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

दिनांक:16.09.2025

सेवा में
As per attached list of Members and Other invitees

विषय: संरक्षण उप-समिति की 62 वीं बैठक की कार्यवृत्त |
Subject: Minutes for 62nd Protection Sub-Committee Meeting-reg

संरक्षण उप-समिति की **62 वीं बैठक, दिनांक 26.08.2025 को 10:30 बजे** से **एनआरपीसी सचिवालय, कटवारिया सराय, नई दिल्ली** में आयोजित की गयी थी | उक्त बैठक की कार्यवृत्त संलग्न है। यह उत्तर क्षेत्रीय विद्युत् समिति की वेबसाइट (http://164.100.60.165/) पर भी उपलब्ध है |

The **62nd meeting** of Protection Sub-Committee was held on **26.08.2025** at **10:30 Hrs** at **NRPC Secretariat, Katwaria Sarai, New Delhi**. The minutes of the meeting is attached herewith. The same is also available on NRPC website (http://164.100.60.165/).

DHARMENDER KUMAR MEENA
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निदेशक (संरक्षण)

Contents

Part-A: NRPC....4

A.1. Confirmation of minutes of 61st meeting of Protection Sub-Committee (agenda by NRPC Secretariat)....4

A.2. Status of action taken on decisions of 61st Protection Sub-Committee meeting (agenda by NRPC Secretariat)....5

A.3. Submission of protection performance indices along with reason and corrective action taken for indices less than unity to NRPC Secretariat for the month of June-July 2025 (agenda by NRPC Secretariat)....5

A.4. Reporting of protection performance indices of SPS by SLDCs (agenda by NRPC Secretariat) 7

A.5. Annual protection audit plan for FY 2025-26 (agenda by NRPC Secretariat)....9

A.6. Third-party protection audit plan (agenda by NRPC Secretariat)....11

A.7. Discussion on audit reports submitted by utilities and compliance of recommendations of protection audit (agenda by NRPC Secretariat)....14

A.8. Updation of protection settings database (agenda by NRPC Secretariat)....17

A.9. Report of the Committee on Review of Protection System And Load Management In RAPS, KTPS Generation Complex (agenda by NRPC Secretariat)....17

A.10. SPS at 400kV substation Bareilly and 400 kV substation Panki (agenda by NRPC Secretariat) 20

A.11. Permission for opening of 6 nos. 50 MVAR capacity non-switchable line reactors installed on various 400 kV lines to improve voltage and reduce MVAR drawal from NR Grid in Rajasthan Control area (agenda by Rajasthan SLDC)....21

A.12. Backup O/C protection in lines at NTPC (agenda by NTPC)....23

A.13. Frequent tripping of 70 kV HVDC Vindhyachal Pole 1 & 2 of POWERGRID due to auxiliary supply source issues (agenda by NRPC Secretariat)....24

A.14. SPS Proposal for ESUCRL 750 MW Solar Park at ISS-1, ISS-2, MSS and RPSS substation (agenda by ESSEL)....26

Part-B: Agenda by NRLDC....27

B.1 Status of remedial actions recommended during previous PSC meetings (agenda by NRLDC) 27

B.2 Multiple elements tripping events in Northern region in the month of June-July 2025 (agenda by NRLDC)....28

B.3 Frequent elements tripping during June-July 2025 (agenda by NRLDC)....44

B.4 Details of tripping of Inter-Regional lines from Northern Region for June-July'25 (agenda by NRLDC) 45

B.5 Necessity of standard operating procedure during any switching operation in view of multiple element tripping events at 220kV Salal(NHPC) on 15th July 2025 and 400/220 kV Panipat(BBMB) on 24th July 2025 (agenda by NRLDC).....46

B.6 Frequency response performance for the reportable events of month of June-July 2025 (agenda by NRLDC).....48

B.7 Mock testing of System Protection Schemes (SPS) in Northern Region (agenda by NRLDC) 53

B.8 Corrective action for healthiness of 500kV Mundra-Mahindergarh SPS (agenda by NRLDC) 56

B.9 Confirmation of regarding implementation of proposed Overvoltage protection setting by committee (agenda by NRLDC).....60

B.10 Confirmation Status of connected load relief quantum during operation of UFR and df/dt (agenda by NRLDC).....61

B.11 Multiple elements tripping at 400/220kV Kashipur(UK) at 04:39 hrs & 05:27 hrs on 18.08.2025 (agenda by NRLDC).....62

Part-C: Agenda for final approval of protection settings by PSC Forum for FTCs which have been provisionally allowed by NRLDC/SLDCs.....65

C.1. First Time Charging of transmission lines/Bays/Transformer/Reactor etc. by NRLDC.....65

