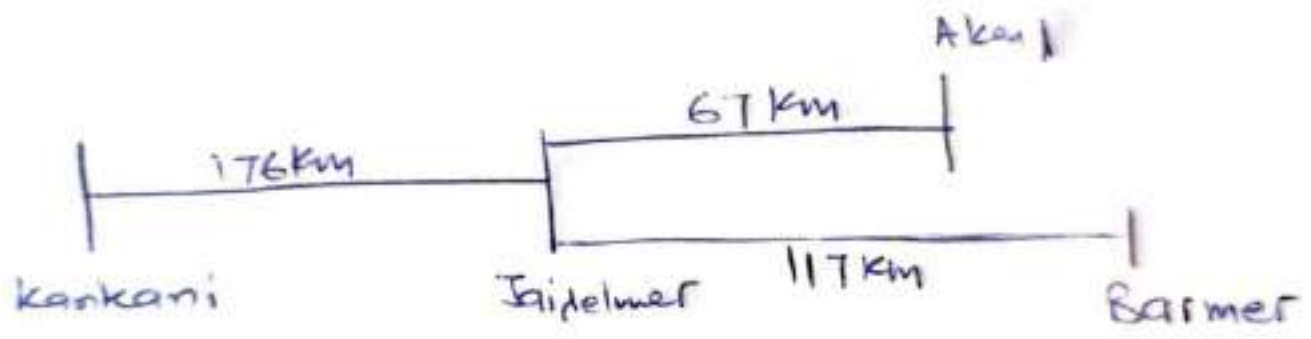
3. Y phase pole of main breaker opened at 18:31:58:774 but tie breaker pole stuck and did not open. Tie LBB was accidentally left disabled after routine testing.



- Therefore the fault was continuously feeded from remote ends of Akal and barmer through 400 KV Akal-Jaiselmer & 400 KV Barmer-Jaiselmer lines.



- 400 KV Akal-Jaiselmer line tripped on zone 2 timing in 300ms as from Akal end in zone 2, reach of 125 KM is covered.
- 400 KV Barmer-Jaiselmer Line distance relays started in zone 3 as for zone 2 reach distance upto 150 km is covered and fault was around 155 km.



- Before the operation of distance relay in zone timing of 800 ms, line was tripped on earth fault in time of 673ms.
- Tie breaker LBB was made enable after the event.

# Multiple element tripping at 400kV Muzaffarnagar(UP)

28-April-2021 22:32

# Antecedent Condition and Tripped Elements

## Antecedent Condition:-

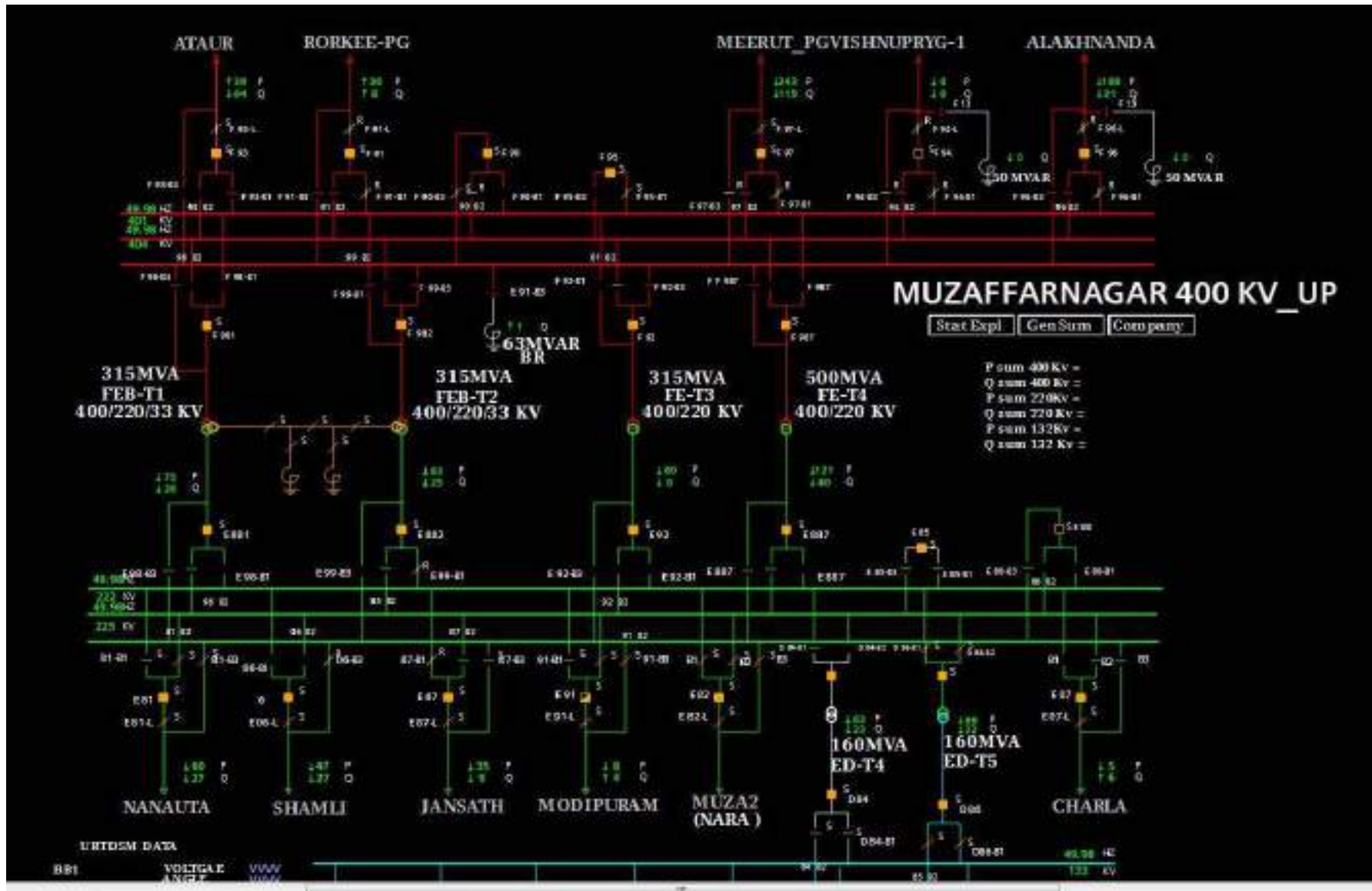
- 400/220 kV 315 MVA ICT 1, ICT 2, ICT 3 & ICT 4 at Muzaffarnagar(UP) carrying 75MW, 83MW, 80MW & 121MW respectively.

## Following elements tripped:-

- 1) 400/220 kV 315 MVA ICT 1 at Muzaffarnagar(UP)
- 2) 400/220 kV 315 MVA ICT 2 at Muzaffarnagar(UP)
- 3) 400/220 kV 315 MVA ICT 3 at Muzaffarnagar(UP)
- 4) 400/220 kV 315 MVA ICT 3 at Muzaffarnagar(UP)
- 5) 400 KV Alaknanda GVK(UPC)-Vishnuprayag(JP) (UP) Ckt-1
- 6) 400 KV Alaknanda GVK(UPC)-Muzaffarnagar (UP) Ckt-1
- 7) 400 KV Muzaffarnagar-Ataur (UP) Ckt-1
- 8) 400 KV Roorkee(PG)-Muzaffarnagar(UP) (PG) Ckt-1
- 9) 400 KV Meerut(PG)-Muzaffarnagar(UP) (PG) Ckt-1

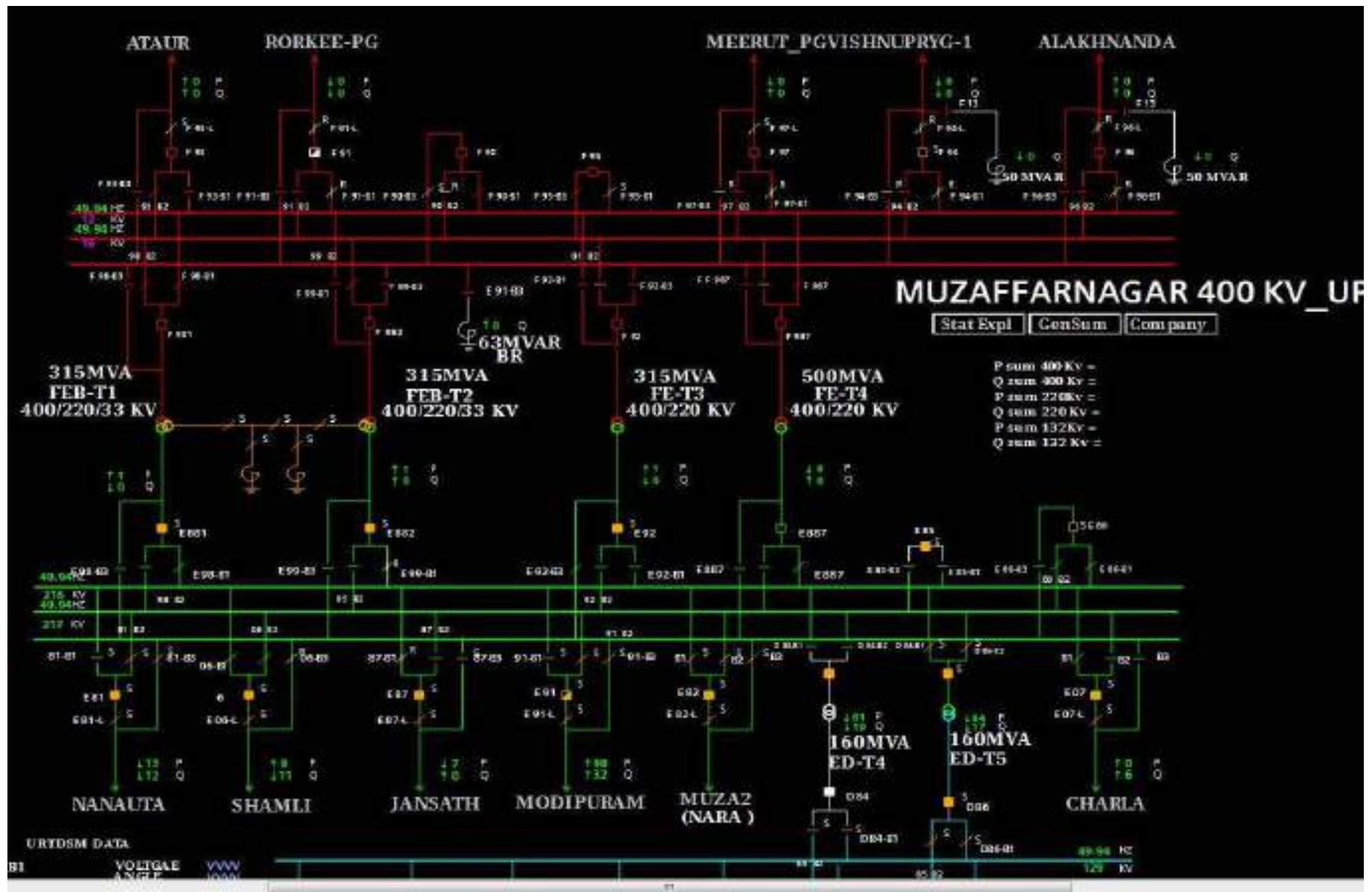
Note: Bus 1 & Bus 3 are connected to each other with isolator.

# SLD before tripping



Wed April 28 2021 22:28:00

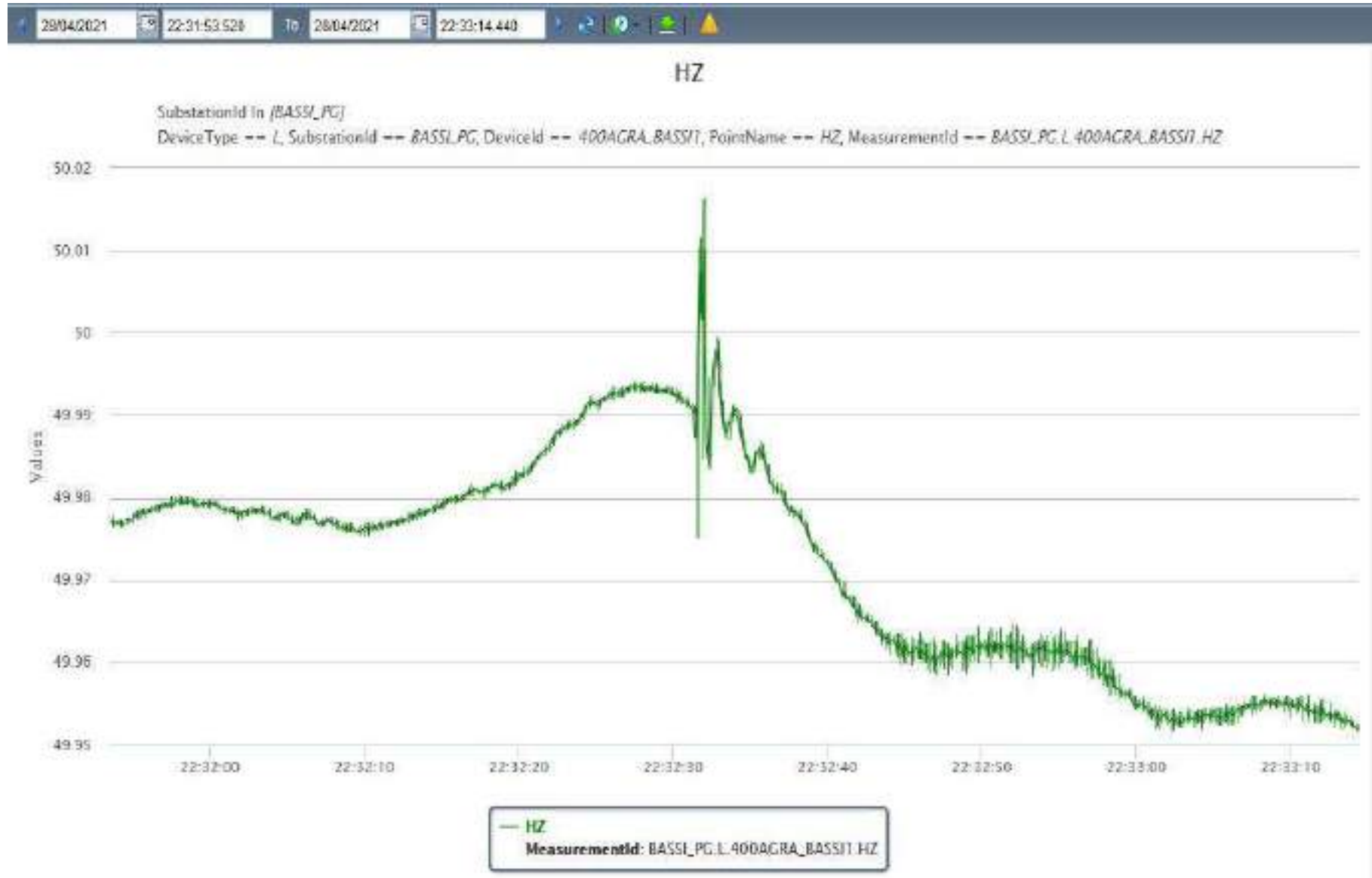
# SLD after tripping



Wed April 28 2021 22:34:00

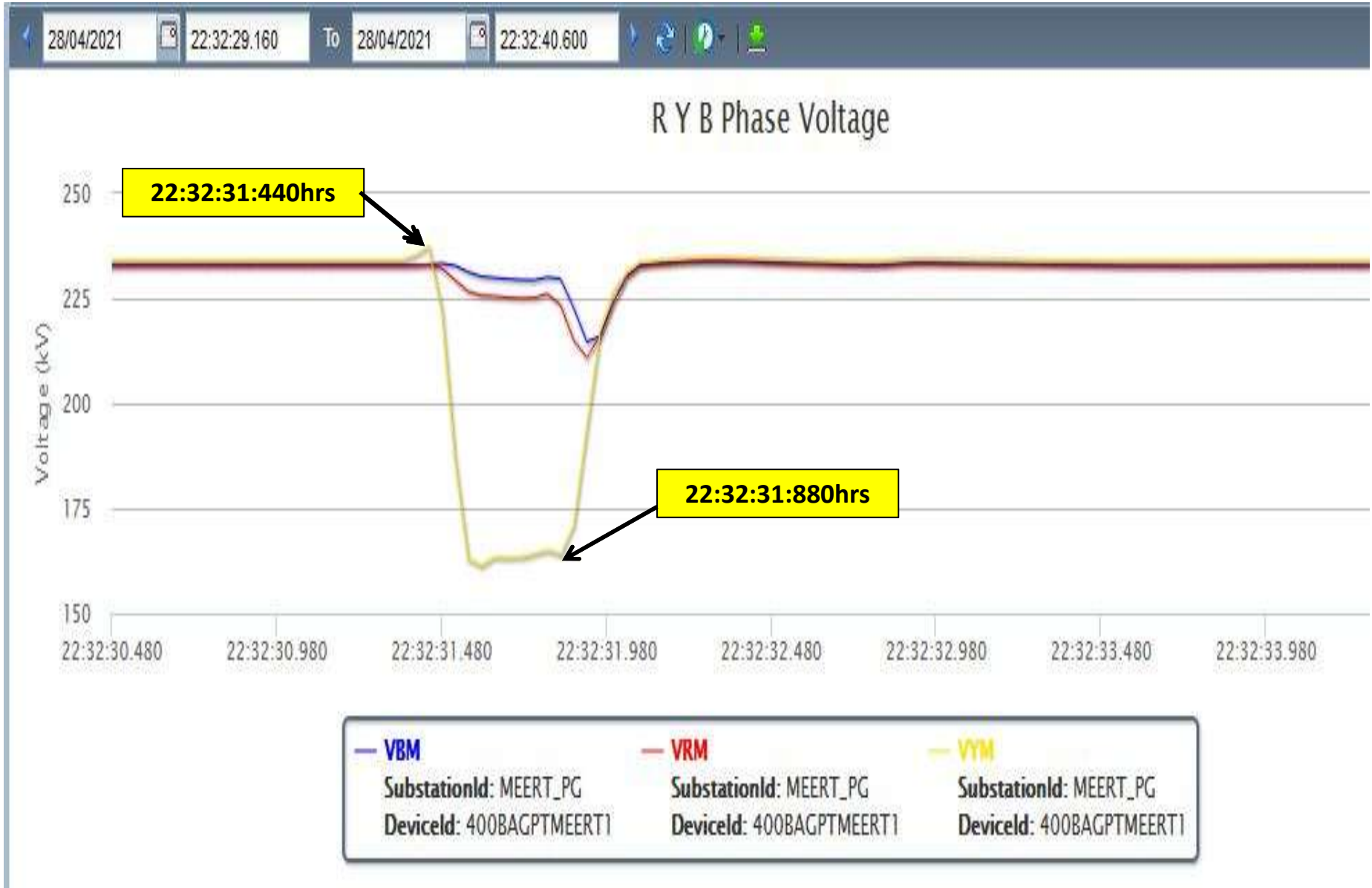
# PMU Plot of frequency at Bassi(RS)

22:32hrs/28-Apr-21



# PMU Plot of phase voltage magnitude at Meerut(PG)

22:32hrs/28-Apr-21



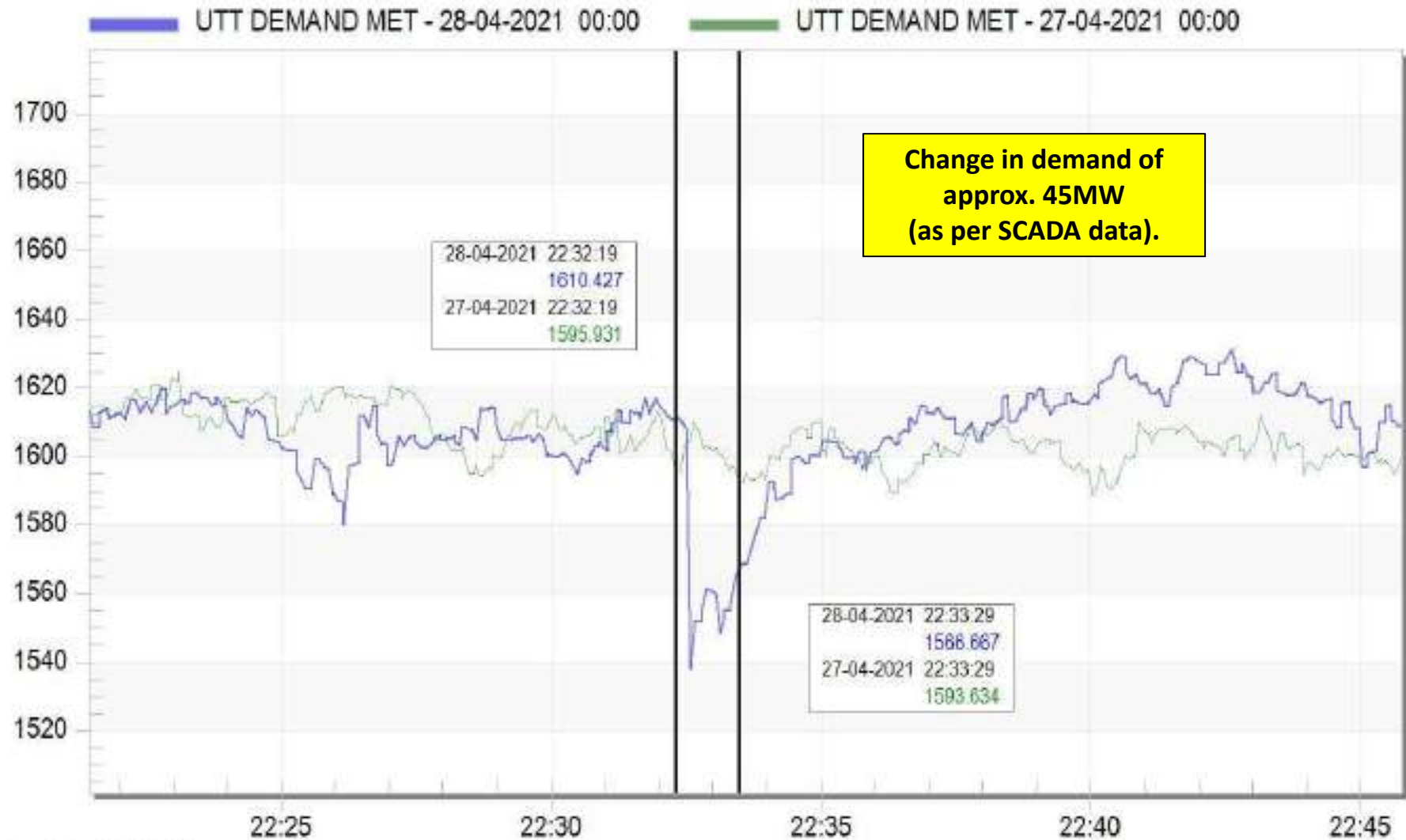


# SCADA SOE

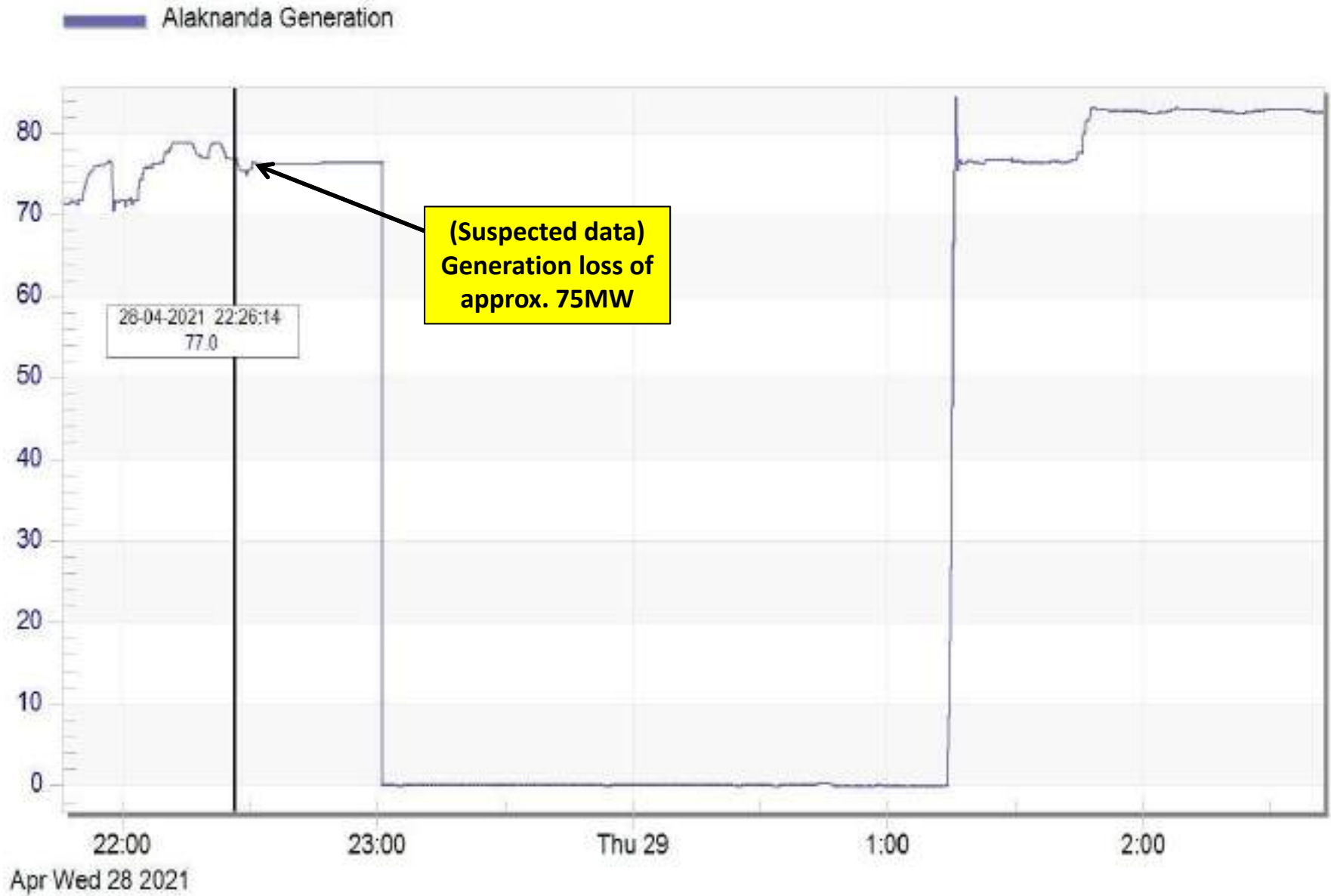
Time	Station Name	Voltage	Element Name	Element Type	Element Status
22:32:31,710	MUZA1_UP	400kV	F_96(VISNU-2)	Circuit Breaker	Open
22:32:31,723	MUZA1_UP	400kV	95MBC	Circuit Breaker	Open
22:32:31,724	MUZA1_UP	400kV	90TBC	Circuit Breaker	Open
22:32:31,725	MUZA1_UP	400kV	F_93(MUR1N)	Circuit Breaker	Open
22:32:31,725	MUZA1_UP	400kV	F_98(T1)	Circuit Breaker	Open
22:32:31,725	MUZA1_UP	400kV	987T4	Circuit Breaker	Open
22:32:31,734	MUZA1_UP	220kV	887T4	Circuit Breaker	Open
22:32:31,752	MUZA1_UP	400kV	F_91(RORKE)	Circuit Breaker	disturbe
22:32:31,768	MUZA1_UP	400kV	F_97(MEERT-1)	Circuit Breaker	Open
22:32:31,770	MUZA1_UP	400kV	F_92(T3)	Circuit Breaker	Open
22:32:31,900	MEERUT	400kV	11MU1KT2	Circuit Breaker	Open
22:32:31,902	MEERUT	400kV	12MUZA11	Circuit Breaker	Open
22:32:31,910	ROORKEE	400kV	1MUZA1	Circuit Breaker	Open
22:32:31,910	ROORKEE	400kV	2T1MU1	Circuit Breaker	Open
22:32:32,894	ATAUR_U	400	03MUZA1	Circuit Breaker	Open

# Uttarakhand Demand during tripping

Uttarakhand Demand Met



# Alaknanda Generation during tripping



## Detail received from SLDC-UP

Generation Loss = 200 MW

Load Loss = Nil

The tripping incident can be summarised as follows:-

1. At 22:30Hrs. Y-phase CT of 400kV bus coupler at 400kV Muzaffarnagar got damage. This created bus fault and all elements on bus – I and bus - II at 400kV side of 400kV Muzaffarnagar tripped.
2. During the incident 400kV Vishnuprayag was generating total of 125 MW through unit 1 & 4 and 400kV Alaknanda HEP was generating 75MW through unit – 4.
3. Since 400kV Muzaffarnagar – Vishnuprayag line was already in shutdown the only evacuation path for generation of 400kV Vishnuprayag HEP was 400kV Vishnuprayag – Alaknanda line .
4. At 400kV Alaknanda HEP, as the 400kV Alaknanda – Muzaffarnagar line tripped so the remaining evacuation path for total generation of 400kV Alaknanda HEP & 400kV Vishnuprayag HEP was 400kV Alaknanda – Srinagar (PTCUL) ckt I & II.
5. As per information received from concerned at 400kV Alaknanda, this much load was not available at 400kV Srinagar(PTCUL) so the unit at 400kV Alaknanda HEP & 400kV Vishnuprayag HEP tripped on the above mentioned flags at 22:32 hrs. and 400kV Alaknanda – Srinagar(PTCUL) ckt I also tripped at same time.
6. 400kV Vishnuprayag -Alaknanda line hand tripped from 400kV Vishnuprayag end at 22:34 hrs .

# Event logger of Muzaffarnagar(UP)

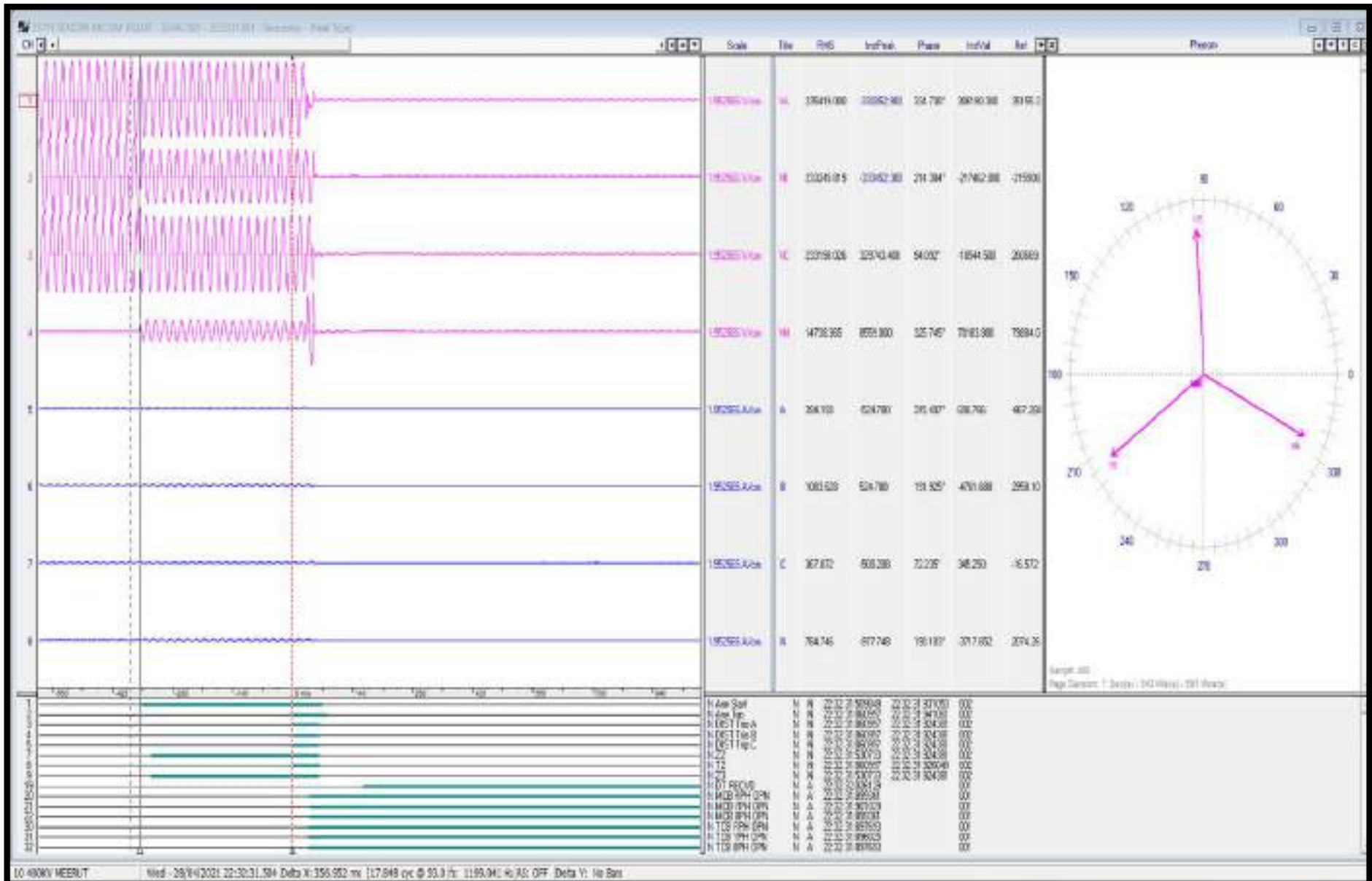
29/04/2021 00:02:45:996	ELA SIGNALS/400 ICT-2 CB 982	TC-1 RYB FAULTY	SET
29/04/2021 00:02:45:988	ELA SIGNALS/400 ICT-2 CB 982	TC-2 RYB FAULTY	SET
28/04/2021 22:19:54:929	ELA SIGNALS/400 ICT-2 CB 982	BUSBAR OPTD	RESET
28/04/2021 22:32:31:979	ELA SIGNALS/400 ICT-2 CB 982	BUSBAR OPTD	SET

29/04/2021 00:16:41:544	ELA SIGNALS/400 ICT-1 CB 981	TC-1 RYB FAULTY	SET
28/04/2021 22:21:12:404	ELA SIGNALS/400 ICT-1 CB 981	BUSBAR OPTD	RESET
28/04/2021 22:32:31:928	ELA SIGNALS/400 ICT-1 CB 981	BUSBAR OPTD	SET

28/04/2021 22:32:32:010	ELA SIGNALS/ROORKEE CB 91	BUS BAR TRIP RLY OPTD	RESET
28/04/2021 22:32:32:005	ELA SIGNALS/ROORKEE CB 91	TRIP COIL-1/2 RYB FAUL...	RESET
28/04/2021 22:32:31:978	ELA SIGNALS/ROORKEE CB 91	TRIP COIL-1/2 RYB FAUL...	SET
16/04/2021 18:10:58:462	ELA SIGNALS/ROORKEE CB 91	BUS BAR TRIP RLY OPTD	SET
16/04/2021 18:10:58:462	ELA SIGNALS/ROORKEE CB 91	MAIN-1/2 CARR FAIL	SET

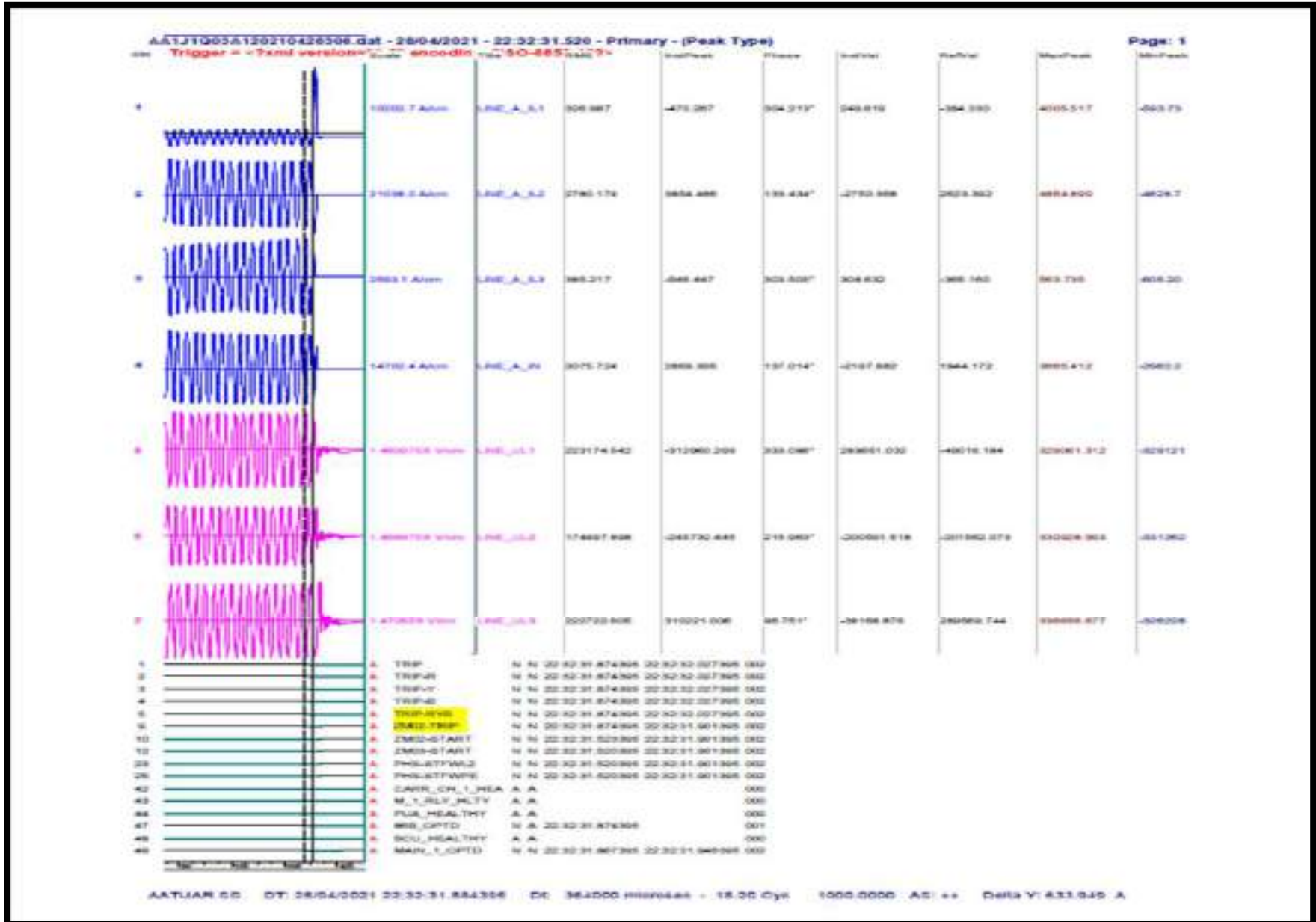
28/04/2021 22:32:32:001	ELA SIGNALS/400 MATTOR CB 97	DT SEND CH-1/2	
28/04/2021 22:32:31:993	ELA SIGNALS/400 MATTOR CB 97	MAIN1/2 CARRIER RCVD	
28/04/2021 22:32:31:979	ELA SIGNALS/400 MATTOR CB 97	BUSBAR PROT OPTD	
28/04/2021 22:32:31:584	ELA SIGNALS/400 MATTOR CB 97	MAIN1/2 CARRIER RCVD	

# DR of 400kV Muzaffarnagar-Meerut(end)



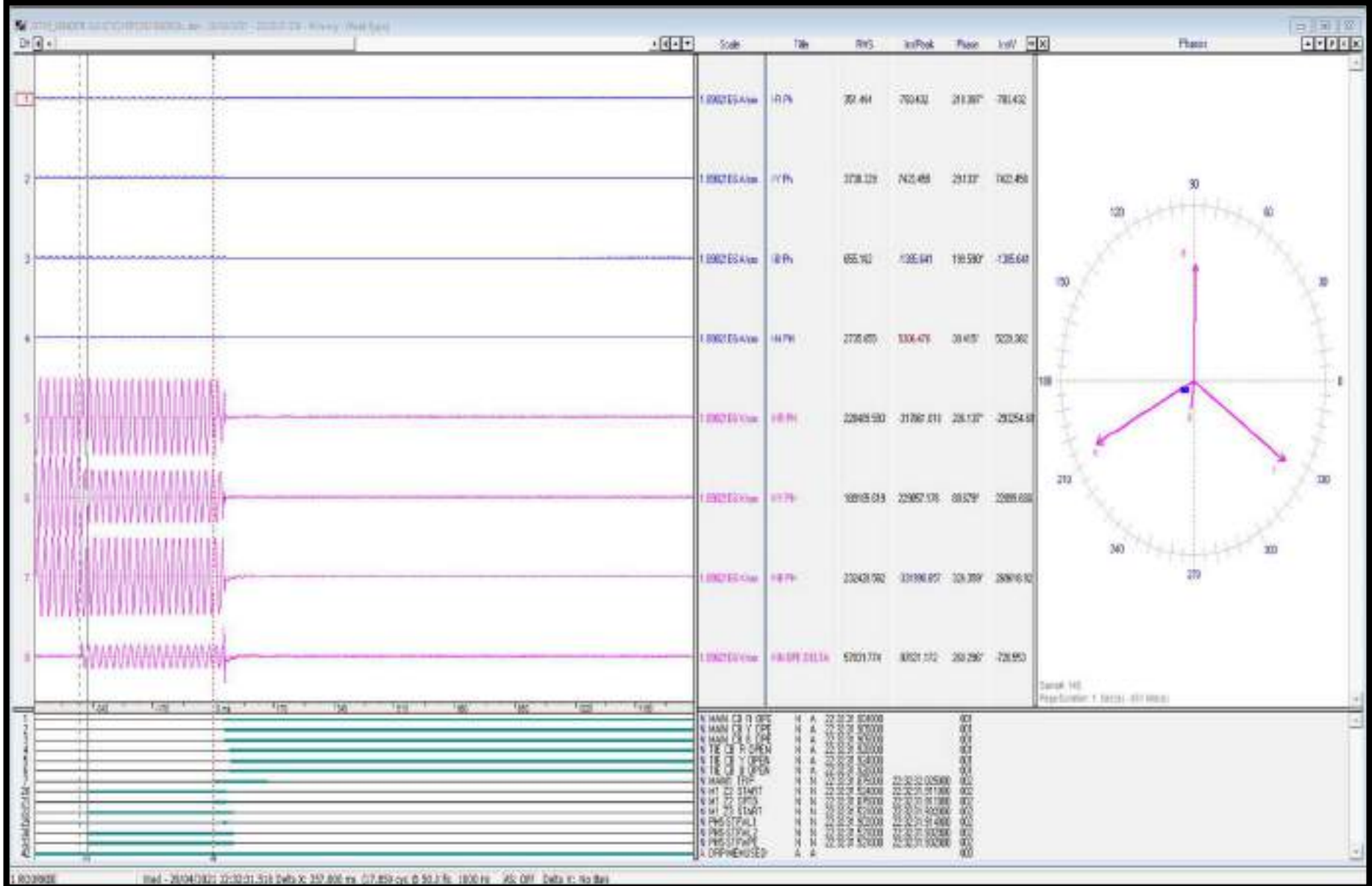
Z-2 trip within 350ms, DT received after 500ms

# DR of 400kV Muzaffarnagar-Aataur(end)



Z-2 trip within 350ms

# DR of 400kV Muzaffarnagar-Roorkee(end)



Z-2 trip within 350ms



# Observations

- Generation Loss: 75 MW
- Load Loss: 45MW (As per UP SLDC)

## Analysis of tripping (As reported):

- Bus bar protection operated at Muzaffarnagar due to Y-ph CT of 400kV Bus coupler got damaged.
- 400 KV Muzaffarnagar-Ataur (UP) Ckt-1 tripped from Ataur end on DT received.
- As per DR of Roorkee end, 400 KV Roorkee(PG)-Muzaffarnagar(UP) (PG) Ckt-1 tripped from Roorkee end in Z-2.
- 400 KV Meerut(PG)-Muzaffarnagar(UP) (PG) Ckt-1 tripped from Meerut end on DT received.

## As per PMU, SCADA data:

- As per PMU, Y-N phase to earth fault with delayed clearance in 440ms is observed.
- As per SCADA, load loss of approx. 45MW in Uttarakhand region and generation loss of approx. 75MW of Alaknanda HEP is observed.

# Points for Discussion

- Reason of delayed clearance of fault?
- As per DR of Roorkee(PG) and Meerut(PG) end, DT not received at their end and line trip in Z-2 at their end. So, reason of DT not received at Roorkee end. Why these lines didn't trip on Bus Bar operation at Muzaffarnagar end.
- As per Event logger at Muzaffarnagar end, bus bar operated after approx. 350-400ms of occurrence of fault which should be instantaneous operation. Reason of delayed operation?

## Remedial action required:

- Healthiness of PLCC communication needs to be ensured so that proper carrier and signal transmission should be there.
- Inspection of bus bar at Muzaffarnagar needs to be done to ensure proper operation.



# 400KV Muzaffarnagar Sub-Station, UPPTCL

**28.04.2021**

**400KV Bus bar Protection Operated**

400 KV Muzaffarnagar S/S bus bar protection operation 28.04.2021.

- **Date & Time of event:** 28.04.2021 at 22:30 hrs
- **Sub-Station affected:** 400KV Muzaffarnagar
- **Date & Time of restoration:** 29.04.2021 at 00:03 hrs.

# Antecedents condition

- In antecedents condition 400 /220 315MVA ICT-Ist , 315MVA ICT-IIInd , 315MVA ICT-IIIrd and 500 MVA ICT-4<sup>th</sup> at 400KV Muzaffarnagar S/S were carrying 75MW, 83MW,80MW and 121MW respectively.

# Flag report

## ELECTRICITY TEST & COMMISSIONING DIVISION MUZAFFARNAGAR FAULT ANALYSIS STATEMENT OF PROTECTIVE GEARS FOR THE MONTH OF APR-2021

400 KV Lines

Sl No.	Tripping Date/Time	Closing Date/Time	Name of Substation	C.B.No. with Direction (Code)	Type of Relay Scheme	Flags & Indications Observed	F/L, D/R, S/R, A/R, C/I etc.	Analysis with discrepancy in flags if any	Level
1	2	3	4	5	6	7	8	9	10
	28/04/2021 22:52	29/04/2021 00:14	400KV S/S Muzaffarnagar	T-43 Ataur	MICOM P444 REL670	96 TR1		400KV Bus Bar Operated in Zone 1 and Zone 2 due to CT Bias of 400KV V Phase Bus Coupler.	96A
	28/04/2021 22:32	29/04/2021 00:14	400KV S/S Ataur	T-403 Muzaffarnagar	MICOM CSC101	Y Phase, Z2, Fault Current-2: 804KA, DT received	120.9Km		470A
	28/04/2021 22:32	28/04/2021 23:30	400KV S/S Muzaffarnagar	T-97 Mator	MICOM	96 TR10			116A
	28/04/2021 22:32	28/04/2021 23:30	400KV S/S Mator	T-410 Muzaffarnagar	MICOM	Y-Phase Ground Fault, FC-9: 64KA, DT received	34.82Km		
	28/04/2021 22:32	28/04/2021 23:33	400KV S/S Muzaffarnagar	T-91 Roorkee	MICOM P442 REL670	96 TR2			
	28/04/2021 22:32	28/04/2021 23:33	400KV S/S Roorkee	T-401 Muzaffarnagar	MICOM CSC101	Y-Phase, N, FC-24KA, DT received	70Km		
	28/04/2021 22:32	29/04/2021 00:27	400KV S/S Muzaffarnagar	T-96 Sirnagar	MICOM SEL421	CP- Distance Protection Operated M1-21XR, 21XY, 21XR, A-Phase, C-Phase, Z1, CS, 1A- 7.826KA, IC-2: 397KA M2-BG Fault	(-)-1.07Km		264A
	28/04/2021 22:32	29/04/2021 00:27	400KV S/S Sirnagar	T-91 Muzaffarnagar	MICOM MICOM	Z2, IC-231, 3A, 86A, 86R, DT received	163.7Km		
	28/04/2021 22:32	29/04/2021 00:10	400KV S/S Muzaffarnagar	T-982892 115MVA ICT-2	MICOM P643	96 TR9			125A
	28/04/2021 22:32	28/04/2021 00:14	400KV S/S Muzaffarnagar	T-983881 115MVA ICT-3	SIEMENS	96 TR0			130A
	28/04/2021 22:32	28/04/2021 00:16	400KV S/S Muzaffarnagar	T-981881 115MVA ICT-1	MICOM P641	96 TR6			118A
	28/04/2021 22:32	29/04/2021 00:19	400KV S/S Muzaffarnagar	T-984884 300MVA ICT-4	SIEMENS	96 TR11			202A

# Events Description

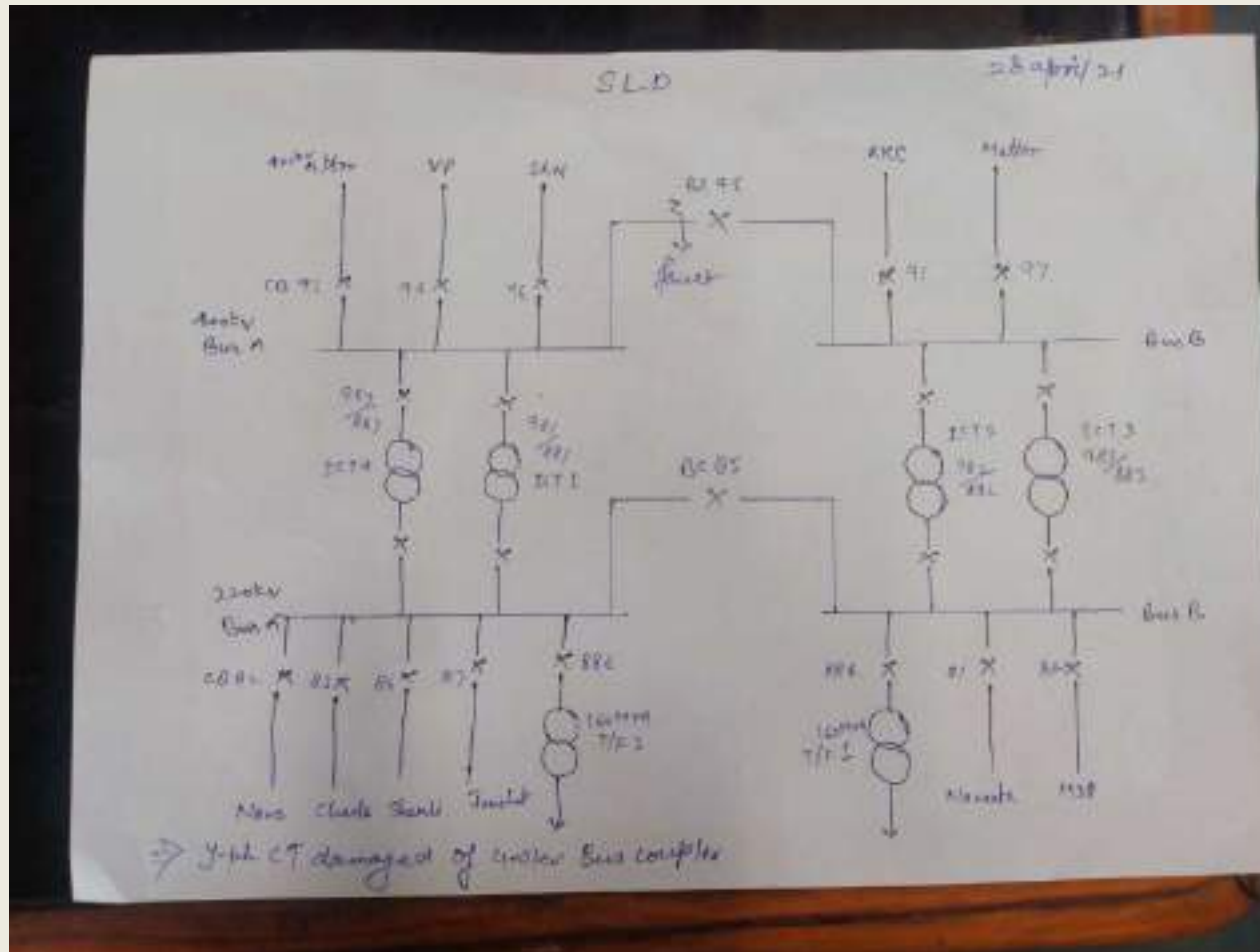
- At 22:30 hrs , Y Phase CT Blast of 400KV Bus Coupler, resulted into bus bar protection operation in zone 1 and Zone 2. All elements connected to both the buses were tripped on bus bar protection and DT command send to remote end of all the connected lines.
- Details of tripped elements are as follows:-

# 400KV Muzaffarnagar

- Bay-1 CB-93 Attor. Time of Restoration- 00:14 hrs.
- Bay-2 CB -91 Roorkee Time of Restoration- 23:23 hrs.
- Bay-3 CB-983 ICT 3 Time of Restoration-00:01 hrs.
- BAY-4 CB 96 Alaknanda Time of Restoration-00:27 hrs.
- Bay-5 CB-94 Vishnuprayag Was already in shutdown.
- Bay-6 CB-981 ICT 1 Time of Restoration-00:16 hrs.
- Bay-7 CB-95 BC Shutdown Taken after CT Blast.
- Bay-9 CB 982 ICT 2 Time of Restoration-00:01 hrs.
- Bay 10 CB-97 Mattor Time of Restoration-23:30 hrs
- Bay 11 CB-987 ICT 4 Time of Restoration-00:19 hrs



# SLD



## Points for discussion to be taken up in 45<sup>th</sup> PSC

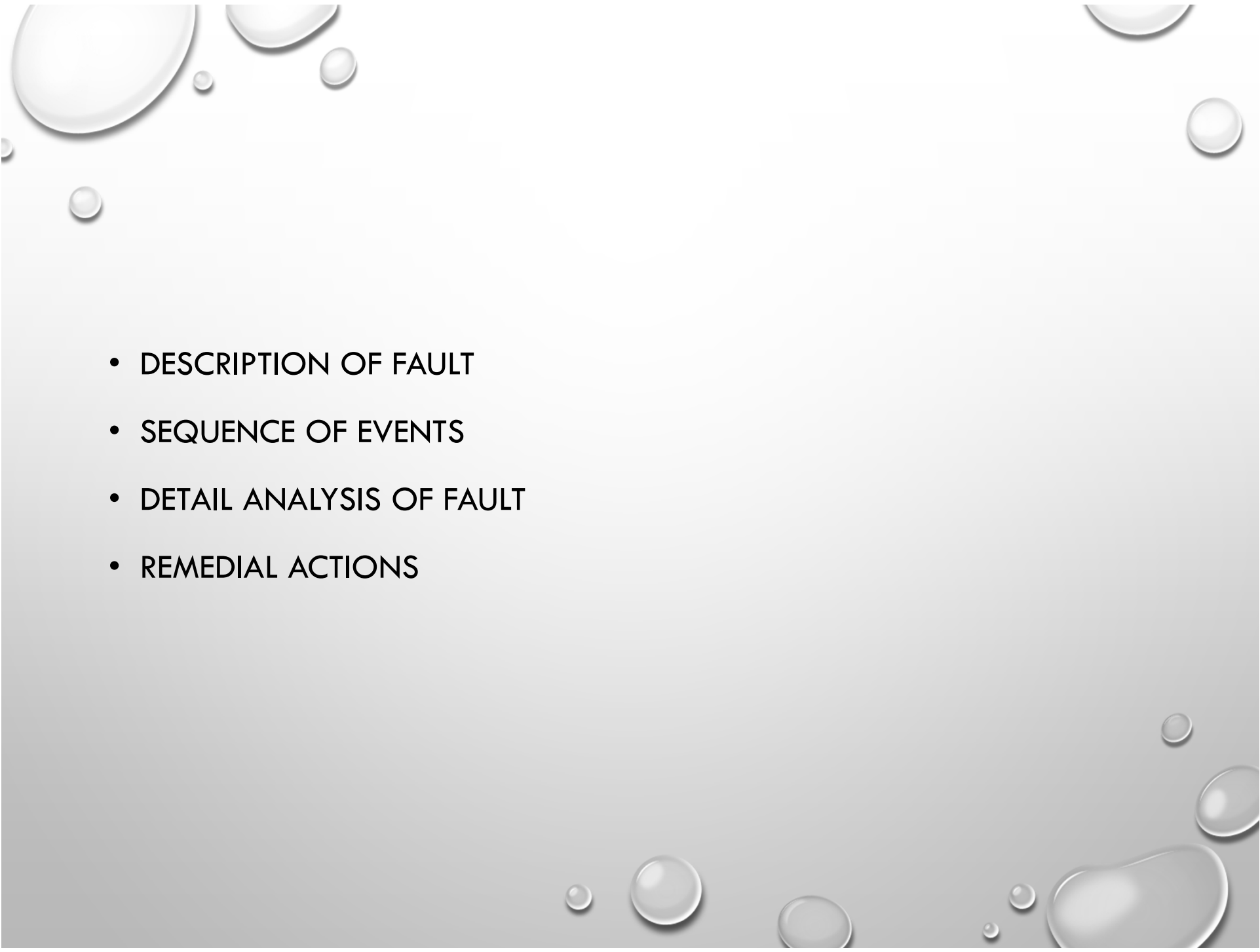
- Why 400KV Alaknanda GVK(UPC)-Vishnuprayag Ckt-I tripped?
- 400kV Vishnuprayag -Alaknanda line hand tripped from 400kV Vishnuprayag end at 22:34 hrs .
- DR of this line not submitted.
- Line was hand tripped.
- What was the exact nature and location of Fault?
- Y Phase CT blasted of 400KV Bus Coupler.
- Details of remedial measures taken to be shared.
- Damaged CT was replaced.

**THANK YOU.**



# ALAKNANDA HYDRO ELECTRIC PLANT 330 MW

‘ TRIPPING REPORT OF 28.04.2021 22:30 HRS ‘

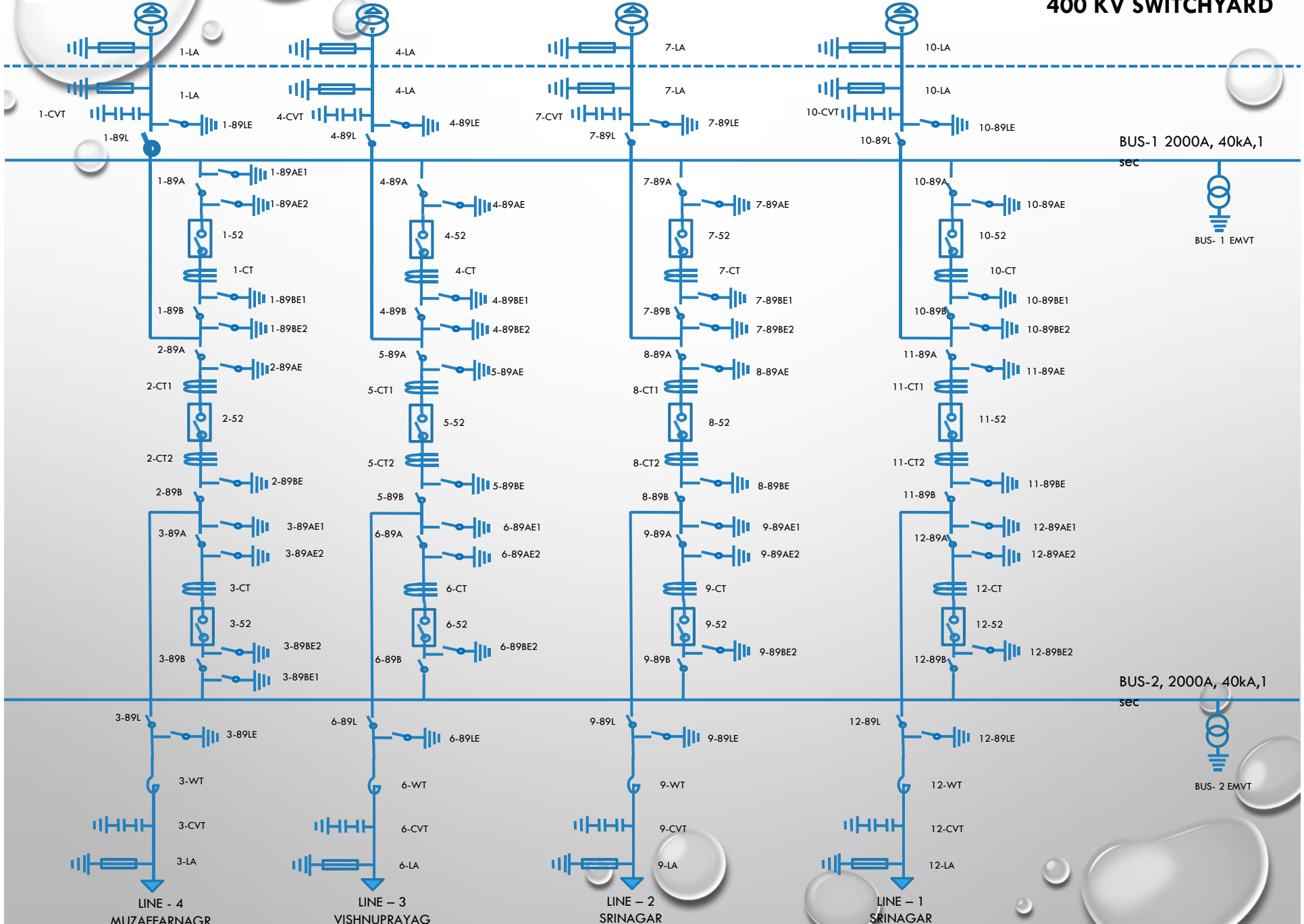
- 
- DESCRIPTION OF FAULT
  - SEQUENCE OF EVENTS
  - DETAIL ANALYSIS OF FAULT
  - REMEDIAL ACTIONS

The slide features a light gray background with a gradient. It is decorated with several realistic water droplets of various sizes, some with highlights and shadows, scattered across the top and bottom edges. The main title is centered in a large, bold, black font.

# DESCRIPTION OF FAULT

UNIT #4 WAS RUNNING WITH TOTAL PLANT LOAD OF 75 MW AS PER SCHEDULE.

LINE-4(MZN) GOT TRIPPED DUE TO WHICH UNIT-4 GOT TRIPPED.



## DETAIL ANALYSIS OF FAULT

- UNIT #4 WAS RUNNING WITH TOTAL PLANT LOAD OF 75 MW AS PER SCHEDULE. LINE-4(MZN) GOT TRIPPED DUE TO WHICH UNIT-4 GOT TRIPPED.
- IN FAULT ANALYSIS IT IS FOUND THAT MZN LINE TRIPPED DUE TO BUSBAR PROTECTION OPERATION AT MUZAFFARNAGAR(UP) , Y-PH CT OF 400KV BUS COUPLER GOT DAMAGED.
- POWER EVACUATION PATH AVAILABLE BUT NOT POSSIBLE THROUGH SRINAGAR LINE 1 &2.



# SEQUENCE OF EVENTS

- 10:32:17.6 – U4 TIE CB OPEN
- 10:32:18.1 – U4 OVER VOLT PRTN RLY OPRTD
- 10:32:18.1 – U4 ELECT TRIP RLY(86Z) OPRTD
- 10:32:18.2 – U4 DESYNCHRONIZED
- 10:32:19.1 – U4 MAIN GTCB OPN
- 10:32:32.8 – LINE-4 MN-1 R/Y/B-PH TRIP
- 10:32:32.8 – LINE-4 MN-2 R/Y/B-PH TRIP
- 10:32:33.2 – LINE-4 CARRIER-2 RECEIVED
- 10:32:33.3 – MZN LINE CB OPEN
- 10:32:33.3 – LINE-4 MN-2 DIRECT TRIP RECVD
- 10:32:33.3 – LINE-4 TRIP RELAY -1 OPRTD
- 10:32:33.3 – LINE-4 TRIP RELAY -2 OPRTD
- 10:32:33.3 – LINE-4 MN-1 DIRECT TRIP RECVD
- 11:11:57 – VSP LINE CB 6-52 OPEN
- 11:12:17.8 – LINE-3 MN-1 DIRECT TRIP RECVD
- 11:12:17.8 – LINE-3 TRP RELAY-2 OPRTD
- 11:12:17.8 – LINE-3 TRP RELAY-1 OPRTD
- 11:12:17.8 – LINE-3 MN-2 DIRECT TRIP RECVD

# REMEDIAL ACTION

- MESSAGE CONVEY TO MZN TO EXPEDITE THE RESTORATION OF LINE.
- MESSAGE CONVEY TO PTCUL(KHANDUKHAL) , INCASE OF FAULT OF MZN LINE , SRN 1&2 NEED TO EVACUATE THE POWER THROUGH THESE LINES.
- SAME MESSAGE REPEATDLY CONVEY TO UK-SLDC ALSO.

The image features a light gray background with a subtle gradient. Scattered across the top and bottom edges are several realistic water droplets of various sizes. Each droplet is rendered with a soft shadow and a highlight, giving it a three-dimensional appearance. The text "THANK YOU" is centered in the middle of the page in a bold, black, sans-serif font.

**THANK YOU**

# Complete station outage at 400KV Nathpa Jhakri(SJ)

04-May-2021 03:49

# Antecedent Condition and Tripped Elements

## Antecedent Condition:-

- 400kV Nathpa Jhakri-Karcham Wangtoo Ckt-1, 400kV Nathpa Jhakri-Rampur Ckt-1 & Ckt-2, 400kV Nathpa Jhakri-Gumma Ckt-2, 400kV Nathpa Jhakri-Panchkula Ckt-1 carrying 192MW, 117MW, 117MW, 37MW & 10MW respectively.

## Following elements tripped:-

- 1) 400kV Nathpa Jhakri-Karcham Wangtoo Ckt-1
- 2) 400kV Nathpa Jhakri-Rampur Ckt-1
- 3) 400kV Nathpa Jhakri-Rampur Ckt-2
- 4) 400kV Nathpa Jhakri-Panchkula Ckt-1
- 5) 400kV Nathpa Jhakri-Gumma Ckt-2
- 6) 400/22 kV 25 MVA ST 1 at Nathpa Jhakri(SJ)
- 7) 400KV Bus 2 at Nathpa Jhakri(SJ)
- 8) 400KV Bus 4 at Nathpa Jhakri(SJ)
- 9) 37MW Sawara Kuddu Unit 1

Note: Bus 2 & Bus 4 are connected to each other with isolator.

# SLD of Nathpa Jhakari before tripping



# SLD of Nathpa Jhakari after tripping



# PMU Plot of frequency at Bassi(RS)

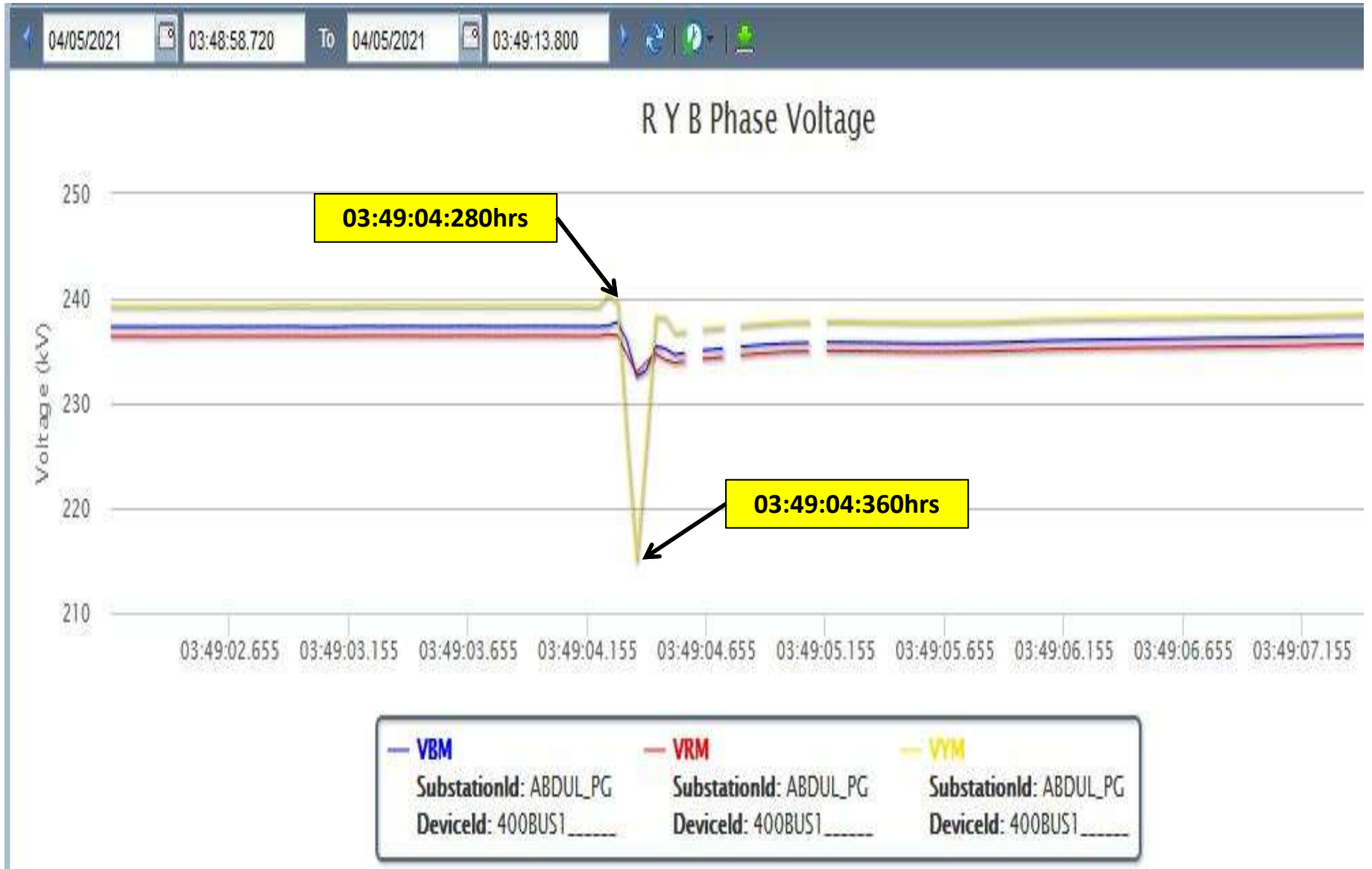
03:49hrs/04-May-21





# PMU Plot of phase voltage magnitude at Abdullapur(PG)

03:49hrs/04-May-21



# SCADA SOE

Time	Station Name	Voltage	Element Name	Element Type	Element Status
03:49:04,000	GUMMA_H	400kV	06JHKRI2	Circuit Breaker	Open
03:49:04,000	GUMMA_H	400kV	05TIE	Circuit Breaker	Open
03:49:04,362	NAPTHA	400kV	08KRCHM1	Circuit Breaker	Open
03:49:04,362	NAPTHA	400kV	13RAMPR2	Circuit Breaker	Open
03:49:04,363	NAPTHA	400kV	15RAMPR1	Circuit Breaker	Open
03:49:04,367	NAPTHA	400kV	14ST	Circuit Breaker	Open
03:49:04,368	NAPTHA	400kV	11GUMMA2	Circuit Breaker	Open
03:49:04,371	NAPTHA	400kV	09GUMMA1	Circuit Breaker	Open
03:49:04,426	PUNCHKULA	400kV	17TIE	Circuit Breaker	Open
03:49:04,521	PUNCHKULA	400kV	16GUMMA1	Circuit Breaker	Open
03:49:04,907	SAWRA_H	220kV	01H00	Circuit Breaker	Disturbe
03:49:09,907	SAWRA_H	220kV	01H01	Circuit Breaker	Open

# Comment from Nathpa Jhakri

## Observation of Fault: -

On dated 04.05.2021, as per initial investigation carried out, there is no fault in the 400KV GIS System (Busbar-2) The probable cause of Busbar-2 operation may be due to some wiring/CT polarity issue. Detailed investigation is under progress and same shall be shared shortly. There is no tripping of generating unit as the same were under standstill condition as per NRLDC schedule.

## Action Taken: -

After the above incidence, following action has been initiated for early rectification of the fault at our end:

1) The status of Bus Bar protection (Low impedance) relay clearly indicated that the fault was in the Y phase connected on Bus Bar-II.

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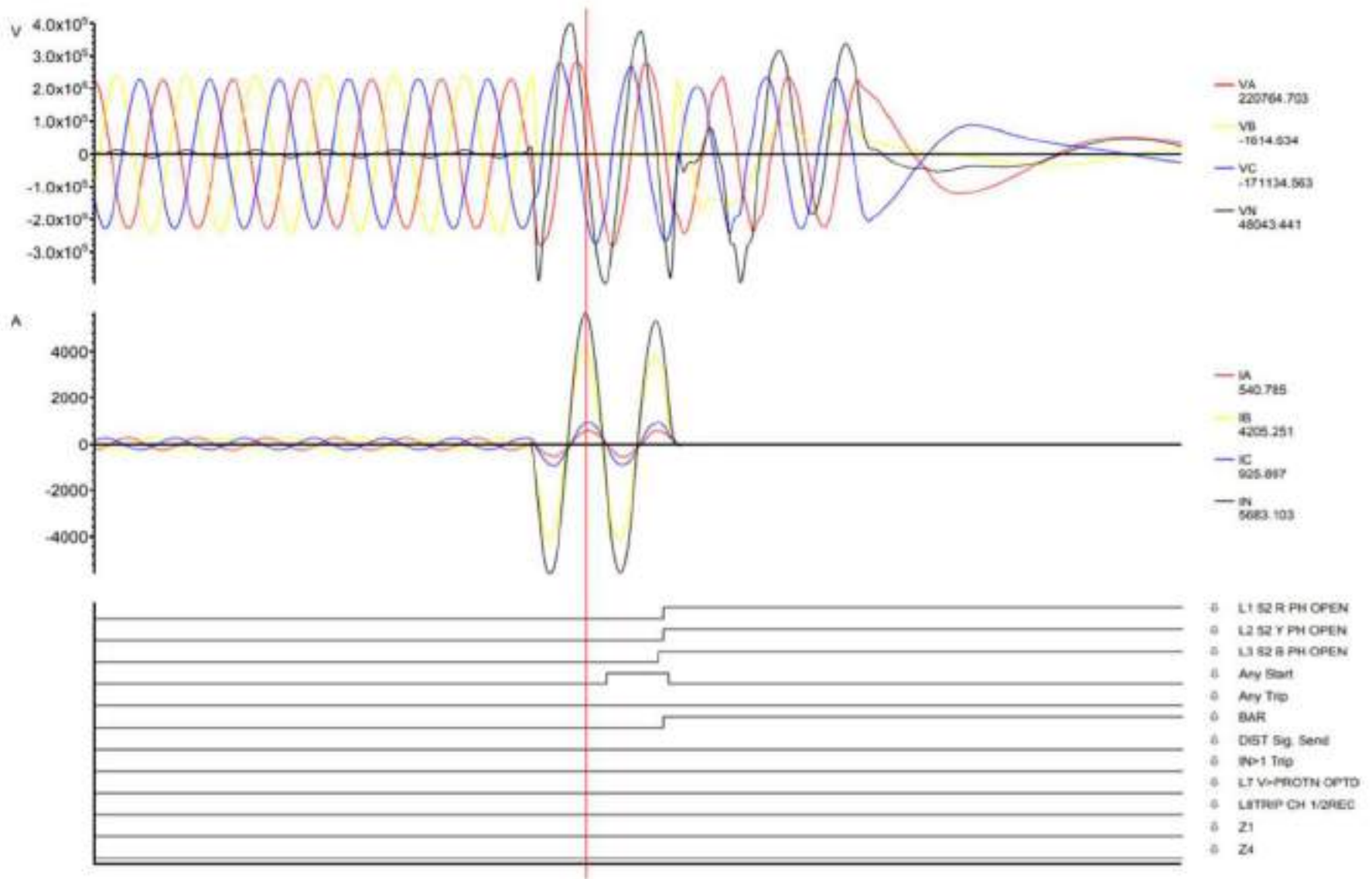
2) As per initial investigation carried out, there is no fault in the 400KV GIS System (Busbar-2) The probable cause of Busbar-2 operation is may be due to some wiring/CT polarity issue.

3) Immediately after analysis, NJ-Rampur Ckt-I was restored with the permission of GRID in Bus Bar-II/Bus Bar-IV and one by one NJ-Rampur Ckt.-II, NJ-Panchkula-I and NJ-Gumma Ckt.-II.

# DR of Nathpa Jhakri end

Fault graphics [C:\Documents and Settings\PROTECTION\My Documents\S1 Studio\SJVNL (Ltr9KW-IP442)\DR\04 May 2021 03:49:04.009.dg] - SJVNL 14

Date: 04.05.0021



# Observations

## SPS Operation:

- As during the event, all the lines from Nathpa Jhakri got tripped Case 3 of SPS installed at Nathpa Jhakri complex got triggered.
- As per the action, 37MW Sawara Kuddu Unit 1 got tripped. And all the generating units at Karcham, Nathpa Jhakri and Baspa were at standstill condition.

## Observations as per SCADA SOE:

- As per SOE, CB open time of 37MW Sawara Kuddu Unit 1 indicates delayed action of SPS because as per SPS standard operation , all action should be achieved within 100ms of the event but Sawara Kuddu unit CB status disturb came after approx. 400ms and status open came after around 5sec.

# Observations

- Event Category: GD-1
- Generation Loss: 37 MW
- Load Loss: Nil (As per HP SLDC)

## Analysis of tripping (As reported):

- Bus bar protection operated at Nathpa Jhakri (Bus 2 & Bus 4) which lead to tripping of all elements connected to Bus 2 & Bus 4.
- During initial inspection, it was found that bus bar operated might be due to Bus Bar CT wiring problem.
- But status of bus bar showing fault in Y-ph connected with Bus Bar 2
- 400kV Nathpa Jhakri-Rampur Ckt-1 & CKt-2 tripped from Rampur end on DT received.
- 400kV Nathpa Jhakri-Panchkula Ckt-1 tripped from Panchkula end on DT received.

## As per PMU, SCADA data:

- As per PMU, Y-N phase to earth fault is observed.

# Points for Discussion

- **Exact reason of Bus Bar protection operation.**
- **Exact location of Y-N fault and reason of occurrence of fault.**

## **Remedial action required:**

- **Inspection needs to be done to check the healthiness of Bus Bar protection.**

# **Detail Report**

**Multiple Element tripping at 400 KV Nathpa Jhakri HEP  
Station at 03:49hrs of 04th May 2021.**



## Detail Report Format

- 1) Time & date of event: - 04/05/2021 03:49:04 Hrs.
- 2) Substation Name: - 400KV Nathpa Jhakri
- 3) Name of tripped Element & Time of tripped Element  
NJ-PKL CKT-I : 03:49:04 Hrs.  
NJ-Gumma CKT-II : 03:49:04 Hrs.  
NJ-Rampur-I & II : 03:49:04 Hrs.  
NJ-KW-I : 03:49:04 Hrs.  
25MVA Station Transformer : 03:49:04 Hrs.
- 4) Triggering incident: -Bus Bar-2 protection operated at 03:49:04 hrs
- 5) Event Description: - As per Next Slide

## Detail Report Format

### **Pre Fault Operation Status:**

At the time of fault, all six units were at standstill condition and no power was evacuated to the grid as per the NRLDC schedule. Prior to the fault, the 420KV Bus Bar status were as following:

1. Nathpa Jhakri- Panchkula Circuit-I in charged condition.
2. Nathpa Jhakri- Gumma-II in charged condition.
3. Nathpa Jhakri- Rampur Circuit -I in charged condition.
4. Nathpa Jhakri- Rampur Circuit -II in charged condition.
5. Nathpa Jhakri- Karcham Wangtoo Circuit -I in charged condition.
6. 400/22KV 25MVA Station transformer in Charged condition.
7. The Generating Unit 1,2,3,4,5,6 & NJ-KW-1, NJ-Rampur-I, NJ-Panchkula-I, NJ-RAMPUR-II, NJ-Gumma-II and 400/22KV 25MVA Station transformer bay was on Bus Bar-II.

## Observation of Fault:-

1) Bus Bar-II operated at 03:49:04:339 Hrs. on account of Y-Ph to Ground Fault Hrs.

Tuesday 04 May 2021 03:49:04.339 D&T - 04/05/2021 - 03:49:04.339 - Secondary - (Peak Type)



Page 1

Tuesday 04 May 2021 03:49:04.339 D&T - 04/05/2021 - 03:49:04.339 - Secondary - (Peak Type)

Bus	Ph	Vol	Phase	Angle	Value	Unit	Label
0001-400	A	1.000	04.102	94.907	1000	0.000	04.102
0001-400	B	1.000	042.000	104.907	1000.00	0.000	042.000
0001-400	C	1.000	083.900	114.907	1000.00	0.000	083.900

A_03_2021_03_49_04_339	0.0000000000000000	0.0000000000000000	0.0000000000000000
B_03_2021_03_49_04_339	0.0000000000000000	0.0000000000000000	0.0000000000000000
C_03_2021_03_49_04_339	0.0000000000000000	0.0000000000000000	0.0000000000000000
A_03_2021_03_49_04_339	0.0000000000000000	0.0000000000000000	0.0000000000000000
B_03_2021_03_49_04_339	0.0000000000000000	0.0000000000000000	0.0000000000000000
C_03_2021_03_49_04_339	0.0000000000000000	0.0000000000000000	0.0000000000000000

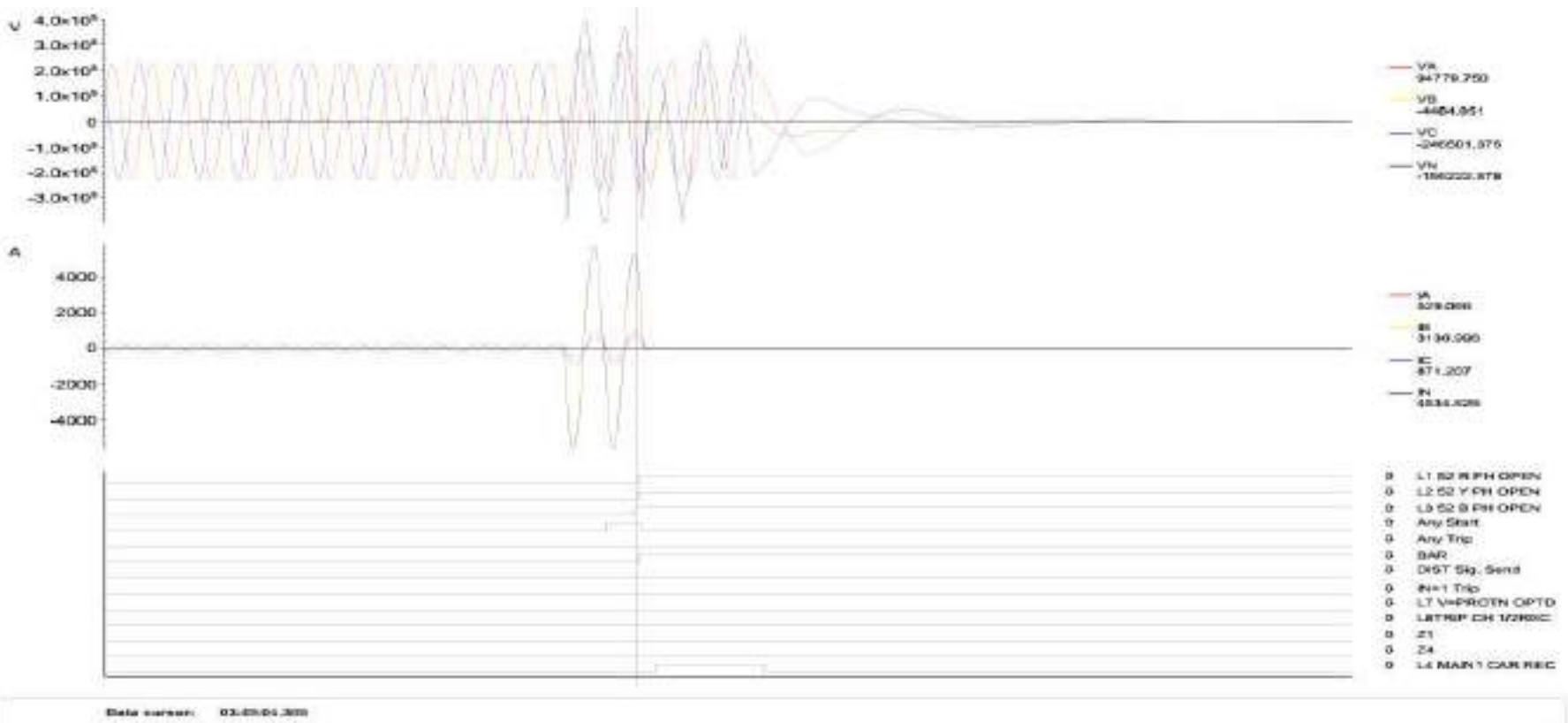
Page 2

## Observation of Fault:-

NJ Karcham Wangtoo-I CB opened at 03:49:04:366 Hrs on account of operation of Bus Bar Protection. Carrier received Karcham end.

Fault graphics [E:\S1 Studio\GJVNL\_HRT2566-8 Tripped 04052021\NJ HW-M4 May 2021 03:49:04.366.chg] - GJVNL\_14

Date: 04.05.2021

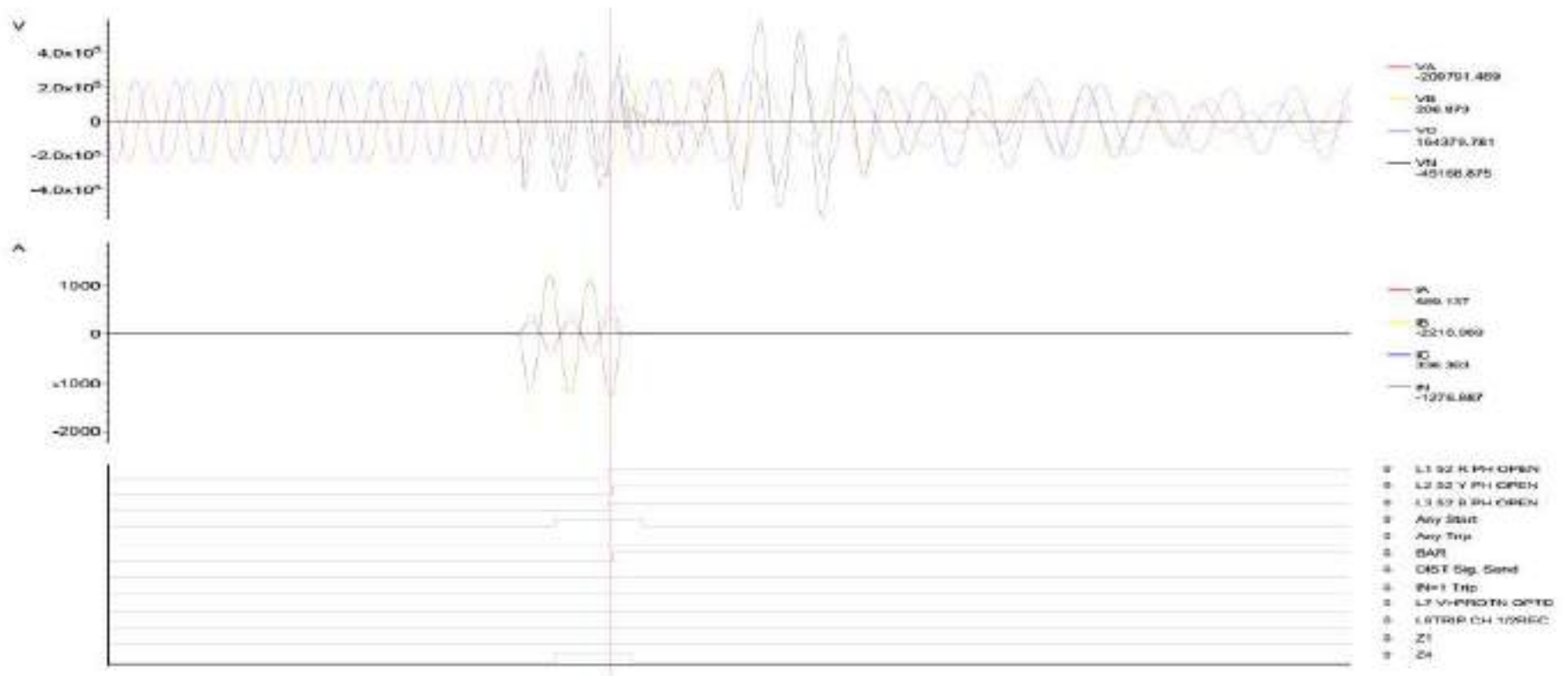


## Observation of Fault:-

- 1) NJ Panchkula-I CB opened at 03:49:04:380 Hrs on account of operation of Bus Bar Protection. No Fault was observed in the line.

Fault analysis I:\Documents and Settings\PROTECTION\My Documents\SI Studio\JV\H Ltd\PK-I\4421\FORM4 May 2021 03:49:04:380.ctd - 5/JVNL 146

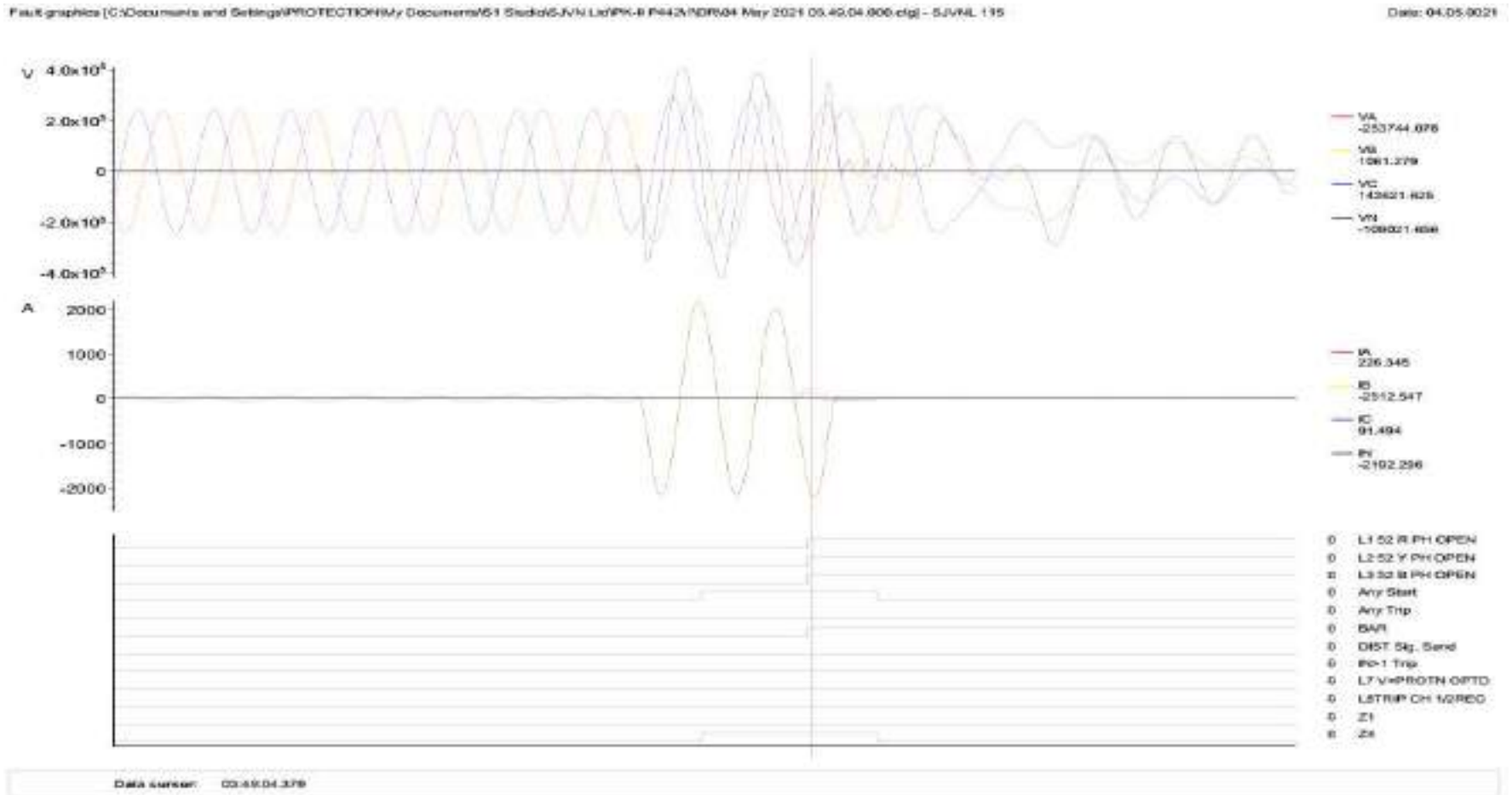
Date: 04.05.2021



Data cursor: 03:49:04.380

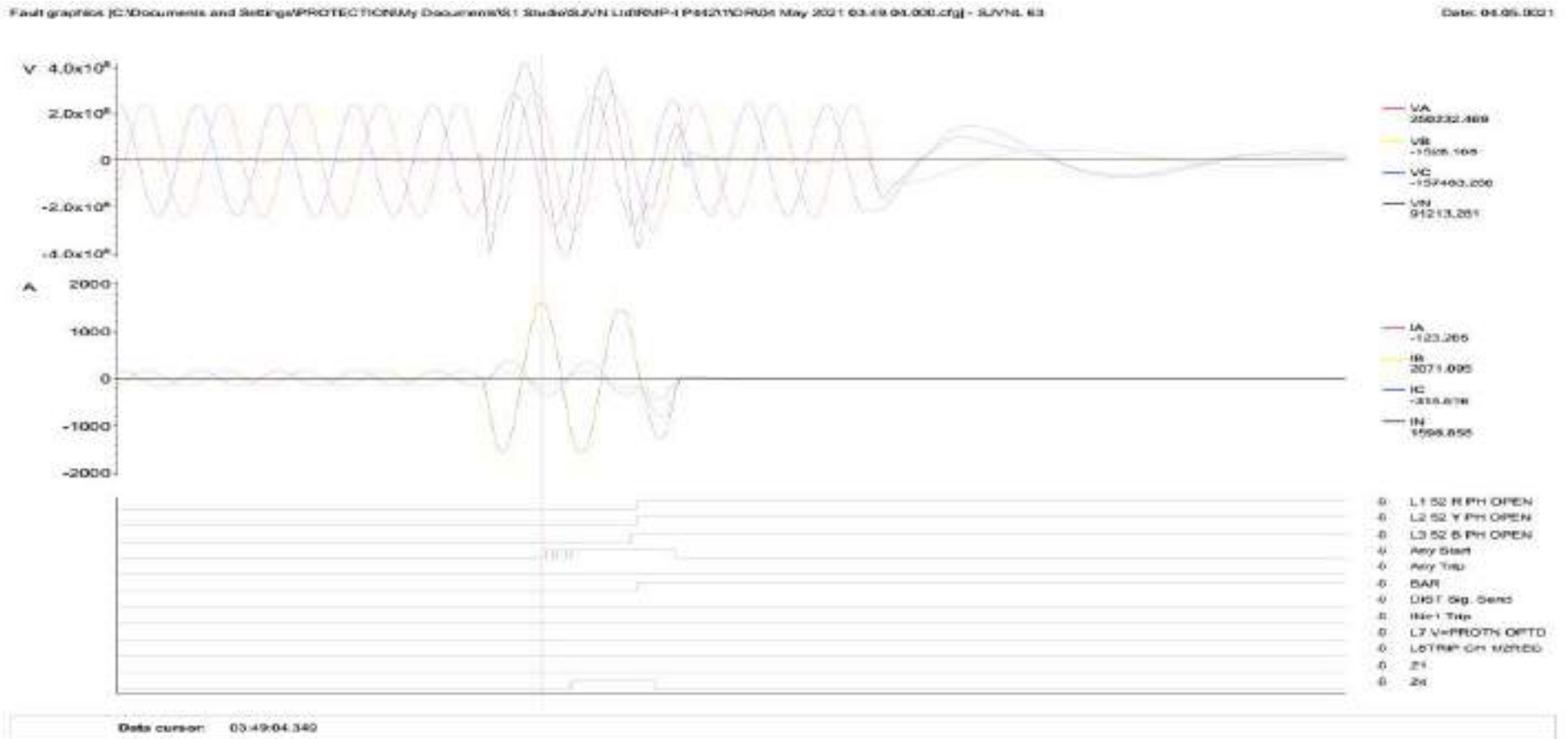
## Observation of Fault:-

NJ Gumma-II CB opened at 03:49:04:379 Hrs on account of operation of Bus Bar Protection. No Fault was observed in the line.



## Observation of Fault:-

NJ Rampur-I CB opened at 03:49:04:380 Hrs on account of Bus Bar Protection operation. No Fault was observed in the line.



## **Observation of Fault:-**

On dated 04.05.2021, as per initial investigation carried out, there is no fault in the 400KV GIS System (Busbar-2) The probable cause of Busbar-2 operation may be due to some wiring/CT polarity issue.

After details investigation, it has been observed that the Busbar protection has been malfunction on external fault occurred in NJ-KW-I line 13 KM from NJ end.



## Action Taken:-

**After the above incidence, following action has been initiated for early rectification of the fault at our end:**

- 1) The status of Bus Bar protection (Low impedance) relay clearly indicated that the fault was in the Y phase connected on Bus Bar-II.
- 2) As per initial investigation carried out, there is no fault in the 400KV GIS System (Busbar-2) The probable cause of Busbar-2 operation is may be due to some wiring/CT polarity issue. The Same has been rectified as best as possible and kept under observation.
- 3) Immediately after analysis, NJ-Rampur Ckt-I was restored with the permission of GRID in Bus Bar-II/Bus Bar-IV and one by one NJ-Rampur Ckt.-II, NJ-Panchkula-I and NJ-Gumma Ckt.-II.

## **Brief Analysis for Bus Bar Protection Operation**

As per the preliminary investigation carried out by NJHPS, there is no fault in the 400KV GIS System (Busbar-2) The probable cause of Busbar-2 operation may be due to some wiring/CT polarity issue.

While checking the DR in details, it has been found that NJ-KW-I line has received Carrier from other end on account of Y-phase to ground fault at 24.72 KM.

And due to malfunction of the Bus-Bar Protection fault, the line along with our complete GIS has got tripped as the complete system was on Bus-Bar-I system and Bus-Bar-II was under maintenance.

The healthiness of Bus-Bar protection has been tested at our end including CT connections. However, further, it is planned to carry out complete Bus-Bar Protection relay testing from OEM.