C.2. First Time Charging of transmission lines/Bays/Transformer/Reactor etc. by SLDCs.....66

Minutes of
62nd Meeting of Protection Sub-Committee (PSC) of
Northern Regional Power Committee

Date and time of meeting	:	*26.08.2025 10.30 Hrs.*
Venue	:	*NRPC Secretariat, Katwaria Sarai, New Delhi*

MS, NRPC welcomed all the participants. List of participants is attached as **Annexure-P.**

Part-A: NRPC

A.1. Confirmation of minutes of 61st meeting of Protection Sub-Committee (agenda by NRPC Secretariat)

A.1.1 EE (P), NRPC apprised that 61st PSC meeting was held on 26.06.2025. Minutes of the meeting were issued vide letter dated. 14.08.2025. No comment has been received till date.

A.1.2 POWERGRID/NR-2 has requested to record in MoM that the agenda for 'Replacement of SCADA at various substations of POWERGRID, NR-2 under ADD-CAP' was referred to the TEST Sub-Committee by the PSC forum.

A.1.3 Forum agreed on the request of POWERGRID/NR-2 as above and recommended that the agenda for 'Replacement of SCADA at various substations of POWERGRID, NR-2 under ADD-CAP' may be put up to the TEST Sub-Committee by POWERGRID.

Decision of the Forum:

Forum approved the minutes of the 61st PSC meeting as issued. POWERGRID was advised to put up an agenda for 'Replacement of SCADA at various substations of POWERGRID, NR-2 under ADD-CAP' to the TEST Sub-Committee.

A.2. Status of action taken on decisions of 61st Protection Sub-Committee meeting (agenda by NRPC Secretariat)

A.2.1 The Status of action taken on the decisions of the 61st PSC meeting was informed to the Forum.

A.2.2 Concerned utilities submitted the status of action taken. Forum noted the same.

A.2.3 Updated status of action taken is attached as **Annexure-A.I**.

Decision of the Forum

Forum instructed utilities to take necessary action on pending issues.

A.3. Submission of protection performance indices along with reason and corrective action taken for indices less than unity to NRPC Secretariat for the month of June-July 2025 (agenda by NRPC Secretariat)

A.3.1 EE (P), NRPC apprised that as per clause 15 (6) of IEGC 2023;

- *Users shall submit the following protection performance indices of the previous month to their respective RPC and RLDC on a monthly basis for 220 kV and above (132 kV and above in NER) system, which shall be reviewed by the RPC:*

  *a) The **Dependability Index** defined as* $D = Nc/Nc+Nf$

  *b) The **Security Index** defined as* $S = Nc/Nc+Nu$

  *c) The **Reliability Index** defined as* $R = Nc/Nc+Ni$

  where,

  Nc is the number of correct operations at internal power system faults,

  Nf is the number of failures to operate at internal power system faults,

  Nu is the number of unwanted operations,

  Ni is the number of incorrect operations and is the sum of Nf and Nu

Further, as per clause 15 (7) of IEGC 2023;

- *Each user shall also submit the reasons for performance indices less than unity of individual element wise protection system to the respective RPC and action plan*

for corrective measures. The action plan will be followed up regularly in the respective RPC.

A.3.2 In the earlier PSC meeting, it was decided that each utility shall submit the **performance indices of the previous month by the 7th day of the next month.**

A.3.3 Accordingly, the status of the indices reported for the month of **June-July 2025** was presented before the Forum, as attached as **Annexure-A.II. Utilities from where the indices were pending were asked to submit on time in the future.**

A.3.4 The following issues were highlighted by EE (P):

i. Some Utilities have not submitted data.
ii. Utilities have submitted on date for some plants, but not all.
iii. Utilities have not mentioned corrective action taken for indices less than unity.
iv. Some utilities have sent data after the cut-off date of the 7th.

A.3.5 **Forum observed that the following utilities are non-compliant as indices (June-July-2025) have not been received in the NRPC Secretariat:**

i. **NTPC (Anta, Auriya, Koldam, Rihand, Singrauli)**
ii. **MEJA Urja Nigam Ltd.**
iii. **DTL**
iv. **UJVNL**
v. **APCPL**
vi. **MEIL Anpara Energy Ltd (Anpara-C)**
vii. **ACME Heeragarh powertech Pvt. Ltd**
viii. **ACME Chittorgarh Solar Energy Pvt Ltd**
ix. **Ayana Renewable Power Three Private Limited**
x. **Ayaana Renewable Power One Pvt. Ltd.**
xi. **Azure Power Forty One Pvt limited**
xii. **Azure Power Forty Three Pvt. Ltd._RSS**
xiii. **Azure Maple Pvt. Ltd.**
xiv. **AZURE POWER INDIA Pvt. Ltd., Bhadla**
xv. **Azure Power Thirty Four Pvt. Ltd.**
xvi. **SB Energy Six Private Limited, Bhadla**
xvii. **Clean Solar Power (Jodhpur) Pvt. Ltd.**
xviii. **Clean Solar Power (Bhadla) Pvt. Ltd**
xix. **Eden Renewable Cite Private Limited**
xx. **Mahindra Renewable Private Limited**
xxi. **Mega Surya Urja Pvt. Ltd. (MSUPL)**
xxii. **AURAIYA Solar**
xxiii. **DADRI SOLAR**
xxiv. **SINGRAULI SOLAR**
xxv. **Anta Solar**
xxvi. **Unchahar Solar**
xxvii. **ReNew Solar Urja Private Limited**
xxviii. **Rising Sun Energy-K Pvt. Ltd.**

xxix. **Serentica Renewables India 4 Private Limited**
xxx. **Thar Surya Pvt. Ltd.**
xxxi. **TP Surya Pvt. Ltd.**
xxxii. **TRANSITION ENERGY SERVICES PRIVATE LIMITED**
xxxiii. **Transition Green Energy Private Limited**
xxxiv. **Transition Sustainable Energy Services Private Limited**

A.3.6 Incidents, where indices were found less than one, were discussed (**Annexure-A.III.**). It was found that utilities have already taken corrective action except few. Utilities were directed to take corrective action wherever it was pending.

A.3.7 Subsequently, SE, NRPC requested RE Plants to comply with the IEGC with respect to the protection chapter added newly in the IEGC.

A.3.8 Further, it was also highlighted that IEGC 2023 has given responsibility to RPCs for receiving indices from all utilities; however, all utilities are not members of NRPC. SLDCs have been requested in earlier PSC meetings to follow up with concerned utilities of states that are not NRPC members and to send compiled indices to NRPC.

A.3.9 MS, NRPC stated that there shall be one nominated officer from each utility for reporting of indices.

Decision of the Forum:

Utilities were asked to submit the Protection performance indices timely by the 7th day of the month, element-wise, along with corrective action taken for indices less than unity. Non-compliant utilities were asked to take necessary action for reporting data. Utilities were also requested to nominate one officer for reporting of indices.

A.4. Reporting of protection performance indices of SPS by SLDCs (agenda by NRPC Secretariat)

A.4.1 EE (P), NRPC apprised that as per clause 16 of IEGC 2023;

- *The users and SLDCs shall report about the operation of SPS immediately and a detailed report shall be submitted within three days of operation to the concerned RPC and RLDC in the format specified by the respective RPCs.*
- *The performance of SPS shall be assessed as per the protection performance indices specified in these Regulations. In case, the SPS fails to operate, the*

concerned User shall take corrective actions and submit a detailed report on the corrective actions taken to the concerned RPC within a fortnight.

A.4.2 He added that the agenda has been discussed in previous PSC meetings, and the following has been decided:

- Utilities and SLDCs shall report on the operation of SPS immediately and a detailed report shall be submitted within three days of operation to the concerned RPC and RLDC.
- SLDCs may submit protection performance indices for SPS on a monthly basis by the 7th date of each month in the same format as that of protection performance indices of elements (lines/ICT, etc.).

A.4.3 However, it has been observed that reporting of the operation/failure of operation of SPS is not being done regularly by the SLDCs/utilities.

A.4.4 None of the SLDCs have submitted indices for SPS in their control area.

A.4.5 UPPTCL, PPGCL, DTL and Lalitpur Plant have informed that no SPS operation has been observed.

A.4.6 EE (P), NRPC added that UPPTCL has mentioned that SPS at Gr. Noida is defective.

A.4.7 UPPTCL representative apprised that there is a need for an assessment to determine whether SPS at Gr. Noida is required. **The forum decided to review this requirement in the upcoming OCC meeting.**

A.4.8 EE (P), NRPC added that NJHPS, Jhakri has reported that SPS has operated due to the malfunctioning of the watt transducer installed on the 400kV Rampur–Nalagarh-Circuit-2 (RH-NJ-II) transmission line. The faulty transducer of the 400kV Rampur–Nalagarh-Circuit-2 transmission line has been replaced by RHPS with a new one. Additionally, digital outputs for >800 MW load alarms have been integrated into both the SPS and DCS systems at NJHPS for effective monitoring. An HMI has also been installed to display real-time load and breaker status for each transmission line, including feedback from the Gumma end for the Gumma–Panchkula lines. These corrective measures are intended to prevent recurrence of similar incidents, ensure accurate fault analysis, and enhance the overall reliability and operational integrity of the SPS system.