Multiple element tripping at 400kV  
Alaknanda GVK (UPC) & 400/220kV  
Srinagar(UK)

24-May-2021 17:20 hrs

# Antecedent Condition and Tripped Elements

## Antecedent Condition:-

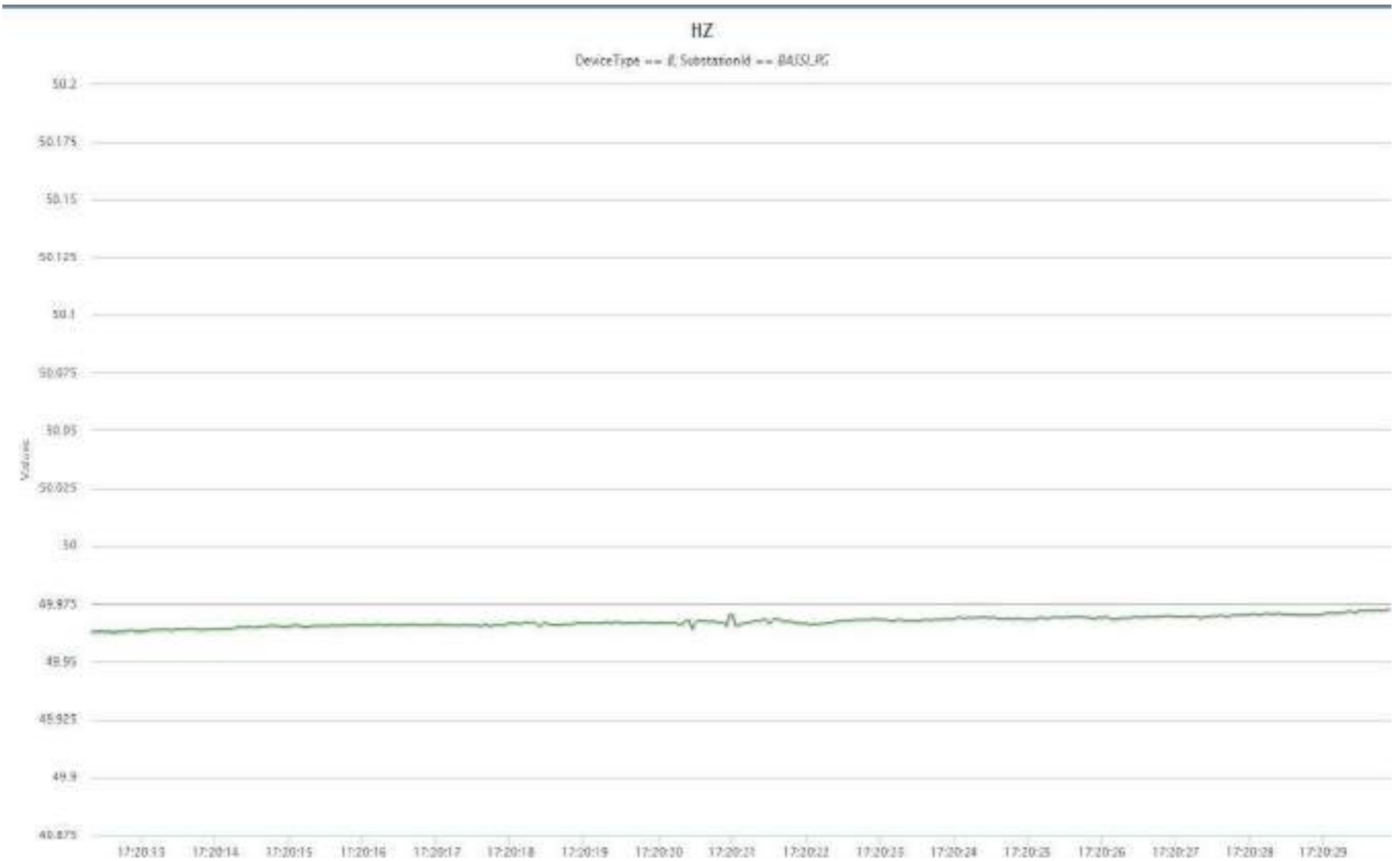
- Weather Conditions: Normal
- Grid Frequency (Hz): 49.98
- Total IR Import (MW): 8462
- Northern Region Demand (MW): 39176
- Generation loss (MW): 138

## Following elements tripped:-

- 1) 400 KV Alaknanda GVK(UPC)-Muzaffarnagar (UP) Ckt-1
- 2) 400 KV Alaknanda GVK(UPC)-Vishnuprayag(JP) (UP) Ckt-1
- 3) 220 KV Singoli Bhatwari(Singoli(LTUHP))-Srinagar(UK) (PTCUL) Ckt-2
- 4) 220 KV Singoli Bhatwari(Singoli(LTUHP))-Srinagar(UK) (PTCUL) Ckt-1
- 5) 400 KV Alaknanda GVK(UPC)-Srinagar(UK)(UK) Ckt-2
- 6) 400 KV Alaknanda GVK(UPC)-Srinagar(UK)(UK) Ckt-1
- 7) 82.5MW Alaknanda HEP UNIT 2 ,
- 8) 33MW Singoli UNIT 1
- 9) 33MW Singoli UNIT 2

# PMU Plot of frequency at Bassi(PG)

17:20hrs/24-May-21



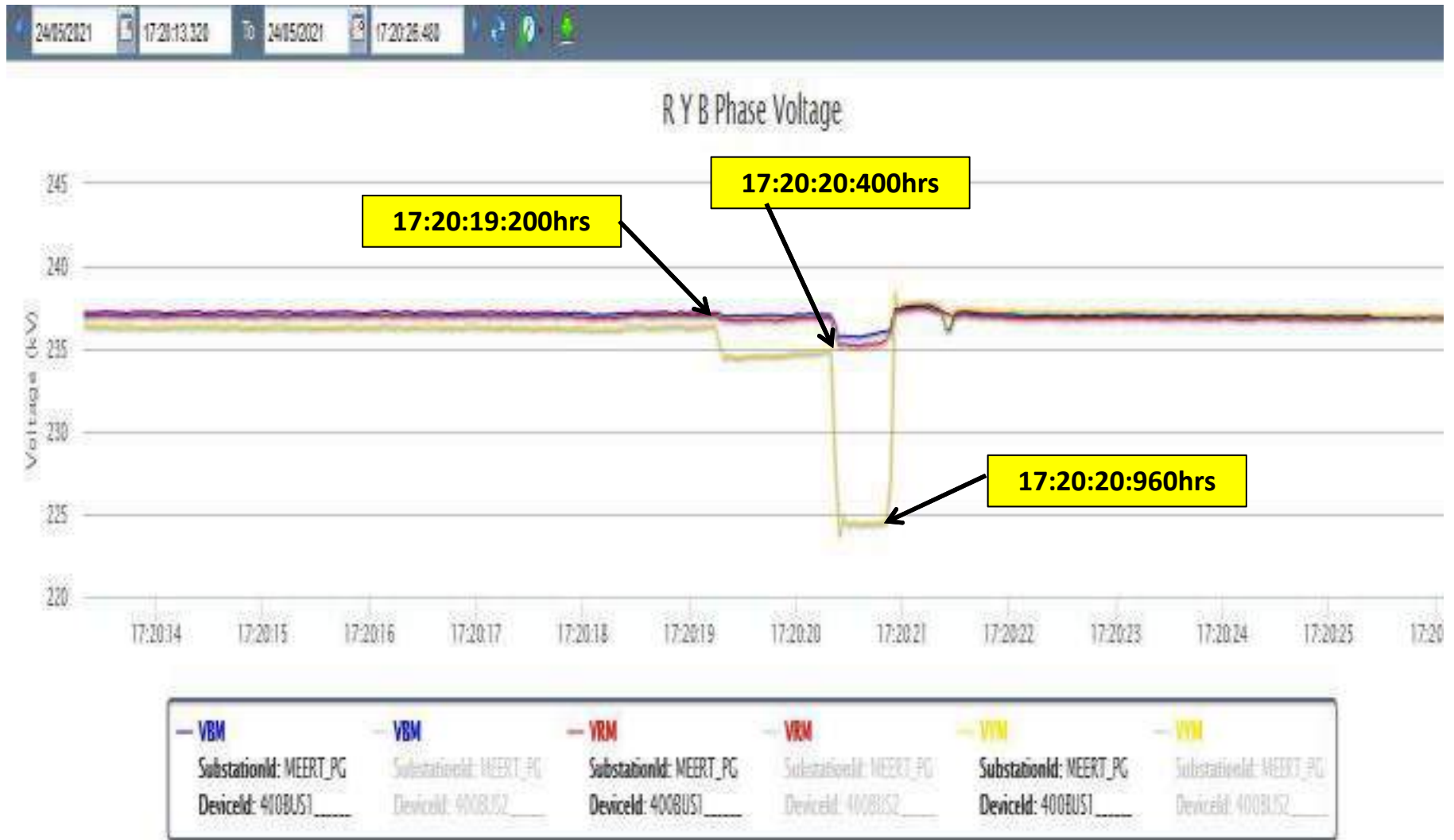
# PMU Plot of frequency at Bassi(PG)

17:36hrs/24-May-21



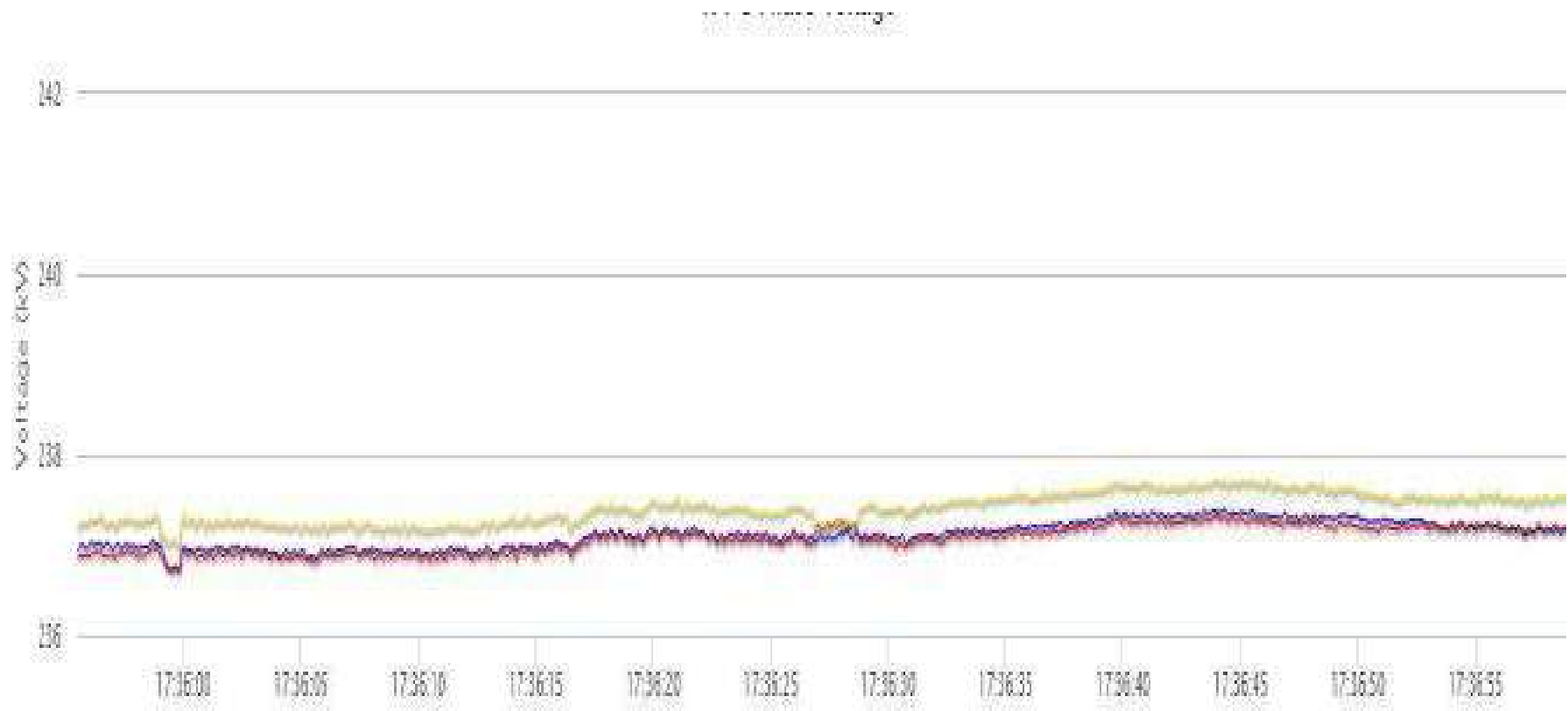
# PMU Plot of phase voltage magnitude at Meerut(PG)

## 17:20hrs/24-May-21



# PMU Plot of phase voltage magnitude at Meerut(PG)

17:36hrs/24-May-21



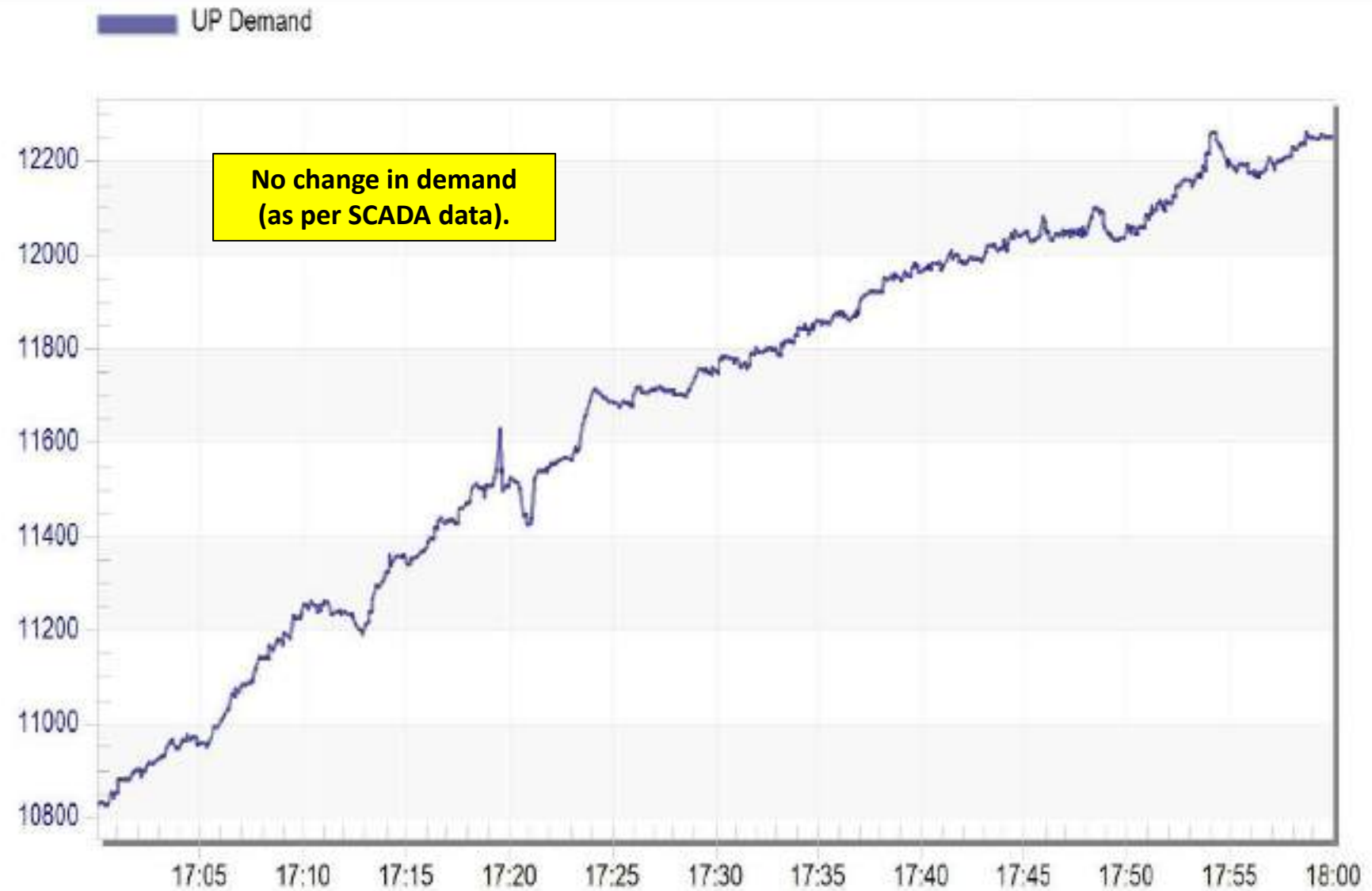
— VBM	— VBM	— VBM	— VM	— VM
SubstationId: MEERT_PG	SubstationId: MEERT_PG	SubstationId: MEERT_PG	SubstationId: MEERT_PG	SubstationId: MEERT_PG
DeviceId: 400BUS1	DeviceId: 400BUS1	DeviceId: 400BUS1	DeviceId: 400BUS1	DeviceId: 400BUS1



# SCADA SOE

Time	Station Name	Voltage	Element Name	Element Type	Element Status
17:20:20,670	MUZA1_UP	400kV	F_96(VISNU-2)	Circuit Breaker	Open
17:20:23,037	ALKND_UP	400kV	09VSNPG2	Circuit Breaker	Open
17:20:23,037	ALKND_UP	400kV	12MUZA2	Circuit Breaker	Open
17:20:23,037	ALKND_UP	400kV	08H03VP2	Circuit Breaker	Open
17:30:54,244	VISNU_UP	400kV	F_07(MUZA1-2)	Circuit Breaker	Open
17:36:02 ***	SIMBH_I	220kV	02SRNGR	Circuit Breaker	Open
17:36:02 ***	SIMBH_I	220kV	01SRNGR	Circuit Breaker	Open
17:36:21,869	ALKND_UP	400kV	03SRNGR1	Circuit Breaker	Open
17:36:23,219	ALKND_UP	400kV	06SRNGR2	Circuit Breaker	Open

# UP Demand during tripping



May Mon 24 2021

# Uttarakhand Demand during tripping

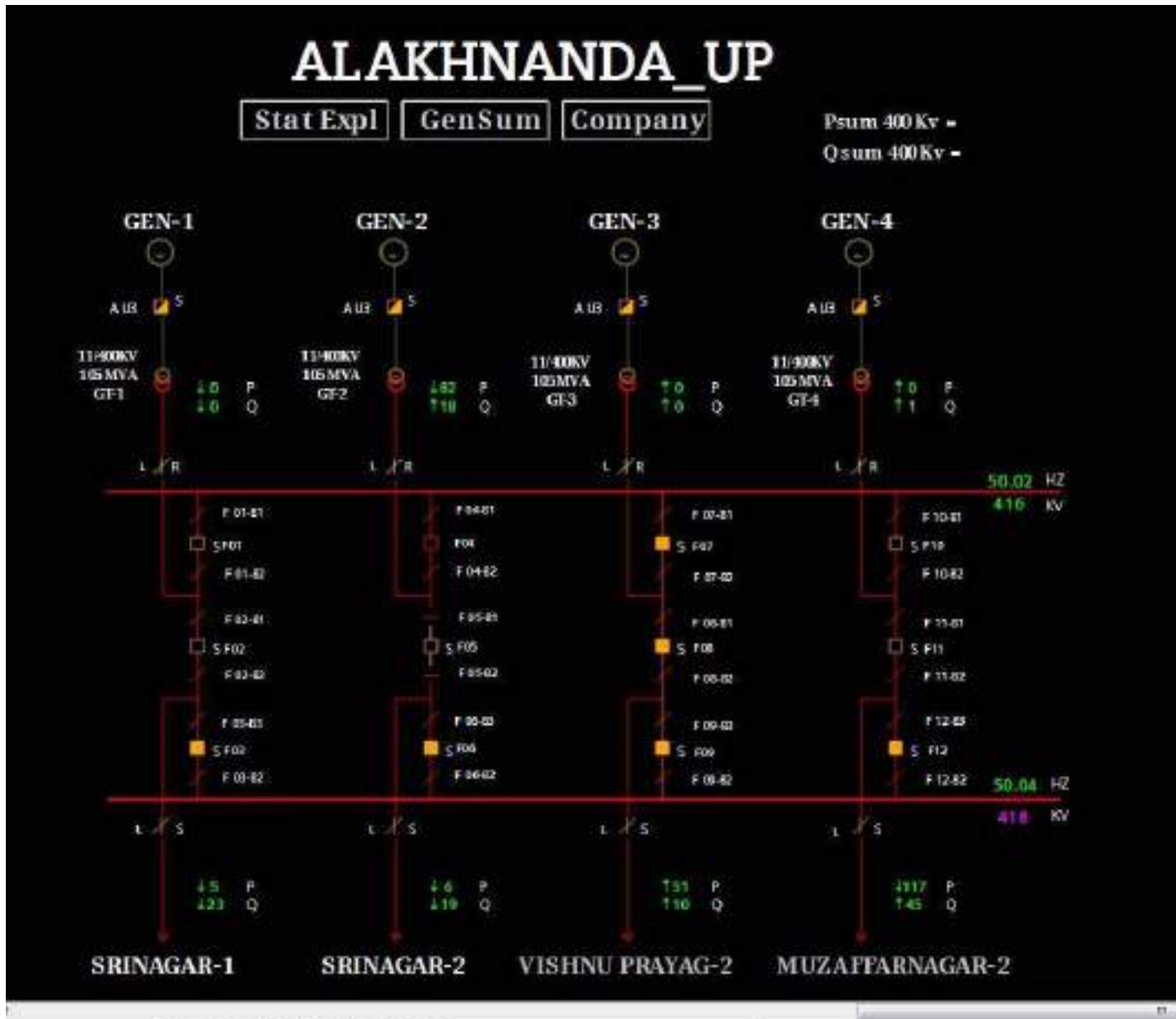
Uttarakhand Demand Met



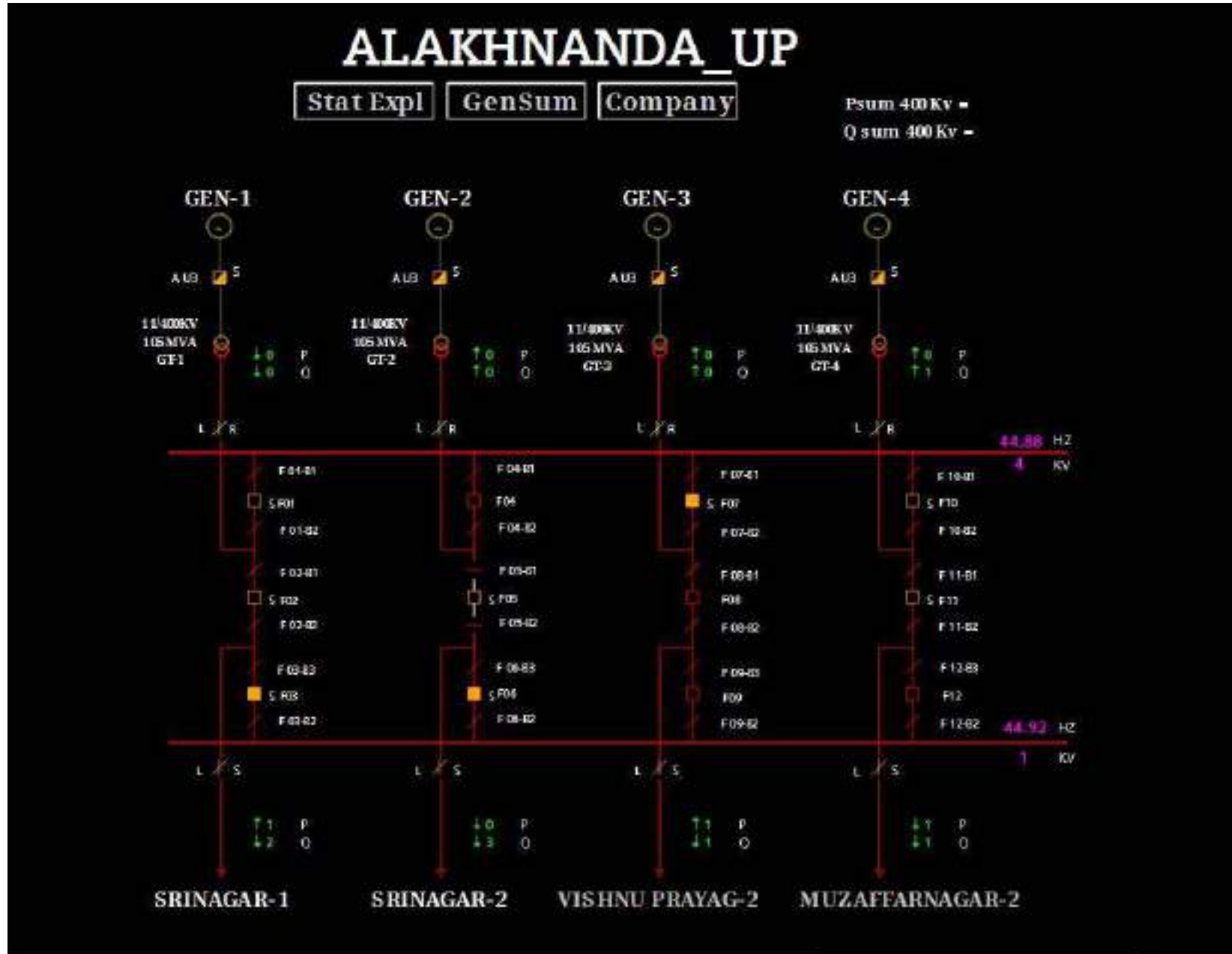
17:00  
May Sun 23 2021

17:30

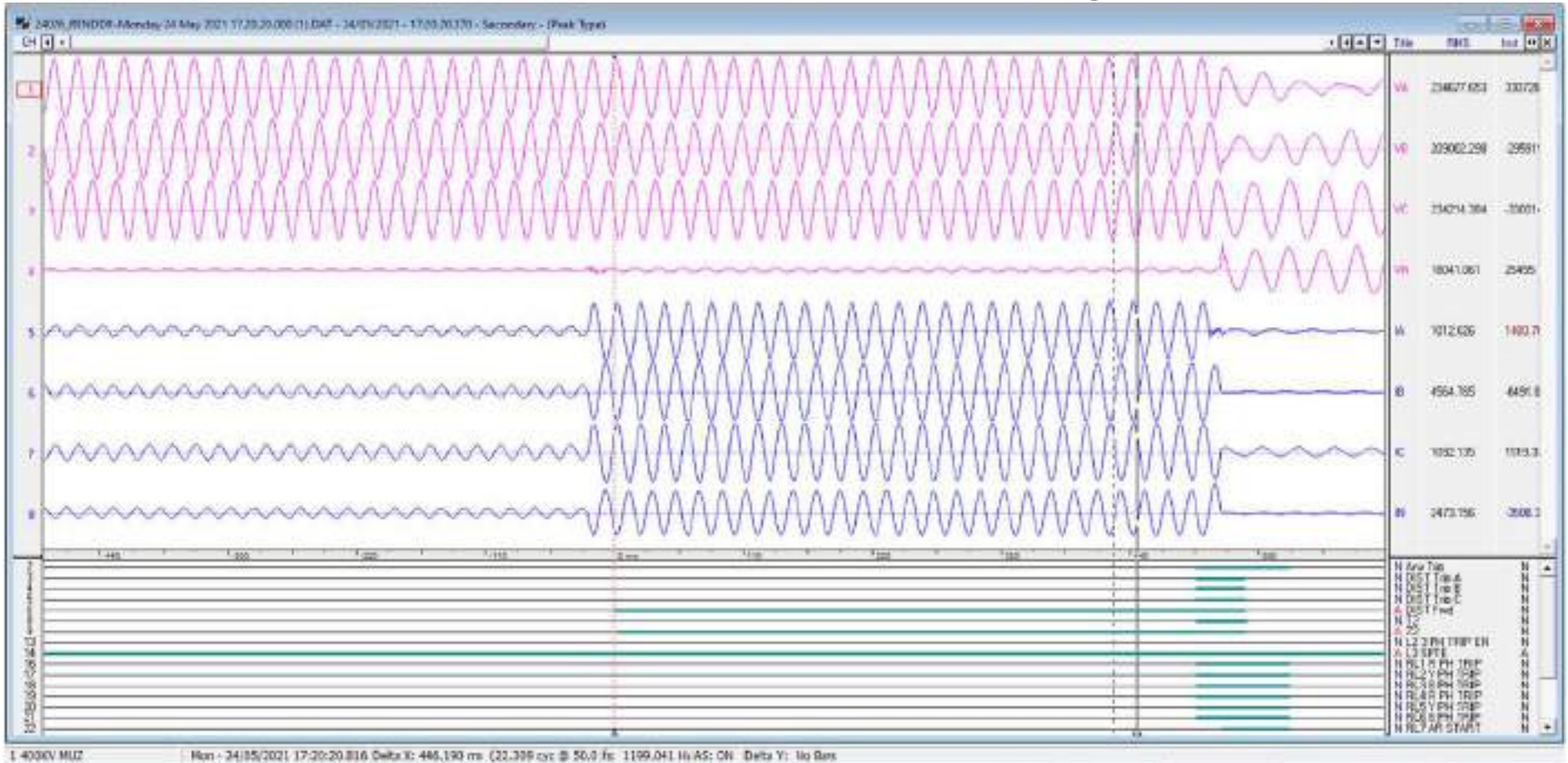
# SLD before tripping



# SLD after tripping



# DR of 400KV Alknanda GVK(UPC)-Muzaffarnagar (UP)(End)Ckt-1



1. Tripped in Zone-2 from Muzaffarnagar end.
2. Fault current observed in all 3- phases.

# Observations

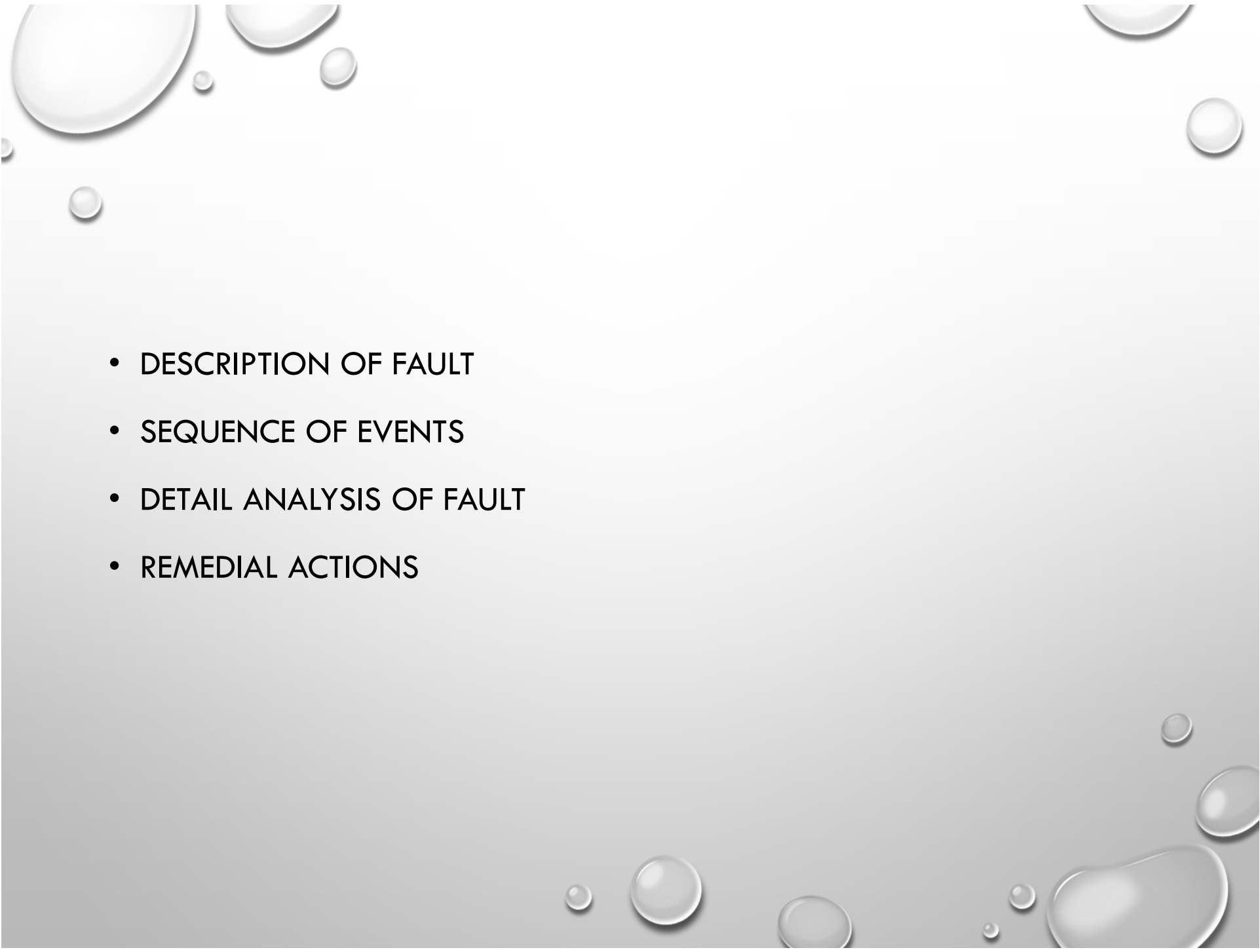
1. Reason of occurrence of fault?
2. Complete DR/EL & tripping report not uploaded on tripping portal by SLDC-UP & SLDC-UK.
3. Reason of delayed clearance of fault?
4. DR of 400kV Alaknanda (end)-Muzaffarnagar line not submitted. Whether distance Protection operated at Alaknanda end?
5. Reason for tripping of 220 KV Singoli Bhatwari(Singoli(LTUHP))-Srinagar(UK) (PTCUL) Ckts not clear?
5. Remedial action taken report needs to be shared.
6. DRs of Alaknanda and singoli units not shared.



# ALAKNANDA HYDRO ELECTRIC PLANT 330 MW

‘ TRIPPING REPORT OF 24.05.2021 17:20 HRS ‘



- 
- DESCRIPTION OF FAULT
  - SEQUENCE OF EVENTS
  - DETAIL ANALYSIS OF FAULT
  - REMEDIAL ACTIONS

# DESCRIPTION OF FAULT

UNIT #2 WAS RUNNING WITH TOTAL PLANT LOAD OF 82 MW AS PER SCHEDULE .

MZN LINE-4 & VSP LINE-3 GOT TRIPPED ON Y-N PHASE TO EARTH FAULT .

DUE TO ABSENCE OF EVACUATIONG LINES THE UNIT GOT TRIPPED.

# SEQUENCE OF EVENTS

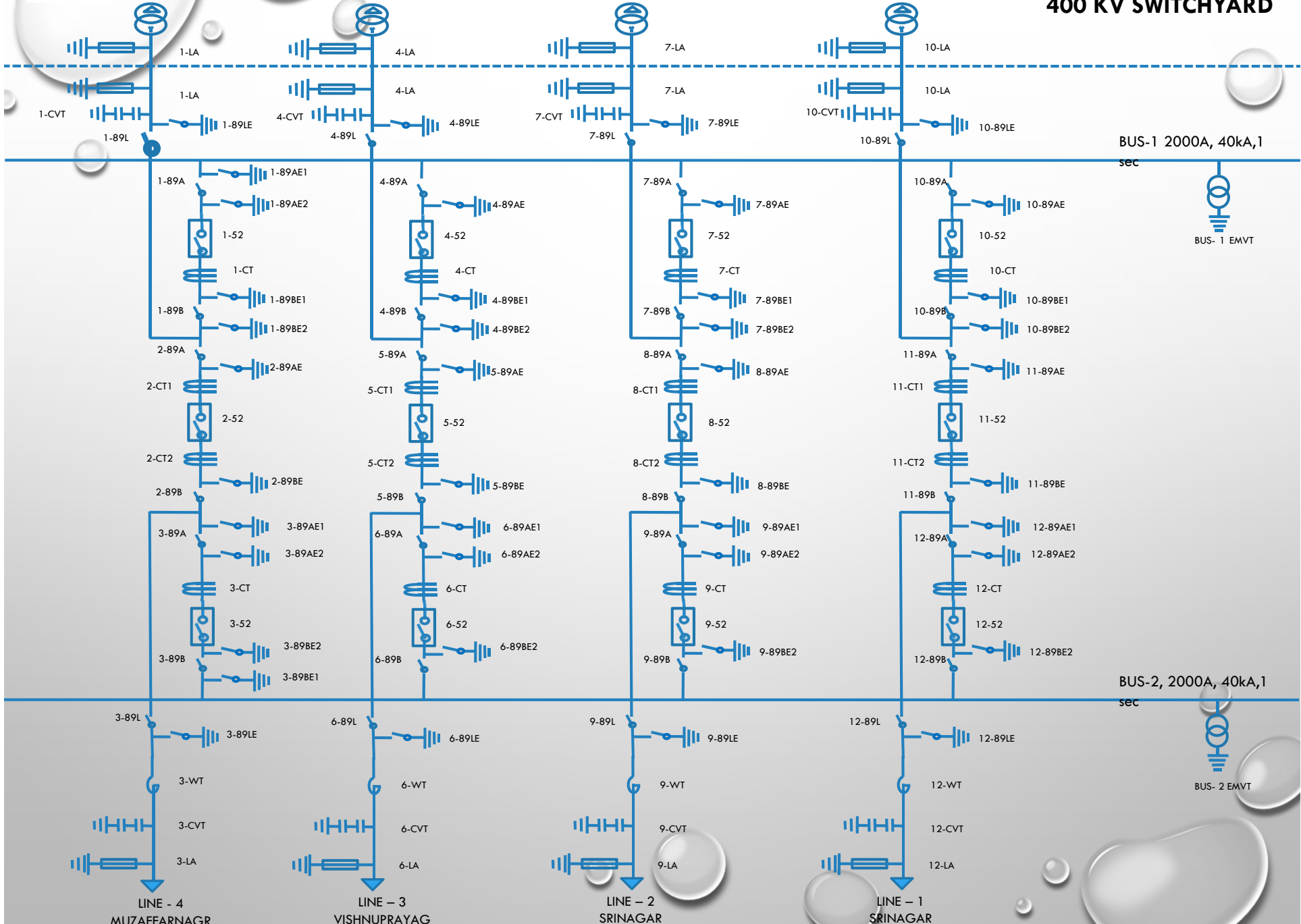
- 17:20:21.6- LINE-4 MN-1 R/Y/B-PH TRIP
- 17:20:21.7- LINE-3 MN-2 R/Y/B-PH TRIP
- 17:20:21.7- LINE-4 MN-2 R/Y/B-PH TRIP
- 17:20:21.7- LINE-4 MAIN-1 A/R LOCKOUT
- 17:20:21.7- LINE-3 MN-1 R/Y/B-PH TRIP
- 17:20:21.7- LINE-3 MN-1 A/R LOCKOUT
- 17:20:21.7- MZN LINE CB 3-52 OPEN
- 17:20:21.7- TIE CB 5-52 OPEN
- 17:20:21.7- VSP LINE CB 3-52 OPEN
- 17:36:22.2 – SNR-1 LINE CB 12-52 OPEN
- 17:36:23.2 – LN-2 MN-2 DEF, SOTF & O/V TRP
- 17:36:23.2 – LINE-2 TRIP RELAY-1 OPRTD
- 17:36:23.2 – LINE-2 MN-1 R/Y/B-PH TRIP
- 17:36:23.2 – SNR-2 LINE CB 9-52 OPEN

# DETAIL ANALYSIS OF FAULT

- UNIT #2 WAS RUNNING WITH TOTAL PLANT LOAD OF 82 MW AS PER SCHEDULE .
- MZN LINE-4 & VSP LINE-3 GOT TRIPPED ON Y-N PHASE TO EARTH FAULT .
- DUE TO ABSENCE OF EVACUATIONG LINES BOTH THE UNITS GOT TRIPPED.
- AT THE SAME TIME SRINAGAR LINE- 1 & 2 ( KHANDUKHAL ) ALSO TRIPPED.

# DETAIL ANALYSIS OF FAULT

- STARTED PHASE B
- TRIPPED PHASE A B & C
- IFB=2.232 KA, ZONE-4,
- IFT=547MS, RT=80.05MS, FD=2.20KM



# REMEDIAL ACTION

- OVER CURRENT FUNCTION DISABLE.

- 50ZGT, 50ZT, 50Z

- 67 DIR OC.

- EARTH FAULT SETTING REVIEWED:

<u>Earlier:</u>	<u>After Review</u>
<ul style="list-style-type: none"><li>• 50zt: line-3 CB</li><li>❖ FAIL EARTH : YES</li><li>❖ IE&gt; BF 0.2IN</li><li>❖ IN&gt;1 60MS</li><li>❖ TMS : 200 MS</li><li>❖ DT ADDER 10 MS</li></ul>	<ul style="list-style-type: none"><li>• 50zt: line-3 CB</li><li>❖ FAIL EARTH : NO</li><li>❖ IE&gt; BF 0.2IN</li><li>❖ IN&gt;1 200MS</li><li>❖ TMS : 300 MS</li><li>❖ DT ADDER 0 MS</li></ul>

The image features a light gray background with a subtle gradient. Scattered across the top and bottom edges are several realistic water droplets of various sizes. Each droplet is rendered with a soft, white-to-gray gradient, giving it a three-dimensional appearance with a visible highlight and shadow. The droplets are more densely packed in the corners and along the bottom edge, while the center of the page is mostly clear.

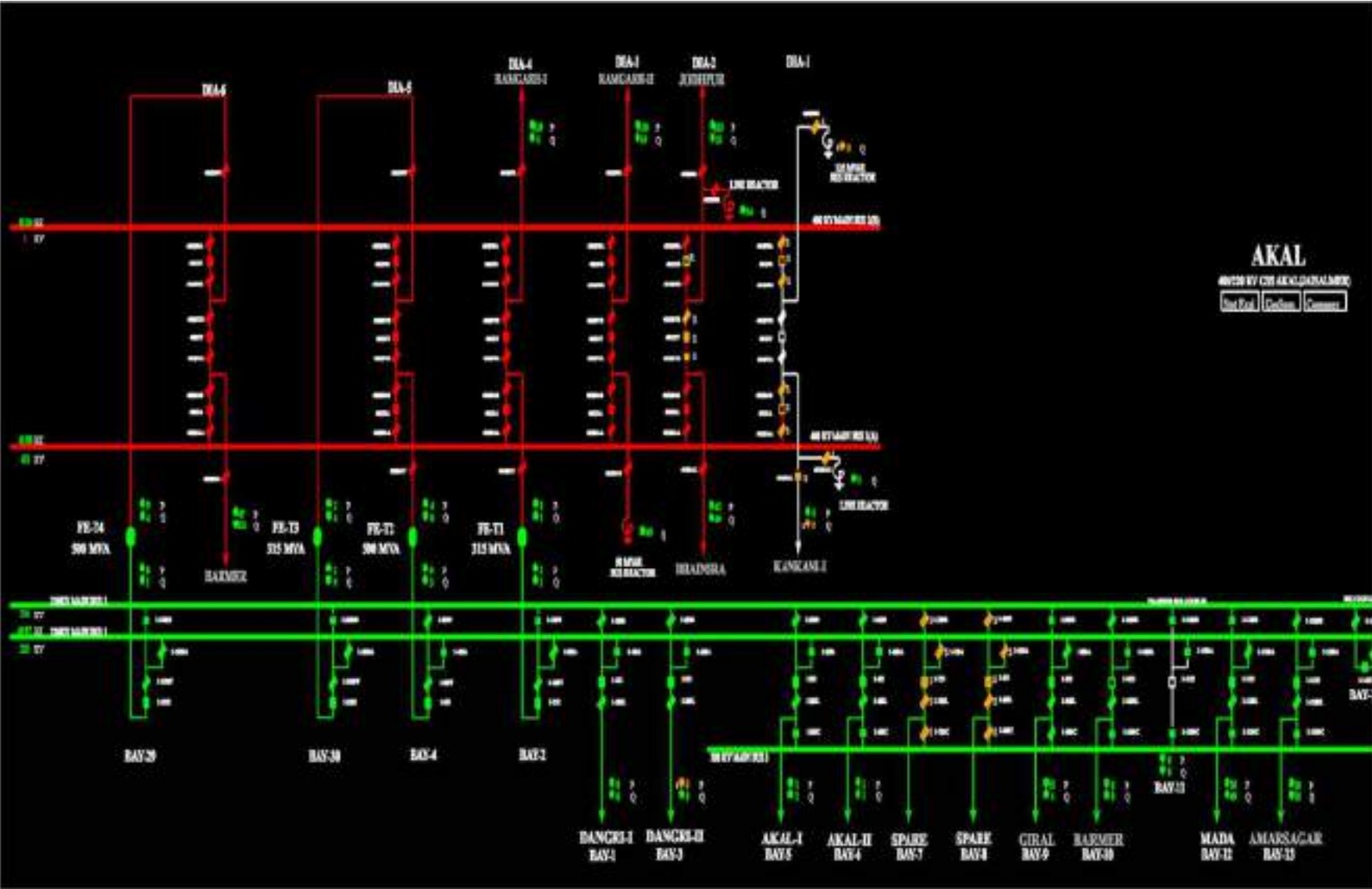
**THANK YOU**



# Multiple element tripping at 400kV Akal(RS)

17-June-2021 01:25

# Single line diagram of 400kV Akal S/s



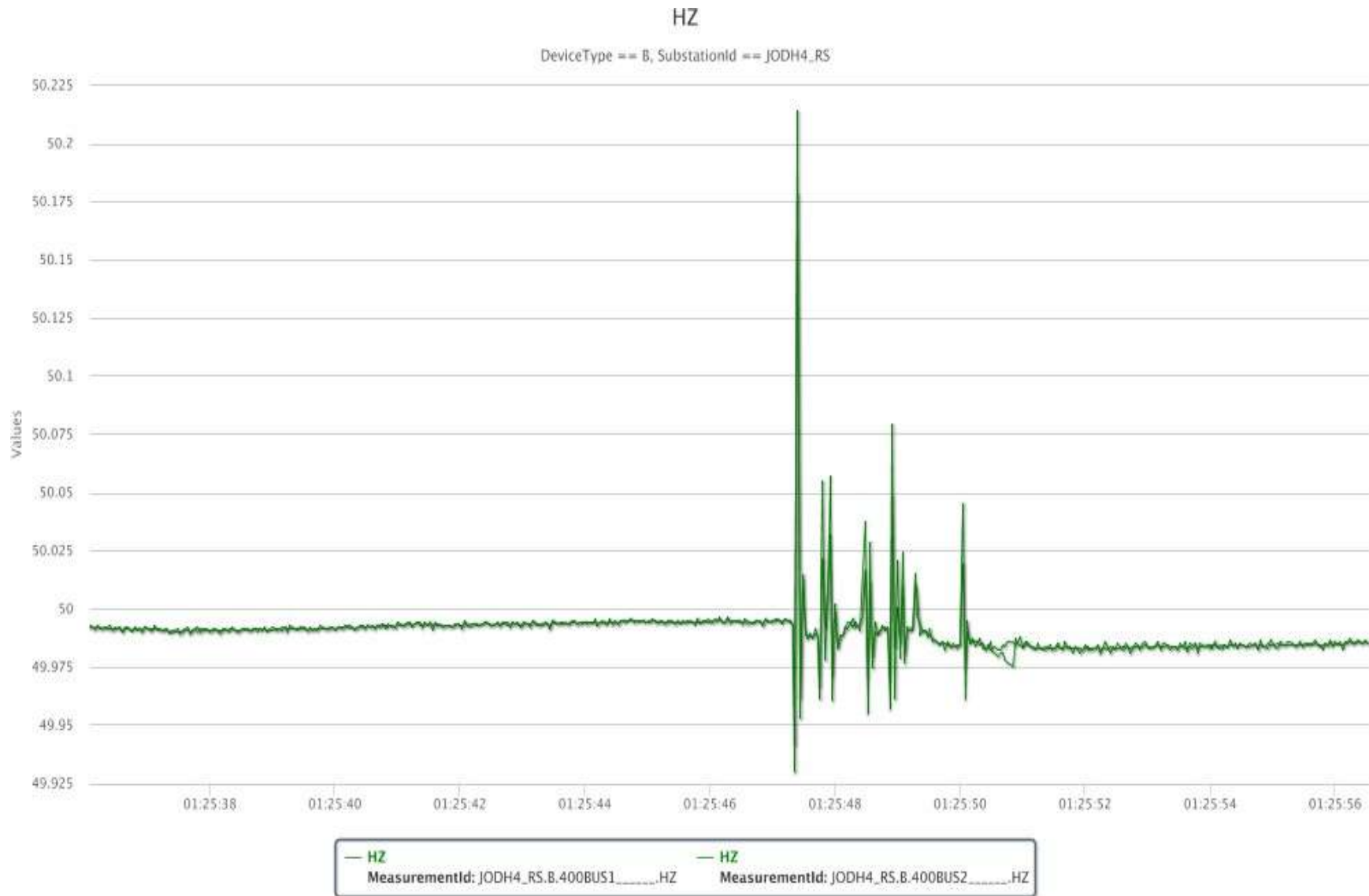
# Antecedent Condition and Tripped Elements

## Following elements tripped:-

- 1) 400/220 kV 315 MVA ICT 1 at Akal(RS)
- 2) 400/220 kV 500 MVA ICT 2 at Akal(RS)
- 3) 400/220 kV 315 MVA ICT 3 at Akal(RS)
- 4) 400/220 kV 500 MVA ICT 4 at Akal(RS)
- 5) 400 KV Akal-Ramgarh Ckt-1
- 6) 400 KV Akal-Ramgarh Ckt-2

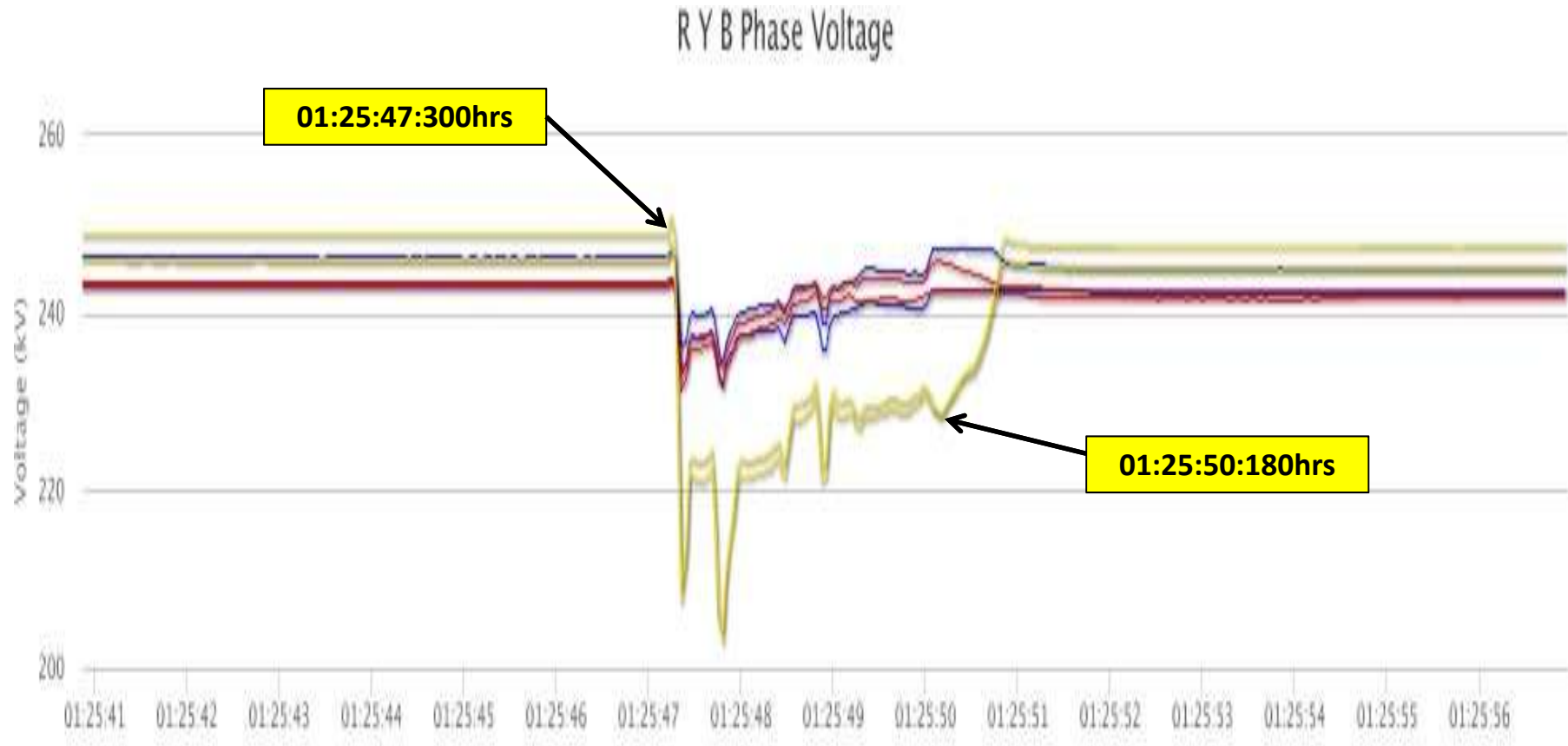
# PMU Plot of frequency at Jodhpur(RS)

01:25hrs/17-June-21



# PMU Plot of phase voltage magnitude at Jodhpur(RS)

01:25hrs/17-June-21



— VBM	— VBM	— VRM	— VRM	— VYM	— VYM
SubstationId: JODH4_RS	SubstationId: JODH4_RS	SubstationId: JODH4_RS	SubstationId: JODH4_RS	SubstationId: JODH4_RS	SubstationId: JODH4_RS
Deviceld: 400BUS1_.....	Deviceld: 400BUS2_.....	Deviceld: 400BUS1_.....	Deviceld: 400BUS2_.....	Deviceld: 400BUS1_.....	Deviceld: 400BUS2_.....

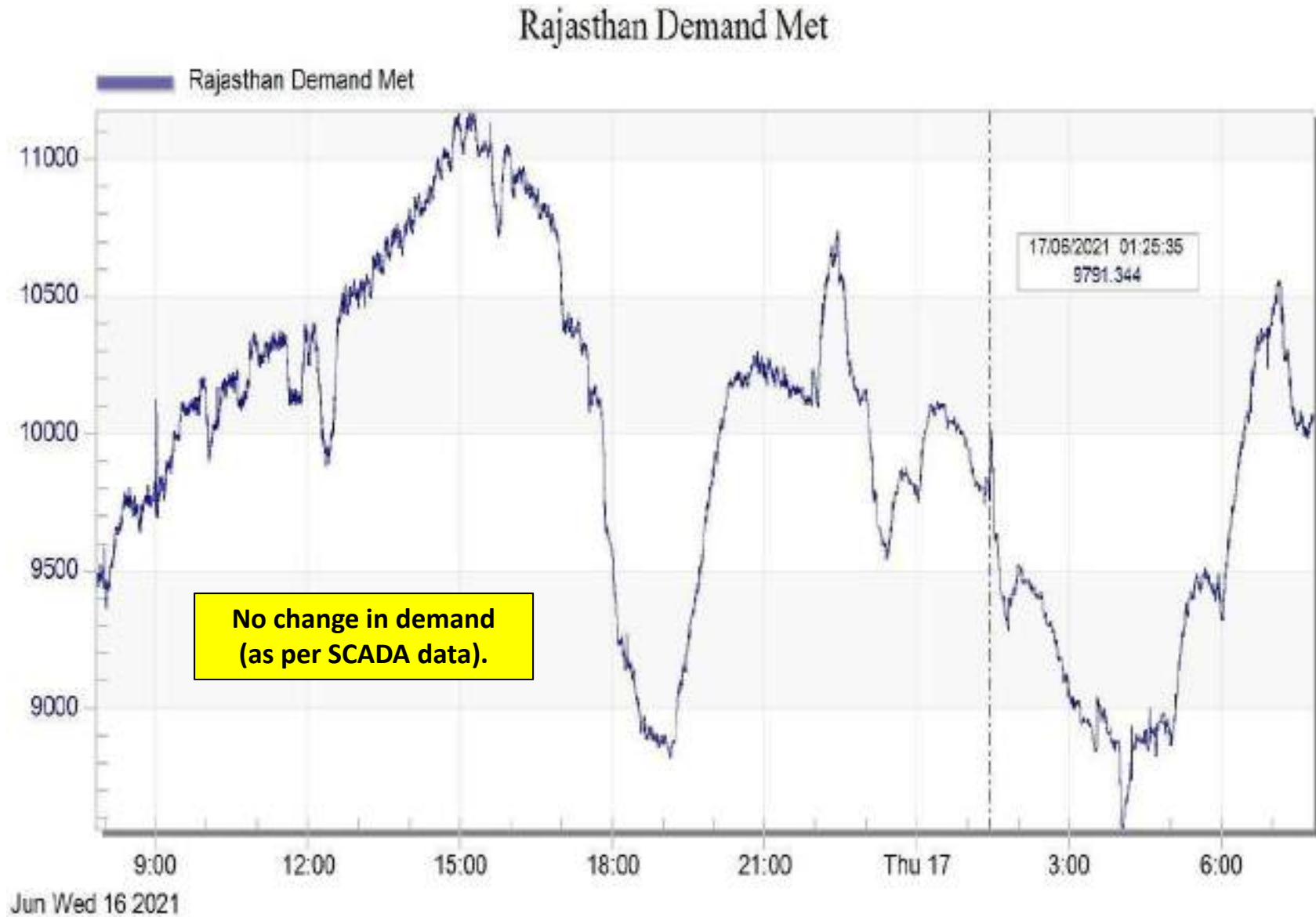
**As per PMU, Y-N phase to earth fault with delayed clearance in 3880ms is observed.**

## SCADA SOE

Time	Station Name	Voltage(kV)	Element Name	Element Type	Element Status
01:25:47,374	RMGR4_R	400	17AKAL2	Circuit Breaker	disturbe
01:25:47,375	RMGR4_R	400	16AKAL2	Circuit Breaker	disturbe
01:25:47,792	RMGR4_R	400	14AKAL1	Circuit Breaker	disturbe
01:25:47,795	RMGR4_R	400	13AKAL1	Circuit Breaker	disturbe
01:25:48,420	RMGR4_R	400	16AKAL2	Circuit Breaker	Open
01:25:48,422	RMGR4_R	400	17AKAL2	Circuit Breaker	Open
01:25:48,861	RMGR4_R	400	13AKAL1	Circuit Breaker	Close
01:25:48,929	RMGR4_R	400	13AKAL1	Circuit Breaker	Open
01:25:48,930	RMGR4_R	400	14AKAL1	Circuit Breaker	Open

As per SOE, delayed tripping of elements are observed at Ramgarh(RS) S/s and SCADA SOE status of tripped element at 400/220 Akal(RS) S/s are not available.

# Rajasthan Demand during tripping



# Observations

- Event Category: GI-2
- Generation Loss: Nil
- Load Loss: Nil (As per Rajasthan SLDC)

## Analysis of tripping (As informed by Akal S/s):

- 400kV Akal station is connected with Ramgarh D/C, Barmer S/C, Bhensara S/C, Jodhpur S/C and Kankani S/C. It also have four ICTs (2\*315+2\*500MVA). 400 kV Akal station have one and half breaker scheme.
- Y-N phase to earth fault occurred on 400kV Akal-Ramgarh Ckt-1 & Ckt-2.
- 400kV Akal-Ramgarh Ckt-1 tripped from both end.
- 400kV Akal-Ramgarh Ckt-2 didn't trip from Akal end due to issue in DC supply to relay coil which lead to delayed clearance in fault.
- As fault in 400kV Akal-Ramgarh Ckt-2 didn't clear, all ICTs tripped on back up earth fault protection operation.

## As per PMU, SCADA data:

- As per PMU, Y-N phase to earth fault with delayed clearance in **3880ms** is observed.
- As per SCADA SOE, delayed clearance of fault observed at Ramgarh(RS) S/s also. SCADA SOE of tripped elements at 400/220kV Akal S/s are not available.



# Points for Discussion

- What was the issue in DC supply to relay coil? If same DC supply is available to all relay coils then why did CB of Ckt-2 didn't open if CB of ckt-1 opened in time.
- If CB of ckt-2 at Akal end didn't open in time then how fault should have cleared. Whether any other line at Akal S/s also tripped? If not then how did fault clear finally? Protection coordination needs to be reviewed at 400kV Akal S/s.
- As per SCADA SOE, CB at Ramgarh S/s also opened after 1500-1600ms which indicates delayed clearance of fault from Ramgarh end too. Root cause of delayed clearance at Ramgarh S/s needs to be identified and to be shared with NRLDC.
- Reason of delayed clearance of fault? As per CEA Grid standard fault should be cleared within 100ms for 400 kV voltage level but here fault persisted for **3880ms**.
- Exact sequence of events in view of cause of event; protection operation/non-operation; opening/closing of breaker, isolator; relevant alarms and any other relevant detail to be shared
- DR/EL from 400/220kV Akal S/s & 400kV Ramgarh S/s and tripping report needs to be shared.

# Remedial Action

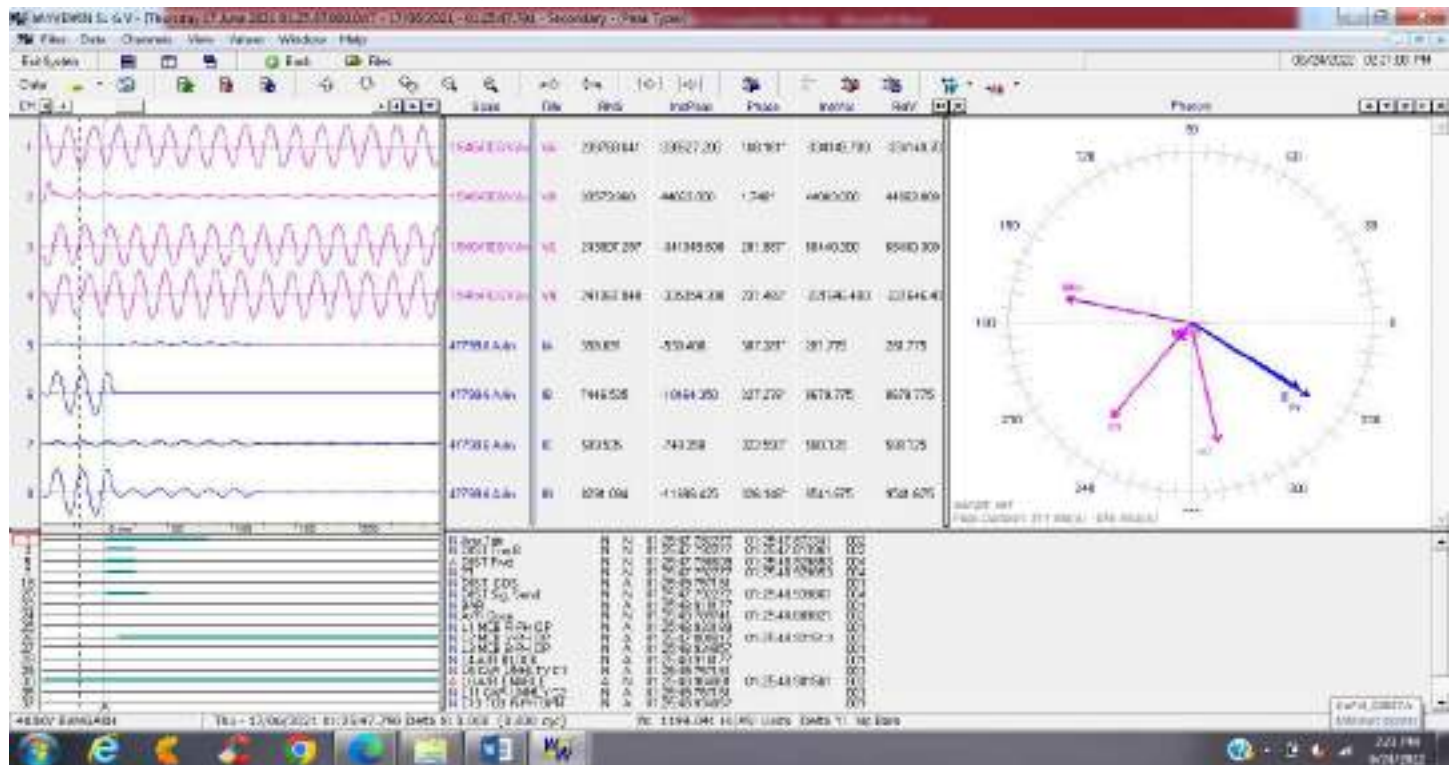
- **Healthiness of DC supply at 400kV Akal S/s needs to be ensured.**
- **Protection settings of all the 400 kV lines and ICTs at Akal station needs to be checked.**
- **Protection coordination also needs to be checked at 400/220 kV Akal station**
- **Availability of SCADA SOE data of all the elements of 400kV Akal S/s needs to be ensured.**

## Tripping occurred at 400 KV GSS Akal on date 17.06.2021.

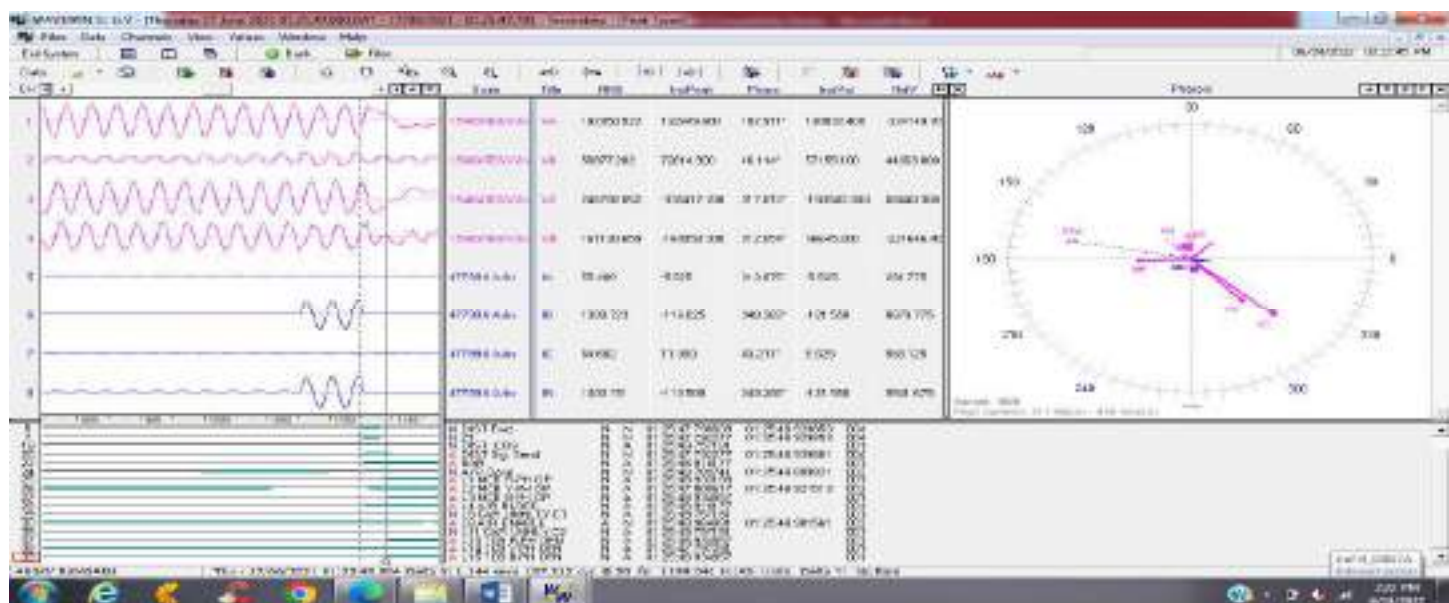
1. A, Y phase to earth fault occurred on double circuit 400 KV Akal-Ramgarh-I & II line.

At ramgarh end for both Akal circuits, faulty Y phase pole tripped in zone-1 and tried reclosing after 1 sec but 3 phase occurred as fault was existing on lines.

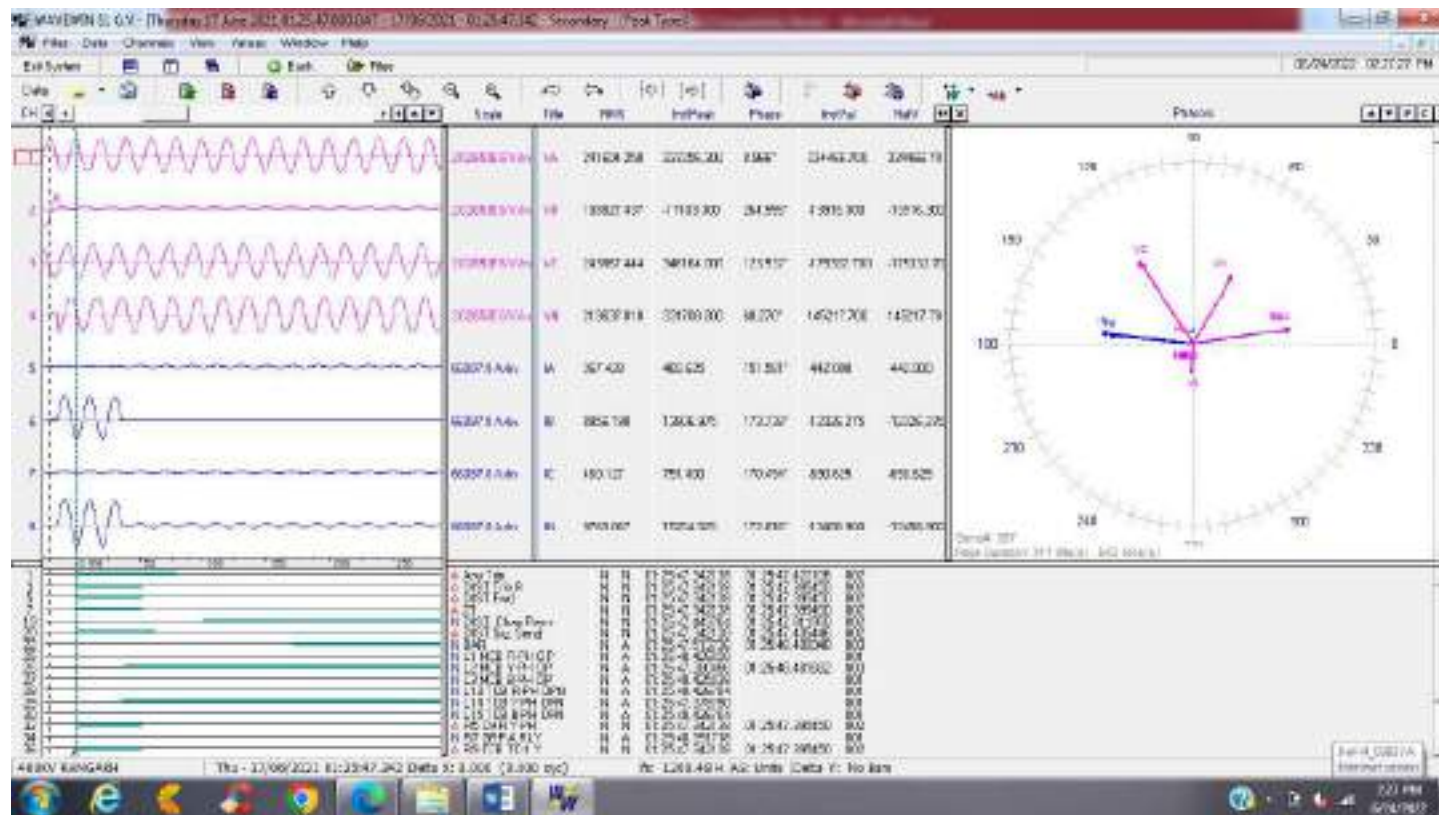
### 400 KV Ramgarh-Akal-I tripping initiation DR



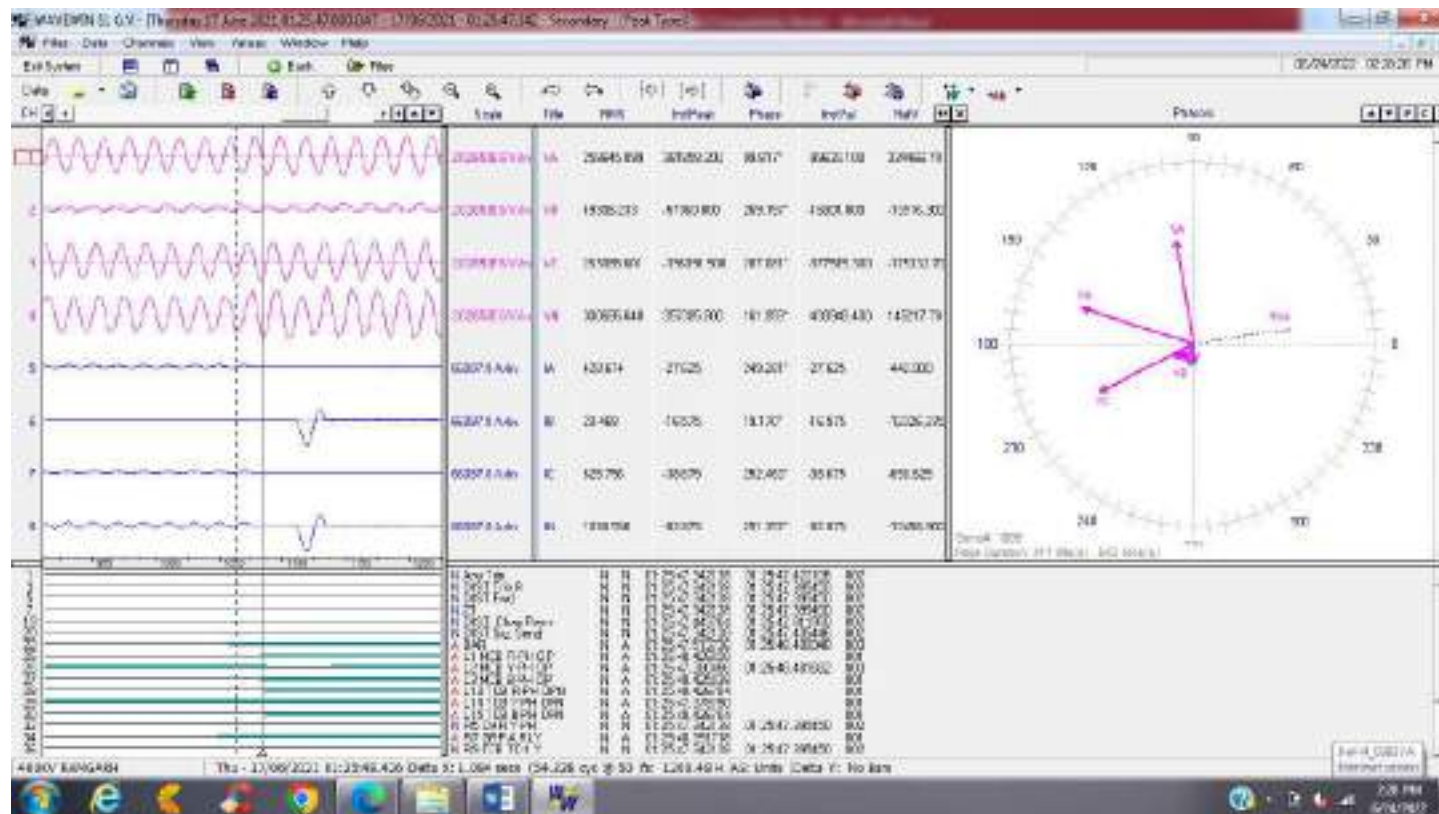
400 KV Ramgarh-Akal-I, 3 phase tripping after trying reclose; breaker opened in 1.144 sec.



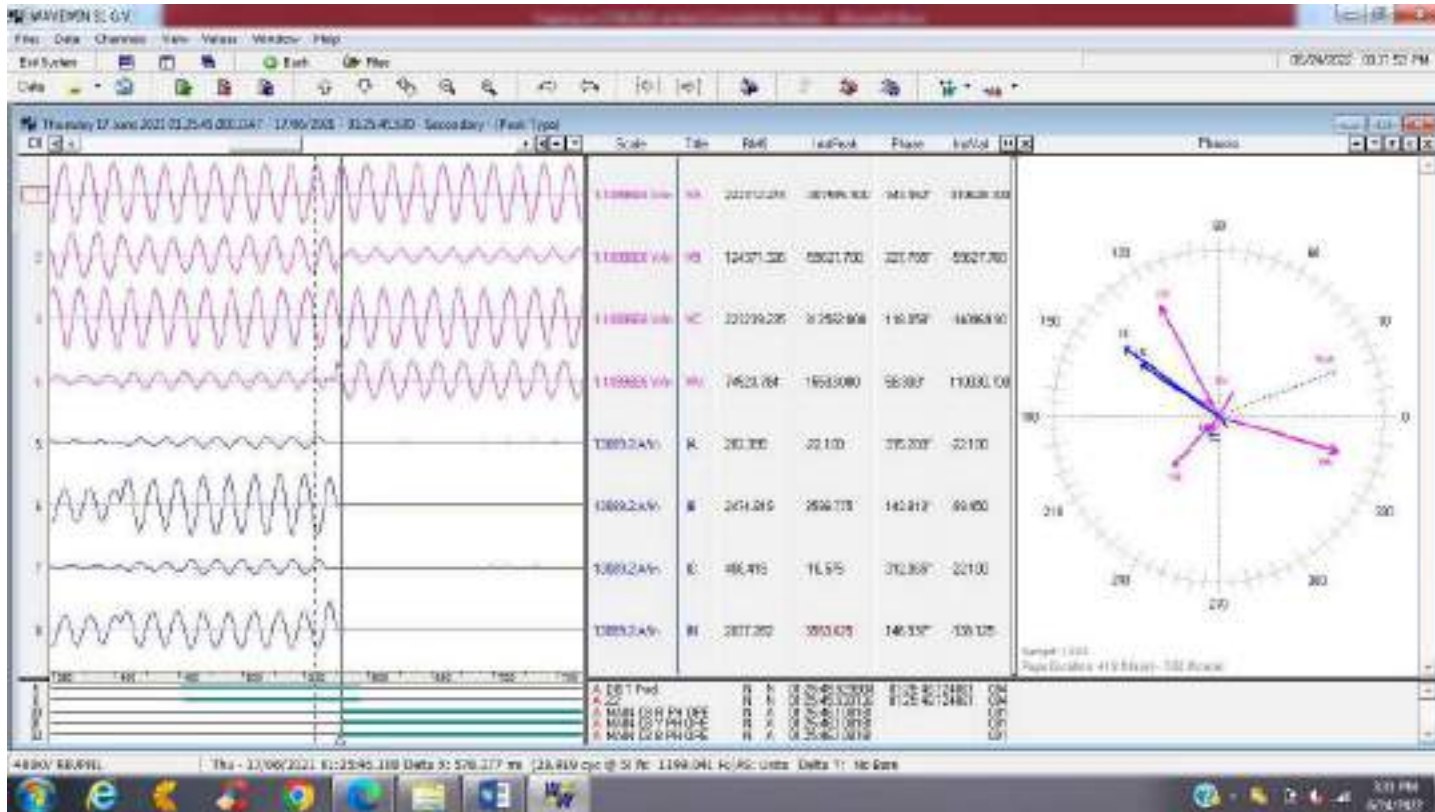
# 400 KV Ramgarh-Akal-II tripping initiation DR



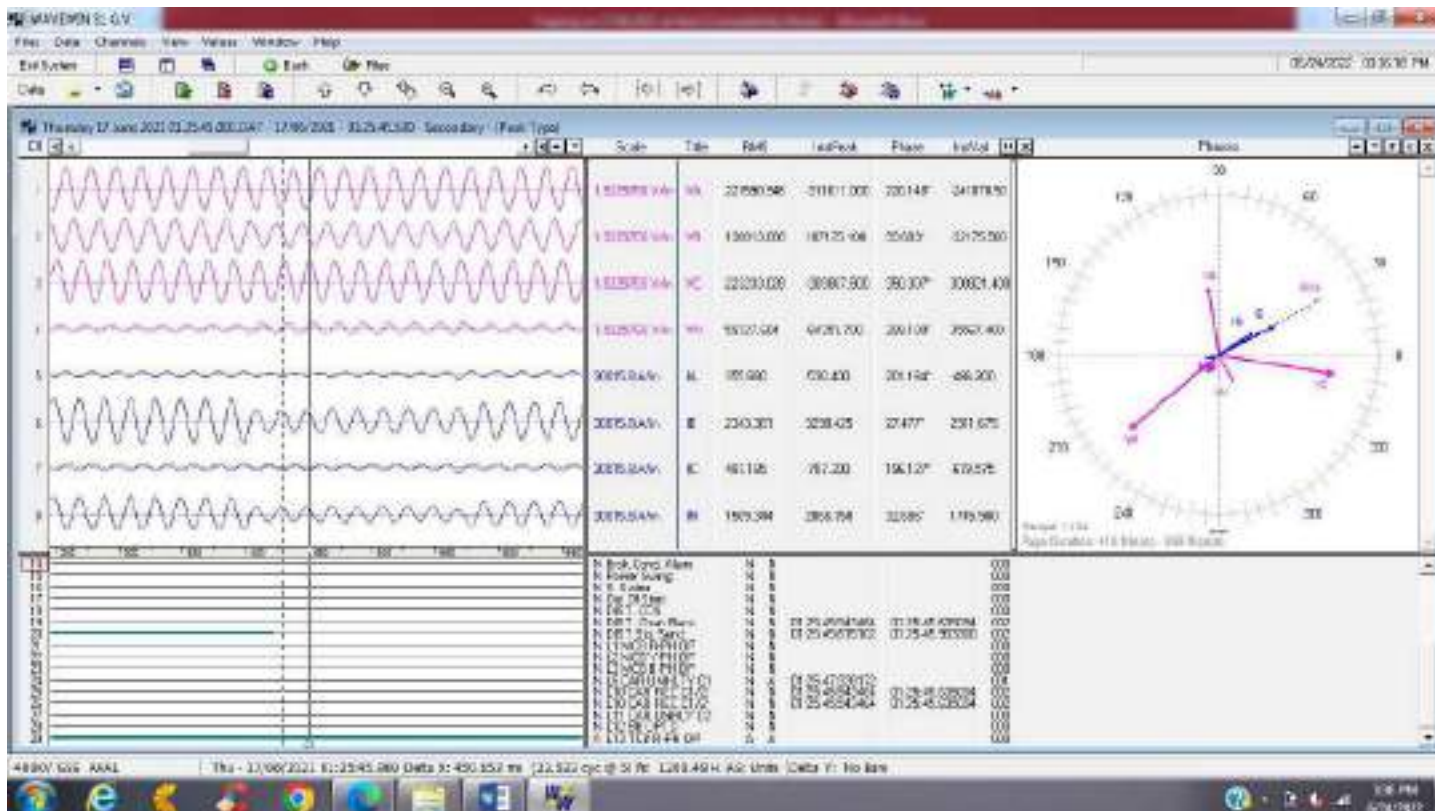
400 KV Ramgarh-Akal-II, 3 phase tripping after trying reclose; breaker opened in 1.084 sec.



- At akal end for Ramgarh-I line, relay picked up in z2 but only Main CB tripped with delayed time of 578 ms. Tie breaker did not opened.



As for Ramgarh-II line, main and tie both breaker did not tripped. LBB also operated but breaker was not tripped.



3. At the end DC source-1 was already out of circuit due to battery cell issue. During this tripping DC source-2 battery charger contactor created a problem due to which sufficient DC current was not pumped to the breaker trip coil to operate the breaker.
4. Both the DC sources have been attended and are running healthy.

# Multiple elements tripping at 220kV Tanakpur(NH)

21-June-2021 14:02 hrs

# Antecedent Condition and Tripped Elements

- Weather Conditions: Normal
- Grid Frequency (Hz): 50.03
- Total IR Import (MW): 13430
- Northern Region Demand (MW): 56973
- Generation loss (MW): 95.00

## **Following elements tripped:-**

- 1) 220 KV Tanakpur(NH)-Sitarganj(PG) (PG) Ckt-1
- 2) 220 KV Tanakpur(NH)-CBGanj(UP) (PG) Ckt-1
- 3) 31.4 MW Tanakpur HPS - UNIT 1
- 4) 31.4 MW Tanakpur HPS - UNIT 2
- 5) 31.4 MW Tanakpur HPS - UNIT 3



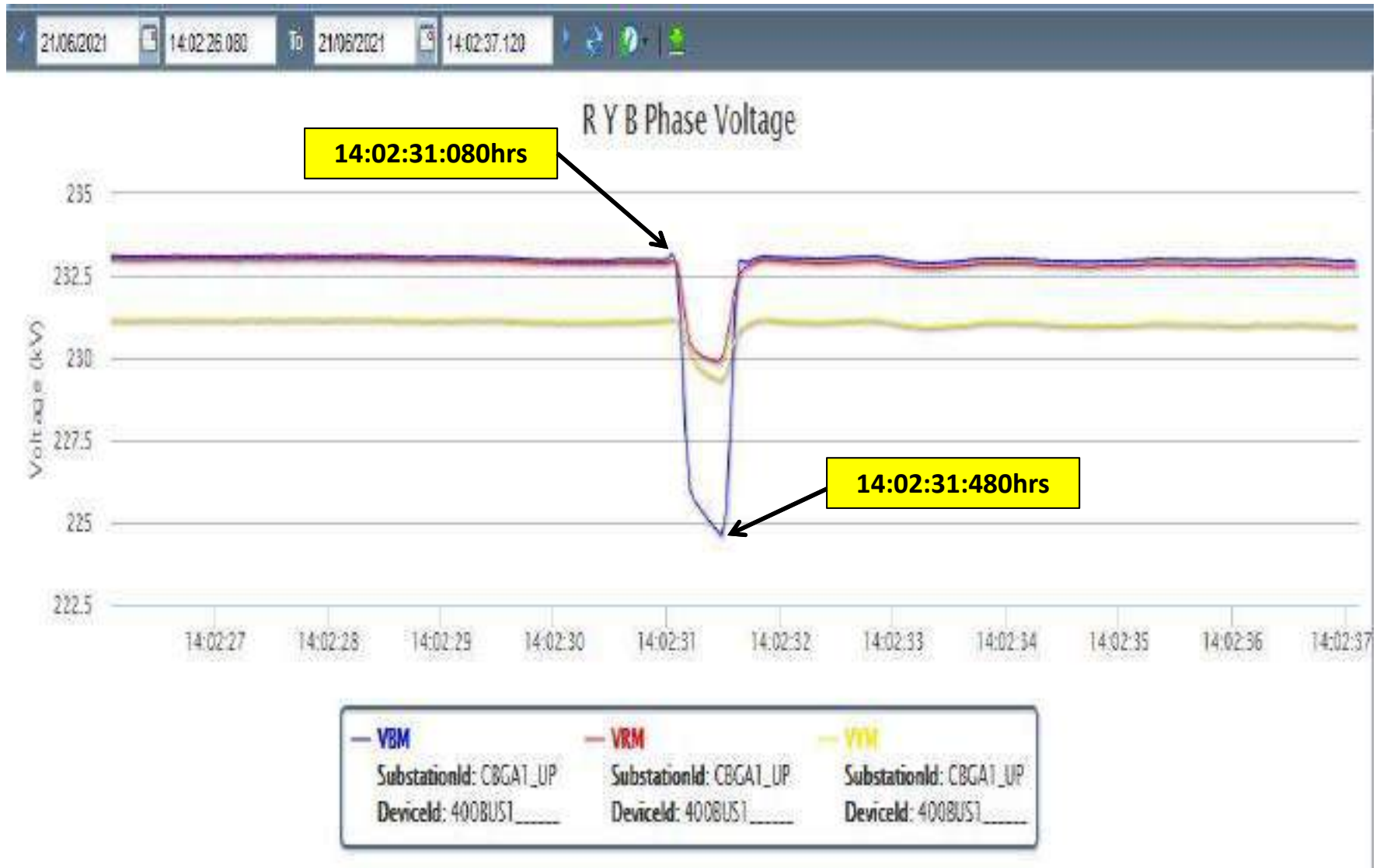
# PMU Plot of frequency at CB Ganj(UP)

14:02hrs/21-June-21

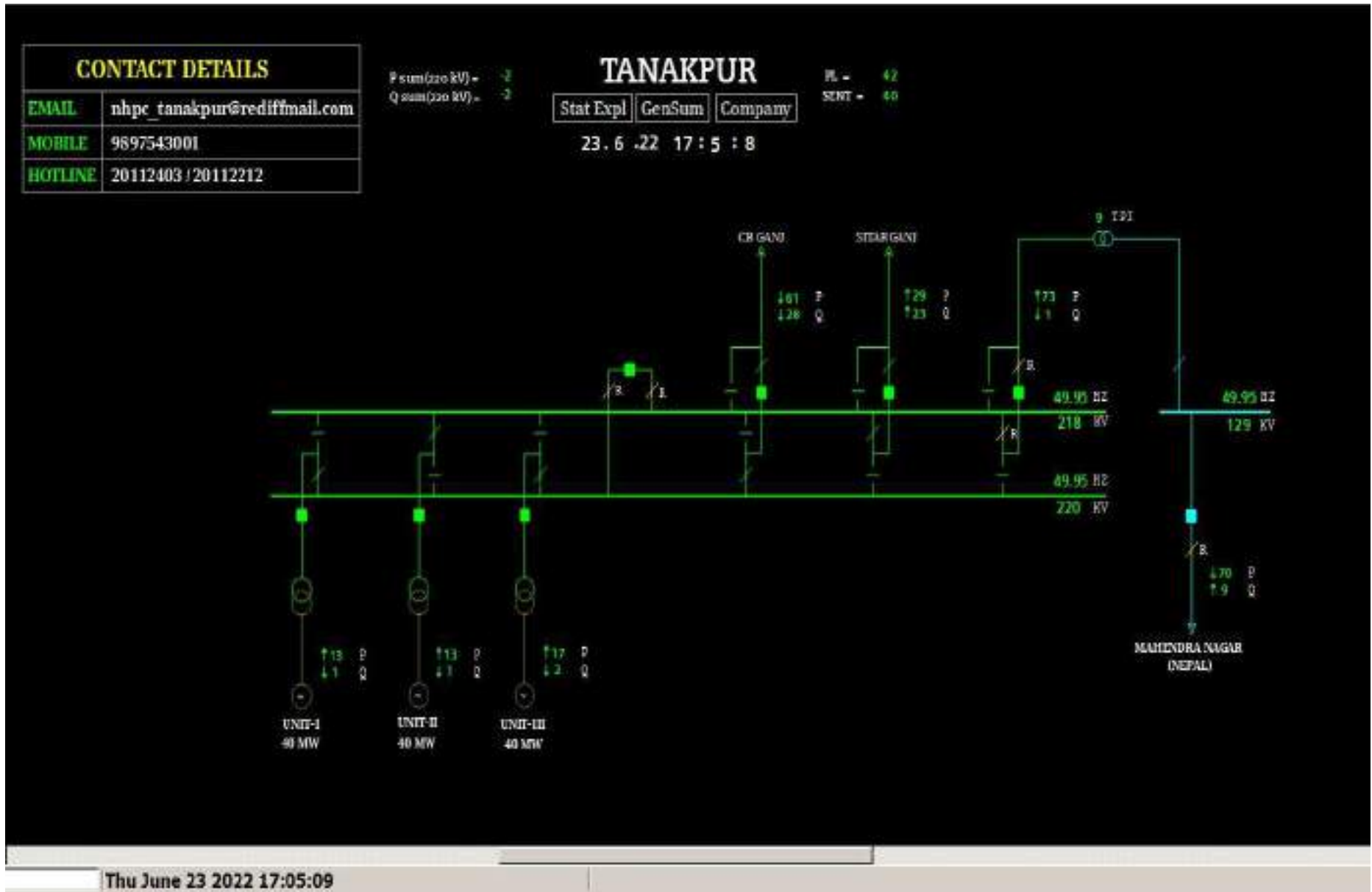


# PMU Plot of phase voltage magnitude at CB Ganj(UP)

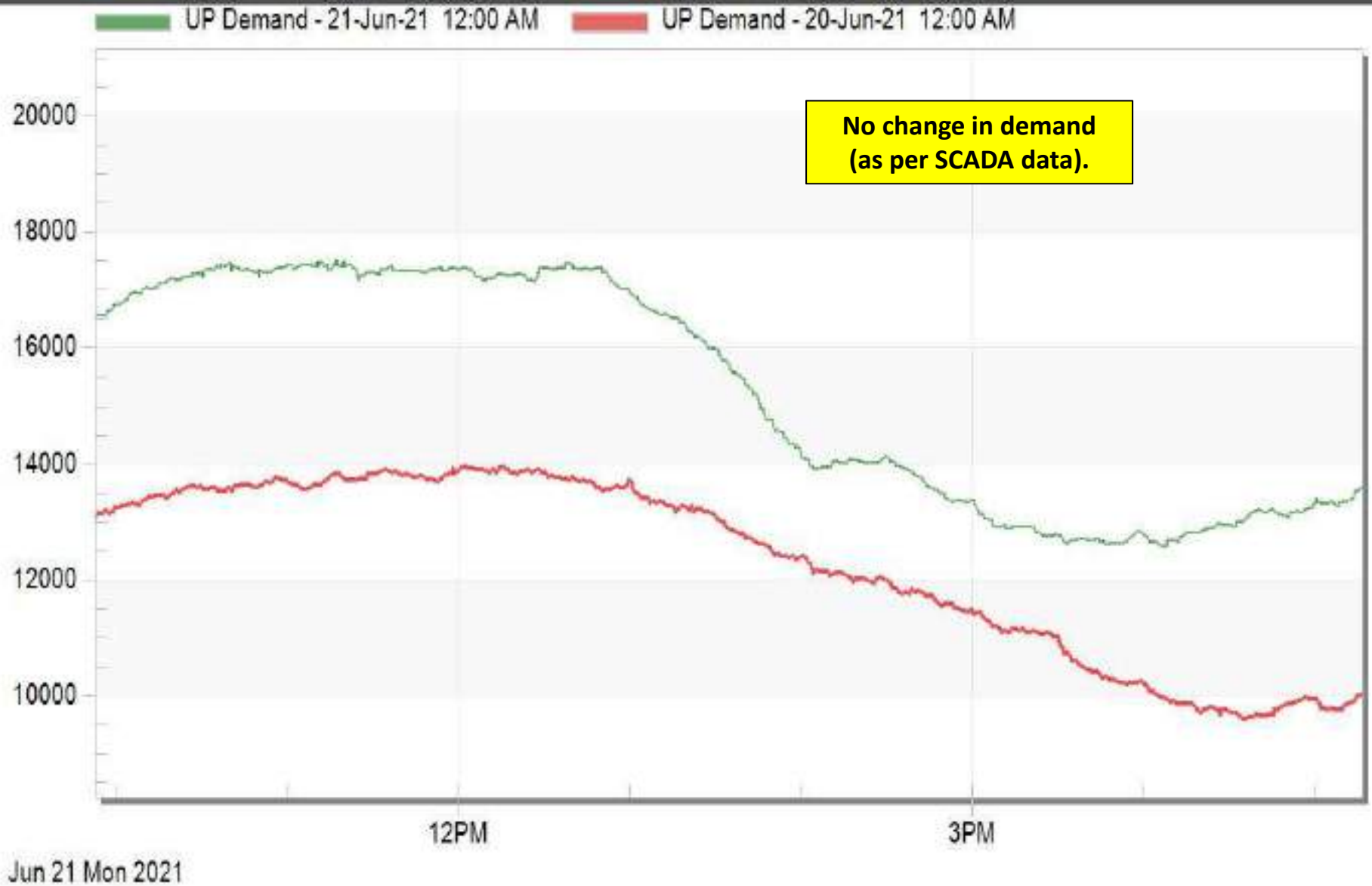
14:02hrs/21-June-21



# SLD of 220kV Tanakpur(NHPC)



# UP Demand during tripping



# Uttarakhand Demand during tripping

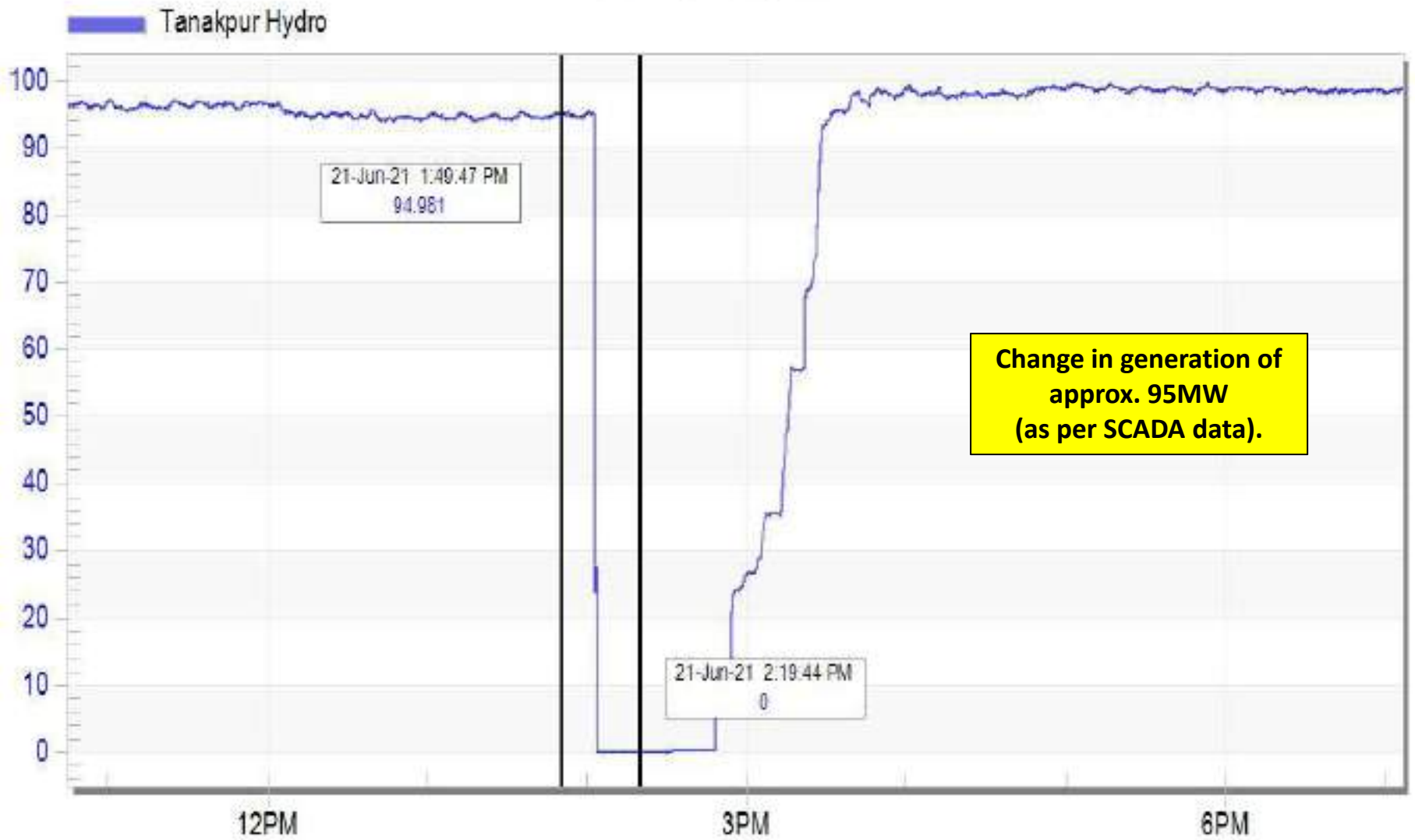
Uttarakhand Demand Met



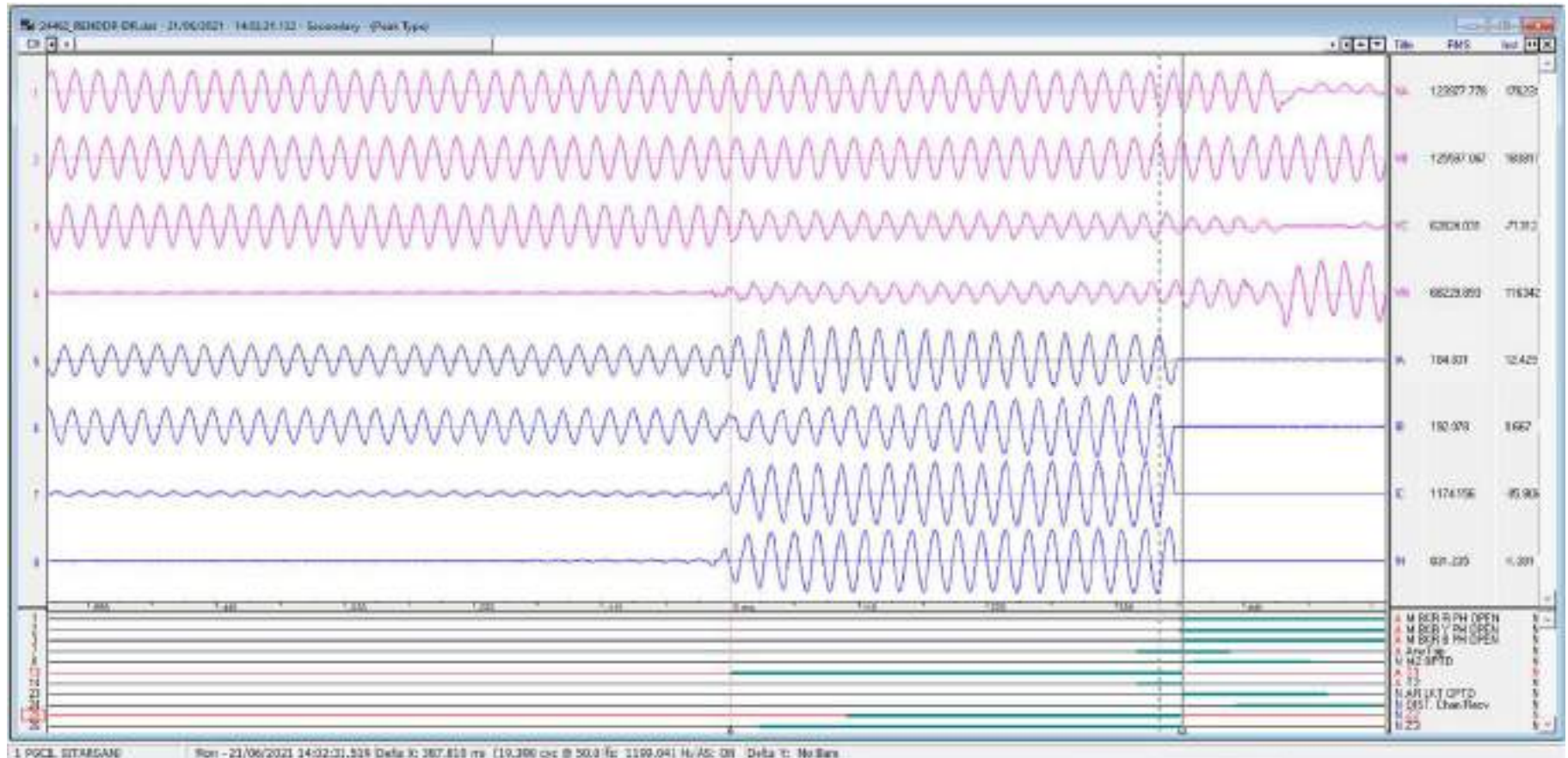
Jun 21 Mon 2021

# Tanakpur(NH) HEP Demand during tripping

Tanakpur Hydro

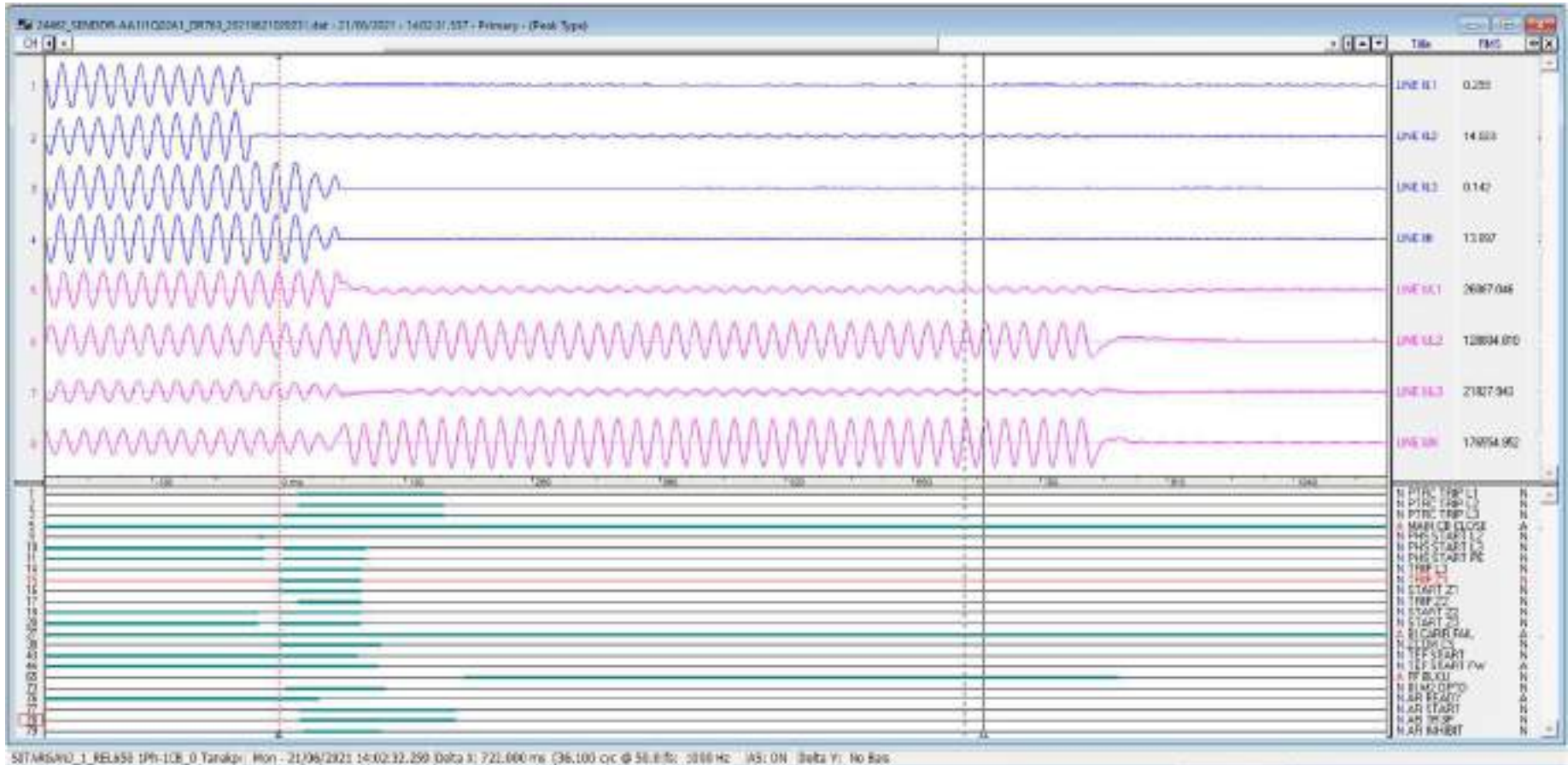


# DR of 220 kV Tanakpur(NH) – Sitarganj (End)-1



1. B-Earth fault visible in DR.
2. Line tripped in Zone-2 after a delay of 370ms.
3. AR under Lockout inspite of Carrier receive from remote end.

# DR of 220 kV Tanakpur(NH) (End)– Sitarganj -1



1. B-Earth fault visible in DR.
2. Line tripped in Zone-1.
3. AR not attempted. Carrier is showing fail.



# Observations

1. Why AR under Lockout inspite of Carrier receive from remote end in 220 kV Tanakpur-Sitarganj -1.
2. Why carrier is fail at Tanakpur for Ckt-1?
3. 220 kV CB Ganj – Tanakpuro(end) – 1 DR channels not configured properly.
4. Why 220 kV Tanakpur – CBganj tripped from CB ganj end?

45<sup>th</sup>

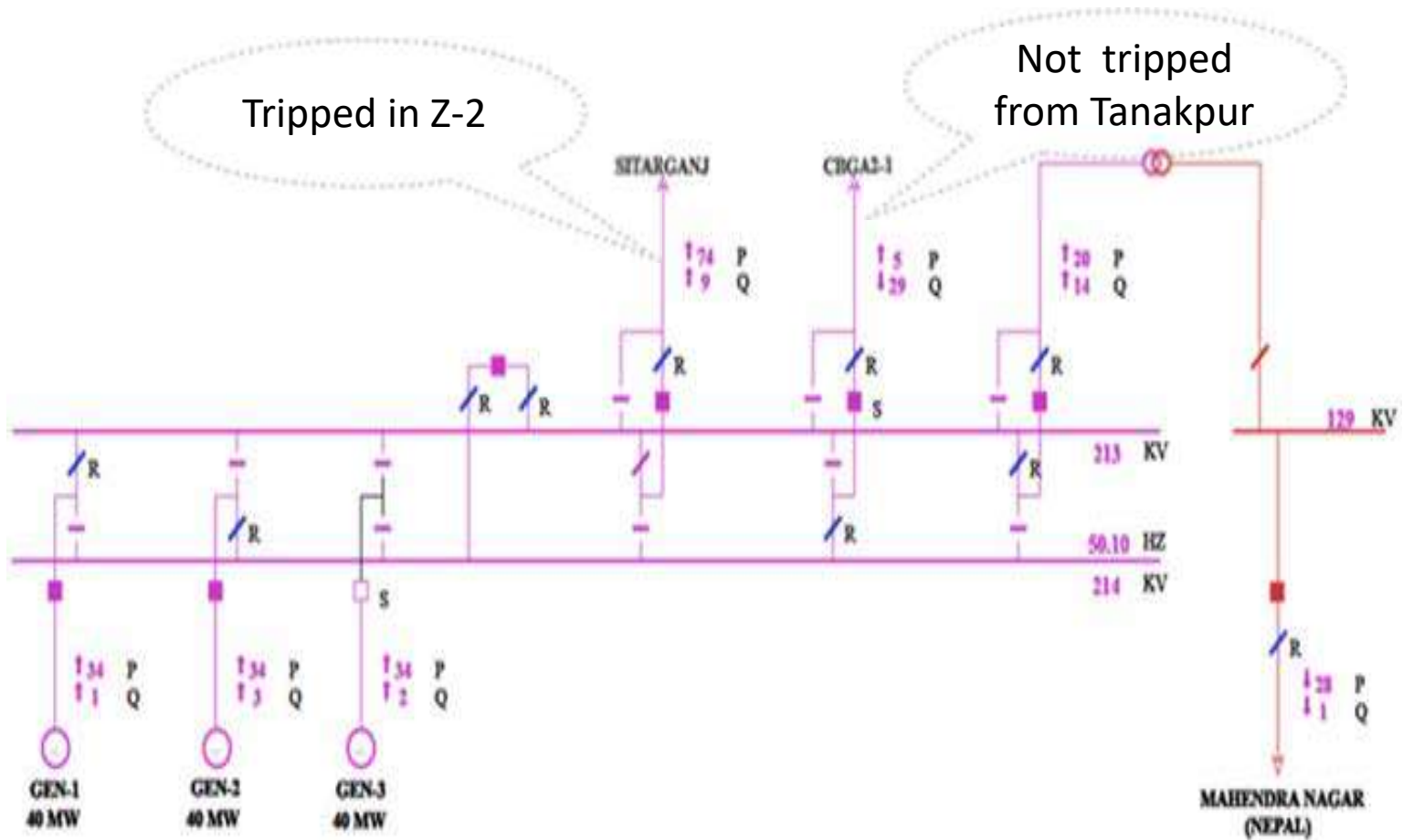
# PCC meeting of NRPC

NHPC Limited

# Tripping at Point No.-7

Tripping of all the three running units of **Tanakpur Power Station(NHPC)** due to line constraints at 14:02 Hrs on 21/06/21

# SLD of Tanakpur PS



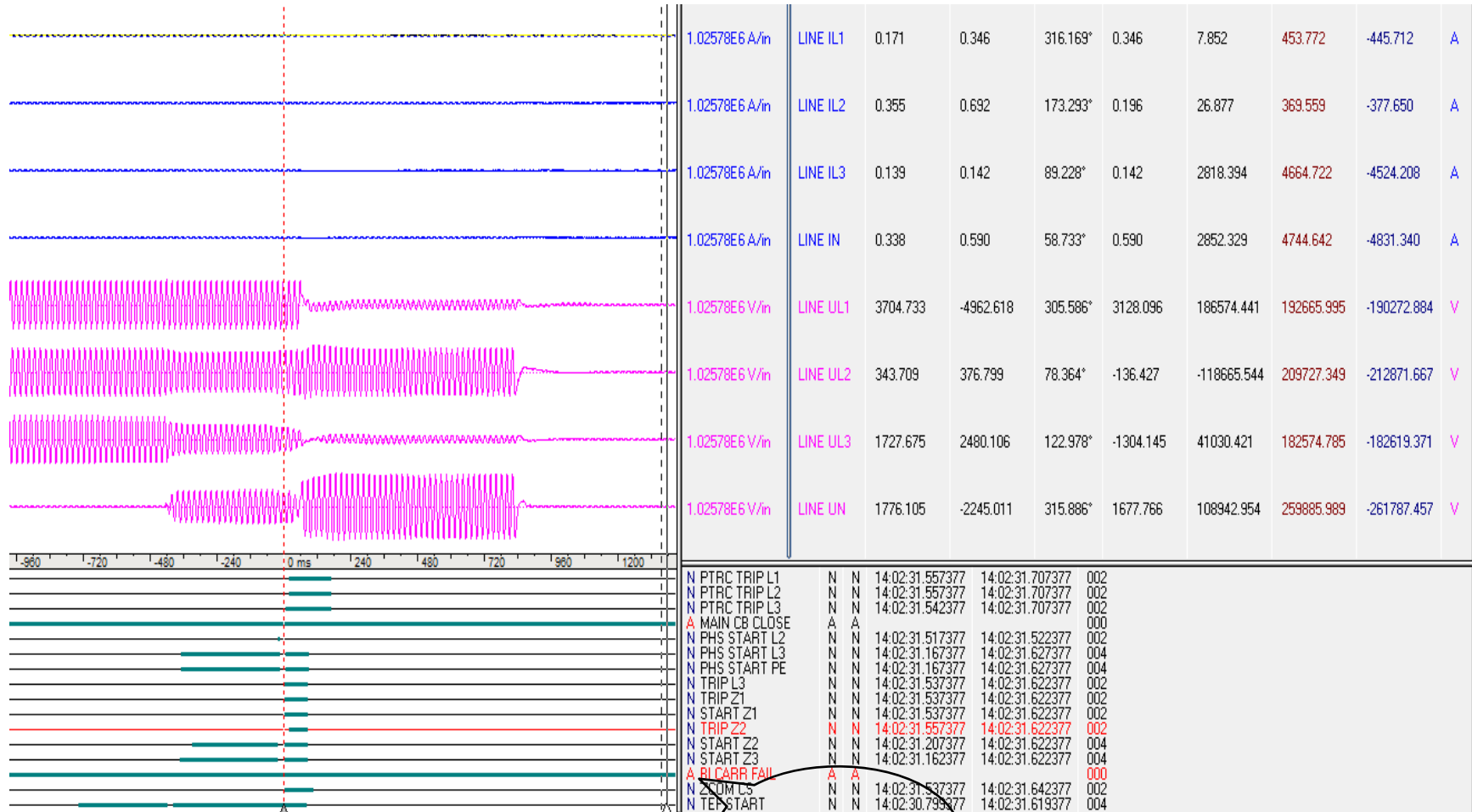
# Elements Tripped on 21/06/2021

क्रम सं	यूनिट / लाइन नाम	से		तक		कुल आउटेज समय	आउटेज के कारण	ऊर्जा नुकसान (मेगावाट)
		तारीख	समय	तारीख	समय			
1	220 KV Tanakpur-CB ganj Line#1	21-Jun-21	14:02:00	21-Jun-21	16:44:00	2:42:00	CB did not trip from Tankpur end, however line CB tripped from remote end	
2	220 KV Tanakpur-Sitaraganj Line#2	21-Jun-21	14:02:00	21-Jun-21	14:46:00	0:44:00	Distance Protection relay operated in Z2	
3	Unit#1	21-Jun-21	14:02:00	21-Jun-21	14:54:00	0:52:00	Over Speed protection operated	33
4	Unit#2	21-Jun-21	14:02:00	21-Jun-21	14:47:00	0:45:00		33
5	Unit#3	21-Jun-21	14:02:00	21-Jun-21	15:21:00	1:19:00		33

# Detail Analysis

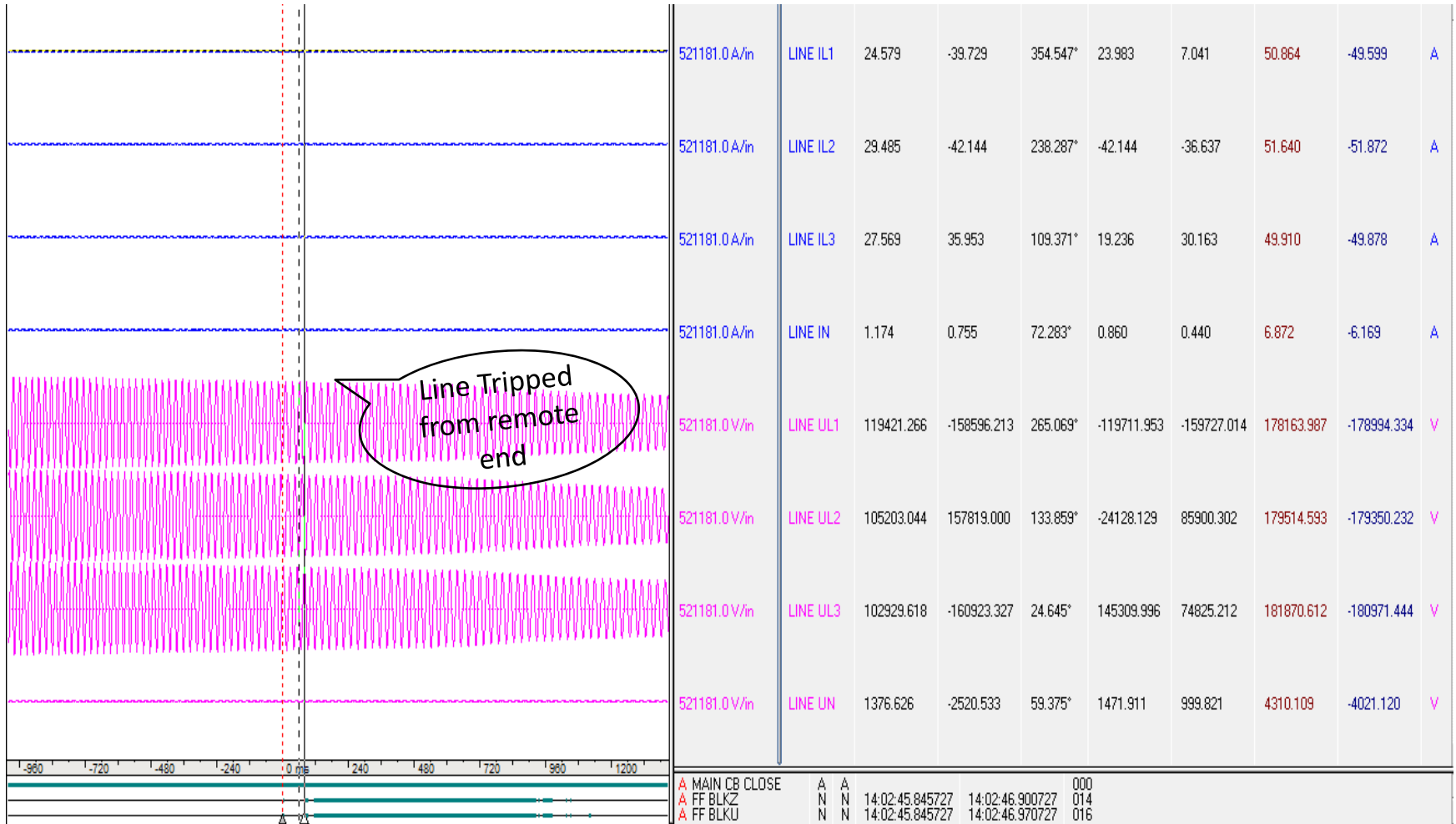
- i. **Tanakpur-Sitaraganj Line#2:-** Relay sensed the fault in Z2 at 14:02:31.209 Hrs and **tripped** after Z2 time delay i.e. at 14:02:31.559 Hrs. Auto reclose did not happen due to carrier fail at Tanakpur end.
- ii. **Tanakpur-CBganj Line#1:-**From the DR of Distance protection relay no fault on the Line observed. Line #1 remain **close** from Tanakpur end. However as reported the line got tripped from remote end. Mahendranagar Line also remain in closed condition from Tanakpur end.
- iii. **Units:-** During the event Tanakpur-Sitaraganj Line#2 was carrying 50 MW (approx.) and Tanakpur-CBganj Line#1 was carrying 11 MW (approx.). Upon tripping of Line#2 & Line#1, due to huge load mismatch, all the three running units tripped on operation of over speed protection.

# Relay DR of Tanakpur-Sitaraganj Line#2



Carrier fail

# Relay DR of Tanakpur-CBganj Line#1





# Points of discussion

1. Why AR under Lockout in spite of Carrier receive from remote end in 220 kV Tanakpur-Sitarganj –1 ?

**The carrier fail indication persisted during the fault. Accordingly AR did not happen and line tripped after Zone-2 time delay.**

2. Why carrier is fail at Tanakpur for Ckt-1?

**The Maintenance of PLCC is being looked after by M/s PGCIL. The problem was already communicated to M/s PGCIL.**

3. 220 kV Bareilly – Tanakpur – 1 DR channels not configured properly.

**Not pertaining to NHPC**

4. Why 220 kV Tanakpur – CB ganj tripped from CB ganj end?

**Not pertaining to NHPC**

# Remedial Measures

- **M/s PGCIL has restored the PLCC system & now PLCC is healthy.**

# Multiple elements tripping at 400/220kV Bamnoli(DV)

09-July-2021 10:24 hrs

# Antecedent Condition and Tripped Elements

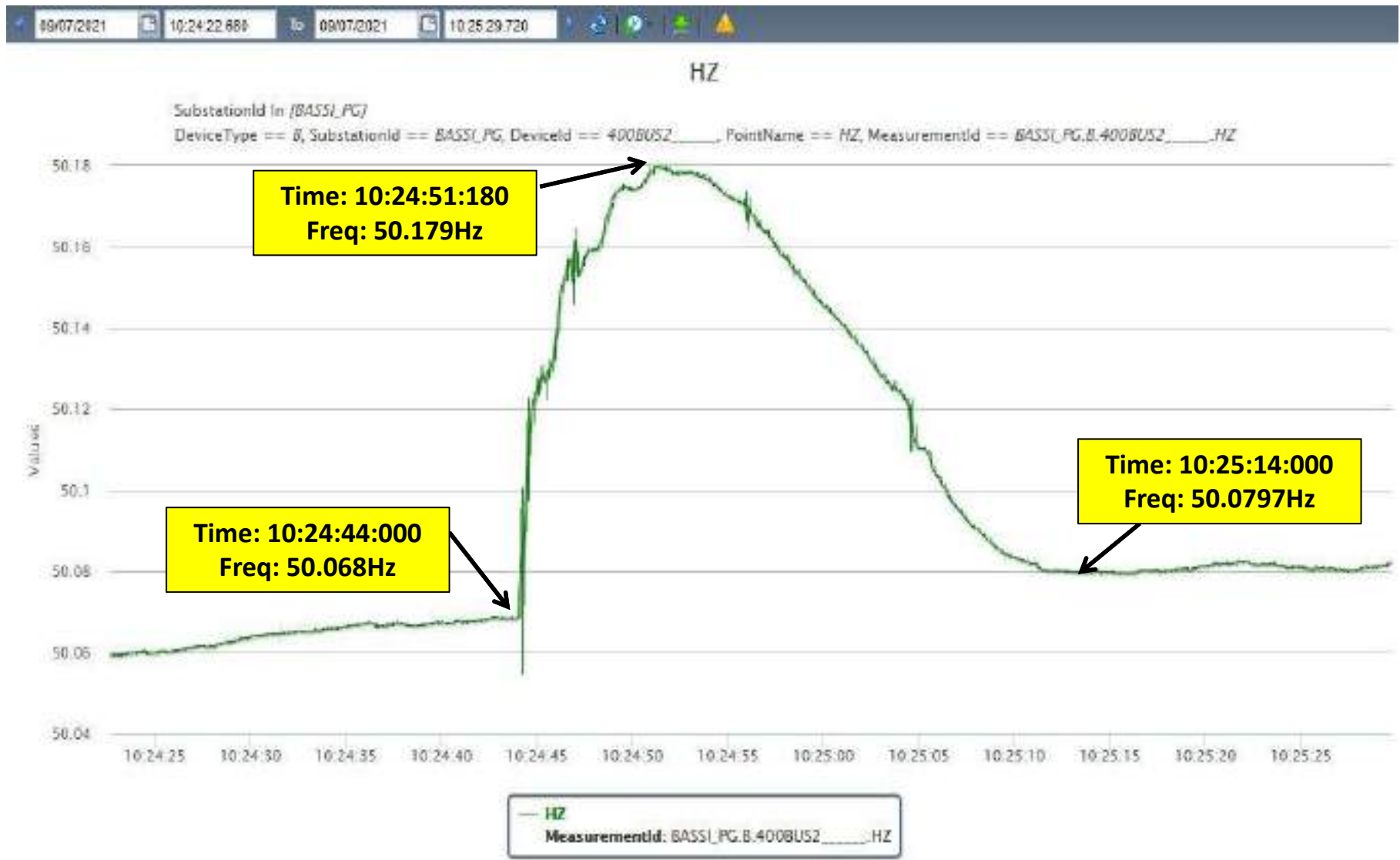
- Weather Conditions: Normal
- Grid Frequency (Hz): 50.09
- Total IR Import (MW): 14892
- Northern Region Demand (MW): 68985
- Load loss (MW): 950

## **Following elements tripped:-**

- 1) 400/220 kV 315 MVA ICT 4 at Bamnoli(DV)
- 2) 400/220 kV 500 MVA ICT 2 at Bamnoli(DV)
- 3) 400/220 kV 315 MVA ICT 1 at Bamnoli(DV)
- 4) 400/220 kV 500 MVA ICT 3 at Bamnoli(DV)
- 5) 220kV Bamnauli-Pappankalan 1-1
- 6) 220kV Bamnauli-Pappankalan 1-2
- 7) 220kV Bamnauli-Pappankalan 2-1
- 8) 220kV Bamnauli-Pappankalan 2-2
- 9) 220kV Bamnauli-Pappankalan 3-1
- 10) 220kV Bamnauli-Pappankalan 3-2
- 11) 220kV Bamnauli-DIAL-1 , 220kV Bamnauli-DIAL-2
- 12) 220kV Bamnauli-Najafgarh-1 , 220kV Bamnauli-Najafgarh-2

# PMU Plot of frequency at Bassi(PG)

10:24hrs/09-July-21



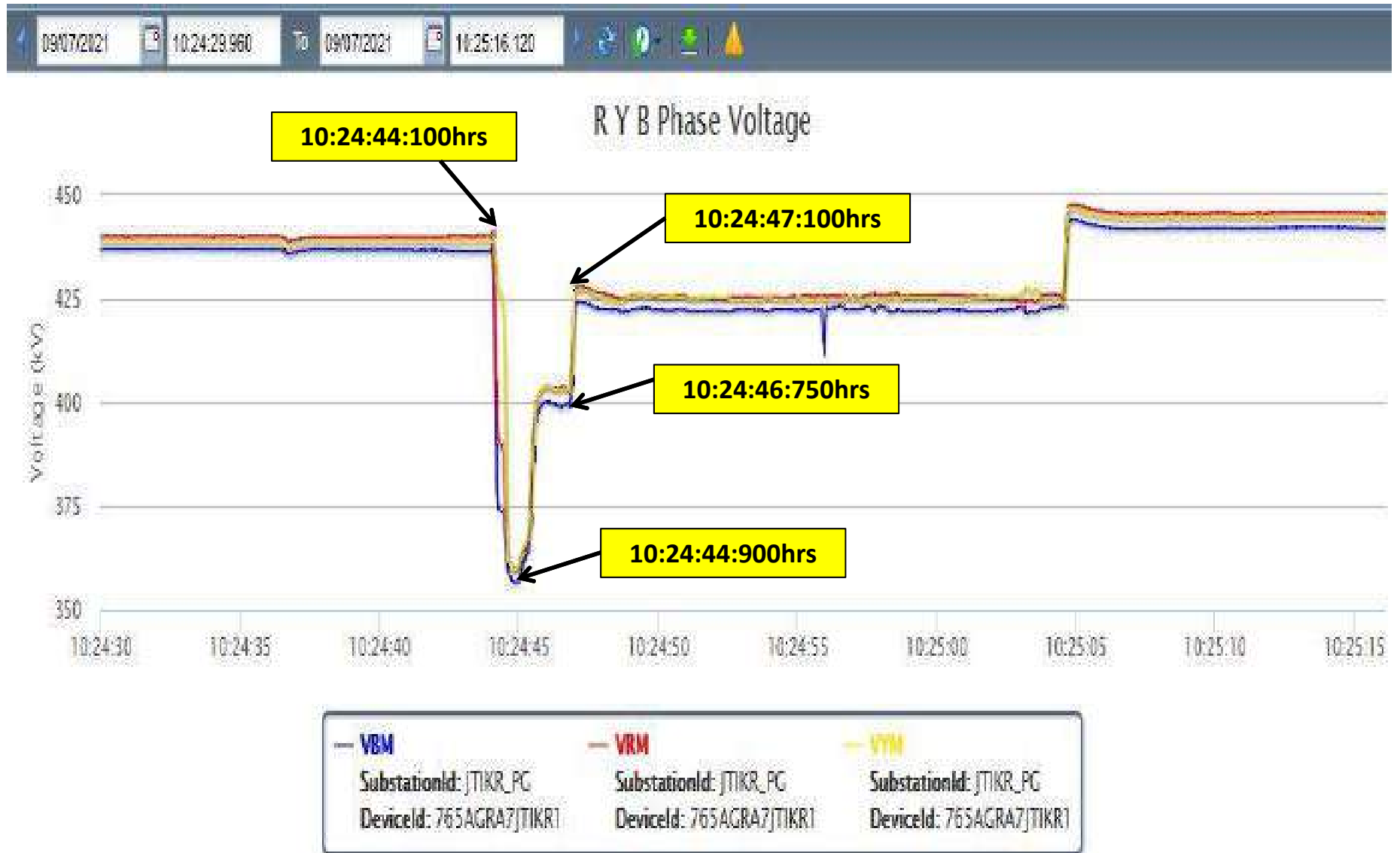
# PMU Plot of phase voltage magnitude at Bamnoli(DV)

10:24hrs/09-July-21

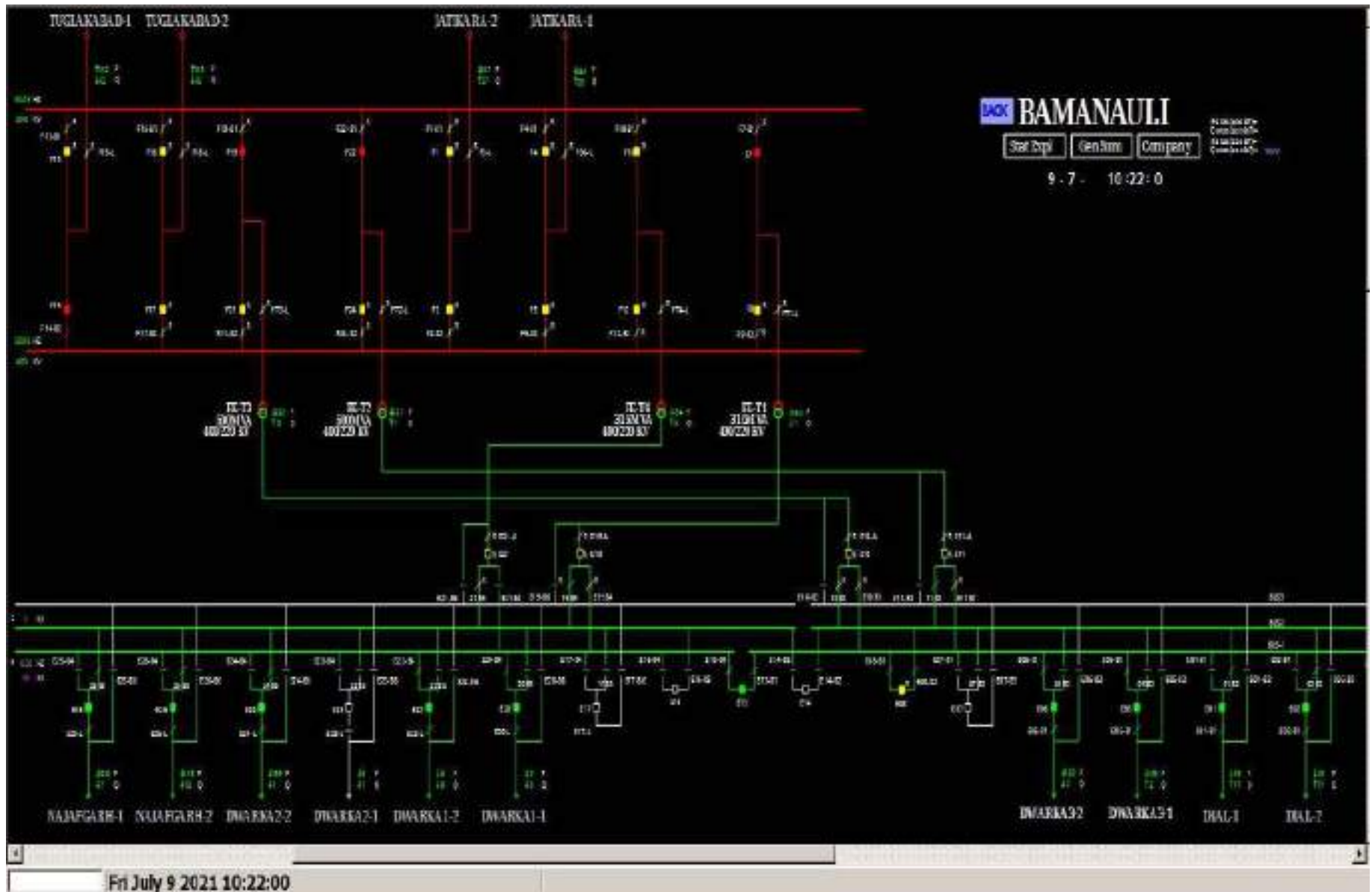


# PMU Plot of phase voltage magnitude at Jhatikra(PG)

10:24hrs/09-July-21

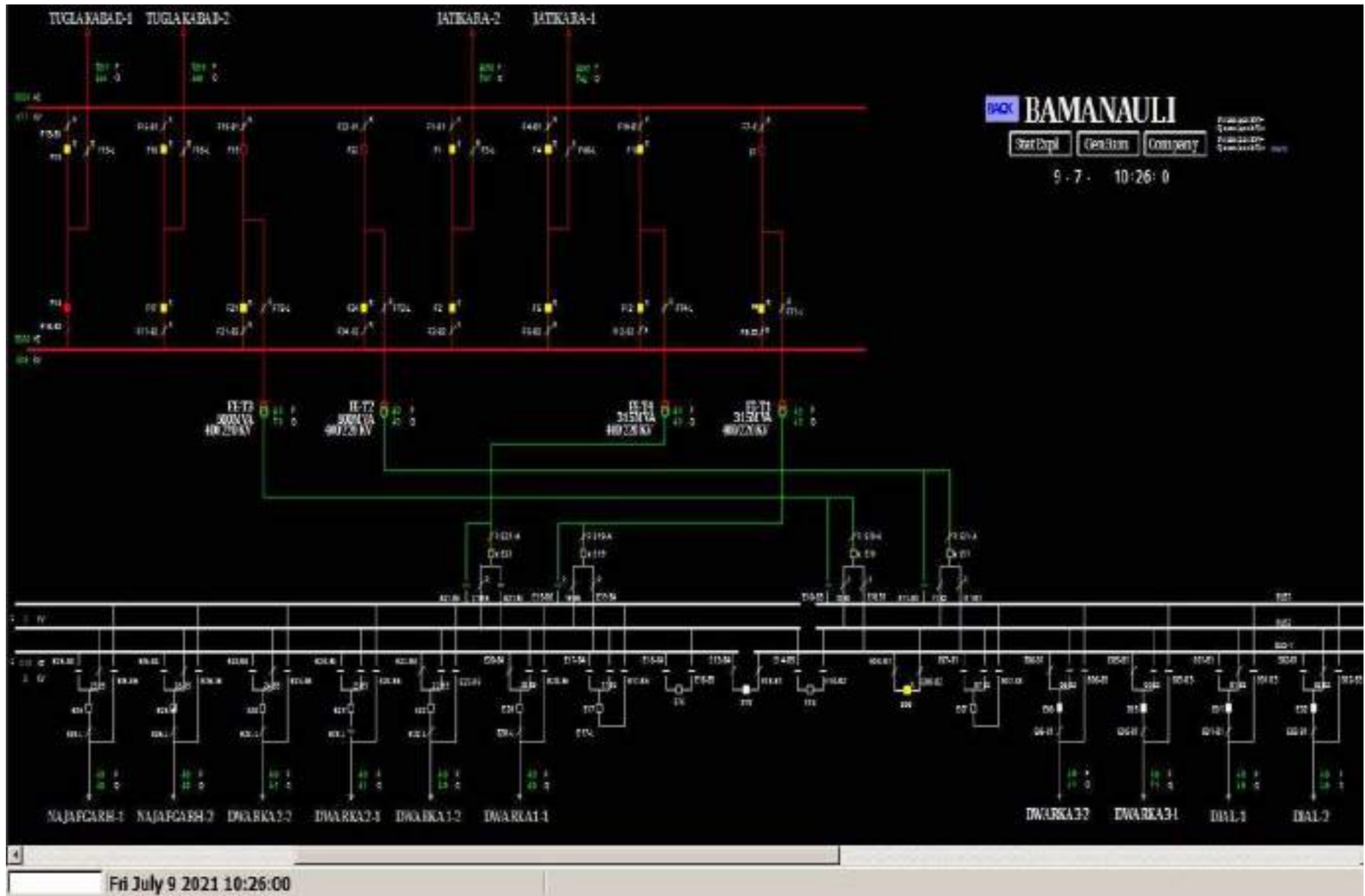


# SLD of 400/220kV Bamnauli(DV) before the tripping





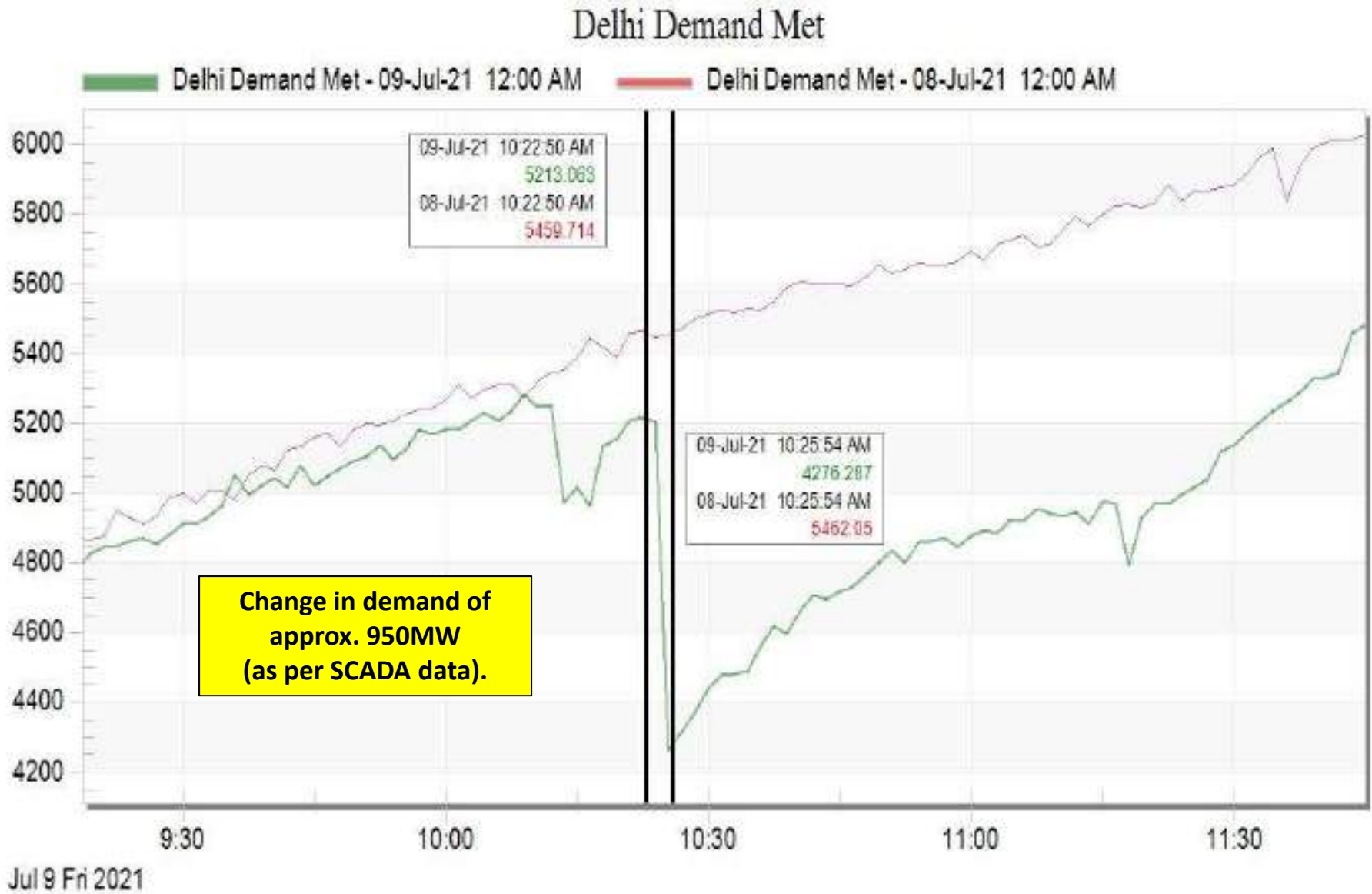
# SLD of 400/220kV Bamnauli(DV) after the tripping



# SCADA SOE

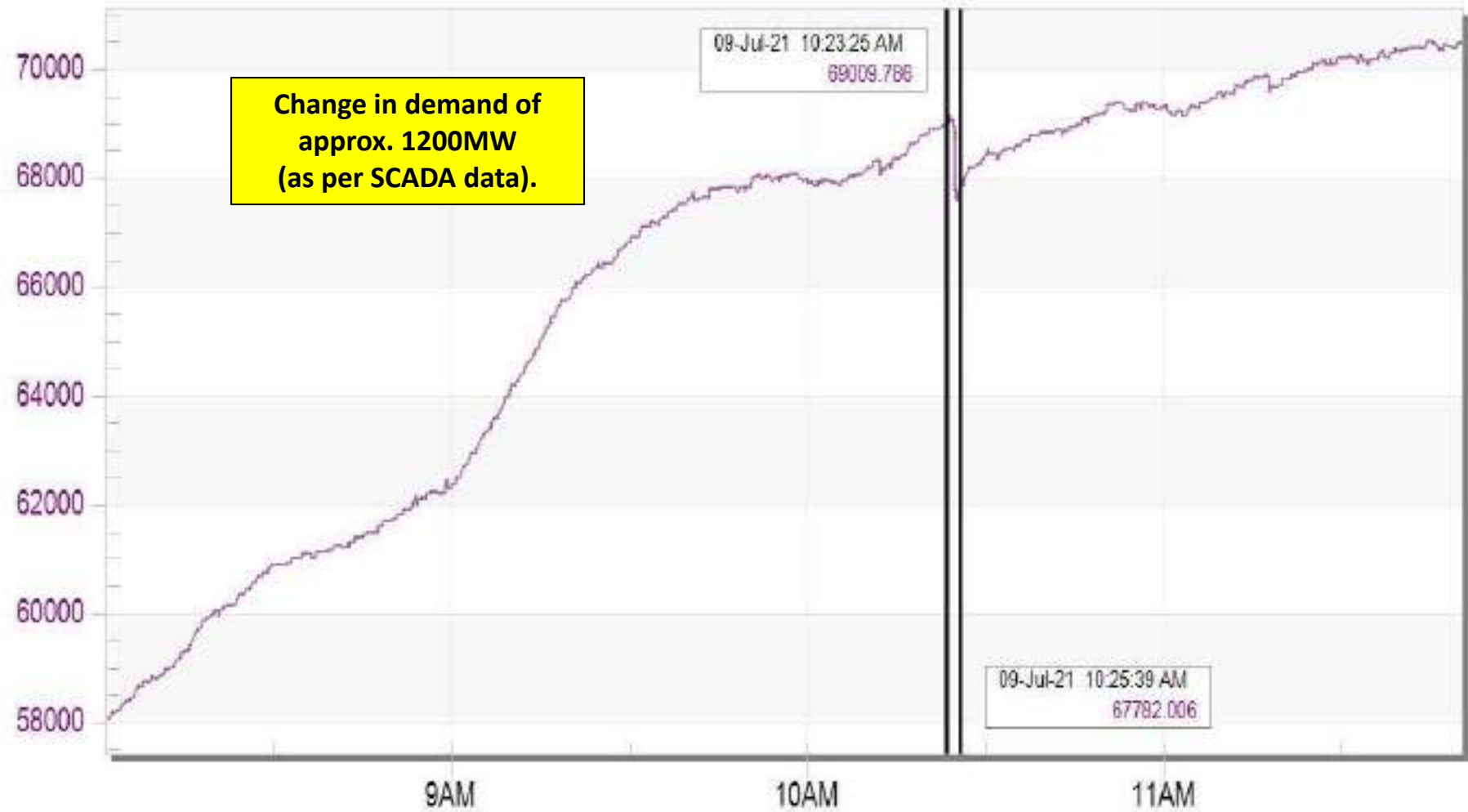
Time	Station Name	Voltage	Element Name	Element Type	Element Status
10:11:31,841	BAMNAULI	220kV	16MBC2	Circuit Breaker	Open
10:11:59,546	BAMNAULI	220kV	14BS2	Circuit Breaker	Open
10:24:44,997	DAIL__DV	220kV	E_07(BAMNL-2)	Circuit Breaker	Open
10:24:45,037	DAIL__DV	220kV	E_06(BAMNL-1)	Circuit Breaker	Open
10:24:45,426	BAMNAULI	400kV	F_19(ICT-3 BUS-1)	Circuit Breaker	Open
10:24:46,924	BAMNAULI	400kV	F_22(ICT-2 BUS-1)	Circuit Breaker	Open
10:25:04,641	BAMNAULI	400kV	F_7(ICT-1 BUS-1)	Circuit Breaker	Open
10:25:45,654	BAMNAULI	220kV	E_22(DWRK1-2)	Circuit Breaker	Open
10:25:54,531	BAMNAULI	220kV	E_20(DWRK1-1)	Circuit Breaker	Open
10:25:57,564	BAMNAULI	220kV	E_24(DWRK2-2)	Circuit Breaker	Open
10:25:58,459	BAMNAULI	220kV	E_26(NAJAG-2)	Circuit Breaker	disturbe
10:25:59,458	BAMNAULI	220kV	E_25(NAJAG-1)	Circuit Breaker	Open

# Delhi Demand during tripping



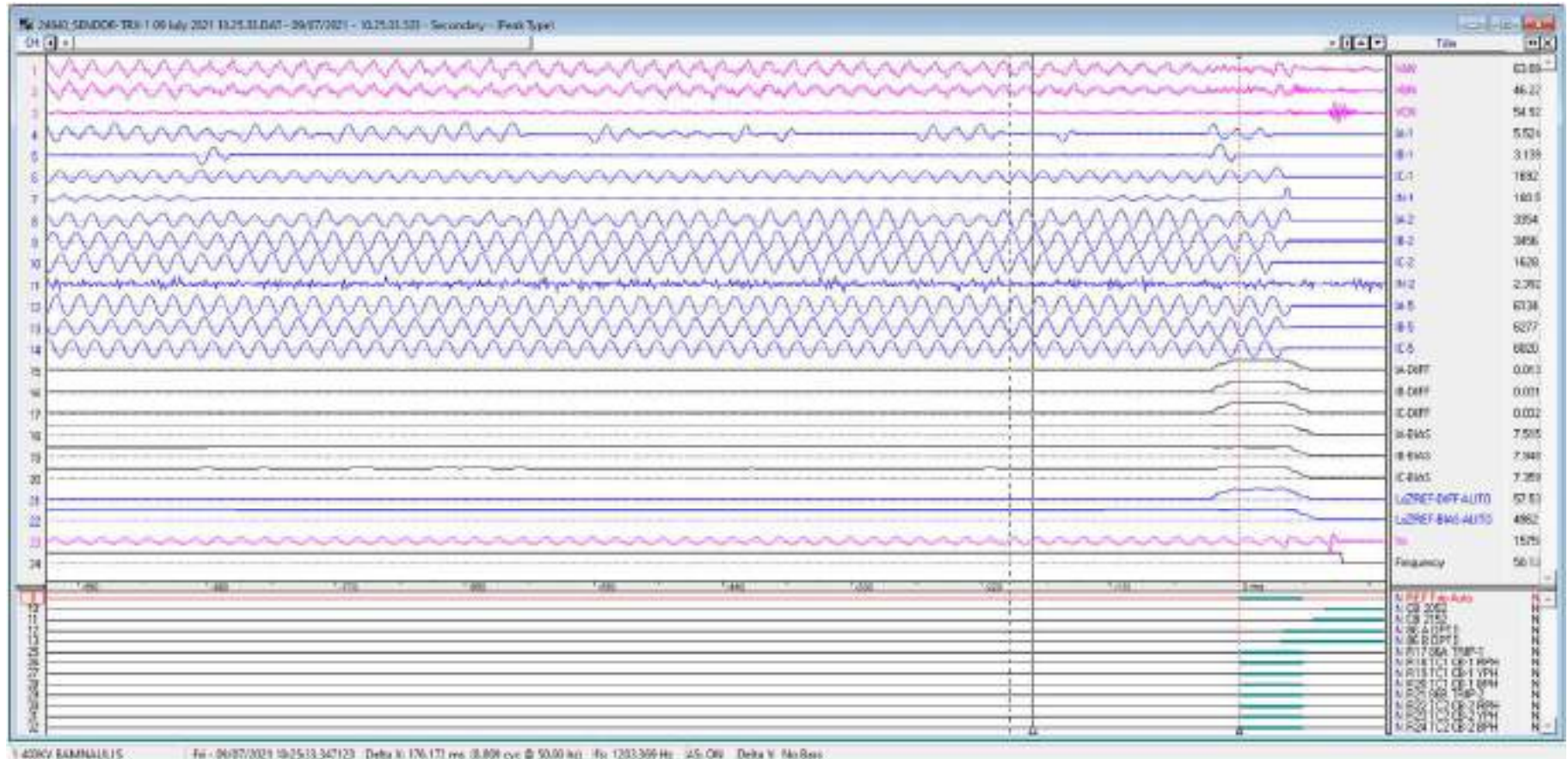
# NR Demand during tripping

NR Demand Met - 09-Jul-21 8:01:46 AM



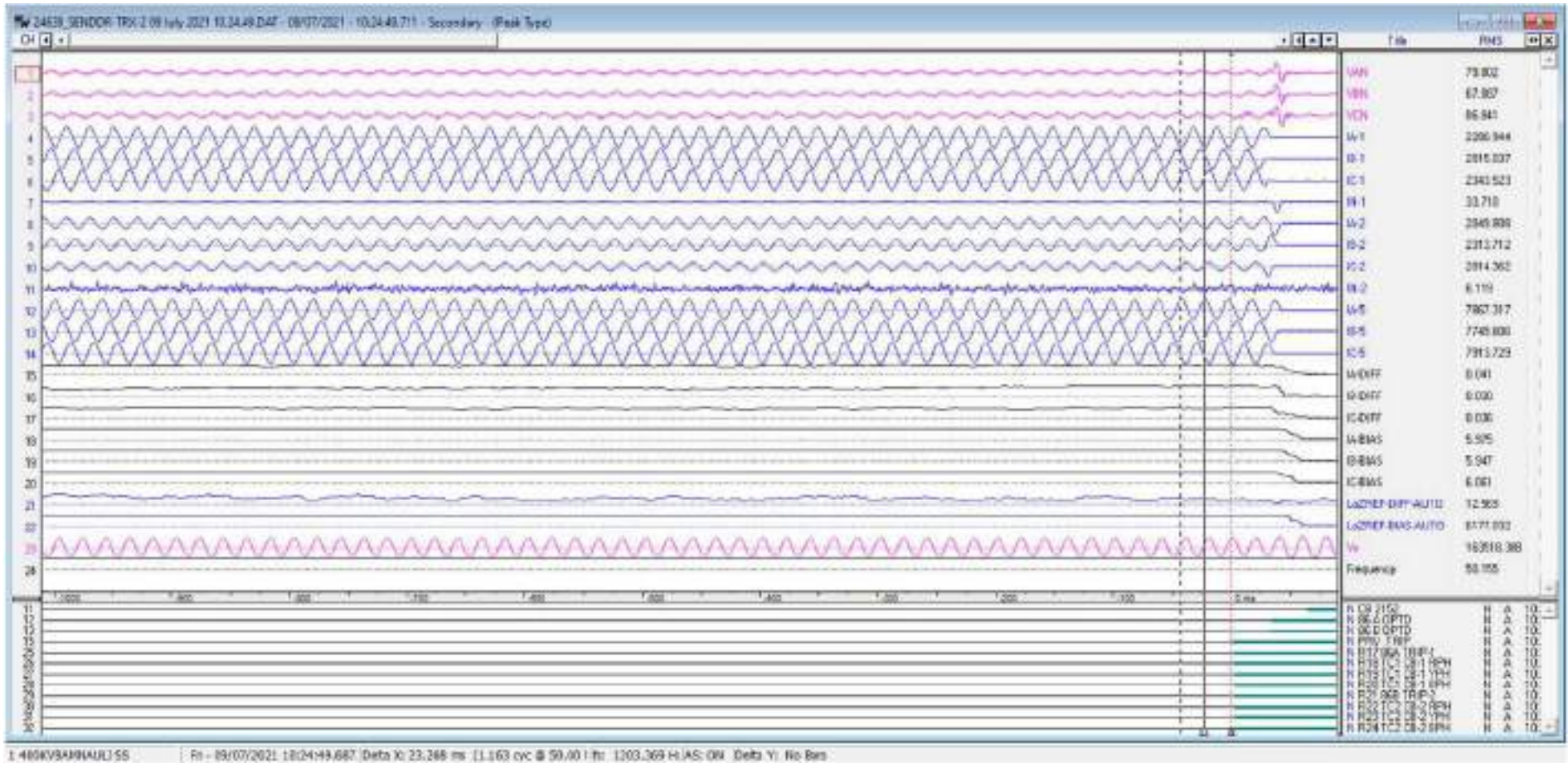
Jul 9 Fri 2021

# DR of 315 MVA ICT-1 at Bamnauli



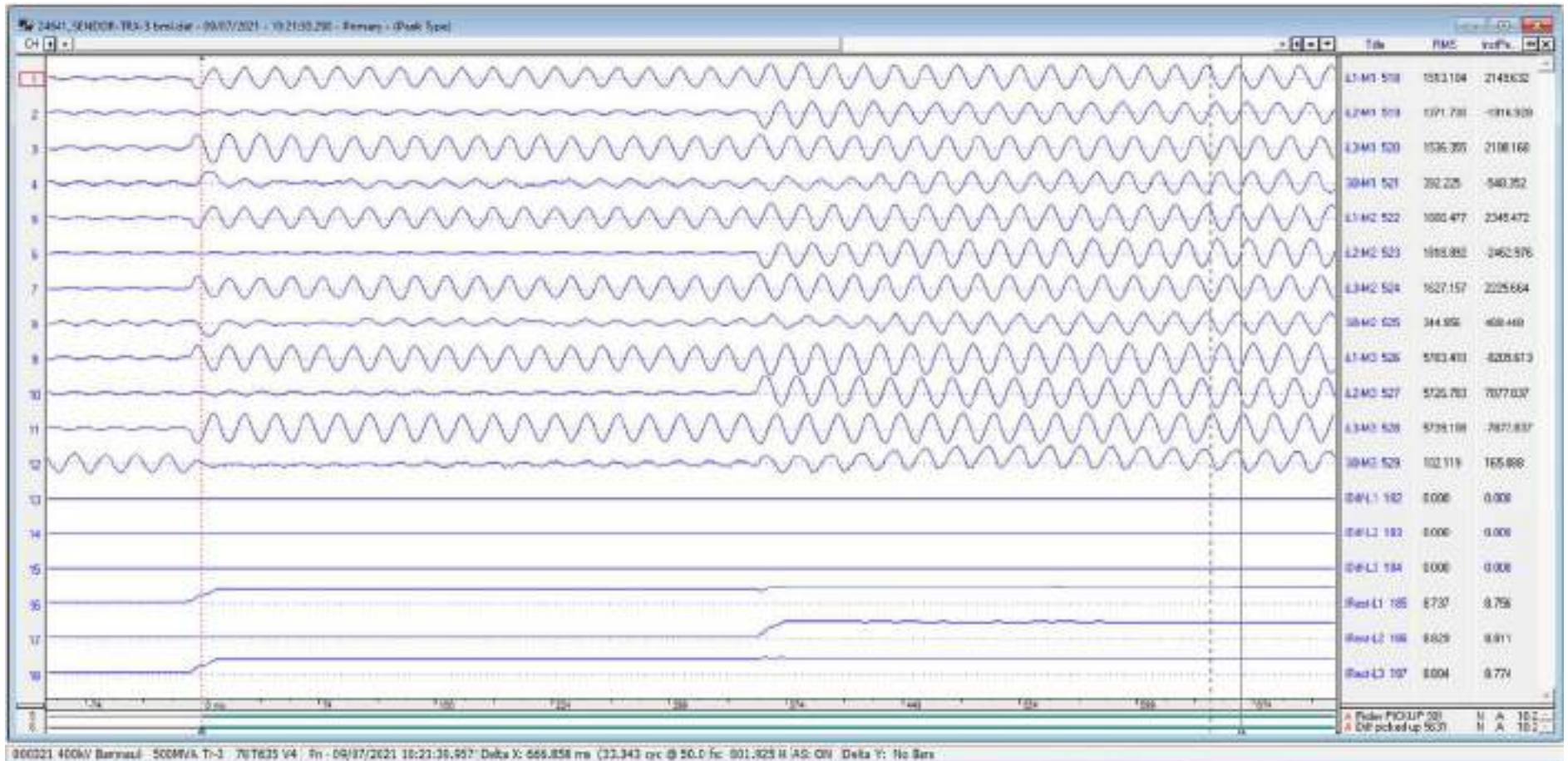
1. REF trip visible in DR.

# DR of 500 MVA MVA ICT-2 at Bamnauli



1. PRV trip visible in DR.

# DR of 500 MVA MVA ICT-3 at Bamnauli



1. Differential start visible. No trip signal.

# Observations

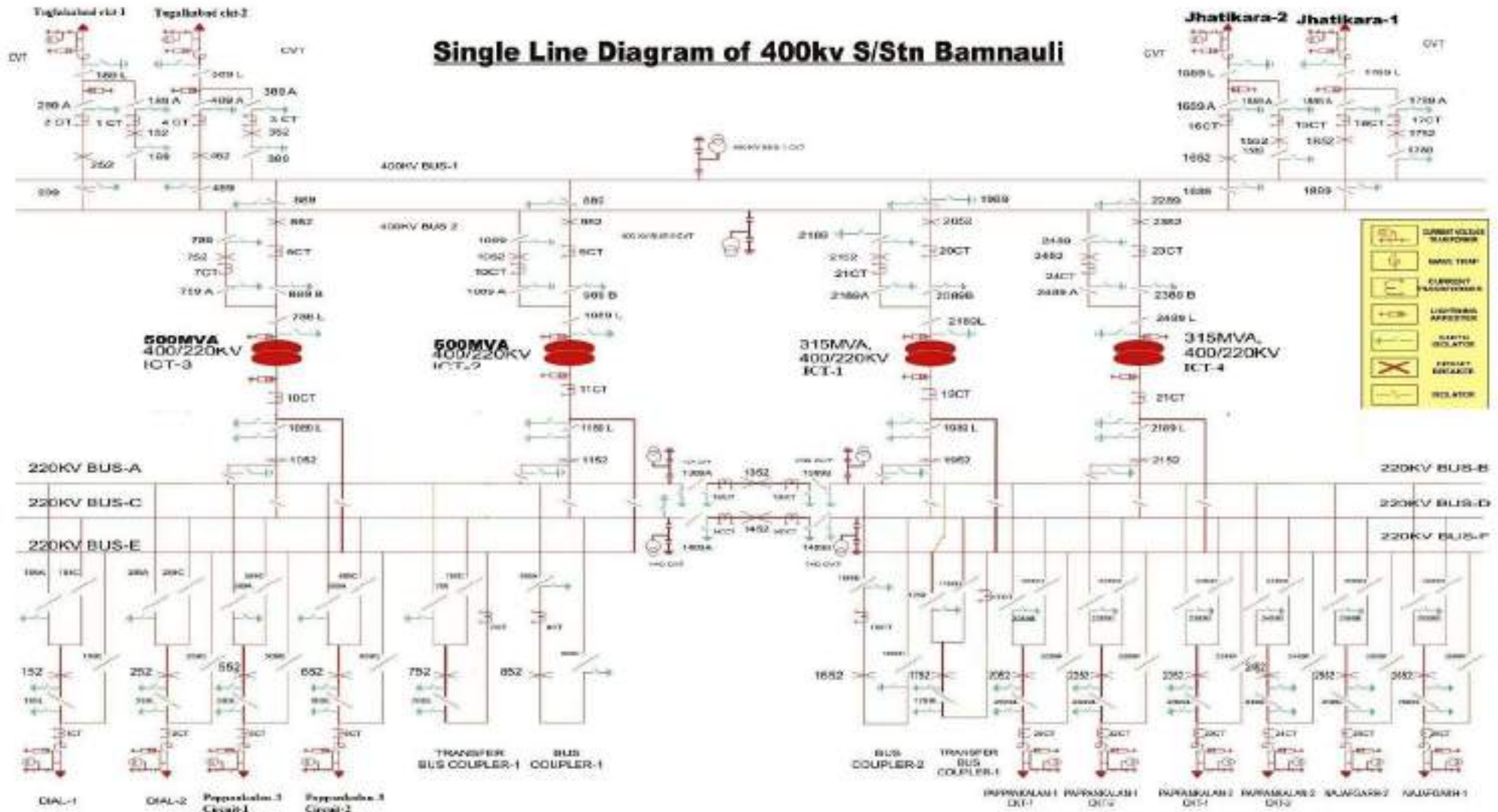
1. Reason of delayed clearance of fault?
2. Why did 220kV Bamnauli-DIAL-1 & DIAL-2 tripped before 400/220 kV 315 MVA ICT 1 at Bamnoli(DV)?(as per SOE obtained at NRLDC)
3. Exact sequence of tripping of elements and detailed tripping report needs to be shared with remedial action taken.



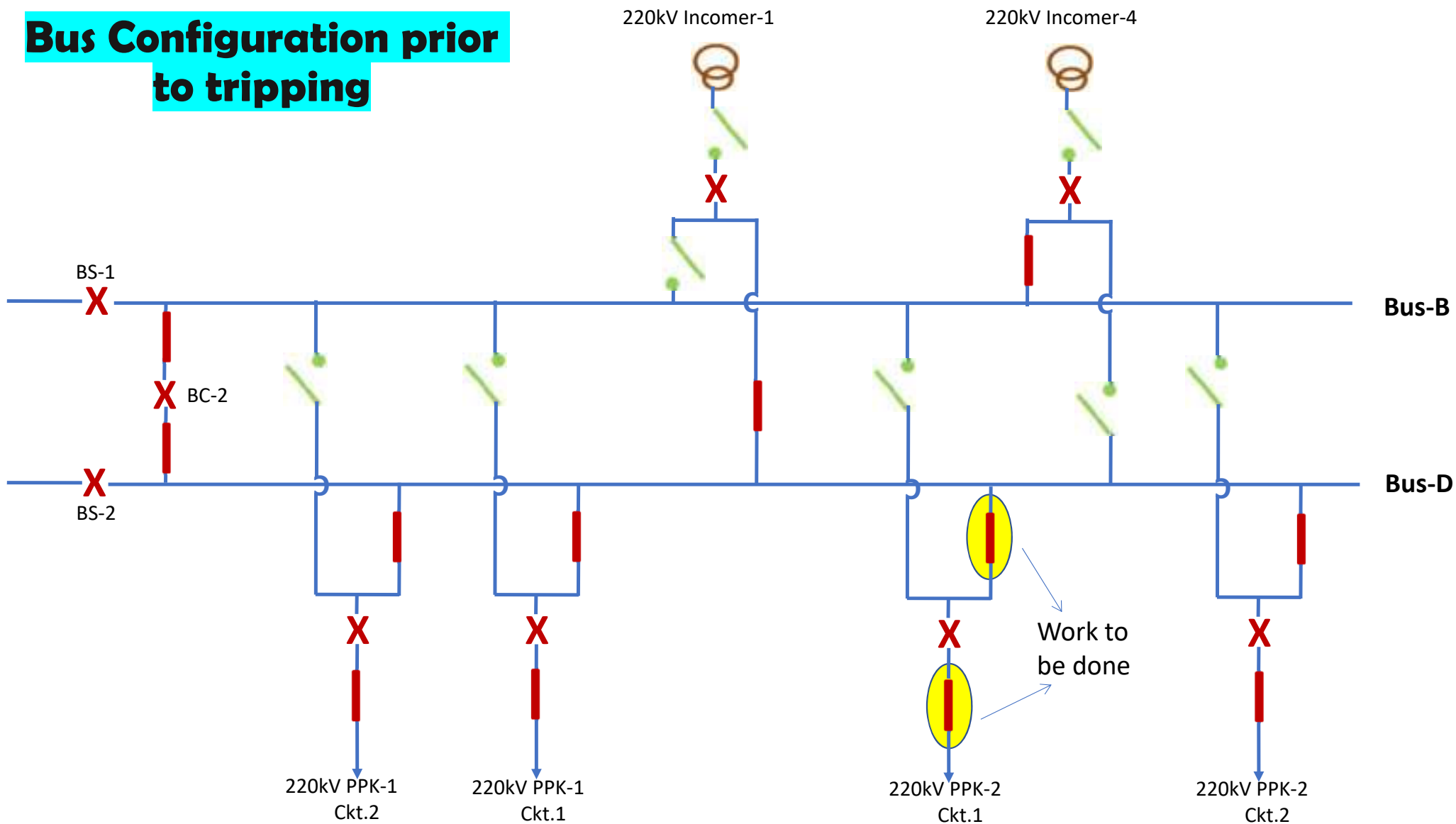


Tripping Incident at  
400kV DTL S/Stn Bamnauli on  
09.07.21 at 10:25 hrs

# Single Line Diagram of 400kv S/Stn Bamnauli



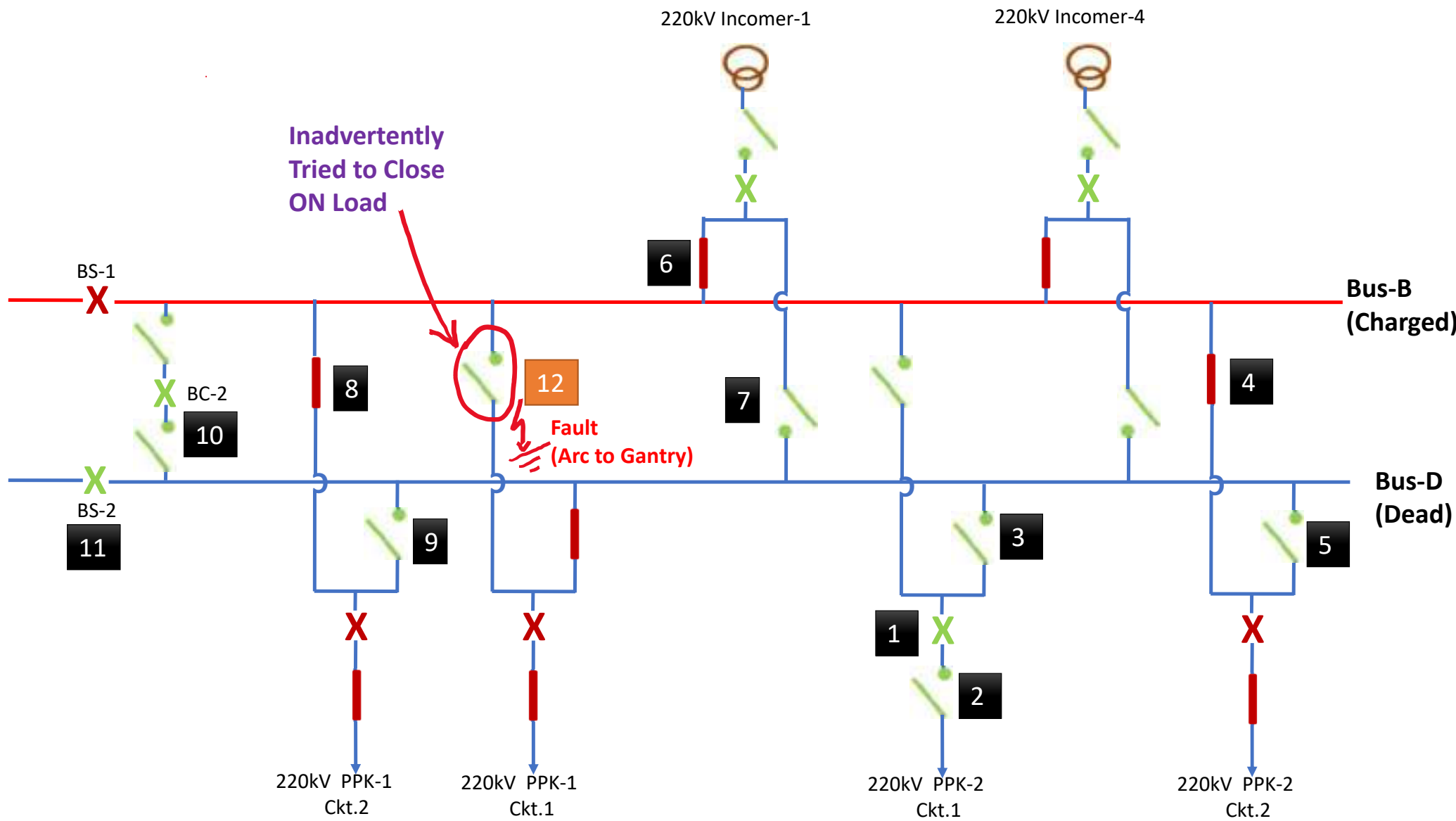
# Bus Configuration prior to tripping



## Sequence of Events dated 09.07.21 with Time

6:22 AM: PTW applied for 220kV Dwarka-2 (Pappankalan-2) Ckt.1

- 1) 10:00 AM: 220kV Dwarka-2 (Pappankalan-2) Ckt-1 CB made OFF.
- 2) 10:00:10:358: 220kV Dwarka-2 (Pappankalan-2) Ckt-1 Line Isolator Opened.
- 3) 10:01:46:541: 220kV Dwarka-2 (Pappankalan-2) Ckt-1 Bus-D Isolator Opened.
- 4) 220kV Dwarka-2 (Pappankalan-2) Ckt-2 Bus-B Isolator Closed.
- 5) 220kV Dwarka-2 (Pappankalan-2) Ckt-2 Bus-D Isolator Opened.
- 6) 10:09:50:069: 220kV Incomer-1 Bus-B Isolator Closed.
- 7) 10:10:43:487: 220kV Incomer-1 Bus-D Isolator Opened.
- 8) 220kV Dwarka-1(Pappankalan-1) Ckt-2 Bus-B Isolator Closed.
- 9) 220kV Dwarka-1(Pappankalan-1) Ckt-2 Bus-D Isolator Opened.
- 10) 10:11:31:841: 220kV Bus Coupler-2 made OFF.
- 11) 10:11:59:546: 220kV Bus Section-2 made OFF.
- 12) 220kV Dwarka-1 (Pappankalan-1) Ckt.1 Bus-B Isolator was inadvertently tried to be closed ON Load without opening CB. Stuck mid-way.



# Points for Discussion

## 1) Reason of delayed clearance of fault?

The high resistance fault formed due to creation of arc got cleared from transformers feeding the fault and from DIAL end in Zone-2. The fault was created due to inadvertent ON-LOAD operation of Bus-B Isolator of 220kV Pappankalan-1 Ckt.1. The bus-bar protection was blocked due to un-defined position of auxiliary contacts of isolator because of sticking of isolator mid-way.

## Points for Discussion

**2) Why did 220kV Bamnauli-DIAL-1 & DIAL-2 tripped before 400/220kV 315MVA ICT-1 at Bamnauli (DV)? (as per SOE obtained at NRLDC)**

220kV Bamnauli- DIAL-1 & 2 tripped from DIAL end in Zone-2 before tripping of 315MVA ICT-1 due to highly resistive nature of the fault.

## Points for Discussion

**3) Exact sequence of tripping of elements and detailed tripping report needs to be shared with remedial action taken.**

Remedial Action taken:

- Old bus-bar protection scheme replaced by GE make centralized numerical bus-bar protection scheme B-90.





**Thank You**

Multiple elements tripping at 200kV  
Samaypur(BB) & 400/220kV Ballabgarh(PG)

13-July-2021 04:58 hrs

# Antecedent Condition and Tripped Elements

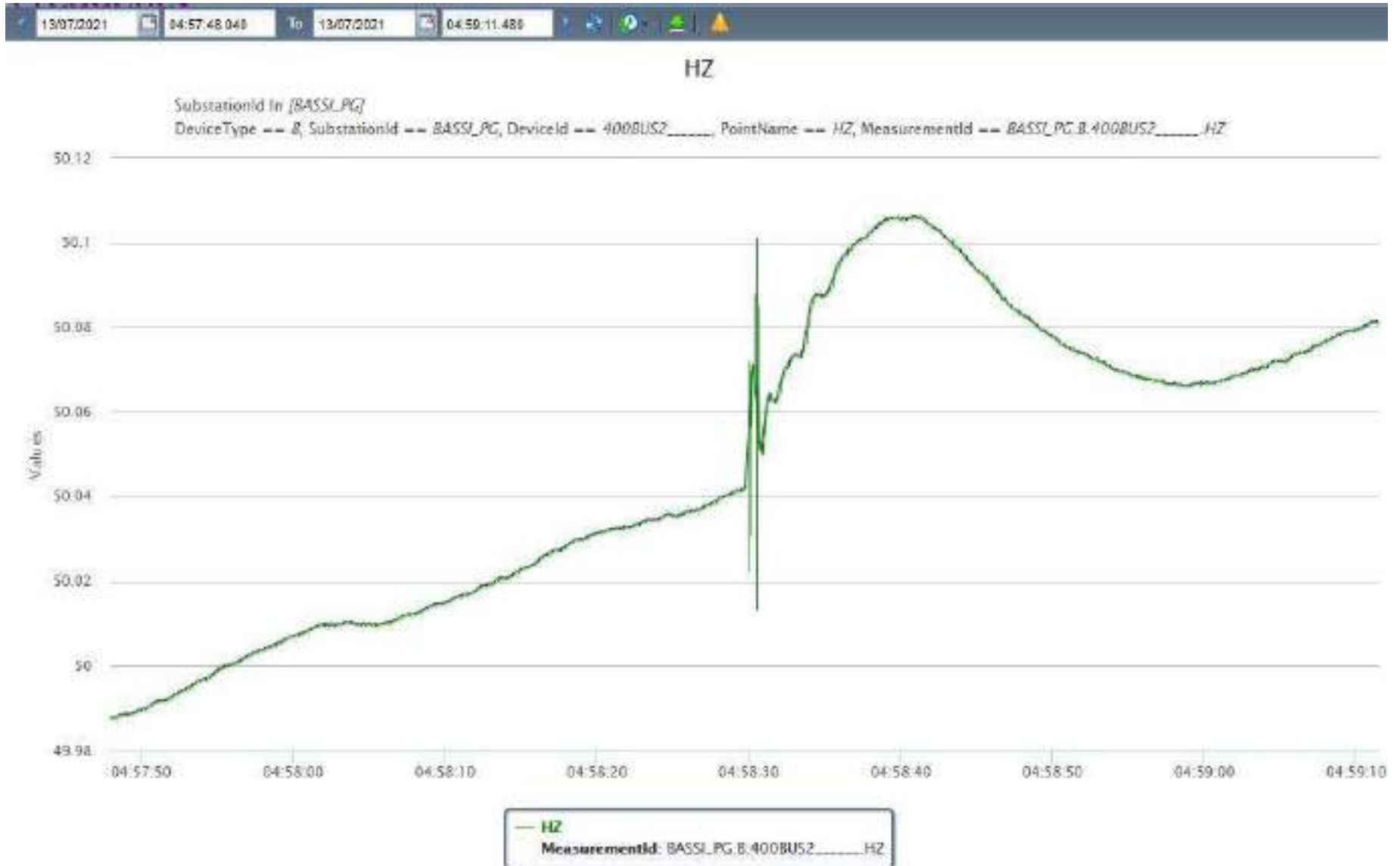
- Weather Conditions: Normal
- Grid Frequency (Hz): 50.00
- Total IR Import (MW): 14006
- Northern Region Demand (MW): 59122
- Load loss (MW): 650

## **Following elements tripped:-**

- 1) 220KV Bus 2 at Samaypur(BB)
- 2) 220KV Bus 1 at Samaypur(BB)
- 3) 220 KV Ballabgarh(BB)-Badarpur(NT) (BB) Ckt-1
- 4) 220 KV Ballabgarh-Samaypur (BB) Ckt-2
- 5) 220 KV Faridabad(NT)-Samaypur(BB) (PG) Ckt-2
- 6) 220 KV Faridabad(NT)-Samaypur(BB) (PG) Ckt-1
- 7) 220 KV Ballabgarh-Samaypur (BB) Ckt-3
- 8) 220 KV Ballabgarh-Samaypur (BB) Ckt-1
- 9) 400/220 kV 500 MVA ICT 2 at Ballabgarh(PG)

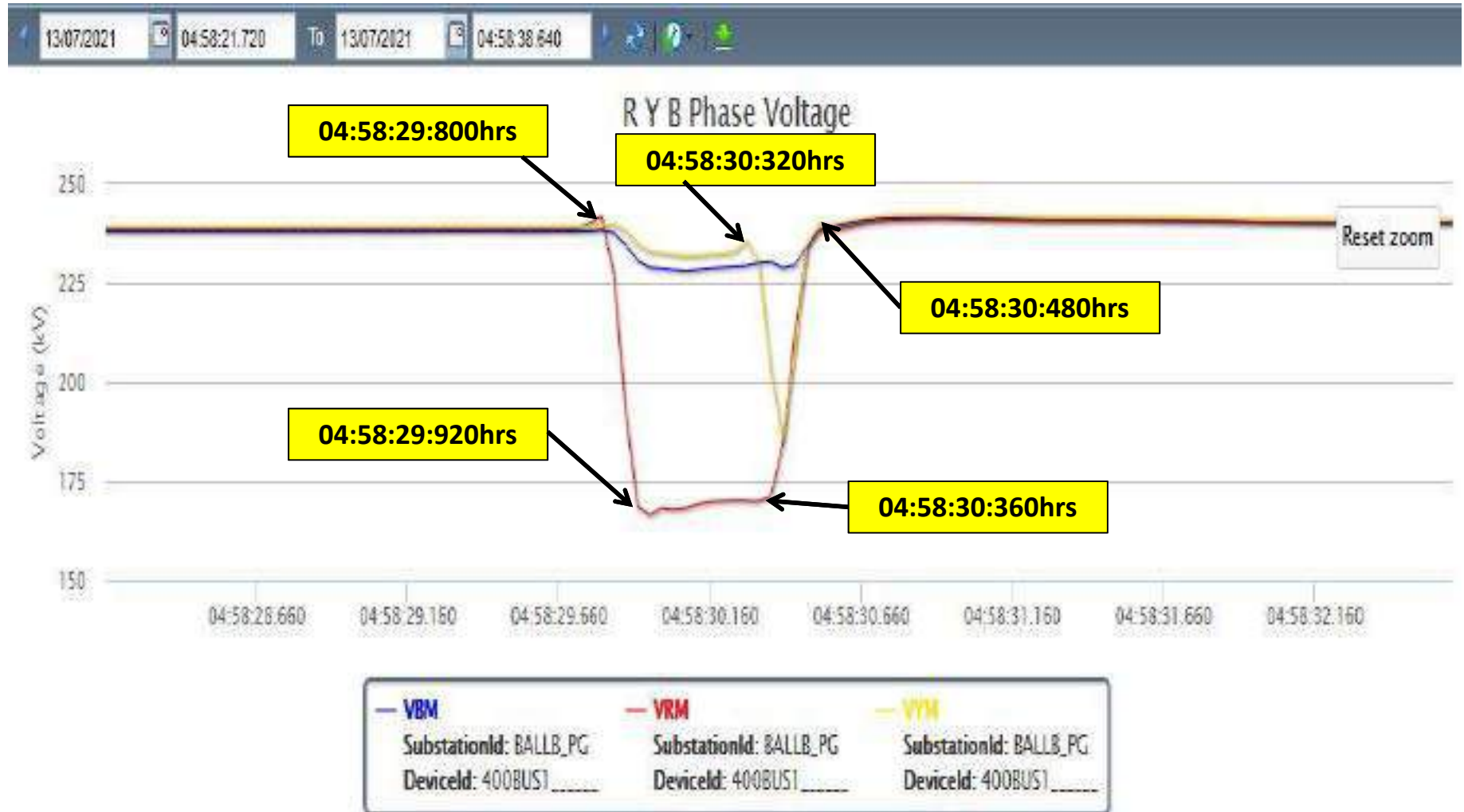
# PMU Plot of frequency at Bassi(PG)

04:58hrs/13-July-21



# PMU Plot of phase voltage magnitude at Ballabgarh(PG)

04:58hrs/13-July-21

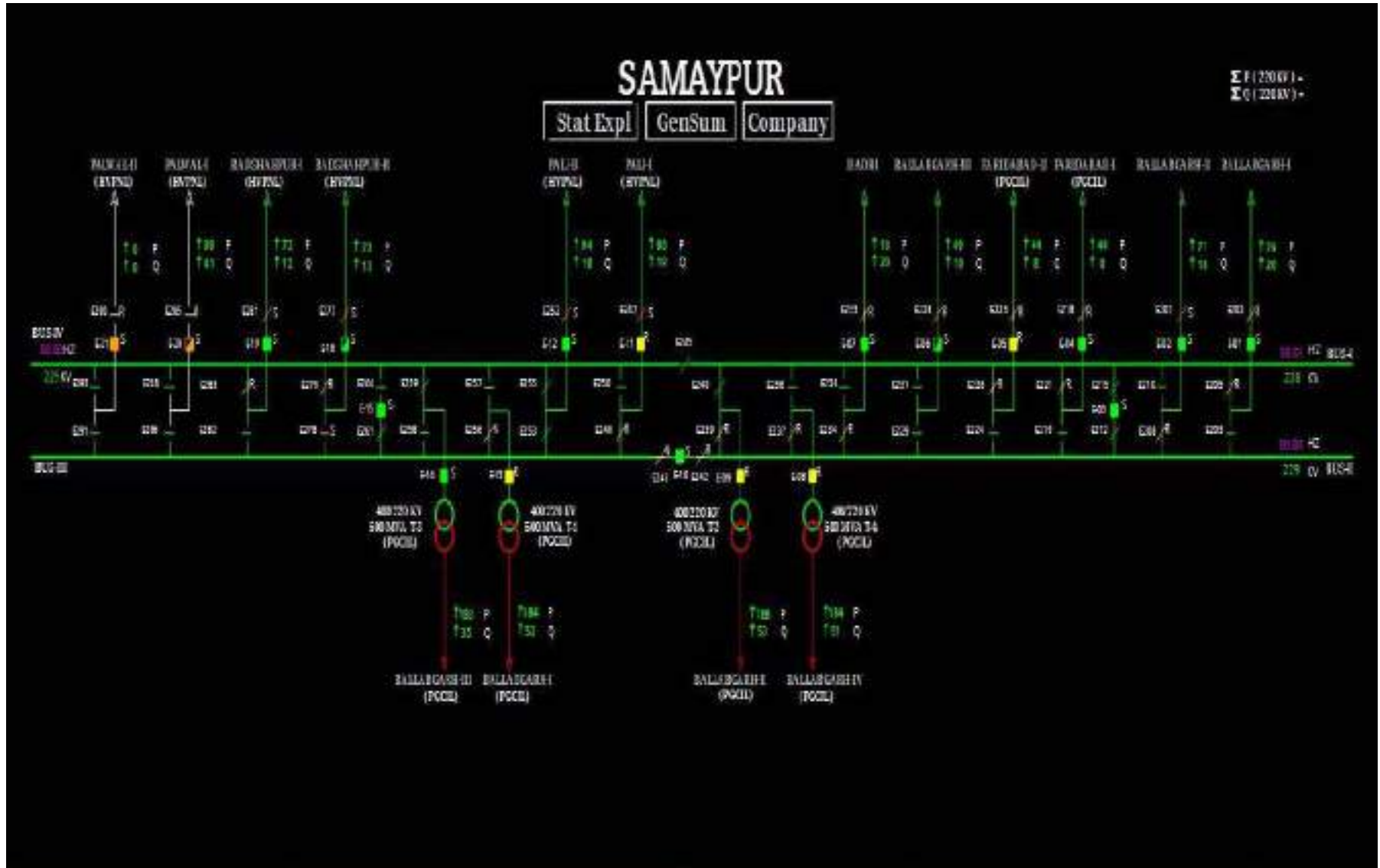


# SCADA SOE

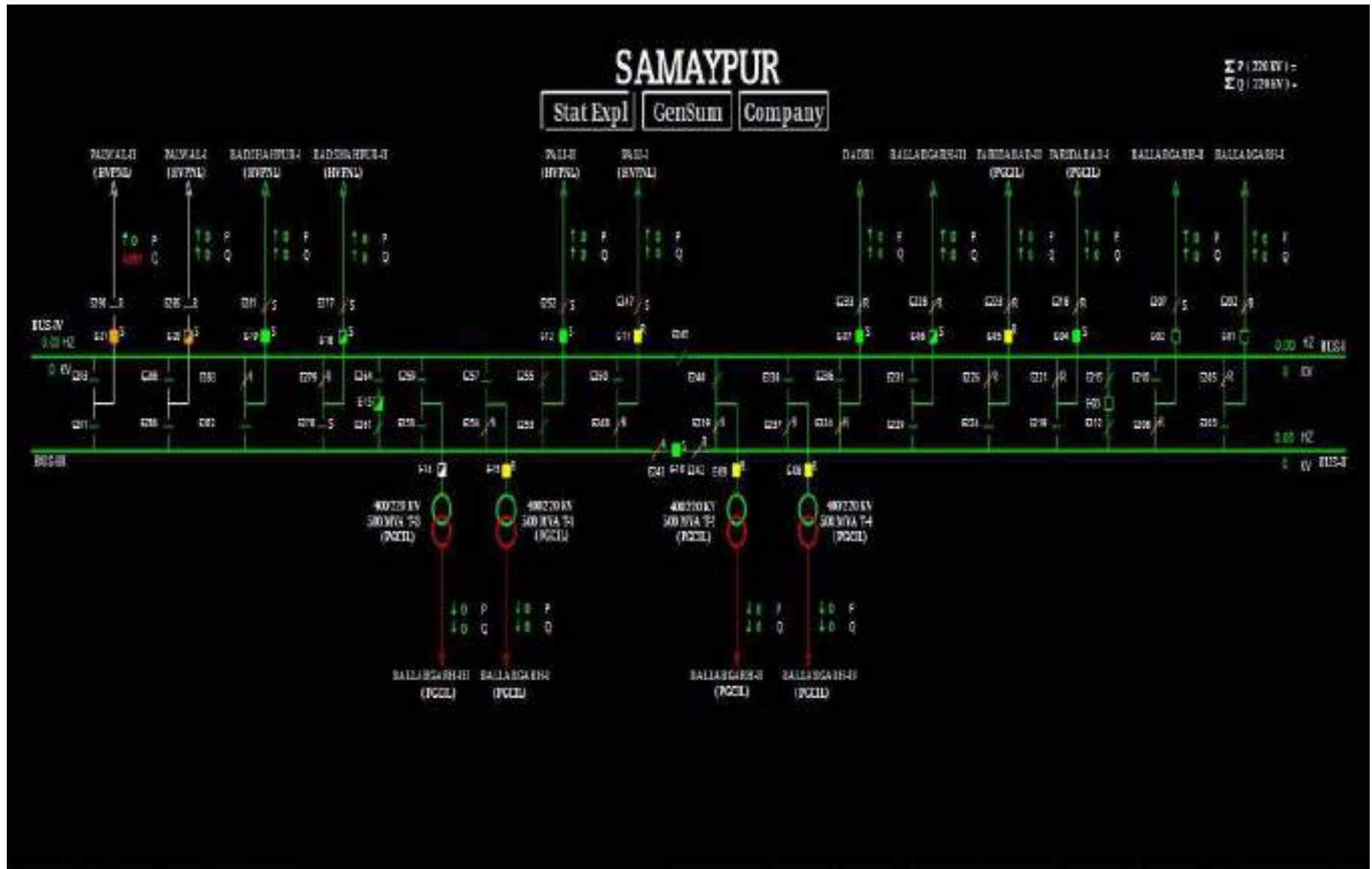
**Fault time: 04:58:29:800**

Time	Station Name	Voltage	Element Name	Element Type	Element Status	Tripping time after fault in hr:mm:sec.ms
4:58:30.085	SAMAYUR	220kV	E_02(BLBGH-2)	Circuit Breaker	Open	0:00:00.285
4:58:30.120	SAMAYUR	220kV	E_01(BLBGH-1)	Circuit Breaker	Open	0:00:00.320
4:58:30.426	BALLABGARH	400kV	06T3	Circuit Breaker	disturbe	0:00:00.626
4:58:30.429	BALLABGARH	400kV	07T4	Circuit Breaker	Open	0:00:00.629
4:58:30.436	BALLABGARH	400kV	08T2T4	Circuit Breaker	Open	0:00:00.636
4:58:30.436	BALLABGARH	400kV	05T1T3	Circuit Breaker	Open	0:00:00.636
4:58:30.437	BALLABGARH	400kV	09T2	Circuit Breaker	Open	0:00:00.637
4:58:30.437	BALLABGARH	400kV	04T1	Circuit Breaker	Open	0:00:00.637
4:58:30.438	SAMAYUR	220kV	E_14(BALLB-3)	Circuit Breaker	disturbe	0:00:00.638
4:58:30.438	BADSHAPUR	220kV	EC_T1_P	Circuit Breaker	Open	0:00:00.638
4:58:30.440	SAMAYUR	220kV	03MBC	Circuit Breaker	Open	0:00:00.640
4:58:30.441	BALLABGARH	220kV	01T1	Circuit Breaker	Open	0:00:00.641
4:58:30.443	BALLABGARH	220kV	03T3	Circuit Breaker	Open	0:00:00.643
4:58:30.447	BALLABGARH	220kV	02T2	Circuit Breaker	Open	0:00:00.647
4:58:30.532	BADSHAPUR	220kV	EC_T1_P	Circuit Breaker	disturbe	0:00:00.732
4:58:32.581	SAMAYUR	220kV	15MBC	Circuit Breaker	Open	0:00:02.781

# SLD of Samaypur(BBMB) before the tripping

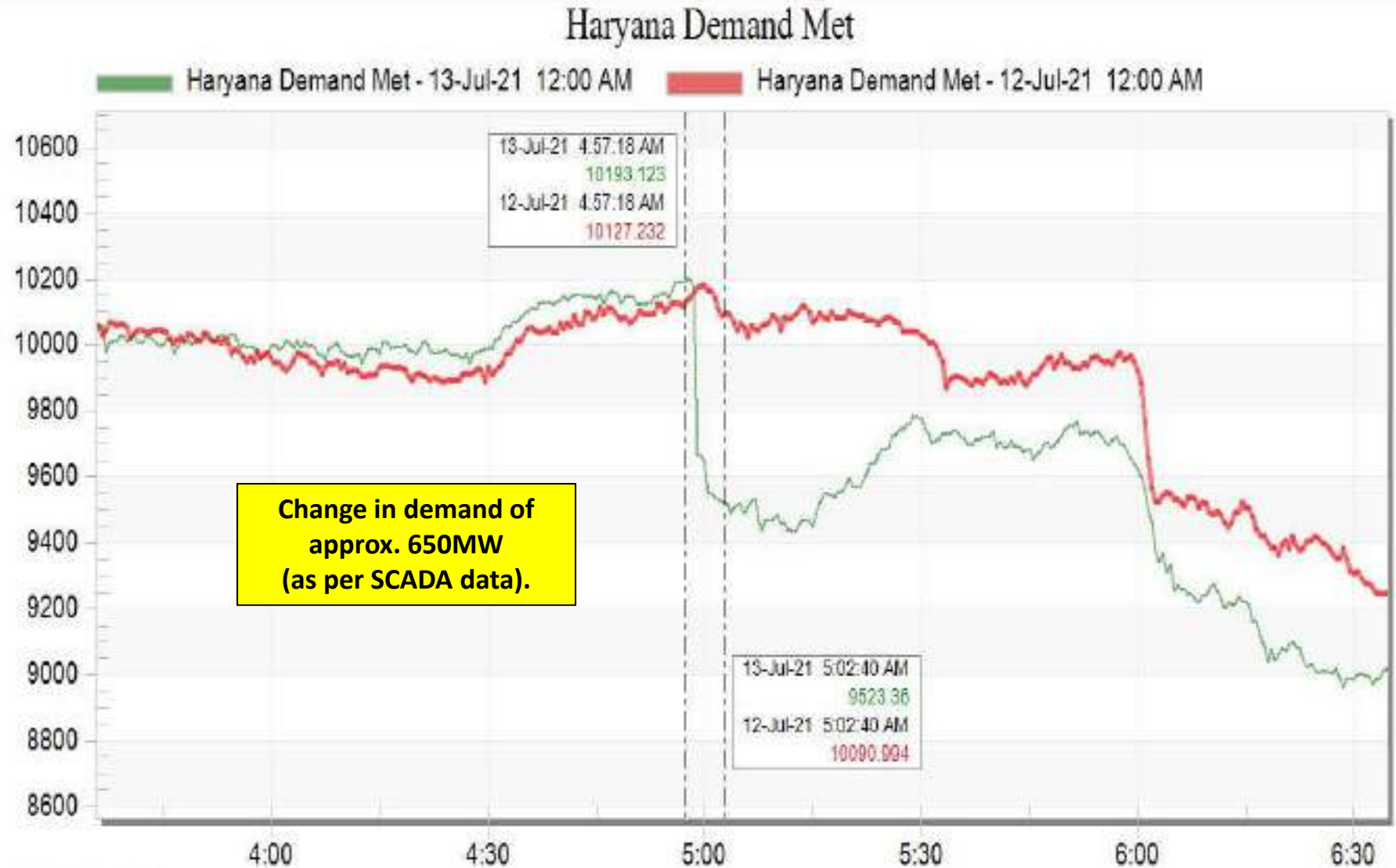


# SLD of Samaypur(BBMB) before the tripping



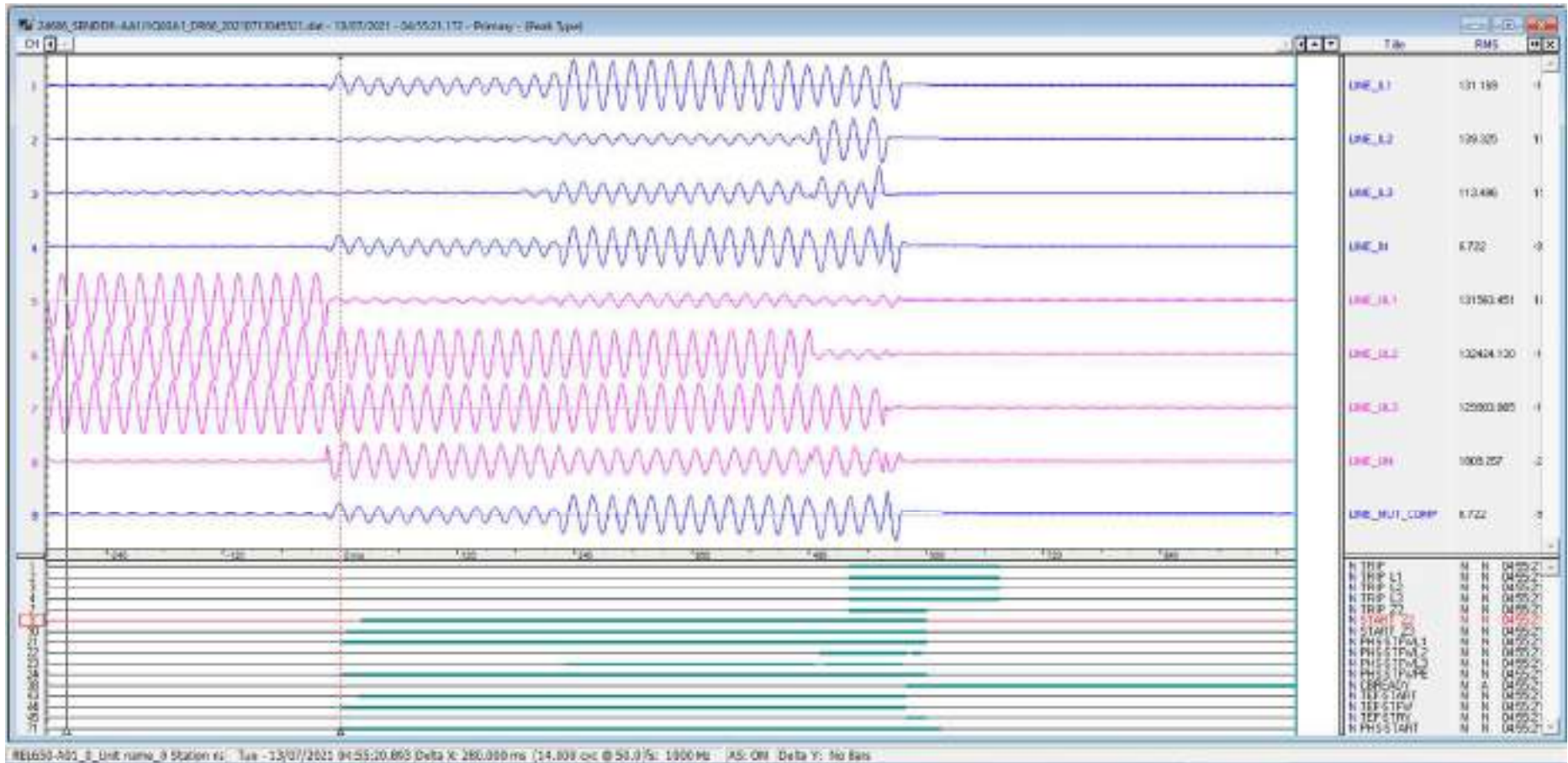


# Haryana Demand during tripping



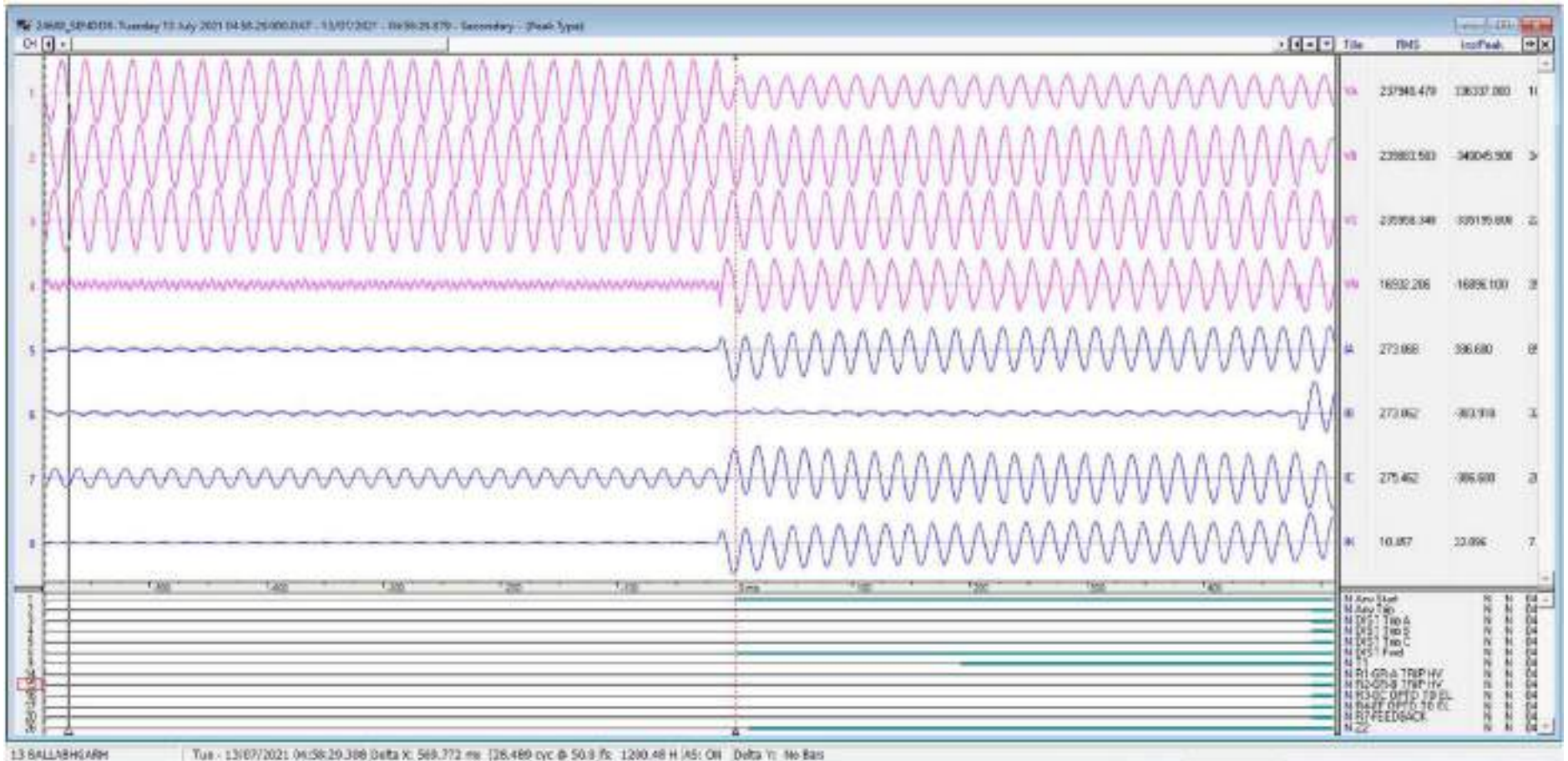
Jul 13 Tue 2021

# DR of 220 kV Ballabgharh (End) – Samaypur - 3



1. Line tripped in Zone-2 from Ballabgharh. Timer=610ms, What is the Zone-2 timer?

# DR of 500 MVA ICT-2 at Ballabhgarh



1. R-E fault visible.
2. ICT-2 tripped on Backup impedance.

# Observations

1. DR channels are not properly configured in 220 kV Ballabgarh – Samaypur – 1.
2. The 220 kV Faridabad-Samaypur ckt-1 DR is faulty.
3. Status of Busbar protection at 220 kV Samaypur?
4. As per SOE, opening of Bus sectionalizer is not observed and delay in opening of bus coupler is also observed which led to the tripping of all ICTs and 220V feeders.
5. Remedial action taken report needs to be shared.

**Detailed Analysis Report of**  
**Multiple Grid Elements Tripped at**  
**BBMB Samaypur Station on dated**  
**13/07/2021 at 04:58 hrs.**

- **A. Introduction**

- **1. Time & Date of Event:** - 13/07/2021, 04:58 hrs.
- **2. Substation(s) Affected along with voltage level:** - 220 KV Substation BBMB Samaypur.
- **3. Brief Event Summary:-** On dated 13/07/21 at 04:58 hrs, there was a heavy spark between male female fingers of Bus 1 Red phase isolator of 400/220 KV, 500 MVA ICT-2. This was a high resistance Bus fault, but as the numerical Bus bar protection of the substation is lying out of service since 10/06/2021 for the want of re-commissioning of the new central unit replaced in place of the defective one by the firm engineer.
- The isolator fault was depicted by the Backup impedance relay of ICT 2 installed in PGCIL control room, ICT-1,3 & 4 also tripped on backup impedance. As the Bus bar protection was out of service therefore the zone 4 reach timings of all the DP Schemes of all the feeders had already been set as 419 m $\Omega$  & 160 ms to check any Bus fault.

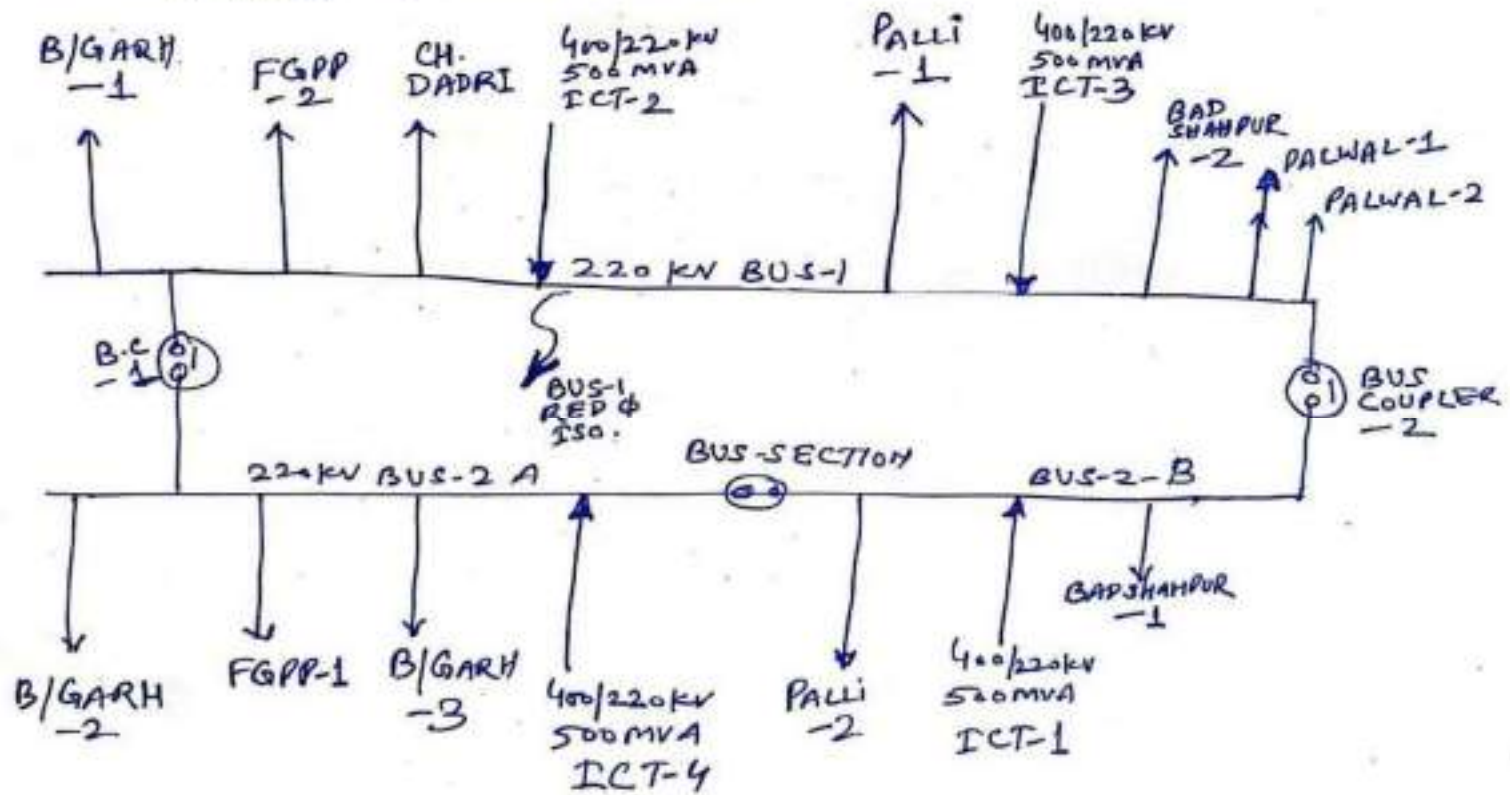
- **B. Antecedent Conditions**

- 1. Weather Information: Cloudy
- 2. Additional relevant information viz. power flow

- **C. Event data**

- 1. Change in Frequency:
- 2. Generation Loss/Load Loss: Generation Loss: - Nil; Load Loss: 689 **MW**
- 3. Single Line Diagram

DT: 13-07-21  
 POSITION OF 220 KV FEEDERS ON 220 KV BUS AT SAMAYPUR

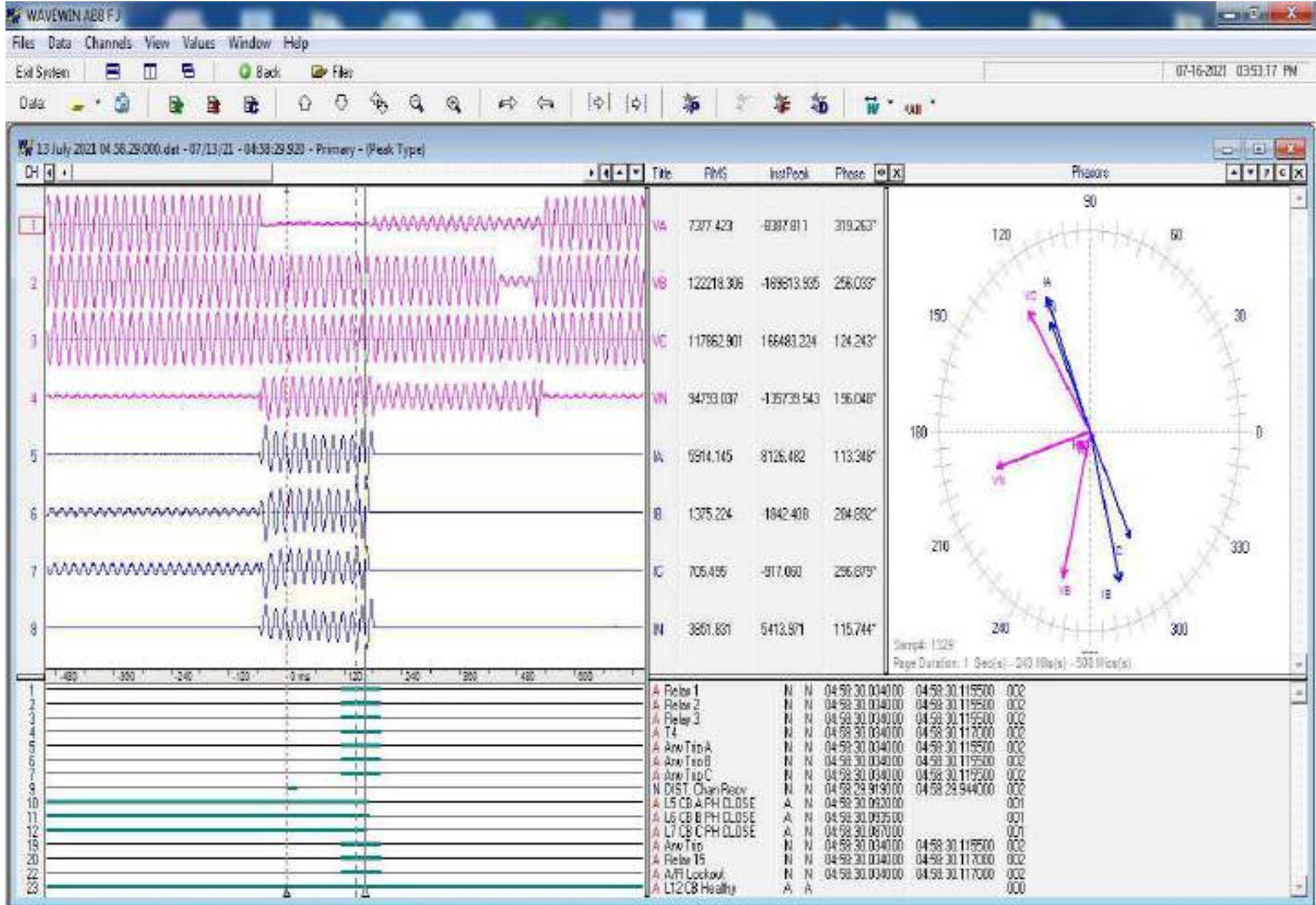


## Name and time of the tripped elements as per SOE :-

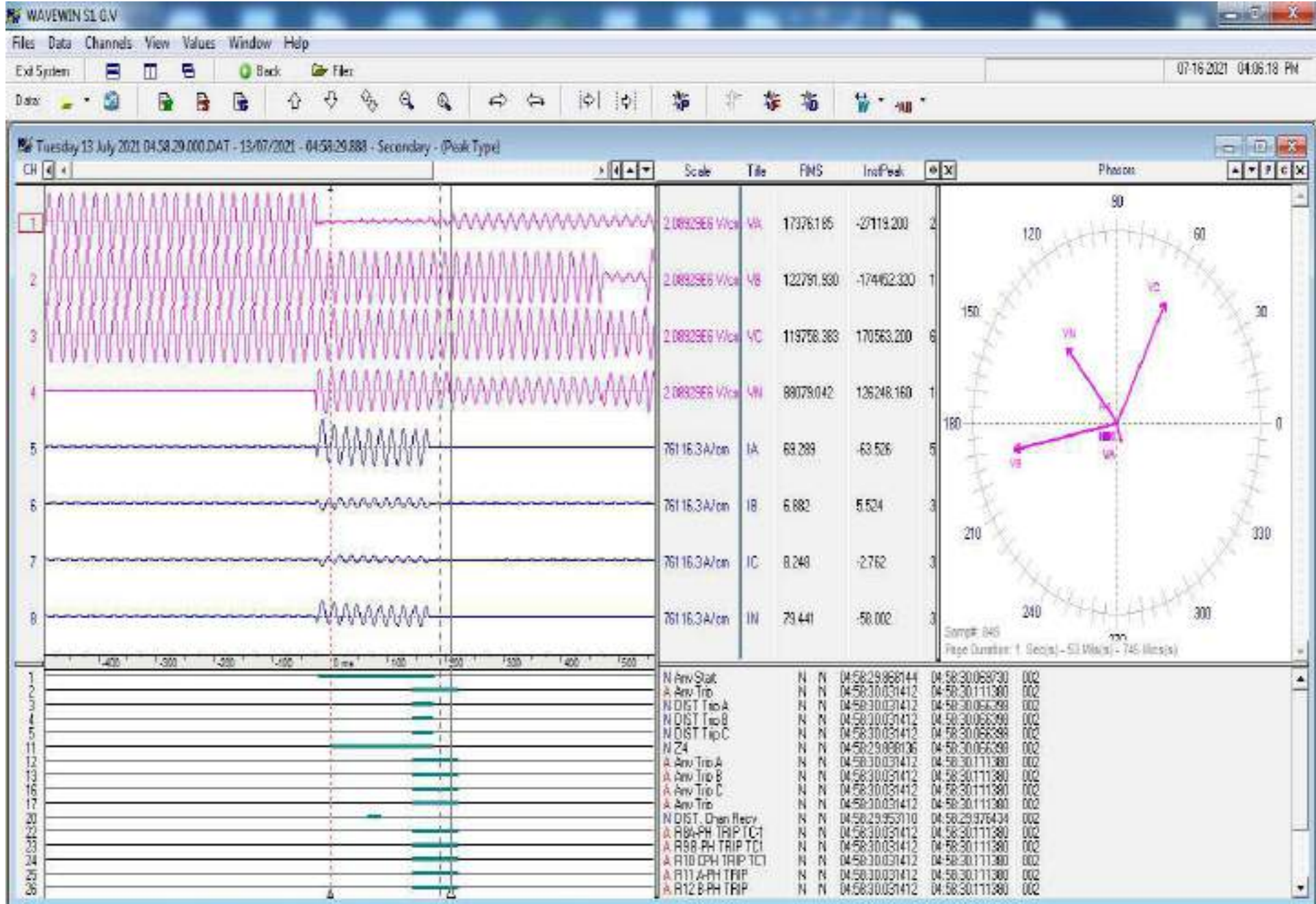
S.No.	Name of Feeder/Bay	Tripping Time (hrs)
1	ICT 2	04:58:23:409
2	ICT 1	04:58:29:879
3	ICT 3	04:58:29:879
4	ICT 4	04:58:29:879
5	Ballabgarh-2	04:58:30:085
6	Ballabgarh-1	04:58:30:120
7	Bus Coupler 1	04:58:30:440
8	Bus Coupler 2	04:58:32:581
9	Palwal-1	06:37 (Manually open)
10	Ballabgarh-3	06:37 (Manually open)
11	Badshahpur-2	06:37 (Manually open)
12	Ch Dadri	06:39:11:004(Manually open)
13	FGPP-2	06:39:28:569(Manually open)
14	FGPP-1	06:39:32:737(Manually open)
15	Pali-1	06:41:08:722(Manually open)
16	Pali-2	06:41:13:071(Manually open)
17	Badshahpur-1	06:41:36:887(Manually open)
18	Palwal 2	06:41:49:211(Manually open)



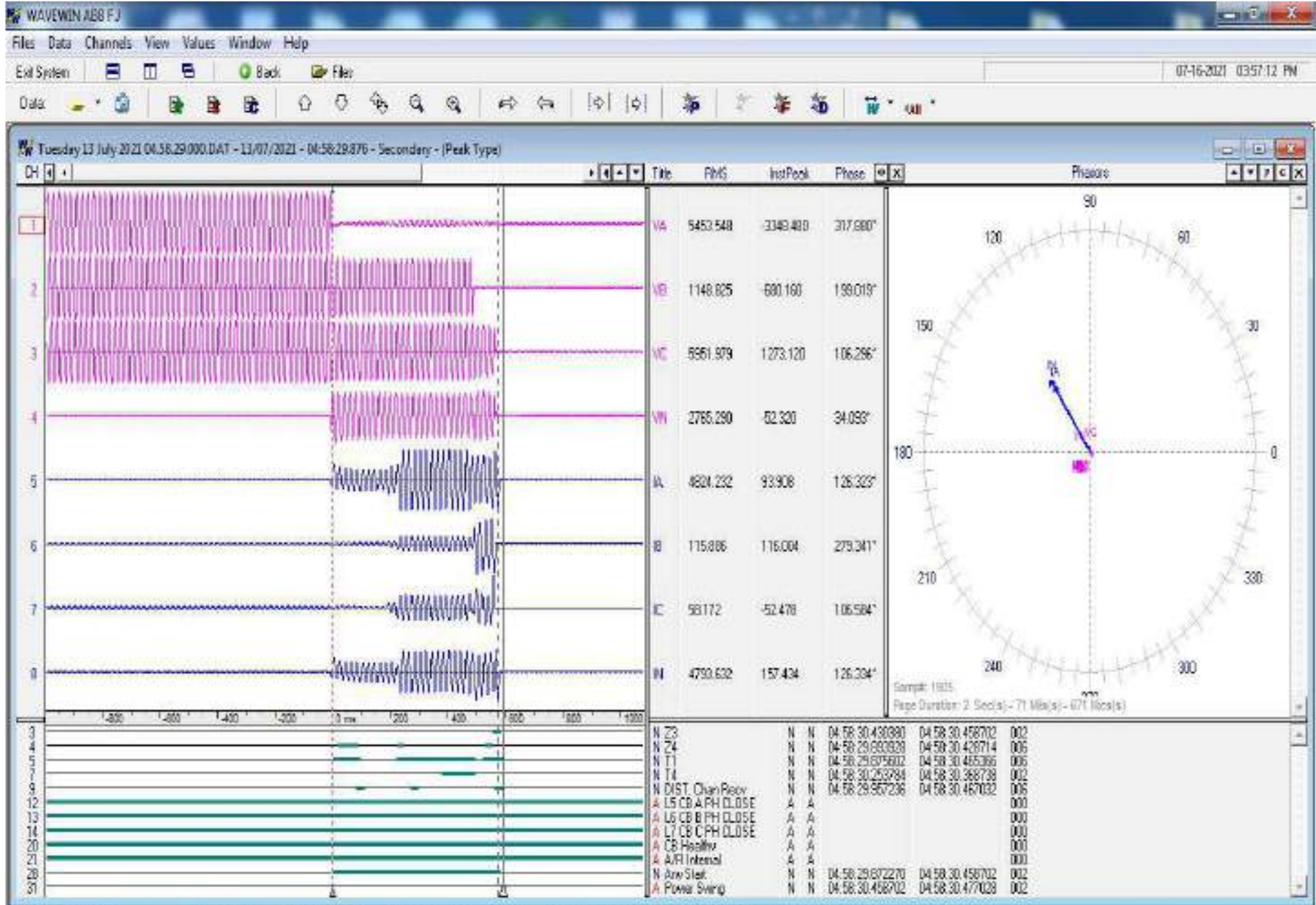
- **5. Location and type of fault:** - A heavy flash occurred on red phase isolator of ICT- 2 (Bus-1) in 220kV, BBMB, Samaypur switchyard resulting into high resistance Bus fault. All the four ICTs (400/220 KV, 500 MVA) tripped on Backup impedance protection as per the settings at PGCIL end.
- 
- **6. Flag Details, DR and EL for each affected element:**  
Attached
- **7. Appropriate Graphical Plot:** Including SCADA data/print out of DR and EL details: - DRs/Events files attached.
- 
- **8. Equipment failure (if any):-** Male female jaw of red phase Bus 1 isolator of ICT-2.



Balabgarh-1 M-1 Tue - 07/13/2021 04:58:30.084000 Delta X: 164.000 ms (8.200 cyc @ 50 Hz) fs: 2000 Hz AS: ON Delta Y: No Bars

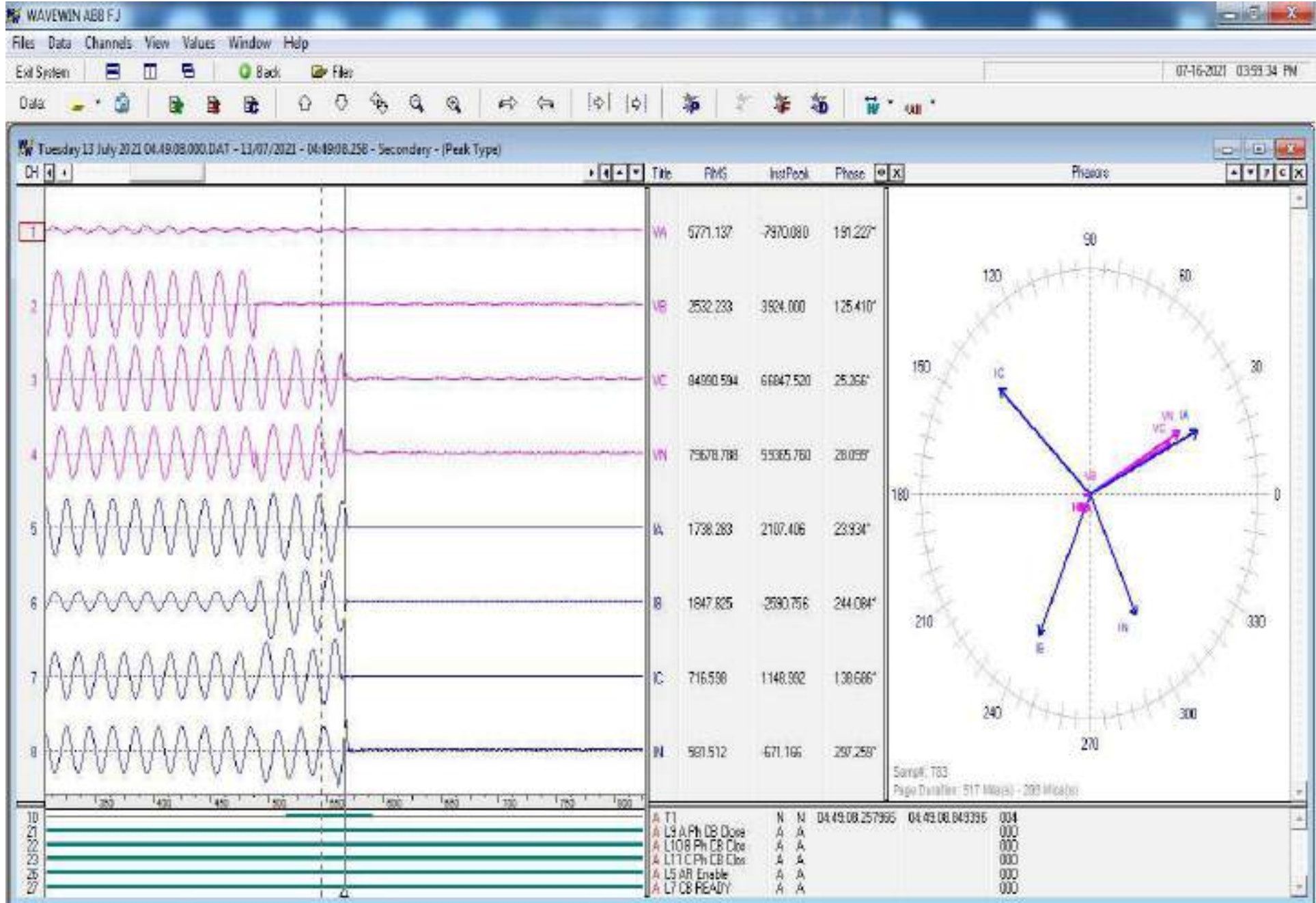


Balibgorh-2 M-2 Tue - 13/07/2021 04:58:30.098 Delta X: 209.916 ms (10.496 cyc @ 50 Hz) AS: Units: Delta Y: No Bars



B/GH-3 MICOM M-2

Tue - 13/07/2021 04:58:30.467032 Data X: 591.430 ms (29.572 cyc @ 50 Hz) fs: 1200.48 Hz AS: ON Delta Y: No Bars



DDR\_Nicom\_M1 Tue - 13/07/2021 04:49:08.824406 Delta X: 566.440 ms (28.322 cyc @ 50 Hz) fs: 1200.48 Hz AS: ON Delta Y: No Bars

d. **Event Description/ Analysis of the Event Description (Detailed description including the reference of DR/EL and explanation based on *points*):-**

- - **From the related Events / DRs:-** The Bus bar protection of 220 kV Samaypur was out of service. 220 KV Bus 1 & Bus 2 were being fed by 4nos. 400/220kV,500 MVA T/Fs i.e. ICT1,ICT2,ICT3&ICT4. The high resistance bus fault between male-female contacts of Bus isolator 1 of ICT 2 was fed by these 4 nos ICTs as both the buses were acting as a close loop as the BC-1& BC-2 were in close position. The high resistance arc was measured by the backup impedance relays (MiCOM P442) of the T/Fs at PGCIL end. The time setting of backup impedance relays is 500ms. Accordingly, the 220 KV breakers of ICT 1,2,3 & 4 got tripped in 559ms (approx) as per related DRs.
  - 
  - 220 KV Ch. Dadri & B/Garh -3 tripped in Zone-2 at other end, the Z-2 timing of other end being 500ms. As per the DRs, Z-4 of these feeders was found to start & reset (three times) before the existing 160ms time setting & there after PSB appeared, as such Z-4 didn't operate by DP Scheme of these feeders.
  - As the bus bar protection was out of service since 10-06-21, Z-4 impedance & timings of DP schemes of all the ckts were already set as 419 milliohm & 160 ms as a remedial measure to check any fault in reverse direction. As a result of these revised settings, Z-4 of Micom P442 DP scheme of 220 kv B/garh-1 & 2 operated on this bus fault, which is also in order.
  - Z-4 of rest of the feeder not operated because all these feeders (namely FGPP-1&2, Badshapur-1&2, Palli -1&2 & Palwal-1&2) are state feeders and run on independent buses at other end. Up to 500ms (till the tripping of ICT-1,2,3&4) these feeder were being continued feeding their running loads by the ICTs (being strong source). After approx. 560ms, there was no source on 220 kV buses at Samaypur as a result of which there was no supply on these feeders & as such the breakers of these feeders were opened manually at both ends.
- In view of above, the behavior of protection system & equipment was observed to be in order.

## E. Restoration:

1. Restoration time of the feeders/Equipment is as below:

S.No.	Name of Feeder/Bay	Closing Time
1	ICT 4	07:16 hrs
2	ICT 1&3	07:18 hrs
3	Bus Coupler 1&2	07:39 hrs
4	Ch Dadri	07:59 hrs
5	FGPP 1	08:05 hrs
6	FGPP 2	08:09 hrs
7	Pali-1&2	09:01 hrs
8	Palwal-1&2	09:44 hrs
9	Badshahpur-1&2	09:55 hrs
10	Ballabgarh- 2&3	19:32 hrs
11	Ballabgarh- 1	19:44 hrs
12	ICT-2	20:20 hrs

- **2. Special finding/ issues identified during restoration: - Nil**
- **F. Remedial Action:-**
- **1. Remedial Action Taken:** The damaged male-female contacts of the isolator of ICT-2 have been replaced with new. Hotspot of red phase CT of Bus 2A side of Bus Coupler-1 has been attended. Hotspot on red phase wave trap of Ballabgarh-3 feeder has been attended.
- No other damage of Equipment was there at 220 KV Samaypur Substation.
- **2. Remedial Action to be taken along with time frame:** The defective CU of MiCOM P741 numerical differential BBP has been replaced with a new CU. This new CU has been re-commissioned by the firm engineer of M/S Alstom on **23.07.2021**.