A.4.9 RHPS representative stated the watt transducer installed in NJ-RH Ckt I &II and RH-NLG Ckt I & II have a response time of 1.5 Sec, leading to an overall fault-clearing

time of more than 3 Sec in case of overloading of any line beyond safe operating limits. In order to ensure correct and reliable operation of SPS, Rampur HPS was requested to relay the Watt signal to the central SPS controller placed at NJHPS with a response time of less than 100mSec. Further, in order to negate any SPS maloperation due to failure of watt transducers, redundancy in the transmitted signal shall be ensured.

A.4.10 NRLDC has informed SPS operation from Apr-July 2025. The same is attached as **Annexure-A.IV.**

A.4.11 CGM, NRLDC stated that the operation of SPS may be reported by utilities.

A.4.12 POWERGRID representative stated that utilities can only give information of their sub-station, but it is not possible to ascertain whether SPS has actually operated at stations of other utilities.

A.4.13 HVPN representative also supported the views of POWERGRID.

A.4.14 CGM, NRLDC added that then, each utility may report to the concerned RLDC/SLDC and then RLDC/SLDC may verify the operation of the complete SPS and may report performance indices to NRPC Secretariat.

Decision of the Forum:

I. Utilities and SLDCs shall report on the operation of SPS immediately and a detailed report shall be submitted within three days of operation to the concerned RPC and RLDC.

II. SLDCs may submit protection performance indices for SPS on a monthly basis by the 7th date of each month in the same format as that of protection performance indices of elements (lines/ICT, etc.). **All utilities shall report their indices to concerned RLDC/SLDCs, then, after verifying SPS operation from all points, SLDC/RLDCs shall report performance indices to the NRPC Secretariat.**

A.5. Annual protection audit plan for FY 2025-26 (agenda by NRPC Secretariat)

A.5.1 EE (P), NRPC apprised that as per clause 15 of IEGC 2023;

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

A.5.2 In view of the above, all utilities were requested to submit the annual protection audit plan for FY-2025-26, latest by 31st October 2024, in the 53rd PSC meeting. Further, concerned utilities were requested to submit the same at the earliest in the 54th, 55th, 56th, 57th, 58th, 59th, 60th, & 61st PSC meetings.

A.5.3 Audit plan submitted by utilities were presented. The status of submitted annual audit plans is enclosed as **Annexure- A.V**.

A.5.4 It was observed that the following utilities have not submitted their audit plans and thus are non-compliant:

1. **PSTCL**
2. **Aravali Power Company Pvt. Ltd**
3. **MEJA Urja Nigam Ltd.**
4. **Adani Power Rajasthan Limited**
5. **UT of J&K**
6. **UT of Ladakh**
7. **ADHPL**
8. **Adani Transmission Limited**
9. **Barsingsar Plant**
10. **Rajwest Plant**
11. **ACME Chittorgarh Solar Energy Pvt Ltd**
12. **Altra Xergi Pvt. Ltd.**
13. **Amplus Ages Private Limited**
14. **Ayana Renewable Power Three Private Limited**
15. **Ayaana Renewable Power One Pvt. Ltd.**
16. **Azure Power Forty One Pvt limited**
17. **Azure Power Forty Three Pvt. Ltd._RSS**
18. **Azure Maple Pvt. Ltd.**
19. **AZURE POWER INDIA Pvt. Ltd., Bhadla**
20. **Azure Power Thirty Four Pvt. Ltd.**
21. **Clean Solar Power (Jodhpur) Pvt. Ltd.**
22. **Clean Solar Power (Bhadla) Pvt. Ltd**
23. **Eden Renewable Cite Private Limited**
24. **Grian Energy private limited**
25. **Mahindra Renewable Private Limited**
26. **Mega Surya Urja Pvt. Ltd. (MSUPL)**
27. **AURAIYA Solar**
28. **DADRI SOLAR**
29. **SINGRAULI SOLAR**
30. **Anta Solar**
31. **Unchahar Solar**

32. **NTPC Devikot Solar plant_240MW**
33. **NTPC Kolayat_400kV**
34. **Nedan Solar NTPC**
35. **NTPC Nokhra_300MW**
36. **One Volt energy Pvt. Ltd.**
37. **Rising Sun Energy-K Pvt. Ltd.**
38. **Serentica Renewables India 4 Private Limited**
39. **Thar Surya Pvt. Ltd.**
40. **TRANSITION ENERGY SERVICES PRIVATE LIMITED**
41. **Transition Green Energy Private Limited**
42. **Transition Sustainable Energy Services Private Limited**

A.5.5 Utilities were requested to submit the audit plan at the earliest.

Decision of the Forum:

Non-compliant utilities were asked to submit an annual audit plan without any further delay. Other utilities were asked to submit a report and compliance status within one month of completion of the audit.