**G. Lesson Learnt: NIL**

**H. Any other Information: NIL**

- 
- 

**Er. Vishal Mohan Dahiya**

**Dy. Director/P&T Cell, BBMB, Panipat**



# Multiple elements tripping at 400/220kV Bareilly(UP)

23-July-2021 16:36 hrs

# Antecedent Condition and Tripped Elements

- Weather Conditions: Normal
- Grid Frequency (Hz): 49.97
- Total IR Import (MW): 14530
- Northern Region Demand (MW): 54175
- Load loss (MW): 300.00
- Generation loss (MW): 280.00

## **Following elements tripped:-**

- 1) 400/220 kV 315 MVA ICT 1 at Bareilly(UP)
- 2) 220 KV Pithoragarh(PG)-Bareilly(UP) (PG) Ckt-1
- 3) 220 KV Dhauliganga(NH)-Pithoragarh(PG) (PG) Ckt-1
- 4) 220 KV Dhauliganga(NH)-Bareilly(UP) (PG) Ckt-1
- 5) 400/220 kV 315 MVA ICT 3 at Bareilly(UP)
- 6) 400/220 kV 315 MVA ICT 2 at Bareilly(UP)
- 7) 220 KV Pantnagar(UK)-Bareilly(UP) (UP) Ckt-1
- 8) 220kV Bareilly-Pilibhit ckt-1 , 220kV Bareilly-Pilibhit ckt-2
- 9) 220kV Bareilly-CB Ganj ckt-1 , 220kV Bareilly-CB Ganj ckt-2
- 10) 220kV Bareilly-Dohna ckt-1 , 220kV Bareilly-Dohna ckt-2 ,
- 11) 4\*70MW Dhauliganga HEP

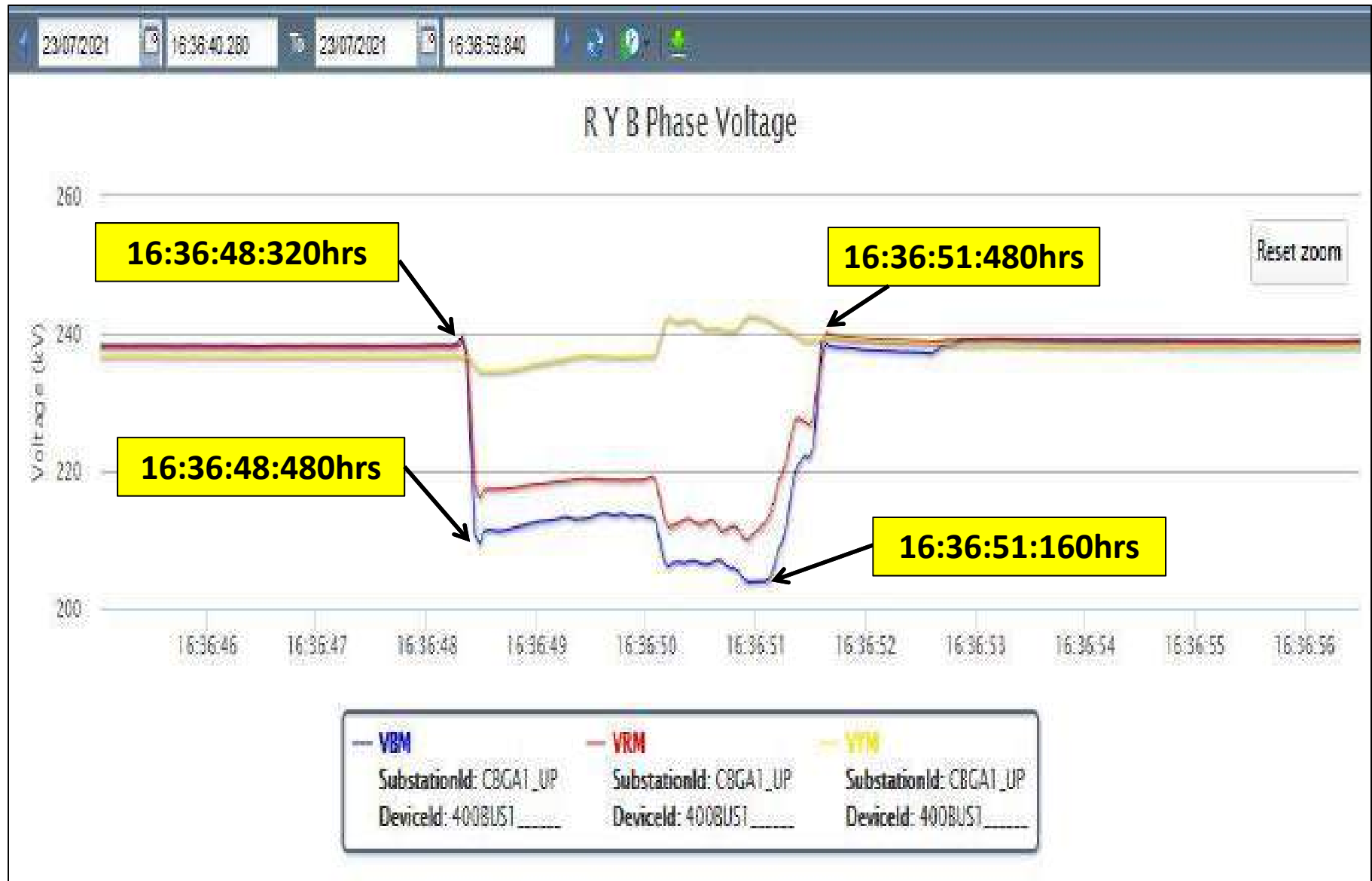
# PMU Plot of frequency at Bassi(PG)

16:36hrs/23-July-21



# PMU Plot of phase voltage magnitude at CB Ganj 1(UP)

16:36hrs/23-July-21



# SCADA SOE

**Fault time: 16:36:48:320**

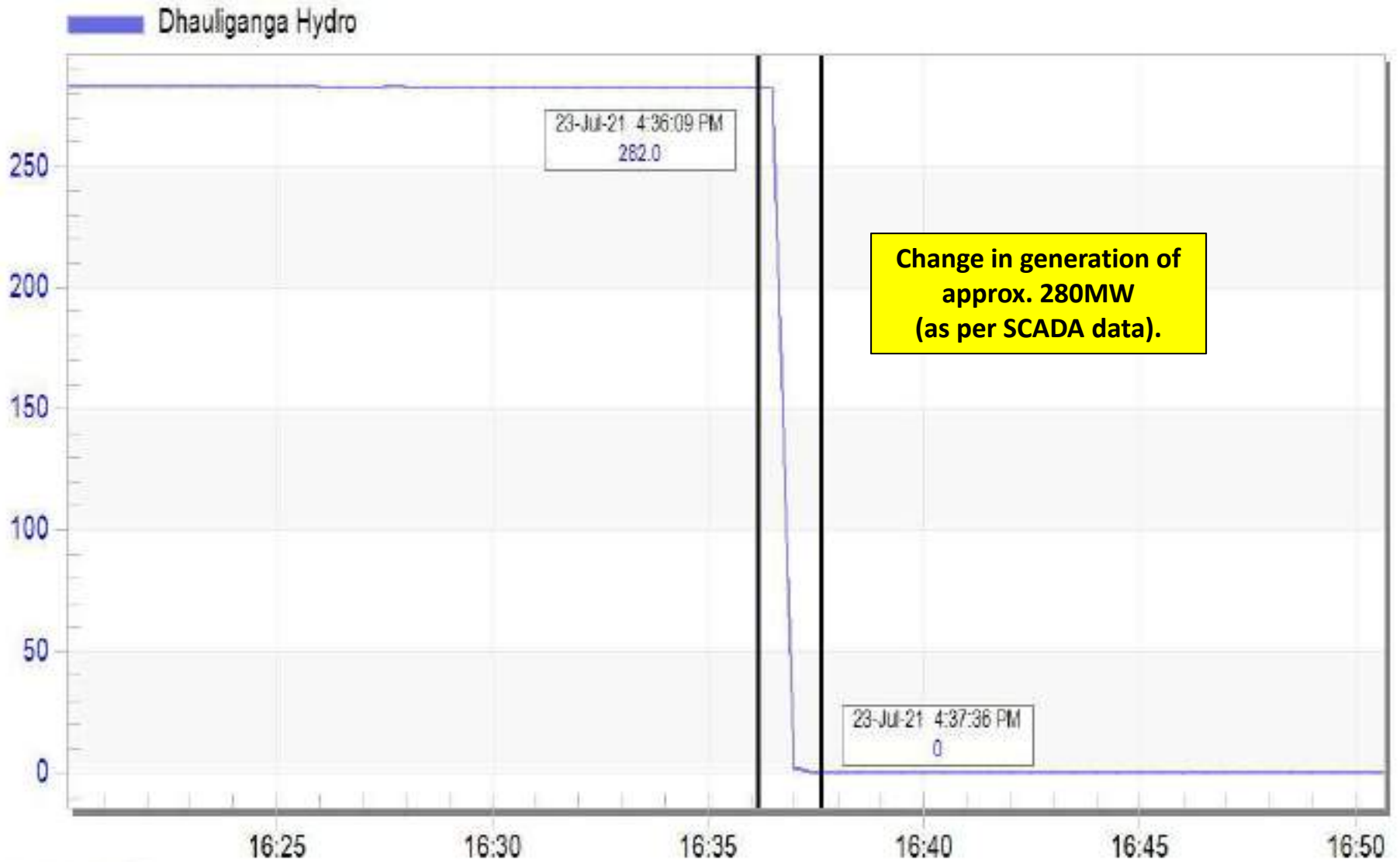
Time	Station Name	Voltage	Element Name	Element Type	Element Status	Tripping time after fault in hr:mm:sec.ms
16:36:49.621	BRKHR_UP	132kV	D_04(PLBHT)	Circuit Breaker	Open	0:00:01.301
16:36:49.651	BRKHR_UP	132kV	D_05(DOHNA)	Circuit Breaker	Open	0:00:01.331
16:36:49.721	BRKHR_UP	132kV	D_03(U02)	Circuit Breaker	disturbe	0:00:01.401
16:36:49.881	CBGA2_UP	220kV	E_51(FUTR2-2)	Circuit Breaker	Open	0:00:01.561
16:36:50.834	DOHNA_UP	220kV	E_03(CBGA1)	Circuit Breaker	Open	0:00:02.514
16:36:50.878	DOHNA_UP	220kV	07CBGA12	Circuit Breaker	Open	0:00:02.558
16:36:51.276	CBGA1_UP	220kV	83T3	Circuit Breaker	Open	0:00:02.956
16:36:51.409	CBGA1_UP	400kV	F_04(T2)	Circuit Breaker	Open	0:00:03.089
16:36:51.409	CBGA1_UP	220kV	E_01(T2)	Circuit Breaker	Open	0:00:03.089
16:36:52.754	PITHORAGARH	220kV	3CBGA1	Circuit Breaker	Open	0:00:04.434
16:37:00.000	BRKHR_UP	132kV	D_03(U02)	Circuit Breaker	Open	0:00:11.680
16:37:01 ***	DHAULIGANGA	220kV	03H01	Circuit Breaker	disturbe	
16:37:01.629	CBGA1_UP	220kV	E_03(T1)	Circuit Breaker	disturbe	0:00:13.309
16:37:01.629	CBGA1_UP	400kV	F_01(T1)	Circuit Breaker	disturbe	0:00:13.309
16:37:01.689	CBGA1_UP	220kV	12PLBT2	Circuit Breaker	disturbe	0:00:13.369
16:37:01 ***	DHAULIGANGA	220kV	03H01	Circuit Breaker	Open	
16:37:01 ***	DHAULIGANGA	220kV	01PTRGH1	Circuit Breaker	Open	

# UP Demand during tripping



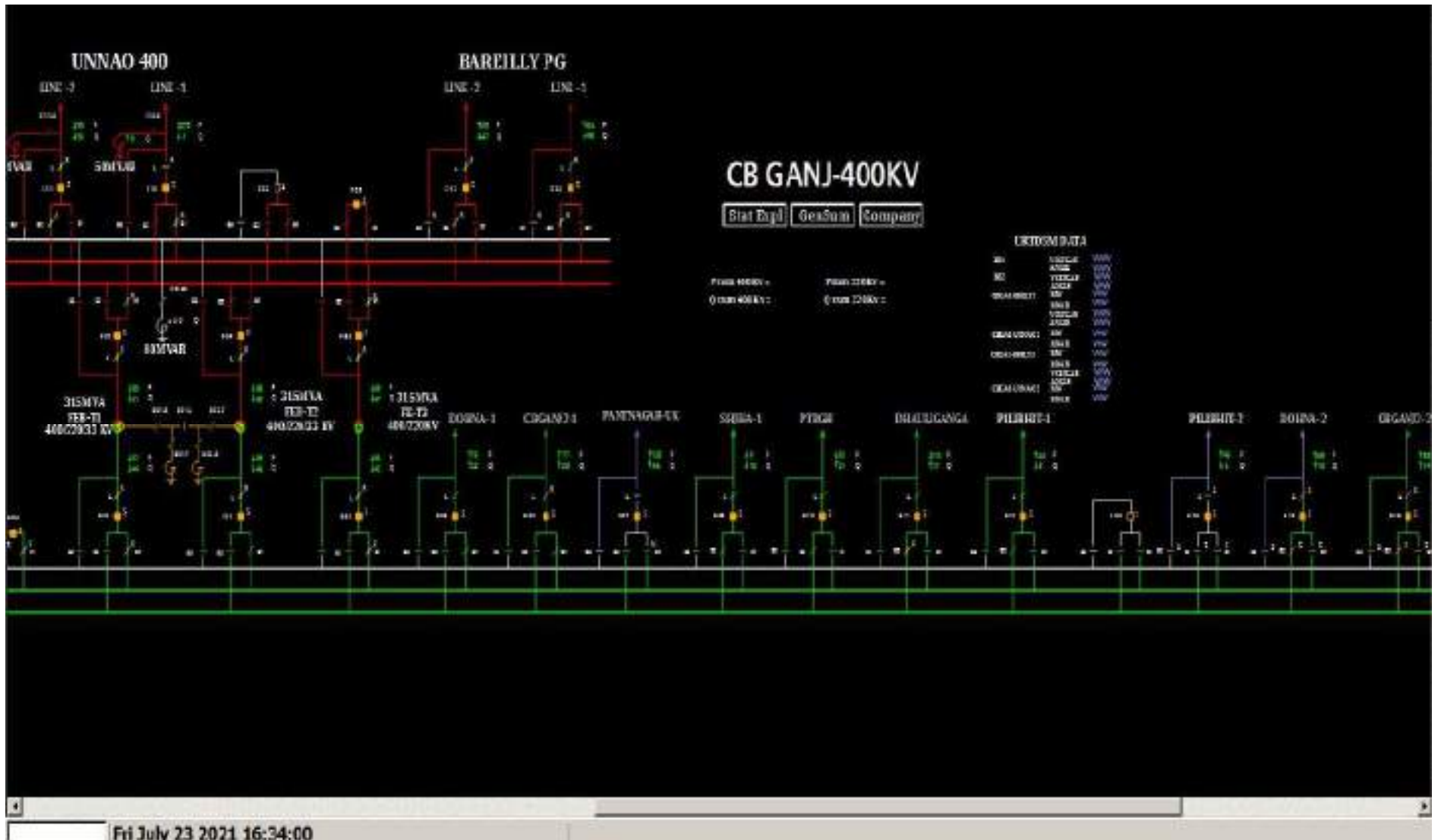
Jul 23 Fri 2021

# Dhauliganga HEP generation during tripping



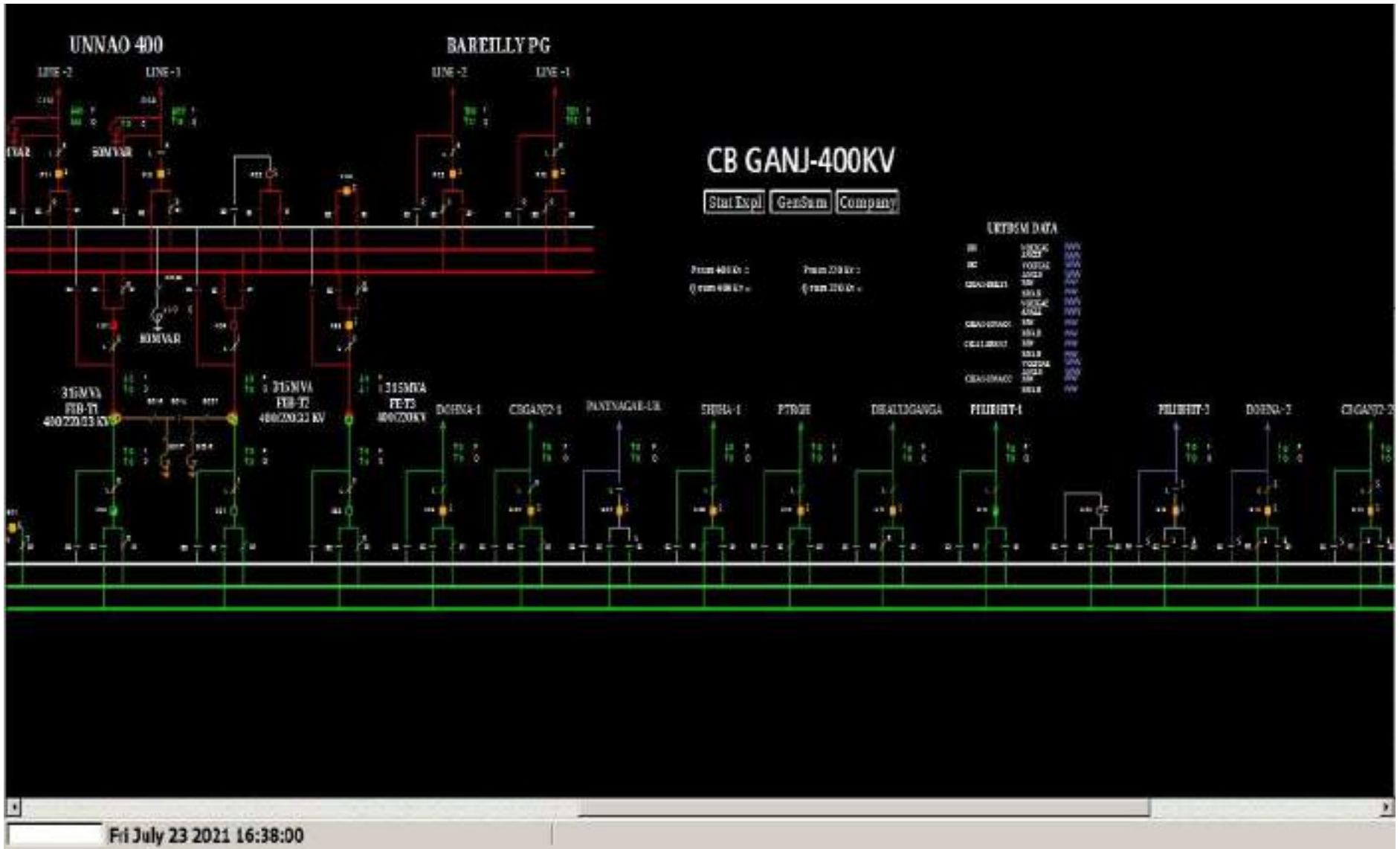
Jul 23 Fri 2021

# SLD before tripping CB Ganj

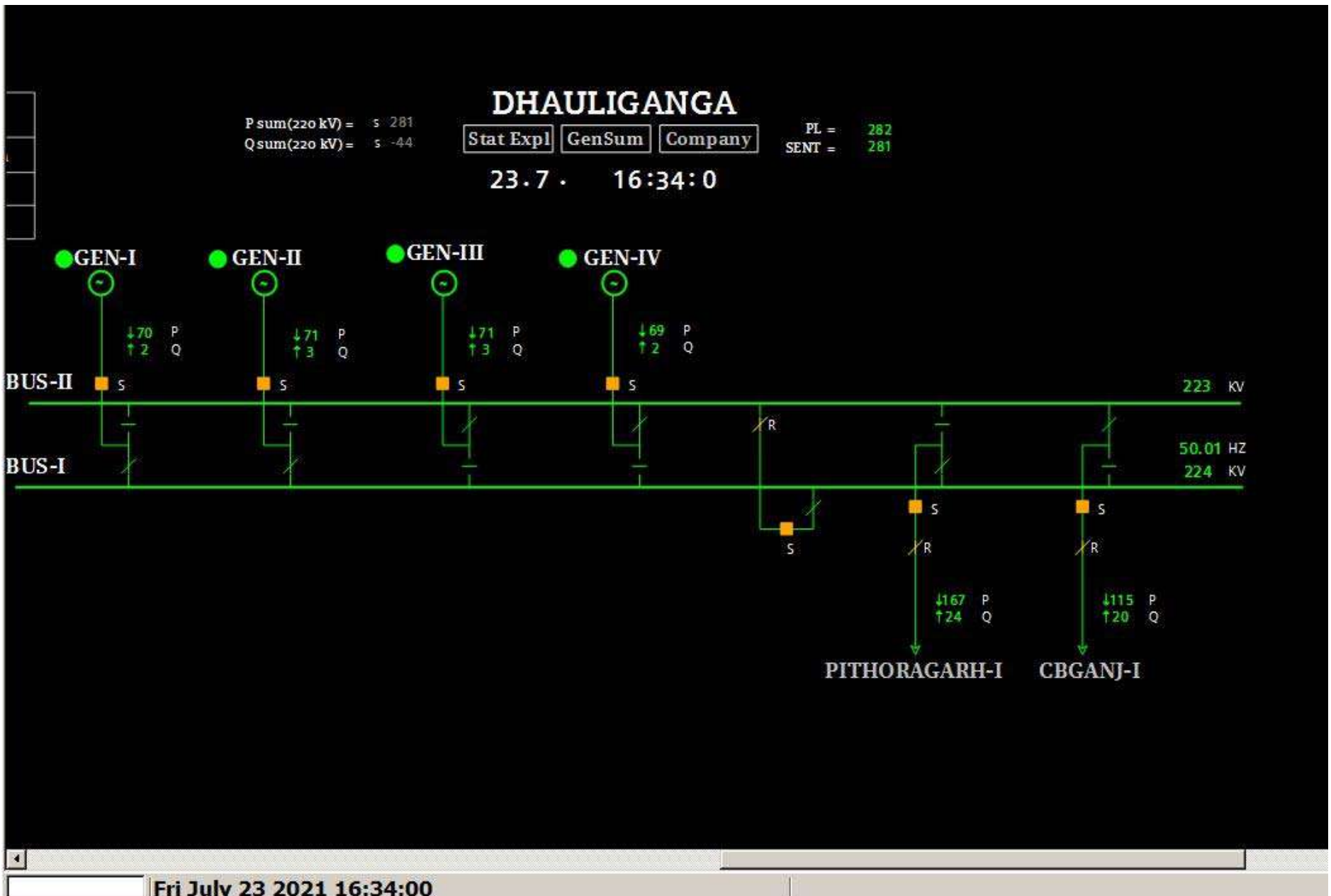




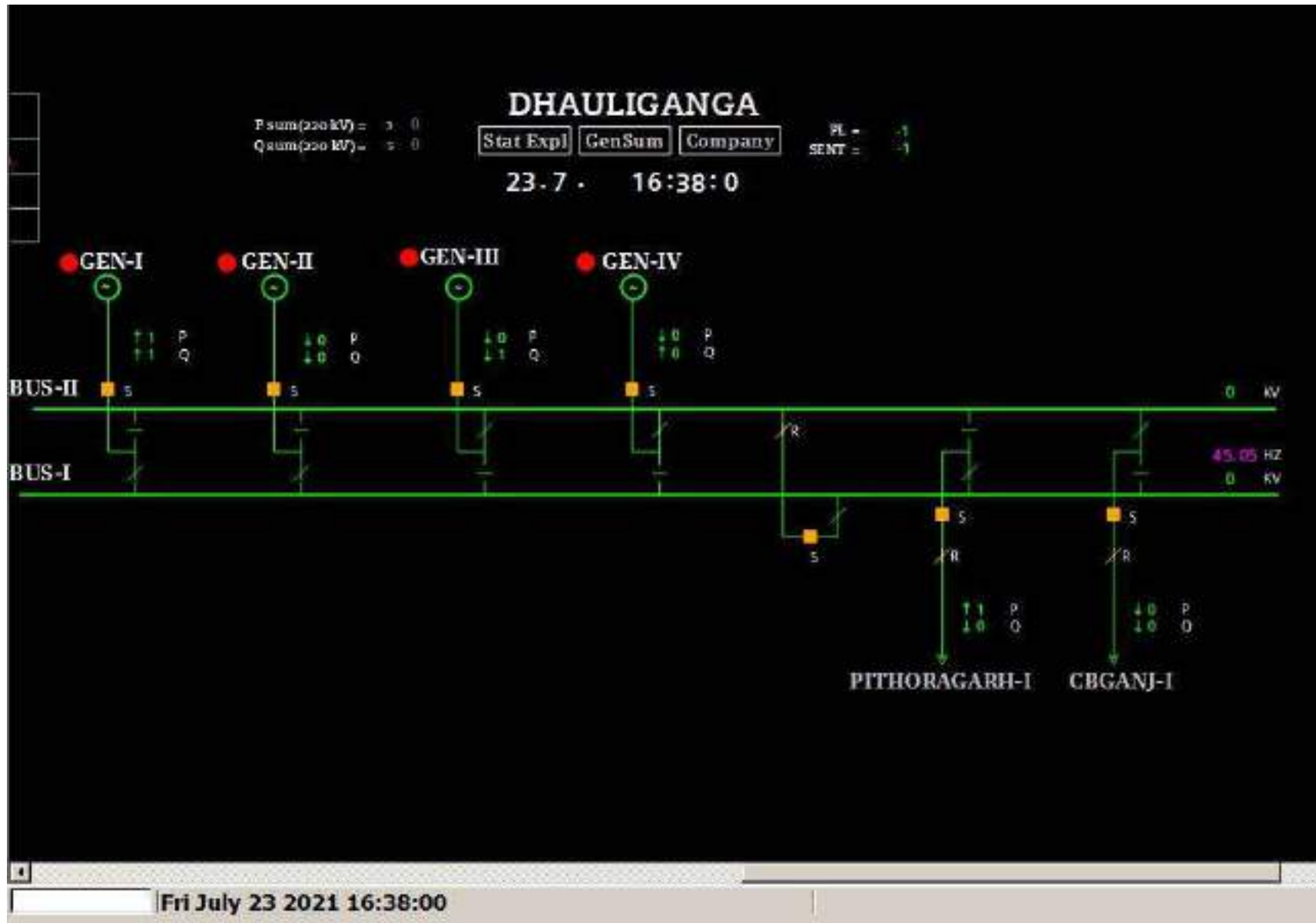
# SLD after tripping CB Ganj



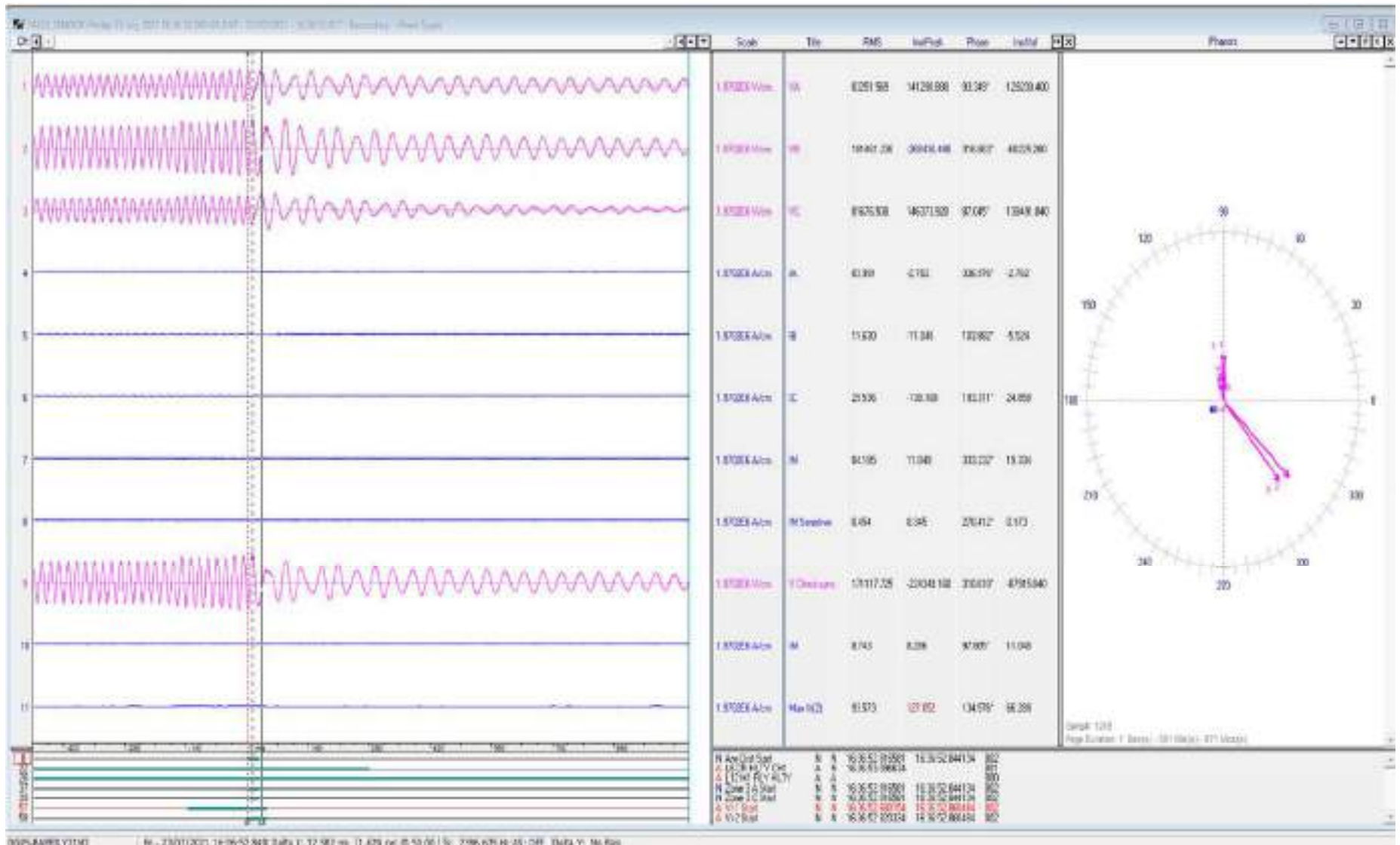
# SLD before tripping Dhauliganga



# SLD after tripping Dhauliganga

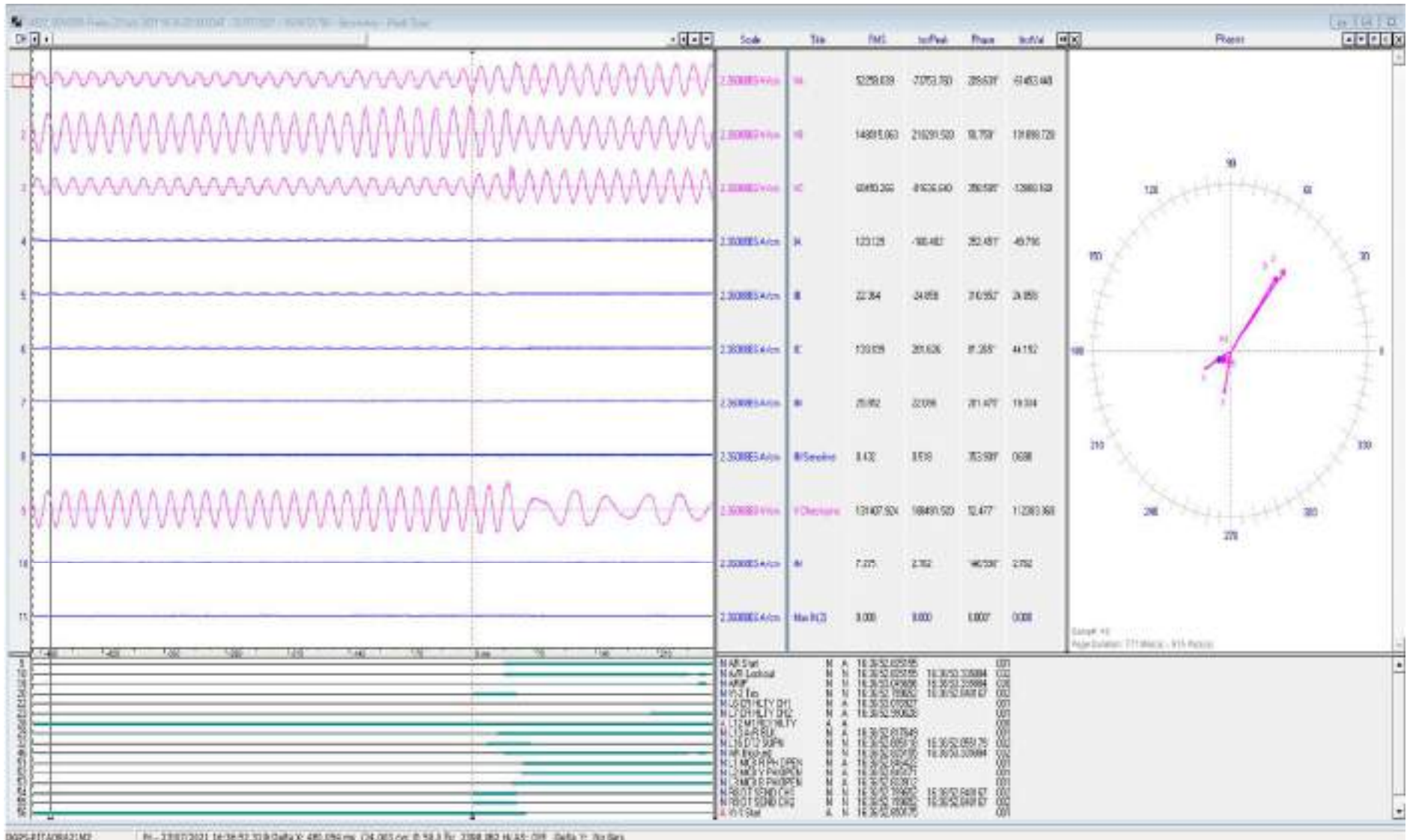


# DR of Dhauliganga-Bareilly (Dhauliganga end)



Line tripped within 50ms of OV stage-2 start, Time delay setting of OV protection at Dhauliganga NHPC needs to be reviewed.

# DR of Dhauliganga-Pithoragarh (Dhauliganga end)

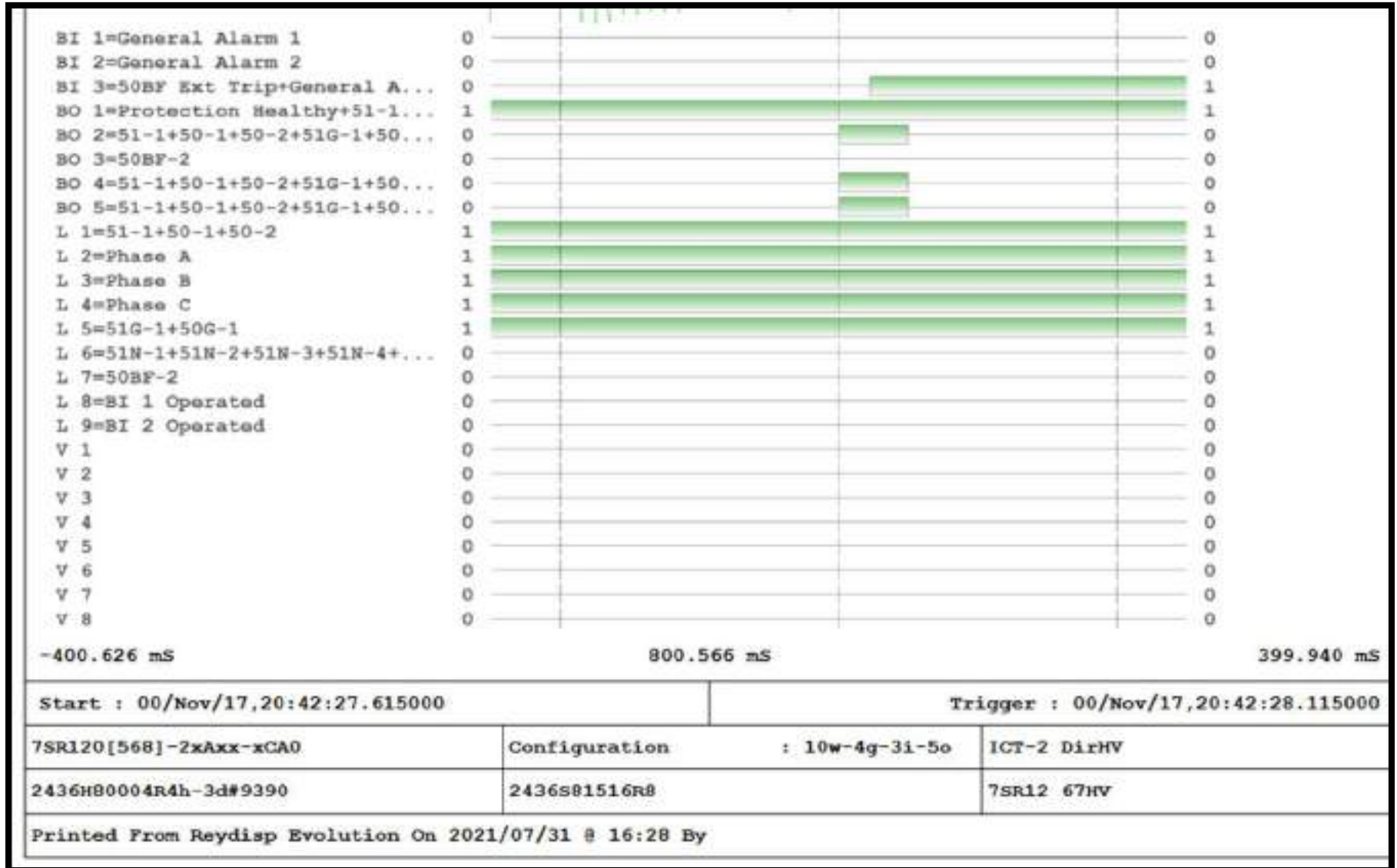


Line tripped within 50ms of OV stage-2 start, time delay setting of OV protection at Dhauliganga NHPC needs to be reviewed.

## Details received from POWERGRID

1. Time & Date of Event:	23/07/2021 16:36:00 Hrs.
2. Substation Name:	220 KV Pithoragarh (PG)
3. Name of the tripped elements & time of tripped elements:	<ul style="list-style-type: none"><li>• 220KV Pithoragarh-Bareilly(UP) Line, 16:36:00 Hrs.</li></ul>
4. Triggering Incident:	<b>R-B fault</b>
5. Flag Details, DR/EL	Attached
6. Event Description	As per below: <ul style="list-style-type: none"><li>• In 220KV Pithoragarh-Bareilly (UP) Line, Distance relay sense R-B fault at 346.0 Km from Pithoragarh (PG) and tripped on Zome-3 from Pithoragarh (PG) End.</li></ul>
7. Restoration Time:	23/07/2021 17:31:00 Hrs.
8. Remedial Action Taken:	

# DR of 400/220kV ICT-2 at Bareilly(UP)



Earth fault protection operated

# Details received from SLDC-UP

Electricity Test & Commissioning Division Bareilly										
Analysis Statement of Protection Gears in view of tripping of ICTs & 220KV Lines on dated 23.07.2021 at 16:36hrs Sub-Division-400K										
S l. No	Tripping Date/Time	Closing Date/Time	Name Of Sub-Station	Transfo rmer / Fedder s/CB No	Type of Protect ion Schem e	Flag Observed				Analysis/ Remark
						This end		Other End		
						Relay Flags	FL Readin g	Relay Flags	FL Readin g	
<b>400 KV Trippings</b>										
1	23.07.2021 16:36	23.07.2021 17:28	400 Bareilly	315 MVA ICT-1 CB981/ 881	ABB	<b>HV Side-</b> CP-Directional O/C protection operated, Overload protection alarm operated, Gr B trip relay operated. RP-Rphase O/C operated , Overload protection- RXIG-21, Overload protection operated, Trip relays- Gr B 3 phase trip relay operated <b>LV Side-</b> CP- Overload protection alarm RP-Overload protection- RXIG-21, GrB 3 phase trip unit operated				Flashover seen near ICT-3 as reported by guard
2	23.07.2021 16:36	23.07.2021 18:48	400 Bareilly	315 MVA ICT-2 CB 982/882	Siemen s	<b>HV Side-</b> CP- Dir O/C protection operated, 86A/86B operated RP- R, B ,Ia=1.3KA, Ib=0.128, Ic=1.630, In=0.342, 86AX, 86BX <b>LV Side-</b> 86A/86B trip relay operated RP-86AX, 86BX.				



# Details received from SLDC-UP

3	23.07.2021 16:36	23.07.2021 18:48	400 Bareilly	315 MVA ICT-3 CB 883	ERL	LV Side- CP- Dir E/F protection operated, 86A/86B operated RP- Inv E/F protection operated, Ia=1.852A, Ib=0.117A, Ic=2.360A, In=0.953A, operating time =2.710", 86 operated. (CTR=1000/1A)				
<b>220 KV trippings</b>										
1	23.07.2021 16:36	23.07.2021 19:49	400 Bareilly	Pilibhit Ckt-1	ERL	86 operated				Due to O/C of ICTs SPS operated and caused tripping of Pilibhit Ckt-1
2	23.07.2021 16:36	23.07.2021 18:20	400 Bareilly	Dhaulti ganga	Siemens	CP- Direct trip receive CH-1 & 2 RP- Direct trip receive CH-1&2, GrA high speed 3 phase trip relay operated.		Over voltage protection operated		
3	23.07.2021 16:36	23.07.2021 17:36	220 Pilibhit	400 Bareilly Ckt-2	Siemens	CP- Distance trip RP-Gen trip, R, Y, B, 73 Km.				315 ICT-3 tripping duration was 2.71 Second caused tripping of lines in Z-3 (1.0 second timing) at other end.
4	23.07.2021 16:36	23.07.2021 18:28	220 Dohna	400 Bareilly Ckt-2	Alstom	CP- Distance protection trip RP- A, B, C, Z-3, 159.6Km, 86A, 86B.				
5	23.07.2021 16:36	23.07.2021 17:36	220 Dohna	400 Bareilly Ckt-1	Alstom	CP- Distance protection trip RP- A, B, C, Z-3, 165.8Km, 86A, 86B.				
6	23.07.2021 16:36	23.07.2021 18:13	220CB Ganj	400 Bareilly- 1	Siemens	CP- Distance trip RP-Gen trip, R, B, Z3, 225.8Km, 86A, 86B.				
7	23.07.2021 16:36	23.07.2021 18:13	220CB Ganj	400 Bareilly- 2	Siemens	CP- Distance trip RP-Gen trip, R, B, Z3, 237.28Km, 86A, 86B.				
<b>Note - At the same time i.e. 16:36Hrs. in SPS system PSU &amp; CPU Card burnt and heavy Smoke observed.</b>										

# Observations

- Exact location of fault in 400/220kV 315MVA ICT-1 at Bareilly (UP)?
- Reason of delayed clearance of fault?
- DR of 220kV lines connected at Bareilly (UP) not received.
- Time delay setting of OV stage-2 at Dhauliganga HEP needs to be reviewed.
- Time sync issue in DR of ICT-2 at Bareilly.

**DETAILED ANALYSIS REPORT OF  
MULTIPLE TRIPPING OCCURRED AT  
400/220kV Bareilly substation  
TIME AND DATE OF  
EVENT:23.07.21/16:36**

# BRIEF SUMMARY

- As per information received from concerned flash over was observed at 315MVA ICT-III Since fault was not cleared timely by the protection of 315MVA ICT-III, other two ICTs tripped on over current and all 220kV lines at 400/220kV Bareilly substation tripped on above mentioned flag.

Load loss:45 MW

# NAME AND TIME OF THE TRIPPED ELEMENT ALONG WITH RESTORATION TIME AND FLAG

NAME OF ELEMENT	TRIPPING DATE	TRIPPING TIME (upto milisecond resolution)	RESTORATION DATE	RESTORATION TIME	FLAGS END 1 (INCLUDING A/R)
220kV Bareilly- Dohna ckt I	23.07.2021	16:36:00	23.07.2021	17:36	Tripped from other end
220kV Bareilly - Dohna ckt II	23.07.2021	16:36:00	23.07.2021	18:28	-do-
220kV Bareilly - C B Ganj ckt I	23.07.2021	16:36:00	23.07.2021	18:13	-do-
220kV Bareilly - C B Ganj ckt II	23.07.2021	16:36:00	23.07.2021	18:13	-do-
220kV Bareilly Pantnagar	-23.07.2021	16:36:00	23.07.2021	17:22	No Tripping
220kV Bareilly Shahjahanpur ckt I	-23.07.2021	16:36:00	23.07.2021	17:22	Line was already open
220kV Bareilly Pithorgarh	-23.07.2021	16:36:00	23.07.2021	17:22	No Tripping

220kV Bareilly Dhauliganga	-23.07.2021	16:36:00	23.07.2021	17:22	-do-
220kV Bareilly Pilibhit ckt I	-23.07.2021	16:36:00	23.07.2021	19:49	86 operated
220kV Bareilly Pilibhit ckt II	-23.07.2021	16:36:00	23.07.2021	17:36	Tripped from other end
315MVA ICT-I	23.07.2021	16:36:00	23.07.2021	17:28	Directional O/C Protection operated, Overload Protection Operated
315MVA ICT-II	23.07.2021	16:36:00	23.07.2021	18:48	Directional O/C Protection Operated, In= 0.342A
315MVA ICT-III	23.07.2021	16:36:00	23.07.2021	18:48	Direction E/F Protection Operated, In=0.953A

DESCRIPTION: DETAILED DESCRIPTION  
INCLUDING THE REFERENCE OF DR/EL  
AND EXPLANATION BASED ON PT  
C.EVENT DATA

- As per information received from concerned flash over was observed at 315MVA ICT-III Since fault was not cleared timely by the protection of 315MVA ICT-III, other two ICTs tripped on over current and all 220kV lines at 400/220kV Bareilly substation tripped on above mentioned flag.

# Issues to be discussed

- **Issues as per PSC**
- 1. Exact location of fault & reason of occurrence of fault? **Due to flashover near ICT-3**
- 2. Reason of delayed clearance of fault? **Low intensity of fault current( $I_n=0.953A$ )**
- 3. As per SCADA SOE, multiple element tripping observed at 132kV Barkhera before tripping of ICTs at Bareilly. Exact location of fault needs to be identified.
- 4. was there malfunction of SPS of Bareilly ICTs?- **No (setting was 1.5 sec for Current 110%) and CPU of SPS damaged after tripping of Pilibhit-1.**
- 5. Reason of tripping of all 220kV lines- **Due to high fault impedance all lines tripped in Z3 from other end.**
- 6. DR/EL & tripping report needs to be shared.



Multiple elements tripping at 400kV  
Muzaffarnagar(UP), 400kV Alaknanda  
GVK(UPC), 400kV Vishnuprayag(JP) and  
220kV Singoli Bhatwari(Singoli)

07<sup>th</sup> Aug 2021, 03:02 hrs

# Tripped elements & Antecedent condition (As reported)

## **Antecedent Condition:**

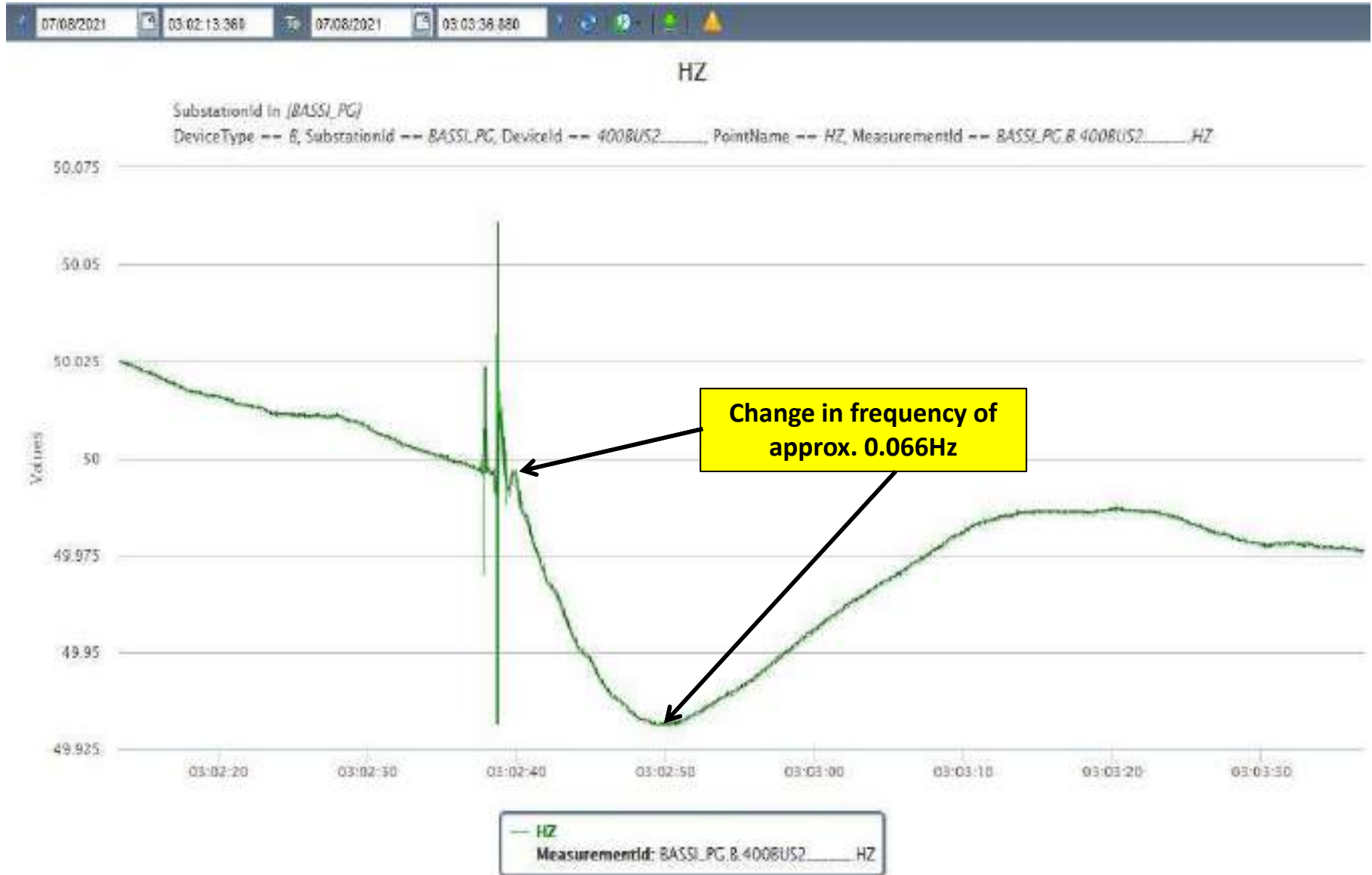
- Weather Conditions: Normal
- Grid Frequency (Hz): 50.02
- Total IR Import (MW): 14006
- Northern Region Demand (MW): 56479

## **Tripped Elements:**

- 1) 400/220 kV 500 MVA ICT 4 at Muzaffarnagar(UP)
- 2) 400 KV Muzaffarnagar-Ataur (UP) Ckt-1
- 3) 400 KV Roorkee(PG)-Muzaffarnagar(UP) (PTCUL) Ckt-1
- 4) 400 KV Muzaffarnagar(UP)-Vishnuprayag(JP) (UP) Ckt-1
- 5) 220 KV Singoli Bhatwari(Singoli(LTUHP))-Srinagar(UK) (PTCUL) Ckt-2
- 6) 400/220 kV 315 MVA ICT 3 at Muzaffarnagar(UP)
- 7) 400/220 kV 315 MVA ICT 1 at Muzaffarnagar(UP)
- 8) 400 KV Meerut(PG)-Muzaffarnagar(UP) (PG) Ckt-1
- 9) 82.5 MW Alakhanda HEP - UNIT 4
- 10) 82.5 MW Alakhanda HEP - UNIT 2
- 11) 82.5 MW Alakhanda HEP - UNIT 3
- 12) 82.5 MW Alakhanda HEP - UNIT 1
- 13) 110 MW Vishnuparyag HPS - UNIT 2
- 14) 110 MW Vishnuparyag HPS - UNIT 3
- 15) 110 MW Vishnuparyag HPS - UNIT 1
- 16) 110 MW Vishnuparyag HPS - UNIT 4
- 17) 220 KV Singoli Bhatwari(Singoli(LTUHP))-Srinagar(UK) (PTCUL) Ckt-1
- 18) 400 KV Alaknanda GVK(UPC)-Muzaffarnagar (UP) Ckt-1
- 19) 400 KV Alaknanda GVK(UPC)-Srinagar(UK) (UK) Ckt-1
- 20) 400 KV Alaknanda GVK(UPC)-Srinagar(UK) (UK) Ckt-2

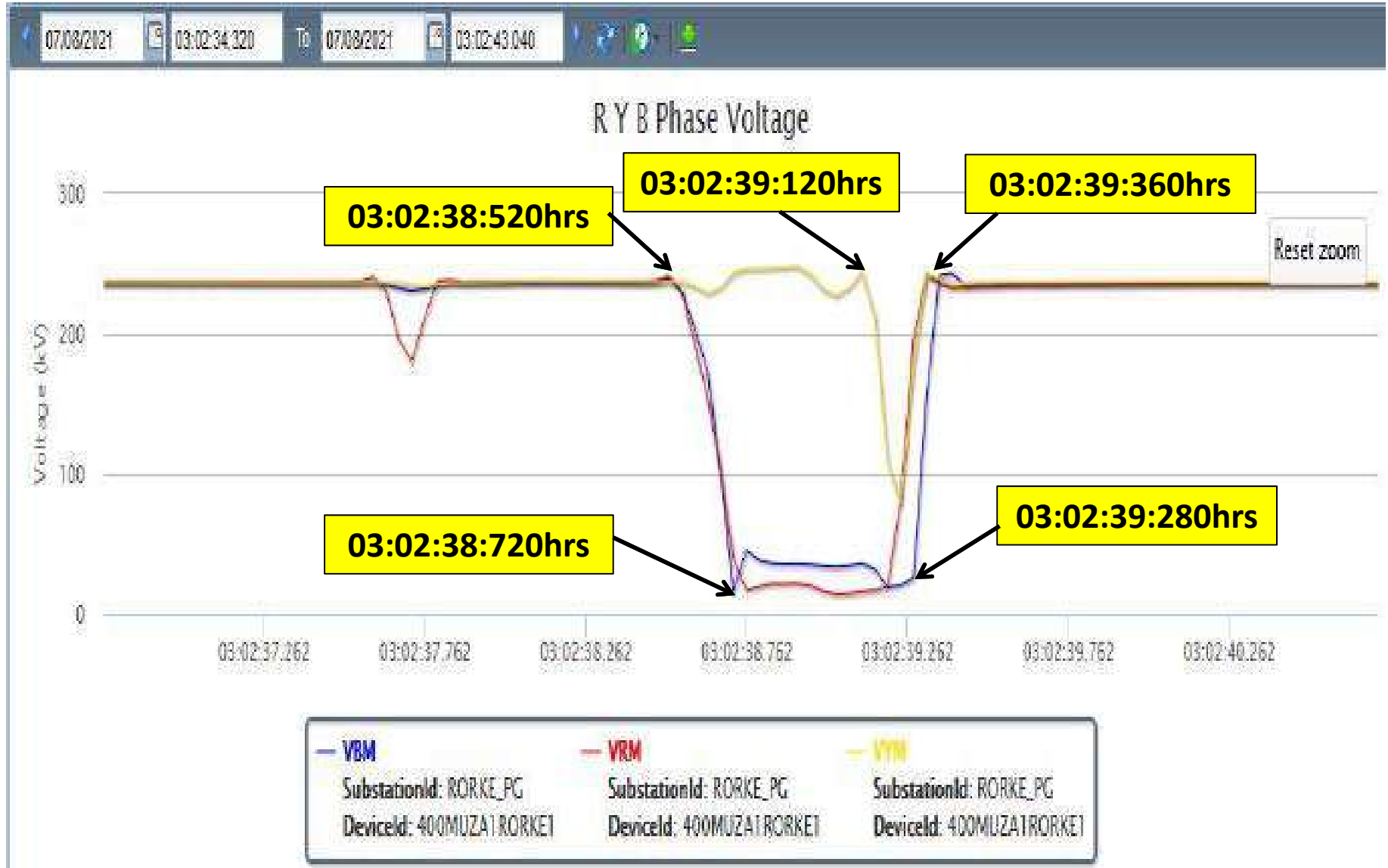
# PMU Plot of frequency at Bassi(PG)

03:02hrs/07-Aug-21



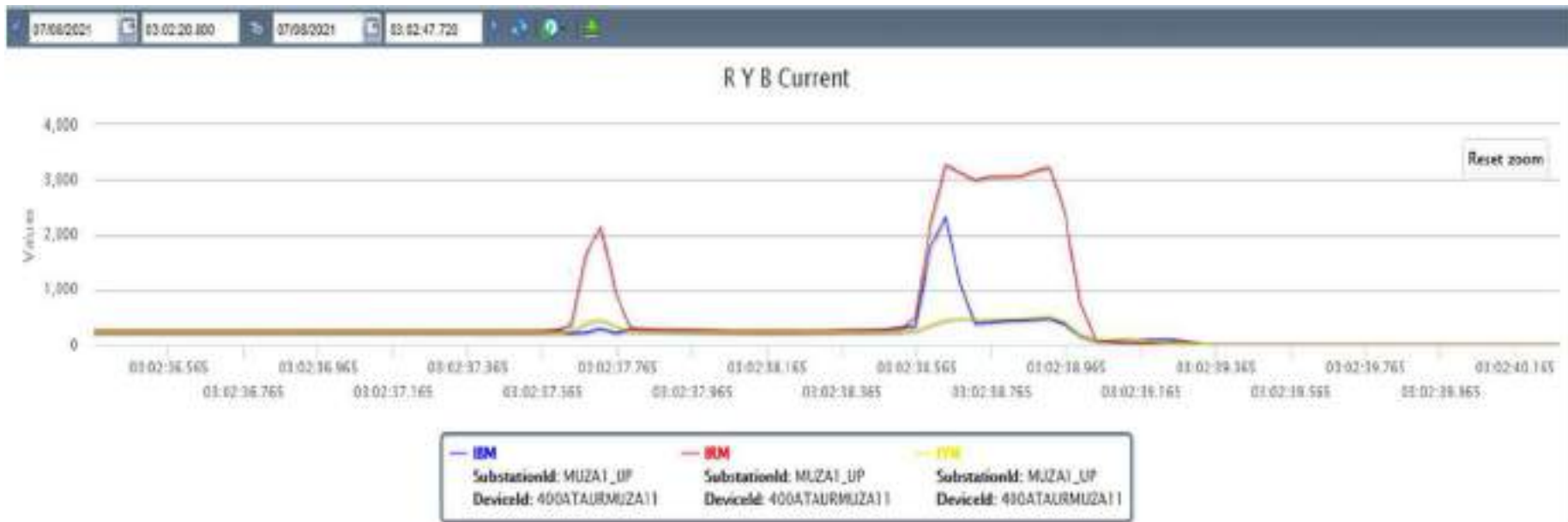
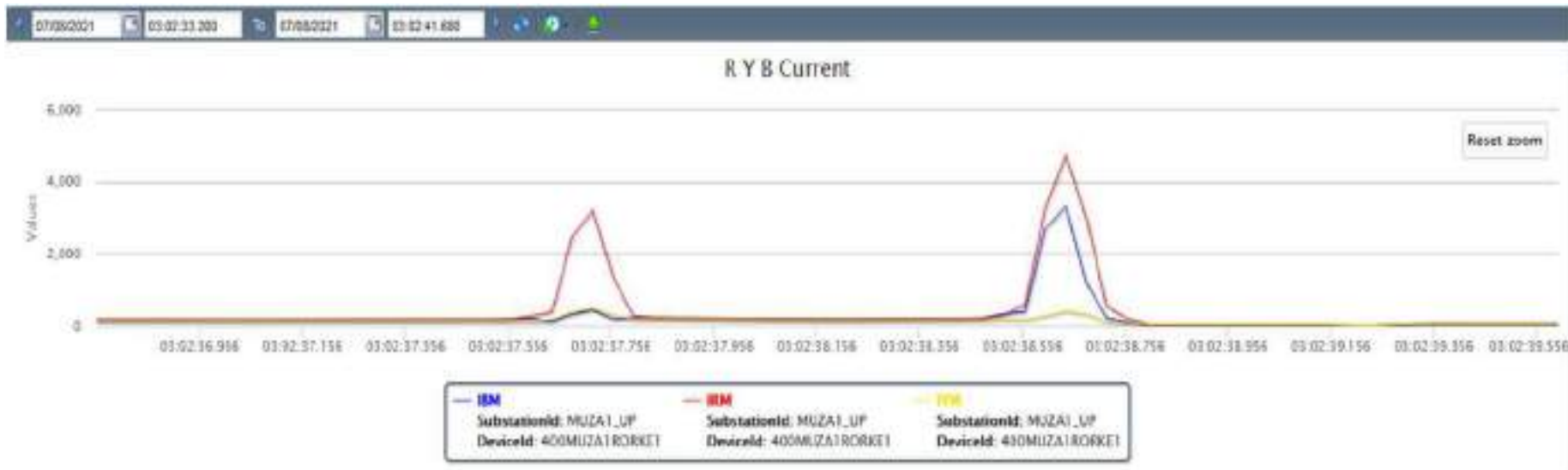
# PMU Plot of phase voltage magnitude at Roorkee(PG)

03:02hrs/07-Aug-21



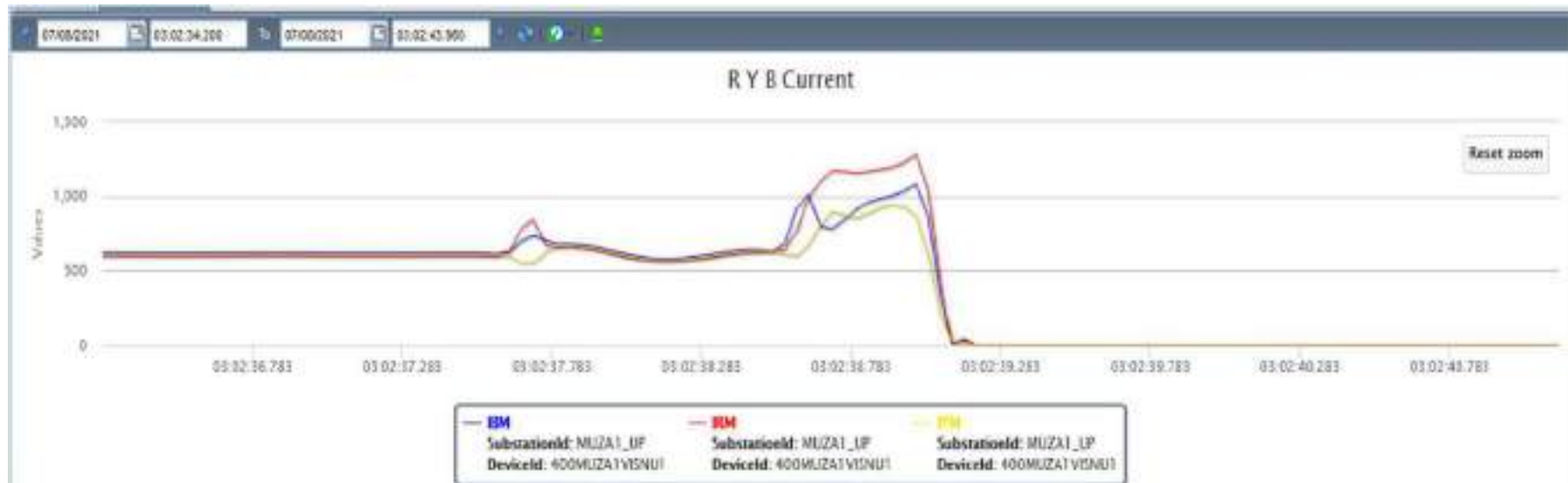
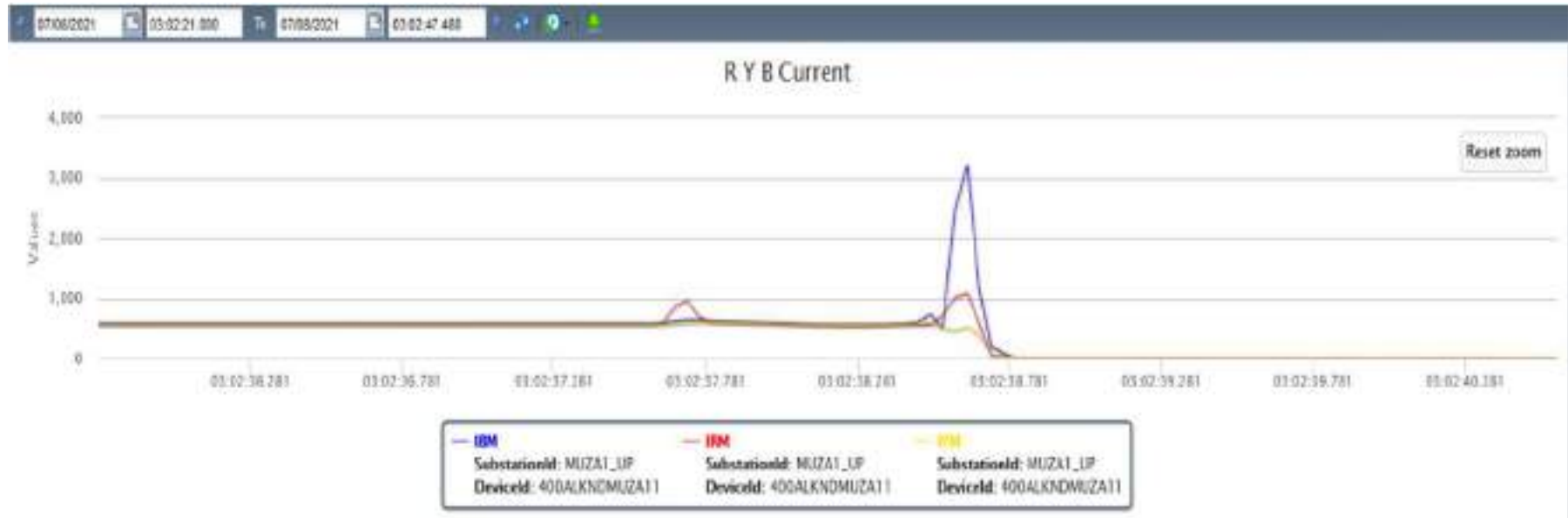
# PMU Plot of phase current magnitude at Muzaffarnagar(UP)

03:02hrs/07-Aug-21



# PMU Plot of phase current magnitude at Muzaffarnagar(UP)

03:02hrs/07-Aug-21

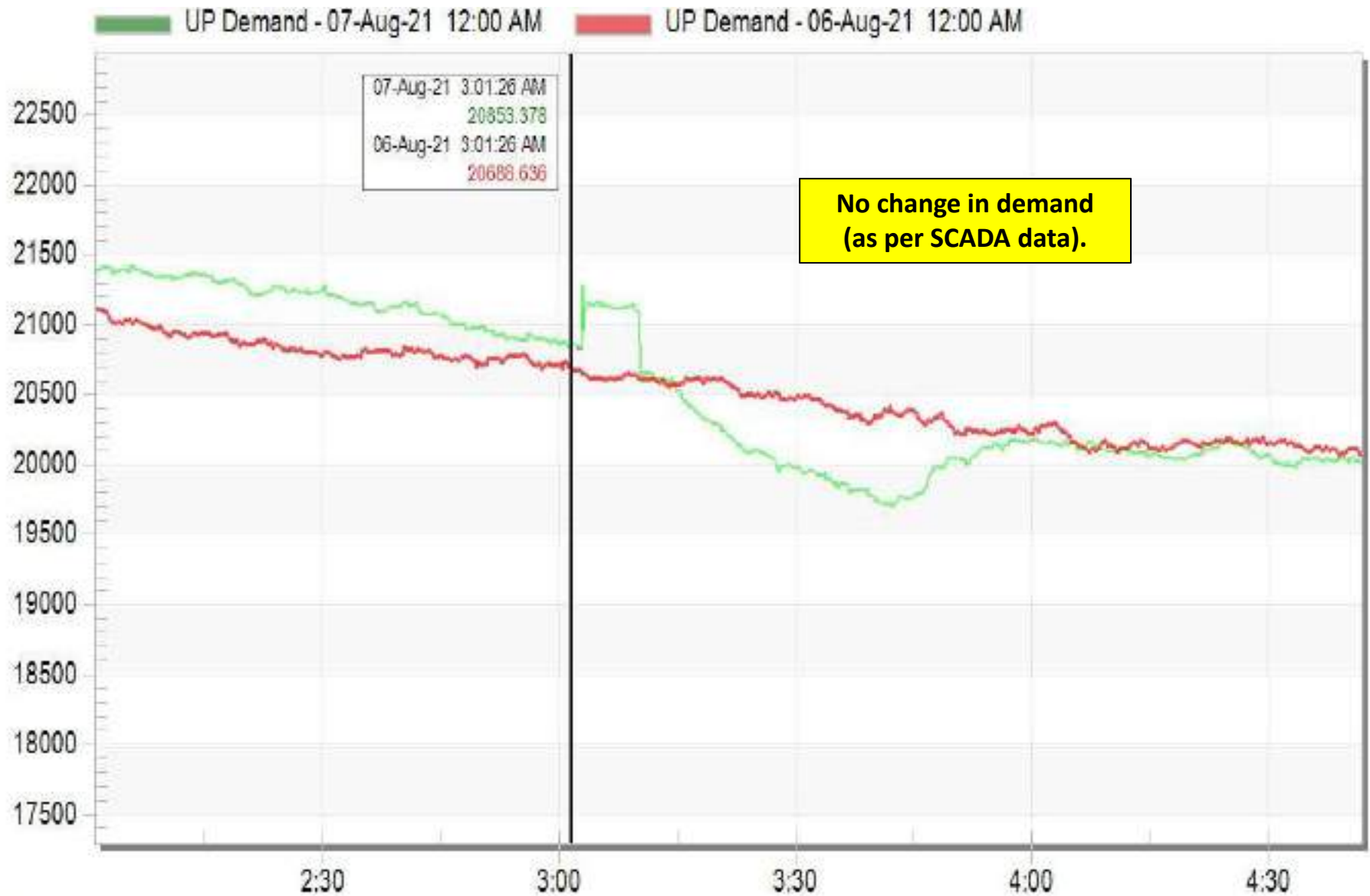


# SCADA SOE

Fault time: 03:02:38.520

Time	Station Name	Voltage	Element Name	Element Type	Element Status	Tripping time after fault in hr:mm:sec.ms
3:02:38.691	ROORKEE	400kV	1MUZA1	Circuit Breaker	Open	0:00:00.171
3:02:38.691	ROORKEE	400kV	2T1MU1	Circuit Breaker	Open	0:00:00.171
3:02:38.972	ATAUR_U	400kV	03MUZA1	Circuit Breaker	Open	0:00:00.452
3:02:38.988	MEERUT	400kV	11MU1KT2	Circuit Breaker	Open	0:00:00.468
3:02:41.260	SIMBH_I	220kV	05H03	Circuit Breaker	Open	0:00:02.740
3:02:41.311	ALKND_UP	400kV	12MUZA2	Circuit Breaker	Open	0:00:02.791
3:02:41.311	ALKND_UP	400kV	11H04MZ2	Circuit Breaker	Open	0:00:02.791
3:02:41.311	ALKND_UP	400kV	07H03	Circuit Breaker	Open	0:00:02.791
3:02:41.360	SIMBH_I	220kV	04H02	Circuit Breaker	disturbe	0:00:02.840
3:02:41.360	SIMBH_I	220kV	03H01	Circuit Breaker	disturbe	0:00:02.840
3:02:41.560	SIMBH_I	220kV	04H02	Circuit Breaker	Open	0:00:03.040
3:02:41.560	SIMBH_I	220kV	03H01	Circuit Breaker	Open	0:00:03.040
3:02:44.410	ALKND_UP	400kV	10H04	Circuit Breaker	Open	0:00:05.890
3:02:45.991	ALKND_UP	400kV	05H02SR2	Circuit Breaker	Open	0:00:07.471
3:02:45.991	ALKND_UP	400kV	04H02	Circuit Breaker	Open	0:00:07.471
3:02:45.991	ALKND_UP	400kV	01H01	Circuit Breaker	Open	0:00:07.471
3:02:47.560	SIMBH_I	220kV	02SRNGR	Circuit Breaker	Open	0:00:09.040
3:02:47.560	SIMBH_I	220kV	01SRNGR	Circuit Breaker	Open	0:00:09.040

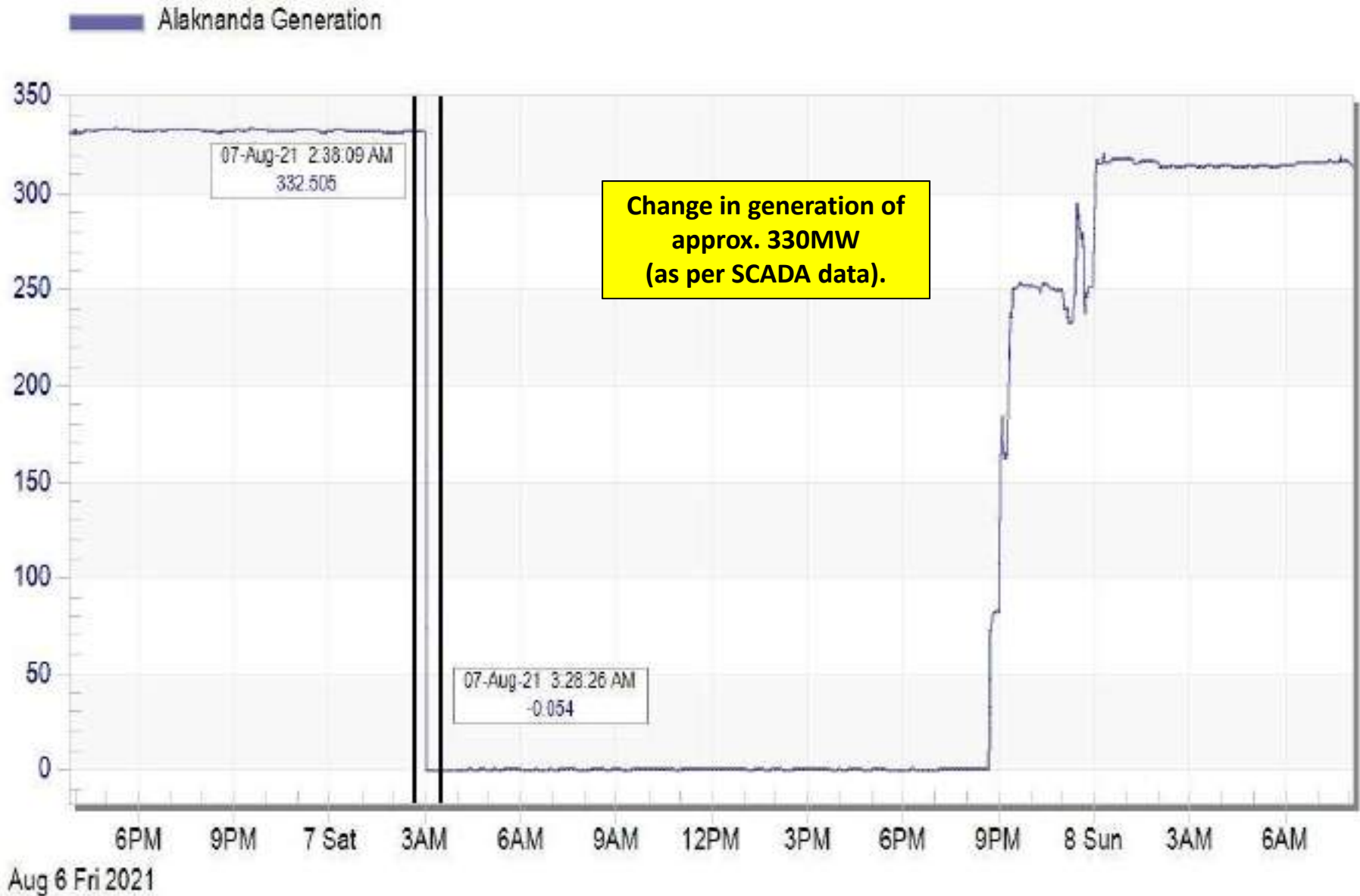
# UP Demand during tripping



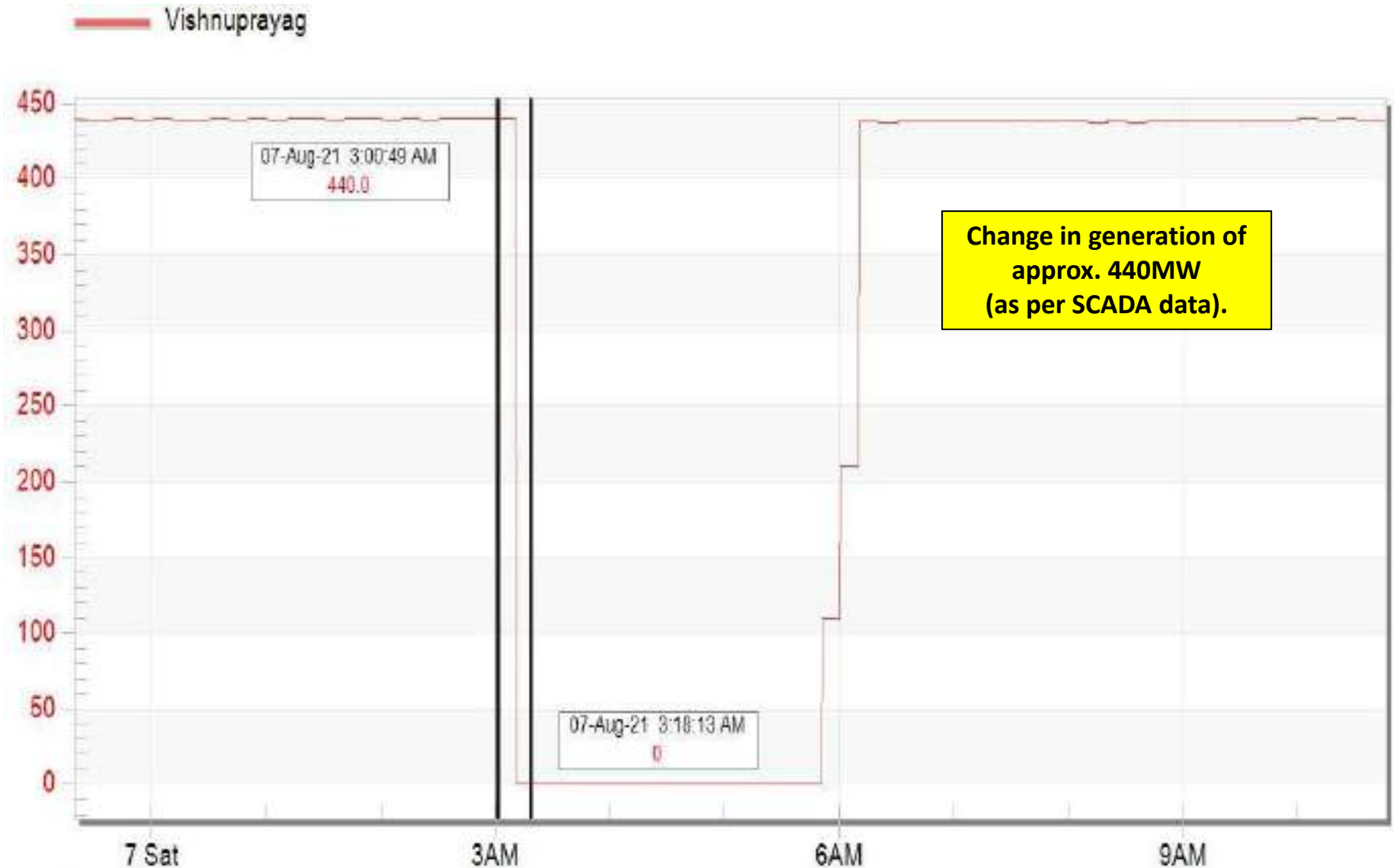
Aug 7 Sat 2021



# Alaknanda HEP generation during tripping

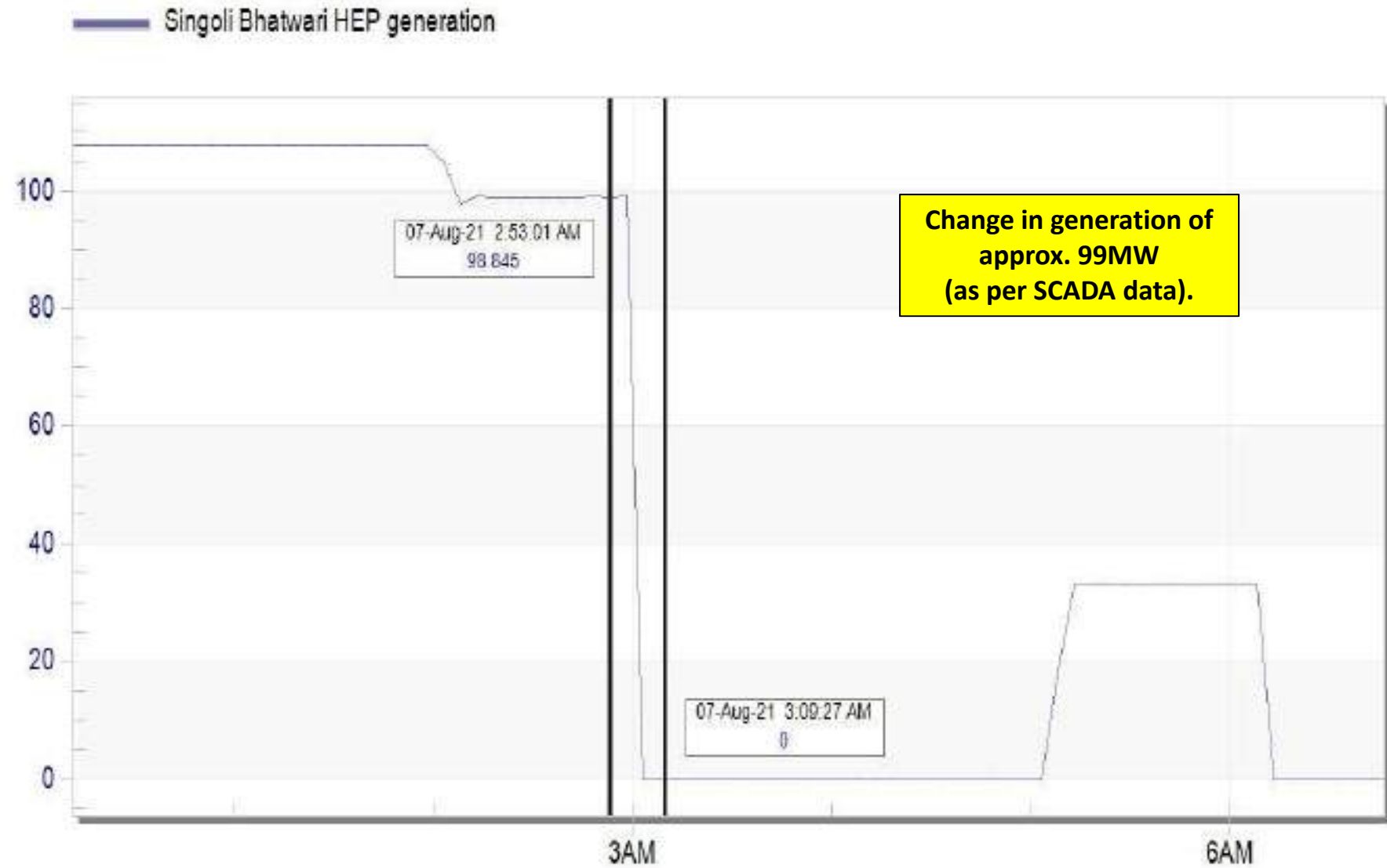


# Vishnuprayag HEP generation during tripping

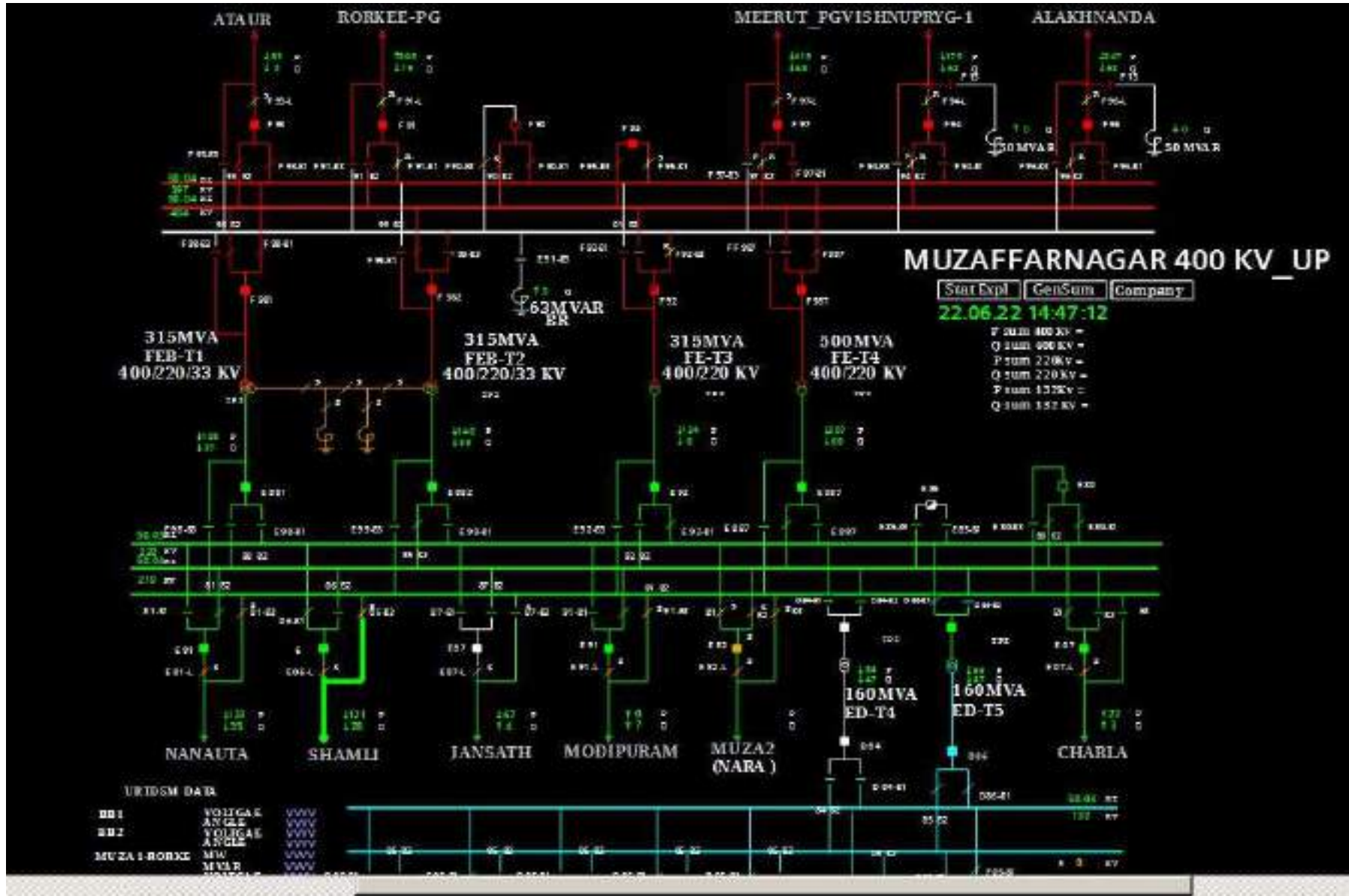


Aug 2021

# Singoli Bhatwari HEP generation during tripping



# SLD of 400/220kV Muzaffarnagar(UP)



**MUZAFFARNAGAR 400 KV\_UP**

Stat Expl    GenSum    Company

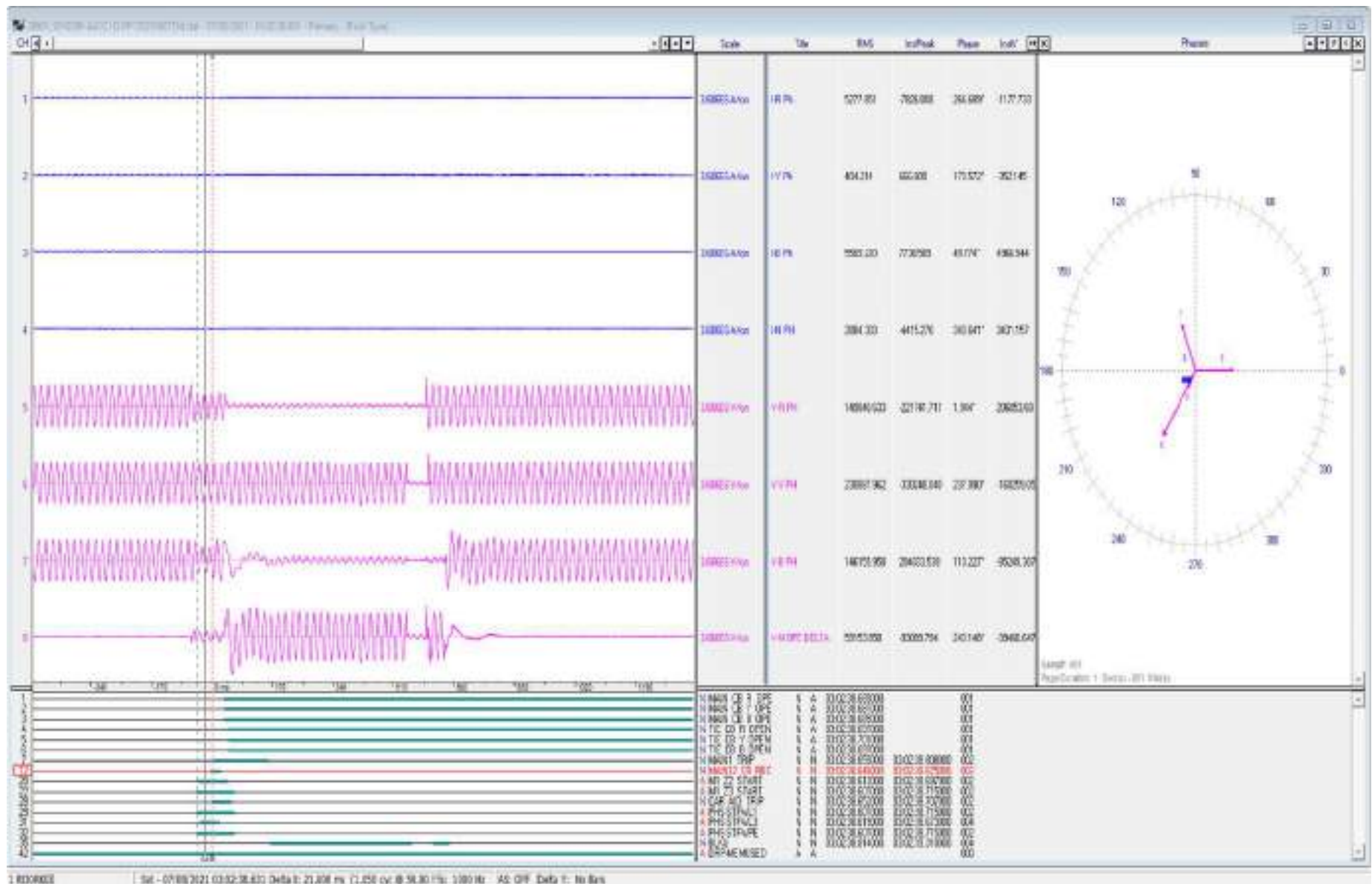
22.06.22 14:47:12

F sum 400 KV =  
 Q sum 400 KV =  
 P sum 220kv =  
 Q sum 220 kv =  
 P sum 132kv =  
 Q sum 132 kv =

URIDSM DATA

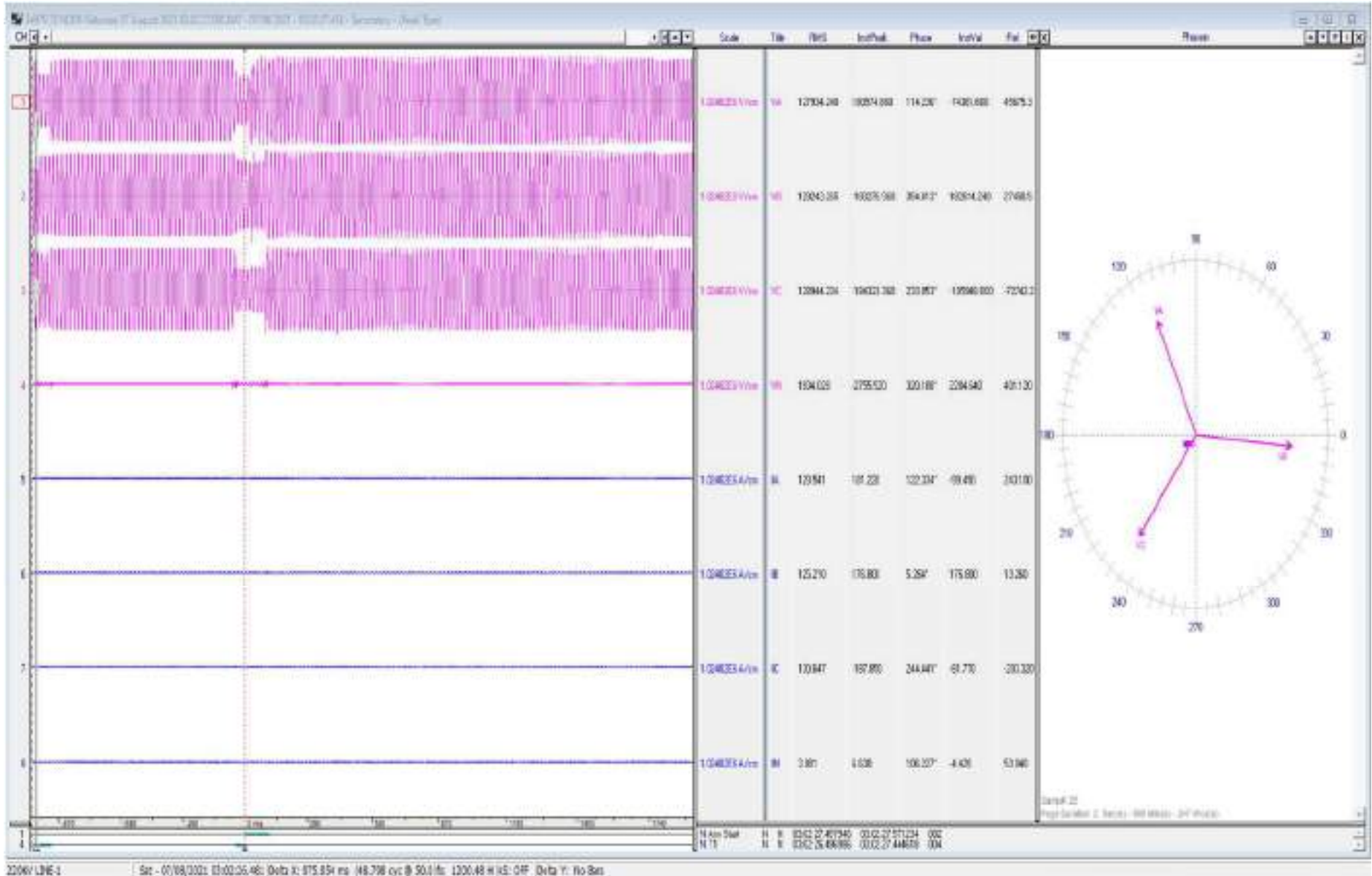
001	VOLTAG	WWW
002	ANGLE	WWW
	VOLTAG	WWW
	ANGLE	WWW
MUZA1-ROHKE	MVA	WWW
	MVAR	WWW

# DR of 400kV Muzaffarnagar-Roorkee ckt (Roorkee end)



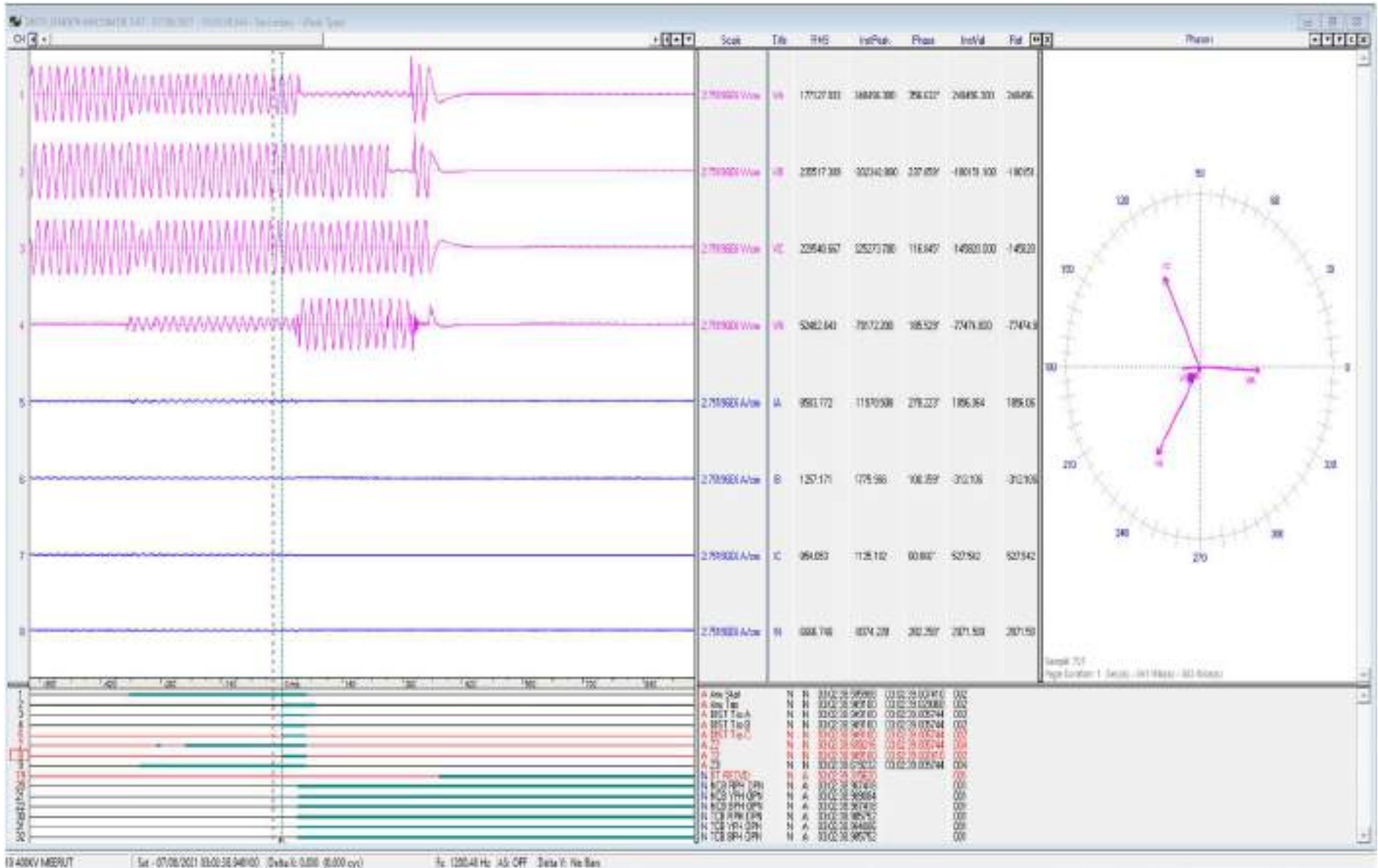
R-B fault, Z-2 from Roorkee end, three phase trip from Roorkee end on carrier received.

# DR of 220kV Singoli Bhatwari-Srinagar ckt (Singoli end)



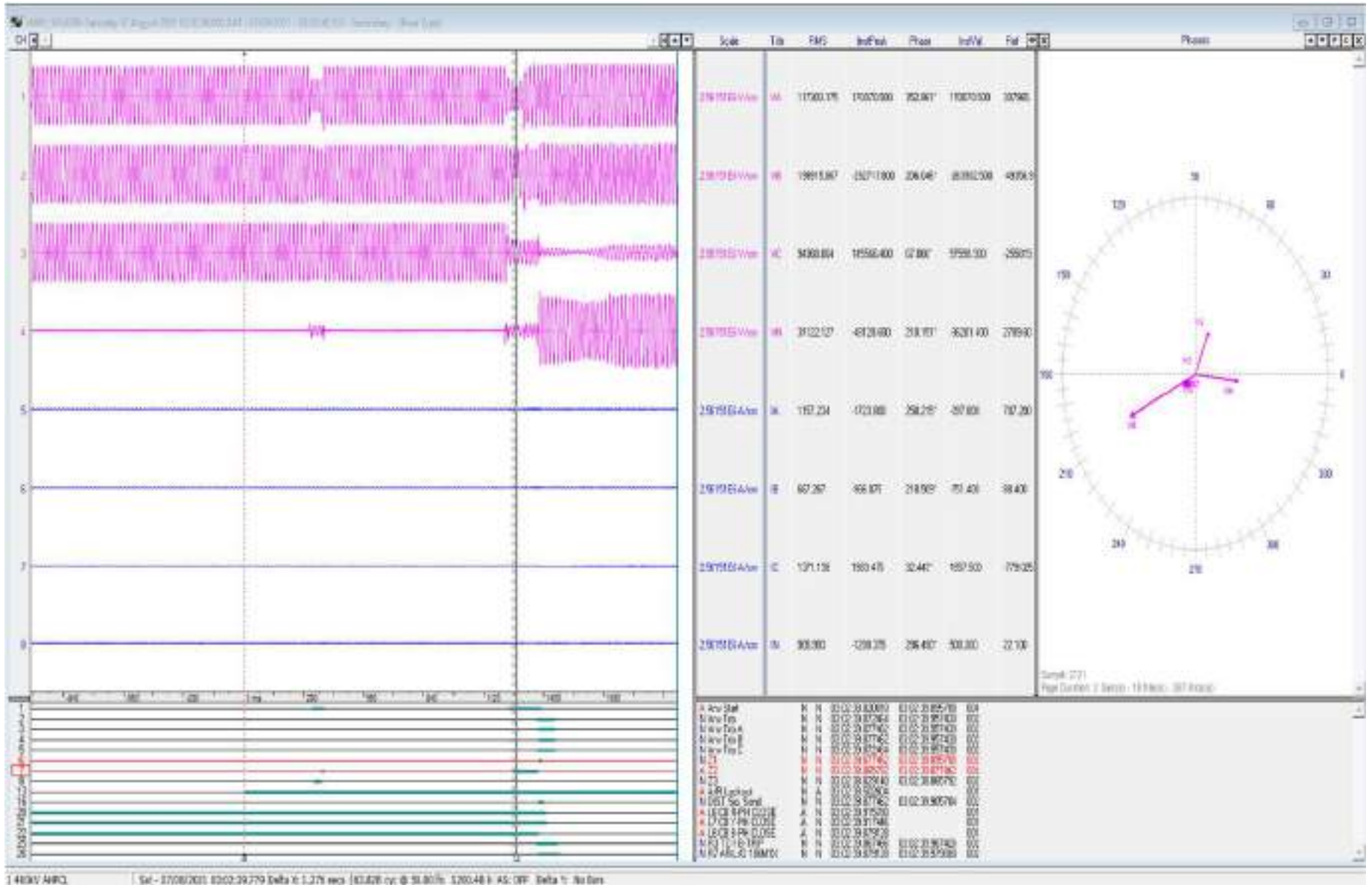
Which protection had initiated the tripping? Not recorded in DR

# DR of 400kV Muzaffarnagar-Meerut ckt (Meerut end)



Line tripped in Z-2 from Meerut end after 300ms

# DR of 400kV Muzaffarnagar-Alkanda ckt (Alkanda end)



Fault was in Z-2 from Alaknanda end



## Details received from SLDC-UP

At 3:03 Hrs. on 07.08.2021, following elements at 400 KV S/S Muzaffarnagar tripped. Normalization time of the elements is mentioned below:-

Sl. No.	Name of Element	Date & time of Normalization		Remark
1.	315MVA ICT-III	S/D		R- phase CT blast
3.	315MVA ICT-I	07.08.2021	5:30	Bus bar protection operated
4.	500MVA ICT-IV	07.08.2021	6:25	-do-
5.	400KV Muzaffarnagar-Ataur line	07.08.2021	5:50	-do-
6.	400KV Muzaffarnagar-Meerut(PG) line	07.08.2021	5:51	-do-
7.	400KV Muzaffarnagar-Vishnuprayag line	07.08.2021	5:34	-do-
8.	400KV Muzaffarnagar- Alakhnanda line	S/D		B-phas,Z-1, If=24KA,dist=.116KA

Generation Loss = 770MW(at 400KV Vishnuprayag HEP and 400KV Alakhnanda HEP)

Load Loss = NIL

As per information received tripping incident may be summarized as follows-

At 03:03 hrs HV Side R-Phase CT of 315MVA ICT-III blasted which was at bus-II. At the same time Bus-Bar protection of bus -I operated which resulted the tripping of all element connected to Bus-I along with Bus coupler and bus reactor which was charged through transfer bus and connected to bus I, 400 kV Muzaffarnagar-Alakhnanda line tripped simultaneously on above mentioned flag.

# Details received from SLDC-UP

## ELECTRICITY TEST & COMMISSIONING DIVISION MUZAFFARNAGAR FAULT ANALYSIS STATEMENT OF PROTECTIVE GEARS FOR THE MONTH OF OCT-2021

Daily Tripping Statement

Sl. No.	Tripping Date/Time	Closing Date/Time	Name of Substation	CB No. with Division (Code)	Type of Relay Scheme	Flag & Indication Observed	FL, DR, SR, AR, C det.	Analysis with discrepancy in flags if any	L. count
1	2	3	4	5	6	7	8	9	10
1	07/08/2021 03:03 (relay is not synchronised)	08/08/2021 03:40	400KV S/S MZN	CB 03/04 400KV CT	MCC04 F44,RE670	CP- DIFF PROT OPTD TRIP GR2/B PROT OPTD RP- HV=06A,06C,06A,06B,06A,06A,06A, LV=0	8.156	HV SIDE RPH CT BLASTED	173
2	07/08/2021 03:02:38.695	07/08/2021 19:24	400KV S/S MZN	CB 04 400KV MDS- ALAKNADA	MCC04/F44, SEL 42	CP- MIMC PROTECTION TRIP C/S, C/E MD-C.N.Z1.11-1X2.11-1X7. 11-1X2.B=04 KA MD-C.N.Z1.11-1X2.11-1X7. 11-1X2.B=0277A	0.114 KM, 0.03KM	B PH CT DAMAGED	
	07/08/2021 03:02:38.695	07/08/2021 19:24	400KV S/S ALAKNADA	CB 04 400KV SVC- MZ	MCC04 F44,RE670	CP- MIMC PROTECTION TRIP, RP-C.X.Z3	2.5		
2	AT zone time 03:02, 400 KV bus bar protection operated								
3	07/08/2021 03:03:35.833	07/08/2021 03:03	400KV S/S MZN	BUS BAR	SEL 47B	CP- BUS BAR ZONE 1 AZON 9OPTD RP=04(MATTOR, CB-07), 06BC, CB-09), 06DCT4, CB- 06T087, 06DCT1, CB-061081, 06(AITTORE, CB- 03), 06(VISHNUPRAYAG, CB-04)		(1) RPH CT OF ICTS BLASTED AND ITS FRAME TOUCHED THE TRANSFER BUS (REACTOR CHARGED THROUGH IT) WHICH WAS CHARGED THROUGH BUSA THUS ZONE1 & ZONE3 BUS BAR PROT OPERATED) (2) (ZONE1)=VISHNUPRAYAG, MATTORE, AITTORE, ICT4, ICT3 (15MVA) (10MVA) ZONE3=ROORKEE, ALAKNADA, ICT3 (15MVA) (ICT2) (15MVA)	ALAKNADA (59A), VR(04A), AITTOR (00A), MATTOR (04A), ICT1 (157A), ICT3 (173A), ICT4 (02A)

# Observations

- As per PMU, R-B fault cleared with delay of 760ms. Reason of delayed clearance of fault?
- Exact location and nature of fault?
- SOE data of elements tripped at 400/220kV Muzaffarnagar sub station is not available.
- Reason of tripping of 220kV Singoli Bhatwari-Srinagar ckt-1 &2?
- DR of bus bar relay needs to be submitted.



# 400KV Muzaffarnagar Sub-Station, UPPTCL

**07.08.2021**

**Bus bar protection operation.**

400 KV Muzaffarnagar S/S bus bar operation  
07.08.2021.

**Date & Time of event:** 07.08.2021 at 03:02 hrs.

- **Sub-Station affected:** 400KV Muzaffarnagar
- **Date & Time of restoration:** 07.08.2021 at 03:40 hrs.

# Antecedents condition

- In antecedent condition 400/220KV 315MVA ICT-1<sup>st</sup> and 315MVA ICT 3<sup>rd</sup> and 500 MVA ICT 4 at 400KV Muzaffarnagar S/S carrying 108MW, 115MW,174MW respectively.