A.6. Third-party protection audit plan (agenda by NRPC Secretariat)

A.6.1 EE (P), NRPC apprised that as per clause 15 of IEGC 2023:

All users shall also conduct a third-party protection audit of each sub-station at 220 kV and above (132 kV and above in NER) once in five years or earlier as advised by the respective RPC.

A.6.2 In view of the above, third-party protection audit plans received from utilities were apprised to the forum and the same is enclosed as **Annexure-A.VI**.

A.6.3 It was observed that the audit plan has not been received from the following, and thus are non-compliant:

i. **NPCIL (RAPS-A&B)**
ii. **PSTCL**
iii. **UJVNL (Tiloth, Khodri, Chibro, Vyasi)**
iv. **HPSEBL (except Kunihar, Baddi, Upera Nangla)**
v. **Aravali Power Company Pvt. Ltd**
vi. **UT of J&K**
vii. **UT of Ladakh**

viii. **UT of Chandigarh**
ix. **Barsingsar plant**
x. **Rajwest Plant**
xi. **ABC Renewable Pvt. Ltd**
xii. **ACME Heeragarh powertech Pvt. Ltd**
xiii. **ACME Pholidi**
xiv. **ACME Deagarh**
xv. **ACME Raisar**
xvi. **ACME Dhoulpar**
xvii. **ACME Chittorgarh Solar Energy Pvt Ltd**
xviii. **Adani Hybrid Energy Jaisalmer One Ltd.**
xix. **Adani Hybrid Energy Jaisalmer Two Ltd.**
xx. **Adani Hybrid Energy Jaisalmer Three Ltd.**
xxi. **Adani Hybrid Energy Jaisalmer Four Ltd.**
xxii. **Adani Renewable Energy (RJ) limited Rawara**
xxiii. **Adani Solar Energy Jaisalmer One Pvt. Ltd._450MW (Solar)**
xxiv. **Adani Solar Enegry Four Private Limited**
xxv. **Adani Hybrid Energy Jaisalmer Four Ltd. (AEML 2-350)**
xxvi. **Adani Solar Energy Jaisalmer Two Private Limited Project Two**
xxvii. **SB Energy Six Private Limited, Bhadla**
xxviii. **Adani Solar Enegry Jodhpur Two Limited, Rawara**
xxix. **Adani Solar Energy RJ Two Pvt. Ltd. (Devikot)**
xxx. **Adani Solar Energy RJ Two Pvt. Ltd. (Phalodi)**
xxxi. **Adani Green Energy 24 Limited (Bhimsar)**
xxxii. **Adani Green Twenty-Five Limited (Badisid)**
xxxiii. **Amplus Ages Private Limited**
xxxiv. **Azure Power Forty One Pvt limited**
xxxv. **Azure Power Forty Three Pvt. Ltd._RSS**
xxxvi. **Azure Maple Pvt. Ltd.**
xxxvii. **AZURE POWER INDIA Pvt. Ltd., Bhadla**
xxxviii. **Azure Power Thirty Four Pvt. Ltd.**
xxxix. **Clean Solar Power (Jodhpur) Pvt. Ltd.**
xl. **Clean Solar Power (Bhadla) Pvt. Ltd**
xli. **Eden Renewable Cite Private Limited**

xlii. **Grian Energy private limited**
xliii. **Mahindra Renewable Private Limited**
xliv. **Mega Surya Urja Pvt. Ltd. (MSUPL)**
xlv. **AURAIYA Solar**
xlvi. **DADRI SOLAR**
xlvii. **SINGRAULI SOLAR**
xlviii. **Anta Solar**
xlix. **Unchahar Solar**
l. **NTPC Devikot Solar plant_240MW**
li. **NTPC Kolayat_400kV**
lii. **Nedan Solar NTPC**
liii. **NTPC Nokhra_300MW**
liv. **One Volt energy Pvt. Ltd.**
lv. **ReNew Solar Energy (Jharkhand Three) Private Limited**
lvi. **RENEW SOLAR POWER Pvt. Ltd. Bhadla**
lvii. **ReNew Solar Urja Private Limited**
lviii. **Renew Sun Bright Pvt. Ltd. (RSBPL)**
lix. **Renew Surya Partap Pvt. Ltd.**
lx. **Renew Surya Ravi Pvt. Ltd.**
lxi. **Renew Surya Roshni Pvt. Ltd.**
lxii. **Renew Surya Vihan Pvt. Ltd.**
lxiii. **Renew Surya Ayaan Pvt. Ltd.**
lxiv. **Renew Solar Photovoltaic Pvt Ltd**
lxv. **RENEW SOLAR POWER Pvt. Ltd. Bikaner**
lxvi. **Rising Sun Energy-K Pvt. Ltd.**
lxvii. **Serentica Renewables India 4 Private Limited**
lxviii. **TRANSITION ENERGY SERVICES PRIVATE LIMITED**
lxix. **Transition Green Energy Private Limited**
lxx. **Transition Sustainable Energy Services Private Limited**

Decision of the Forum:

Forum directed utilities to submit an audit plan. Subsequently, the audit reports along with compliance status may be submitted to the NRPC Secretariat within one month

of completion of the audit.

A.7. Discussion on audit reports submitted by utilities and compliance of recommendations of protection audit (agenda by NRPC Secretariat)

A.7.1 EE (P), NRPC apprised that as per clause 15 of IEGC 2023*;*

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

A.7.2 As per clause 15 (4) of IEGC 2023;

- *The* third-party protection audit report shall contain information sought in the format enclosed as Annexure–1 (IEGC). The protection audit reports, along with an **action plan for rectification of deficiencies detected, if any, shall be submitted to the respective RPC and RLDC or SLDC, as the case may be, within a month of submission of the third-party audit report.** The necessary compliance to such a protection audit report shall be followed up regularly in the respective RPC.

A.7.3 Following the internal audit reports were discussed in the meeting and observations were given:

S.N.	FY (Audit Date)	Utility	Stations	Observation of forum
1	2024-25	UPPTCL	**Agra Zone- (24 Substations)** 765 kV Substation-Fatehabad	Every audit team has given list of observations. Some major issues

			400kV Substation- Agra (Pilipokhar), Agra South, Manth, Aligarh (Akrabad) 220kV Substation- Sirsaganj, Tundla, Bah, Shamshabad, Sikandara, Firozabad, Kirawali, Vrindavan, Gokul, Manth, Chhata, Meetai, Khair, Boner, Atrauli, Sikandararao, Kashganj (Soron), Etah, Mainpuri	are with the DC fault, V/F settings, and the Unavailability of main-2 relays. Bus-bar and LBB not installed at some places. The same shall be complied by sub-stations.
2	2024-25	DTL	**220 kV sub-stations (33)** Bawana, Geeta Colony, Kanjhawala, Naraina, Narela, Ridge Valley, R K Puram, Rohini-1, Rohini-2, SGTN, Subzi Mandi, Trauma Centre, DIAL, Indraprastha, Kashmere gate, Lodhi Road, Okhla, Park Street, Peeragarhi, Pragati, Rajghat, Shalimar bagh, Vasant Kunj, Wazirpur, Maharani bagh, Mehrauli, Preet Vihar, Harsh Vihar, BTPS, Gazipur, HCML, Masjid Moth, Sarita Vihar	Narela: Zone-1 protection setting is more than 200%. Issues in 2nd and 5th harmonic settings. V/f settings have issues. Power Swing De-block time may be corrected.
3	2025-26	RVPN	400 kV: Hindaun 220 kV: Khinvser, Sikar,	SOTF Disabled has

			Kotputli, Hanumangarh, MIA (Alwar), Jahlamand, Mandawar, Bherunda	been found. V/F settings may be aligned as per philosophy.
4	2025-26	NPCIL	RAPP-C (RAPS-Unit-5&6)	Distance protection zones should be made as per the philosophy.
5	2025-26	NLC	Barsingsar Thermal Plant	SOTF Delay has been set. Need to be aligned with philosophy.
6	2025-26	AMP ENERGY GREEN PVT LTD	AEGPL_BHDL2, AEGSPL_BHDL2, AEGFPL_BHDL2, AEG4PL_BHDL2	Settings not mentioned in the report.

A.7.4 The following third-party audit report was discussed in the meeting and an observation was given:

S.N.	**YEAR**	**Utility**	**Stations**	**Observation of the forum**
1	AUG 2025	HVPN	Dhanoda	The audit party has mentioned points for compliance. The same may be complied.

A.7.5 **The above submitted reports were made available at the NRPC website: http://164.100.60.165/meetings/prsub.html**

A.7.6 Utilities were asked to submit a compliance report of the issues highlighted by the audit.

Decision of the Forum:

The forum discussed the audit report and directed utilities to submit a compliance report. Protection settings may be aligned with NRPC philosophy. Further, other utilities were directed to submit the protection audit report (for audited S/s as per submitted plan) to NRPC Secretariat and to update the compliance status regularly.

A.8. Updation of protection settings database (agenda by NRPC Secretariat)

A.8.1 As per regulation 14 (3) of IEGC 2023:

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

A.8.2 EE (P), NRPC mentioned that protection settings data available with the NRPC Secretariat has been uploaded in Microsoft OneDrive.