# Flag Report

**ELECTRICITY TEST & COMMISSIONING DIVISION MUZAFFARNAGAR**  
**FAULT ANALYSIS STATEMENT OF PROTECTIVE GEARS FOR THE MONTH OF OCT-2020**

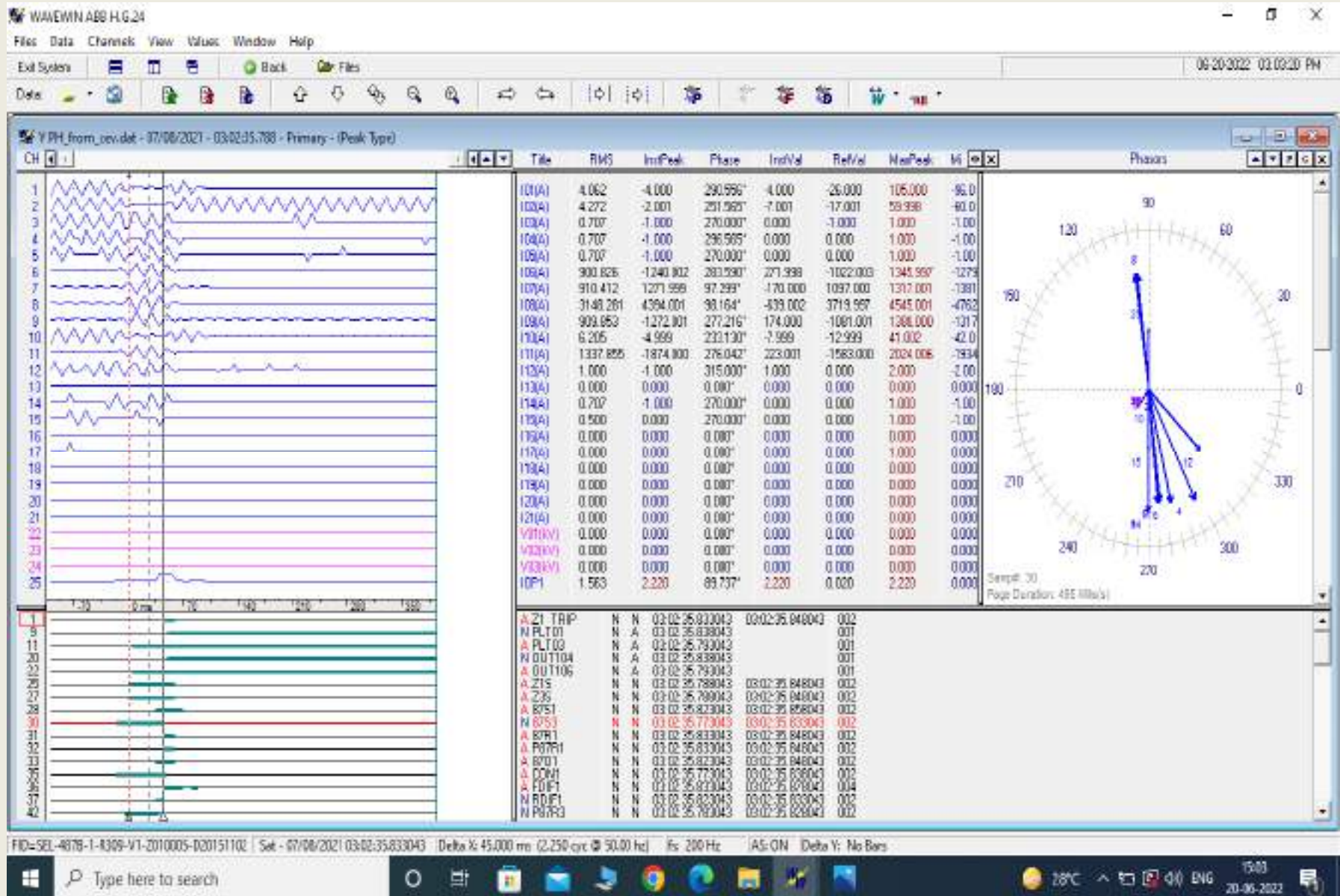
Sl. No.	Tripping Date/Time	Closing Date/Time	Name of Substation	C/R No. with Direction (Code)	Type of Relay Scheme	Flags & Indications Observed	Fl, Dr, SR, AR, C/Err.	Analysis with discrepancy in flag if any	Daily Tripping Statement		
									1	2	
1	07/08/2021 03:02:38.415	08/08/2021 03:40	400KV S/S MZN	CR 90386 400KV CT3	MISOM PAC RELAY	C.P. DEF PROT OPTD. TRIP.GEFA B PROT OPTD RP- HV/MAX,BRE,MPI,BRE2,MAL,BAC, LV=00	4.3%	HV SIDE RPH CT BLASTED	1	13	
2	07/08/2021 03:02:38.415	07/08/2021 18:24	400KV S/S MZN	CR 90 400KV MZN ALAKHANDA	VICTOR PAC, DEL 40	C.P.- MISOM PROTECTION TRIP/CS, CR MI-C/NZ121-DR21-EXY 21-DR.BB-04 EA MD-C/NZ121-DR21-EXY 21-DR.BB-0417A	6.116 KM, 0.02KM	R PH CT DAMAGED			
	07/08/2021 01:02:38.615	07/08/2021 19:24	400KV S/S ALAKHANDA	CR 90 400KV MZN- MZN	MISOM PAC RELAY	C.P.- MISOM PROTECTION TRIP RP-C/NZ1	20%				
2. After blasting R ph ct of ICT 3, 400 KV bus bar protection operated											
3	07/08/2021 03:02:35.531	07/08/2021 03:45	400KV S/S MZN	MISOM	SI-MTA	C.P- BUS BAR ZONE 1 & ZONE 2 OPTD. RP-MSM/TDR/CR-97/LNDC/CR-95, NAKTALCB M7A47, WBC/TL/CR-90/SU/SU/LWATTHRE/CR- VU/SWYTHIN/PRA/AL/CR-91		10R PH CT OF ICT3 BLASTED AND ITS FLAME TOUCHED THE TRANSFER BUS FACTOR CHARGED THROUGH IT WHICH WAS DAMAGED THROUGH BUS BAR ZONE 1 & ZONE 2 BUS BAR PROT OPERATED ((ZCONE1-VISHU/PRA/KLANTOR/LATWRE/KTA/CT/DR/PA/13 BR/VE) ZCONE2-ROHIT/ALAKHANDA/CT/DR/PA/CT/31/SM/4)	AT JENADA (M/LA/PA/14/LAT/10R (C/R/LA/PA/23/PA/44/LA/CT/11/TA/ KTV/7/PA/TA/CR/3A)		

# Events Description

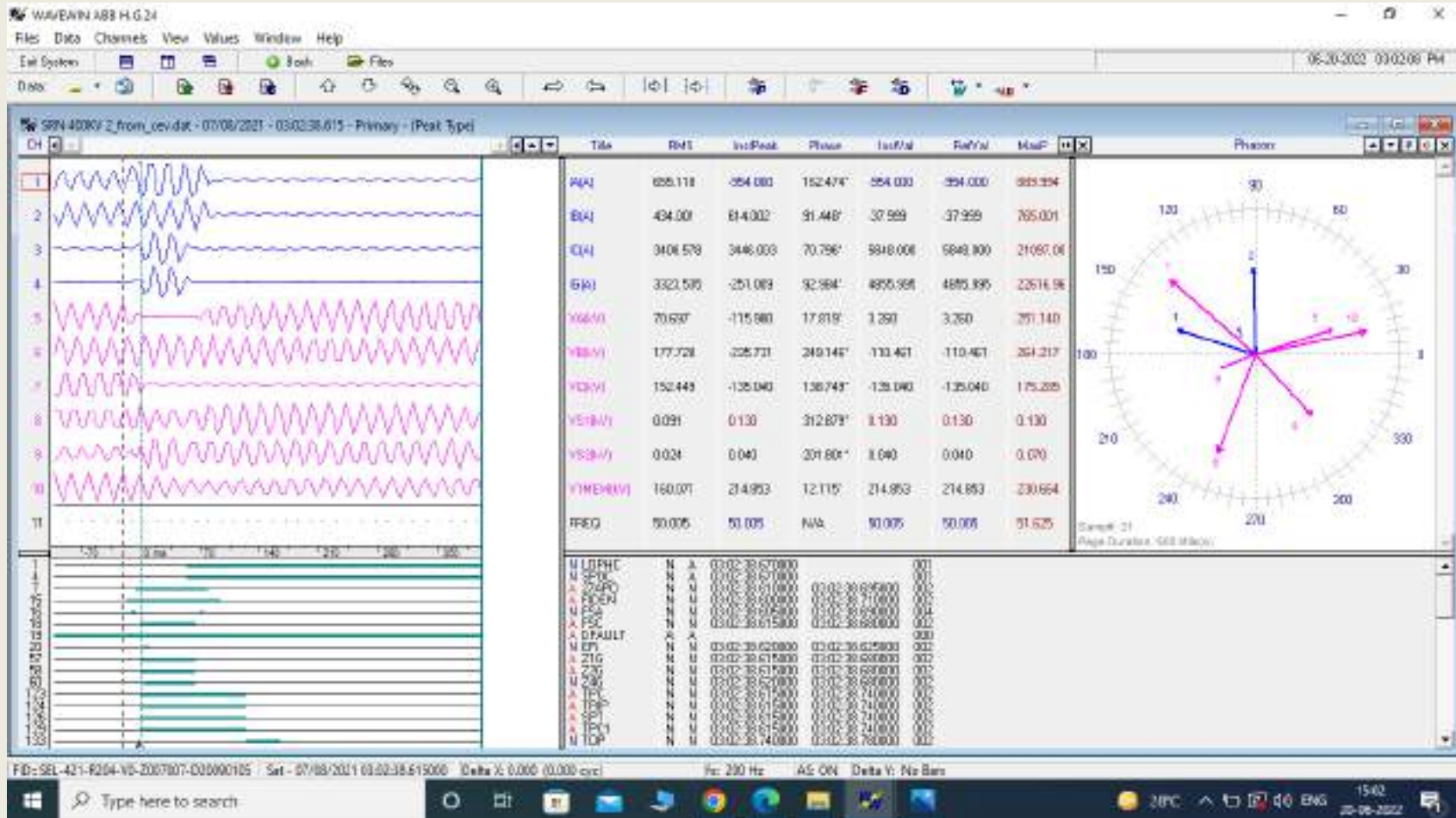
- At 03:02 hrs , R phase CT blasted of 400 /220 KV ICT 3 resulting into differential protection operation of this ICT 3. Due to blasting of R phase CT ,R ph CT got fire and caused damages to the adjacent B phase CT of 400 KV Muzaffarnagar – Alaknanda line resulting into damage of this CT also.
- R phase blasted CT fire flame touched the transfer bus that was connected to Bus reactor and Transfer Bus was charged through the bus 1 so Bus bar protection operated in Zone 1 and Zone 3 at 03:02:35.833.
- Details of elements connected to the Bus A, Bus B and Bus C. are as follows:-
- ZONE1(Bus A)=VISHNUPRAYAG,MATORE,ATTORE,ICT4(500MVA),ICT1(315MVA)  
ZONE2(Bus B)=ROORKEE,ALAKNANDA,ICT3(315MVA),ICT2(315MVA)  
ZONE3(Bus C)=Bus Reactor
- 400 KV Muzaffarnagar- Alaknanda line was tripped by distance relay.fault sense by relay at 03:02:38.615 and fault was cleared at 03:02:38.695 (fault cleared within 70 to 80 millisecond approx.)



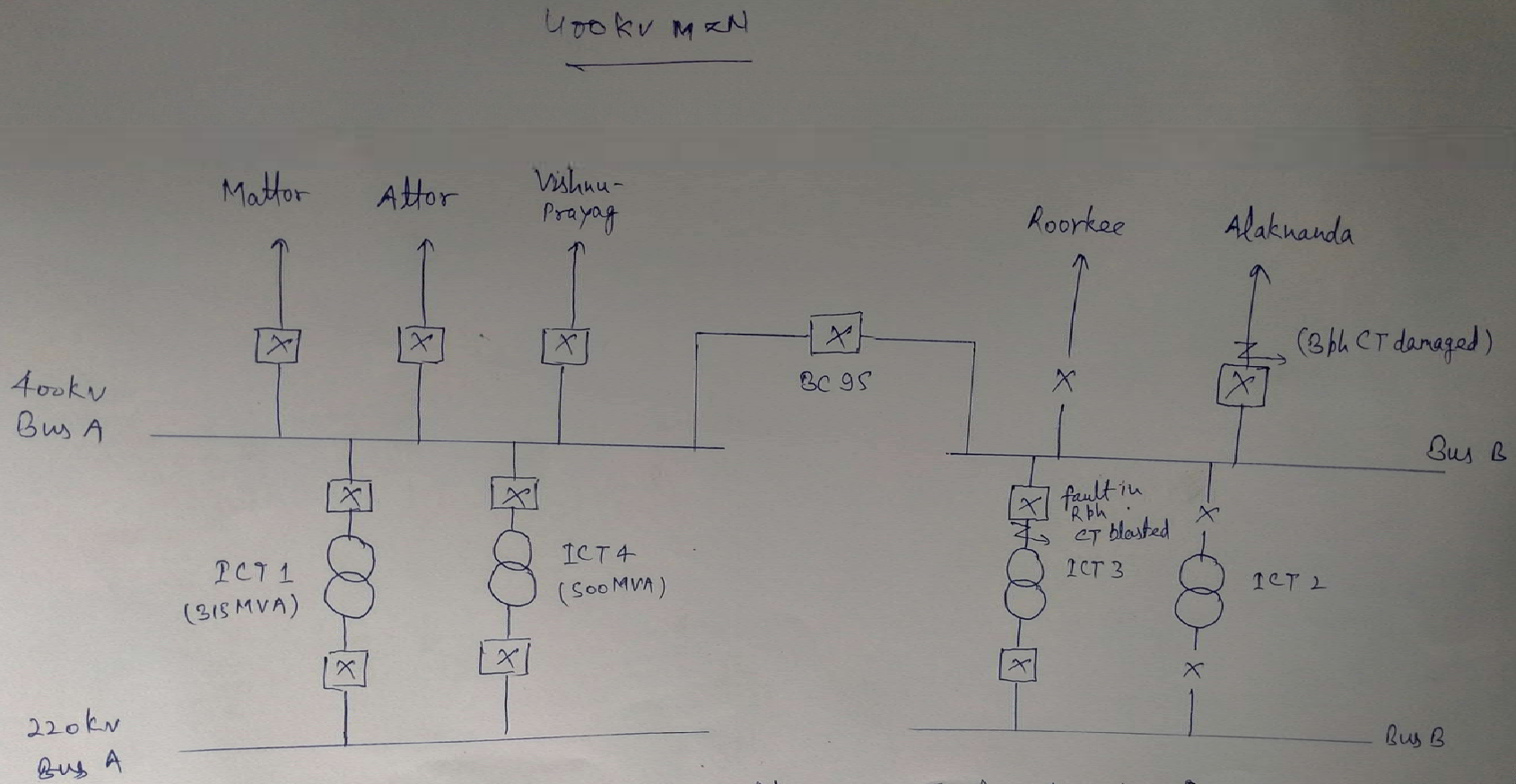
# DR OF BUS BAR RELAY



# DR OF 400 KV MZN- ALAKNANDA



# SLD



⇒ R-ph CT was blasted of ICT-3, due to it B-ph CT of Alaknanda line was damaged  
 (2) Bus Reactor (63 MVA) charged by TBC and TBC charged by BUS 1.

## Points for discussion to be taken up in 45<sup>th</sup> PSC

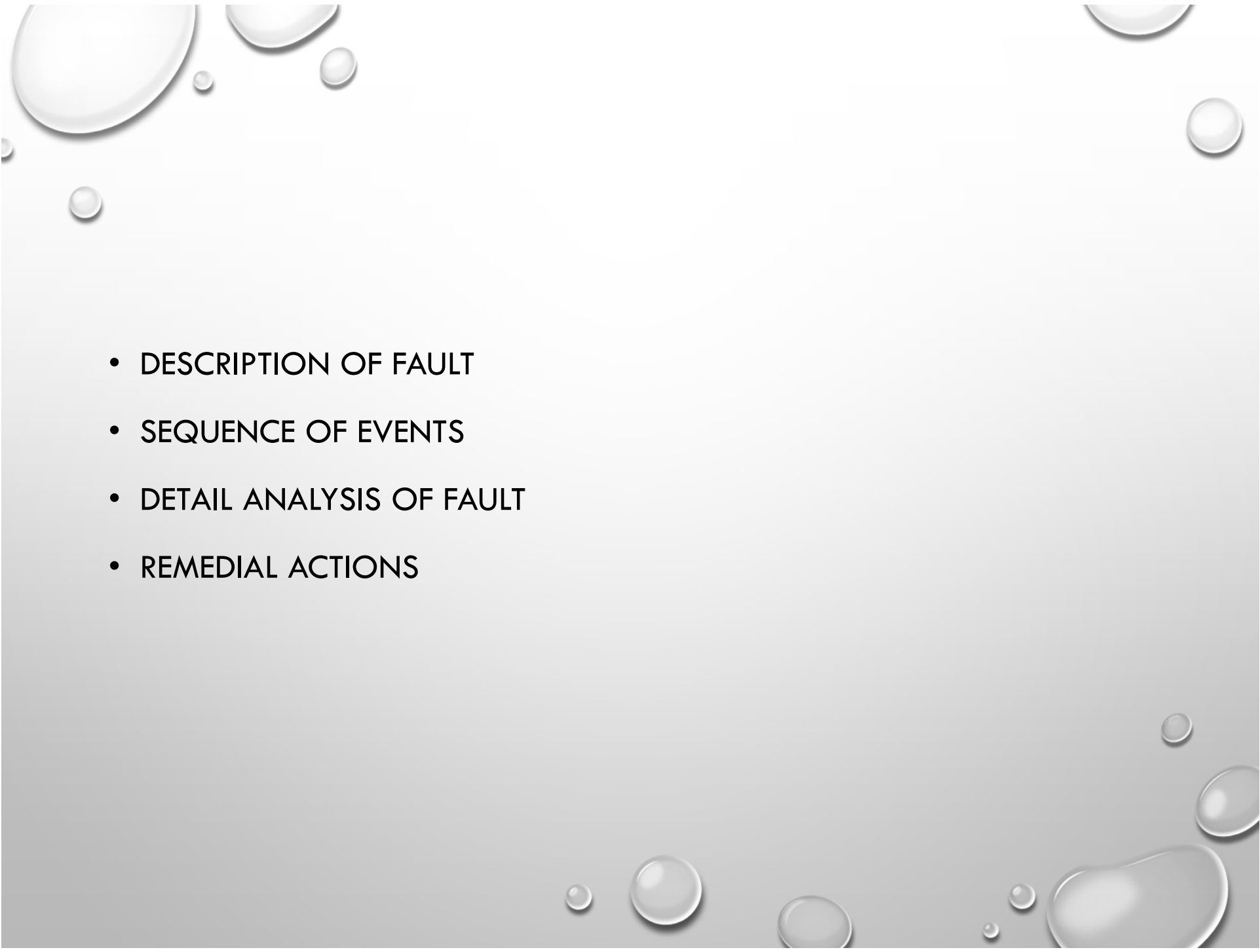
- Why did bus bar protection of Bus 1 operate(as fault was in ICT3 which was connected to bus 2).
- R phase CT of ICT3 blasted and its flame touched the transfer bus (Bus Reactor was charged through it) and Transfer bus was charged through Bus 1 thus ZONE1 & ZONE3 of Bus Bar Protection operated.
- Reason of delayed clearance of fault.
- As per DR of 400 KV Muzaffarnagar-Alaknanda, At 400 KV Muzaffarnagar fault occurred at 03:02:38.615 and fault was cleared at 03:02:38.695 (fault cleared within 70 to 80 ms. approx.) for ICT-3 fault was cleared within 40ms on differential protection and bus fault was cleared within 60ms as per DR.
- Why did B-N fault in 400KV Muzaffarnagar-Alaknanda ckt also clear with 760ms delay(as reported fault was in Z-1 from Muzaffarnagar end)
- As per DR of 400 KV Muzaffarnagar-Alaknanda, At 400 KV Muzaffarnagar fault occurred at 03:02:38.615 and fault was cleared at 03:02:38.695 (fault cleared within 70 to 80 ms. approx.)
- Remedial action taken report needs to be shared.
- Damaged CT's were replaced with new CT.

**THANK YOU.**



# ALAKNANDA HYDRO ELECTRIC PLANT 330 MW

‘ TRIPPING REPORT OF 07.08.2021 03:02 HRS ‘

- 
- DESCRIPTION OF FAULT
  - SEQUENCE OF EVENTS
  - DETAIL ANALYSIS OF FAULT
  - REMEDIAL ACTIONS

# DESCRIPTION OF FAULT

- AS PER SCHEDULE ALL UNITS OF AHPCL WAS RUNNING AT 82.5 MW. A TOTAL LOAD OF 332 MW + 80MW ( KHANDUKHAL) = 412 MW WAS EXPORTING THROUGH MZN LINE.
- VISHUPRAYAG LINE WAS ALREADY UNDER BREAKDOWN MAINTENANCE.
- MZN LINE-4 GOT TRIPPED ON DT RECEIVED.
- DUE TO ABSENCE OF EVACUATING PATH ALL UNITS GOT TRIPPED.



# SEQUENCE OF EVENTS

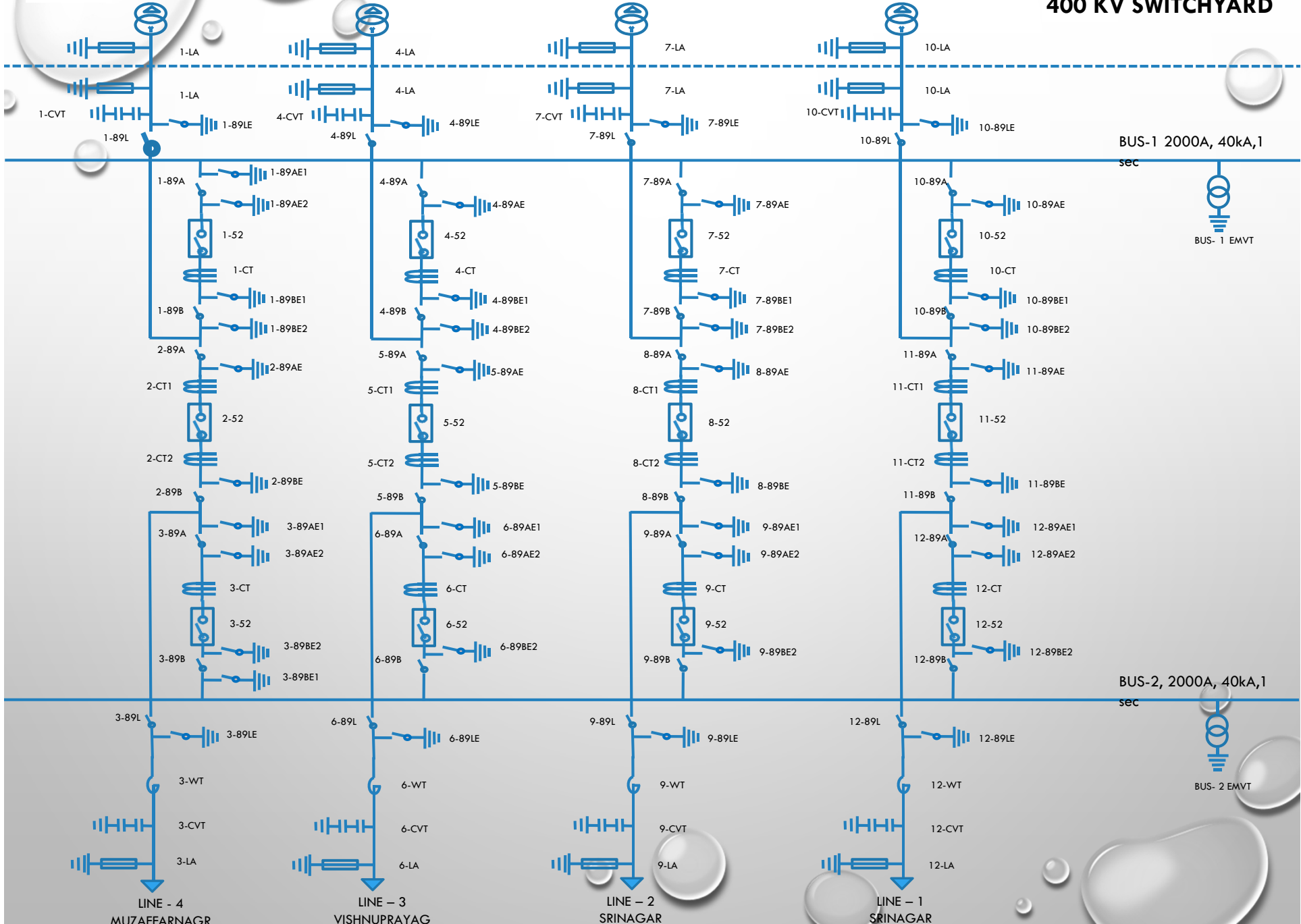
- 03:02:39 – LINE-4 MN-1 CARRIER FAIL
- 03:02:40 – LINE-4 CARRIER-2 RECEIVED
- 03:02:40 – LINE-4 MN-2 R/Y/B-PH TRIP
- 03:02:40 – LINE-4 MN-1 A/R LOCKOUT
- 03:02:40 – LINE-4 MN-1 R/Y/B-PH TRIP
- 03:02:40 – MZN LINE CB-3 52 OPEN

## DETAIL ANALYSIS OF FAULT

- AS PER SCHEDULE ALL UNITS OF AHPCL WAS RUNNING AT 332 MW. A TOTAL OF 332MW + 80MW ( KHANDUKHAL) = 412 MW WAS EXPORTING THROUGH MZN LINE.
- VISHUPRAYAG LINE WAS ALREADY UNDER BREAKDOWN MAINTENANCE.
- MZN LINE-4 GOT TRIPPED ON DT RECEIVED, WHICH LED TO TRIPPING OF ALL THE UNITS, DUE TO ABSENCE OF EVACUATING LINES.
- IN FAULT ANALYSIS IT IS FOUND THAT MZN LINE TRIPPED DUE TO B-N PH TO EARTH FAULT CAUSED B-PH CT DAMAGED AT MUZAFFARNAGAR(UP) S/S .

# DETAIL ANALYSIS OF FAULT

- CPD
- LINE CB , TIE CB & GT CB AUTO TRIPPED.
- LRPA
- TRIPPED PHASE B, ZONE 2 & 3, 86M1B
- LRPB:
- TRIPPED PHASE B, ZONE 2 & 3, 86M2B, 86Y2
- $FD=215.2$  KM,  $IF=1180A$



# REMEDIAL ACTION

- MESSAGE CONVEY TO MZN TO EXPEDITE THE RESTORATION OF LINE.
- MESSAGE CONVEY TO PTCUL(KHANDUKHAL) , INCASE OF FAULT OF MZN LINE , SRN 1&2 NEED TO EVACUATE THE POWER THROUGH THESE LINES.
- SAME MESSAGE REPEATDLY CONVEY TO UK-SLDC ALSO.

The background of the slide is a light gray gradient. It is decorated with several realistic water droplets of various sizes, scattered across the top and bottom edges. The droplets have highlights and shadows, giving them a three-dimensional appearance.

**THANK YOU**

# Multiple elements tripping at 400/220kV Akal(RS)

02<sup>th</sup> Sep 2021, 16:47 hrs

## Tripped elements & Antecedent condition (As reported)

### **Antecedent Condition:**

- Weather Conditions: Normal
- Grid Frequency (Hz): 49.83
- Total IR Import (MW): 12025
- Northern Region Demand (MW): 56098
- Load Loss: Nil

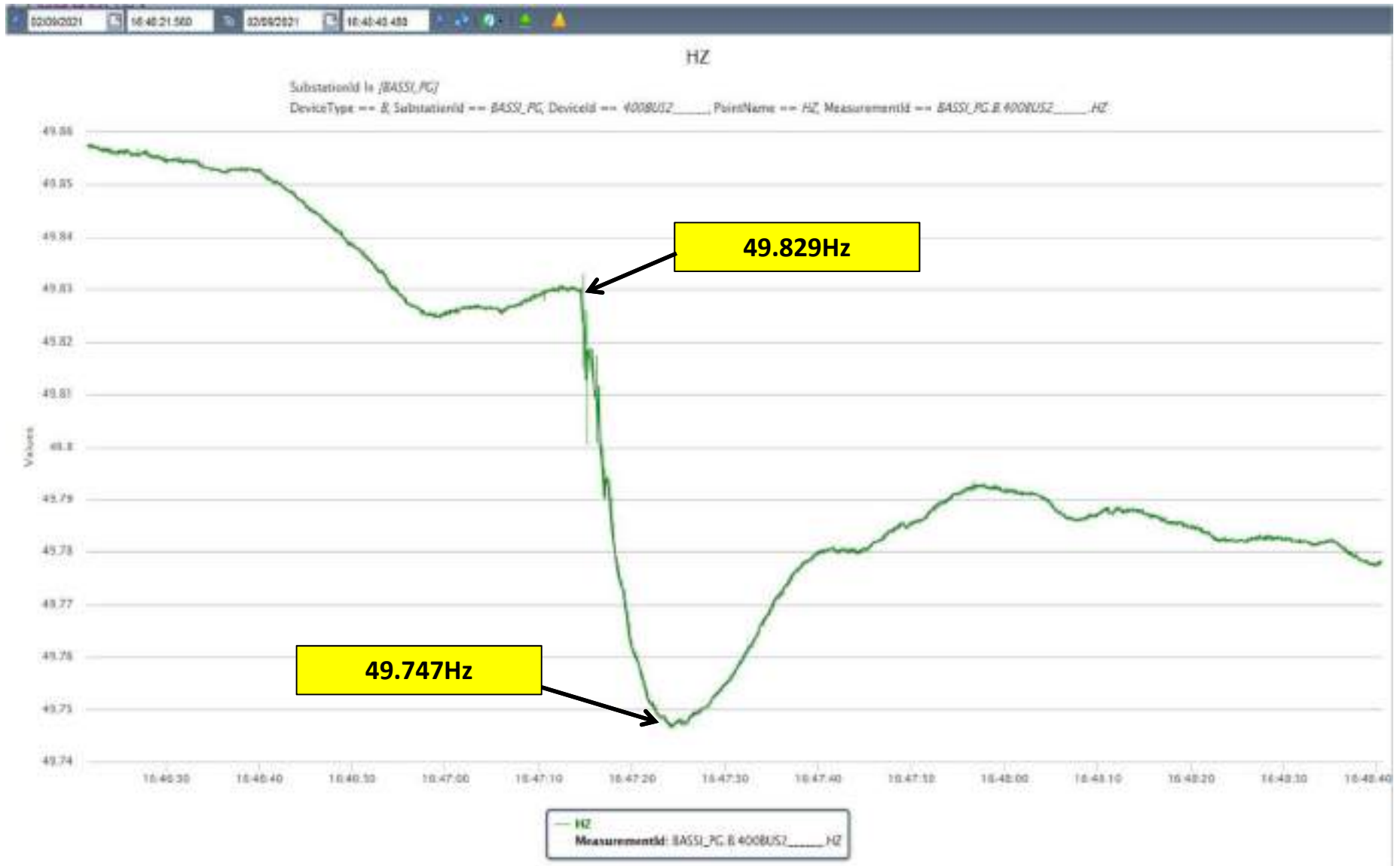
### **Tripped Elements:**

- 400/220 kV 315 MVA ICT 3 at Akal(RS)
- 400/220 kV 500 MVA ICT 4 at Akal(RS)
- 220 kV Amarsagar-Akal (RS) Ckt-1
- 220kV Akal–Bhu (RS) ckt-1
- 220kV Akal–Bhu (RS) ckt-2
- 400/220 kV 500 MVA ICT 1 at Akal(RS)
- 220 KV Akal-Barmer Ckt-1
- 220 KV Akal-Giral Ckt-1
- 220kV Akal-Mada Ckt-1



# PMU Plot of frequency at Bassi(PG)

16:47hrs/02-Sept-21



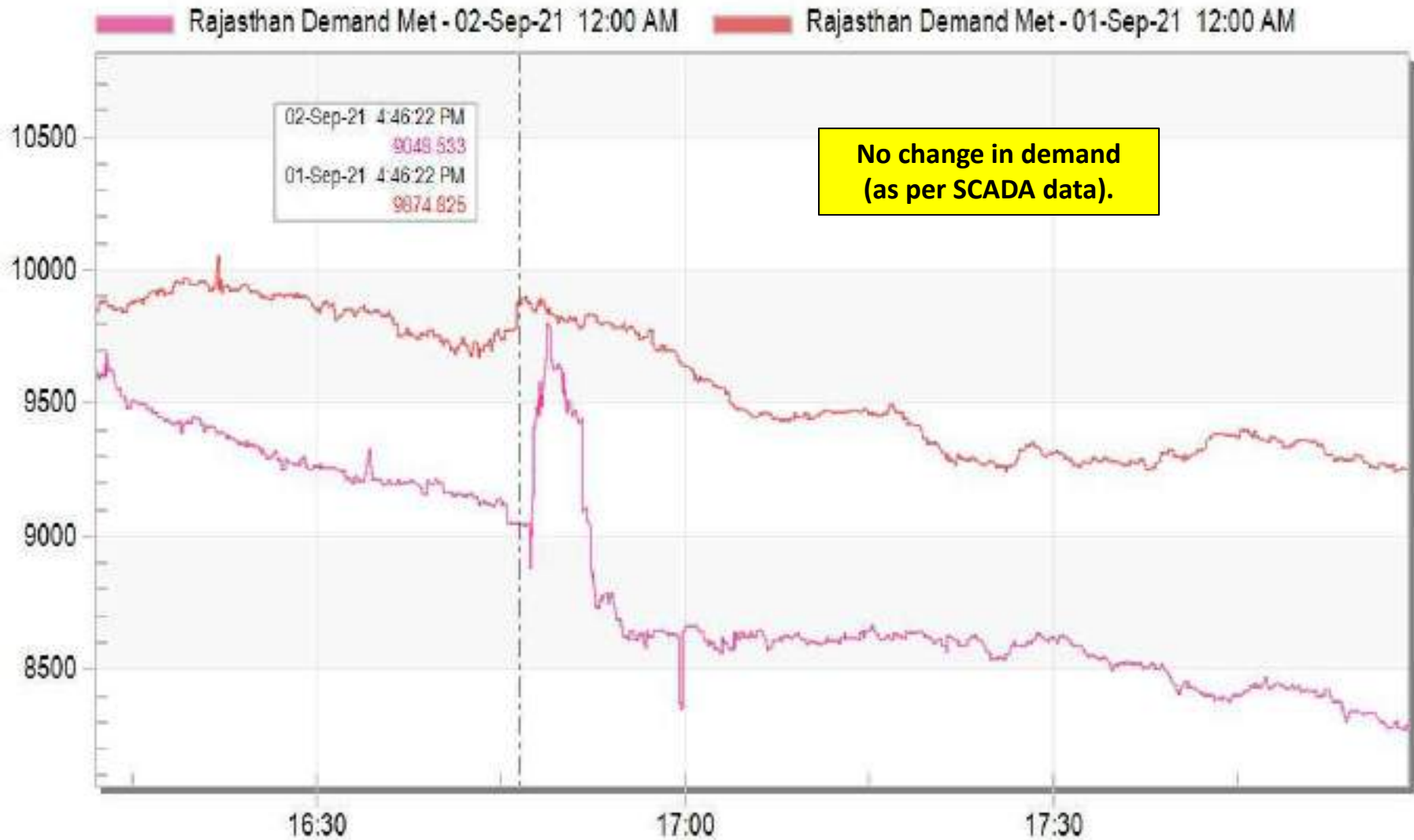
# PMU Plot of frequency at Jodhpur(RS)

16:47hrs/02-Sept-21



# Rajasthan Demand during tripping

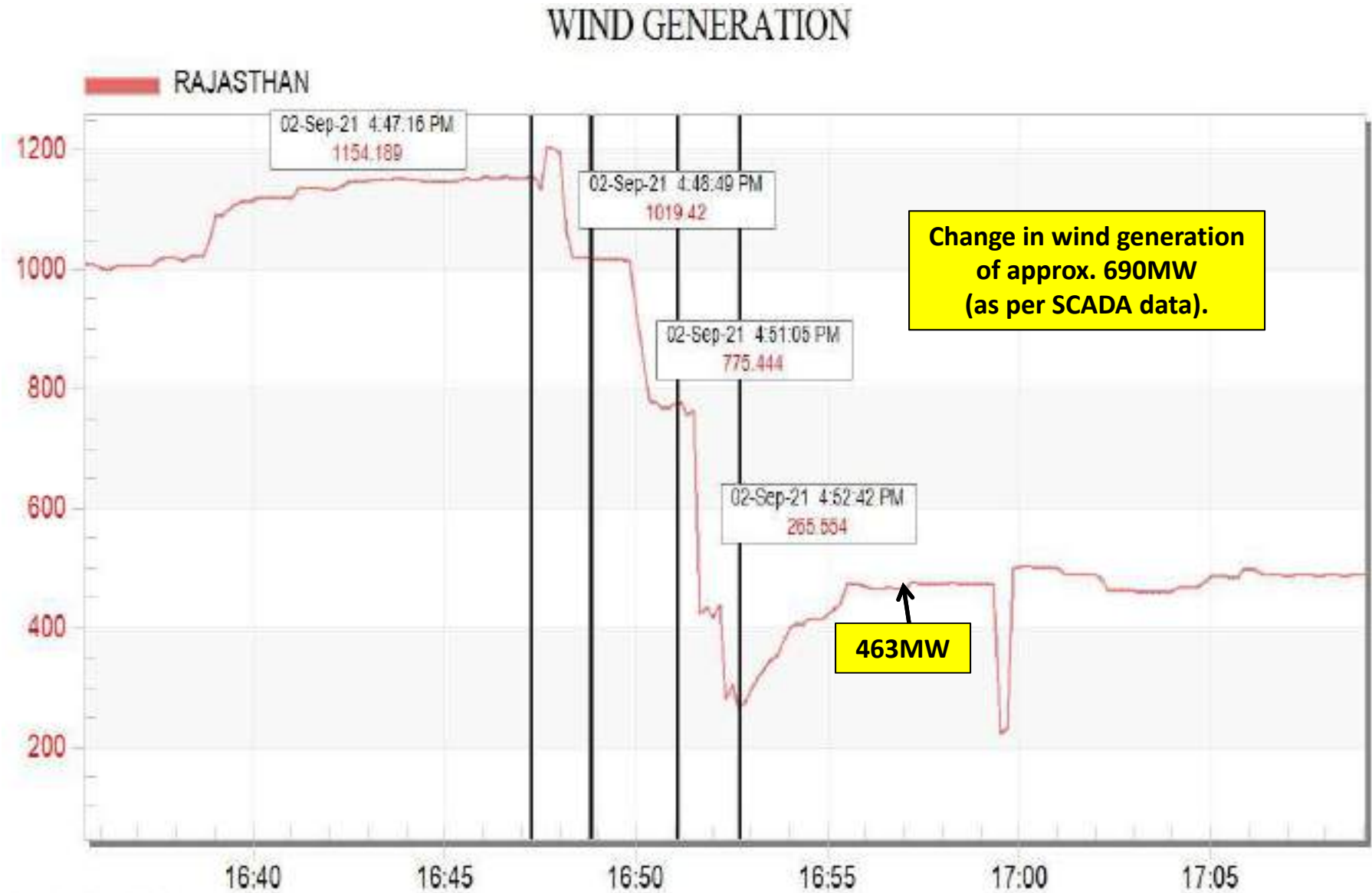
Rajasthan Demand Met



# SCADA SOE

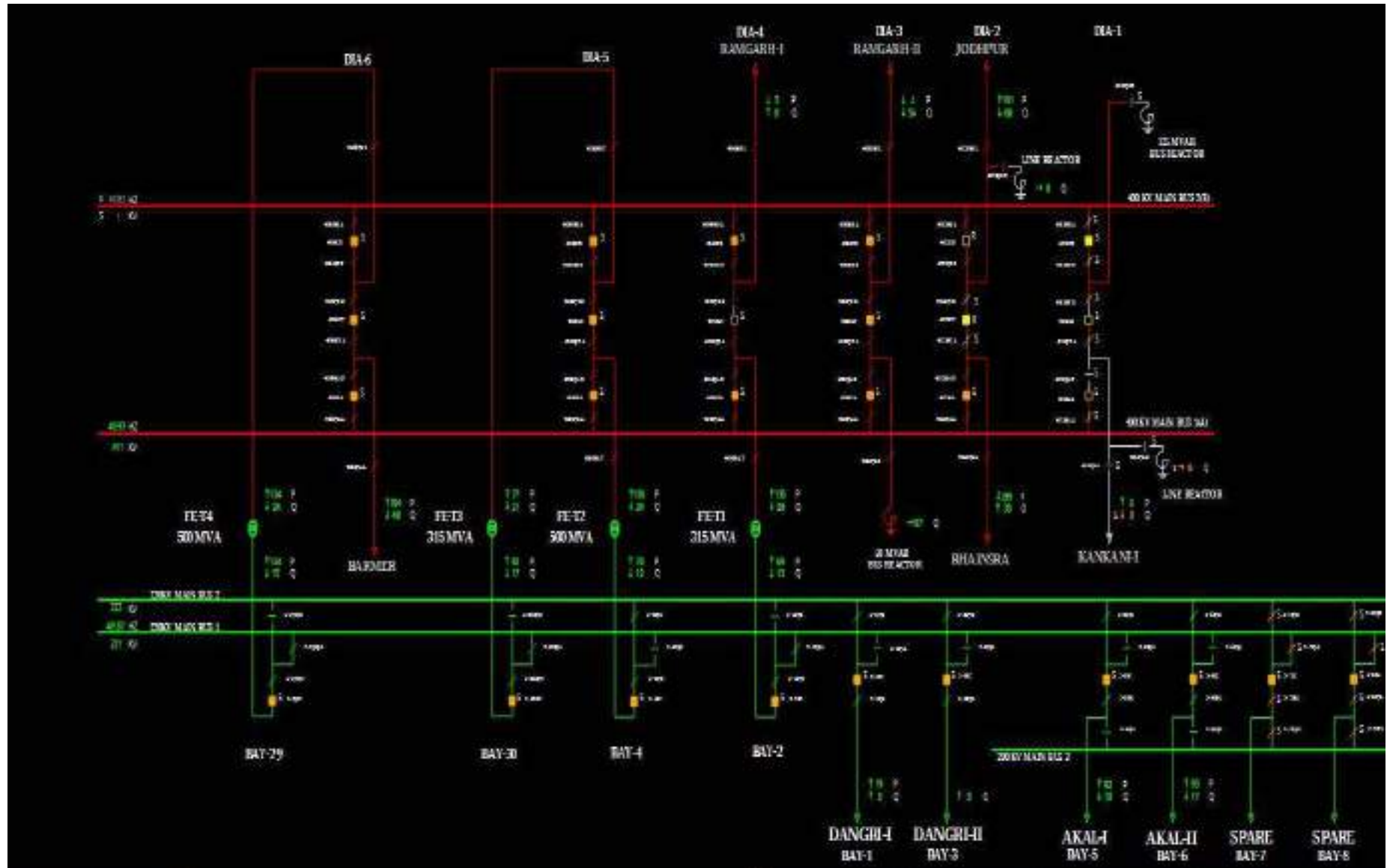
Time	Station Name	Voltage	Element Name	Element Type	Element Status
16:51:51,237	AKAL400	220kV	E_08_B1(AMSGR-1)	Circuit Breaker	Open
16:51:51,237	AKAL400	220kV	E_06_B1(GIRAL-1)	Circuit Breaker	Open
16:51:51,237	AKAL400	220kV	10BARMR	Circuit Breaker	Open
16:51:51,237	AKAL400	220kV	E_03_B1(T1)	Circuit Breaker	Open
16:51:51,237	AKAL400	220kV	12MADA	Circuit Breaker	Open
16:51:51,237	AKAL400	400kV	12TIE	Circuit Breaker	Open
16:51:51,237	AKAL400	220kV	14MBC	Circuit Breaker	Open
16:51:51,237	AKAL400	400kV	12T1	Circuit Breaker	Open
16:52:01,340	AKAL400	220kV	E_09_B1(BHU__-1)	Circuit Breaker	Open
16:52:01,340	AKAL400	400kV	17TIE	Circuit Breaker	Open
16:52:01,340	AKAL400	220kV	29T4	Circuit Breaker	Open
16:52:01,340	AKAL400	400kV	16T4	Circuit Breaker	Open
16:52:01,340	AKAL400	220kV	30T3	Circuit Breaker	Open
16:52:01,340	AKAL400	400kV	13T3	Circuit Breaker	Open

# Rajasthan wind generation during tripping



Sep 2 Thu 2021

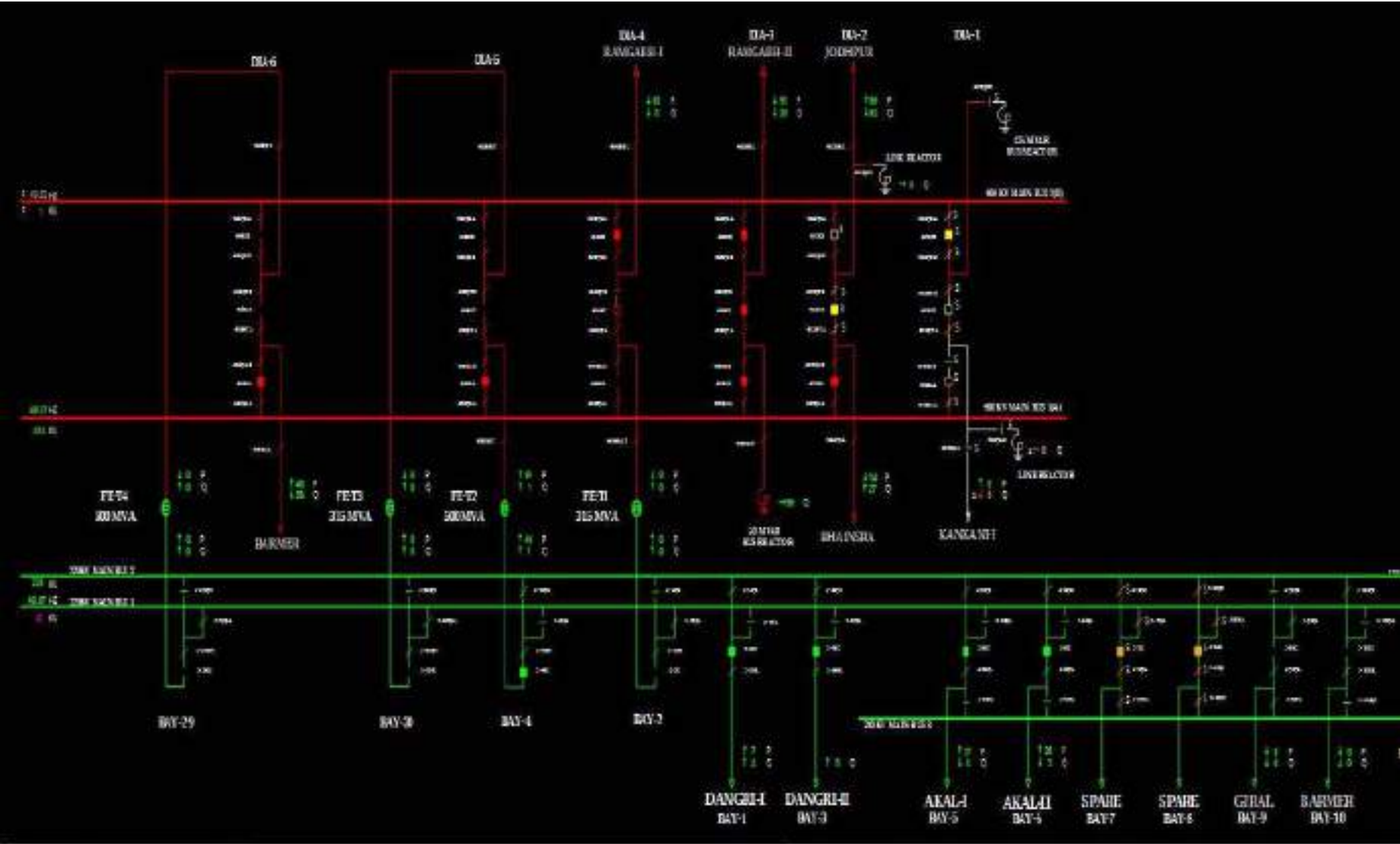
# SLD of 400/220 Akal S/s before the tripping



# SLD of 400/220 Akal S/s before the tripping

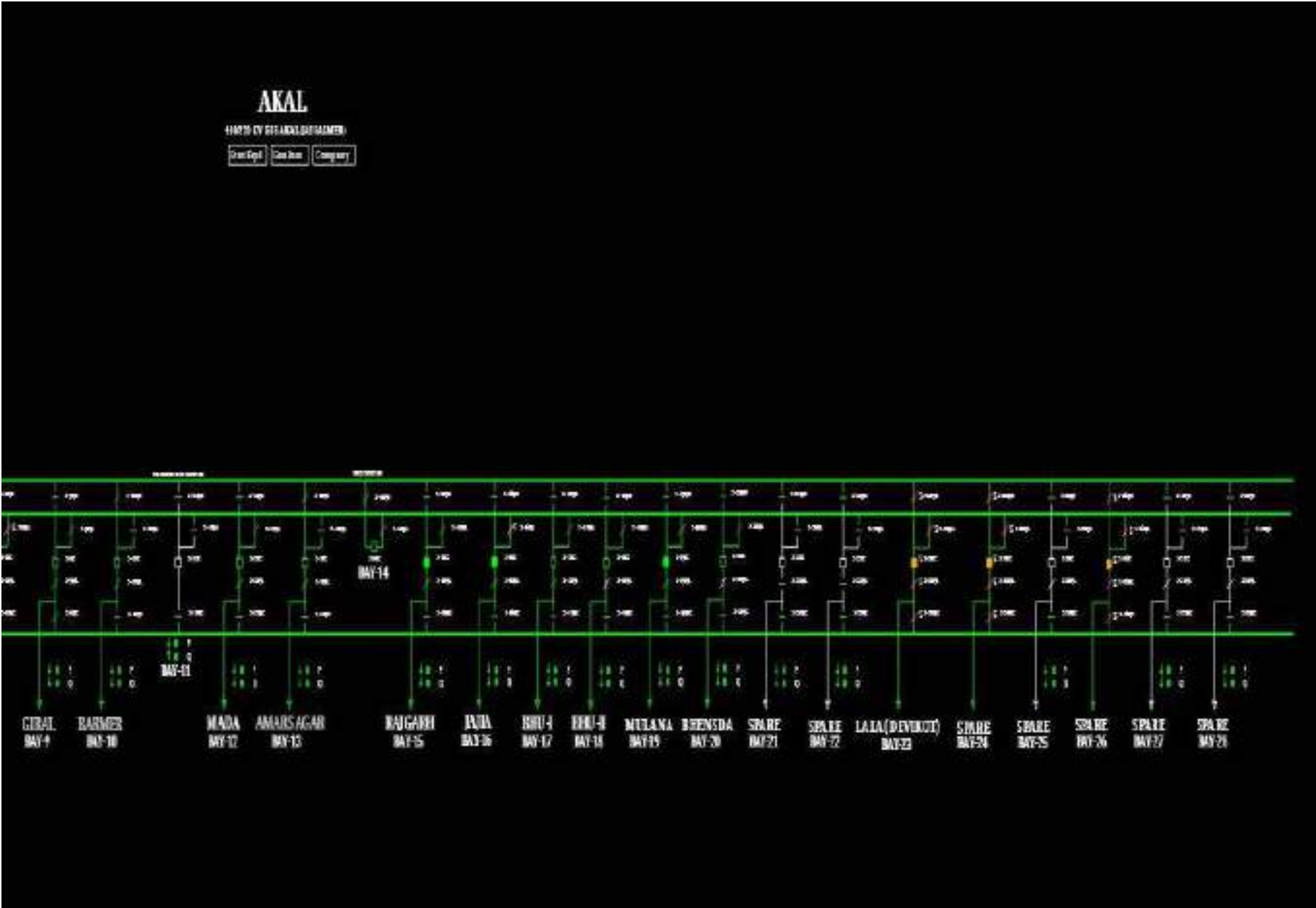


# SLD of 400/220 Akal S/s after the tripping

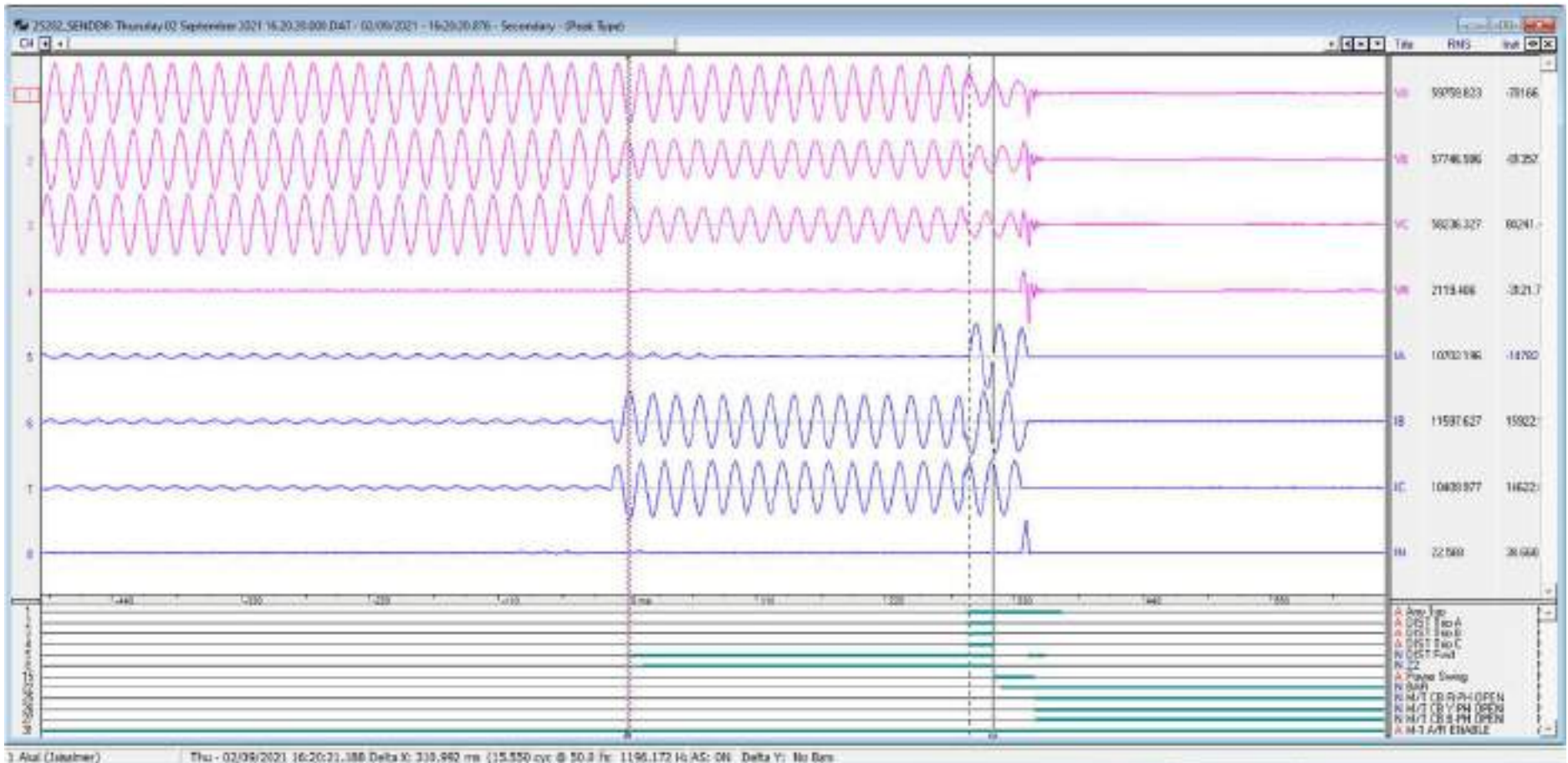




# SLD of 400/220 Akal S/s after the tripping

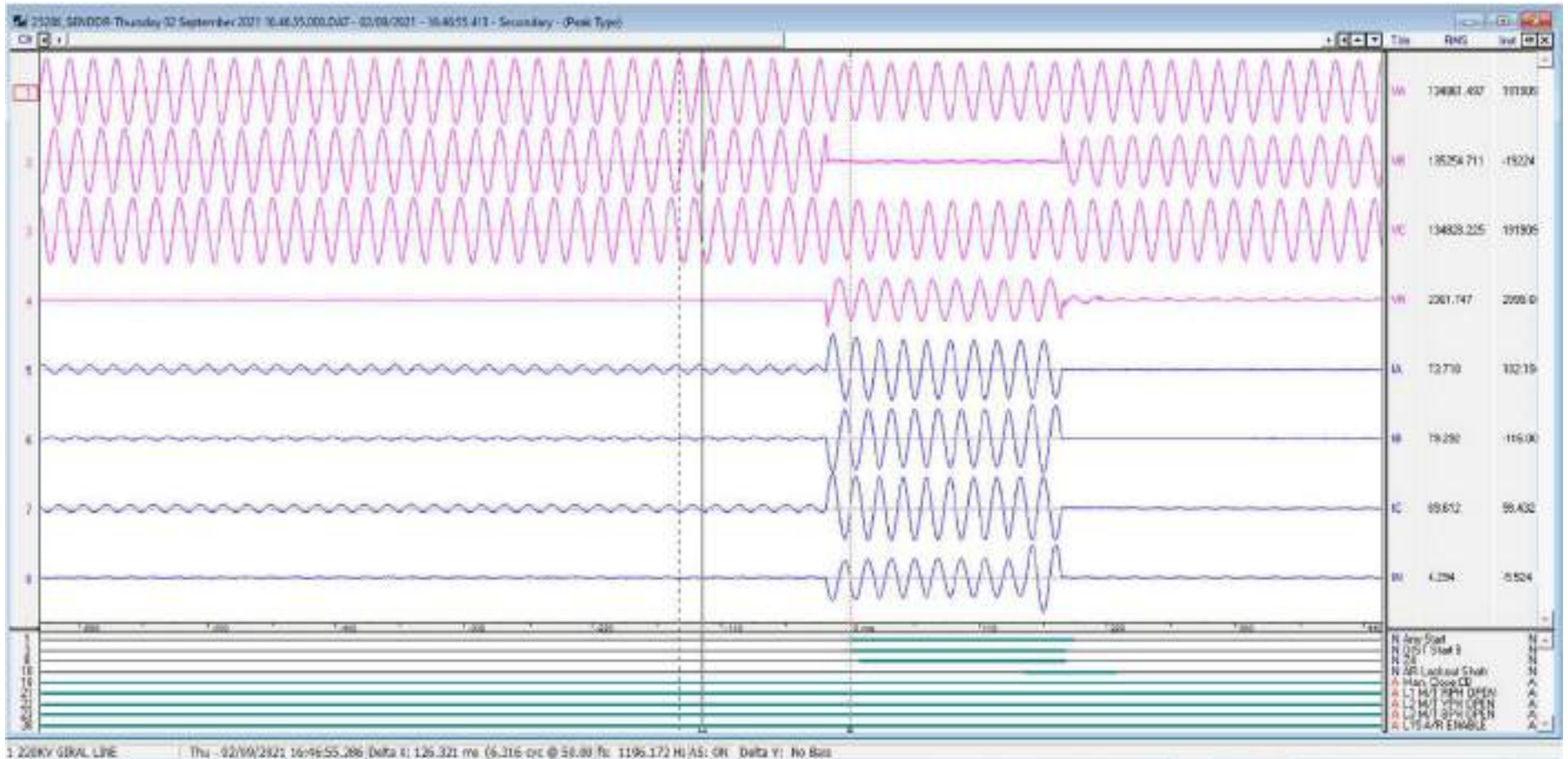


# DR of 220 kV Akal(End)-Bhu Ckt-1



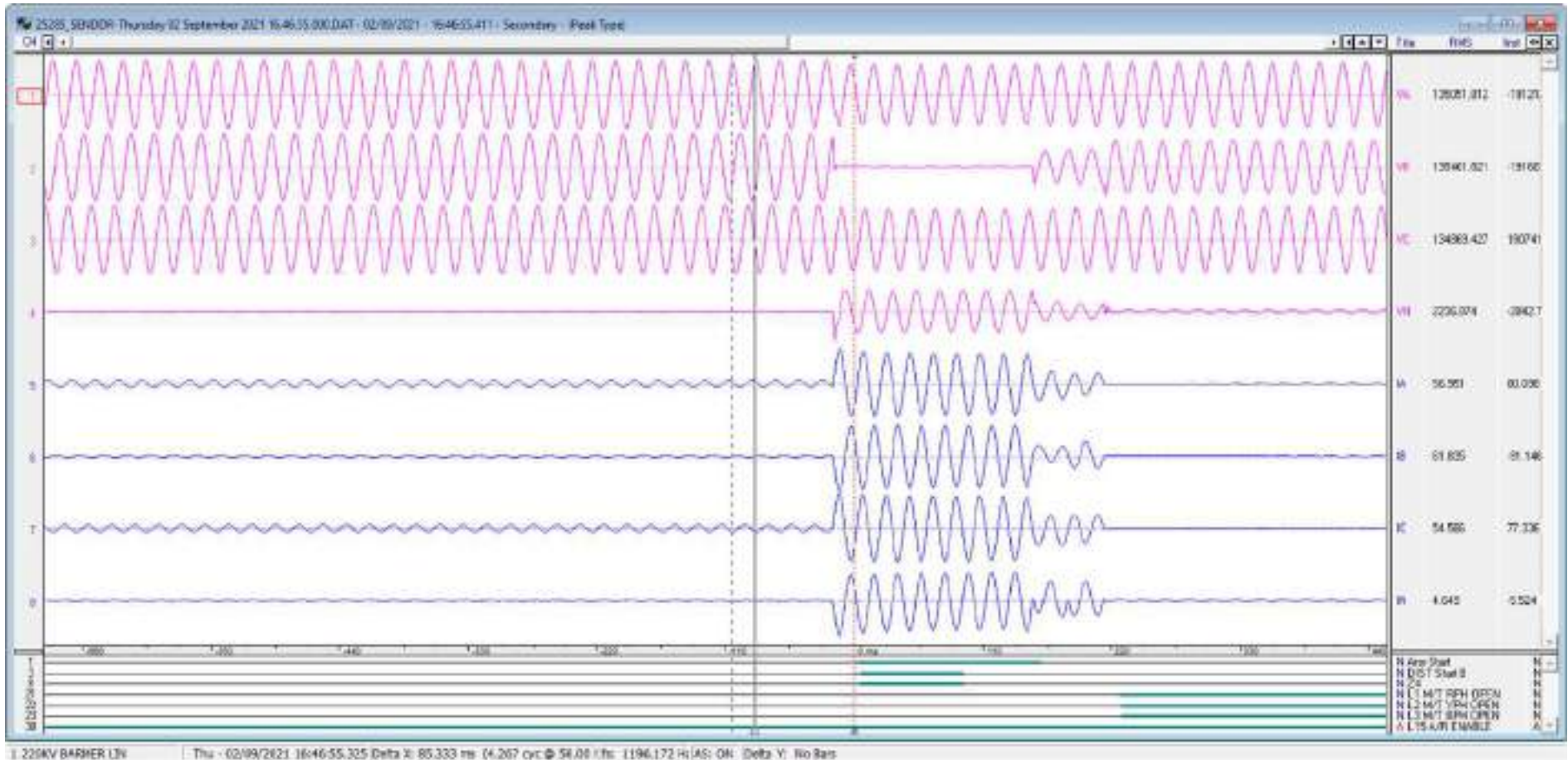
1. Y-B phase fault visible.
2. Z-2 start and trip visible.
3. Relay time sync?

# DR of 220 kV Akal(End)-Giral Ckt-1



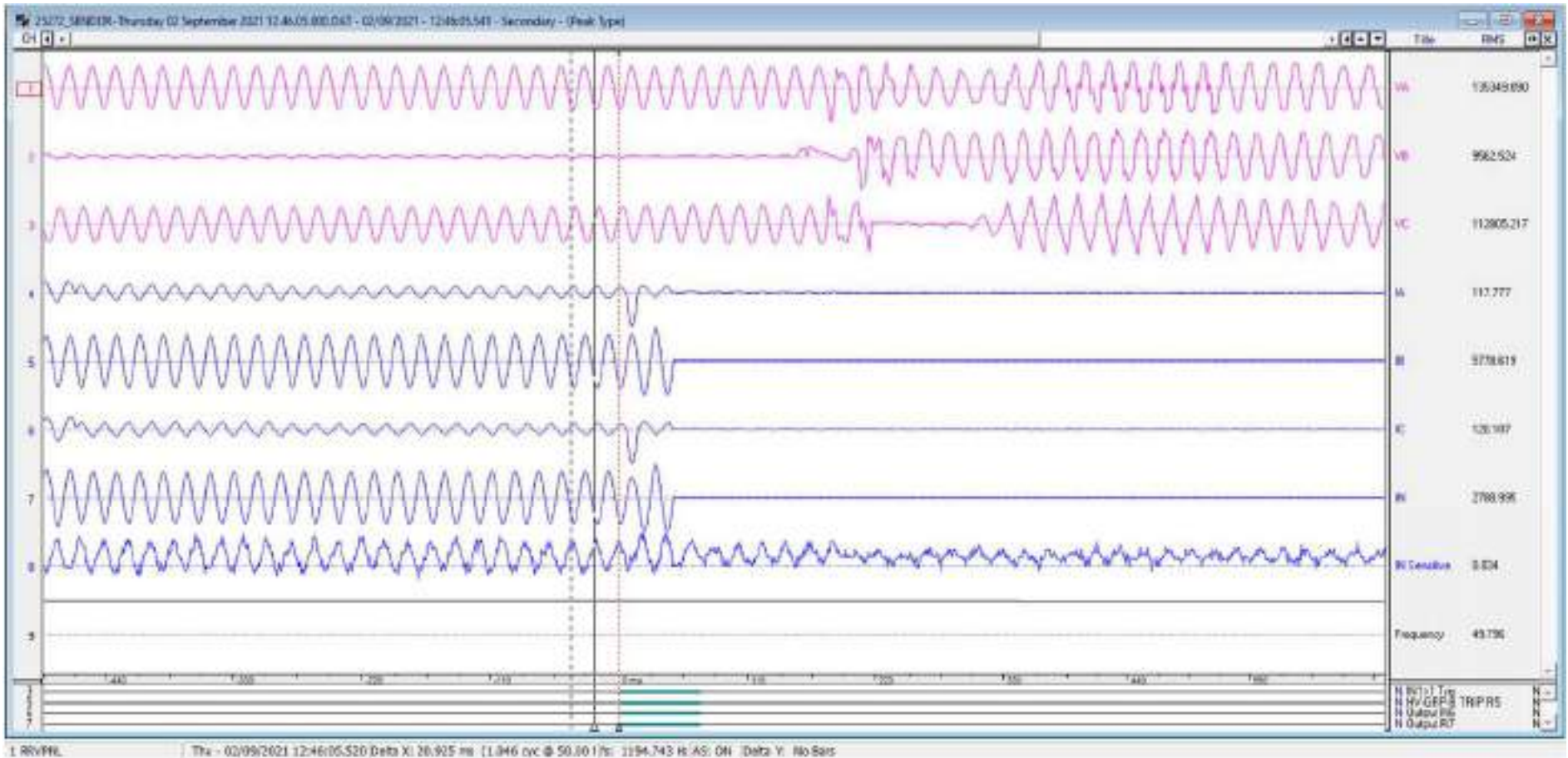
1. Y-B phase fault visible.
2. Z-4 reverse trip visible. Timer 170 ms?

# DR of 220 kV Akal(End)-Barmer Ckt-1



1. Y-B phase fault visible.
2. Z-4 reverse trip visible. Timer 154 ms?

# DR of 500 MVA ICT-4



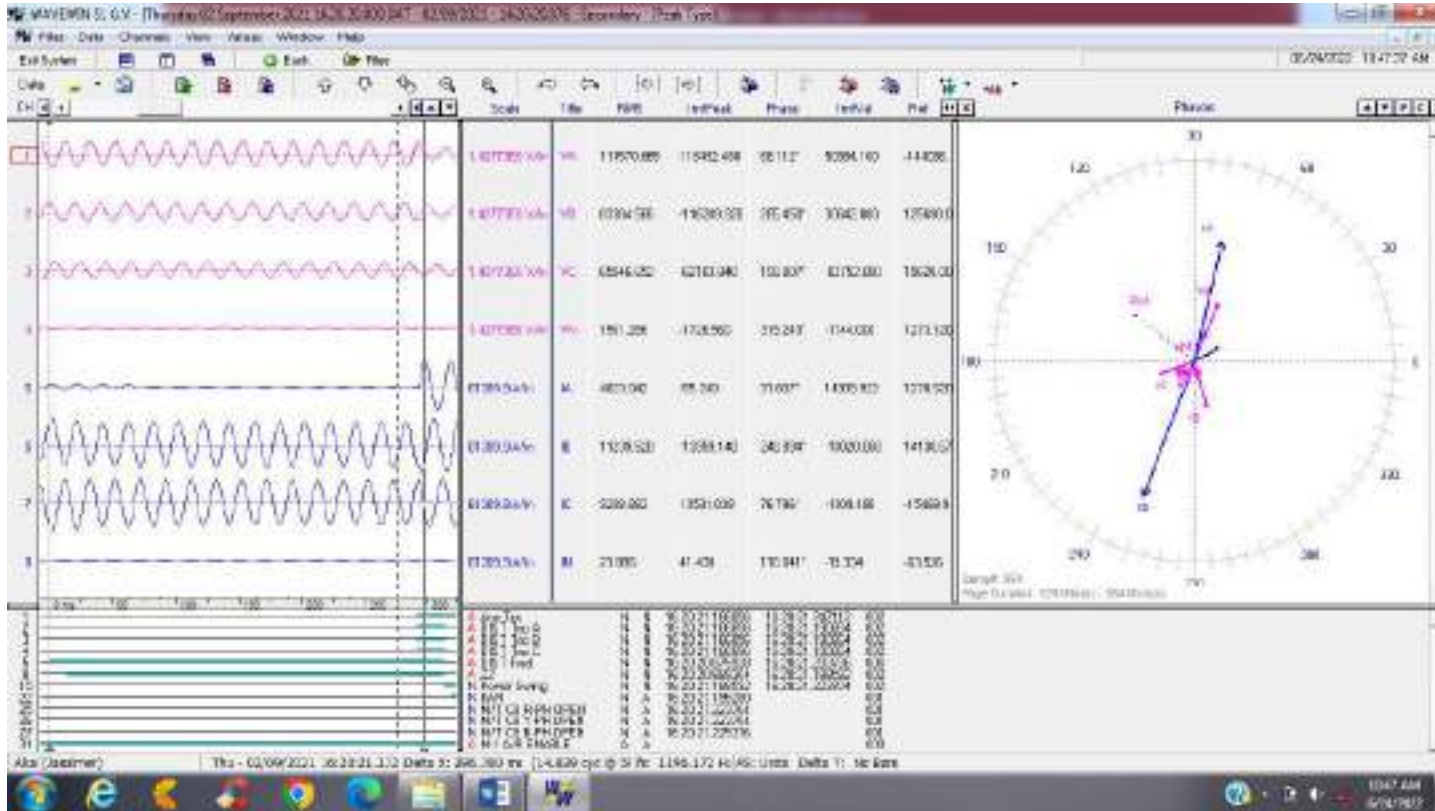
1. Y-B phase fault visible.
2. Relay time sync?

# Observations

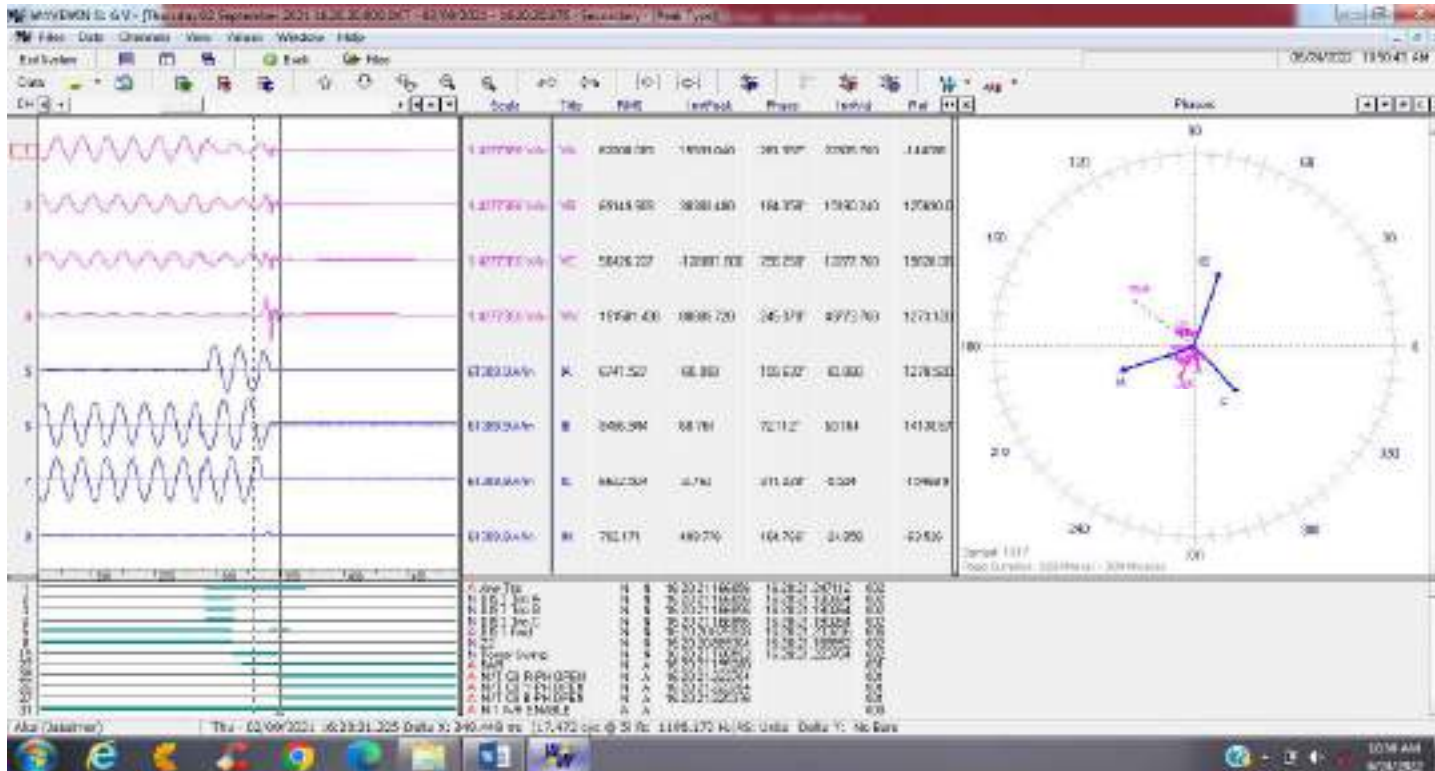
1. Exact location and nature of fault?
2. As per SCADA SOE at NRLDC, timing of tripped elements are 5min ahead of grid event timing. Time sync needs to be ensured at Akal S/s.
3. Why did 220kV feeders to Bhu-2, Jajiya, Rajgarh and Mulana didn't trip in Z-4?
4. Relay time sync issue found.
5. Status of 220 kV busbar protection at Bhu.
6. Has z-4 timing of lines kept 160ms?

## Tripping occurred at 400 KV GSS Akal on date 02.09.2021.

1. A, Y-B phase to phase fault occurred due to jumper snapping on 220 KV Akal-bhu-I line at 12.54 km distance from akal end (line length-13 km).

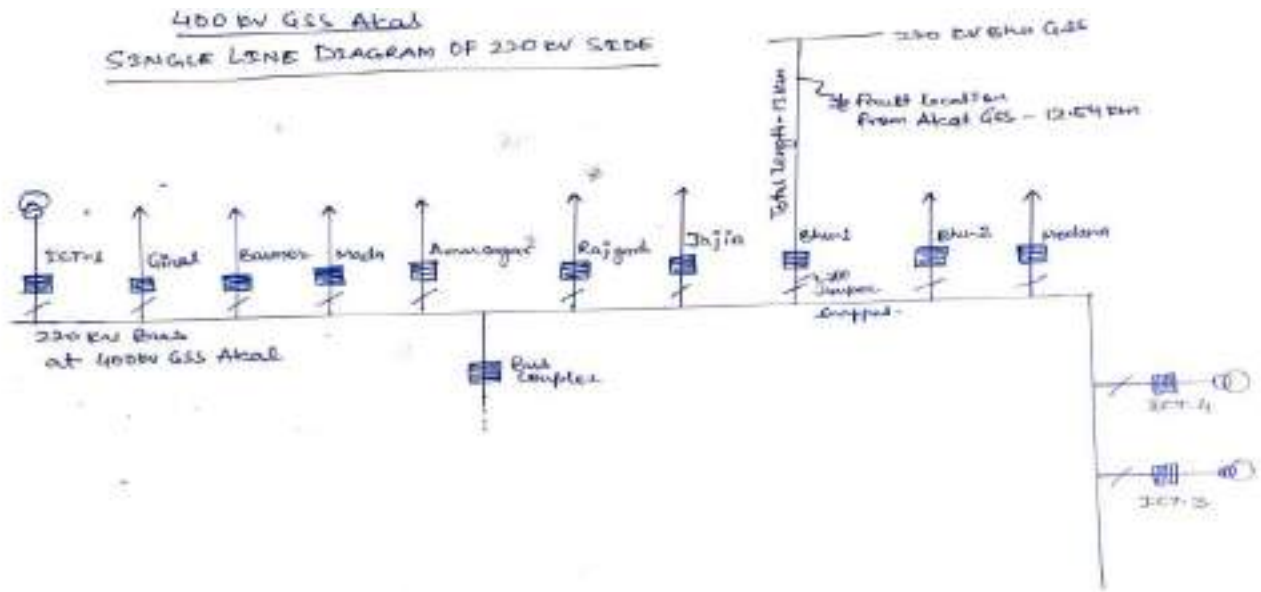


2. Distance relay issued trip command for this zone 2 fault and bhu-1 line breaker opened in zone 2+breaker opening timing of 350ms.



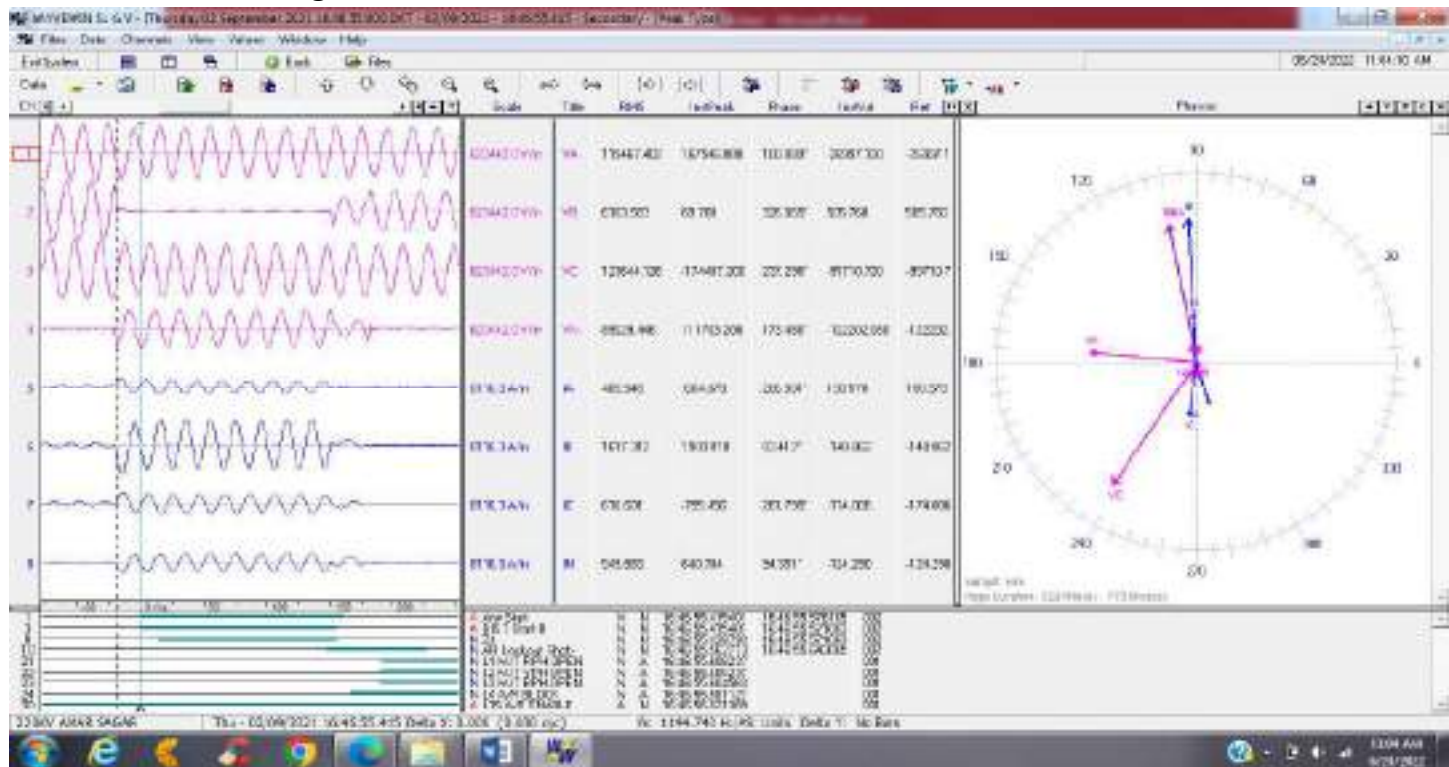
- During the Bhu-I line fault, the bus side jumper of Y-phase of 220 KV Bhu-I line snapped and created the bus fault.

4.



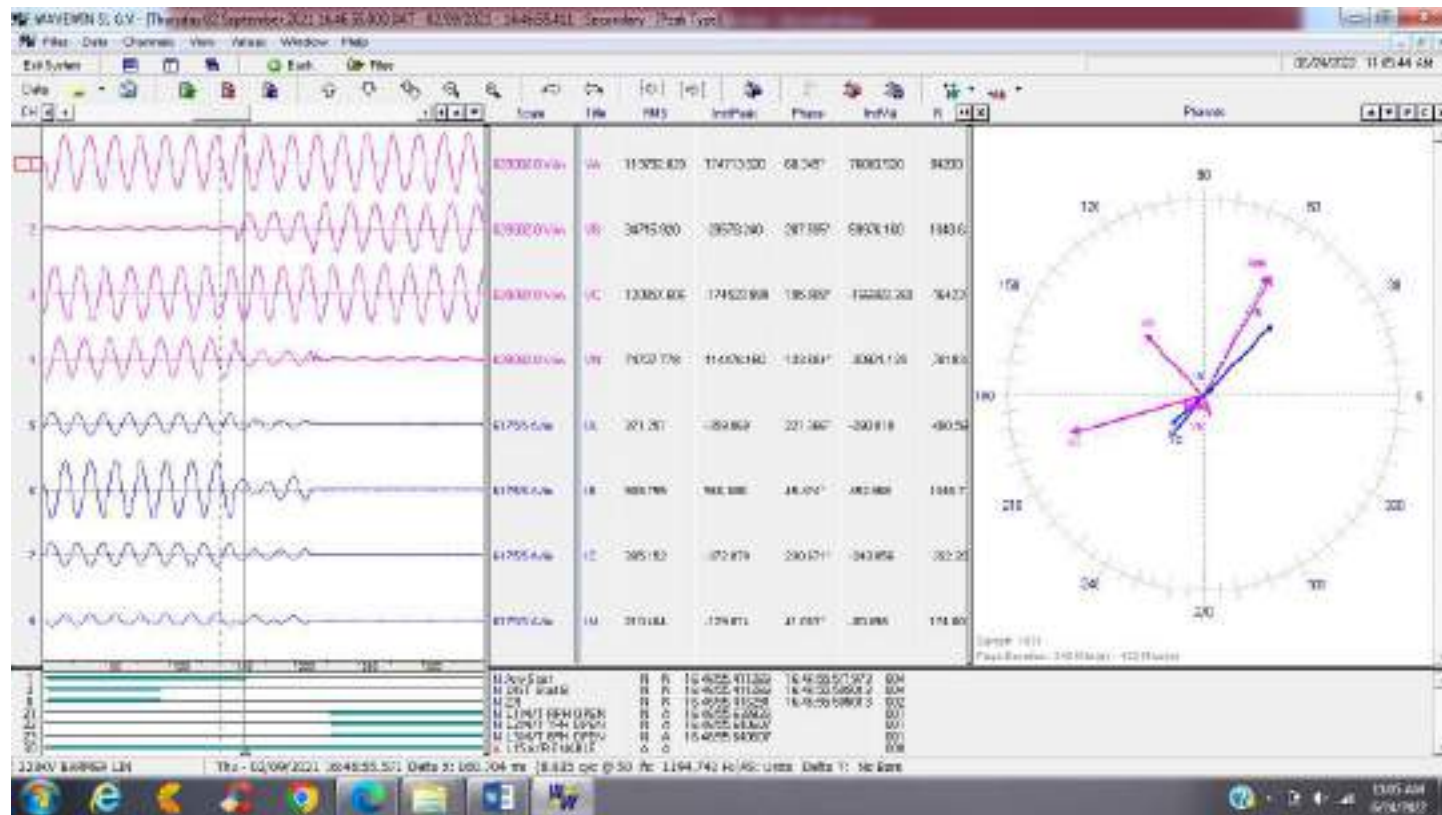
As distance zone 4 timing was kept as 160ms due to outage of 220 KV Bus bar scheme, 220 KV feeders Bhu-2, Giral, Amarsagar, Mada, Barmer tripped on reverse zone 4 in 160 ms timing.

### 220 Kv Akal-Amarsagar

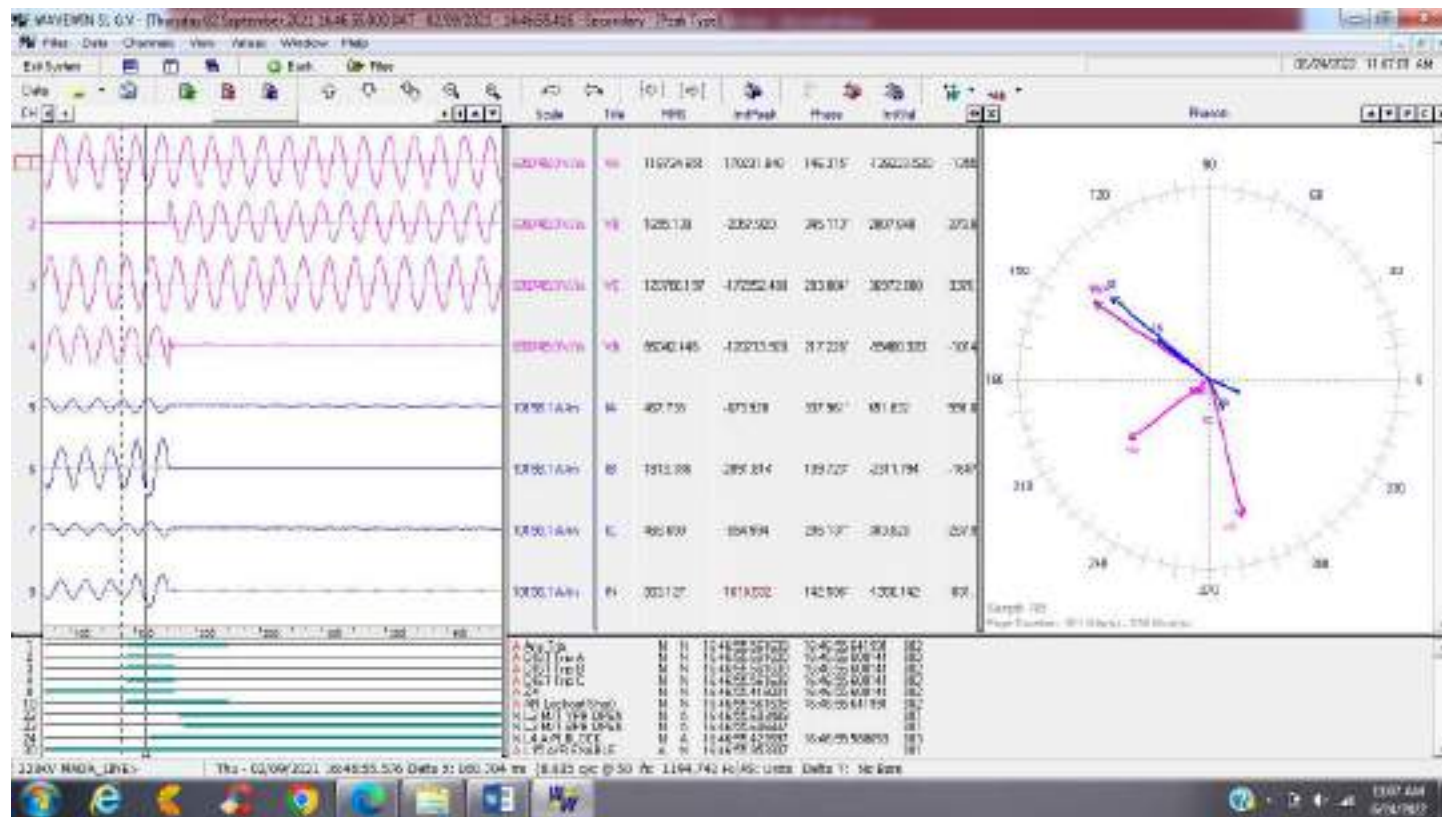




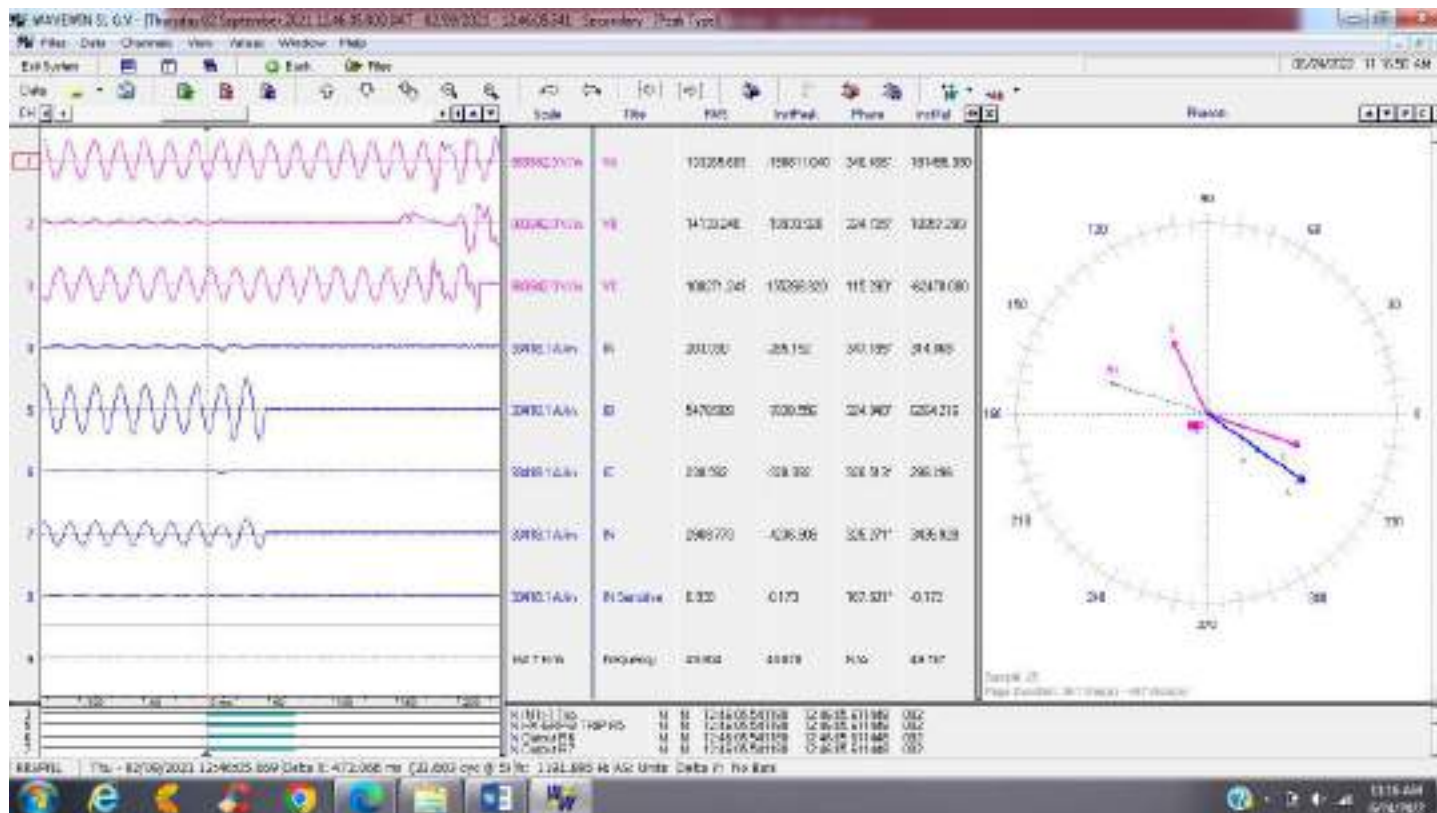
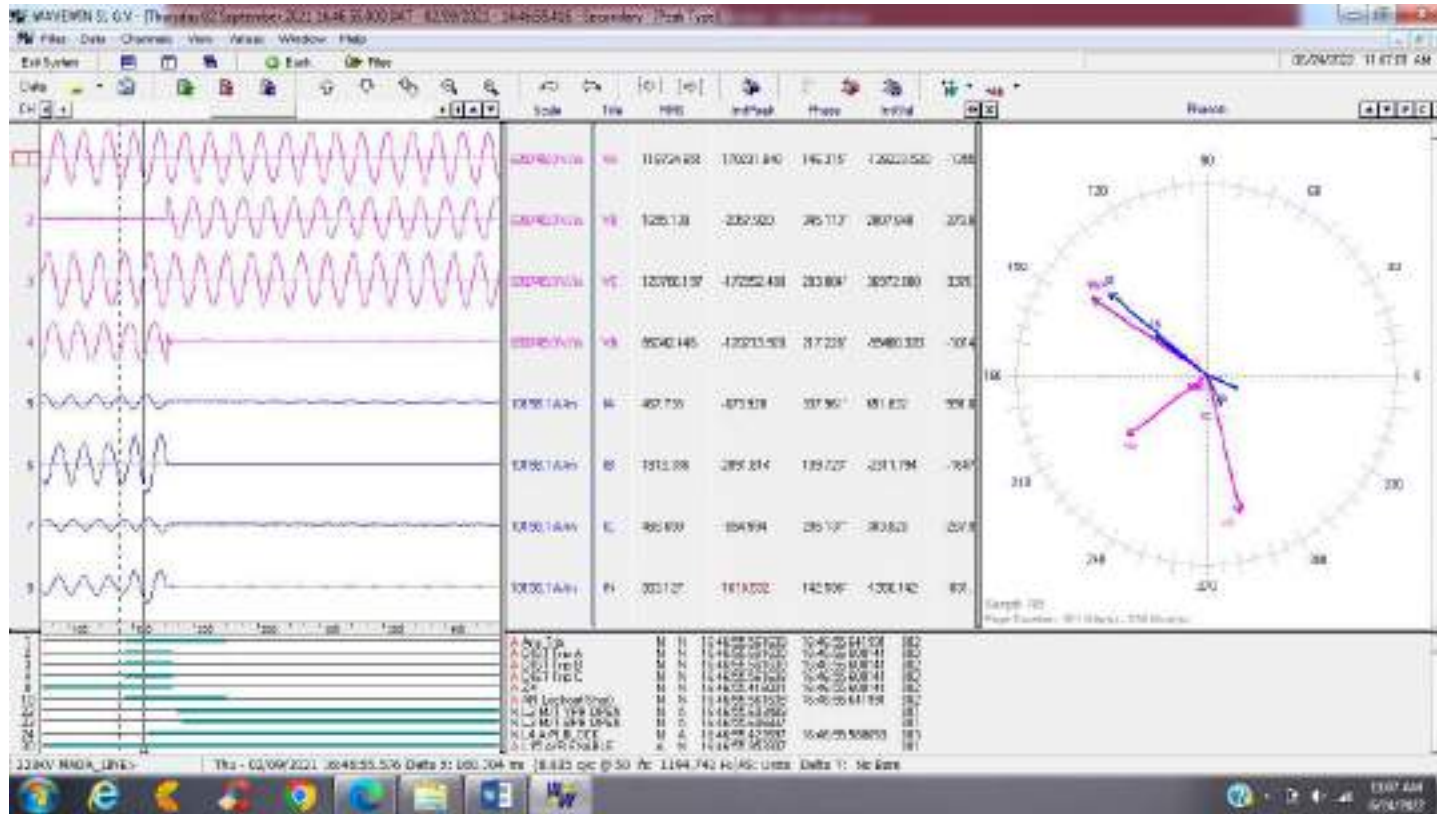
## 220 KV Barmer



## 220 KV Mada



5. As the connected feeders tripped on zone 4 timings, feeder like Bhu-2, Jajiya, Ramgarh and mulana were manually tripped as they run radial and have no available source on their side.
6. Finally the ICTs were tripped on earth fault protection in around 680 ms.



7. 220 KV amarsagar Line PU was defective at akal gss due to which the bus bar scheme was out of circuit but now the defective PU has been replaced and now 220 KV Bus bar scheme is healthy and in service.
8. Time synchronization issue has not yet been cleared as some of the Ethernet switches are still defective.