A.8.3 **It was decided that drive link shall be shared to utilities via e-mail and password shall be shared in next PSC meeting verbally.**

A.8.4 All utilities are requested to check the settings available on the link and inform the NRPC Secretariat if settings have been changed but are not reflecting in the database.

A.8.5 If any element (line/ICT/etc) is missing, the same may be intimated to the NRPC Secretariat .

Decision of the Forum:

Drive link of database shall be shared to utilities via e-mail and password shall be shared in next PSC meeting verbally. All utilities were requested to check the data on the link and inform the NRPC Secretariat in case of missing data or wrong data.

A.9. Report of the Committee on Review of Protection System and Load Management In RAPS, KTPS Generation Complex (agenda by NRPC Secretariat)

A.9.1 EE (P), NRPC mentioned that on 05th January 2024, at 05:16hrs, cascade tripping of multiple elements occurred in RAPS, KTPS generation complex in Rajasthan control

area leading to loss of total running generation of KTPS, RAPS (A, B & C) and other small hydro stations (Jawahar Sagar HEP & Rana Pratap Sagar HEP) in the complex.

A.9.2 Again, on 29th March 2024, at 20:22 hrs, a grid event (GD-1) of blackout of this complex occurred.

A.9.3 During the above two grid events, i.e., 05th January 2024 and 29th March 2024, all the running units at RAPS A, B & C went under Xe-poisoning of reactors. Units were able to synchronize back to the grid only after 2-3 days of the grid events, as a significant time period (56-72 hours) is required for complete poison out of Xe from the reactor.

A.9.4 Based on decision of 50th PSC meeting, NRPC constituted the committee for detailed analysis of the events and to give recommendations for strengthening the reliability and security of this complex.

A.9.5 Report of the Committee is attached as **Annexure-A.VII.**

A.9.6 Committee has given following recommendation:

i. Strong connectivity in the complex:

a) The number of changes in the connectivity in the complex have strengthened the complex. Radial paths have been minimised, and alternate evacuation paths have been made. With the changes in the complex, reliability of the complex has been improved. However, it needs to be ensured that any future changes in the connectivity in the complex should be done after load flow and contingency analysis in the complex.

b) The changes affecting the reliability in the complex should be avoided or to be done after comprehensive discussion among concern stakeholders. SLDC-Rajasthan shall also ensure the proper load management in the complex as per network condition to avoid any cascade tripping.

c) Further, proactive Intrastate Transmission planning for creating transmission adequacy in the complex is needed.

ii. Healthiness of the protection system:

a) The protection system and its proper coordination need to be ensured. It is also to be ensured that the protection system and its settings are kept in line with the standards and protection philosophy. Any changes in the protection philosophy should only be made after prior approval from NRPC.

b) Necessary preventive and corrective measures need to be taken by RVPNL to minimise the frequent tripping of 220kV lines evacuation from RAPS.

c) As mandated by IEGC, conducting Annual Self Protection Audit and Third-Party Protection Audit also needs to be ensured.

iii. Healthiness of SCADA data and telemetry:

a) Telemetry of SCADA data and its healthiness is necessary for decision-making during real-time grid operation. Non-availability of complete SCADA data and issues of wrong/unhealthy data have been observed due to unhealthy RTUs at the site. Concerned may take expeditious actions to make all the RTUs in the complex healthy and ensure the availability and healthiness of SCADA data of the complex.

b) Further, it is also observed that there is no PMU at RAPS A, B and Rajasthan stations in the complex. The nearest PMU is at Kota(PG) at the 400kV level. As this complex is critical and frequent events have also been observed in this complex. Therefore, RAPS and Rajasthan may plan for the Installation of PMU at the 220kV level in the complex so that high-resolution data of the complex may be captured, which will be useful in monitoring and event analysis.

iv. Healthiness of ATS, protection & control system at RAPS:

a) The changes done in the ATS, i.e., relay software upgradation, ATS

logic review, etc., will enhance the chances of successful ATS operation. However, the upgradation in ATS is pending in Unit-6 at RAPS C. Expeditious implementation of necessary changes in ATS in Unit-6 at RAPS C needs to be ensured.

b) A necessary system for alarms/control panel annunciation to alert the control room operators at RAPS regarding any deficiency in the control system or auxiliary system may also be explored. It will help in better decision-making by control room operators at RAPS. Further, a periodic review of ATS also needs to be done.

v. Island subsystem and its operation:

a) Load generation balance in the RAPS island scheme has been reviewed comprehensively. Necessary changes in network configuration and load profile of the island scheme have been made to ensure the feasibility of the island subsystem. Further, SLDC-Rajasthan shall ensure that the load generation balance in the island subsystem (feasible G/L) is maintained all the time.

b) The SCADA display of the RAPS island subsystem, along with the telemetry of all the involved substations, needs to be ensured. RAPS may also explore the possibility to have the island subsystem network and data telemetry at their control room.

c) Island system and its operational logic also need to be reviewed on a periodic basis.