# Multiple elements tripping at 400/220kV Bareilly(UP)

23<sup>th</sup> Oct 2021, 16:28 hrs

# Tripped elements & Antecedent condition (As reported)

## **Antecedent Condition:**

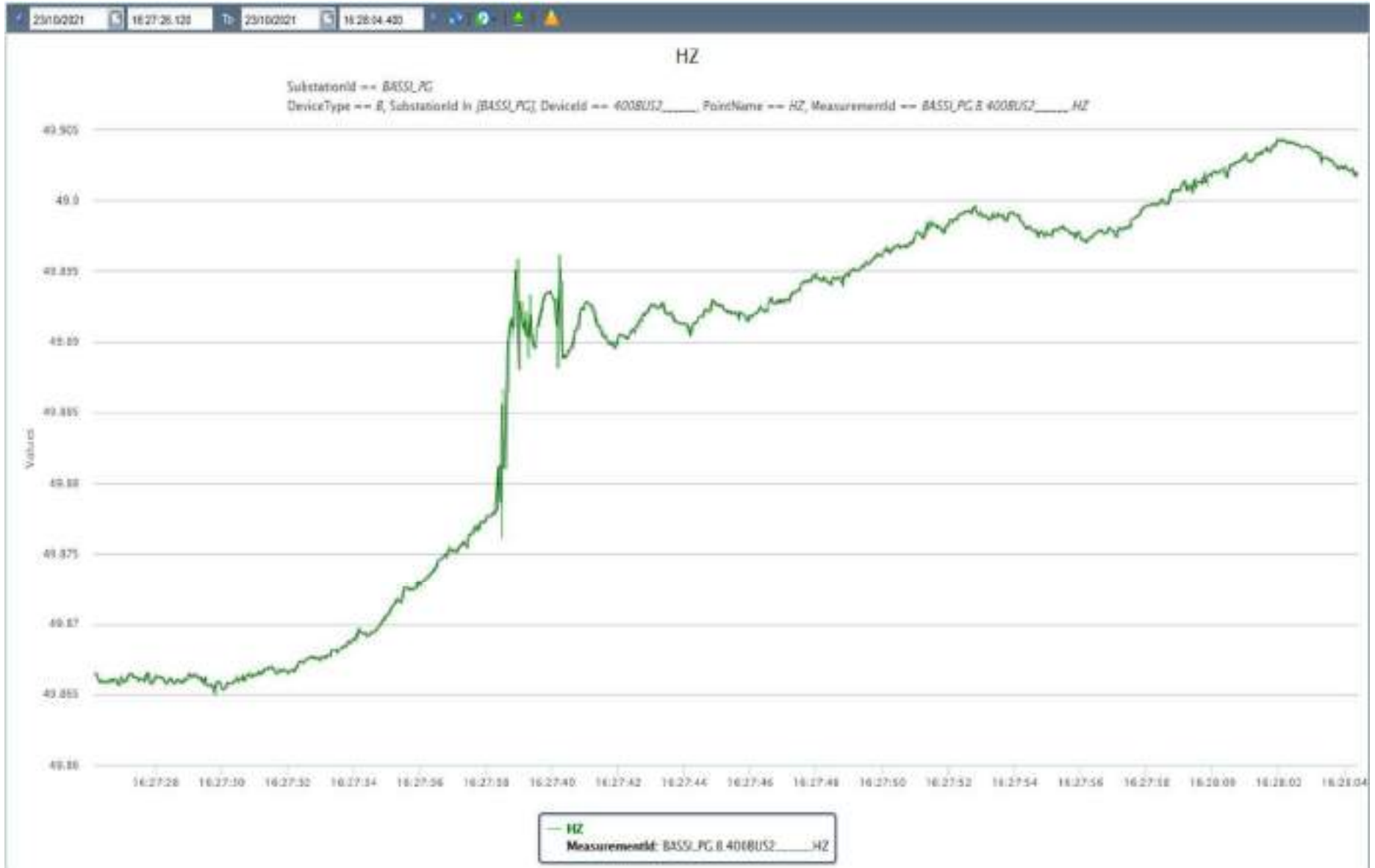
- Weather Conditions: Normal
- Grid Frequency (Hz): 49.88
- Total IR Import (MW): 6092
- Northern Region Demand (MW): 39724
- Load Loss: Nil

## **Tripped Elements:**

- 132 KV Pithoragarh(PG)-Almora(PTCUL)(PTCUL) Ckt-1
- 220 KV Dhauliganga(NH)-Pithoragarh(PG) (PG) Ckt-1
- 220 KV Dhauliganga(NH)-Bareilly(UP) (PG) Ckt-1
- 220 KV Tanakpur(NH)-CB Ganj(UP) (PG) Ckt-1
- 400/220 kV 315 MVA ICT 1 at Bareilly(UP)
- 400/220 kV 315 MVA ICT 2 at Bareilly(UP)
- 400/220 kV 315 MVA ICT 3 at Bareilly(UP)
- 220 KV Pithoragarh(PG)-Bareilly(UP) (PG) Ckt-1
- 220 KV Pantnagar(UK)-Bareilly(UP) (UP) Ckt-1

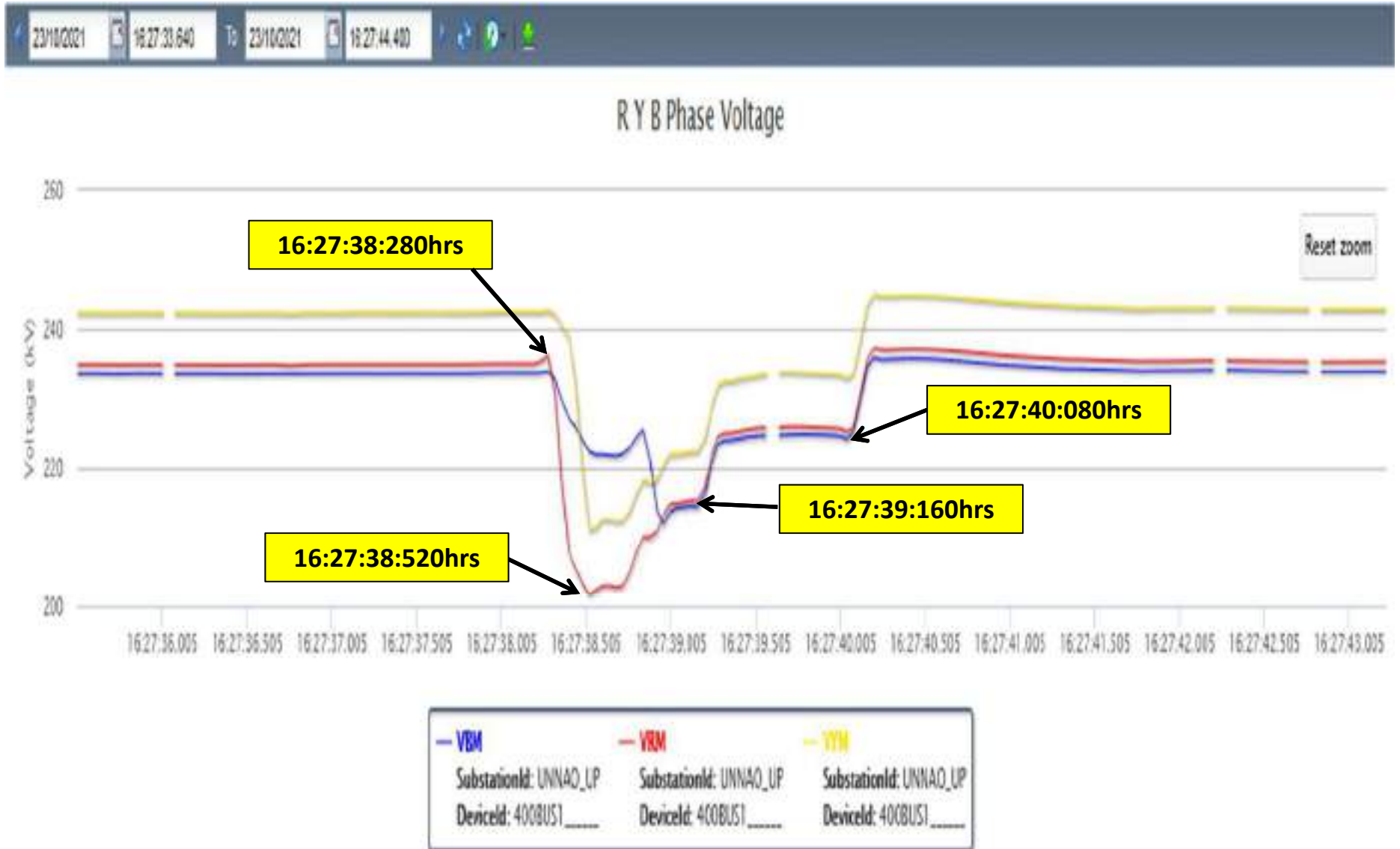
# PMU Plot of frequency at Bassi(PG)

16:27hrs/23-Oct-21

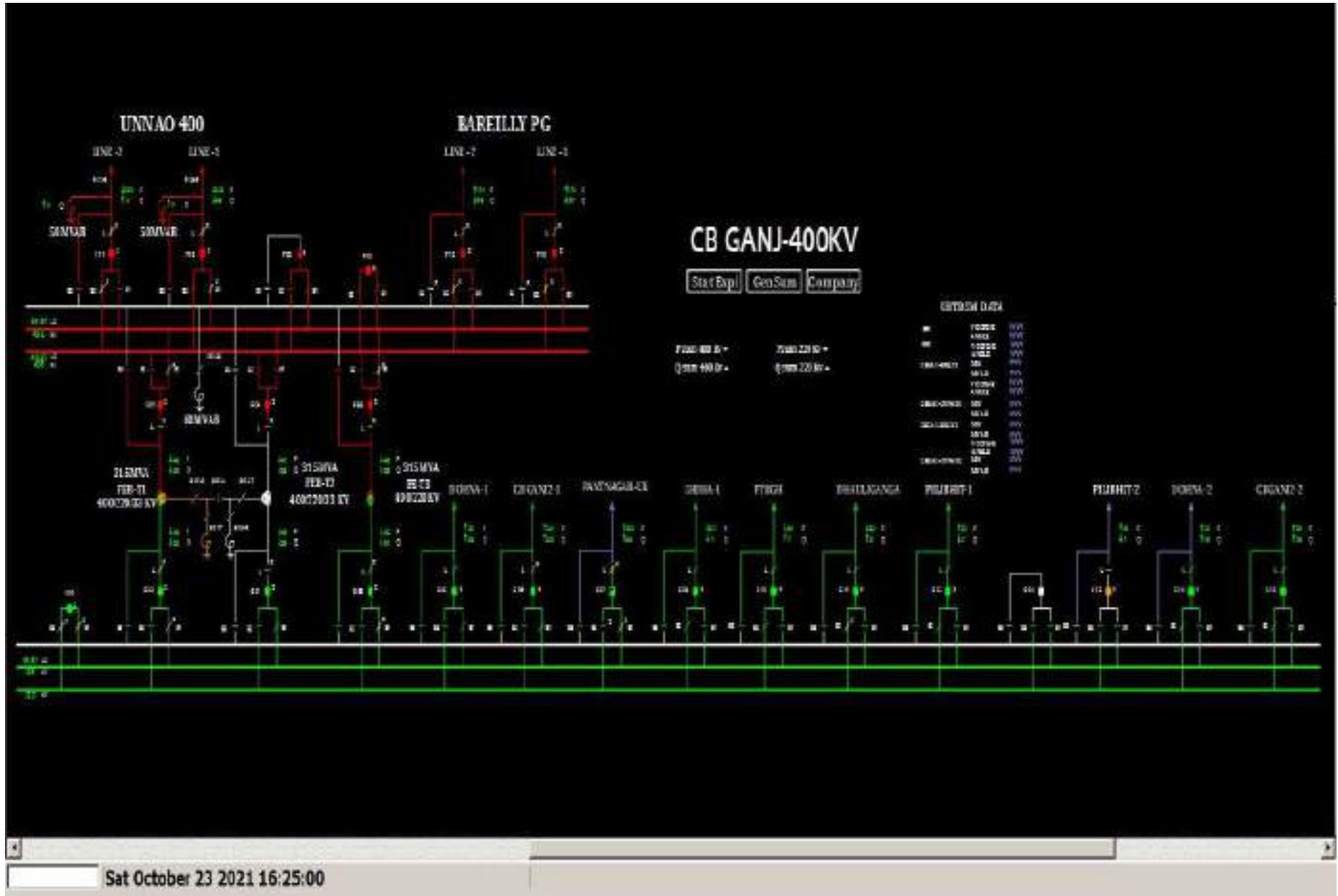


# PMU Plot of phase voltage magnitude at Unnao(UP)

16:27hrs/23-Oct-21

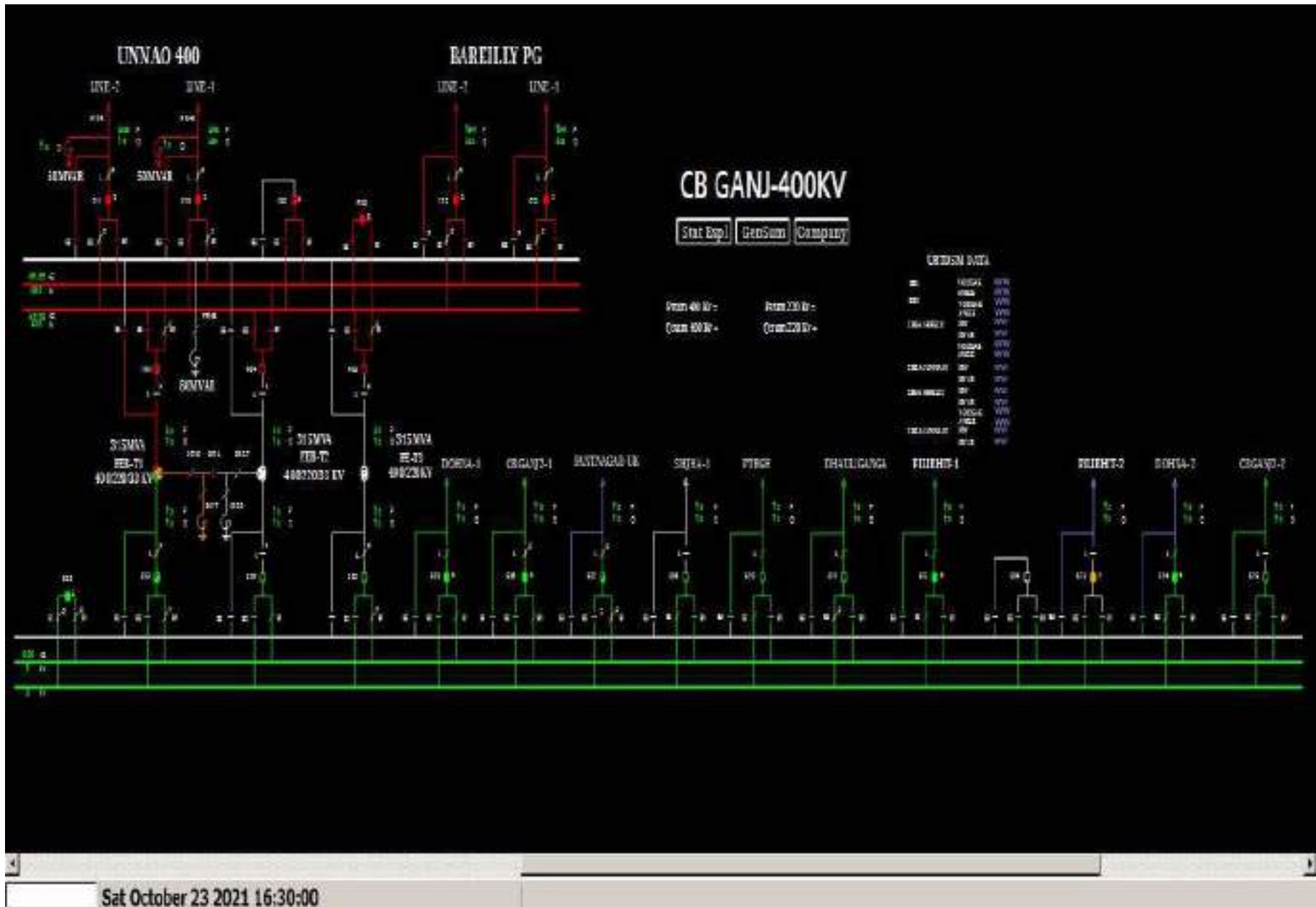


# SLD of 400/220kV Bareilly(UP) before the tripping





# SLD of 400/220kV Bareilly(UP) after the tripping

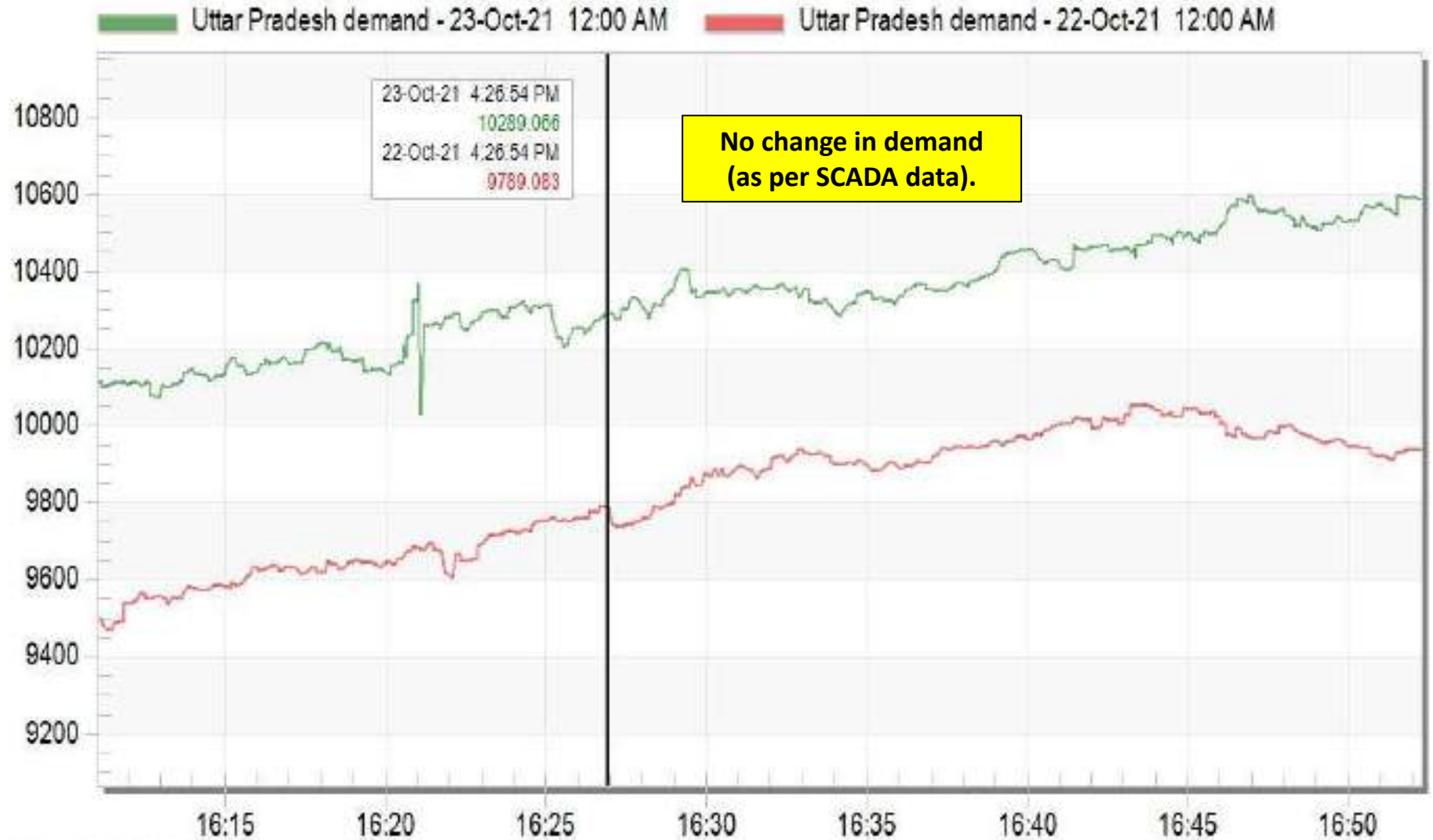


# SCADA SOE

Time	Station Name	Voltage	Element Name	Element Type	Element Status	Remark
16:27:38,432	TANAKPUR	220kV	06CBGA21	Circuit Breaker	Open	CB of 220kV Tanakpur-CB Ganj ckt opened
16:27:38,595	TANAKPUR	220kV	03G3	Circuit Breaker	Open	CB of 40MW UNIT 3 of Tanakpur HEP opened
16:27:38,630	CBGA1_UP	220kV	E_11(DHULI-2)	Circuit Breaker	Open	CB of 220kV CB Ganj-Dhauliganga ckt opened
16:27:38,630	CBGA1_UP	220kV	E_08(SHJHA-1)	Circuit Breaker	Open	CB of 220kV CB Ganj-SHJHA ckt opened
16:27:38,630	CBGA1_UP	220kV	E_10(PTRGH)	Circuit Breaker	Open	CB of 220kV CB Ganj-Pithoragarh ckt opened
16:27:38,630	CBGA1_UP	220kV	15CBGA22	Circuit Breaker	Open	CB of 220kV CB Ganj-CB Ganj2 ckt-2 opened
16:27:38,730	DOHNA_UP	220kV	E_03(CBGA1)	Circuit Breaker	Open	CB of 220kV Dohna-CB Ganj ckt opened
16:27:38,747	DOHNA_UP	220kV	07CBGA12	Circuit Breaker	Open	
16:27:38,784	ROSA_UP	220kV	E_05(HAROD-2)	Circuit Breaker	Open	
16:27:39,035	CBGA1_UP	400kV	F_04(T2)	Circuit Breaker	Open	CB at 400kV side of 400/220kV 315MVA ICT 2 opened
16:27:39,035	CBGA1_UP	220kV	E_01(T2)	Circuit Breaker	Open	CB at 220kV side of 400/220kV 315MVA ICT 2 opened
16:27:40,213	CBGA1_UP	220kV	83T3	Circuit Breaker	Open	CB at 220kV side of 400/220kV 315MVA ICT 3 opened
16:27:40,213	CBGA1_UP	400kV	83T3	Circuit Breaker	Open	CB at 400kV side of 400/220kV 315MVA ICT 3 opened
16:27:49,282	CBGA1_UP	220kV	E_03(T1)	Circuit Breaker	disturbe	
16:27:49,282	CBGA1_UP	400kV	F_01(T1)	Circuit Breaker	disturbe	
16:28:38,119	TANAKPUR	220kV	02G2	Circuit Breaker	Open	CB of 40MW UNIT 2 of Tanakpur HEP opened
16:28:48,582	CBGA1_UP	220kV	04TBC	Circuit Breaker	Open	

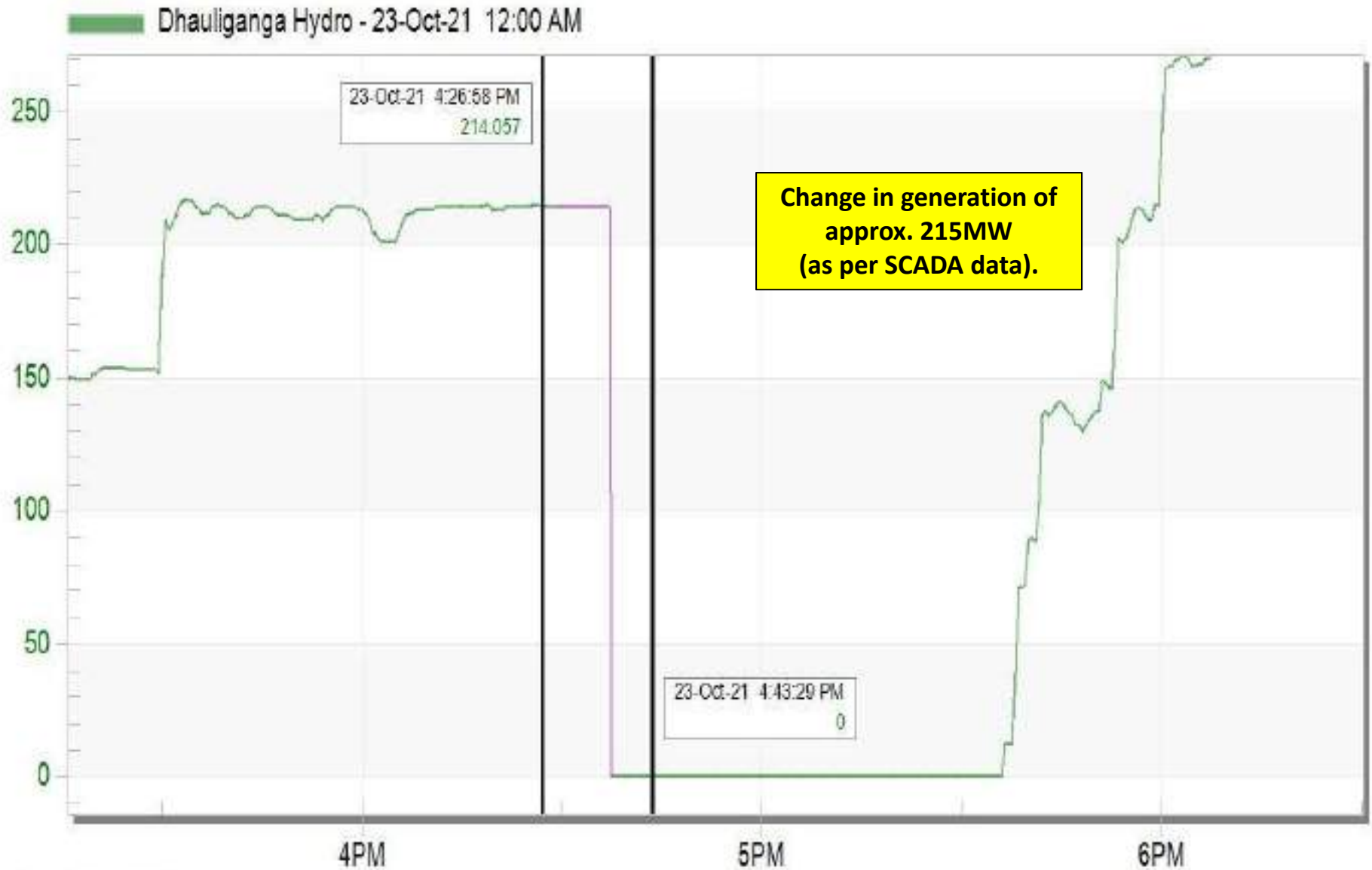
# UP demand during tripping

Uttar Pradesh Demand



Oct 23 Sat 2021

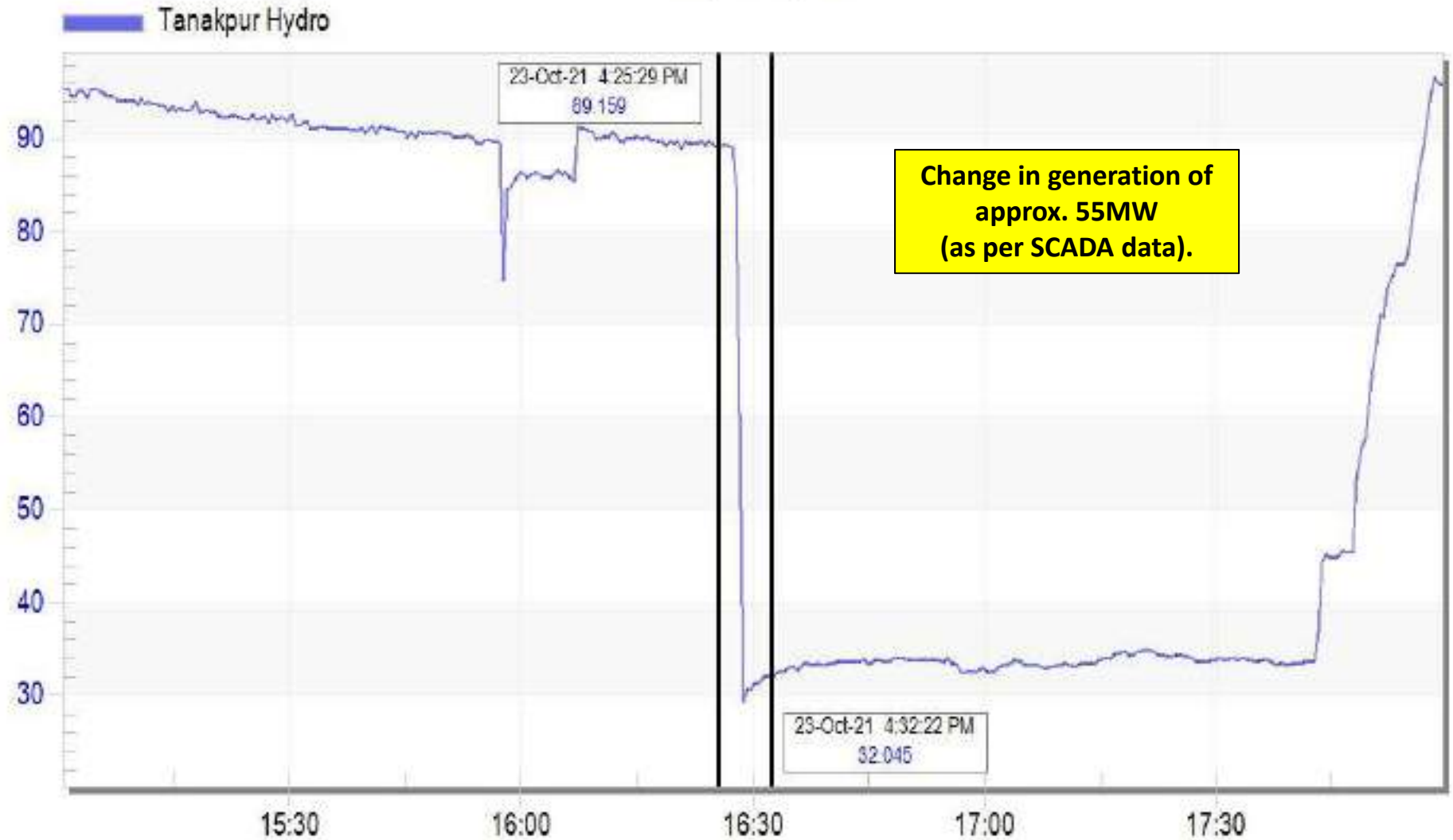
# Dhauliganga HEP generation during tripping



Oct 23 Sat 2021

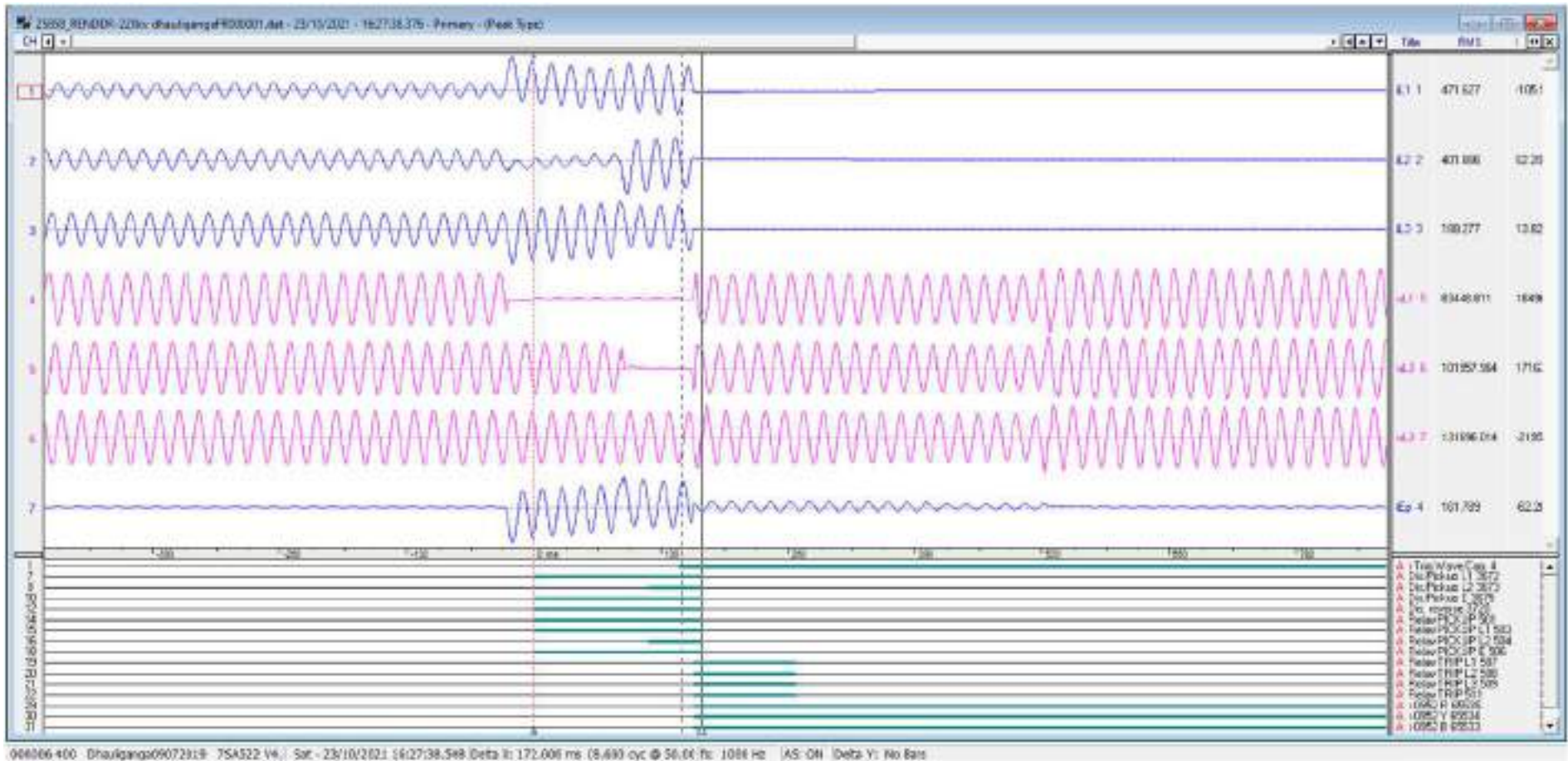
# Tanakpur HEP generation during tripping

Tanakpur Hydro



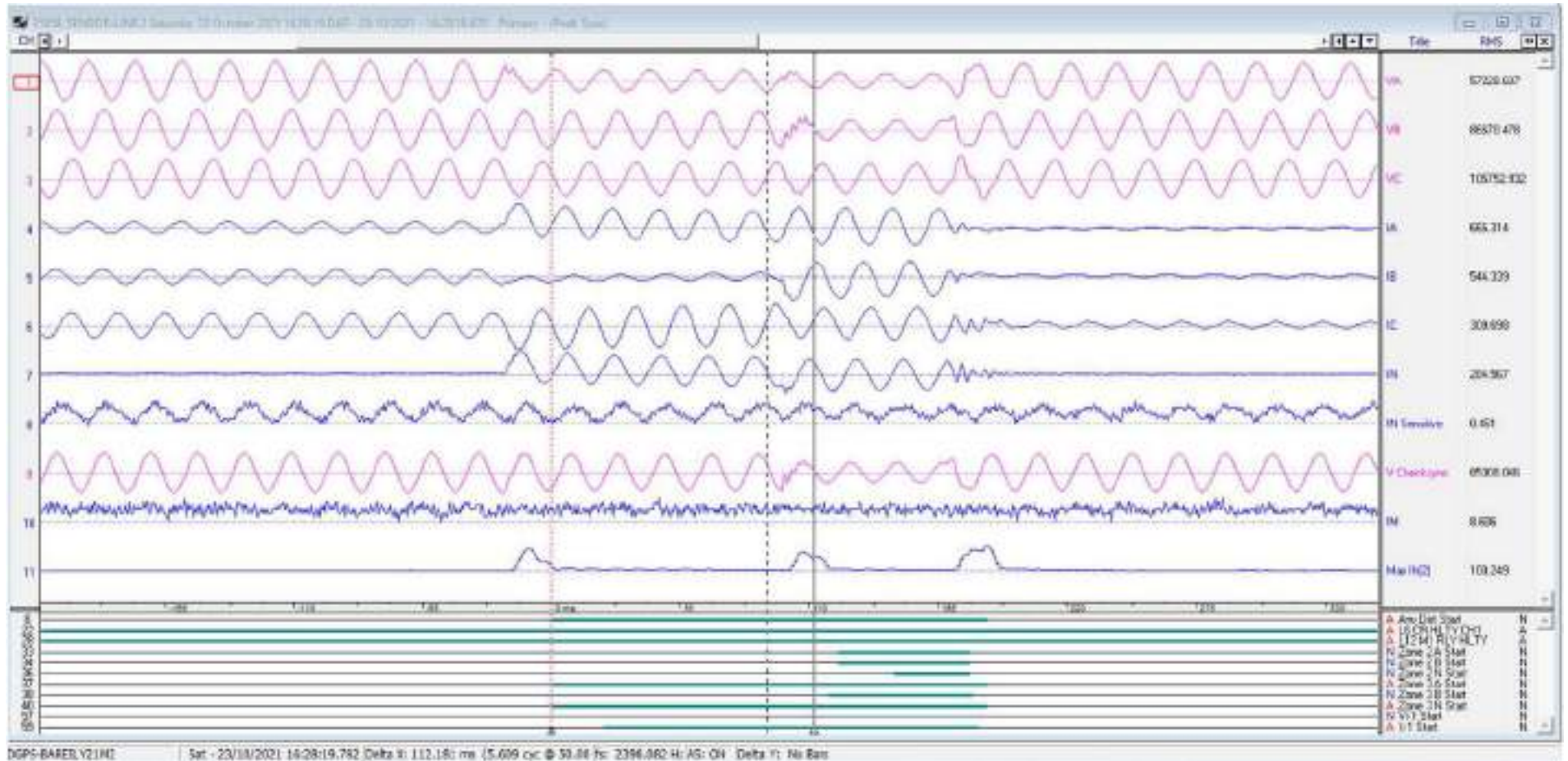
Oct 23 Sat 2021

# DR of 220 kV Bareilly(End)- Dhauliganga



1. Fault in R and Y phases.
2. Zone-4 reverse operated.
3. Timer is around 170 ms.

# DR of 220 kV Bareilly – Dhauliganga(End)



1. Zone-2 operated.

# Tripping report of UPPTCL Bareilly

**FAULT ANALYSIS STATEMENT OF PROTECTION GEARS Dated 23.10.2021 at 400 KV BLY**

SL NO	TRIPPING DATE/TIME	CLOSING DATE/TIME	NAME OF SUB-STATION	C.B.NO/DIRECTION	TYPE OF PROTECTION SCHEME	FLAGS OBSERVED		REMARK	
						THIS END	OTHER END		
						RELAY FLAGS	RELAY FLAGS		
1	2	3	4	5	6	7	9	12	
1	23.10.2021 16:27	23.10.2021 17:27	400 KV Bareilly	ICT-1	ABB	CP- PRV trip, Gr B trip relay operated. PRV trip, Gr B trip relay- 86B	RP-		
2	23.10.2021 16:27	23.10.2021 17:01		ICT-2	Siemens	CP- Buchholz alarm, Buchholz trip, 86A/86B trip relay operated. Buchholz alarm, Buchholz trip, 86AX, 86BX	RP-		
3	23.10.2021 16:27	23.10.2021 17:14		ICT-3	ERL	CP- Directional O/C / E/F protection operated, GrA/ B trip relay operated. RP- Directional E/F relay- Inv high set O/C operated, In=1742A, IY=1742A, Ib=1625A, In=247A, Gr A trip relay 86A1/86A2, Gr B trip relay 86B1/86B2			
4	23.10.2021 16:27	23.10.2021 17:28		Dhauri Ganga	Siemens/ MicomP442	CP- Main-1 operated, A/R lockout, Gr A/B relay operated, Main-2 Z1/2/3 operated, A/R Block. RP- Main-1- Gen trip, R,Y, Z-4, 0.58KA, 0.57KA, 0.31KA Contact multn Relay-Z1/2/3 High speed 3phase trip relay 86A Main2- R, Y, Z4 High speed 3phase trip relay 86B, Breaker failure relay- R,Y, B phase initiation			
5	23.10.2021 16:27	23.10.2021 17:42		Pithoragarh	Siemens/ MicomP442	CP- Main-2 distance operated, A/R lockout, Gr A/B relay operated, Main-2 Z1/2/3 operated, A/R Block. RP- Main-1- R,Y Contact multn Relay-Z1/2/3 High speed 3phase trip relay 86A, Main2- R, Y, Z4 High speed 3phase trip relay 86B, Breaker failure relay- R,Y, B phase initiation			
6	23.10.2021 16:27	24.10.2021 01:15		Pantnagar	REL-670/ RXPE+RX9G	CP- Main distance protection trip trip, R,Y,B,Z4, A/R block	RP- Main- Gen	Gen trip, R, Y, Z2, A/R lockout, Ia=1.606KA, Ib=788.3A, Ic=86.48A	transfer breaker did not tripped with Distance protection relay as relay was not working properly.



# Observations

1. Exact location & nature of fault?
2. DR of other 220kV lines & ICTs at Bareilly not submitted.
3. Why 220 kV Dhauliganga – Pithoragarh tripped.
4. Why 220 kV busbar protection is out of service at 400 kV Bareilly.

**TRIPPING ANALYSIS REPORT OF DATE 23.10.2021 AT 16.27 HRS AT**  
**400 KV SUB-STATION, BAREILLY**

**SEQUENCE OF EVENTS**

On date 23.10.2021 at 16.27 hrs. R-phase jumper along with disc insulator string of 220 kv Bareilly- Pantnagar line snapped and fell down on 220 kv transfer bus making two phase faults (R & Y). 220 kv Bareilly- Pantnagar line was being fed through transfer bus coupler breaker. Distance protection of 220 kv Bareilly- Pantnagar line operated but TBC circuit breaker did not trip which converted into 220 kv bus fault resulting into tripping of all the 3\*315 MVA, ICTs and some 220 kv lines in reverse zone Z<sub>4</sub> while remaining lines from remote end in zone-2 and zone-3. Total fault clearance time was 1800 msec. Tripping of ICTs and 220 kv lines is given below,

SL. NO.	Date & time of Tripping	Name of 220 kv Elements	Flags at this end	Flags at other end
1	2	3	4	5
1	Not tripped	Pantnagar	R,Y,B Ph, Z <sub>4</sub>	R, y, Z <sub>2</sub>
2	23.10.21; 16.27 Hrs	Dhailiganga	R,Y Ph, Z <sub>4</sub>	
3	23.10.21; 16.27 Hrs	Pithoragarh	R,Y Ph, Z <sub>4</sub> , Dist.-7.77 Km	
4	23.10.21; 16.27 Hrs	Shahjahanpur	R,Y	
5	23.10.21; 16.27 Hrs	Dohna-1	Not Tripped	R, Y, Z <sub>2</sub>
6	23.10.21; 16.27 Hrs	Dohna-2	Not Tripped	R, Y, Z <sub>2</sub>
7	23.10.21; 16.27 Hrs	CB Ganj-1	Not Tripped	R,Y, Z <sub>2</sub>
8	23.10.21; 16.27 Hrs	CB Ganj-2	R, Y, Z <sub>4</sub>	
9	23.10.21; 16.27 Hrs	Pilibhit-1	Not Tripped	R, Y Dist.-56.40 Km
10	23.10.21; 16.27Hrs	Pilibhit-2	Not Tripped	R, Y, Z <sub>2</sub> , Dist.-30.10 km
11	23.10.21; 16.27 Hrs	315 MVA, ICT-1	PRV Trip	
12	23.10.21; 16.27 Hrs	315 MVA, ICT-2	Buch. Trip	
13	23.10.21; 16.27 Hrs	315 MVA, ICT-3	Inv.O/C, Ir-1742A, Ib-1742A, Ic-1625A, In-247A, FD-1669 msec.	

**REASON OF TRIPPING:**

- 1) On date 23.10.2021 at 16.27 hrs. R-phase jumper along with disc insulator string of 220 kv Bareilly- Pantnagar line snapped and fell down on 220 kv transfer bus making two phase faults (R & Y). 220 kv Bareilly- Pantnagar line was being fed through transfer bus coupler breaker. Distance protection of 220 kv Bareilly- Pantnagar line operated but master trip relay 86 in TBC relay panel did not operate due to which TBC circuit breaker,

through which Pantnagar line was being fed, did not operate. On checking tripping bus wires in 220 kv Dohna-1 relay panel found open which is installed between 220 kv Pantnagar and 220 kv TBC relay panel.

- 2) 220 kv Dohna-1 relay panel was replaced in the month of April, 2019 and the different bus wires connecting different relay panels opened during replacement have not been connected and restored so far.
- 3) As the 220 kv busbar protection is not in service since march, 2021 after its capacity exhausted hence some 220 kv lines tripped in reverse zone Z4 and remaining lines tripped from remote end. Though reverse zone Z4 settings of all 220 kv lines had been changed to 02 Km and time was kept 160 ms in the month of March, 2021 as per NRPC guidelines.
- 4) Further 220 kv bus coupler does not have any protection except LBB and BBP hence both bus-1 & 2 tripped.
- 5) LBB protection also did not operate as in this case master trip relay (86) is also placed in 2200 kv TBC relay panel.
- 6) 220 kv Dohna-1&2, CB Ganj-2 and Pilibhit-1&2 did not operate in reverse zone Z4.
- 7) After two phase faults (R &Y) phase voltage R-N and Y-N found to be only 01.900 kv observed from DR. Such type of dead fault might have resulted into turbulence in oil inside the transformer may be the reason of tripping of 315 MVA, ICT-1&2 on PRV and buchholz protection.
- 8) Tripping of 220 kv Rosa- Dohna line in zone-2 due to lower Z2 time setting.

#### **Corrective Actions Taken:**

- 1) Shut down of 220 kv Pantnagar, Dohna-1&2, Shahjahanpur, Pilibhit-1 and CB Ganj-2 was taken to check the configuration and operational behavior of relays. Except Pantnagar and Pilibhit-1 lines all other lines have Main-1( MiCOM P442) and Main-2( ABB REL 650) relays.
- 2) During testing main-1 (P442) relays have been found working in order. DR of these relays could not be made available by concerned officers as the data had been deleted during testing done by them earlier after the tripping on 23.10.2021.
- 3) During testing of main-2 (ABB REL 650) relays fault conditions were simulated to all the relays but no relay operated in reverse zone on that fault. After changing the settings from 0.833 ohm to 2.40 ohms (minimum value in primary) relay was operating hence the reverse zone setting has been changed to 2.40 ohms in all (REL 650) relays.

- 4) 220 kv Pantnagar line though operated in reverse zone but it was found that the relay hangs during testing. On checking it was found that in distance relay REL 670 Active setting group 1&2 had kept ON though settings were done in Active setting group-2. Now active setting group-1 has been kept OFF. Now relay hangs after 5-6 continuous operations and it has been kept under observations for its behavior.
- 5) 220 kv Pilibhit-1 line has distance relay (ERL LPRO) which was tested and changed some logics, after that relay was found working alright. Actual behavior will be known after real time fault.
- 6) Single phase A/R of Pilibhit-1 line has been made functional which was not operating earlier. After laying a control cable CB status has also provided to the relay.
- 7) Single phase A/R through main-2 relay REL 650 in Dohna-1&2, CB Ganj-2 and Shahjahanpur line has been made functional after changing some logics in the relay which was not operating earlier and 3 phase tripping of CB was there.
- 8) All REL 650 and REL 670 relays have been time synchronized at the s/s.
- 9) Zone-2 setting of 220 kv Rosa- Dohna line at Rosa end has got changed from 350ms to 500ms.

**Pending Works:**

- 1) Inter-panel bus wiring including Transfer bus coupler tripping wiring has to be restored at the earliest.
- 2) LBB tripping requires to be put in service till complete 220 kv BBP is commissioned.
- 3) 220 kv BBP requires to be commissioned.
- 4) Integration of balance 07 numbers 220 kv lines i.e. Pithoragarh, Dhauliganga, Dohna-1&2, Shahjahanpur, CB Ganj-2 and Pilibhit-1 lines and 315 MVA, ICT-2&3 is yet to done with event logger which has to be re –configured.

**Enclosures:**

- 1) SLD of 400 kv s/s Bareilly showing position of tripped 400 KV, ICTs and 220 kv Lines.
- 2) DR

(KAVINDRA SINGH)

(TECHNICAL ADVISOR)

# Multiple elements tripping at 220/66kV Narela(DV)

27<sup>th</sup> Nov 2021, 09:24 hrs

# **Tripped elements & Antecedent condition (As reported)**

## **Antecedent Condition:**

- Weather Conditions: Normal
- Grid Frequency (Hz): 50.06
- Total IR Import (MW): 12756
- Northern Region Demand (MW): 46917
- Load Loss: Nil

## **Tripped Elements:**

- 220 KV Mandola(PG)-Narela(DV) (DTL) Ckt-1
- 220 KV Mandola(PG)-Narela(DV) (DTL) Ckt-2
- 220 KV Panipat(BB)-Narela(DV) (BBMB) Ckt-3
- 220 KV Panipat(BB)-Narela(DV) (BBMB) Ckt-2
- 220 KV Panipat(BB)-Narela(DV) (BBMB) Ckt-1

# PMU Plot of frequency at Panipat(BB)

09:24hrs/27-Nov-21



# PMU Plot of phase voltage magnitude at Panipat(BB)

09:24hrs/27-Nov-21



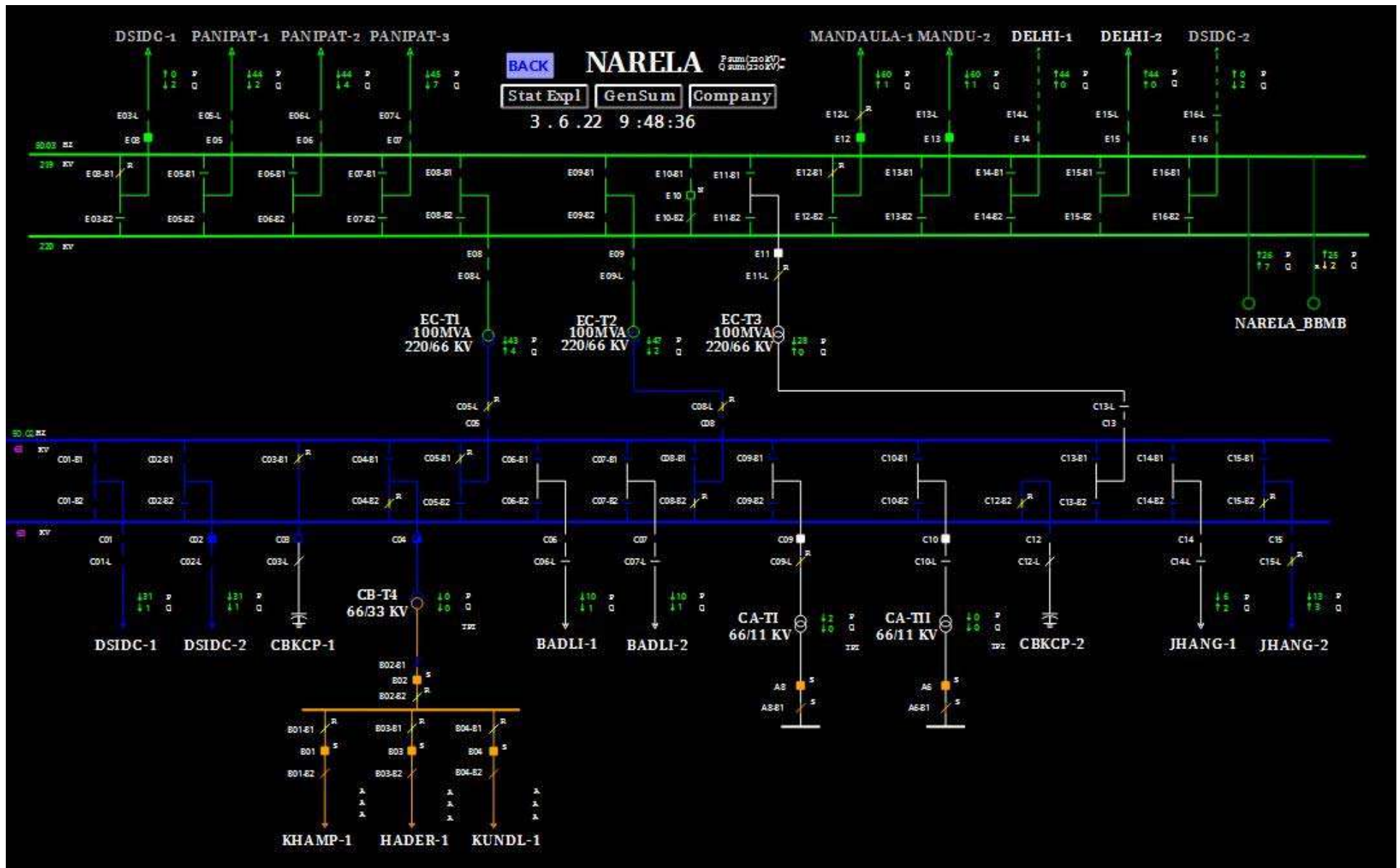


## SCADA SOE

Time	Station Name	Voltage	Element Name	Element Type	Element Status
09:24:31,904	MANDAULA	220kV	01NAREL1	Circuit Breaker	Open
09:24:31,914	MANDAULA	220kV	02NAREL2	Circuit Breaker	Open
09:24:32,168	PANIPAT	220kV	E_13(NAREL-1)	Circuit Breaker	Open
09:24:32,168	PANIPAT	220kV	E_07(NAREL-3)	Circuit Breaker	Open



# 220 kV Narela SLD



## **DTL Preliminary Tripping Report**

### **220kV Narela\_ Panipat & Mandola on date 27 Nov. 21**

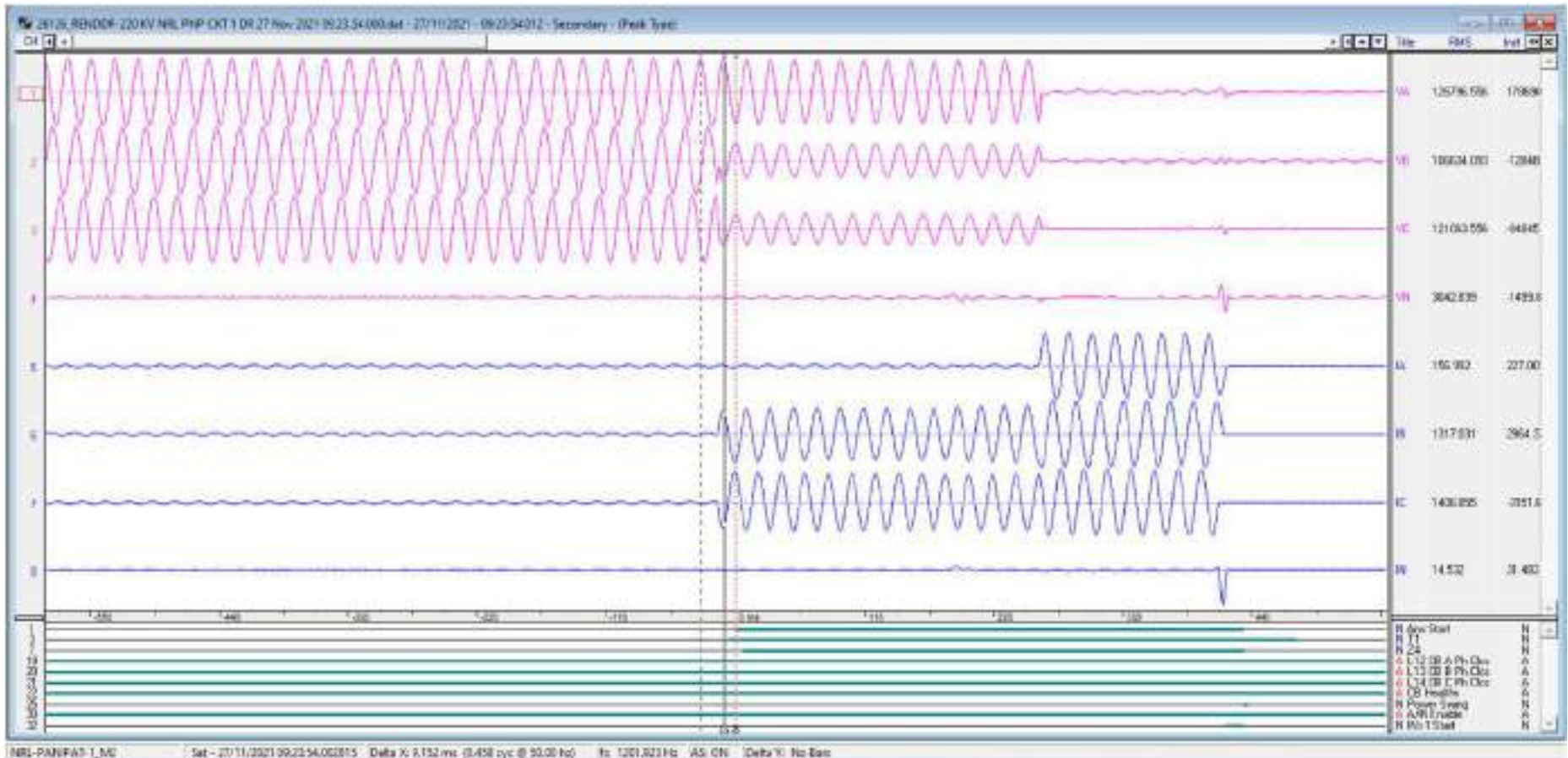
#### **A. INTRODUCTION**

- 1. Time & Date of Event: - 09:24 Hrs. 27-11-2021**
- 2. Substation affected along with voltage level: - 220 kV Narela,DTL.**
- 3. Brief event summary: -**

220kV Narela\_Panipat Ckt. 2 got tripped by Main-2 distance relay in Zone 4 with Carrier signal received at DTL end. The fault was on Bus isolator of 220kV Rohtak Road Ckt-2 Yellow-Blue phase-to-phase fault which later on got converted into RYB phase fault. This fault was sensed by all distance relays of 220kV Panipat Ckt-1,2,3 and Mandola Ckt-1&2 at Narela end in Zone-4 and was cleared in Zone-2 timings from remote end. The fault magnitude was approx.. 20kA (2.5kA+2.5kA+2.6kA+6.3kA+6.3kA) and was cleared in approx.. 450mSec by remote end relays located at Panipat and Mandola ends.

The reason for clearance of fault from remote end is 220kV Bus Bar protection relay at Narela got DC MCB tripped prior to fault due to some DC leakage to earth in switchyard which might be due to Bus isolator Motor box replacement work being carried out by BBMB in their switchyard and Bus Bar relay cables from BBMB transformer-1 bay were also to be dismantled and terminated to new motor box. Thus the fault cleared by remote end distance relays in their respective zone-2 timings.

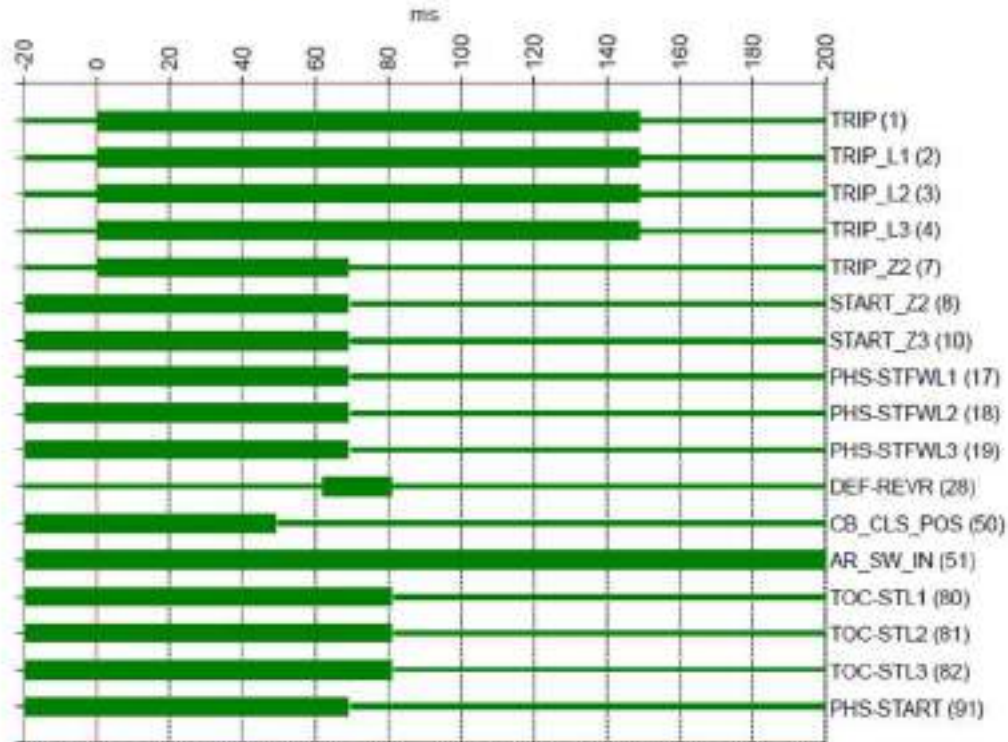
# DR of 220 kV Narela(End)-Panipat CKT-1



1. Fault in Y-B phase.
2. Fault sensed in Z-4 reverse.
3. Timer?

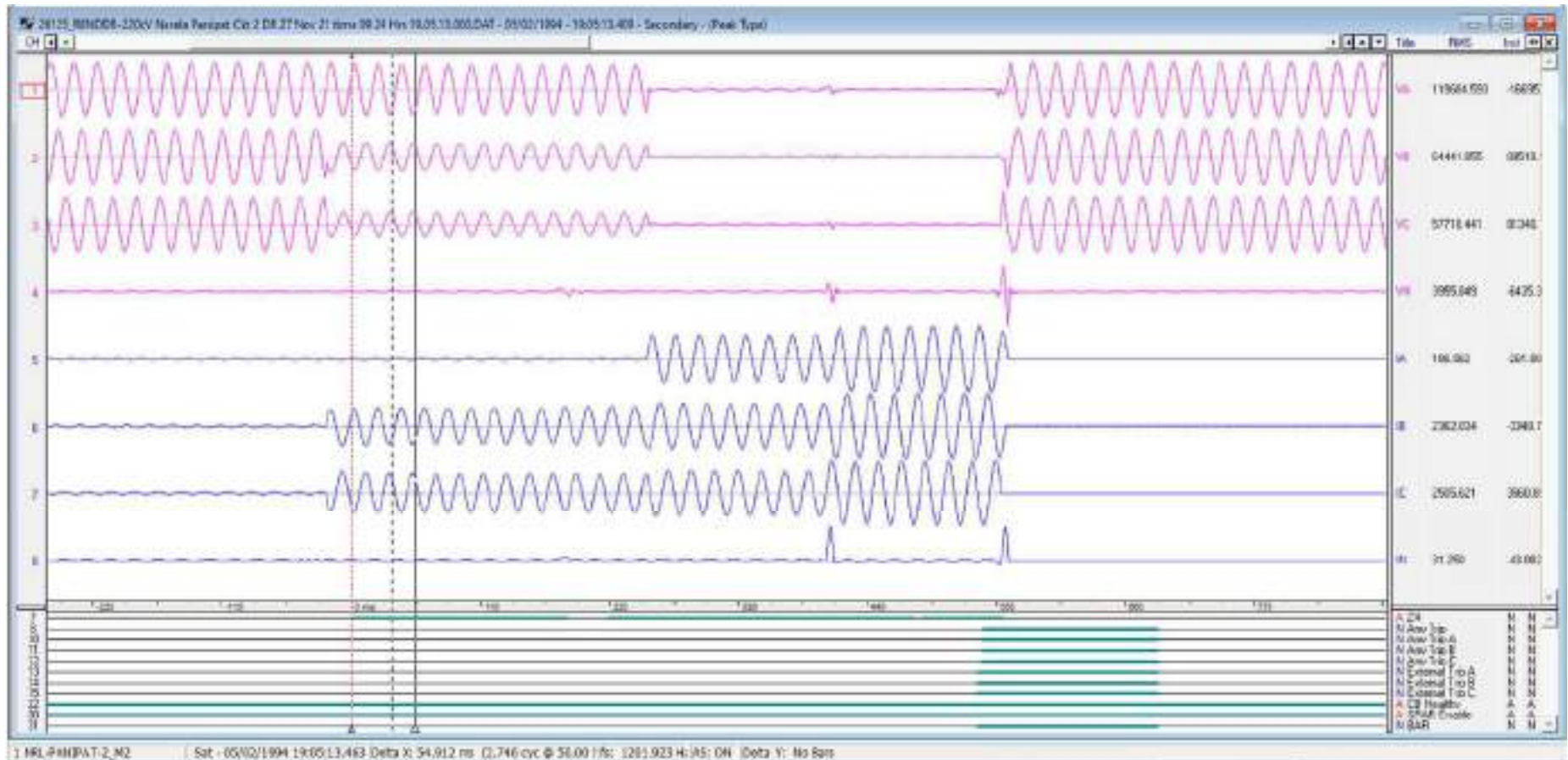
# DR of 220 kV Narela-Panipat(End) CKT-1

Trig Date Time: 11/27/2021 9:08:45:724 AM



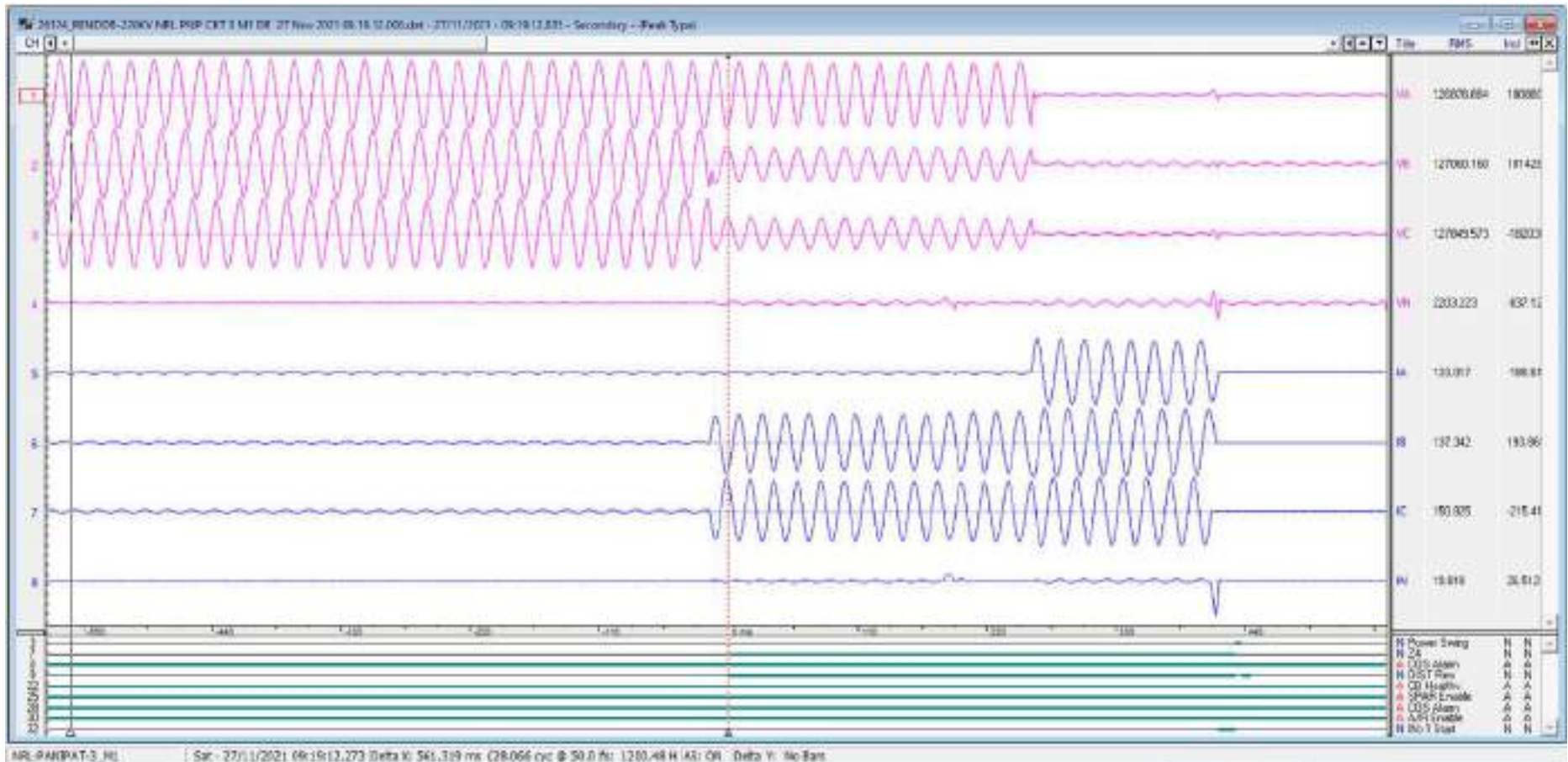
1. Fault in Y-B phase.
2. Fault sensed in Z-2.

# DR of 220 kV Narela(End)-Panipat CKT-2



1. Fault in Y-B phase.
2. Fault sensed in Z-4 reverse.
3. Timer is 550 ms

# DR of 220 kV Narela(End)-Panipat CKT-3



1. Fault in Y-B phase.
2. Fault sensed in Z-4 reverse.
3. Timer is 435 ms



## DR of 220 kV Narela-Panipat(End) CKT-3

28	DEF-REVR	On	11/27/2021 9:19:43:396 AM
80	TOC-STL1	Off	11/27/2021 9:19:43:396 AM
81	TOC-STL2	Off	11/27/2021 9:19:43:396 AM
82	TOC-STL3	Off	11/27/2021 9:19:43:396 AM
7	TRIP_Z2	Off	11/27/2021 9:19:43:399 AM
8	START_Z2	Off	11/27/2021 9:19:43:399 AM
10	START_Z3	Off	11/27/2021 9:19:43:399 AM
17	PHS-STFWL1	Off	11/27/2021 9:19:43:399 AM
18	PHS-STFWL2	Off	11/27/2021 9:19:43:399 AM
19	PHS-STFWL3	Off	11/27/2021 9:19:43:399 AM
91	PHS-START	Off	11/27/2021 9:19:43:399 AM
17	PHS-STFWL1	On	11/27/2021 9:19:43:404 AM
18	PHS-STFWL2	On	11/27/2021 9:19:43:404 AM
19	PHS-STFWL3	On	11/27/2021 9:19:43:404 AM
91	PHS-START	On	11/27/2021 9:19:43:404 AM
17	PHS-STFWL1	Off	11/27/2021 9:19:43:409 AM
18	PHS-STFWL2	Off	11/27/2021 9:19:43:409 AM
19	PHS-STFWL3	Off	11/27/2021 9:19:43:409 AM
91	PHS-START	Off	11/27/2021 9:19:43:409 AM
91	PHS-START	On	11/27/2021 9:19:43:414 AM
28	DEF-REVR	Off	11/27/2021 9:19:43:416 AM
91	PHS-START	Off	11/27/2021 9:19:43:419 AM
1	TRIP	Off	11/27/2021 9:19:43:484 AM
2	TRIP_L1	Off	11/27/2021 9:19:43:484 AM
3	TRIP_L2	Off	11/27/2021 9:19:43:484 AM

1. Fault in Y-B phase.
2. Fault sensed in Z-2.

# Observations

1. 220 kV Mandola – Narela DRs not submitted by utility.
2. What was the reason for fault.
3. Why delayed clearance was there?
4. Z-4 time delay?
5. Alarm of DC fault?
6. Bus bar status?

## **DTL Preliminary Tripping Report**

### **220kV Narela\_ Panipat & Mandola on date 27 Nov. 21**

#### **A. INTRODUCTION**

1. Time & Date of Event: - 09:24 Hrs. 27-11-2021

2. Substation affected along with voltage level: - 220 kV Narela,DTL.

3. Brief event summary: -

220kV Narela\_Panipat Ckt. 2 got tripped by Main-2 distance relay in Zone 4 with Carrier signal received at DTL end. The fault was on Bus isolator of 220kV Rohtak Road Ckt-2 Yellow-Blue phase-to phase fault which later on got converted into RYB phase fault. This fault was sensed by all distance relays of 220kV Panipat Ckt-1,2,3 and Mandola Ckt-1&2 at Narela end in Zone-4 and was cleared in Zone-2 timings from remote end. The fault magnitude was approx.. 20kA (2.5kA+2.5kA+2.6kA+6.3kA+6.3kA) and was cleared in approx.. 450mSec by remote end relays located at Panipat and Mandola ends.

The reason for clearance of fault from remote end is 220kV Bus Bar protection relay at Narela got DC MCB tripped prior to fault due to some DC leakage to earth in switchyard which might be due to Bus isolator Motor box replacement work being carried out by BBMB in their switchyard and Bus Bar relay cables from BBMB transformer-1 bay were also to be dismantled and terminated to new motor box. Thus the fault cleared by remote end distance relays in their respective zone-2 timings.

#### **B. ANTECEDENTCONDITION**

1. Weather Information: - Clear

2. Additional relevant Information: -NIL

#### **C. EVENT DATA**

1. Change in Frequency: -Nil

2. Generation Loss: -Nil

3. Single Line Diagram of affected area:-NA

4. Name and time of the tripped elements in the time chronology: - Nil

6. Appropriate Graphical plot: NA

7. Equipment Failure: -Nil

#### **D. EVENT DESCRIPTION /ANALYSIS OF THE EVENT**

Description:-NA

#### **E. RESTORATION**

1. Restoration Time of Tripped elements in time chronology: -

220kV Narela Mandola Ckt-1 at time 13:02Hrs.

220kV Narela Mandola Ckt-1 at time 13:12Hrs.

220kV Narela Panipat Ckt-1 at time 13:16Hrs.

220kV Narela Panipat Ckt-2 at time 12:47Hrs.

220kV Narela Panipat Ckt-3 at time 12:03Hrs. on 27 Nov. 2021

2. Special finding/issues identified during restoration: NA

#### **F. REMEDIAL ACTION**

1. Remedial action taken: NA.

2. Remedial action to be taken along with the frame: NA

#### **G. LESSON LEARNT : NA**

#### **H. ANY OTHER INFORMATION: NA**

# Multiple elements tripping at 400/220kV Obra\_B(UP)

06<sup>th</sup> Dec 2021, 18:27 hrs

# Tripped elements & Antecedent condition (As reported)

## **Antecedent Condition:**

- Weather Conditions: Normal
- Grid Frequency (Hz): 50.01
- Total IR Import (MW): 11176
- Northern Region Demand (MW): 49429
- Load Loss: 300MW (as reported by SLDC-UP)

## **Tripped Elements:**

- 400 KV Obra\_C\_TPS-Obra\_B (UP) Ckt-1
- 400 KV Anpara-Obra\_B (UP) Ckt-1
- 400 KV Obra\_B-Sultanpur (UP) Ckt-1
- 400 KV Obra\_B-Rewa Road (UP) Ckt-1
- 200 MW Obra TPS - UNIT 10
- 200 MW Obra TPS - UNIT 11
- 200 MW Obra TPS - UNIT 12
- 400KV Bus 2 at Obra\_B(UP)
- 400KV Bus 1 at Obra\_B(UP)
- 400/220 kV 240 MVA ICT 3 at Obra\_B(UP)
- 400/220 kV 315 MVA ICT 2 at Obra\_B(UP)

# PMU Plot of frequency at Anpara(UP)

18:31hrs/06-Dec-21

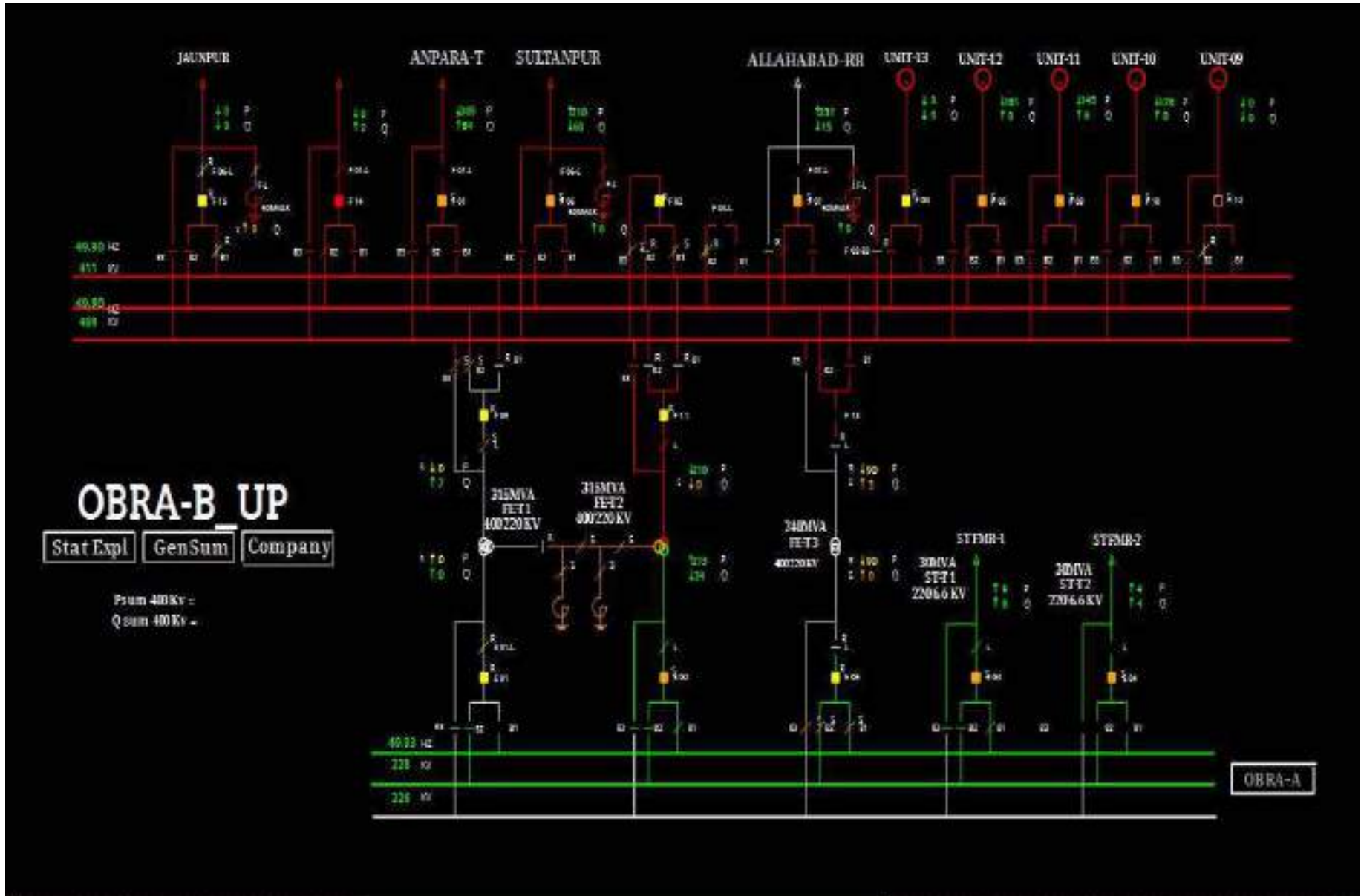


# PMU Plot of phase voltage magnitude at Anpara(UP)

## 18:31hrs/06-Dec-21

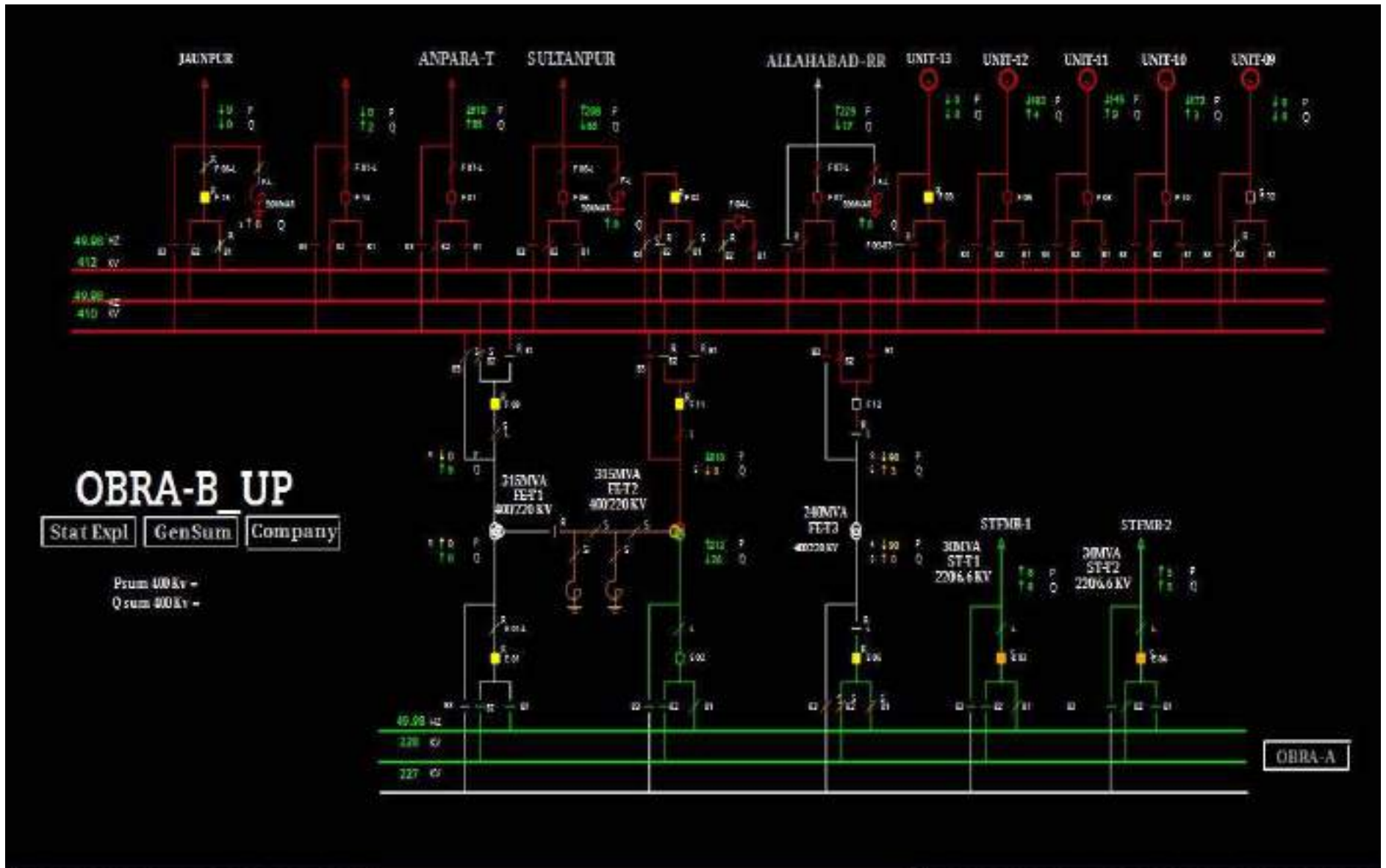


# SLD of 400/220kV Obra B before the tripping





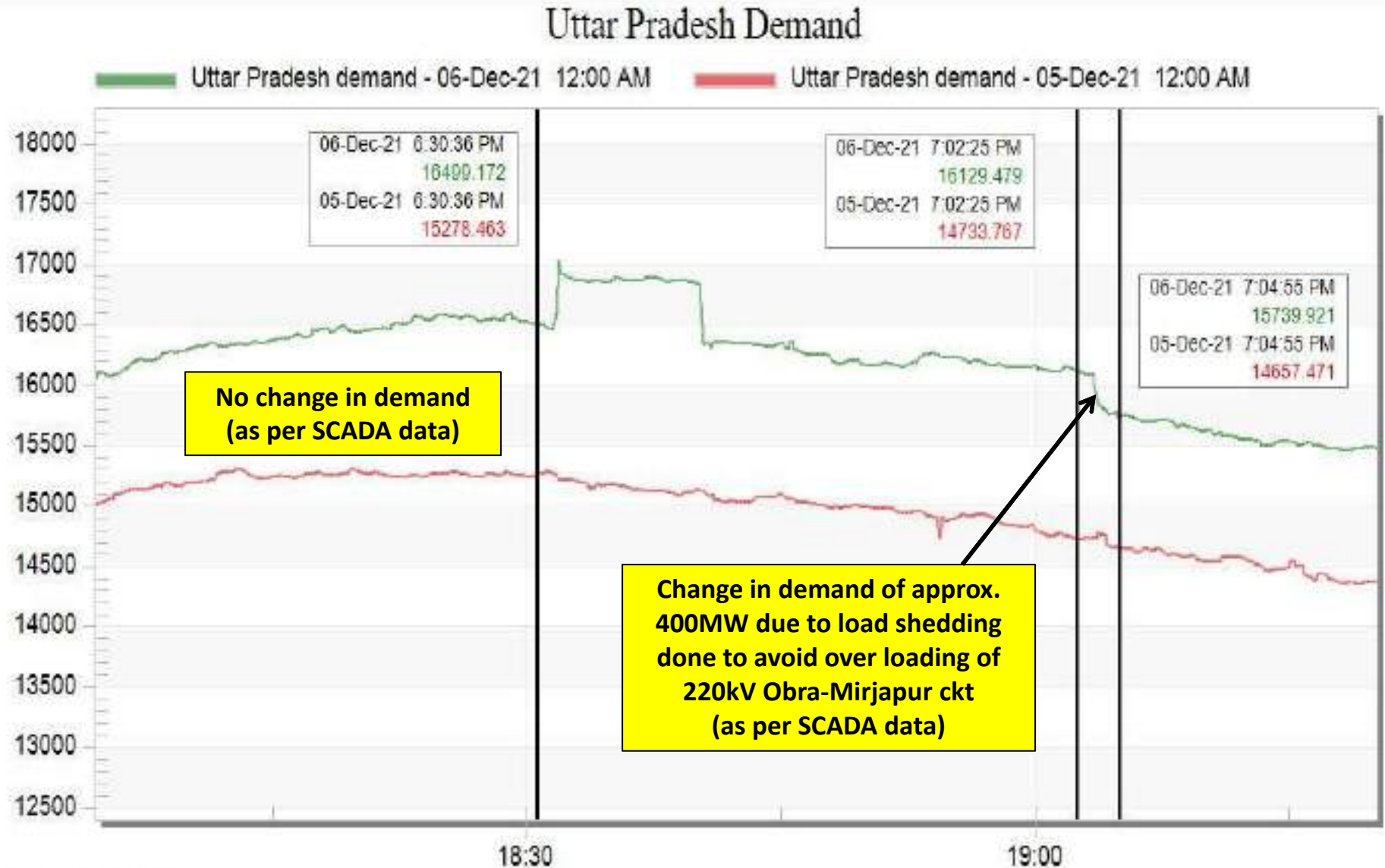
# SLD of 400/220kV Obra B before the tripping



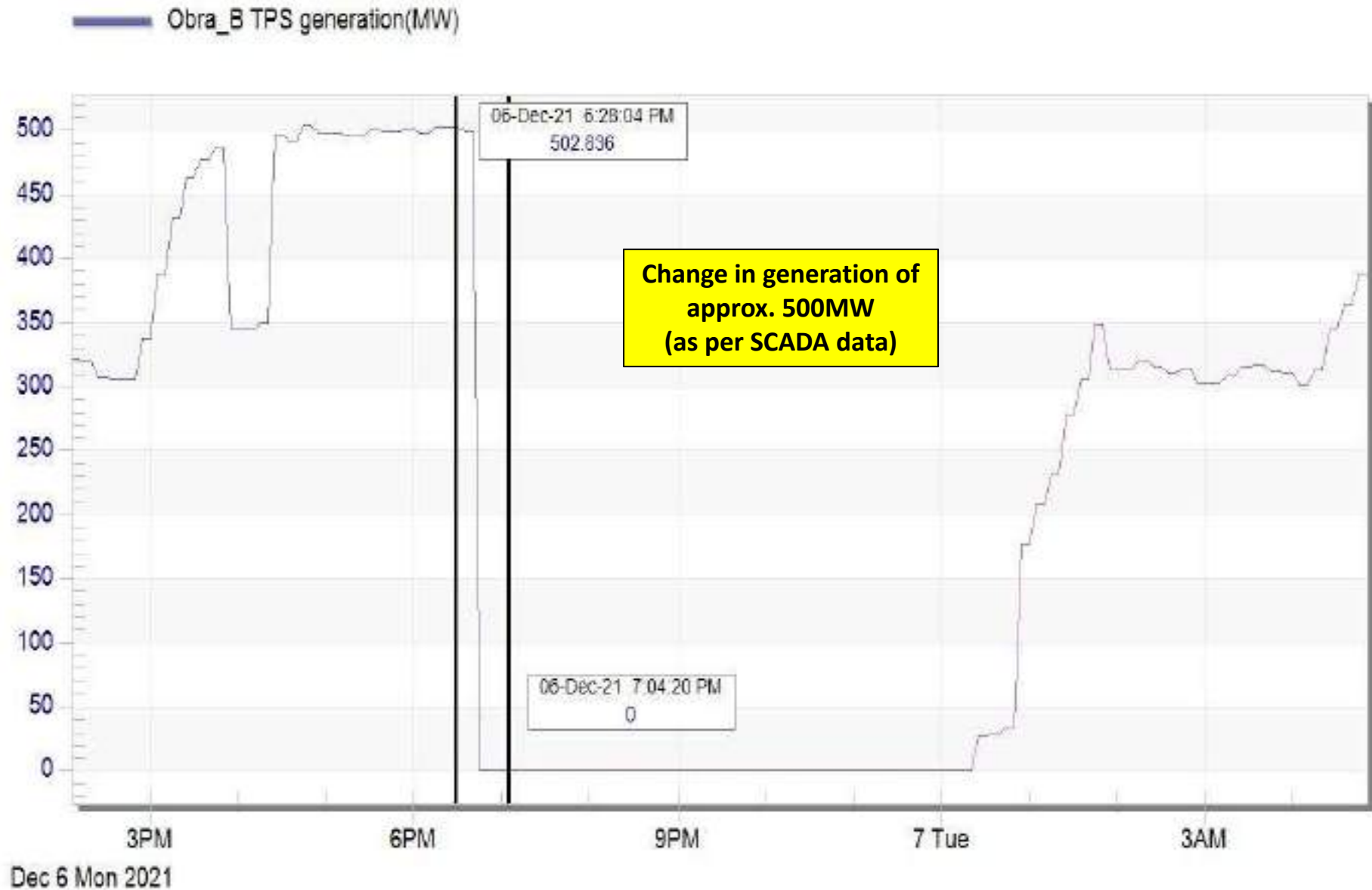
# SCADA SOE

Time	Station Name	Voltage	Element Name	Element Type	Element Status	Remark
18:30:14,642	OBRAB_UP	400kV	13T3	Circuit Breaker	Open	CB at 400kV side of 400/220kV 240MVA ICT3 at Obra_B(UP) opened
18:31:32,222	OBRAB_UP	400kV	F_05(U12)	Circuit Breaker	Open	CB of 200MW Unit 12 opened
18:31:32,233	OBRAB_UP	400kV	14OBRA-C	Circuit Breaker	Open	Line CB at Obra_B of 400kV Obra_B-Obra_C ckt opened
18:31:32,233	OBRAB_UP	400kV	04MBC	Circuit Breaker	Open	Bus coupler opened
18:31:32,236	OBRAB_UP	400kV	F_08(U11)	Circuit Breaker	Open	CB of 200MW Unit 11 opened
18:31:32,244	OBRAB_UP	400kV	F_10(U10)	Circuit Breaker	Open	CB of 200MW Unit 10 opened
18:31:32,245	OBRAB_UP	400kV	F_01(ANPAR-1)	Circuit Breaker	Open	Line CB of 400kV Obra_B-Anpara ckt opened
18:31:32,252	OBRAB_UP	400kV	F_06(SULT1)	Circuit Breaker	Open	Line CB at Obra_B of 400kV Obra_B-Sultanpur ckt opened
18:31:32,253	OBRAB_UP	400kV	F_07(ALHA1)	Circuit Breaker	Open	Line CB of 400kV Obra_B-Allahabad(Rewa Road) ckt opened
18:31:32,263	OBRAC_U	400kV	11OBRST1	Circuit Breaker	Open	
18:31:32,265	OBRAC_U	400kV	12OBRAB	Circuit Breaker	Open	Line CB at Obra_C of 400kV Obra_B-Obra_C ckt opened
18:31:32,292	OBRAB_UP	220kV	E_02(T2)	Circuit Breaker	Open	CB at 220kV side of 400/220kV 315MVA ICT2 at Obra_B(UP) opened
18:31:32,311	SULT1_UP	400kV	F_03(OBRAB)	Circuit Breaker	Open	Line CB at Sultanpur of 400kV Obra_B-Sultanpur ckt opened

# UP demand during tripping



# Obra\_B TPS generation during tripping



# Details received from 400/220kV Obra\_B

## Preliminary Report on the Incident of multiple tripping occurred at 5X200MW, TPS, Obra

On 06.12.2021 at 18:31:32Hrs. 400kV elements tripped along with 200MW Units at BTPS, Obra.

### Element Status: 400kV Substation.

400kV Bus-I	:	Trip Time	Restoration Time	Protection Operated	Remark
200MW Unit-13	:	18:31:32	---	Bus Bar Diff Bus-I Trip, 96 Operated	Voltage build up is under progress for synchronization of Unit-13 after R&M.
<b>400kV Bus-II</b>	:				
200MW Unit-10	:	18:31:32	Lit up	96 Operated	
200MW Unit-11	:	18:31:32	Lit up	96 Operated	
200MW Unit-12	:	18:31:32	Lit up	96 Operated	
315MVA, 400/220kV ICT-II	:	18:31:32	19:39:27	96 Operated	
240MVA, 400/220kV ICT-III	:	18:31:32	20:06:57	96 Operated	
400kV Rewa Road line.	:	18:31:32	19:49:29	96 Operated	
400kV Sultanpur line.	:	18:31:32	20:27:28	96 Operated	
400kV Anpara line.	:	18:31:32	19:36:01	96 Operated	
400kV Obra C	:	18:31:32	20:57:57	96 Operated	
<b>400kV Bus Coupler (In Service)</b>	:	18:31:32	20:08:41	<b>LBB Trip</b> 96 Operated	Breaker one pole not tripped timely, LBB protection Operated. Resulted tripping of both Bus-I & II.

Generation Loss: 490MW

**Incidence at 400kV Substation:** 200MW Unit-13 was under synchronization after R&M work. Voltage build up was under progress through DAVR, all of sudden at 18:13:31 Hrs when generator voltage was around 14.1kV, 400kV Breaker B Phase blasted and Bus Bar Differential Protection BUS-I Operated and 96 Relay of this bay operated which initiated the tripping of Bus Coupler Breaker and Unit-13 lockout relay (186A, 186AX, 286A, 286AX) along with tripping of generator field breaker. Generator-13 field breaker tripped at 18:31:31 but 400kV Bus Coupler breaker one pole not tripped timely and LBB protection of BC bay operated at 18:31:32 and extended the tripping of all the elements running on Bus-II.

## Details received from 400/220kV Obra\_B

**Incidence at 220kV Substation:** All the three 100MVA, 220/132kV ICT<sub>B</sub> installed at ATPS got tripped from for end and 220kV Robertsgunj, 220kV Shaupuri and 30MVA, 220/6.9kV ST-I & II were being fed by 220kV Mirzapur line only. As the information received from Mirzapur end line was getting overloaded and for the safety reason 200kV Obra-Mirzapur line was hand tripped from Mirzapur end at 19:03 Hrs which resulted Zero voltage at both the 220kV Bus-I & II. Both the 30MVA, 220/6.9kV ST-I & II also become dead which feeding the station supply to 5X200MW, BTPS, Obra.

**Remedial measure:** 400kV BHEL make SF<sub>6</sub> breaker was installed in 200MW Unit-13 and TBC bay was supplied in the year of 2008-09. Above breaker arc chamber, PIR, Hydraulic drive mechanism, electrical panel were got rusted during the period of 12 year of storage. Erection of breakers were carried out after overhauling of the same.

Apart from this 400kV BC breaker was also ABCB type of BBC make (1976) which is needed to be replaced on priority. Supply and Erection was included in the capital overhauling of 200MW Unit-9 budget.

# Observation

- Proper operation of bus bar protection and healthiness of circuit breaker at Obra\_B(UP) to be ensured.
- Have Bus coupler breaker replaced or not?
- DRs of tripped elements haven't been submitted yet.
- Remedial action taken report to be shared.

**INCIDENT OF OBRA BTPS ON DATED 06  
DECEMBER 2021**

**PRESENTED BY**

**EMD-I, BTPS, OBRA**



# ELEMENT STATUS JUST BEFORE TRIPPING OF 400 KV BTPS

- 400 KV BUS-I:- 200MW UNIT-13
- 400 KV BUS-II:- 200MW Unit-10, 200MW Unit-11, 200MW Unit-12, 315MVA 400/220kV ICT-II, 240MVA, 400/220kV ICTIII, 400kV Obra-Rewa Road line, 400kV Obra-Sultanpur line, 400kV Obra-Anpara line.

# HISTORY OF 400KV CIRCUIT BREAKERS

- UNIT-13 CB :- 400kV BHEL make SF6 breaker was installed in 200MW Unit-13 bay was supplied in the year of 2008-09. Above breaker arc chamber, PIR, Hydraulic drive mechanism, electrical, panel were got rusted during the period of 12 year of storage. Erection of breakers were carried out after overhauling of the same.
- 400KV BUS COUPLER :- This breaker is ABCB type of BBC make (1976).

## DETAIL OF INCIDENT

200MW Unit-13 was under Synchronization after R&M work. Voltage build up was under progress through DAVR, all of sudden at 18:13:31 Hrs when generator voltage was around 14.1kV, 400kV Breaker B Phase blasted and Bus Bar Differential Protection BUS-I Operated and 96 Relay of this bay operated which initiated the tripping of Bus Coupler Breaker and Unit-13 lockout relay (186A, 186AX, 286A, 286AX) along with tripping of generator field breaker. Generator-13 field breaker tripped at 18:31:31 but 400kV Bus Coupler breaker one pole not tripped timely and LBB protection of BC bay operated at 18:31:32 and extended the tripping of all the elements running on Bus-II

# REMEDIAL MEASURE FOR 400kV CIRCUIT BREAKER

- For Unit 13 CB:- 400kV BHEL make SF6 breaker which was installed in Unit-13 after damage incident, replace with New GE make SF6 Spring Operated CB and unit was ready for synchronization within 10 days.
- For 400 KV Bus-Coupler CB:- Process for replacement existing ABCB CB with New SF6 Spring Operated CB is under pipeline.

---

THANK YOU

# Multiple elements tripping at 400/220kV Sultanpur(UP)

05<sup>th</sup> Jan 2022, 02:58 hrs

# Tripped elements & Antecedent condition (As reported)

## **Antecedent Condition:**

- Weather Conditions Normal
- Grid Frequency (Hz) 49.99
- Total IR Import (MW) 5260
- Northern Region Demand (MW) 31121
- Load Loss: Nil

## **Tripped Elements:**

- 400KV Bus 1 at Sultanpur(UP)
- 400KV Bus 3 at Sultanpur(UP)
- 400KV Bus 2 at Sultanpur(UP)
- 400 KV Obra\_B-Sultanpur (UP) Ckt-1
- 400 KV Tanda(NT)-Sultanpur(UP) (UP) Ckt-1
- 400/220 kV 315 MVA ICT 3 at Sultanpur(UP)
- 400/220 kV 240 MVA ICT 2 at Sultanpur(UP)
- 400/220 kV 315 MVA ICT 1 at Sultanpur(UP)

# PMU Plot of frequency at Bassi(PG)

02:58hrs/05-Jan-22





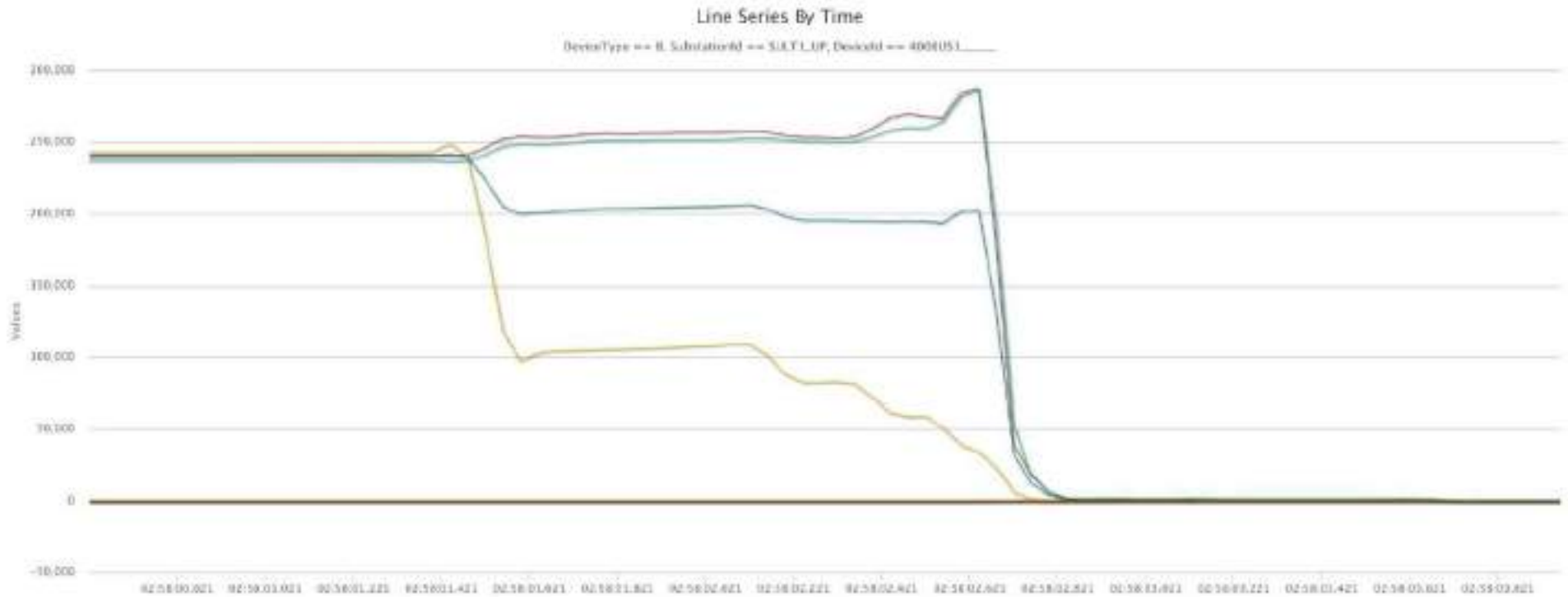
# PMU Plot of phase voltage magnitude at Lucknow(PG)

02:58hrs/05-Jan-22



# PMU Plot of phase voltage magnitude at Sultanpur Bus

02:58hrs/05-Jan-22



# SCADA SOE

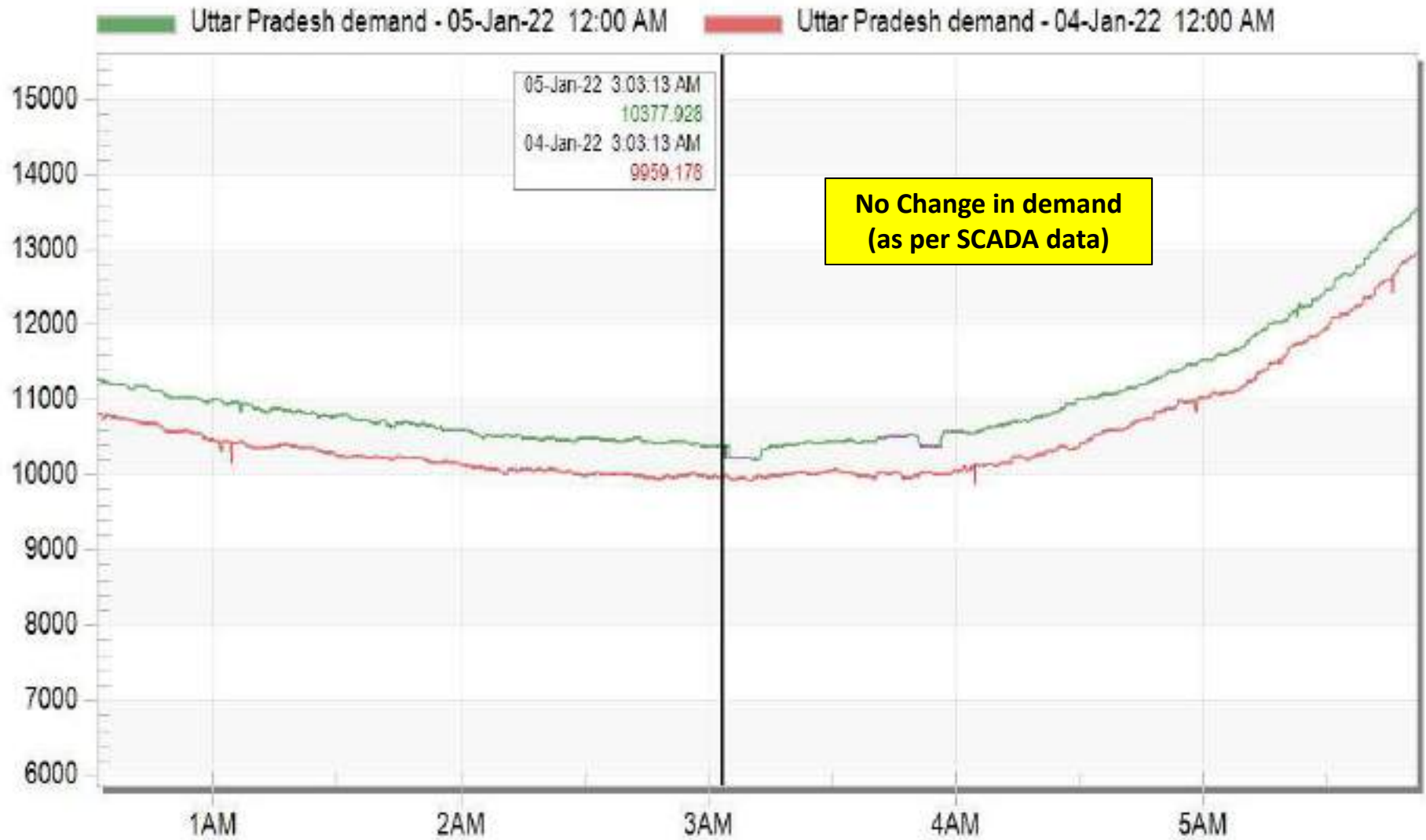
Time	Station Name	Voltage	Element Name	Element Type	Element Status	Remark
02:58:01,505	SULT1_UP	400kV	F_05(LKNOW)	Circuit Breaker	Close	CB of 400kV Sultanpur-Lucknow ckt closed
02:58:01,789	SULT1_UP	400kV	02TBC	Circuit Breaker	Open	
02:58:02,126	TNDA1_U	400kV	09BR	Circuit Breaker	Open	Main CB of 125MVAR Bus reactor at Tanda(UP) opened
02:58:02,133	TNDA1_U	400kV	08AZMBR	Circuit Breaker	Open	Tie CB of 125MVAR Bus reactor at Tanda(UP) opened
02:58:02,166	SULT1_UP	400kV	01TNDA1	Circuit Breaker	Open	Line CB of 400kV Sultanpur-Tanda ckt opened
02:58:02,182	TNDA1_U	400kV	05SLTFT	Circuit Breaker	Open	Tie CB of 400kV Tanda-Sultanpur ckt opened
02:58:02,183	TNDA1_U	400kV	04SULT1	Circuit Breaker	Open	Main CB of 400kV Tanda-Sultanpur ckt opened
02:58:02,379	SULT1_UP	400kV	F_04(T1)	Circuit Breaker	Open	CB at 400kV side of 400/220kV 315MVA ICT-1 opened
02:58:02,385	SULT1_UP	220kV	E_01(T1)	Circuit Breaker	Open	CB at 220kV side of 400/220kV 315MVA ICT-1 opened
02:58:02,385	SULT1_UP	400kV	09T3	Circuit Breaker	Open	CB at 400kV side of 400/220kV 315MVA ICT-3 opened
02:58:02,405	SULT1_UP	220kV	03T3	Circuit Breaker	Open	CB at 220kV side of 400/220kV 315MVA ICT-3 opened
02:58:02,579	OBRAB_UP	400kV	F_06(SULT1)	Circuit Breaker	Open	Line CB of 400kV Obra_B-Sultanpur ckt opened
02:58:02,662	SULT1_UP	220kV	E_02(T2)	Circuit Breaker	Open	CB at 400kV side of 400/220kV 315MVA ICT-2 opened
02:58:02,713	SULT1_UP	400kV	F_06(T2)	Circuit Breaker	Open	CB at 220kV side of 400/220kV 315MVA ICT-2 opened
02:58:03,691	SULT1_UP	400kV	F_05(LKNOW)	Circuit Breaker	Open	Line CB of 400kV Sultanpur-Lucknow ckt opened





# UP demand during tripping

## Uttar Pradesh Demand



No Change in demand  
(as per SCADA data)

## DR of 400 kV Obra(End)- Sultanpur

Number	Indication	Value	Date and time	Cause	State
00301	Power System fault	18 - ON	05.01.2022 02:58:01.557		
00302	Fault Event	18 - ON	05.01.2022 02:58:01.557		
03684	21 Pickup BG	ON	0 ms		
03702	21 Selected Loop BG forward	ON	0 ms		
02784	79: Auto recloser is not ready	ON	197 ms		
03805	21 TRIP command Phases ABC	ON	1000 ms		
03801	21 Distance General TRIP command	ON	1000 ms		
03818	21 TRIP 3phase in Z3	ON	1000 ms		
00536	Relay Definitive TRIP	ON	1000 ms		
00533	Primary fault current Ia	0.52 kA	1004 ms		
00534	Primary fault current Ib	1.43 kA	1004 ms		
00535	Primary fault current Ic	0.12 kA	1004 ms		
03671	21 PICKED UP	OFF	1045 ms		
03702	21 Selected Loop BG forward	OFF	1045 ms		
10255	59-1-Vphph Pickup	ON	1046 ms		
10259	59-Vphph Pickup C-A	ON	1046 ms		
01124	Fault Locator Loop BG	ON	1017 ms		
01117	Fit Locator: secondary RESISTANCE	2.92 Ohm	1017 ms		
01118	Fit Locator: secondary REACTANCE	28.24 Ohm	1017 ms		
01114	Fit Locator: primary RESISTANCE	10.62 Ohm	1017 ms		
01115	Fit Locator: primary REACTANCE	102.68 Ohm	1017 ms		
01119	Fit Locator: Distance to fault	310.3 km	1017 ms		
01120	Fit Locator: Distance [%] to fault	129.3 %	1017 ms		

1. Zone-3 tripping from obra end. Timer is 1000ms.
2. Fault current is 1.43 KA.

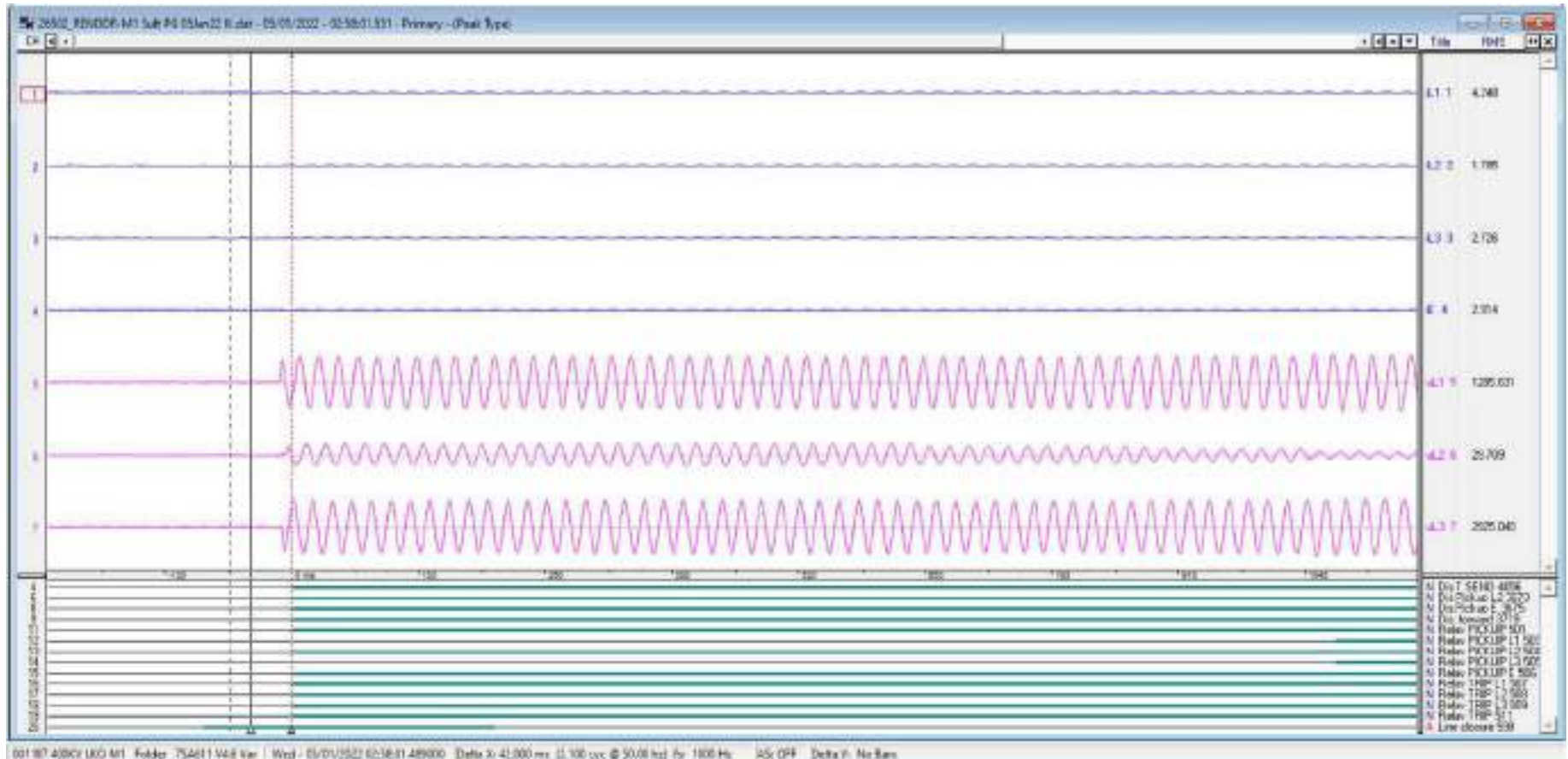
# Details of 400 kV Obra – Sultanpur (End)

Serial Number	Tripping Date/Time	Closing Date/Time	Name of Sub-Stations	C.B. Number/ Direction	Type of Protection Scheme	Flags observed				Analysis
						This end		Other end		
						Relay Flags	F.L. Reading	Relay Flags	F.L. Reading	
1	2	3	4	5	6	7	8	9	10	11
3-	05.01.2022 02:58hrs (Hand tripped)	07.01.2022 15:09hrs	400 KV S/S, Sultanpur	92/ 400KV PGCIL Lucknow Line	Main-I Siprotec: 7SA611 Main-II Micom P442	<p><u>Main-I (Siprotec)</u> E/F pickup, Gen. trip, SOTF, Carrier Send/Receive, SOF O/C pickup L2 ON 0ms, SOF O/C trip L123 ON 0ms, Definitive trip ON 0ms, Distance pickup L2E ON 0ms, Distance loop L2E f ON 0ms, Distance trip 3P ON 0ms, Dist. T Send ON 1ms, IL1=0.21kA, IL2=2.61kA, ILJ=0.16kA Jms, Line Closure OFF 208ms, Ughph&gt; pickup ON 1071ms Ughph-&gt;) FU L31 ON 1071ms SOTF O/C pickup OFF 1076ms Distance pickup OFF 1187ms Distance loop L2E f OFF 1187ms Ughph&gt; pickup OFF 1187ms Ughph-&gt;) FU L31 OFF 1187ms Relay trip OFF 1192ms Distance =33.7Km, D(%) 20.6% 1076ms</p> <p><u>Main-II (Micom)</u> Started phase ABCN, Tripped phase ABC, start element distance, Over-voltage Start V&gt;1 SOTF TOR Trip, Fault Duration 1.185sec, Relay trip time 1.176sec, I<sub>a</sub>=155.2A, I<sub>b</sub>=5.561kA, I<sub>c</sub>=148.4A, VAN=250.9KV, VBN=102.8KV, VCN=252.2kV, Fault in Zone None</p>		Nil		At 400kV s/s Sultanpur 400KV Sultanpur – PGCIL Lucknow line Distance Protection Relays tripped on SOTF fault when line was charged from Sultanpur end. But, due to defective BO contact of Main-I and Main-II relays used for SOTF, trip command was not issued to 86 trip relay, leading to non auto tripping of C.B. 92 and non initiation of LBB relay All the elements feeding to this line tripped on respective faults. Spare BO Contacts in the DP Relays have been configured and connected for tripping, in consultation with relay service engineer to ensure proper operation of the relays.
PLCC	Reading									
	TX-1 RX-1	TX-2 RX-2	TX-3 RX-3							
Before Fault	90 46	70 11	54 15							
After Fault	90 46	70 11	56 15		} M-1					
Before Fault	73 220	107 41	34 5							
After Fault	73 228	107 41	36 5		} M-2					

1. Tripped on SOTF.
2. Fault current is 1.43 KA.



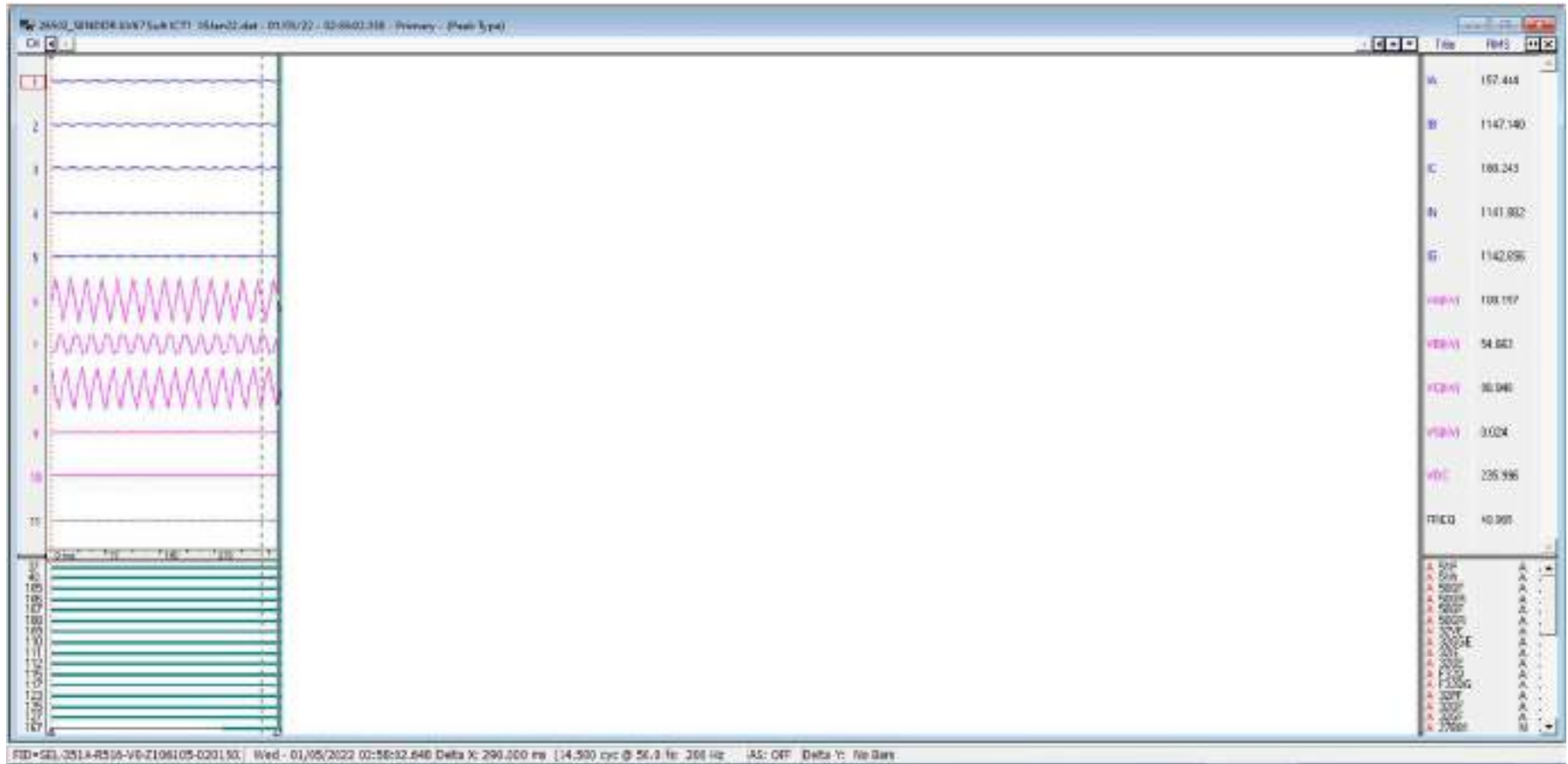
# DR of 400 kV LKW – Sultanpur (End)



1. Tripped on Z-1
2. Fault current is 3.1 KA.
3. Relay time sync faulty.



# DR of 400/220 Kv ICT-1



1. 51N Tripped.
2. Fault current 1142 amp in B-Phase.

# Observations

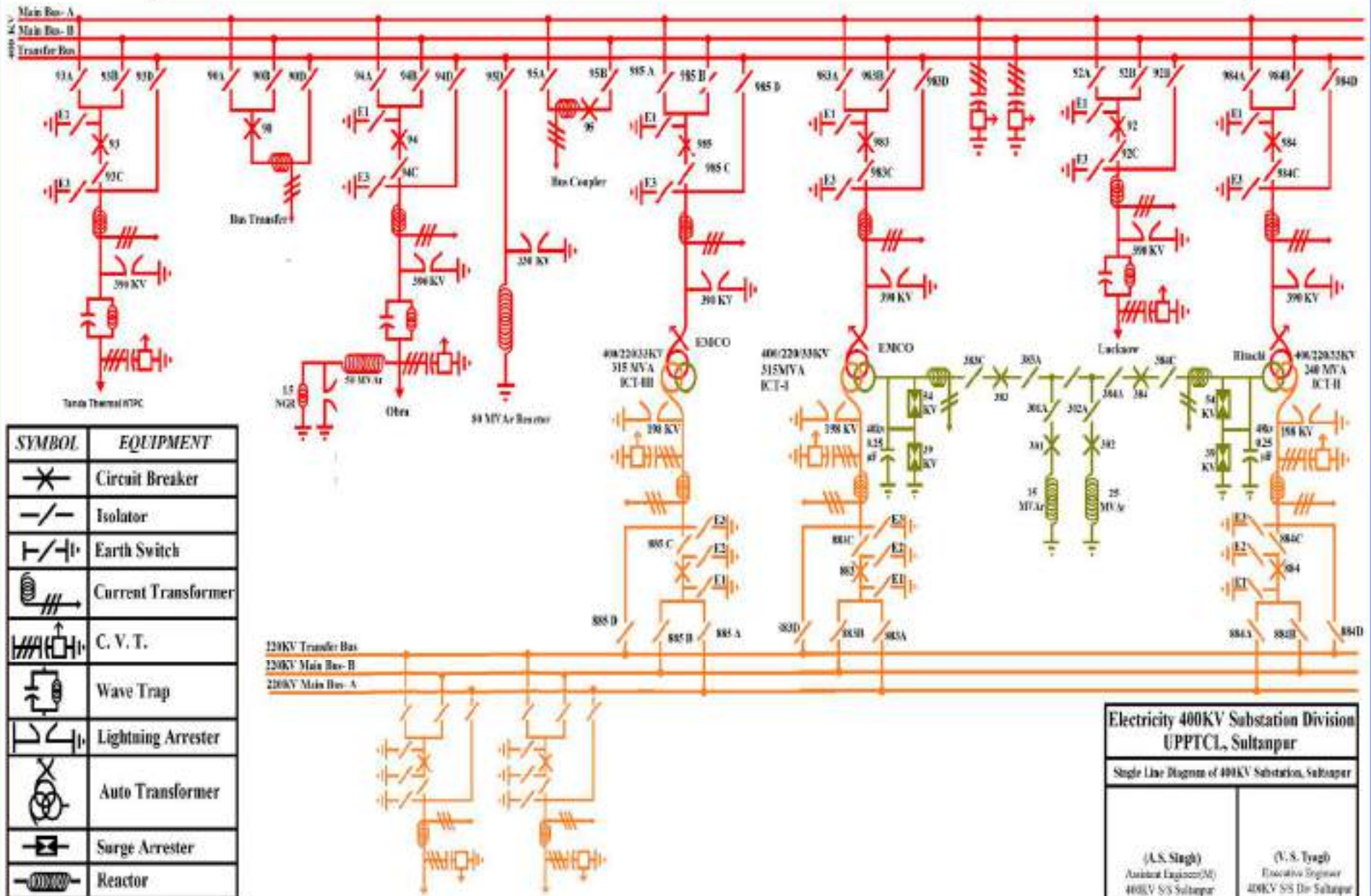
1. As per DR 400kV Sultanupr-Lucknow line tripped on SOTF operation then why did fault persist later also?
2. Why delayed fault clearance is there?
3. Did busbar protection trip at Sultanpur?

# UPPTCL- Transmission Central

400 kV s/s Sultanpur

Tripping on 05.01.2022 (02:58hrs)

# SINGLE LINE DIAGRAM OF 400KV SUBSTATION, SULTANPUR



# BRIEF SUMMARY

As per information received from concerned of 400kV Sultanpur incidents may be summarised as follows:-

1. At 01:34Hrs on dated 05.01.2022, fault occurred on 400kV Sultanpur-Lucknow(PG) line and line tripped on Y Phase, Zone 1,Dist:32.5 Km,F/C:5.6 kA.
2. At 02:58Hrs on dated 05.01.2022, try of 400kV Sultanpur-Lucknow (PG) line was taken to charge, but line did not hold and tripped on SOTF.
3. At the same time, ICTs tripped from 220kV side on E/F, 400kV Sultanpur-Obra line tripped only from Obra end and 400kV Sultanpur-Tanda (NTPC) line tripped from both ends..

# NAME AND TIME OF THE TRIPPED ELEMENT ALONG WITH RESTORATION TIME AND FLAG

NAME OF ELEMENT	TRIPPING DATE	TRIPPING TIME (upto millisecond resolution)	RESTORATION DATE	RESTORATION TIME	FLAGS END 1 (INCLUDING A/R)
400kV Lucknow(PG)-Sultanpur line	05.01.2022	2:58:01.531	07.01.22	15:09	Y Phase, Zone 1, Dist:32.5 Km, F/C:5.6 kA, SOTF
400kV Sultanpur-Tanda (NTPC) line	05.01.2022	2:58:0.1	05.01.22	4:40	DT received
400kV Obra B-Sultanpur line	05.01.2022	2:58	05.01.22	5:22	Z-3, Dist.-310km. from Obra end, F/C:1.43kA
315 MVA ICT I at 400kV Sultanpur	05.01.2022	2:58	05.01.22	4:50	Tripped from 220kV side on E/F
240MVA ICT-II at 400kV Sultanpur	05.01.2022	2:58	05.01.22	4:51	-do-
315 MVA ICT III at 400kV Sultanpur	05.01.2022	2:58	05.01.22	4:58	-do-



# Multiple Tripping Report at 400KV Substation Sultanpur

## Date:05.01.2022 time 02:58Hrs

### **Multiple Tripping Report at 400KV Substation Sultanpur Date:05.01.2022 time 02:58Hrs**

At 01:35Hrs 400KV Sultanpur- Lucknow PGCIL line tripped at following flags

C/P Distance protection main I trip, auto reclose , auto reclose lockout, inter trip signal received

R/P 86B, High speed trip relay

Main I –(Siemens)

Y phase pick up, E/F trip, Z1 trip, Gen trip, carrier send/received, IL2 - 5.6kA, dist 32.5km, d% 19.9

Main II (Alstom)

R,Y,B phase trip, 1 trip, carrier send, distance protection operated

Code for the charging of the line was received (D/1067, L/154, AL/69) above line tried at 02:58hrs but did not hold and tripped along with following elements

-315MVA ICT 1 (tripped both sides)(400kv &220KV side)

-240MVA ICT 2 (tripped both side)

- 315MVA ICT 3(tripped both side)

-400KV Sultanpur- Obra line tripped at Obra end only

-400KV SultanpurTanda thermal line tripped at both ends

Flags for the above tripped elements

### **400KV SultanpurLucknow PGCIL line**

Main I-

R,Y, B phase pickup, E/F pickup, Gen trip, Z1 trip, Z 2 trip, Z 3 trip, carrier send/received, SOTF dist 33.7km, D%-20.6%,IL1 0.21kA, IL2 2.61kA, IL3 0.16kA

Main II

R, Y,B trip, Z1 trip carrier send, distance optd

### **400KV SultanpurTanda Thermal line**

•No flag at sultanpur end

Flag at other end- master trip operated, Back up E/F, Y phase

### **400KV SultanpurObra line**

•No flag at our end

Flag at Obra end- Distance protection , Z 3 operated, 86A, 86B, dist 310km

# Multiple Tripping Report at 400KV Substation Sultanpur

## Date:05.01.2022 time 02:58Hrs

- 
- **315MVA ICT 1**
- Back up O/C, E/F trip, Gr A protection operated
- RP- LV 67, 186HV , 186LV
- **240MVA ICT 2**
- LV side directional E/F relay, 67N/51N , 86
- **315MVA ICT 3**
- Back up O/C, E/F trip, Gr A protection operated
- RP- LV 67, 186HV , 186LV
- 
- **Bus Position of 400KV lines and ICTs at 400KV Substation Sultanpur before02:58Hrs dated 05.01.2022**
- 315MVA ICT 1 400KV B-Bus
- 240MVA ICT 2 400KV A-Bus
- 315MVA ICT 3 400KV A-Bus
- 400KV Sultanpur-Tanda thermal line 400KV A-Bus
- 400KV Sultanpur-Lucknow PGCIL line 400KV A-Bus
- 400KV Sultanpur-Obra-Anpara line 400KV B-Bus
- 80MVAR Bus Reactor 400KV B-Bus
- 
- **After normalization**
- 315MVA ICT 1 400KV B-Bus
- 240MVA ICT 2 400KV A-Bus
- 315MVA ICT 3 400KV A-Bus
- 400KV Sultanpur-Tanda thermal line 400KV A-Bus
- 400KV Sultanpur-Lucknow PGCIL line 400KV A-Bus
- 400KV Sultanpur-Obra-Anpara line 400KV B-Bus
- 80MVAR Bus Reactor 400KV B-Bus

## Load at 400KV S/S, Sultanpur at 02:00hrs on 05.01.2022

Load at 02:00Hrs. on dated 05.01.2022	
Name	MW
400KV Sultanpur-Obra-Anpara line	287 I
400KV Sultanpur-Tanda thermal line	54 E
400KV Sultanpur-Lucknow PGCIL line	Tripped ( Load at 01:00-48E)
315MVA ICT 1	86 E
240MVA ICT 2	61 E
315MVA ICT 3	86 E

**Bus Position and load at 400KV S/S, Sultanpur at 02:58hrs on  
05.01.2022 as per Flash report**

<b>Name of Equipments</b>	<b>Bus Position on 400KV Side</b>	<b>Load (Imp/Exp) in MW</b>
315 MVA ICT-I	B Bus	84 MW (Exp)
240 MVA ICT-II	A Bus	60 MW (Exp)
315 MVA ICT-III	A Bus	83 MW(Exp)
400KV Sultanpur-Lucknow (PG) line	A Bus	0 MW
400KV Sultanpur- NTPC Tanda line	A Bus	48 MW (Exp)
400KV Sultanpur- Obra line	B Bus	275 MW (Imp)

## SCADA SOE

Time	Station Name	Voltage	Element Name	Element Type	Element Status	Remark
02:58:01,505	SULT1_UP	400kV	F_05(LKNOW)	Circuit Breaker	Close	CB of 400kV Sultanpur-Lucknow ckt closed
02:58:01,789	SULT1_UP	400kV	02TBC	Circuit Breaker	Open	
02:58:02,126	TNDA1_U	400kV	09BR	Circuit Breaker	Open	Main CB of 125MVAR Bus reactor at Tanda(UP) opened
02:58:02,133	TNDA1_U	400kV	08AZMBR	Circuit Breaker	Open	Tie CB of 125MVAR Bus reactor at Tanda(UP) opened
02:58:02,166	SULT1_UP	400kV	01TNDA1	Circuit Breaker	Open	Line CB of 400kV Sultanpur-Tanda ckt opened
02:58:02,182	TNDA1_U	400kV	05SLTFT	Circuit Breaker	Open	Tie CB of 400kV Tanda-Sultanpur ckt opened
02:58:02,183	TNDA1_U	400kV	04SULT1	Circuit Breaker	Open	Main CB of 400kV Tanda-Sultanpur ckt opened
02:58:02,379	SULT1_UP	400kV	F_04(T1)	Circuit Breaker	Open	CB at 400kV side of 400/220kV 315MVA ICT-1 opened
02:58:02,385	SULT1_UP	220kV	E_01(T1)	Circuit Breaker	Open	CB at 220kV side of 400/220kV 315MVA ICT-1 opened
02:58:02,385	SULT1_UP	400kV	09T3	Circuit Breaker	Open	CB at 400kV side of 400/220kV 315MVA ICT-3 opened
02:58:02,405	SULT1_UP	220kV	03T3	Circuit Breaker	Open	CB at 220kV side of 400/220kV 315MVA ICT-3 opened
02:58:02,579	OBRAB_UP	400kV	F_06(SULT1)	Circuit Breaker	Open	Line CB of 400kV Obra_B-Sultanpur ckt opened
02:58:02,662	SULT1_UP	220kV	E_02(T2)	Circuit Breaker	Open	CB at 400kV side of 400/220kV 315MVA ICT-2 opened
02:58:02,713	SULT1_UP	400kV	F_06(T2)	Circuit Breaker	Open	CB at 220kV side of 400/220kV 315MVA ICT-2 opened
02:58:03,691	SULT1_UP	400kV	F_05(LKNOW)	Circuit Breaker	Open	Line CB of 400kV Sultanpur-Lucknow ckt opened

**U.P. POWER TRANSMISSION CORPORATION LIMITED**  
**ELECTRICITY TEST & COMMISSIONING DIVISION, SULTANPUR**  
**FAULT ANALYSIS STATEMENT OF PROTECTION GEARS FOR THE MONTH OF January 2022**  
**400 KV TRIPPINGS**

Serial Number	Tripping Date/Time	Closing Date/Time	Name of Sub-Stations	C.B. Number/ Direction	Type of Protection Scheme	Flags observed				Analysis	
						This end		Other end			
						Relay Flags	F.L. Reading	Relay Flags	F.L. Reading		
1	2	3	4	5	6	7	8	9	10	11	
1-	05.01.2022 01.34.54hrs	A/R	400 KV S/S, Sultanpur	92/ 400KV PGCIL Lucknow Line	Man-I Siprotec 7SA611 Main-II Micom P442	<p><b>Main-I (Siprotec)</b>                      Y-φ pickup, E/F pickup, Gen. trip, Z1 Trip, 86B, Auto Reclose Oprd, Carrier Send/Receive, Distance trip IPL2 ON 1ms, Definite trip ON 1ms, Dist. T Send ON 1ms, IL2=4.93kA 1ms, 1Pole Open L2 ON 32ms, Dist. Tol Rec. CH1 ON 41ms, Distance pickup OFF 58ms, Distance loop L2E/ OFF 58ms, Relay trip OFF 98ms, Distance =32.9Km, D(%) 20.1% 41ms</p> <p><b>Main-II (Micom)</b>                      BN, Tripped phase B, start element distance, Distance trip Z1, Fault Duration 33.37ms, Relay trip time 79.98msec, Fault Location 33.37km, I<sub>A</sub>=174.1A, I<sub>B</sub>=5.105kA, I<sub>C</sub>=276.8A, VAN=249.3KV, VBN=102.1KV, VCN=250.5KV, Fault Resistance 0.6472Ω, Fault in Zone-1</p>		<p><b>Main-I</b>                      Relay Gen. trip, Y-φ pickup, Z1 trip, I<sub>φ</sub>=3.8kA, Dist 12.5Km.</p> <p><b>Main-II</b>                      I<sub>φ</sub>=3.5kA</p> <p>.....</p>		400KV Sultanpur – PGCIL Lucknow Transmission line C.B. tripped on transient Yphase to Earth line fault and auto reclosed successfully from both ends. It tripped from both ends again due to Y phase to earth line fault repetition within reclaim time.	
2.	05.01.2022 01.34.56hrs	05.01.2022 02.58hrs	400 KV S/S, Sultanpur	92/ 400KV PGCIL Lucknow Line	Man-I Siprotec 7SA611 Main-II Micom P442	<p><b>Main-I (Siprotec)</b>                      Distance pickup L2E ON 0ms, A/R L/O, Distance trip IPL2 ON 0ms, Definite trip ON 0ms, Dist. T Send ON 0ms, IL2=5.60kA 4ms, 1Pole Open L2 ON 34ms, Distance pickup OFF 76ms, Distance loop L2E/ OFF 76ms, Relay trip OFF 101ms, Distance =32.5Km, D(%) 19.9% 41ms</p> <p><b>Main-II (Micom)</b>                      Started phase ABCN, Tripped phase ABC, start element distance, Overvoltage Start V&gt;1, SOTF TOR Trip, Fault Duration 9.997ms, Relay trip time 79.98msec, Fault Location 32.97Km, I<sub>A</sub>=152.1A, I<sub>B</sub>=5.377kA, I<sub>C</sub>=149.6A, VAN=250.2KV, VBN=101.8KV, VCN=250.3KV, Fault Resistance 1.239Ω, Fault in Zone-1</p>		<p>400KV LKO</p> <p>400KV SULT</p>			
PLCC	Reading										
	TX-1 RX-1	TX-2 RX-2	TX-3 RX-3								
Before Fault	87 45	67 11	54 15	} M-1							
After Fault	96 46	70 11	54 15								
Before Fault	70 226	104 41	54 5	} M-2							
After Fault	73 226	107 41	54 5								

*Signature*  
**Executive Engineer (T&C)**

**U.P. POWER TRANSMISSION CORPORATION LIMITED**  
**ELECTRICITY TEST & COMMISSIONING DIVISION, SULTANPUR**  
**FAULT ANALYSIS STATEMENT OF PROTECTION GEARS FOR THE MONTH OF January 2022**  
**400 KV TRIPPINGS**

Serial Number	Tripping Date/Time	Closing Date/Time	Name of Sub-Stations	C.B. Number/ Direction	Type of Protection Scheme	Flags observed				Analysis	
						This end		Other end			
						Relay Flags	F.L. Reading	Relay Flags	F.L. Reading		
1	2	3	4	5	6	7	8	9	10	11	
3-	05.01.2022 02:58hrs (Hand tripped)	07.01.2022 15:09hrs	400 KV S/S, Sultanpur	92/ 400KV PGCIL Lucknow Line	Main-I Sigrotec TSA611 Main-II Micom P442	<u>Main-I (Sigrotec)</u> E/F pickup, Gen. trip, SOTF, Carrier Send/Receive, SOTF O/C pickup L2 ON 0ms, SOTF O/C trip L123 ON 0ms, Definitive trip ON 0ms, Distance pickup L2E ON 0ms, Distance loop L2E f ON 0ms, Distance trip 3P ON 0ms, Dist T 5ead ON 1ms, IL1=0.21kA, IL2=2.61kA, IL3=0.16kA 3ms, Line Closure OFF 208ms, Uphpb> pickup ON 1071ms Uphpb>(-) PU L31 ON 1071ms SOTF O/C pickup OFF 1076ms Distance pickup OFF 1187ms Distance loop L2EF OFF 1187ms Uphpb> pickup OFF 1187ms Uphpb>(-) PU L31 OFF 1187ms Relay trip OFF 1192ms Distance =33.7Km, D(%) 20.6% 1076ms  <u>Main-II (Micom)</u> Started phase ABCN, Tripped phase ABC, start element distance, Overvoltage Start V>I SOTF TOR Trip, Fault Duration 1.185sec, Relay trip time 1.176sec, I <sub>a</sub> =155.2A, I <sub>b</sub> =5.561kA, I <sub>c</sub> =148.4A, VAN=250.9KV, VBN=102.8KV, VCN=252.2KV, Fault in Zone None		Nil		At 400KV s/s Sultanpur 400KV Sultanpur - PGCIL Lucknow line Distance Protection Relays tripped on SOTF fault when line was charged from Sultanpur end. But, due to defective BO contact of Main-I and Main-II relays used for SOTF, trip command was not issued to 86 trip relay, leading to non auto tripping of C.B. 92 and non initiation of LBB relay All the elements feeding to this line tripped on respective faults. Spare BO Contacts in the DF Relays have been configured and connected for tripping, in consultation with relay service engineer to ensure proper operation of the relays.	
PLCC	Reading										
	TX-1 RX-1	TX-2 RX-2	TX-3 RX-3								
Before Fault	90 46	70 11	54 15								
After Fault	90 46	70 11	56 15		} M-1						
Before Fault	73 226	107 41	54 1								
After Fault	73 226	107 41	56 1		} M-2						

*[Signature]*  
 Executive Engineer (T&C)

**U.P. POWER TRANSMISSION CORPORATION LIMITED**  
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**FAULT ANALYSIS STATEMENT OF PROTECTION GEARS FOR THE MONTH OF January 2022**  
**400 KV TRIPPINGS**

Serial Number	Tripping Date/Time	Closing Date/Time	Name of Sub-Stations	C.B. Number/ Direction	Type of Protection Scheme	Flags observed				Analysis	
						This end		Other end			
						Relay Flags	F.L. Reading	Relay Flags	F.L. Reading		
1	2	3	4	5	6	7	8	9	10	11	
4	(05.01.2022 02:51 hrs) (Only from Obra end)	(05.01.2022 05:22 hrs)	400 KV S/S, Sultanpur	94/ 400KV Obra Line	Main-I Siprotec 7SA52 Main-II Siprotec 7SA52	Nil		Main-I Z3 trip, $I_0=1.43kA$ , Dist. 300Km, 86A, 86B Main-II $I_0=1.6kA$ , Dist. 310Km, 86A, 86B		400KV Sultanpur – Obra Transmission line tripped from Obra end on Zone-3 protection due to fault on 400KV Sultanpur- PGCIL Lucknow Line.	
	05.01.2022 02:50hrs	05.01.2022 04:40hrs	400 KV S/S, Sultanpur	93/ 400KV NTPC Tanda Line	Main-I Micom P442 Main-II Siprotec 7SA52	Nil		Backup Earth Fault Protection $I_A=254.1A$ $I_B=2.01211A$ $I_C=325A$ $V_A=240.68kV$ $V_B=196.35kV$ $V_C=242.86kV$		400KV Sultanpur – NTPC Tanda Transmission line tripped from NTPC end on Backup Earth fault protection and from Sultanpur end on DT Command received from NTPC end due to fault on 400KV Sultanpur- PGCIL Lucknow line.	
	PLCC Reading	OBRA		NTPC TANDA							
	TX-A RX-A	TX-B RX-B		TX-A RX-A	TX-B RX-B						
Before Fault	96 08	46 41	} M-1	21 34	41 25	} M-1					
After Fault	96 08	46 41		21 34	46 31			46 31			
Before Fault	90 42	45 43	} M-2	56 34	41 02	} M-2					
After Fault	90 42	45 43		67 34	46 02			46 02			

*[Signature]*  
**Executive Engineer (T&C)**



**U.P. POWER TRANSMISSION CORPORATION LIMITED**  
**ELECTRICITY TEST & COMMISSIONING DIVISION, SULTANPUR**  
**FAULT ANALYSIS STATEMENT OF PROTECTION GEARS FOR THE MONTH OF January 2022**  
**400 KV TRIPPINGS**

Serial Number	Tripping Date/Time	Closing Date/Time	Name of Sub-Stations	C.B. Number/ Direction	Type of Protection Scheme	Flags observed				Analysis
						This end		Other end		
						Relay Flags	F.L. Reading	Relay Flags	F.L. Reading	
1	2	3	4	5	6	7	8	9	10	11
5-	05.01.2022 02.58hrs	05.01.2022 04.50hrs	400 KV S/S, Sultanpur	983/883 315MVA ICT-I	SEL 787D, 351A, 751A	CP: -Backup O/C E/F Trip, Gr. A protection operated  RP:- LV 67 Relay: Event: BG T, I <sub>A</sub> =222A, I <sub>B</sub> =1625A, I <sub>C</sub> =255A, I <sub>F</sub> = 1617A, Freq= 49.94 Hz, SHOT: TARGETS: 51, 186HV, 186LV				315MVA ICT-I tripped on LV side Backup Earth fault protection due to fault on 400KV Sultanpur-PGCIL Lucknow Line.
6-	05.01.2022 02.58hrs	05.01.2022 04.51hrs	400 KV S/S, Sultanpur	984/884 240MVA ICT-II	English Electric CDD	CP: Protection Trip RP: LV Side Directional E/F Relay: 67N51N, 86ITC,86ITD				240MVA ICT-II tripped on LV side Backup Earth fault protection due to fault on 400KV Sultanpur-PGCIL Lucknow Line.
7-	05.01.2022 02.58hrs	05.01.2022 04.58hrs	400 KV S/S, Sultanpur	985/885 315MVA ICT-III	SEL 787D, 351A, 751A	CP: -Backup O/C E/F Trip, Gr. A protection operated  RP:- LV 67 Relay: Event: BG T, I <sub>A</sub> =222A, I <sub>B</sub> =1625A, I <sub>C</sub> =255A, I <sub>F</sub> = 1617A, Freq= 49.94 Hz, SHOT: TARGETS: 51, 186HV, 186LV				315MVA ICT-III tripped on LV side Backup Earth fault protection due to fault on 400KV Sultanpur-PGCIL Lucknow Line.

  
**Executive Engineer (T&C)**

# Main1 DPR of 400kV Sult-Lko(PGCIL) Line at Sult end

**SIEMENS**

7SA611 V4.6 Var\_prn\_11\_52\_16  
 Indications

**SIMATIC** Trip Log - 001185 / 05-01-22  
 1:34:54.779 AM - 400KV LKO M1 / 05.01.22 11:52:21

**1 Indications**

**1.1 Trip Log - 001185 / 05-01-22 1:34:54.779 AM - 400KV LKO M1 / Folder / 7SA611 V4.6 Var/7SA611 V04.65.01**

Trip Log - 001185 / 05-01-22 1:34:54.779 AM - 400KV LKO M1 / Folder / 7SA611 V4.6 Var/7SA611 V04.65.01

Number	Indication	Value	Date and time	Cause	State
00301	Power System fault	1185 - ON	05.01.2022 01:34:54.779		
00302	Fault Event	1185 - ON	05.01.2022 01:34:54.779		
03684	Distance Pickup L2E	ON	1 ms		
03702	Distance Loop L2E selected forward	ON	1 ms		
03803	Distance TRIP command - Only Phase L2	ON	1 ms		
00536	Relay Definitive TRIP	ON	1 ms		
04056	Dis. Telep. Carrier SEND signal	ON	1 ms		
00534	Primary fault current IL2	4.93 kA	2 ms		
00592	Single pole open detected in L2	ON	32 ms		
04006	>Dis.Telep. Carrier RECEPTION Channel 1	ON	41 ms		
03671	Distance PICKED UP	OFF	58 ms		
03702	Distance Loop L2E selected forward	OFF	58 ms		
00511	Relay GENERAL TRIP command	OFF	98 ms		
01124	Fault Locator Loop L2E	ON	41 ms		
01117	Fit Locator: secondary RESISTANCE	0.31 Ohm	41 ms		
01118	Fit Locator: secondary REACTANCE	2.99 Ohm	41 ms		
01114	Fit Locator: primary RESISTANCE	1.12 Ohm	41 ms		
01115	Fit Locator: primary REACTANCE	10.87 Ohm	41 ms		
01119	Fit Locator: Distance to fault	32.9 km	41 ms		
01120	Fit Locator: Distance [%] to fault	20.1 %	41 ms		

# Main1 DPR of 400kV Sult-Lko(PGCIL) Line at Sult end

**SIEMENS**

7SA611 V4.6 Var\_pn\_11\_53\_37  
 Indications

**SMATIC** Trip Log - 001186 / 05-01-22  
 1:34:56.198 AM - 400KV LKO M1 / 05.01.22 11:53:37

**1 Indications**

**1.1 Trip Log - 001186 / 05-01-22 1:34:56.198 AM - 400KV LKO M1 / Folder / 7SA611 V4.6 Var/7SA611 V04.65.01**

*Trip Log - 001186 / 05-01-22 1:34:56.198 AM - 400KV LKO M1 / Folder / 7SA611 V4.6 Var/7SA611 V04.65.01*

Number	Indication	Value	Date and time	Cause	State
00301	Power System fault	1186 - ON	05.01.2022 01:34:56.198		
00302	Fault Event	1186 - ON	05.01.2022 01:34:56.198		
03604	Distance Pickup L2E	ON	0 ms		
03702	Distance Loop L2E selected forward	ON	0 ms		
03803	Distance TRIP command - Only Phase L2	ON	0 ms		
00536	Relay Definitive TRIP	ON	0 ms		
04056	Dis. Telep. Carrier SEND signal	ON	0 ms		
00534	Primary fault current IL2	5.60 kA	4 ms		
00592	Single pole open detected in L2	ON	34 ms		
03671	Distance PICKED UP	OFF	76 ms		
03702	Distance Loop L2E selected forward	OFF	76 ms		
00511	Relay GENERAL TRIP command	OFF	101 ms		
01124	Fault Locator Loop L2E	ON	41 ms		
01117	Fit Locator: secondary RESISTANCE	0.26 Ohm	41 ms		
01118	Fit Locator: secondary REACTANCE	2.96 Ohm	41 ms		
01114	Fit Locator: primary RESISTANCE	0.95 Ohm	41 ms		
01115	Fit Locator: primary REACTANCE	10.76 Ohm	41 ms		
01119	Fit Locator: Distance to fault	32.5 km	41 ms		
01120	Fit Locator: Distance [%] to fault	19.9 %	41 ms		

# Main1 DPR of 400kV Sult-Lko(PGCIL) Line at Sult end

## SIEMENS

7SA611 V4.6 Var\_pri\_11\_54\_37

Indications

Trip Log - 001187 / 05-01-22

2:58:01.531 AM - 400KV LKO M1 /

05.01.22 11:54:37

SIMATIC

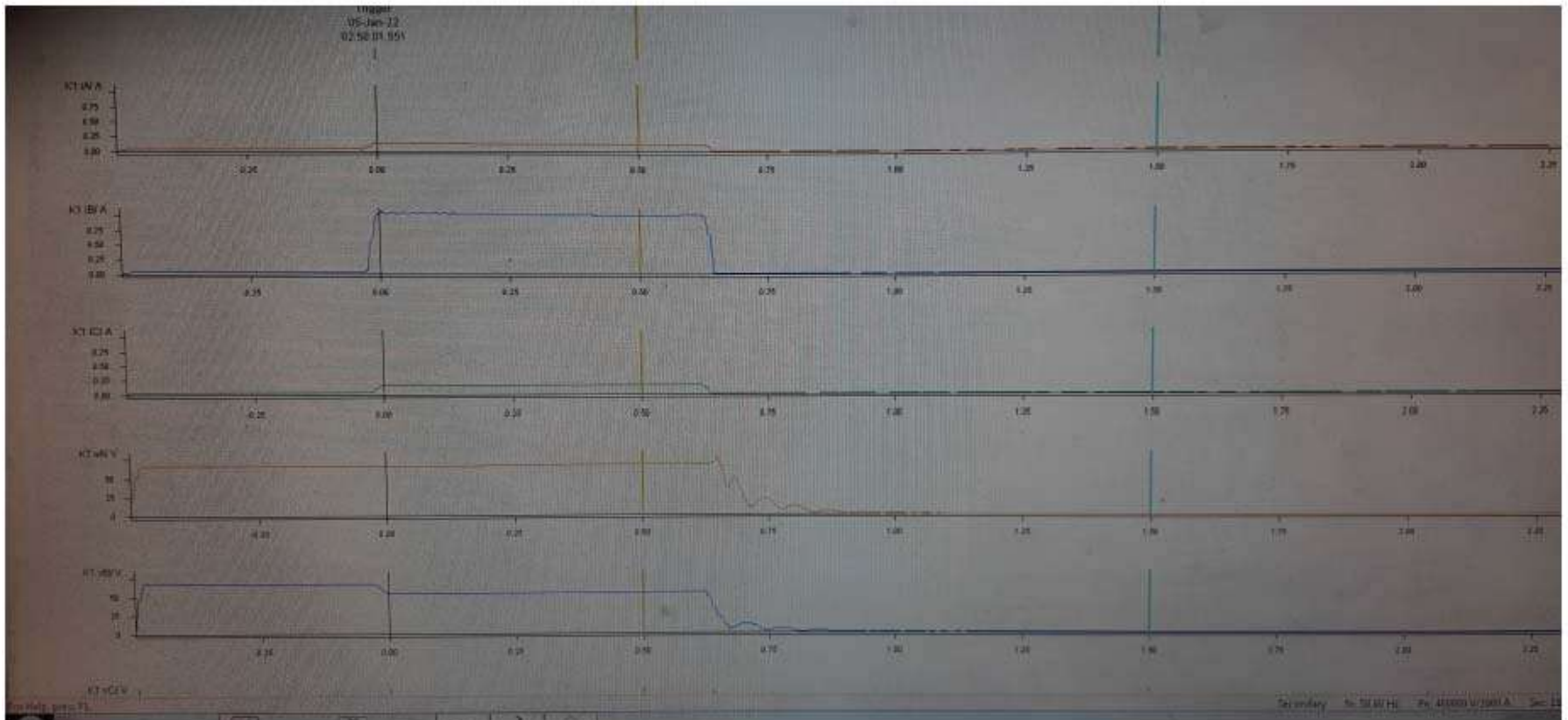
### 1 Indications

1.1 Trip Log - 001187 / 05-01-22 2:58:01.531 AM - 400KV LKO M1 / Folder / 7SA611 V4.6 Var/7SA611 V04.65.01

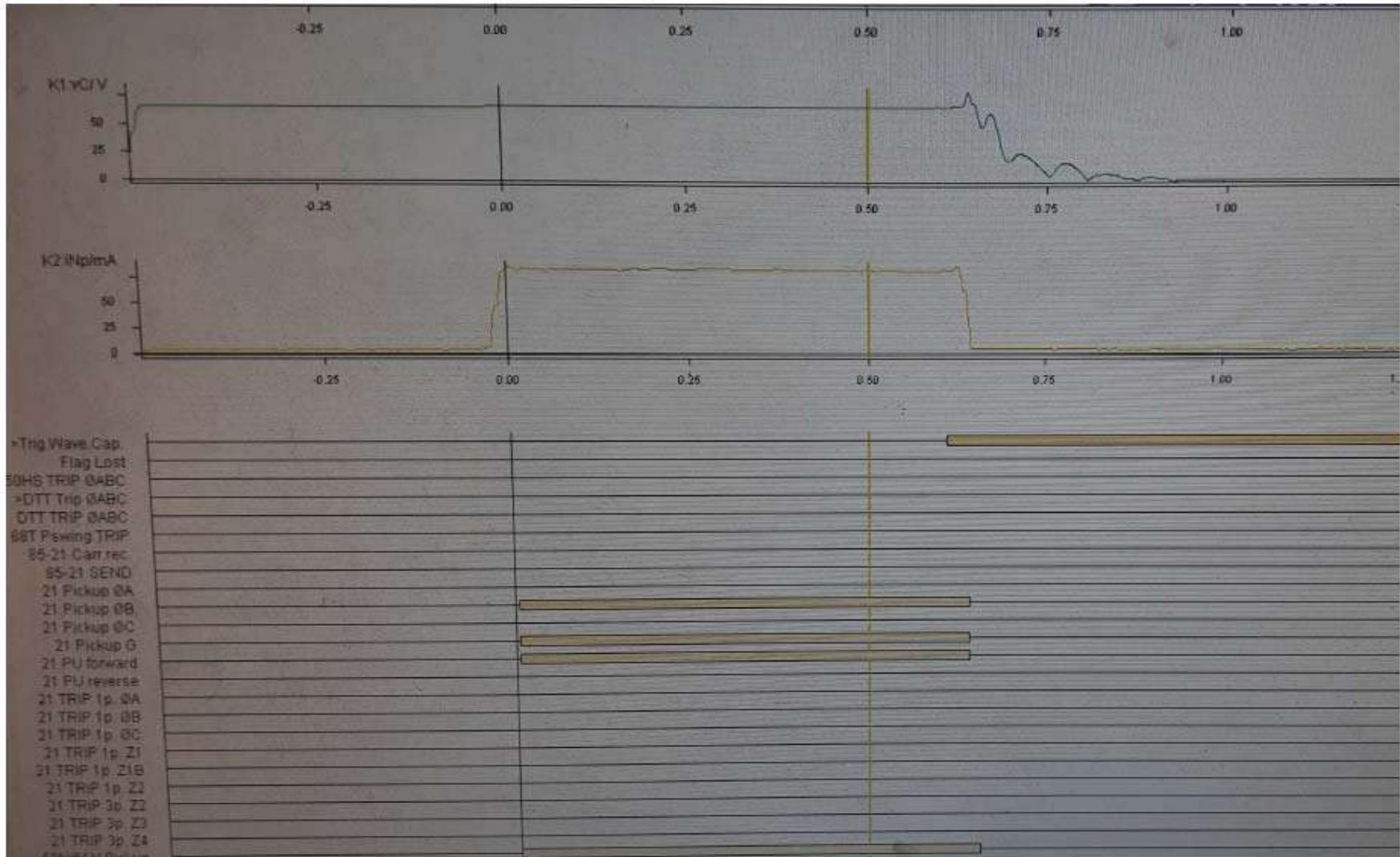
Trip Log - 001187 / 05-01-22 2:58:01.531 AM - 400KV LKO M1 / Folder / 7SA611 V4.6 Var/7SA611 V04.65.01

Number	Indication	Value	Date and time	Cause	State
00301	Power System fault	1187 - ON	05.01.2022 02:58:01.531		
00302	Fault Event	1187 - ON	05.01.2022 02:58:01.531		
04203	SOTF-O/C Pickup L2	ON	0 ms		
04295	SOTF-O/C TRIP command L123	ON	0 ms		
00636	Relay Definitive TRIP	ON	0 ms		
03684	Distance Pickup L2E	ON	0 ms		
03702	Distance Loop L2E selected forward	ON	0 ms		
03805	Distance TRIP command Phases L123	ON	0 ms		
04066	Dis. Telep. Carrier SEND signal	ON	1 ms		
00533	Primary fault current IL1	0.21 kA	3 ms		
00534	Primary fault current IL2	2.61 kA	3 ms		
00535	Primary fault current IL3	0.16 kA	3 ms		
00690	Line closure detected	OFF	208 ms		
10255	Uph-ph> Pickup	ON	1071 ms		
10269	Uph-ph(>) Pickup L3-L1	ON	1071 ms		
04281	SOTF-O/C PICKED UP	OFF	1076 ms		
03671	Distance PICKED UP	OFF	1187 ms		
03702	Distance Loop L2E selected forward	OFF	1187 ms		
10255	Uph-ph> Pickup	OFF	1187 ms		
10269	Uph-ph(>) Pickup L3-L1	OFF	1187 ms		
00611	Relay GENERAL TRIP command	OFF	1192 ms		
01124	Fault Locator Loop L2E	ON	1076 ms		
01117	Fit Locator: secondary RESISTANCE	0.16 Ohm	1076 ms		
01118	Fit Locator: secondary REACTANCE	3.07 Ohm	1076 ms		
01114	Fit Locator: primary RESISTANCE	0.59 Ohm	1076 ms		
01115	Fit Locator: primary REACTANCE	11.16 Ohm	1076 ms		
01119	Fit Locator: Distance to fault	33.7 km	1076 ms		
01120	Fit Locator: Distance [%] to fault	20.6 %	1076 ms		

# Main1 DPR of 400kV Tanda - Sult Line at Tanda(NTPC) end



# Main1 DPR of 400kV Tanda - Sult Line at Tanda(NTPC) end



# Main1 DPR of 400kV Obra- Sult Line at Obra end

SIEMENS						
B407_21_1_7SA522 V4_7_prt_13_35_18						
Indications						
SIMATIC		Trip Log - 000018 / 1/ 5/2022		2:58:01.557 AM - 3296_100_UP...		
				10.01.22 13:05:21		
1 Indications						
1.1 Trip Log - 000018 / 1/ 5/2022 2:58:01.557 AM - 3296_100_UPRVUNL_OBRA / KIOSK4 / LI						
NE WITH REACTOR / B407 / B407_21_1_7SA522 V						
Trip Log - 000018 / 1/ 5/2022 2:58:01.557 AM - 3296_100_UPRVUNL_OBRA / KIOSK4 / LINE WITH REACTOR / B407 /						
B407_21_1_7SA522 V						
Number	Indication	Value	Date and time	Cause	State	
00301	Power System fault	18 - ON	05.01.2022 02:58:01.557			
00302	Fault Event	18 - ON	05.01.2022 02:58:01.557			
03684	21 Pickup BG	ON	0 ms			
03702	21 Selected Loop BG forward	ON	0 ms			
02784	78: Auto recloser is not ready	ON	197 ms			
03605	21 TRIP command Phases ABC	ON	1000 ms			
03801	21 Distance General TRIP command	ON	1000 ms			
03818	21 TRIP 3phase in Z3	ON	1000 ms			
00536	Relay Definitive TRIP	ON	1000 ms			
00533	Primary fault current Ia	0.62 kA	1004 ms			
00534	Primary fault current Ib	1.43 kA	1004 ms			
00535	Primary fault current Ic	0.12 kA	1004 ms			
03671	21 PICKED UP	OFF	1045 ms			
03702	21 Selected Loop BG forward	OFF	1045 ms			
10205	59-1-vphph Pickup	ON	1046 ms			
10209	59-vphph Pickup C-A	ON	1046 ms			
01124	Fault Locator Loop BG	ON	1017 ms			
01117	Ft Locator: secondary RESISTANCE	2.62 Ohm	1017 ms			
01118	Ft Locator: secondary REACTANCE	28.24 Ohm	1017 ms			
01114	Ft Locator: primary RESISTANCE	10.62 Ohm	1017 ms			
01116	Ft Locator: primary REACTANCE	102.65 Ohm	1017 ms			
01119	Ft Locator: Distance to fault	310.3 km	1017 ms			
01120	Ft Locator: Distance [%] to fault	129.3 %	1017 ms			
03801	21 Distance General TRIP command	OFF	1101 ms			
03818	21 TRIP 3phase in Z3	OFF	1101 ms			
00511	Relay GENERAL TRIP command	OFF	1101 ms			
00592	Single pole open detected in Phase B	ON	1104 ms			
10205	59-1-vphph Pickup	OFF	1163 ms			
10209	59-vphph Pickup C-A	OFF	1163 ms			

# Flash report

- 1. Exact location and nature of fault?
- 2. Reason of delayed clearance of fault?
- 3. Why did 400 KV Obra\_B-Sultanpur (UP) Ckt-1 not trip from Sultanpur end?
- 4. What was the antecedent voltage of 400kV Sultanpur-Tanda ckt at Tanda end? Tripping of line on Over voltage to be reviewed.
- 5. As per SOE, 400 KV Lucknow-Sultanpur ckt tripped at the end after tripping of all other elements. Exact time of initiation of SOTF to be checked.
- 6. Remedial action taken report to be shared.



# 1. Exact location and nature of fault?

- **Y phase** Suspension string was found damaged & broken at **loc. no. 101**, Distance about 35-36 km from Sultanpur end.. String replaced..





loc. no. 101



## 2. Reason of delayed clearance of fault?

- After tripping of 400kV Sultanpur- PGCIL Lko line from both ends on 05.01.2022 at 01:34 hrs due to Y phase to earth fault on line at about 33km distance from Sultanpur, CB successfully auto reclosed from both ends.
- C.B. finally tripped from both ends due to fault repetition in 2 sec (within reclaim time)
- When line was tried to charge at 02:58hrs from Sultanpur end, Dist. Prot. Relays issued SOTF trip command due to persistent line fault (Y ph suspension string damaged at loc. No. 101) but due to **defective DO contact of Main1 & Main2** relays used for SOTF (3 ph trip), trip command was not issued to 86 Trip relay leading to non auto tripping of CB 92 & non initiation of LBB relay
- Fault was cleared from other end of Lines/ Transformers:  
Obra end on Z3 trip (1000ms), Tanda end on B/U E/F (600ms), ICT 1 & ICT 3 on LV side E/F (850ms), ICT 2 on LV side E/F (1200ms)

### 3. Why did 400 KV Obra\_B-Sultanpur (UP) Ckt-1 not trip from Sultanpur end?

- Fault was on 400kV Sultanpur- PGCIL Lko line, which was in reverse direction of relays for 400kV Sultanpur Obra line at Sultanpur end.
- As Bus Bar protection is Healthy, Z4 reach has been set to 50% of shortest line (Sultanpur – Tanda) i.e. around 51km
- However, this fault was treated as a border line case by both Dist. Prot. relays(Main1 &2 Siemens Siprotec 7SA52) leading to non initiation of Z4.
- Hence, no tripping of the line at sultanpur end.

4. What was the antecedent voltage of 400kV Sultanpur-Tanda ckt at Tanda end? Tripping of line on Over voltage to be reviewed.

- 400kV Sultanpur- Tanda line tripped on B/U E/F at Tanda end in around 600ms.
- C.B. tripped at Sultanpur end due to DTR PLCC carrier command.
- No significant rise in voltage is being observed as per DR of Tanda end.

5. As per SOE, 400 KV Lucknow-Sultanpur ckt tripped at the end after tripping of all other elements. Exact time of initiation of SOTF to be checked

- 400kV Sultanpur- PGCIL Lko line tripped at the end of SOE, after around 2 sec of initiation of fault & tripping of all the elements , as the CB was hand tripped by operator.
- SOTF command was initiated from Main 1 & Main2 relays of Sultanpur end for 400kV PGCIL Lko- Sultanpur line at **02:58:01.531** hrs on 05.01.2022 (as per DR).

## 6. Remedial action taken report to be shared.

- At Sultanpur end DPRs were retrofitted for 400kV Lko line:
  - Siemens Siprotec 7SA611 as Main1 on 25.09.2009
  - Alstom Micom P442 as Main 2 on 13.04.2014
- Both DPRs were found ok during Annual relay testing on 28.09.2021
- Both Siemens (Main 1) & Alstom (Main 2) service engineers were consulted for simultaneous failure of DO contacts for 3 ph trip.
- In view of supposedly excessive burden of existing 86 relays Two spare DO contacts have been configured in parallel for all 1 Ph & 3 ph trip commands in both relays.
- Moreover, DO card of Main 2 relay has been replaced with the one of spare relay on 24 May 2022 , with same configuration to improve reliability.

## Minutes of Meeting

M/S RBS Engineering	M/S UPPTCL	Date
Mr. Deepak pal	Mr. Rajesh Kumar(AE M-II) 400KV S/S Sultanpur	24-May-22
	Mr. Dharmraj (AE T&C) 400KV S/S Sultanpur	

M/s RBS representative arrived on 400kV s/s Sultanpur UP Site Dt. 24-May-2022 and were carried out following jobs,

Project Name: Configuration and testing of 400kV SLN-PGCIL LKOLine.

Equipment Name		Serial No.
400kV SLN-PGCIL LKOLine		
Distance protection relay MICOM P44291AB6MD710M	Configured tested	33655124/04/16

- Old relay Do Card was replaced with DO card of Spare relay.
- Above mentioned Relay configured as per previous settings and logic.
- Above relay were tested and all enabled function and found healthy.

### General Notes:

- 1) Master trip Relay command checked through protection relays and found ok.
- 2) Auto Reclose function checked and found Ok in all phases.
- 3) AUX Circuit Checked & Found ok.
- 4) Closing and tripping circuit checked & found ok.

M/s RBS representative left the site on 24MAY 2022.

Note: - All above points have been checked by M/s UPPTCL and found Ok

Organization	M/S RBS Engineering	M/S UPPTCL



# Highlights

- Cause of Event
- Defective DO contact for 3 ph trip of Main1 & Main2 relays
- Action Taken
- Two spare DO contacts have been configured in parallel for all 1 Ph & 3 ph trip commands in both Main1 & Main2 Dist. Prot, relays at Sultanpur end.
- DO card of Main 2 relay has been replaced on 24 May 2022 with same configuration.
- Measures to be taken in Future
- Replacement of electromechanical type EE make RP of 400/220kV 240 MVA ICT-2 with numerical type RP
- Replacement of same make & type Main1 & Main2 DPR (Siemens Siprotec 7SA52) of 400kV Obra line with different make DPR.

Thank you

# Multiple elements tripping at 220kV Pong(BBMB)

17<sup>th</sup> March 2022, 08:40 hrs

# **Tripped elements & Antecedent condition (As reported)**

## **Antecedent Condition:**

- Weather Conditions Normal
- Grid Frequency (Hz) 49.99
- Total IR Import (MW) 4389
- Northern Region Demand (MW) 48021
- Load Loss: Nil

## **Tripped Elements:**

- 220 KV Jessore(HP)-Pong(BB) (PG) Ckt-1
- 220 KV Jalandhar-Pong (BB) Ckt-1
- 220 KV Jalandhar-Pong (BB) Ckt-2
- 220 KV Pong(BB)-Dasuya(PS) (BBMB) Ckt-1
- 220 KV Pong(BB)-Dasuya(PS) (BBMB) Ckt-2
- 220 KV Bairasiul(NH)-Pong(BB) (PG) Ckt-1
- 220KV Bus 1 at Pong(BB)

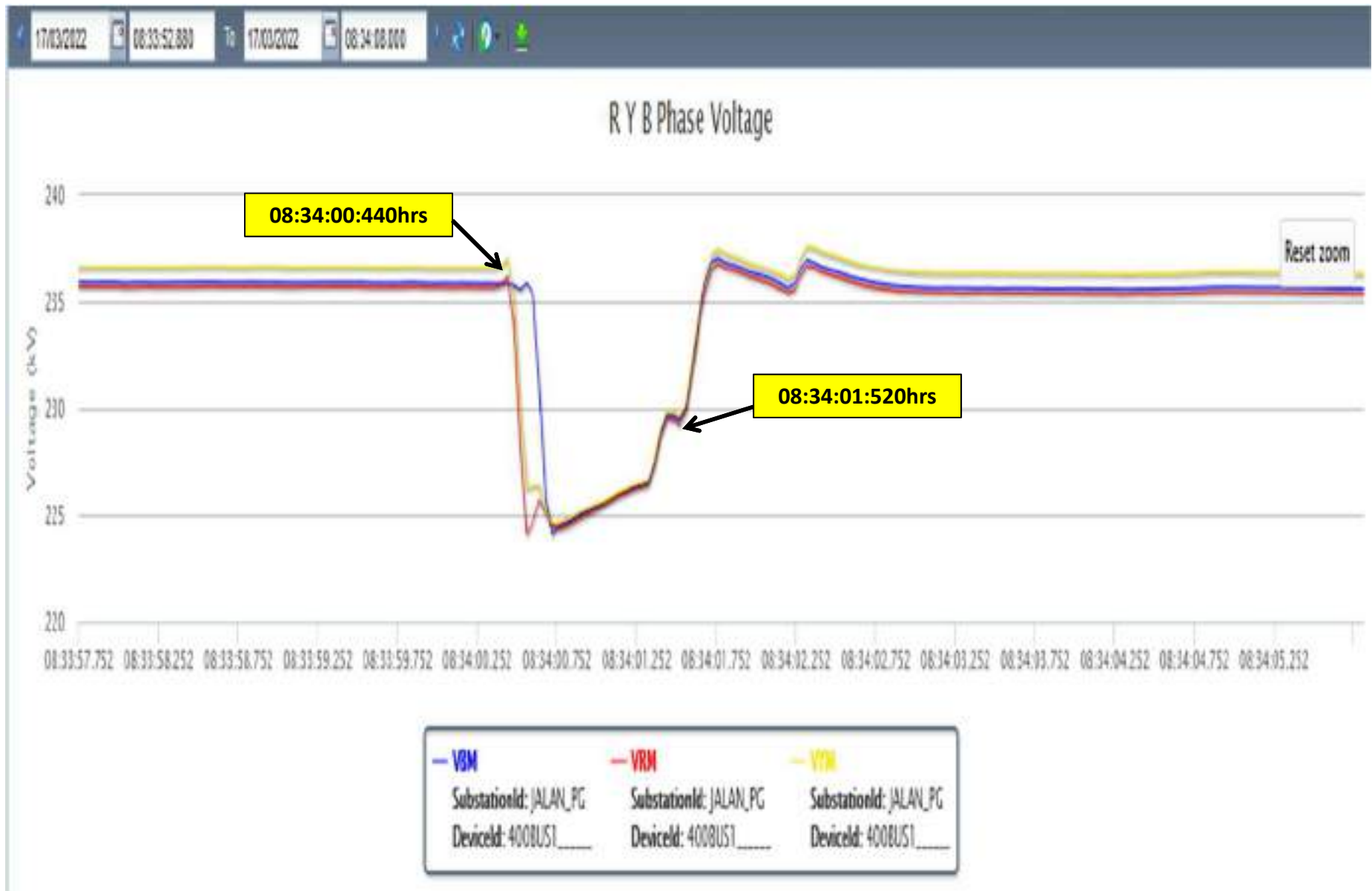
# PMU Plot of frequency at Bassi(PG)

08:34hrs/17-Mar-22

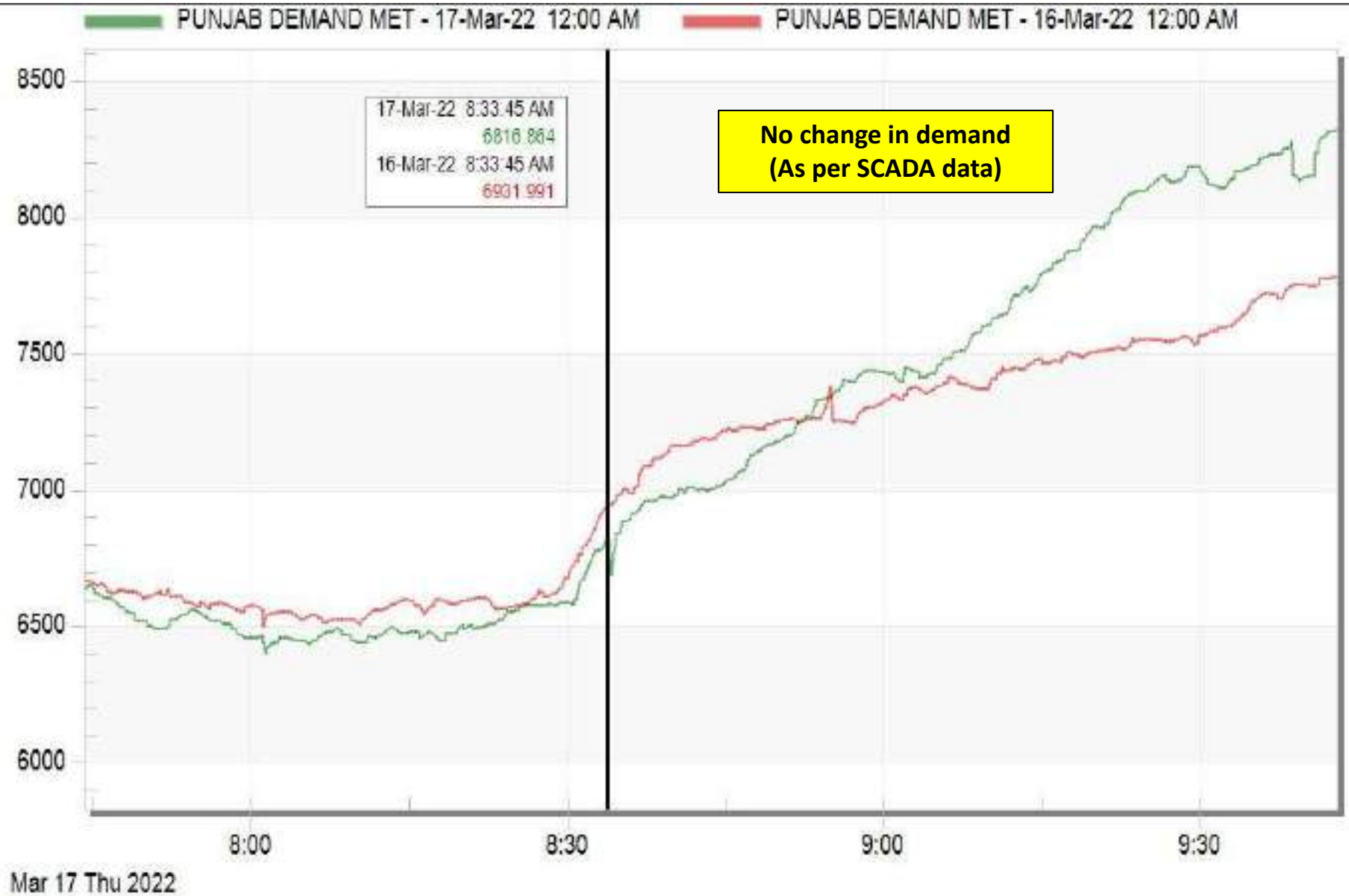


# PMU Plot of phase voltage magnitude at Jalandhar(PG)

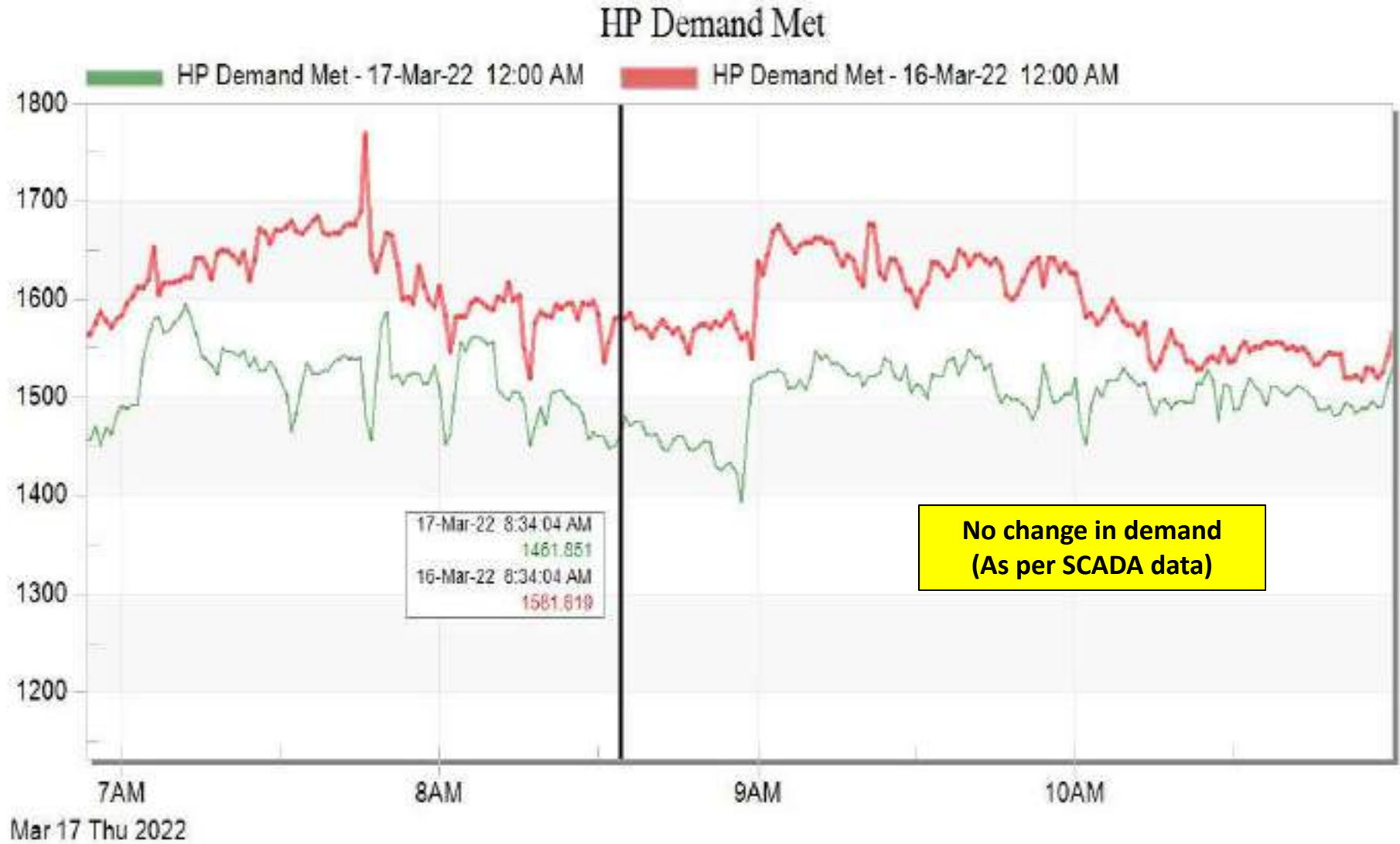
08:34hrs/17-Mar-22



# Punjab demand during the tripping

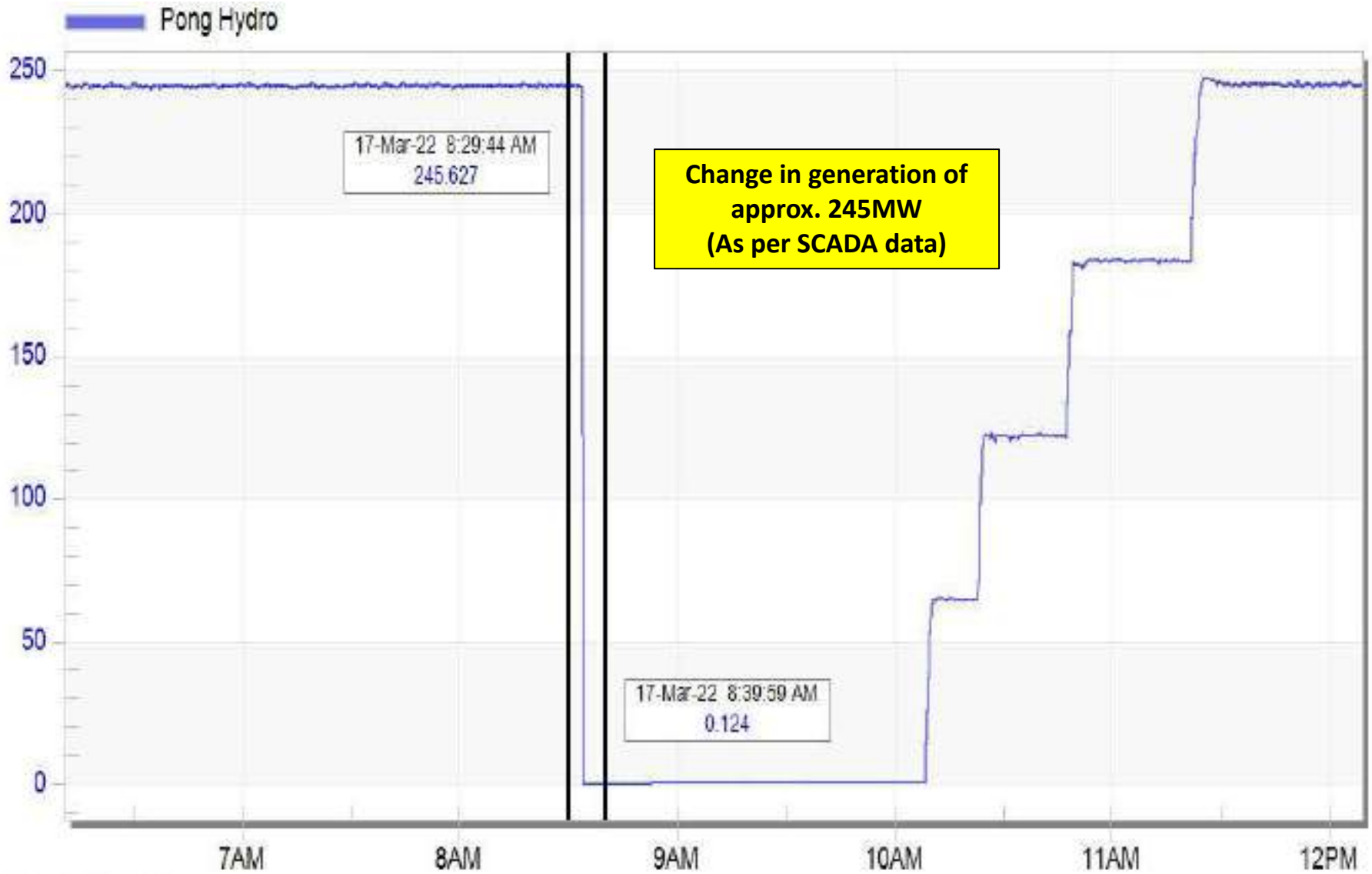


# HP demand during the tripping



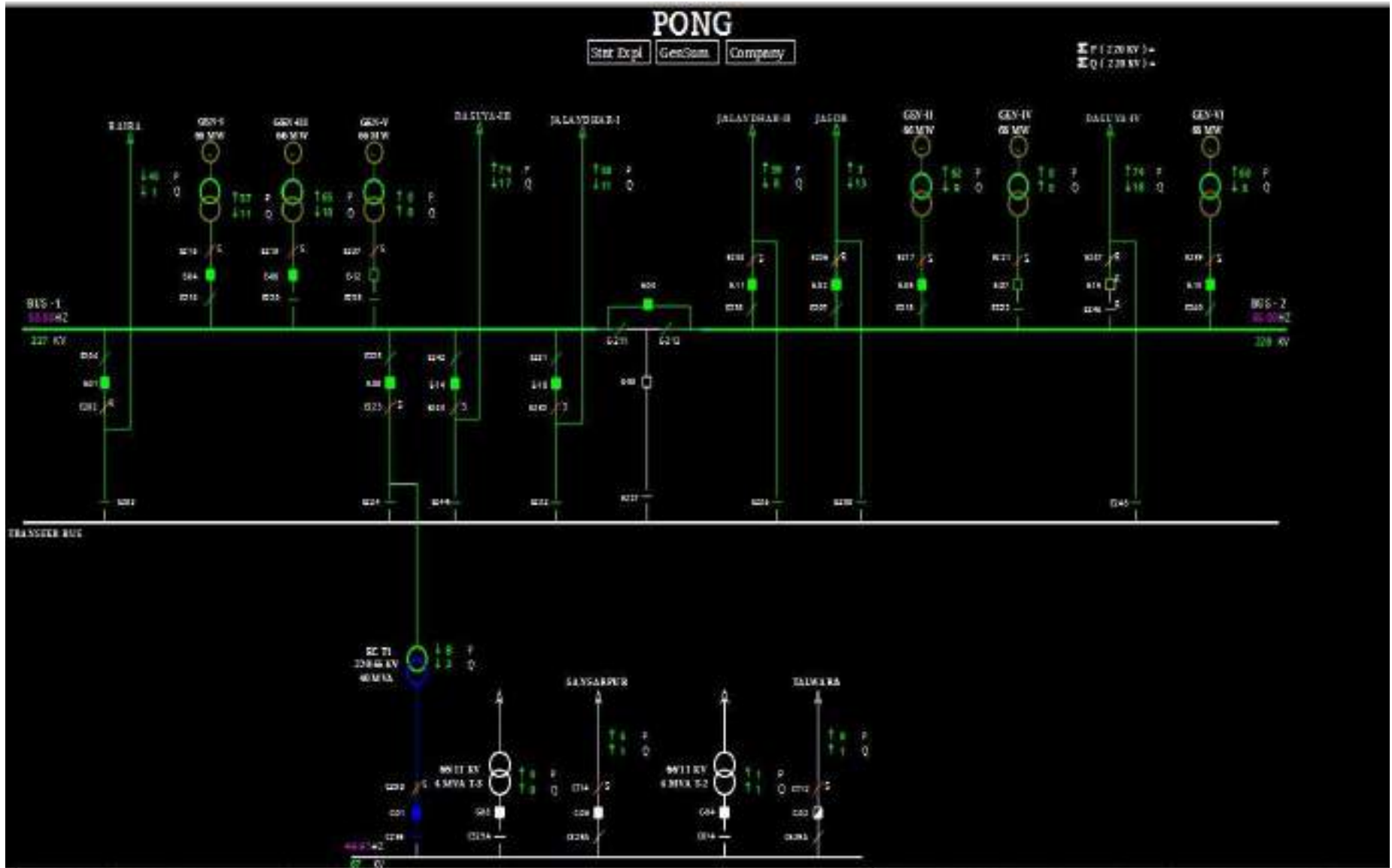


# Pong HEP generation during the tripping

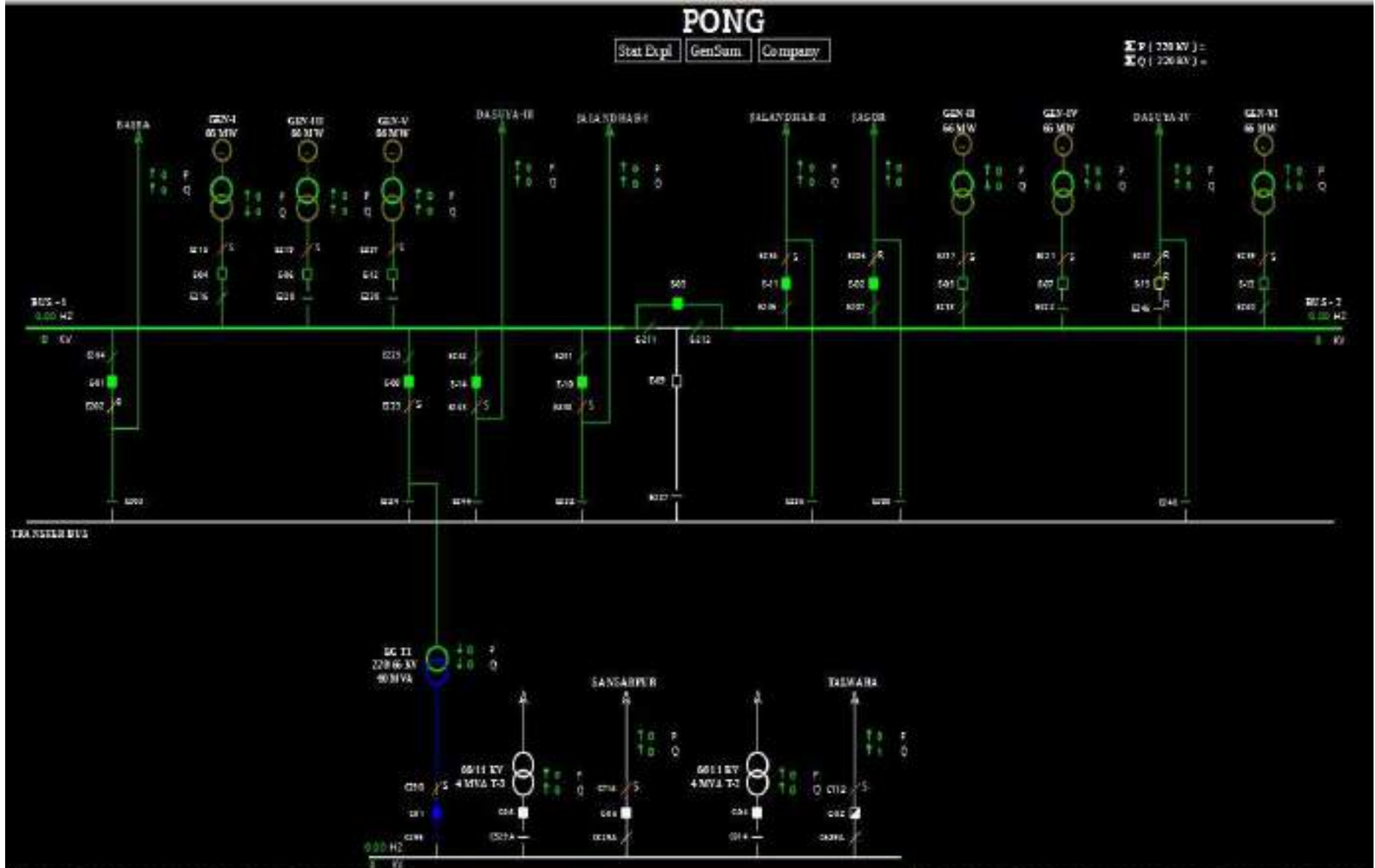


Mar 17 Thu 2022

# SLD of 200kV Pong(BBMB) before the tripping



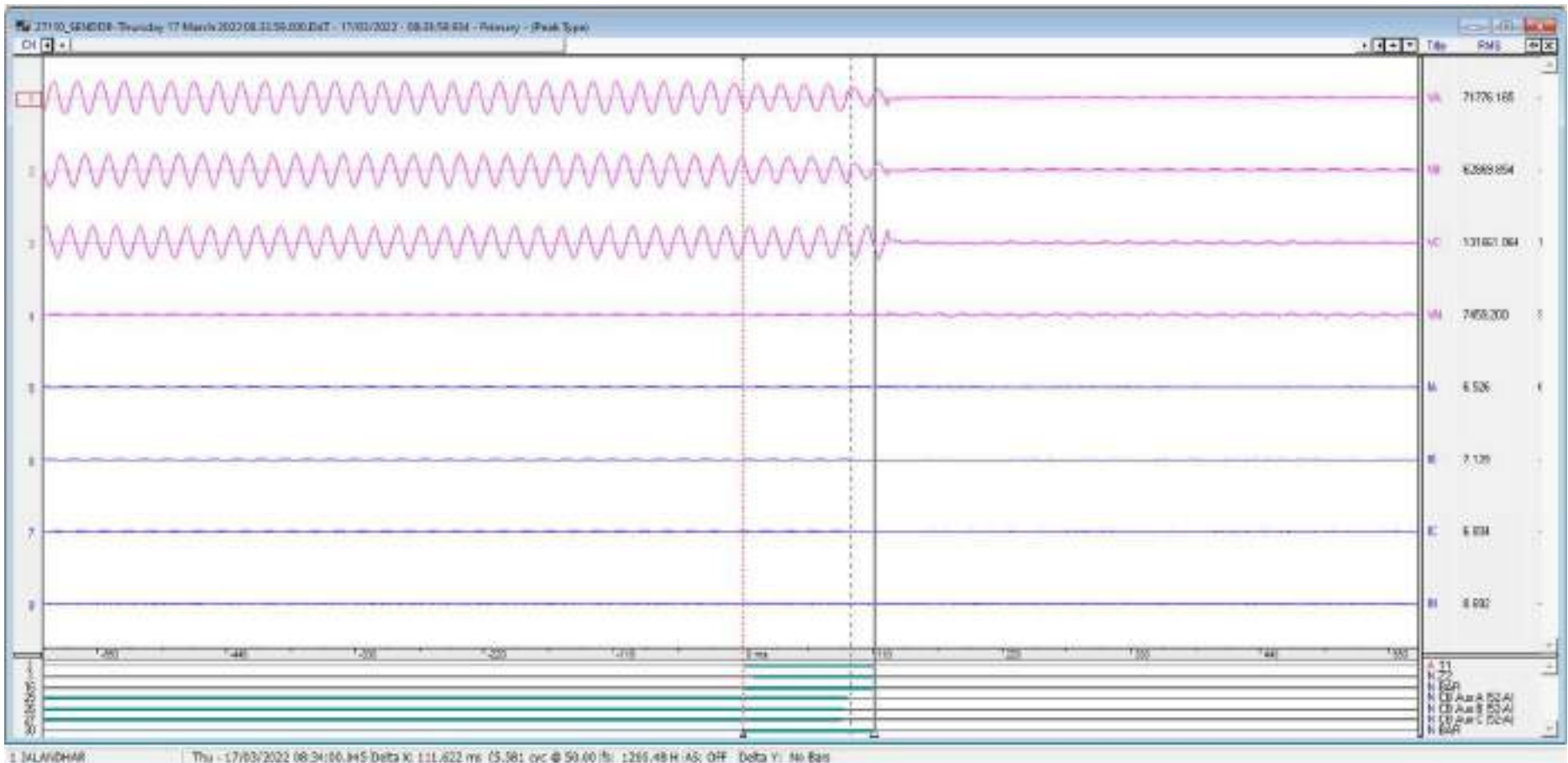
# SLD of 200kV Pong(BBMB) after the tripping



## SCADA SOE

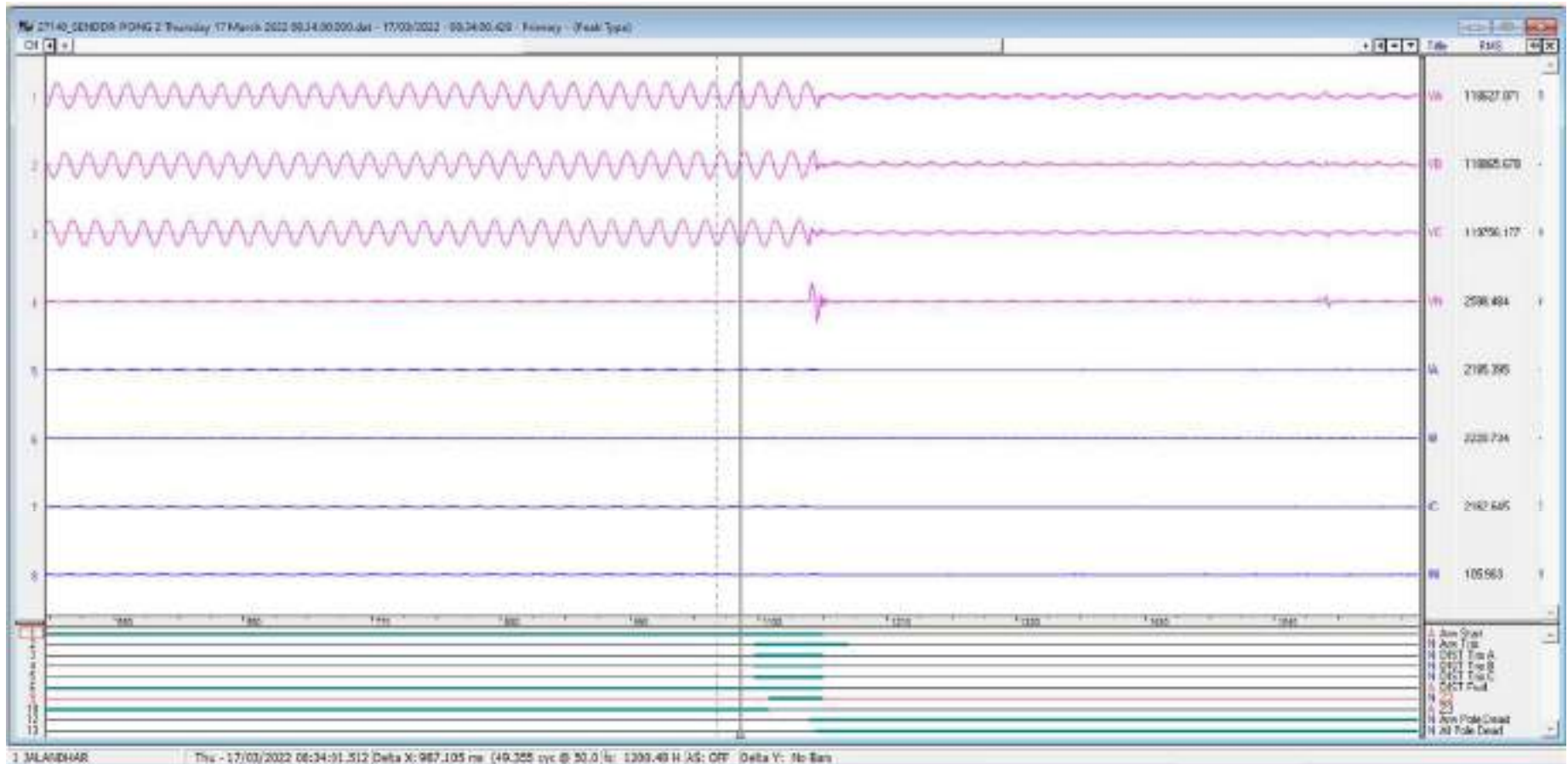
Time	Station Name	Voltage	Element Name	Element Type	Element Status	Remark
08:34:00,834	PONG	220kV	E_06(H03)	Circuit Breaker	Open	CB of 66MW Unit-3 at Pong(BBMB)
08:34:01,394	DASUYA	220kV	E_7(PONG_-2)	Circuit Breaker	Open	Line CB of 220 KV Pong(BB)- Dasuya(PS) (BBMB) Ckt-1 opened
08:34:02,054	PONG	220kV	E_04(H01)	Circuit Breaker	Open	CB of 66MW Unit-1 at Pong(BBMB)
08:34:02,164	PONG	220kV	E_05(H02)	Circuit Breaker	Open	CB of 66MW Unit-2 at Pong(BBMB)
08:34:02,194	PONG	220kV	E_13(H06)	Circuit Breaker	Open	CB of 66MW Unit-6 at Pong(BBMB)
08:34:04,348	BAIRASUIL	220kV	04PONG	Circuit Breaker	Open	Line CB of 220 KV Bairasiul(NH)- Pong(BB) (PG) Ckt-1 opened

# DR of 220 kV Jalandhar (End) – Pong – 2 Line



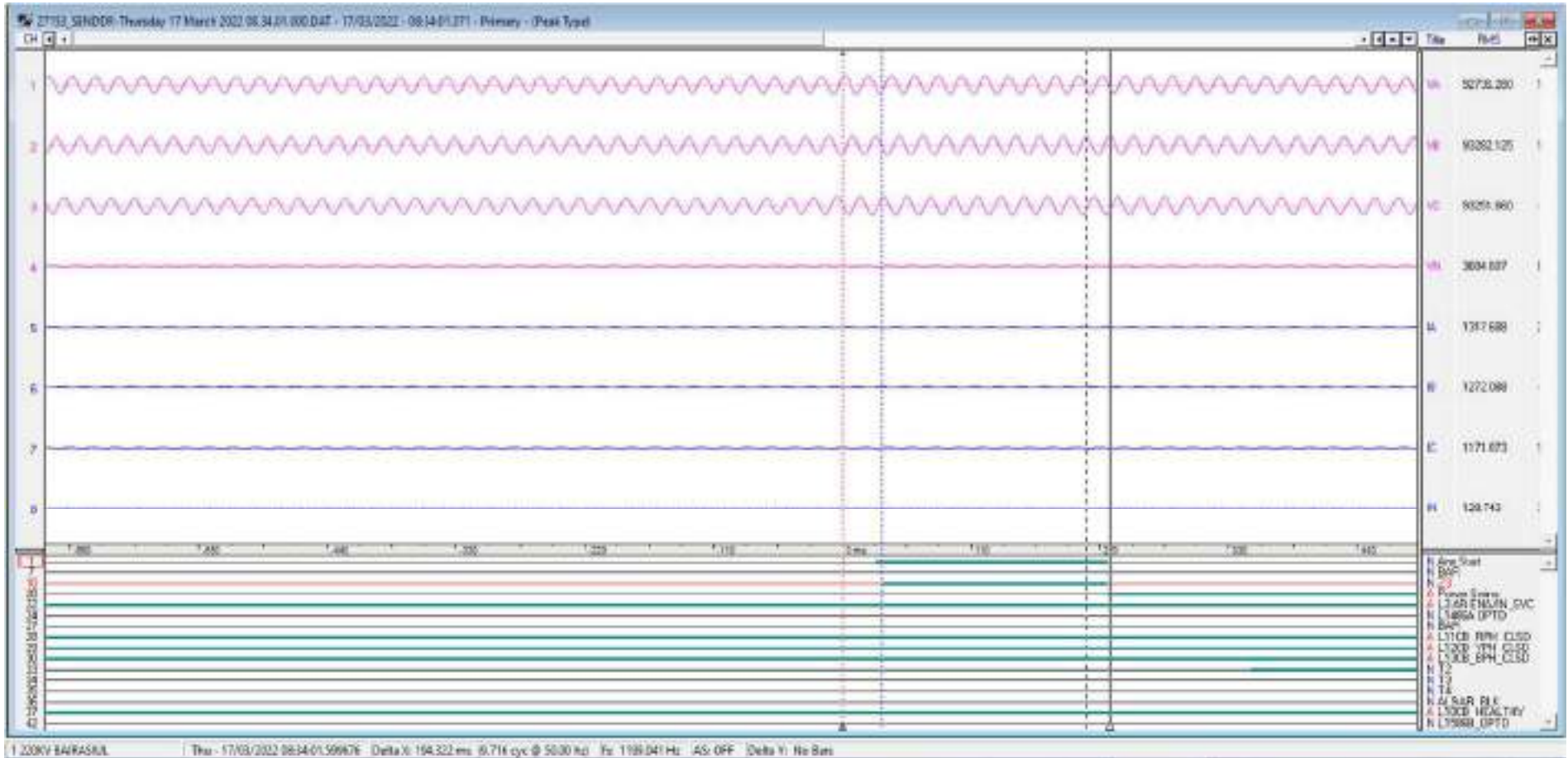
1. Line tripped on Zone-2 from Jalandhar End.
2. Zone – 2 timer at Jalandhar end seems to be 100 ms ?
3. No carrier received from Pong?

# DR of 220 kV Jalandhar (End) – Pong - 1 Line



1. Line tripped on Zone-3 from Jalandhar End.
2. No carrier received from Pong?

# DR of 220 kV Bairasiul – Pong - 1 Line



1. Line tripped on Zone-3 from Bairasiul end.
2. Zone-3 timer seems to be 200 ms.
3. No carrier received from Pong?


# Details for 220 kV Pong-Jassure S/C Line

TRIPPING REPORT		
Circuit Name: 220 kV S/C Pong to Jassure		
Sr. No.	Description	Detail
1	Trip Time & Date	220 kV Jassure Pong Line. AT: - 08:53 Hrs. Dated: - 17-05-22.
2	Relay Operated/Alarm	O/C, E/F, R.Y, B & Zone - 3.
3	Fault Parameter	Zone - 3. $L_1 - 2.255 \times 10^{-1} = 1804 \text{ A}$ , $L_2 - 2.384 \times 10^{-1} = 1867 \text{ A}$
4	Action Taken	$L_3 - 2.270 \times 10^{-1} = 1816 \text{ A}$ . Resistance - $2.896 \Omega$ - Wide Charging Code - N.R.L.DC - 3895, R.T.A.M.C - 844
5	Shutdown	
6	Restoration Time	AT: - 10:11 Hrs. Breaker closed at Jassure End. AT: - 10:12 Hrs. Breaker closed from Pong End.
7	Generation /Load Loss	- Nil -

1. No DR received from Jassure end.
2. O/C, E/F, Zone-3 all mentioned. Which protection operated?
3. No carrier received from Pong?



# Details received from Pong

 <b>BHAKRA BEAS</b> <b>NATION'S PRIDE</b>		<b>TRANSMISSION SYSTEM</b> <b>TRIPPING/FAULT REPORT OF TRANSMISSION LINES</b>				<b>Doc No. : TS/SS/F/0211</b> <b>Issue No. : 03</b> <b>Page : 01 of 01</b> <b>Page Rev No.: 0</b> <b>Date : 1<sup>ST</sup>JAN.2018</b>																		
Subject					Reporting procedure in line with IEGC-2010 clause 5.9.6																			
1	2	3	4	5		6	7	8	9	10														
Time and date of event	Location	Plant or equipment directly involved	Description and cause of event.	Antecedent condition of Load		Duration of Interruption	All relevant system data: (DR/event logger etc)	Sequence of tripping with time:-	Flag appeared	Remedial measure														
8.34 17.03.22	220 KV Substation BBMB, Jalandhar.	220 KV Jal-Pong Ckt. No. 1 & 2	The tripping occurred due to damage of Y-phase wave trap of 220 KV Pong Ckt.-1at Pong end. However the affected area of the line has been patrolled and nothing abnormal was observed.  Sd/- SSE BBMB Jalandhar.	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 5%;">A</td> <td style="width: 15%;">Voltage</td> <td style="width: 80%;">227 KV</td> </tr> <tr> <td>B</td> <td>Frequency</td> <td>50.04 HZ</td> </tr> <tr> <td>C</td> <td>Load</td> <td>140 Amp.</td> </tr> <tr> <td>D</td> <td>Time of Tripping</td> <td>8.34</td> </tr> <tr> <td>E</td> <td>Weather condition.</td> <td>Clear</td> </tr> </table>	A	Voltage	227 KV	B	Frequency	50.04 HZ	C	Load	140 Amp.	D	Time of Tripping	8.34	E	Weather condition.	Clear	<b>Pong-1</b> Closed at 18.30 hrs on dt 17.03.22 (Duration-09.56 Hrs.)  <b>Pong-2</b> Closed at 09.52 hrs dt 17.03.22 (Duration :-1.18 Hrs)	DR/Event already sent.	At 8.34 hrs. 220 KV Jal-Pong Ckt. No. 1 & 2 tripped off simultaneously	<b>Pong-1</b> At Jal. End MICOM P-442 Started Phase AB, Z-2 Fault Location: 86.13 KM REL 650:- Fault Loop L-1, L-2, Z-2 Distance- 86.275 KM At Other end- Did not trip.  <b>Pong-2</b> REL-650 Z-3, Distance-133.3 Km, PSB, AVR lockout. At Other end- Did not trip.	NA
A	Voltage	227 KV																						
B	Frequency	50.04 HZ																						
C	Load	140 Amp.																						
D	Time of Tripping	8.34																						
E	Weather condition.	Clear																						

1. No DR/SOE received from Pong/BBMB.
2. Reason of fault and nature of fault not clear.

# Observations

1. No DR/SOE received from BBMB Pong end.
2. Exact nature and reason of fault at Pong end is not clear.
3. Z-3 time at Bairasiul end?
4. Whether 220kV Bus-1 bus bar operated or not?

**Analysis Report of Multiple**  
**Tripping at Pong Power House**  
**BBMB Talwara Station on dated**  
**17.03.2022 at 08.34 hrs.**

- **A. Introduction**

- **1. Time & Date of Event:** - 17.03.2022 at 08.34 hrs.

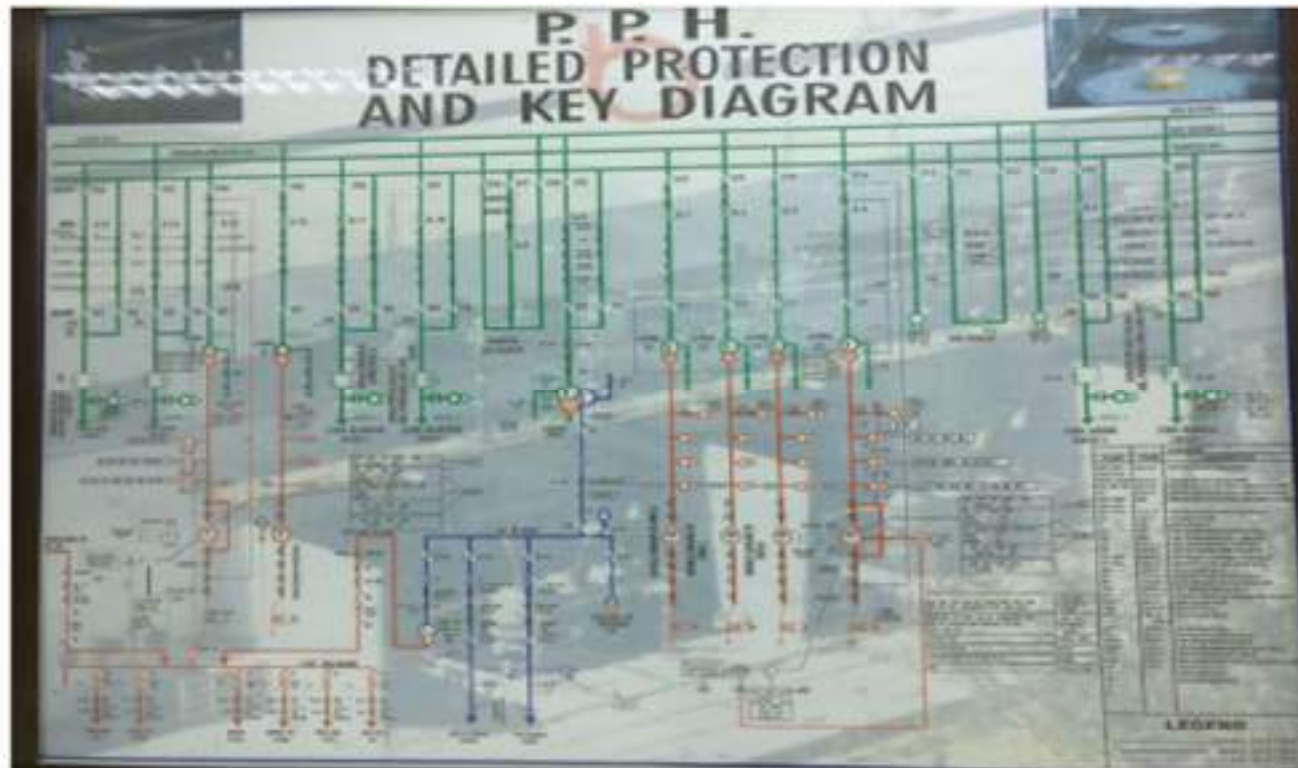
- **2. Substation(s) Affected along with voltage level:-**  
220 KV Substation Pong Power House BBMB Talwara.

## **Brief Event Summary:-**

- On 17.03.2022 at 08.34 hrs, wave trap of Yellow phase of 220 KV Pong- Jalandhar ckt-I busted.
- This resulted, all the 220 KV feeders tripped from other end and opened manually Pong end. All running machine on full load (M/c No- I, II, III & VI) also got tripped.
- 220KV Pong- Jalandhar Ckt-I & II opened manually.
- 220 KV Pong- Dasuya Ckt- III & IV opened manually.
- 40MVA, 220/66KV Transformer opened manually.
- 220kV Bus Coupler A-3 opened manually.
- 220KV Pong- Bairasuil Ckt opened manually.
- 220KV Pong Jassure Ckt opened manually.
- Unit No. 4 on PTW.
- Unit No. 5 on in Stop condition.

## B. Antecedent Conditions:-

Weather Information: Normal



- **Name and time of the tripped elements:-**

Sr. No.	Date & Time	Name of feeder
1	17.03.2022 / 08:34 hrs.	Unit No. 1
2	17.03.2022 / 08:34 hrs.	Unit No. 2
3	17.03.2022 / 08:34 hrs.	Unit No. 3
4	17.03.2022 / 08:34 hrs.	Unit No. 6
<sup>5</sup>	All 220KV Circuits opened manually at Pong end.	

- **5. Equipment failure (if any):-**

Y-Phase Wave Trap of 220 KV Pong-Jalandhar Circuit-1 busted.

- **6. Relay indication:-**

1	Unit no. 1,2,3 & 6	Pole slip (out of step) Over freq stage-I & II Gen. over speed elect stage-I 86A1, 86 A2 Loss of excitation, gen field failure
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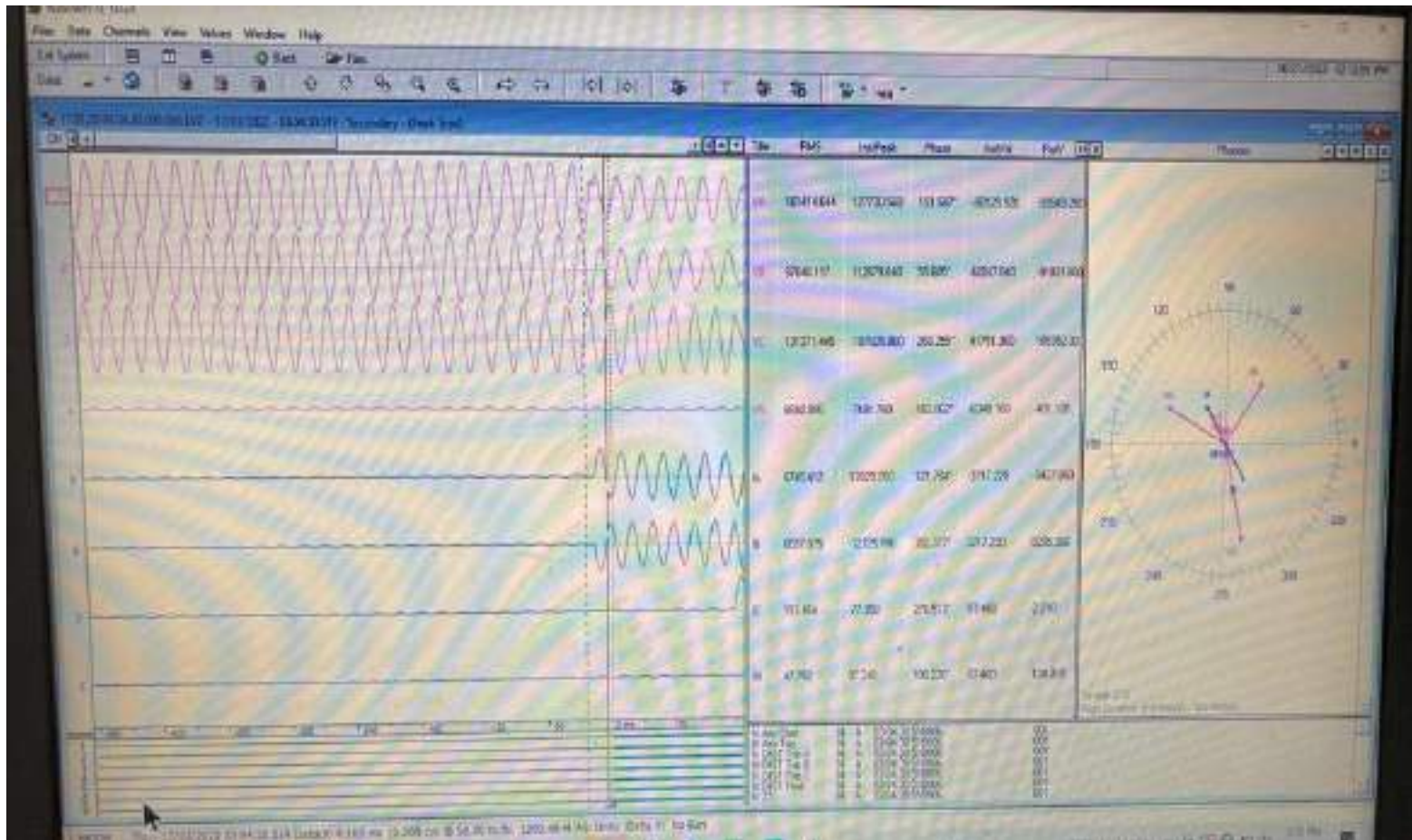
- **Description/ Analysis of tripping:-**

- **(A) Sequence of event:**

- **(a)** Y-Phase Wave- trap of 220 KV Pong- Jalandhar Circuit-1 busted but the line did not tripped at Pong-end and it tripped from Jalandhar end on distance protection relay operated in Zone-1 added.
- **(b)** All Machines running on full load (1, 2, 3 & 6) also got tripped.
- **(c)** All remaining 220 KV Lines connected to Pong Power House tripped from other end which are 220kv Jalandhar Pong ckt -2 (Zone-3), 220 KV Pong–Bairasuil Circuit-1(Zone-2), 220 KV Pong–Jassure Circuit-1 (Zone-2) and 220 KV Pong-Dasuya Circuit -III & IV (Zone-3).
- (d)** It was an arcing fault at the boundary of Zone-2 &3, therefore, some of the circuits have detected the fault in Zone-3.

- While busting of Y-Phase Wave-trap of 220 KV Pong- Jalandhar Circuit-1, the Distance Protection relay of Pong-Jalandhar Ckt-I operated and master trip relay 86B &86C operated, but trip supply from Trip Transfer Switch TTS (Normal, Inter & Transfer switch) did not extended to breaker due to loose wire strand in thimble of TTS switch of this feeder/panel. So that the breaker did not tripped and the breaker at Jalandhar end tripped on Zone-I added. Since the fault persist on the Bus and the fault was cleared from other end on Zone-2/3 of other circuits. It is further added that the LBB/BBP relay installed at PPH Talwara is old type electromechanical relay and the operation of this relay may be sluggish. So it may be the cause of delay in operation. The Replacement of this old relay with new Numerical relay is under process.

## DR of 220KV Pong Jalandhar Ckt –I



• **E. Restoration:-**

Sr. No.	Name of feeder / Transformer	Date & Time / Restoration
1.	220KV Pong-Jalandhar Ckt- II	17-03-2022 09:56 Hrs
2.	220KV Bus Coupler A-3	17-03-2022 10:06 Hrs
3.	Unit no. III	17-03-2022 10:08 Hrs
4.	220KV Pong Jassure Ckt	17-03-2022 10:12 Hrs
5.	Unit No. I	17-03-2022 10:23 Hrs
6.	220KV Pong Dasuya Ckt -III	17-03-2022 10:26 Hrs
7.	220KV Pong Dasuya Ckt -IV	17-03-2022 10:29 Hrs
8.	220KV Pong Bairasuil Ckt	17-03-2022 10:32Hrs
9.	40MVA 220/66KV	17-03-2022 10:44 Hrs
10	Unit No. VI	17-03-2022 10:47 Hrs
11	Unit No. II	17-03-2022 11:20 Hrs

- **8. Special finding/ issues identified during restoration: - N/A**

- **9. Remedial Action Taken:-**

- During checking, it found loose wire strand in thimble of TTS switch (Normal, Inter & Transfer switch) of 220KV Pong Jalandhar ckt-I and same was made corrected and checked out all control & protection wiring in Control & Relay panel including the operation of Circuit Breaker.
- LBB operation also checked after that and found in order.

- **10. Remedial Action to be taken along with time frame: -**

- The replacement of existing electro mechanical LBB protection relay is under process with new numerical protection relay.
- Looseness of old Control & protection wiring to be checked regular basis on PTW.

Thanks.

# Multiple element tripping at 400 KV Noida Sec 148(UP)

06<sup>th</sup> April 2022, 21:22 hrs

# Tripped elements & Antecedent condition (*As reported*)

## **Antecedent Condition:**

- Weather Conditions: Normal
- Grid Frequency (Hz): 49.68
- Total IR Import (MW): 5464
- Northern Region Demand (MW): 53347
- Load Loss: Nil

## **Tripped Elements:**

- 400 KV Noida Sec 148-Noida Sec 123 (UP) Ckt-1
- 400 KV Noida Sec 148-Noida Sec 123 (UP) Ckt-2
- 400 KV Gr.Noida\_2(UPC)-Noida Sec 148 (UP) Ckt-1
- 400 KV Gr.Noida\_2(UPC)-Noida Sec 148 (UP) Ckt-2
- 500 MVA 400/220 kV ICT – 1



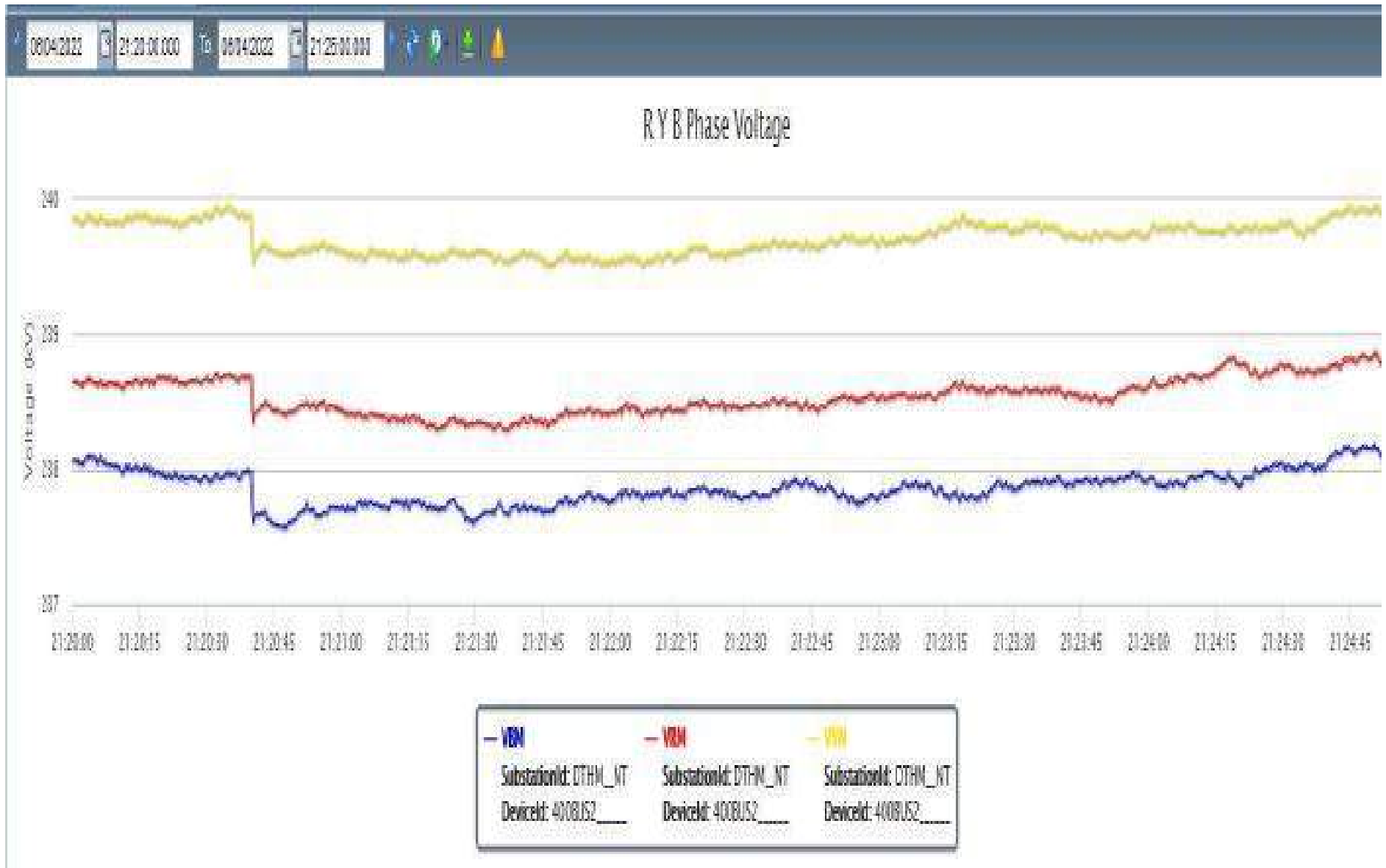
# PMU Plot of frequency at Bassi(PG)

21:22hrs/06-Apr-22

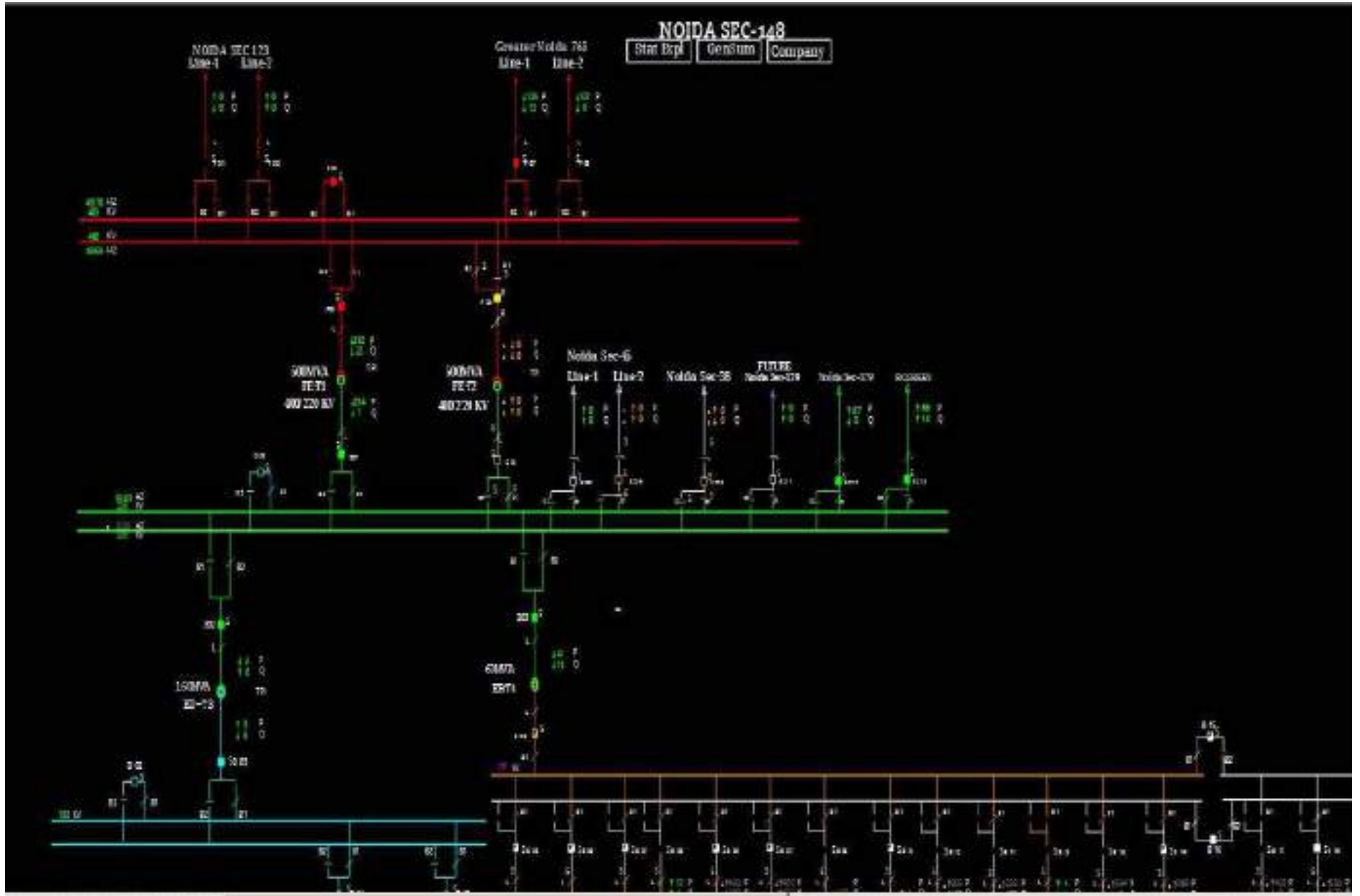


# PMU Plot of phase voltage magnitude at Dadri(NT)

21:22hrs/06-Apr-22

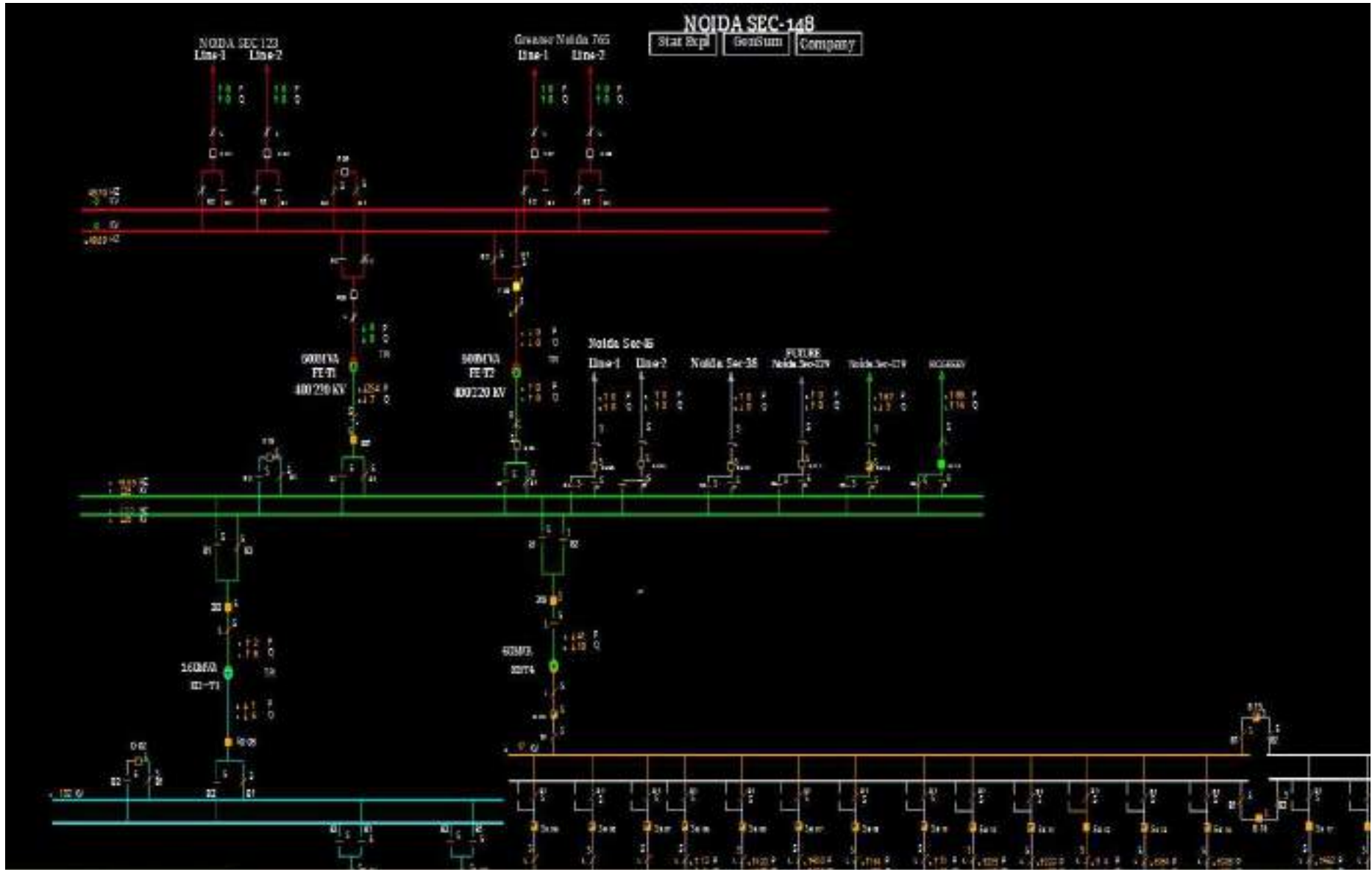


# SLD of 400/220kV Noida sec 148(UP) before the tripping



Wed April 6 2022 21:20:00

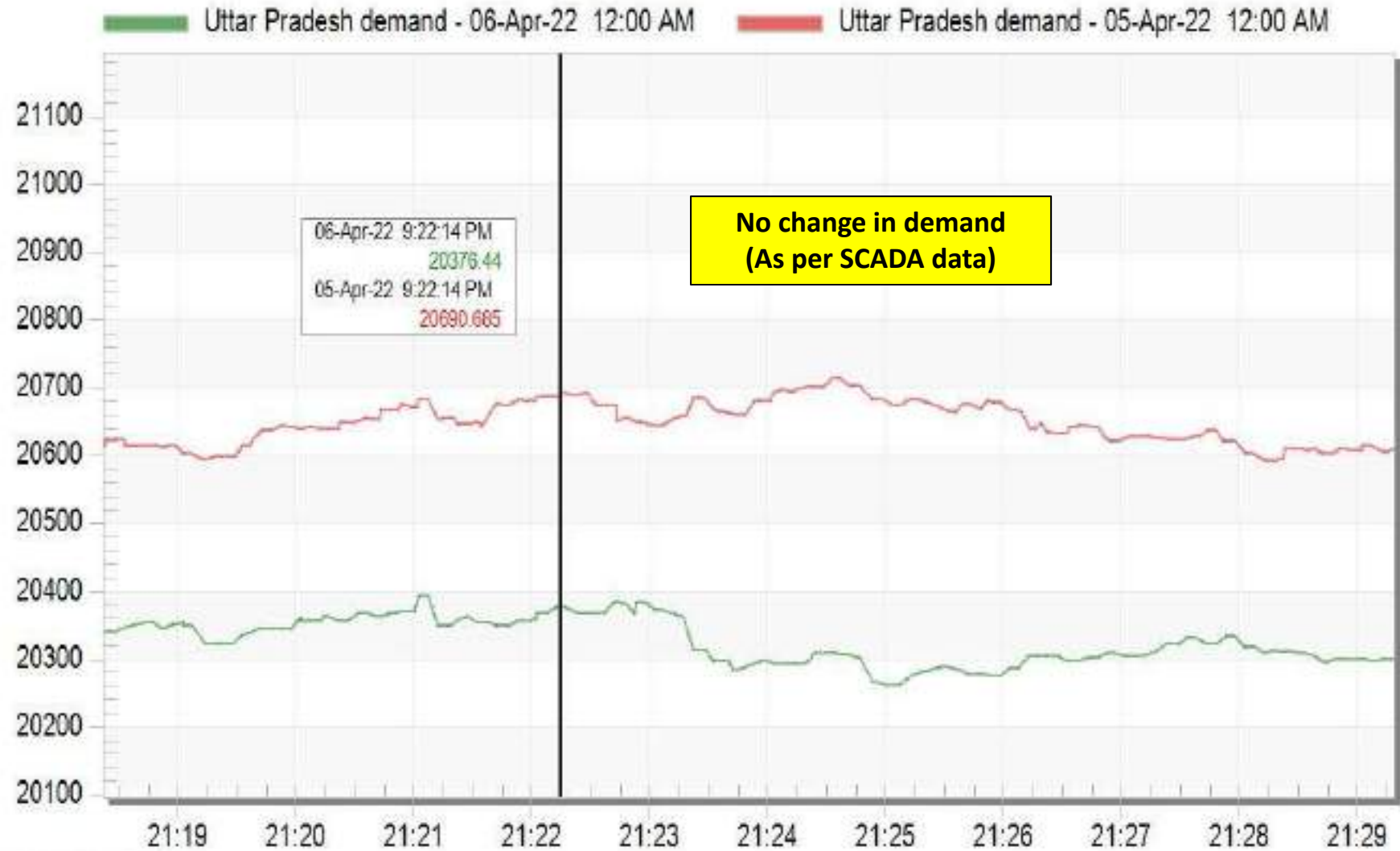
# SLD of 400/220kV Noida sec 148(UP) after the tripping



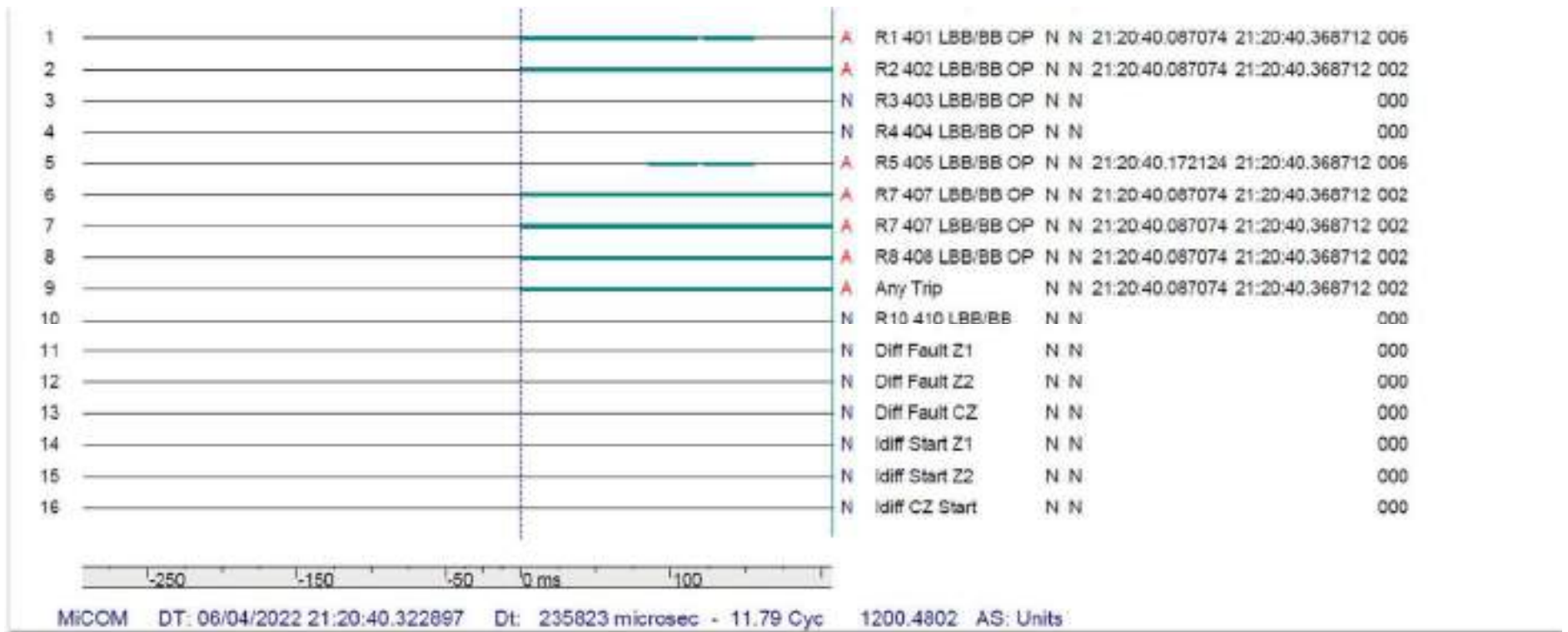
Wed April 6 2022 21:25:00

# UP demand during the tripping

Uttar Pradesh Demand



# Noida Sector – 148 S/S - DR of Busbar relay



1. LBB/BB trip signal high in all the bays.
2. Signal is high intermittently in some bays such as 405.

# 765kV Greater Noida (End) - Noida Sector – 148 Line DR



GREATER NOIDA DT: 06/04/2022 21:20:40.080376 Dt: 0 microsec - 0.00 Cyc 1191.8951 AS: ++

1. Current and voltages in line were normal at time of tripping and no fault observed.
2. Tripping occurred on DT received from Noida Sec-148 end.

## Details received from Noida Sec-123 end

① • 400kV sector 123 Noida sector 148 Noida CKT - 1  
Breaker is not energize and no supply  
ejection from 400kV substat<sup>n</sup> sector - 123 Noida.

② 400kV sector - 123 Noida sector 148 Noida CKT - 2  
Breaker is not energize and no supply ejection  
from 400kV substation sector - 123 Noida

1. Was 400 kV Noida Sec-148 – Noida Sec – 123 Line already out ?



# Observations

1. Status of changeover of DC source? If not automatic then why?
2. What is the Bus bar protection scheme adopted?
3. In GIS gas detectors whether NO or NC is used?
4. Was 400 kV Noida Sec-148 – Noida Sec – 123 Line already out ?
5. What remedial measures have been taken?
6. Frequent LBB high and low. Why?



# 400KV Noida Sec-148 GIS Sub-Station, UPPTCL

06.04.2022

400KV Bus bar Protection Operation

400 KV Noida Sec 148 S/S bus bar protection operation 06.04.2022.

- **Date & Time of event:** 06.04.2022 at 21:22 hrs.
- **Sub-Station affected:** 400 KV Noida Sec 148 GIS S/S
- **Date & Time of restoration:** 06.04.2022 at 22:24 hrs.

## Antecedents conditions

- There was no fault in the system and no load loss occurred during tripping. In antecedents condition 400KV Noida Sec 148-Gr Noida Ckt 1&2 carrying 126MW & 127MW respectively.

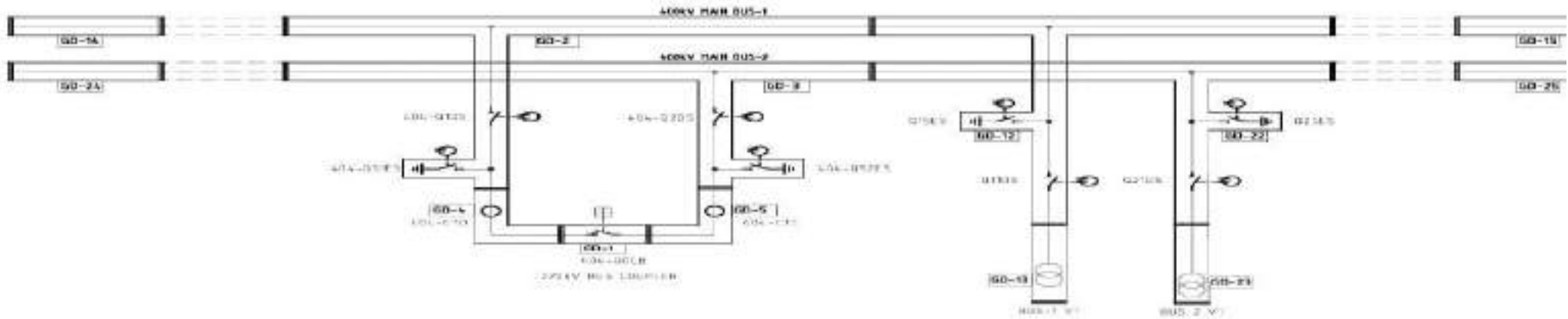
# Events Description

- At 21:22 hrs., There was some problem in battery charger which was being rectified. Meanwhile one cell(11<sup>th</sup> no) of DC source –I got dead and there was some time delay in changeover contactor to shift on DC source-II. Hence gas detector stage-3 contactor(KGD-1R3) got de-energized and its contact used for Busbar tripping got Normally Closed(NC) which extended Positive Supply for Busbar Protection Relay D.I(External input to D.I) which issued Tripping command to Both Zone1 and Zone2.
- Details of tripped elements are as follows:-
- Bay-407 400KV Gr.Noida(765KV) CKT-I Restoration time-22:28hrs.
- Bay-408 400KV Gr.Noida(765KV) CKT-II Restoration time-22:29hrs.
- Bay-401 400KV Sec-123 Noida CKT-I Restoration time-22:24hrs.
- Bay-402 400KV Sec-123 Noida CKT-II Restoration time-22:25hrs.
- Bay-404 Bus Coupler Restoration time -22:26hrs.
- Bay-405 500MVA ICT Restoration time-22:27hrs.

# Busbar Tripping Report

400 KV GIS SUBSTATION SEC148NOIDA

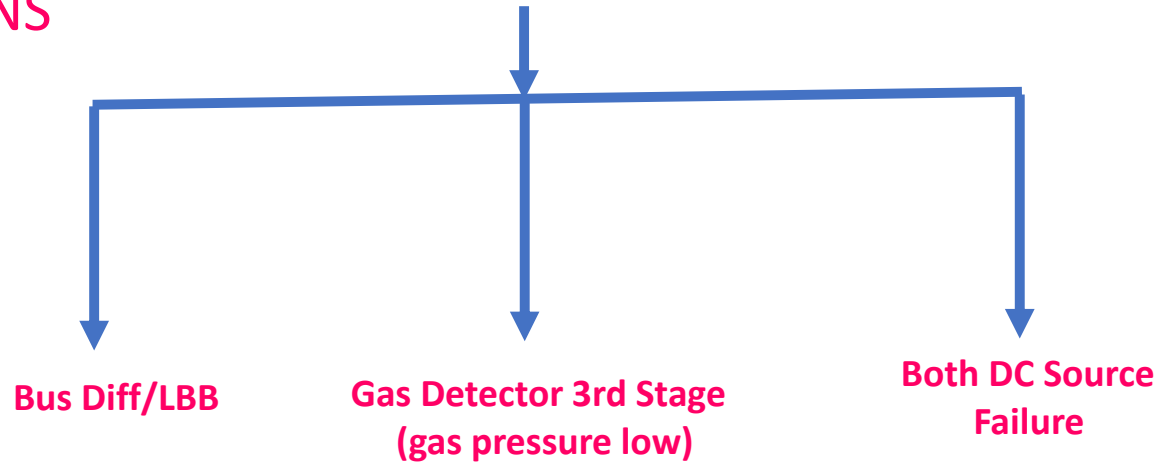
4



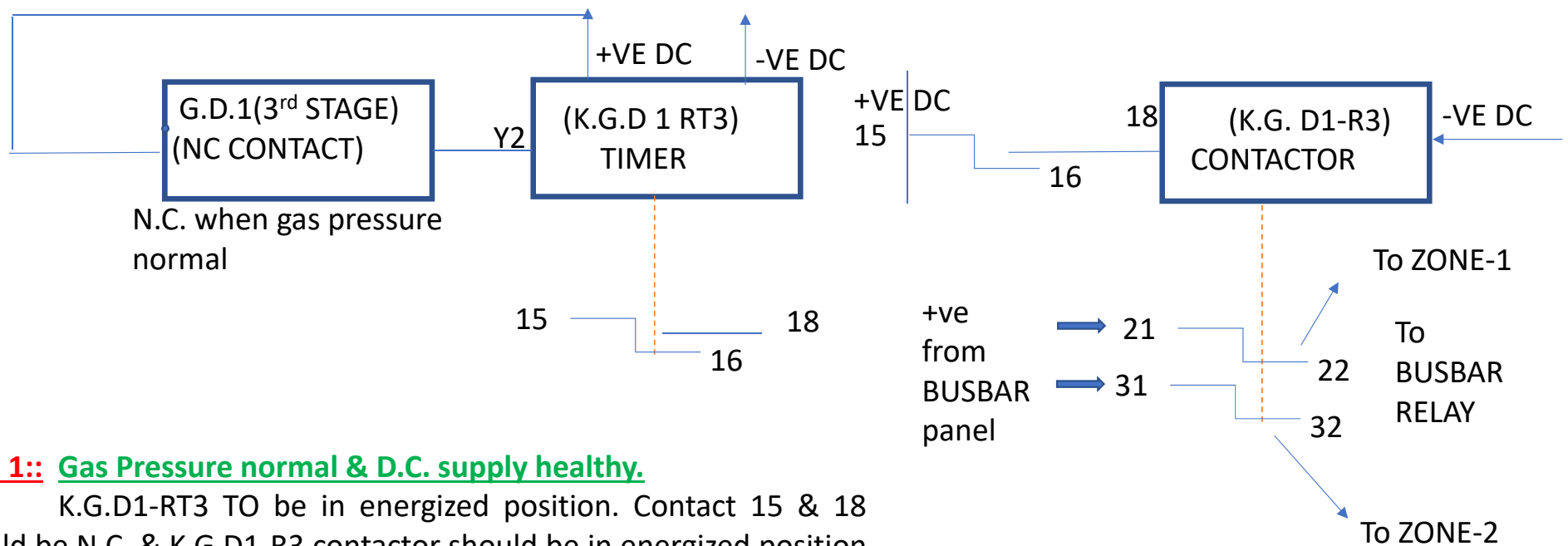
Drawn: J.P.S.	Client: LPTCL	<b>SIEMENS</b>	400KV BUS COUPLER & BUSBAR	Sheet No: 001-001/001	REV: 1
Checked: P.P.	Substation Name: 400/220/132/33KV GIS, SEC-148-149		SINGLE LINE DIAGRAM	Project Name: 400/220/132/33KV GIS, SEC-148-149	REV: 2
Date: 10/10/2018	Contract No: 148/2014/004/001, 002, 003, 004		Scale: 1:1	Revision: 2	DATE: 10/10/2018

# Busbar Tripping scheme at 400 KV GIS S/S SEC-148 NOIDA

- BUSBAR CAN OPERATE UNDER ANYONE OF THE FOLLOWING CONDITIONS



# Why did Busbar Operate on DC Fail

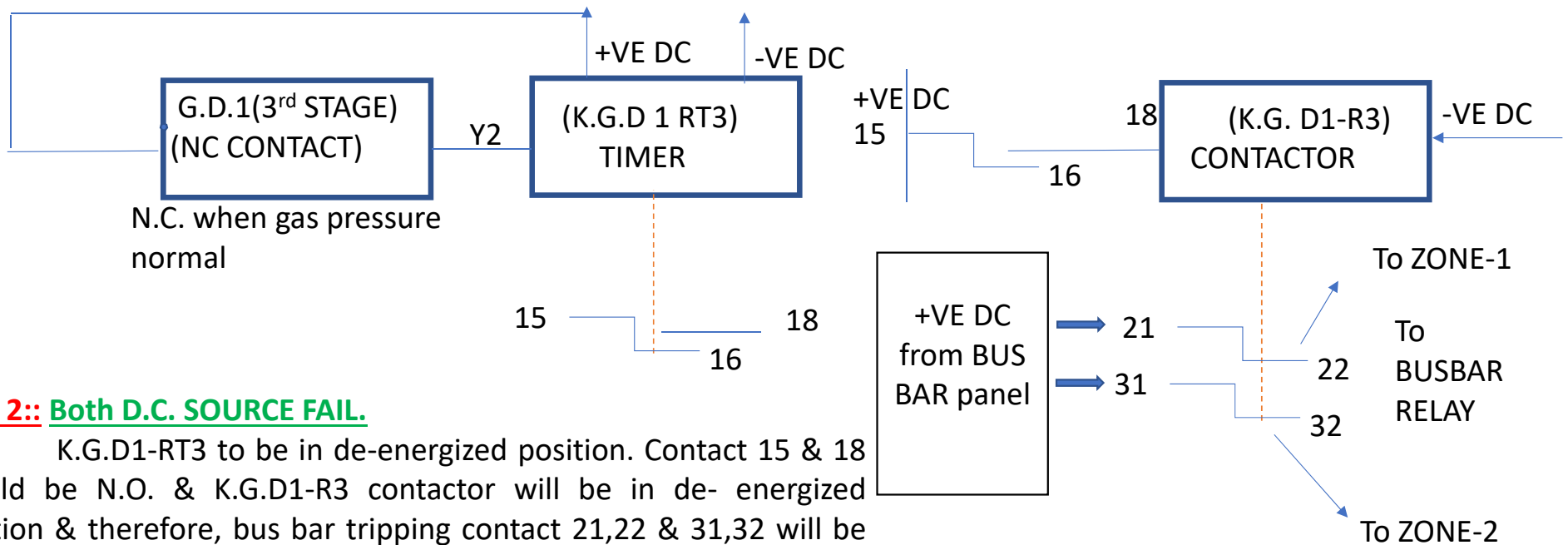


## **Case 1:: Gas Pressure normal & D.C. supply healthy.**

K.G.D1-RT3 TO be in energized position. Contact 15 & 18 should be N.C. & K.G.D1-R3 contactor should be in energized position & therefore, bus bar tripping contact 21,22 & 31,32 will be N.O. & system will run healthy without tripping.



# Why did Busbar Operate on DC Fail

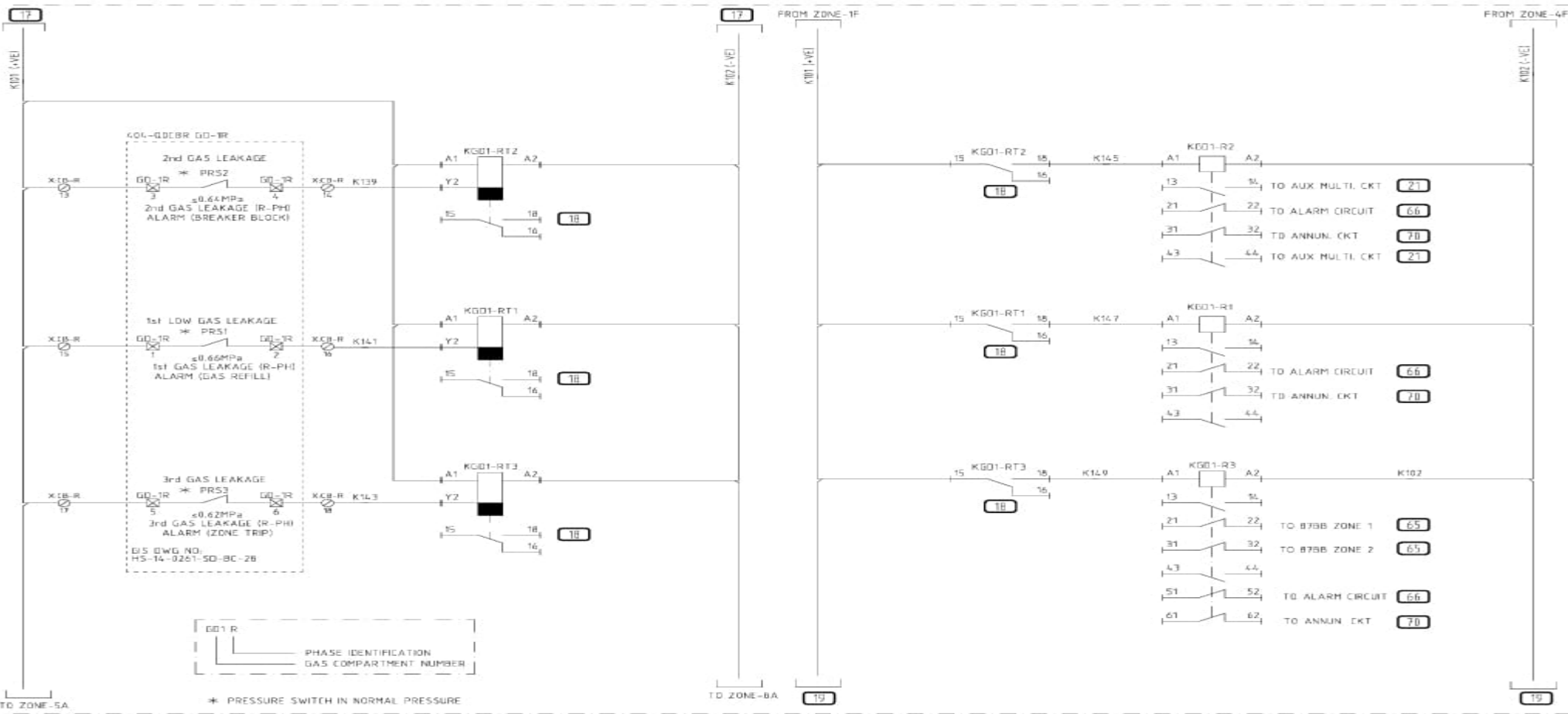


## Case 2:: Both D.C. SOURCE FAIL.

K.G.D1-RT3 to be in de-energized position. Contact 15 & 18 should be N.O. & K.G.D1-R3 contactor will be in de-energized position & therefore, bus bar tripping contact 21,22 & 31,32 will be N.C. & Busbar Relay D.I will become High(Logic-1) and thus led to busbar tripping.

DRAWING ATTACHED

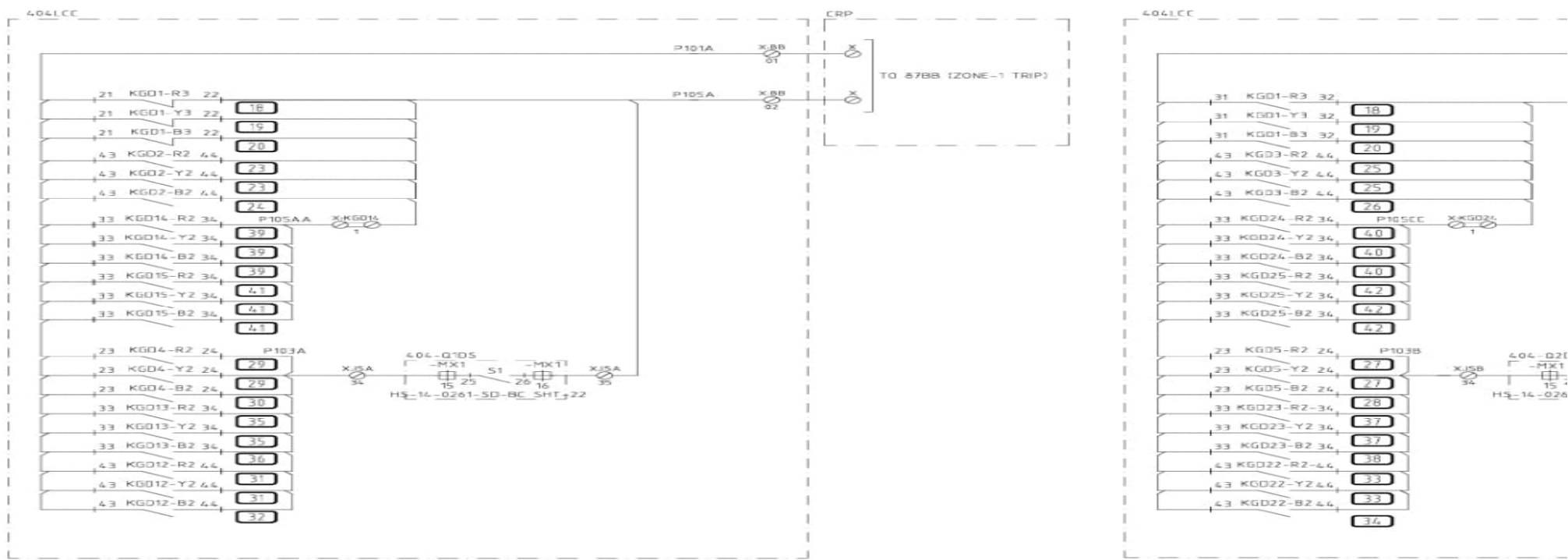




Date	28.10.16	Client:	UPPTCL	<b>SIEMENS</b>	400kV BUS COUPLER & BUSBAR	Sales Reference No.:	3004960164	DWT	400KV BC & BB	Page
Checked	PTR	Substation Name:	400/220/132/33kV GIS, SECTOR-14B		CB R-PH CONTACT MULTI. CIRCUIT	Project Name:	400/220/132/33kV GIS, SECTOR-14B	404		
Appr.	RJP	Contractor:	PISEESIA POWER TR. PVT. LTD		Circuit Diagram	Revision:	0	[4]G719EA-HG9186-01-WC604		

Remarks	Date	Name	Norm.	2	3	4	5	6	Rev

1	2	3	4	5	6



NOTE : X THUS MARKED TBs TO BE CONFIRMED BY CUSTOMER

Client: UPPTCL	Date: 28.10.16	Checked: PTR	Appr: RJP	Substation Name: 400/220/132/33kV GIS, SECTOR-14B	<b>SIEMENS</b>	400KV BUS COUPLER & BUSBAR	Sat#		
Contractor: PISCESIA POWER TR. PVT. LTD				87BB ZONE-1 & ZONE-2 TRIP TO BB PANEL		Prep			
Remarks	Date	Name	Norm.	2	3	4	5	6	Rev

Panel C:\USERS\NIZAM\DESKTOP\SIEMENS\CONVERT\ANALOG\CC\SCHEM\404-87BB\_ZONE-1 & ZONE-2\_TRIP\_TO\_BB\_PANEL.DWG

# Points for discussion to be taken up in 45<sup>th</sup> PSC

- Is there single DC source at Noida Sec-148 S/S?
- No. There are two DC sources at Noida Sec-148 S/S.
- What is the bus bar protection scheme adopted.
- Bus Bar protection operation on Bus differential/LBB, Gas Detector Stage-3 and Both DC source failure.
- In GIS gas detectors whether NO or NC is used?
- Yes. NO or NC are used, in normal condition gas detector contacts remain in close condition .
- Was 400KV Noida Sec-148-Noida Sec 123 line already out?
- No. 400KV Noida Sec-148-Noida Sec 123 line was in charge condition before busbar tripping.
- What remedial measures have been taken?
- Defective cards in battery charger have been changed so that dc failure does not occur again.

THANKING YOU

# Multiple elements tripping at 765/400/220kV Fatehgarh2(PG)

13<sup>th</sup> April 2022, 16:45 hrs

# Tripped elements & Antecedent condition (As reported)

## **Antecedent Condition:**

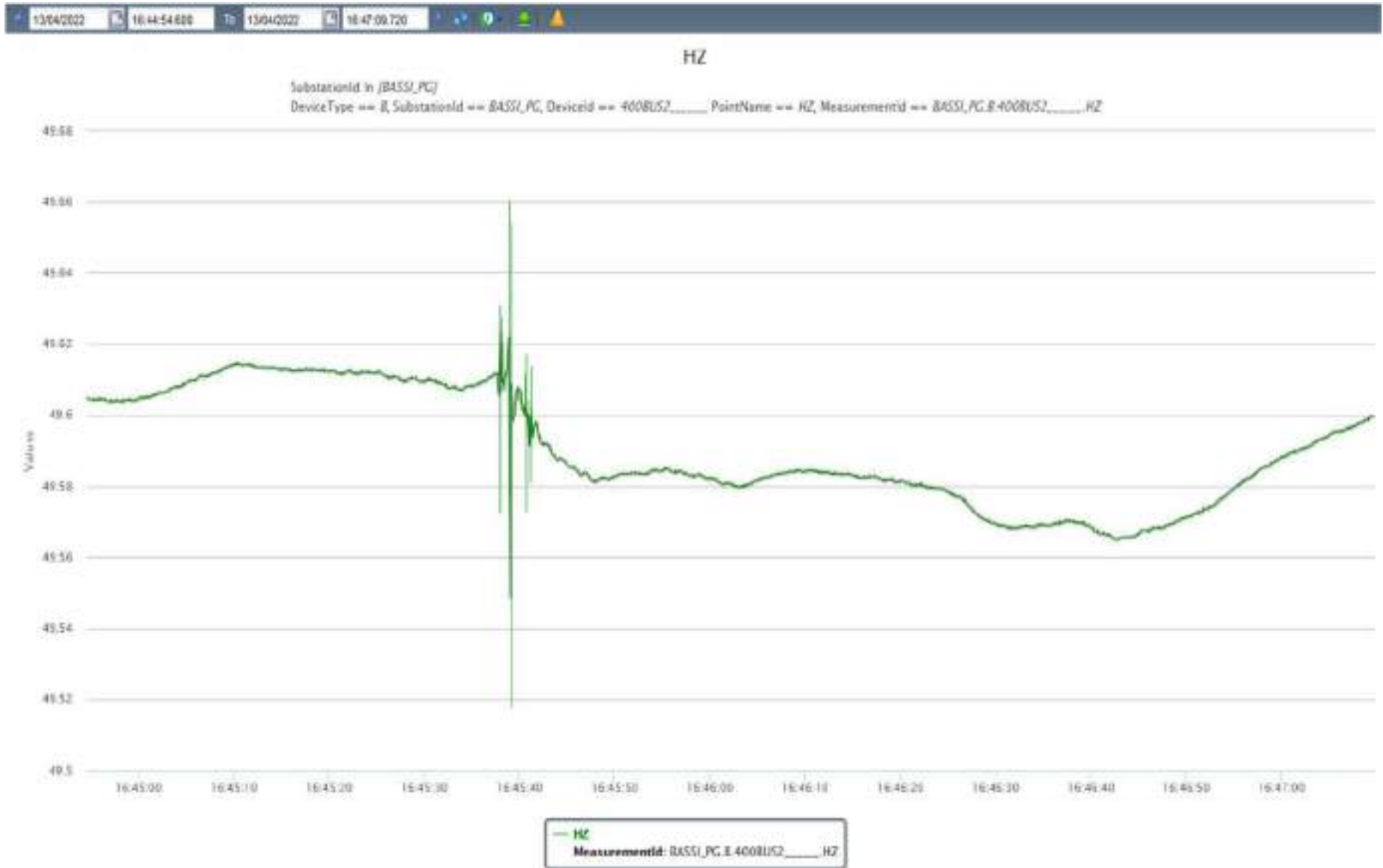
- Weather Conditions: Wind storm
- Grid Frequency (Hz): 49.65
- Total IR Import (MW): 1701
- Northern Region Demand (MW): 49554

## **Tripped Elements:**

- 220 KV Renew SunBright SL\_FGARH\_PG (RSBPL)-Fatehgarh\_II(PG) (RENEW SUN BRIGHT (RSBPL)) Ckt-1
- 220 KV Adani RenewPark\_SL\_FGARH\_FBTL (AREPRL)-AHEJ4L PSS 3 HB\_FGRAH\_FBTL (AHEJ4L) (AREPRL) Ckt-1
- 220 KV Adani RenewPark\_SL\_FGARH\_FBTL (AREPRL)-AHEJ4L PSS 4 HB\_FGRAH\_FBTL (AHEJ4L) (AREPRL) Ckt-1
- 765 KV Bhadla\_2 (PG)-Fatehgarh\_II(PG) (PFTL) Ckt-2
- 765 KV Bhadla\_2 (PG)-Fatehgarh\_II(PG) (PFTL) Ckt-1

# PMU Plot of frequency at Bassi(PG)

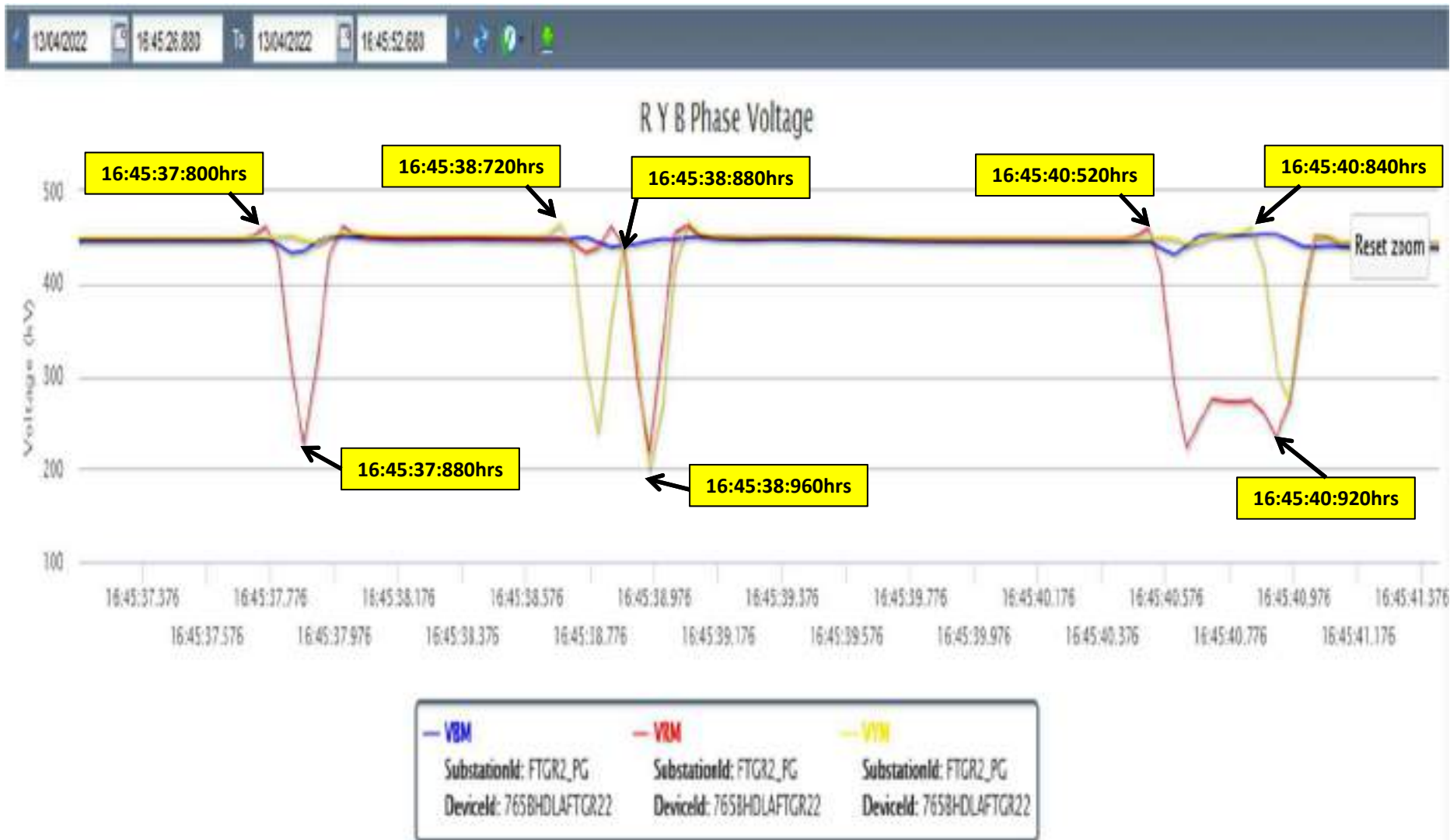
16:45hrs/13-April-22





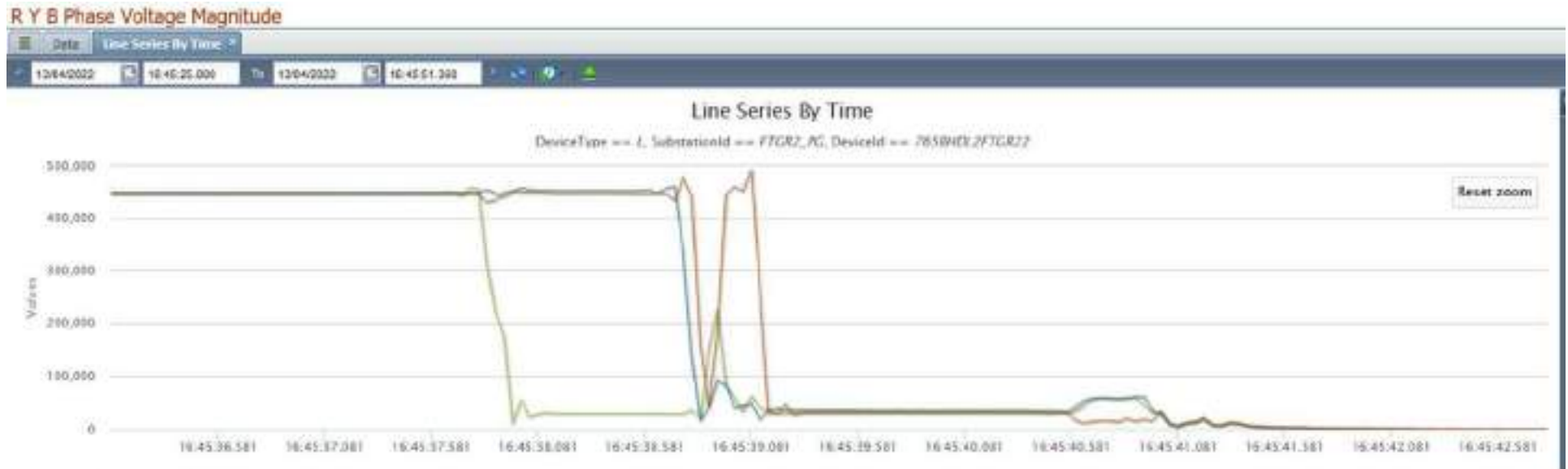
# PMU Plot of phase voltage magnitude at Fatehgarh2 (PG)

16:45hrs/13-April-22



# PMU Plot of phase voltage magnitude 765 kV Bhadla2-Fatehgarh2 – 2

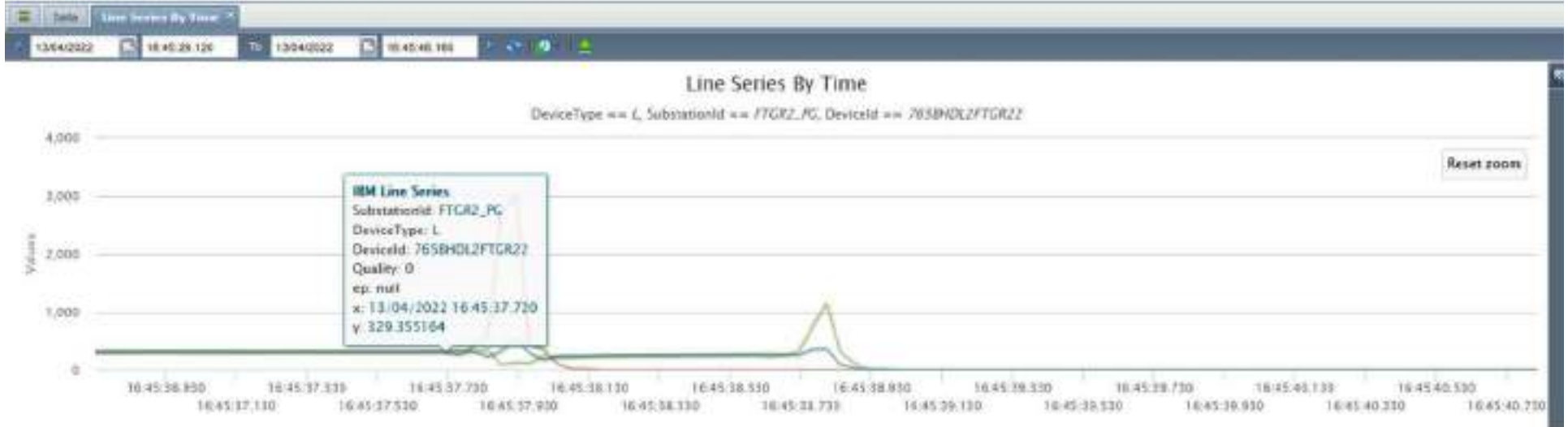
## 16:45hrs/13-April-22



# PMU Plot of phase current magnitude 765 kV Bhadla2-Fatehgarh2 – 2

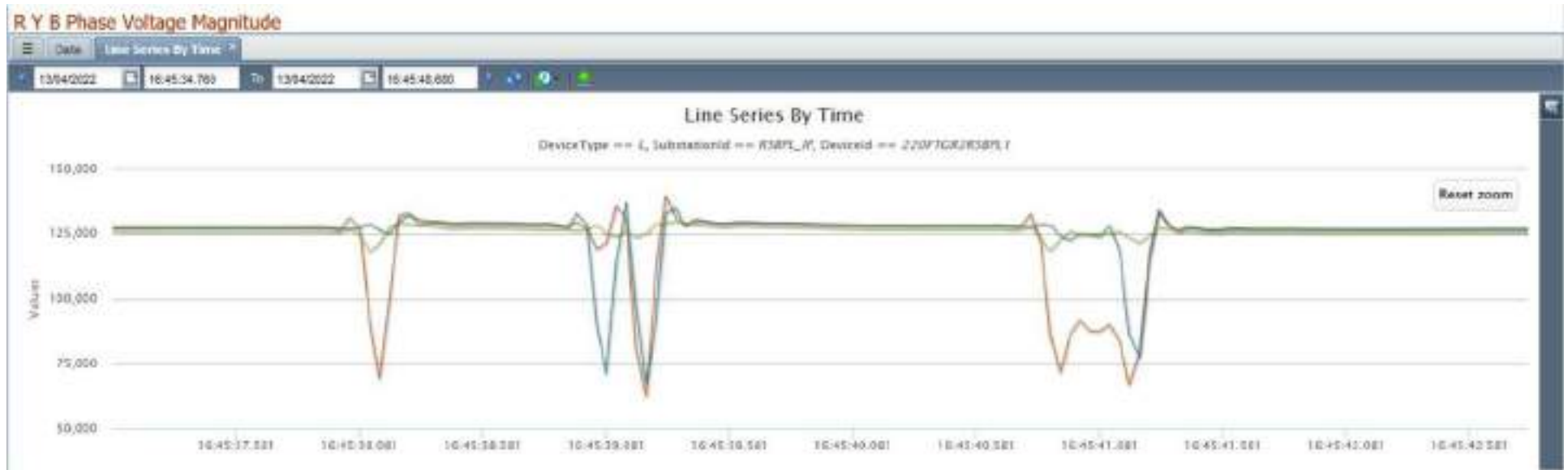
## 16:45hrs/13-April-22

### R Y B Phase Current



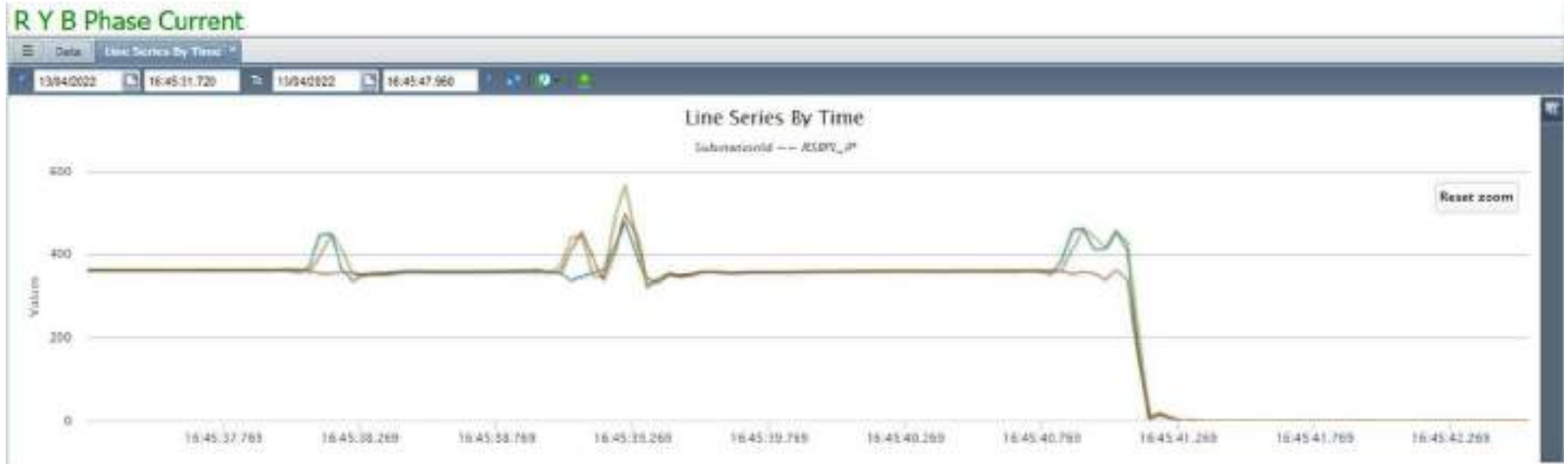
# PMU Plot of phase Voltage magnitude 220 kV Fatehgarh2-RSBPL-1

## 16:45hrs/13-April-22



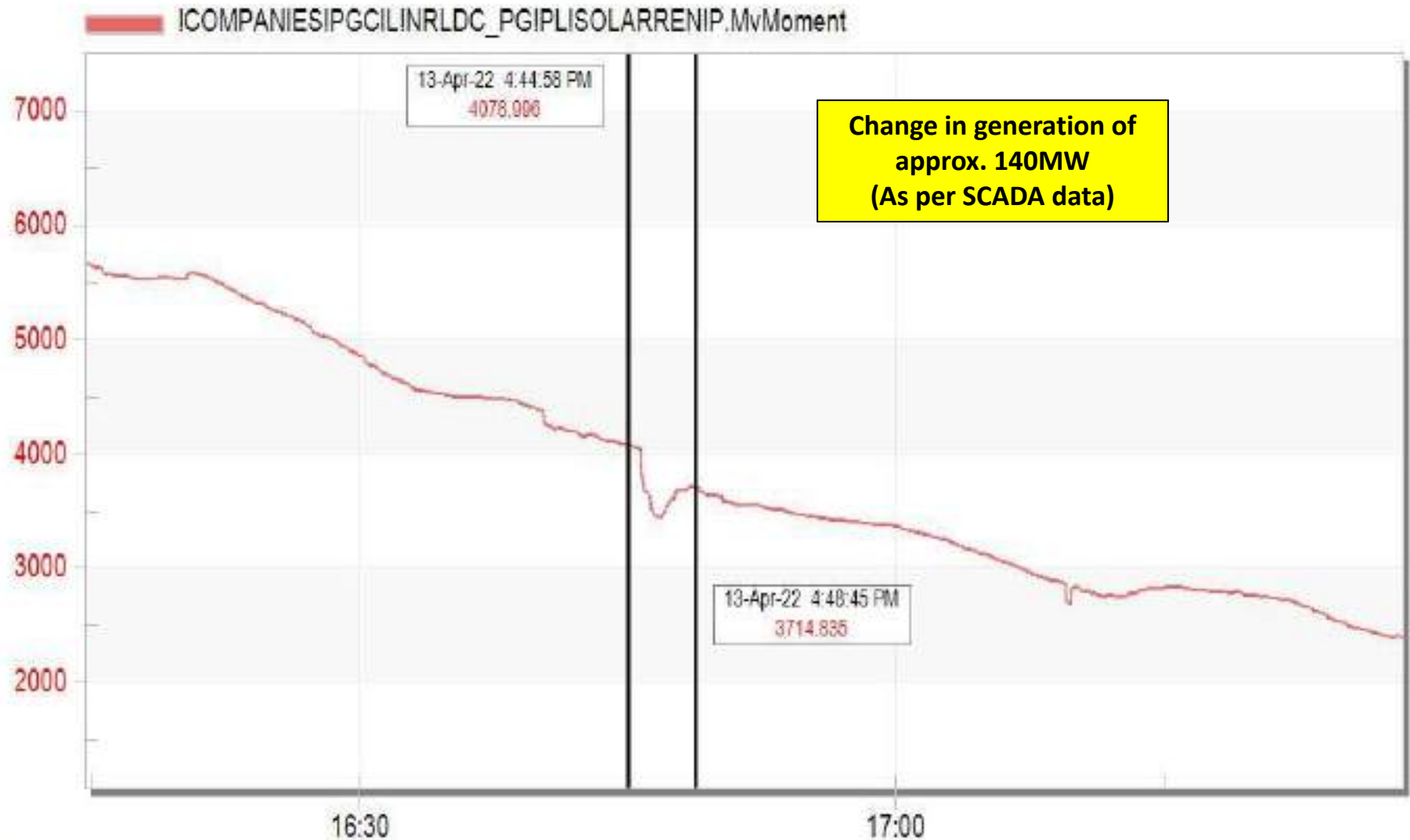
# PMU Plot of phase current magnitude 220 kV Fatehgarh2-RSBPL-1

## 16:45hrs/13-April-22



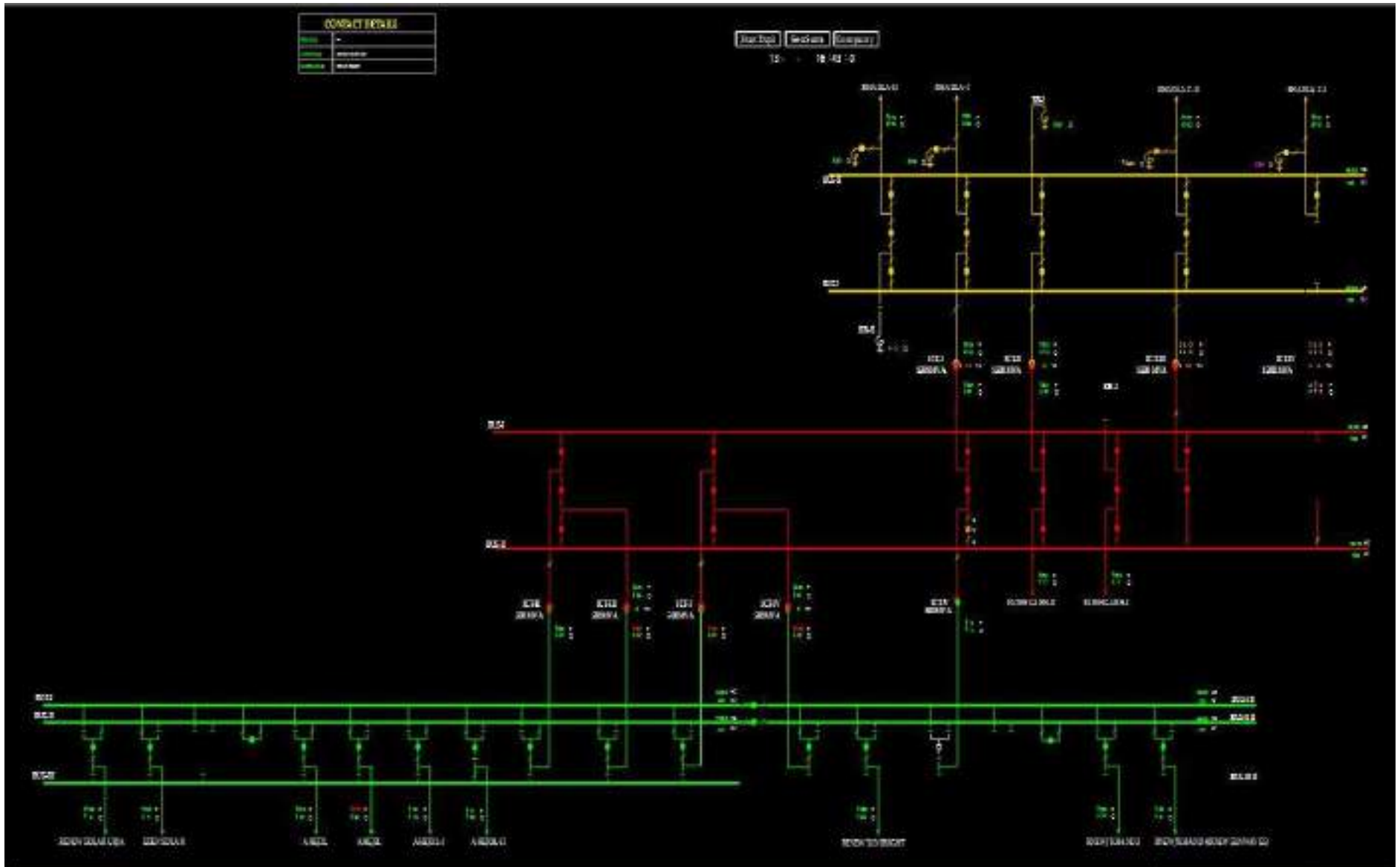
# NR Total Solar generation during the tripping

## Solar Generaton



Apr 13 Wed 2022

# SLD of 765/400/220kV Fatehgarh2(PG)



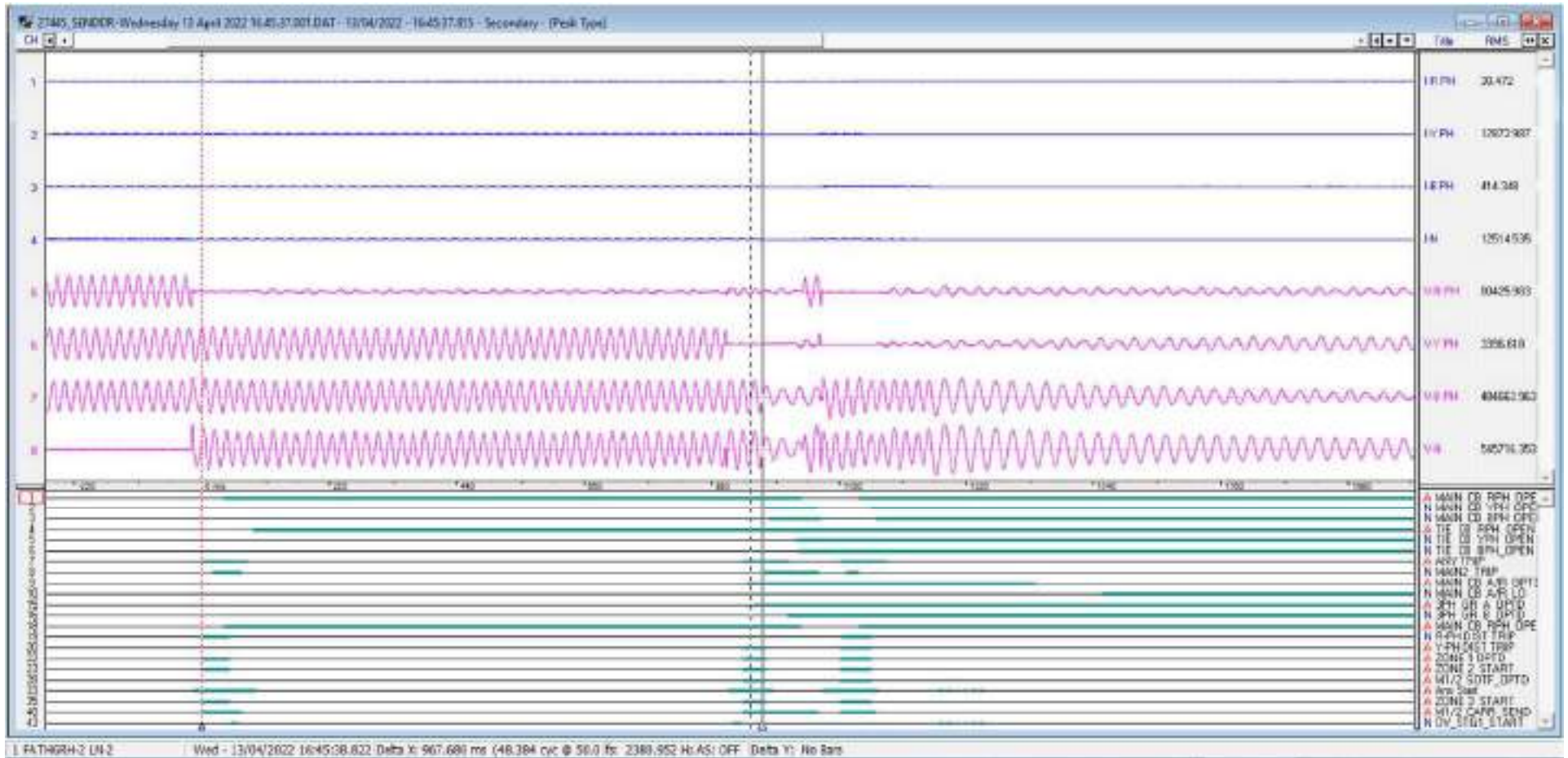
Wed April 13 2022 16:43:00

# SCADA SOE

Time	Station Name	Voltage(kV)	Element Name	Element Type	Element Status	Remark
16:45:37,889	BHDL2_P	765	10FTGR22	Circuit Breaker	disturbe	
16:45:37,890	BHDL2_P	765	11TIE	Circuit Breaker	disturbe	
16:45:37,930	FTGR2_P	765	18BDLA22	Circuit Breaker	disturbe	
16:45:37,930	FTGR2_P	765	17TIE	Circuit Breaker	disturbe	
16:45:38,824	FTGR2_P	765	17TIE	Circuit Breaker	Open	Tie CB at Fatehgarh2 end of 765 KV Bhadla_2 (PG)-Fatehgarh_II(PG) (PFTL) Ckt-2 opened
16:45:38,825	FTGR2_P	765	18BDLA22	Circuit Breaker	Open	Main CB at Fatehgarh2 end of 765 KV Bhadla_2 (PG)-Fatehgarh_II(PG) (PFTL) Ckt-2 opened
16:45:38,831	BHDL2_P	765	10FTGR22	Circuit Breaker	Open	Main CB at Bhadla2 end of 765 KV Bhadla_2 (PG)-Fatehgarh_II(PG) (PFTL) Ckt-2 opened
16:45:38,831	BHDL2_P	765	11TIE	Circuit Breaker	Open	Tie CB at Bhadla2 end of 765 KV Bhadla_2 (PG)-Fatehgarh_II(PG) (PFTL) Ckt-2 opened
16:45:38,938	BHDL2_P	765	10FTGR22	Circuit Breaker	Close	Main CB at Bhadla2 end of 765 KV Bhadla_2 (PG)-Fatehgarh_II(PG) (PFTL) Ckt-2 closed
16:45:39,016	BHDL2_P	765	10FTGR22	Circuit Breaker	Open	Main CB at Bhadla2 end of 765 KV Bhadla_2 (PG)-Fatehgarh_II(PG) (PFTL) Ckt-2 opened
16:45:40,653	BHDL2_P	765	07FTGR21	Circuit Breaker	Open	Main CB at Bhadla2 end of 765 KV Bhadla_2 (PG)-Fatehgarh_II(PG) (PFTL) Ckt-1 opened
16:45:40,653	BHDL2_P	765	08TIE	Circuit Breaker	Open	Tie CB at Bhadla2 end of 765 KV Bhadla_2 (PG)-Fatehgarh_II(PG) (PFTL) Ckt-1 opened
16:45:40,815	AFSPS_I	220	05AWPS3	Circuit Breaker	Open	Line CB of 220kV AFSPS-AWPS III opened
16:45:40,842	AFSPS_I	220	04AWPS4	Circuit Breaker	Open	Line CB of 220kV AFSPS-AWPS IV opened
16:45:40,872	RSBPL_I	220	FTGR2	Circuit Breaker	Open	Line CB at Renew Sunbright end of 220kV farehgarh2-Renew Sunbright Solar opened
16:45:40,981	FTGR2_P	765	21BDLA21	Circuit Breaker	Open	Main CB at Fatehgarh2 end of 765 KV Bhadla_2 (PG)-Fatehgarh_II(PG) (PFTL) Ckt-1 opened



# DR of 765 KV Bhadla\_2 (PG)-Fatehgarh\_II(PG) (PFTL) Ckt-2



1. R-Phase to earth fault, FC-13 kA
2. AR attempted but Y-Phase to earth fault appeared, FC-12 kA.

# Observations

1. RSBPL side DR not submitted.
2. Issue of mismatch of phase RYB (current plot) in PMU?
3. Tripping of other line?
4. Exact location of fault?

# **Multiple elements tripping at 400/220kV Harduaganj(UP)**

25<sup>th</sup> April 2022, 22:38 hrs

# **Tripped elements & Antecedent condition (As reported)**

## **Antecedent Condition:**

- 400/220 kV 315 MVA ICT 2 at Harduaganj was under shutdown.
- Weather Conditions: Inclement weather condition
- Grid Frequency (Hz): 49.83
- Total IR Import (MW): 6859
- Northern Region Demand (MW): 50741

## **Tripped Elements:**

- 110 MW Harduaganj-C TPS – UNIT - 7
- 400/220 kV 315 MVA ICT - 1 at Harduaganj (UP)
- 250 MW Harduaganj-D TPS - UNIT 8
- 250 MW Harduaganj-D TPS - UNIT 9
- 220kV Harduaganj-Khurj (UP) ckt-2
- 220kV Harduaganj-Khurj (UP) ckt-1
- 220kV Harduaganj-Jahangirabad (UP) ckt-1
- 220kV Harduaganj-Sikandra Rao (UP) ckt-1
- 220kV Harduaganj-Boner ckt-1
- 220kV Harduaganj-Atrli ckt-1
- 220kV Harduaganj-Rukhi ckt-1
- 220kV Harduaganj-Etah ckt-1

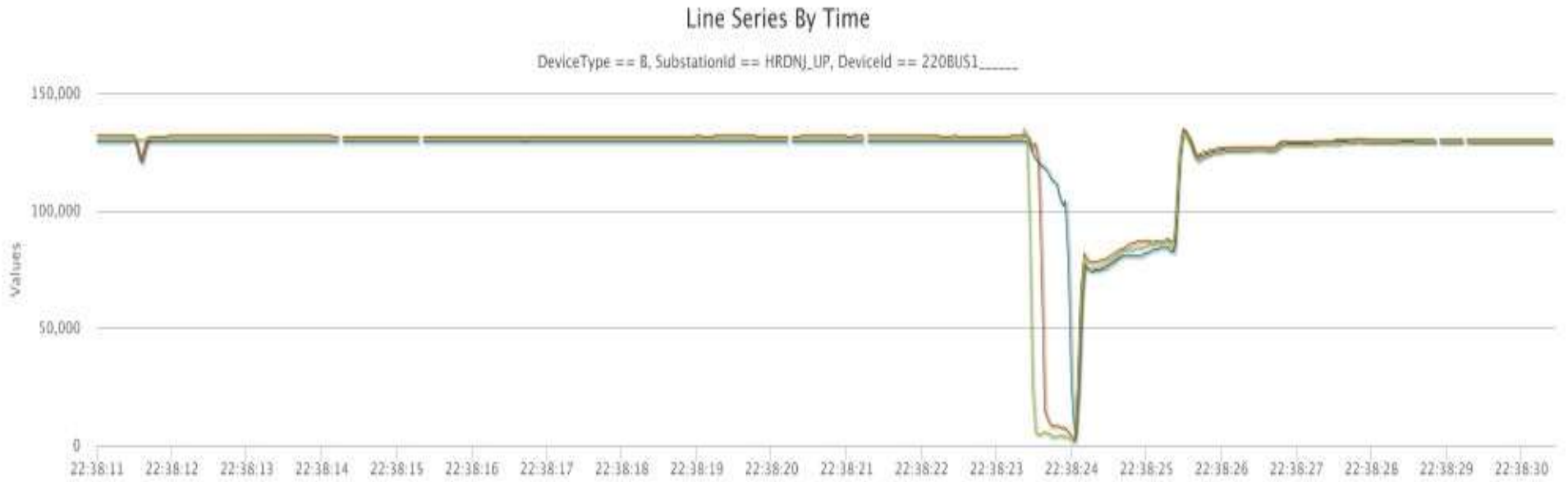
# PMU Plot of frequency at Bassi(PG)

22:38hrs/25-April-22



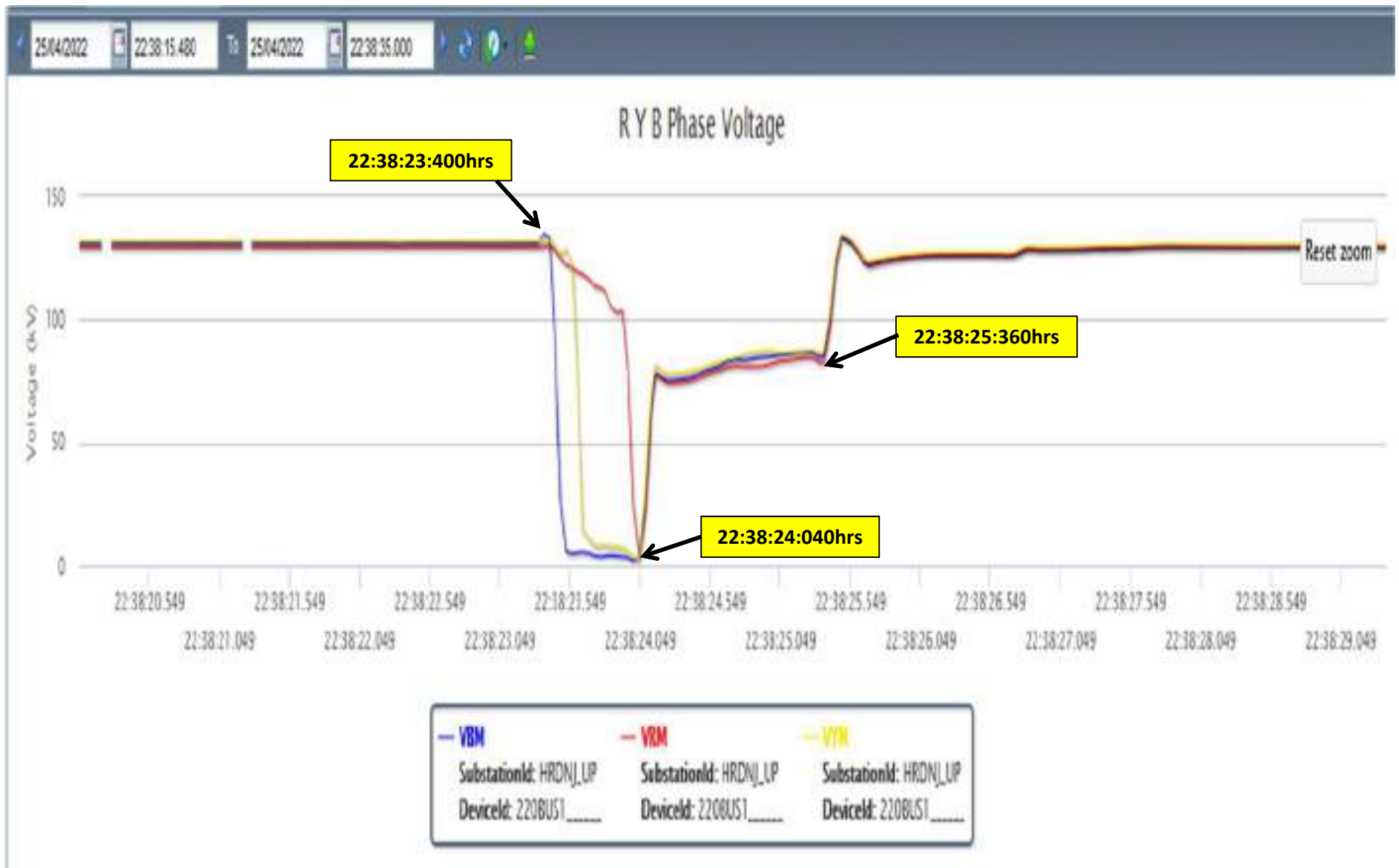
# PMU Plot of phase voltage magnitude at Harduaganj(UP)

22:38hrs/25-April-22



# PMU Plot of phase voltage magnitude at Harduaganj(UP)

22:38hrs/25-April-22



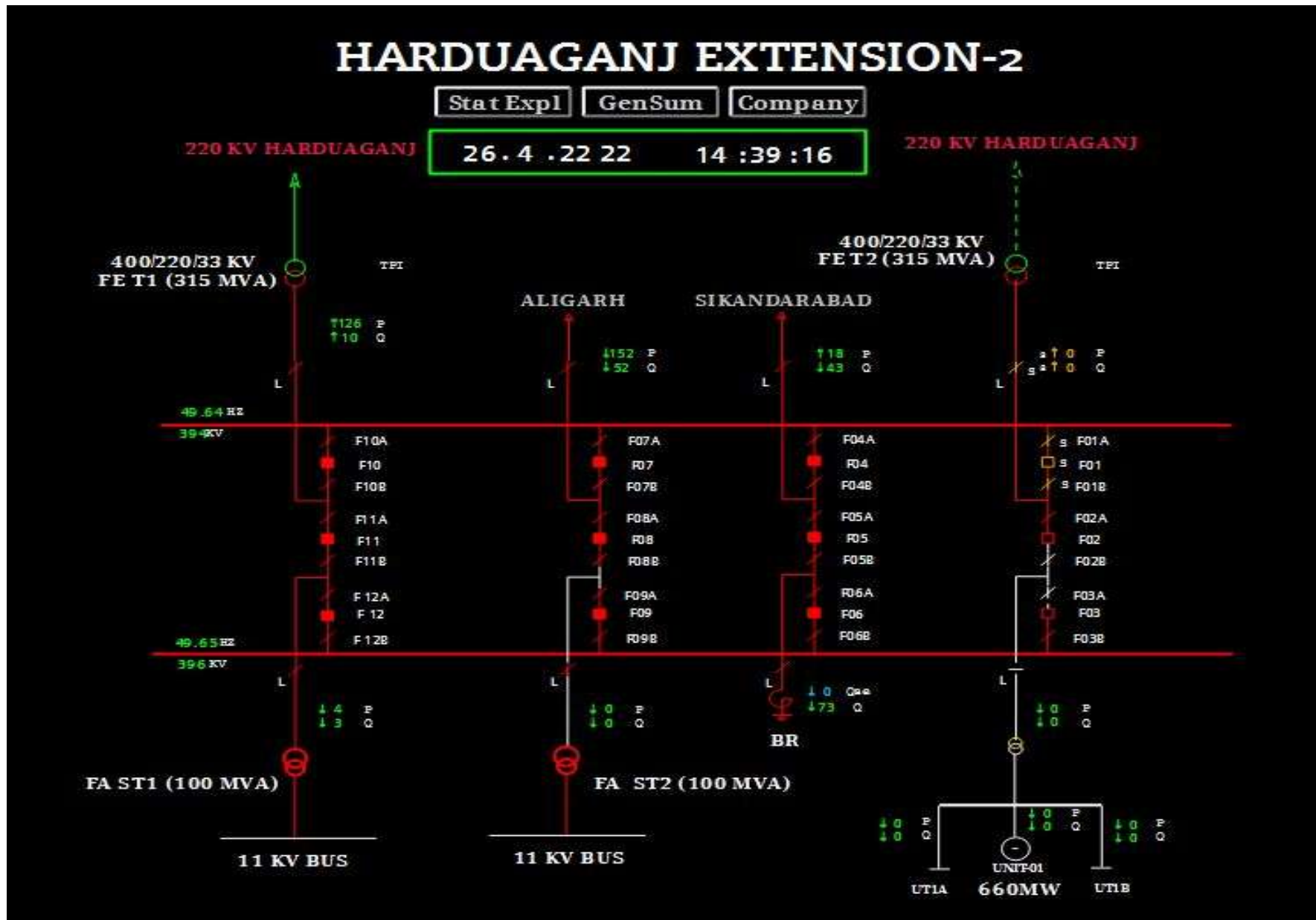
# PMU Plot of phase current magnitude Atroli – Harduaganj Line

22:38hrs/25-April-22

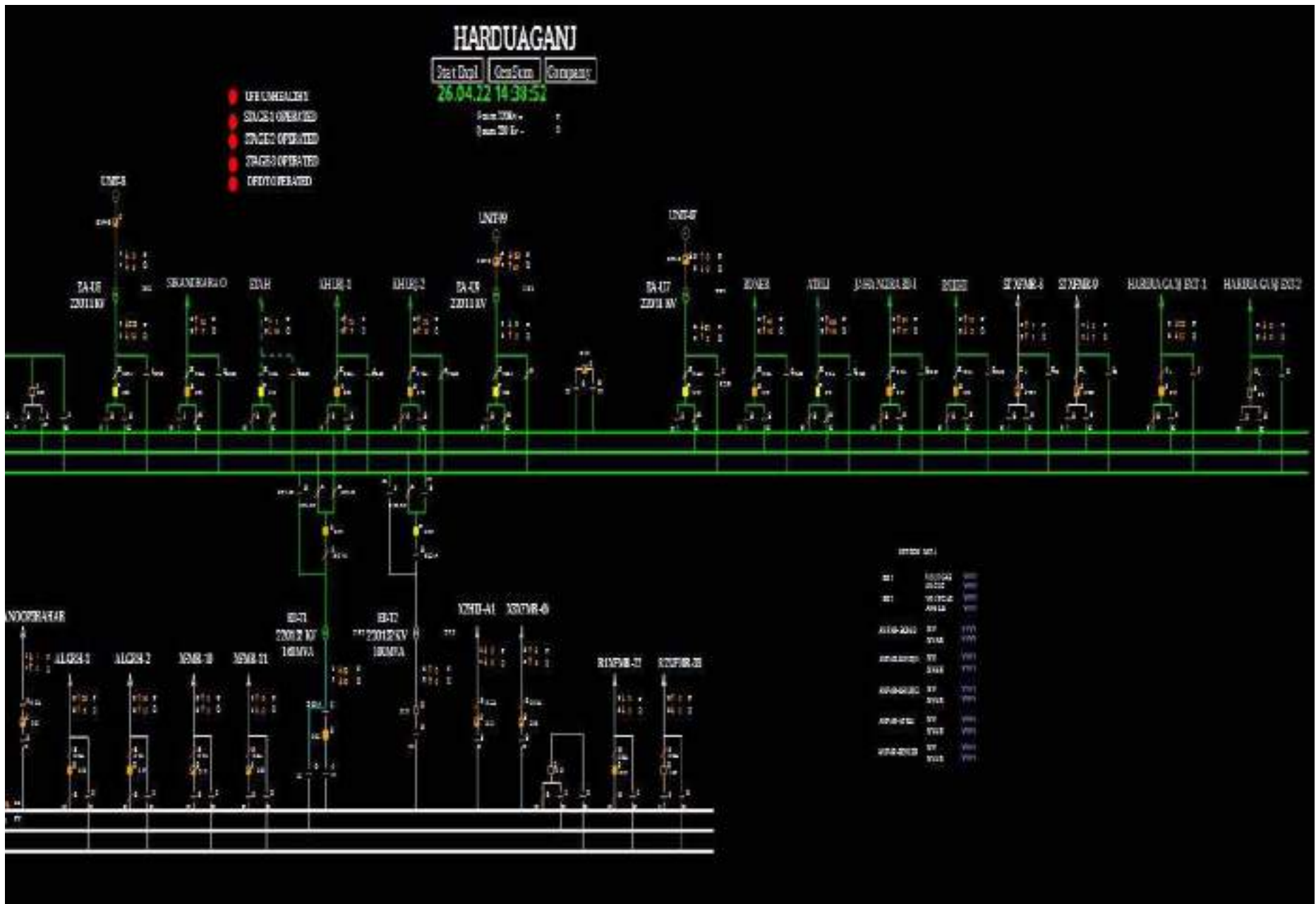




# SLD of 400kV Harduaganj(UP)

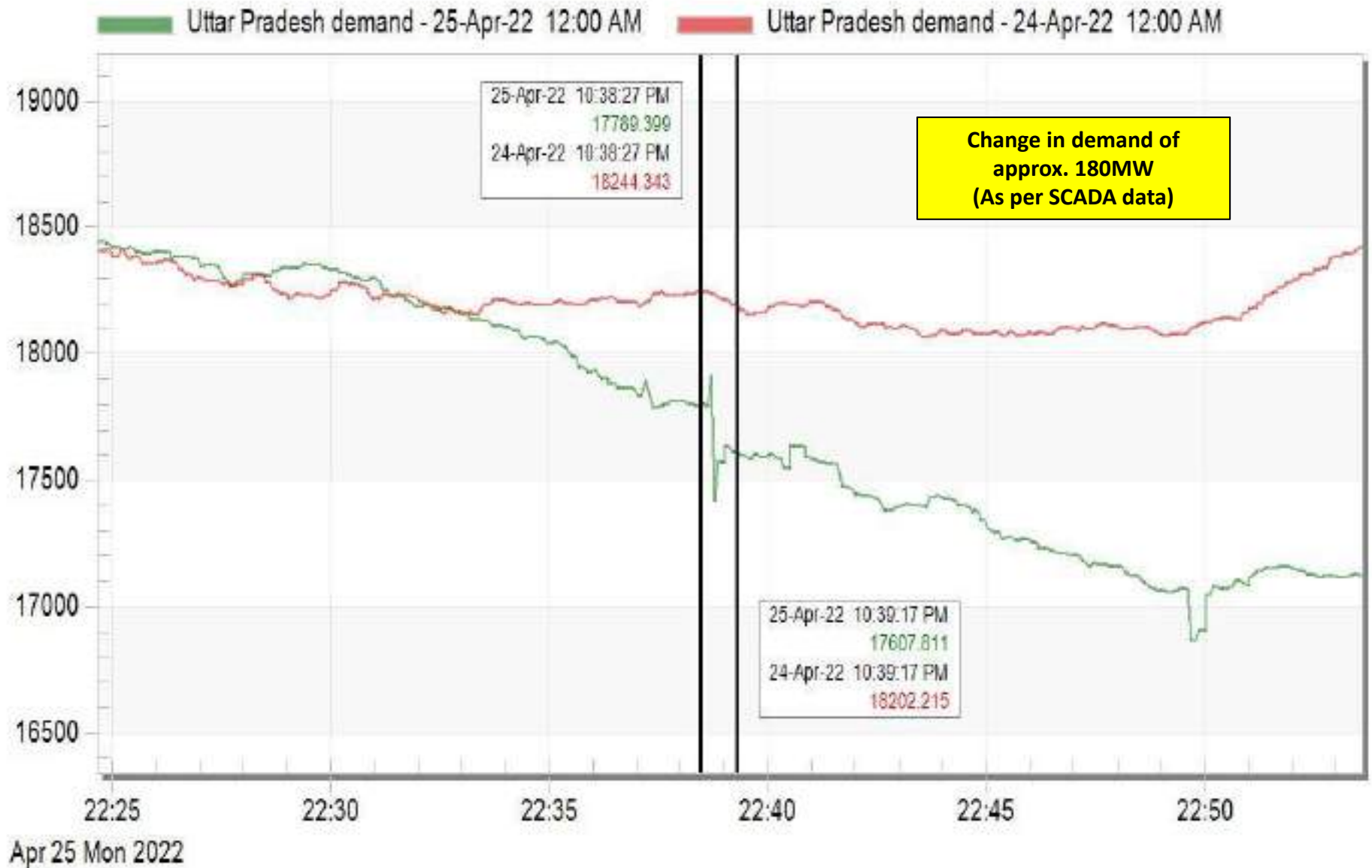


# SLD of 220kV Harduaganj(UP)

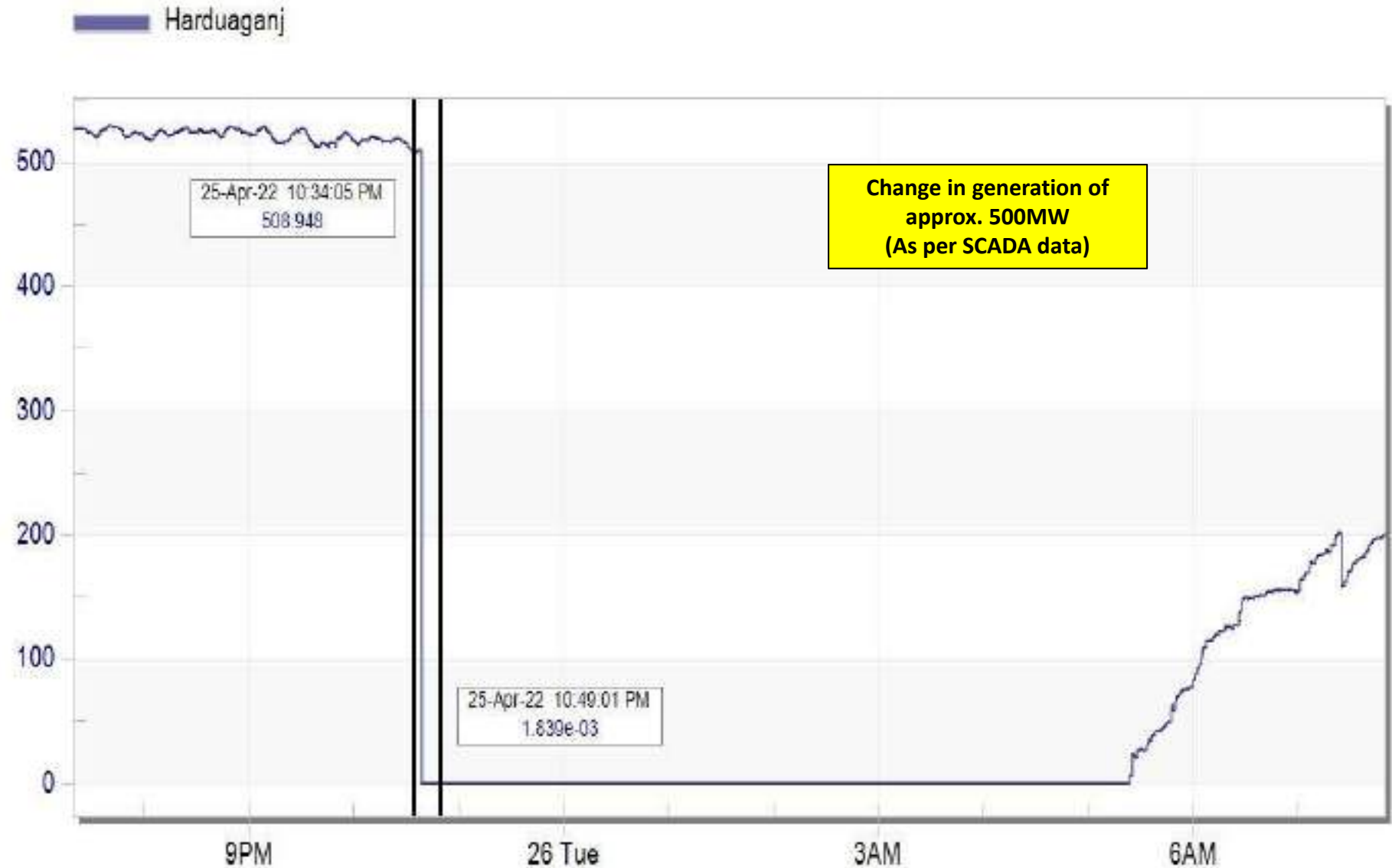


# Uttar Pradesh demand during the tripping

Uttar Pradesh Demand



# Harduaganj TPS generation during the tripping



Apr 25 Mon 2022

# SCADA SOE

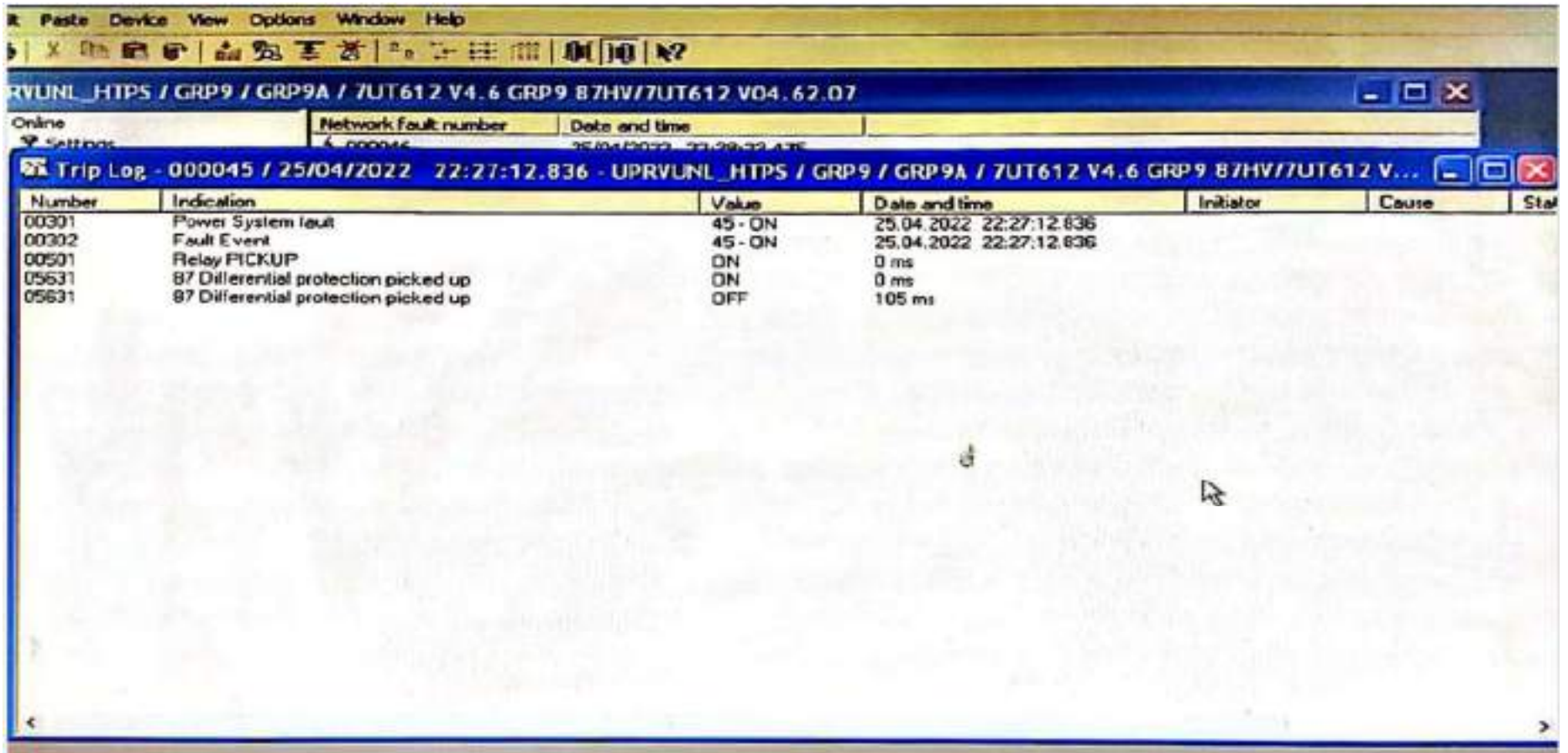
Time	Station Name	Voltage	Element Name	Element Type	Element Status	Remark
22:38:23,418	HRDNJ_UP	220kV	10KHURJ2	Circuit Breaker	Open	Line CB at Harduaganj end of 220kV Harduaganj-Khurj ckt-2 opened
22:38:23,424	HRDNJ_UP	220kV	23JHNGR1	Circuit Breaker	Open	Line CB of 220kV Harduaganj-Jahangirabad ckt-1 opened
22:38:23,446	HRDNJ_UP	220kV	08KHURJ1	Circuit Breaker	Open	Line CB at Harduaganj end of 220kV Harduaganj-Khurj ckt-1 opened
22:38:23,460	HRDNJ_UP	220kV	03SKRAO	Circuit Breaker	Open	Line CB of 220kV Harduaganj-Sikandra Rao ckt-1 opened
22:38:23,463	KHURJ_UP	220kV	04HRDNJ2	Circuit Breaker	Open	Line CB at Khurj end of 220kV Harduaganj-Khurj ckt-2 opened
22:38:23,465	KHURJ_UP	220kV	03HRDNJ1	Circuit Breaker	Open	Line CB at Khurj end of 220kV Harduaganj-Khurj ckt-1 opened
22:38:23,585	HRDNJ_UP	220kV	21BONER	Circuit Breaker	disturbe	
22:38:23,838	HRDNJ_UP	220kV	15MBC	Circuit Breaker	disturbe	
22:38:24,866	HDJE2_U	400kV	07TF1	Circuit Breaker	Open	Main CB at 400kV side of 400/220 kV 315 MVA ICT 1 at Harduaganj (UP) opened
22:38:24,872	HDJE2_U	400kV	08TIE	Circuit Breaker	Open	Tie CB at 400kV side of 400/220 kV 315 MVA ICT 1 at Harduaganj (UP) opened
22:38:25,173	HRDNJ_UP	220kV	12T1	Circuit Breaker	Open	CB at 220kV side of 400/220 kV 315 MVA ICT 1 at Harduaganj (UP) opened

# DR of 250 MW Unit - 8

Number	Indication	Value	Date and time	Initiator	Cause	Sta
00301	Power System fault	80 - ON	25.04.2022 22:38:23.480			
00302	Fault Event	80 - ON	25.04.2022 22:38:23.480			
00501	Relay PICKUP	ON	0 ms			
01761	Time Overcurrent picked up	ON	0 ms			
01764	Time Overcurrent Phase L3 picked up	ON	0 ms			
01810	I> picked up	ON	0 ms			
00511	Relay GENERAL TRIP command	ON	98 ms			
01791	Time Overcurrent TRIP	ON	98 ms			
01815	I> TRIP	ON	98 ms			
00533	Primary fault current IL1	1.43 kA	128 ms			
00534	Primary fault current IL2	0.53 kA	128 ms			
00535	Primary fault current IL3	3.00 kA	128 ms			
01764	Time Overcurrent Phase L3 picked up	OFF	153 ms			
01810	I> picked up	OFF	153 ms			
01761	Time Overcurrent picked up	OFF	153 ms			
00301	Power System fault	80 - OFF	25.04.2022 22:38:23.634			

Overcurrent protection operated fault current of 1.43 kA in R – Phase and 3 kA in B - Phase.

# DR of 250 MW Unit - 9

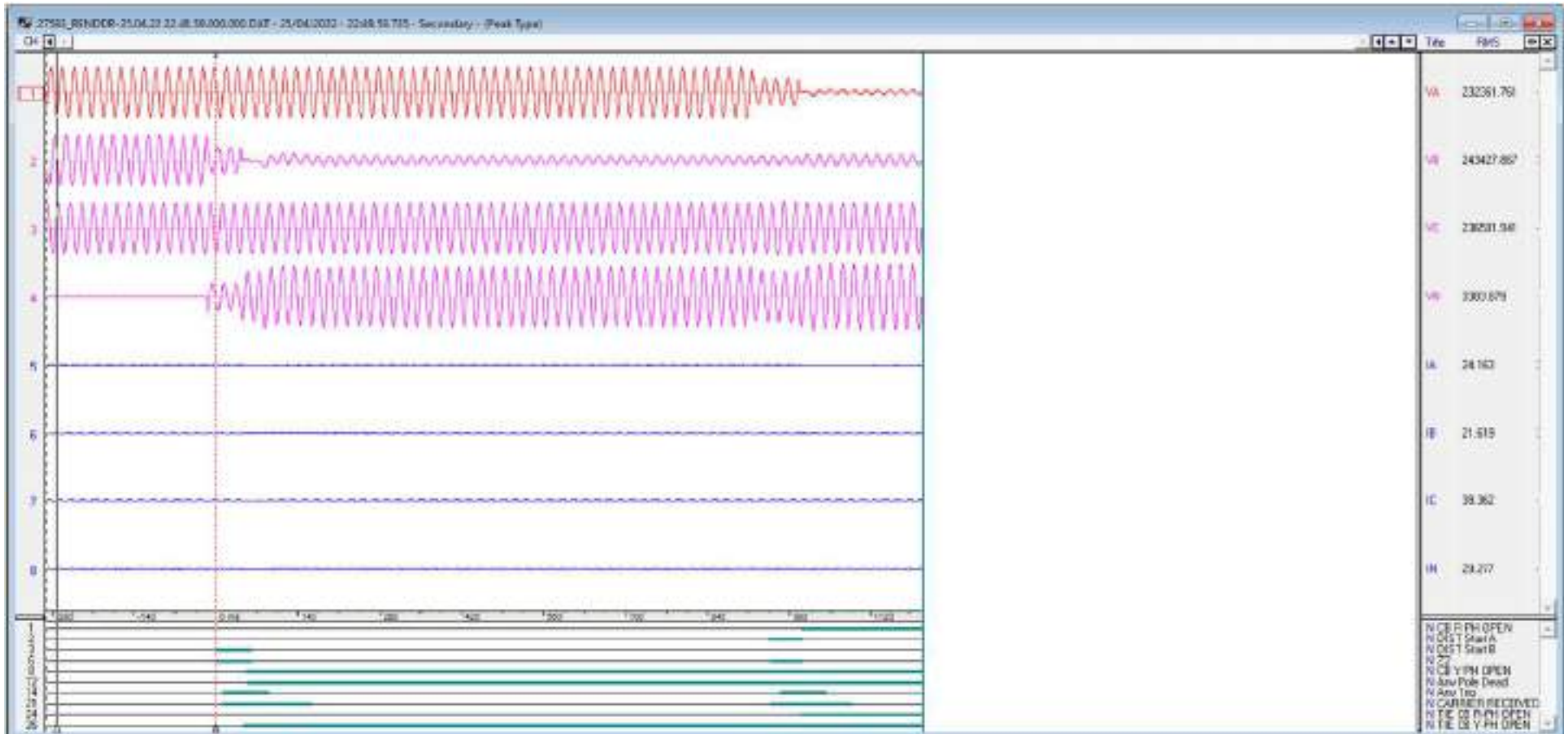


The screenshot displays a SCADA interface window titled "Trip Log - 000045 / 25/04/2022 22:27:12.836 - UPRVUNL\_HTPS / GRP9 / GRP9A / 7UT612 V4.6 GRP9 87HV/7UT612 V...". The window contains a table with the following data:

Number	Indication	Value	Date and time	Initiator	Cause	Stat
00301	Power System fault	45 - ON	25.04.2022 22:27:12.836			
00302	Fault Event	45 - ON	25.04.2022 22:27:12.836			
00501	Relay PICKUP	ON	0 ms			
05631	87 Differential protection picked up	ON	0 ms			
05631	87 Differential protection picked up	OFF	105 ms			

87 Differential Protection Start.

# DR of 400 kV Harduaganj – Aligarh(End) Line



1. Time sync faulty.
2. Y-Phase fault evident. Zone-2, Carrier receive.
3. AR attempted but unsuccessful.



# DR of 400 kV Harduaganj(End)– Aligarh Line

Channel Number	Name	Status	Time
22	PHS-STFWL2	On	25-04-2022 22:20:36.260
24	PHS-STFWPE	On	25-04-2022 22:20:36.260
14	ZM03-START	On	25-04-2022 22:20:36.263
42	TUV1-START	On	25-04-2022 22:20:36.265
44	TOV1-START	On	25-04-2022 22:20:36.265
1	TRIP1_TRIP	On	25-04-2022 22:20:36.266
3	TRIP1_L2	On	25-04-2022 22:20:36.266
5	TRIP2_TRIP	On	25-04-2022 22:20:36.266
7	TRIP2_L2	On	25-04-2022 22:20:36.266
9	ZM01-TRIP	On	25-04-2022 22:20:36.266
10	ZM01-START	On	25-04-2022 22:20:36.266
12	ZM02-START	On	25-04-2022 22:20:36.266
26	ZOOM_CS	On	25-04-2022 22:20:36.266
38	TEF-START	On	25-04-2022 22:20:36.273
77	MAIN CB CL	Off	25-04-2022 22:20:36.282
79	TIE CB CLOSE	Off	25-04-2022 22:20:36.287
38	TEF-START	Off	25-04-2022 22:20:36.306
22	PHS-STFWL2	Off	25-04-2022 22:20:36.323
24	PHS-STFWPE	Off	25-04-2022 22:20:36.323
9	ZM01-TRIP	Off	25-04-2022 22:20:36.338
10	ZM01-START	Off	25-04-2022 22:20:36.338
12	ZM02-START	Off	25-04-2022 22:20:36.338
14	ZM03-START	Off	25-04-2022 22:20:36.338
44	TOV1-START	Off	25-04-2022 22:20:36.354
26	ZOOM_CS	Off	25-04-2022 22:20:36.368
60	TIE_PREP3P_TR	On	25-04-2022 22:20:36.369
59	MAIN_PREP3P_T	On	25-04-2022 22:20:36.404
1	TRIP1_TRIP	Off	25-04-2022 22:20:36.419

Main-I

Trip Log - 000117 / 25-04-2022 22:20:36.257 - HARDUAGANJ\_REV01 / 400KV / 407 / AA1C1007FN2/7SA522 V04.74.02

Number	Indication	Value	Date and time	Cause	State
00301	Power System fault	117 - CN	25.04.2022 22:20:36.257		
00302	Fault Event	117 - CN	25.04.2022 22:20:36.257		
03684	Distance Pickup L2E	ON	0 ms		
03702	Distance Loop L2E selected forward	ON	0 ms		
03803	Distance TRIP command - Only Phase L2	ON	0 ms		
04056	Dis. Telep. Carrier SEND signal	ON	1 ms		
00534	Primary fault current IL2	8.57 kA	2 ms		
01335	Earth fault protection Trip is blocked	ON	14 ms		
01358	E/F picked up FORWARD	ON	16 ms		
01337	E/F phase selector L2 selected	ON	16 ms		
01357	E/F 3I0p PICKED UP	ON	16 ms		
10240	Uph-e- Pickup	ON	20 ms		
10242	Uph-e-(+) Pickup L1	ON	20 ms		
10244	Uph-e-(+) Pickup L3	ON	20 ms		
00562	Single pole open detected in L2	ON	54 ms		
14083	E/F 3I0p is blocked	ON	54 ms		
01332	Earth fault protection is BLOCKED	ON	54 ms		
03671	Distance PICKED UP	OFF	55 ms		
03702	Distance Loop L2E selected forward	OFF	56 ms		
01337	E/F phase selector L2 selected	OFF	56 ms		

Main-II

[Station EL](#)

1. Time sync faulty.
2. Y-Phase fault evident. Zone-1 trip.
3. AR attempted but unsuccessful.

# Observations

1. Reason for voltage dip at 22:38:11
2. Status of 220 kV Bus bar protection at Harduaganj.
3. DRs for 22:28:00 events.
4. Why ICT-2 did not trip on O/C, E/F
5. Weather 400 kV Harduaganj – Aligarh also tripped during said event.
6. Why fault is coming in Zone-1 for Harduaganj-Khurja from Khurja end.
7. Why Harduaganj - Atroli and Hraduaganj – Jhangirabad did not trip. PMU showing HDJ-ATRL tripped.
8. What are O/C E/F settings of ICTs.
9. Time sync and relay nomenclature issues.
10. DR to be sent in cfg format only.

**DETAILED ANALYSIS REPORT OF  
MULTIPLE TRIPPING OCCURRED AT  
220KV HARDUAGANJ**

**TIME AND DATE OF EVENT**

**:22:38 Hrs 25.04.2022**

# BRIEF SUMMARY

- At 22:28Hrs of dated 25.04.2022, a heavy storm observed & simultaneously heavy voltage dip with sound take place & 220kV Harduaganj-Rukhi line & ST-10 tripped. Again at 22:38Hrs a heavy voltage dip observed resulting Unit#7, 8 & 9 tripped & all the 220kV connected lines 400kV/220kV, 315MVA ICT-I also tripped causing 220kV Bus-II to get dead. 220kV /132kV, 160MVA ICT-I & 400kV /200kV, 315MVA ICT-II remained intact & 220kV Bus-I remained charged.
- Generation Loss:555MW

# NAME AND TIME OF THE TRIPPED ELEMENT ALONG WITH RESTORATION TIME AND FLAG

NAME OF ELEMENT	RESTORATION DATE	RESTORATION TIME	FLAGS END 1 (INCLUDING A/R)
Unit#7	25.04.22	03:12	Master Fuel Trip
Unit#8	25.04.22	05:24	GT O/C
Unit#9		Under B/D	GT O/C
ST#8		Not tripped	Not tripped
ST#9	25.04.22	04:00	Not tripped
400kV /220kV, 315MVA ICT-I	25.04.22	03:58	Back up E/F
400kV /220kV, 315MVA ICT-II		Not tripped	Not tripped
220kV/1332kV, 160MA ICT-I		Not tripped	Not tripped
220kV/1332kV, 160MA ICT-IIs		Under B/D	
220kV Harduaganj-Khurja-I	25.04.22	23:58	Reverse Zone

220kV Harduaganj-Khurja-II	25.04.22	04:01	Reverse Zone
220kV Harduaganj-Sikandra Rao	25.04.22	12:09	Reverse Zone
220kV Harduaganj -Etah	25.04.22	04:10	Reverse Zone
220kV Bus coupler		Under B/D	Tripped O/C, B-phase
220kV Harduaganj-Atrauli	25.04.22	04:28	Reverse Zone
220kV Harduaganj-Boner	25.04.22	04:07	Reverse Zone
220kV Harduaganj-Jahangirabad	25.04.22	04:25	Reverse Zone
220kV Harduaganj-Rukhi	25.04.22	12:35	Zone-1

# CAUSE OF CONCERN

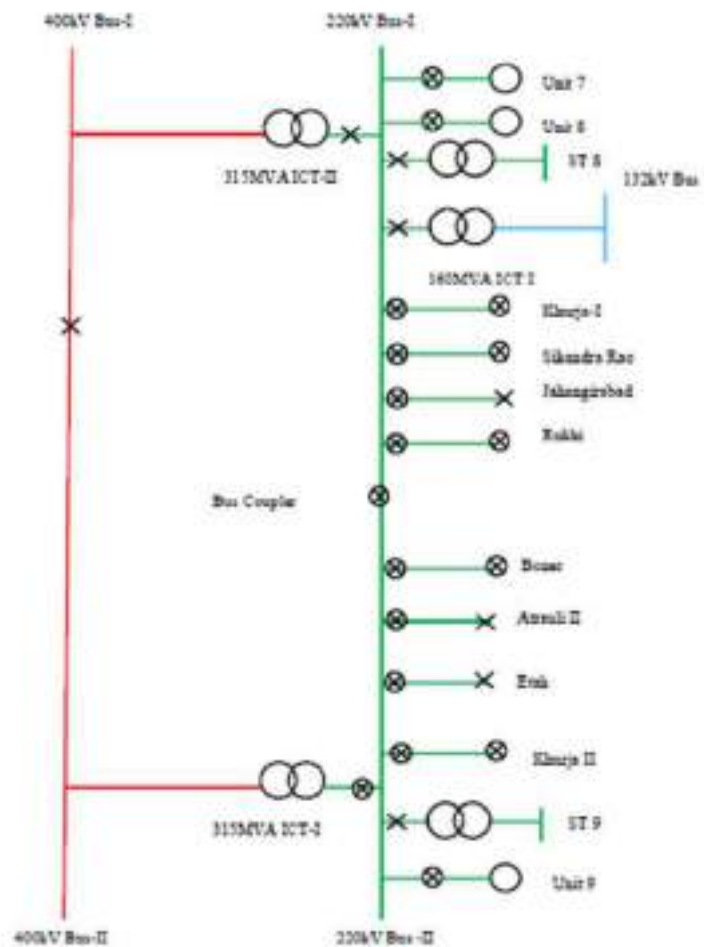
- At 22:28Hrs of dated 25.04.2022, a heavy storm observed & simultaneously heavy voltage dip with sound talk place & 220kV Harduaganj-Rukhi line & ST-10 tripped. Again at 22:38Hrs a heavy voltage dip observed resulting Unit#7, 8 & 9 tripped & all the 220kV connected lines 400kV/220kV, 315MVA ICT-I also tripped causing 220kV Bus-II got dead. 220kV /132kV, 160MVA ICT-I & 400kV /200kV, 315MVA ICT-II remained intact & 220kV Bus-I remained charged.
- **Analysis:** - As no physical damage such as puncture of insulator, broken conductor etc observed & at the time of incidence, a heavy cyclone was there so it seems that some conducting material approached the live part of Bus coupler Bay which created earth fault in 220kV main Bus- II resulting all the connected 220kV lines of both the 220kV buses tripped in Reverse Zone & 400kV/220kV, 315MVA ICT- I tripped on Back up E/F simultaneously and 220kV Bus-II got dead. Unit 8 & 9 (2X250MW) tripped on GT O/C. Unit#7 tripped on Master Fuel Trip as both ID Fans tripped due to tripping of Station Transformer 132kV/6.6kV, 20MVA R1 on REF as it seems that some conduction material approached that live part of its 132kV side Conductor due to storm. 220kV/132kV, 160MVA ICT-I & 400kV /220kV, 315MVA ICT-II remained intact & 220kV Bus - I remained charged.
- **Observation:** On site visit, no physical damage of equipment & conductor found, so it was decide to charge 220kV Bus-II. Bus Circuit Breaker of 220kV Bus Coupler did not hold and we found oil leakage from all three CTs of 220kV Bus Coupler

# Issues to be discussed

- Bus Bar protection implementation at Harduaganj TPS needs to be expedited.
- Since fault was on bus coupler and lines on Bus - I also tripped on reverse zone then reason of not tripping of 315 MVA ICT - II and 160 MVA ICT - I.
- 220kV Boner & Sikandra Rao tripped on Z-2 protection on other end along with Z-4 protection. Therefore, protection setting of these lines may be looked into at far end.
- High set setting of 315 MVA ICTs may be looked into.
- Delay in opening of bus coupler observed which may be looked into.
- As per SOE 220kV Khurja – Harduaganj ckt I & II tripped from Khurja end also in Zone – 1 protection after tripping of lines from Harduaganj end. Therefore, protection setting of these lines may be looked into at far end.
- As per SOE Breaker address F07 & 08 instead of F10 & F11.
- Issues as per PSC :
  - **1. Reason for voltage dip at 22:38:11**
  - **2. Status of 220 kV Bus bar protection at Harduaganj.**
  - **3. DRs for 22:28:00 events.**
  - **4. Why ICT-2 did not trip on O/C, E/F**
  - **5. Weather 400 kV Harduaganj – Aligarh also tripped during said event.**
  - **6. Why fault is coming in Zone-1 for Harduaganj-Khurja from Khurja end.**
  - **7. Why Harduaganj - Atroli and Hraduaganj – Jhangirabad did not trip.**
  - **8. PMU showing HDJ-ATRL tripped.**
  - **9. What are O/C E/F settings of ICTs.**
  - **10. Time sync and relay nomenclature issues.**
  - **11. DR to be sent in cfg format only.**



Sl. No.	Point	Reply	Remark
1	Reason for voltage dip at 22:38:11	Fault in 220kV Bus Coupler	
2	Status of 220 kV Bus bar protection at Harduaganj.	Not in Service	
3	DRs for 22:28:00 events.	Attached	
4	Why ICT-2 did not trip on O/C, E/F	ICT-2 was connected through 220kV Bus-I and the fault was observed in 220kV Bus-II which is cleared timely by O/C Protection Relay of 220kV Bus Coupler.	
5	Whether 400 kV Harduaganj – Aligarh also tripped during said event.	No, it tripped at 22:20 hrs.	
6	Why fault is coming in Zone-1 for Harduaganj-Khurja from Khurja end.	Settings at 220kV Khurja end were overreaching. Z1 settings has been reviewed and revised in Relays at 220kV Khurja end.	
7	Why Harduaganj - Atroli and Hraduaganj – Jhangirabad did not trip.	Both the lines already got trip from Harduaganj end on Z-4 protection and did not trip from far end.	
8	PMU showing HDJ-ATRL tripped.	Yes, it tripped from Harduaganj end.	
9	What are O/C E/F settings of ICTs	Attached	
10	Time sync and relay nomenclature issues.	No such issues observed.	
11	DR to be sent in cfg format only.	Attached	



**Legend**

CB Tripped	⊗
CB Closed	×
CB Open	⊠
CB Manually Open	⊗