A.9.7 The following action point is pending that should be expedited:

i. Addressing Autorecloser-related issues at RAPS end **[by NPCIL/RAPS]**

ii. RAPS and Rajasthan may plan for the Installation of PMU at the 220kV level in the complex so that high-resolution data of the complex may be captured, which will be useful in monitoring and event analysis. [**Rajasthan**]

iii. Upgradation in ATS is pending in Unit-6 at RAPS C. Expeditious implementation of necessary changes in ATS in Unit-6 at RAPS C needs to be

ensured. A necessary system for alarms/control panel annunciation to alert the control room operators at RAPS regarding any deficiency in the control system or auxiliary system may also be explored. **[by NPCIL/RAPS]**

A.9.8 MS, NRPC stated that the proposal of the revised island may be discussed in the upcoming OCC for approval.

A.9.9 Rajasthan SLDC and RVPN were asked to give a presentation on the revision proposed on the island, as well as the readiness of the required infrastructure.

Decision of the Forum:

Forum accepted the report and appreciated the efforts of the committee members. It was decided to discuss the revised island in the upcoming OCC meeting.

A.10. SPS at 400kV substation Bareilly and 400 kV substation Panki (agenda by NRPC Secretariat)

A.10.1 EE (P), NRPC mentioned that in the 234th OCC meeting (held on 14.08.2025), the SPS proposal of UP at Bareilly and Panki was discussed. It was decided to implement the SPS, and if the PSC forum has any observations, the same shall be implemented by UP.

A.10.2 SPS scheme is attached as **Annexure-A.VIII.**

A.10.3 Forum agreed on SPS settings.

Decision of the Forum:

Forum agreed on SPS proposal.

A.11. Permission for opening of 6 nos. 50 MVAR capacity non-switchable line reactors installed on various 400 kV lines to improve voltage and reduce MVAR drawal from NR Grid in Rajasthan Control area (agenda by Rajasthan SLDC)

A.11.1 Rajasthan SLDC apprised that in the various NRPC/OCC meetings regarding critically low voltage issues in the Rajasthan control area has been discussed and Rajasthan SLDC has been advised to improve voltage and reduce MVAR drawal from the NR grid.

A.11.2 This agenda was also discussed in the 234th OCC meeting held on 14.8.2025,

wherein it was advised to put up the agenda in the forthcoming PSC meeting.

A.11.3 In this regard, it is intimated that various measures, viz., regular pursuance with intrastate generators for injection MVAR as per their capability curve, MVAR injection by RE Generators as per CEA Regulations, proper maintenance & operation of the shunt capacitor banks, etc., are being taken by SLDC, Rajasthan. In this regard, SLDC Rajasthan has also explored opening non-switchable line reactors installed on 400 kV lines so that in the daytime, the voltage can be improved. 50 MVAR capacity non-switchable line reactors are installed on the following 400 kV lines, whose line lengths are less than 200 km:-

i. 400 kV S/C Bikaner-Merta line (Twin moose) with 50 MVAR non-switchable line reactors **at both ends of the line** (172 kM)

ii. 400 kV D/C Bhadla-Bikaner line (quad moose) with 50 MVAR non-switchable line reactors on each circuit at Bhadla end (189.1 kM)

iii. 400 kV S/C Ramgarh-Bhadla line (Twin moose) with 50 MVAR non-switchable line reactor at Ramgarh end of line (160 km)

iv. 400 kV S/C Jaisalmer 2-Kankani line (Quad moose) with 50 MVAR non-switchable line reactor at Kankani end of line (176.84 kM)

A.11.4 Rajasthan SLDC has carried out load flow studies in the latest PSSE file shared by NRLDC to assess the impact of opening of above 6 nos. 50 MVAR capacity non-switchable line reactors installed on the aforesaid 400 kV lines to improve daytime low Grid voltage in the Rajasthan Control area. Details are attached as **Annexure-A.IX.**

A.11.5 NRLDC representative also presented their view. PPT is attached as **Annexure-A.X.**

A.11.6 NRLDC highlighted the following:

i. Voltages are generally below 420kV during the Nov-Feb months. 400kV Merta slightly higher up to 425kV.

ii. As per studies, the voltage rise at the open end was in the range of 5-10kV only

iii. Requirement of L/R must have been planned in line with the CEA manual on TPC 2023

iv. LRs provide essential open-end voltage support during the energization of long EHV T/L as well as during A/R. Unavailability may adversely impact voltage control and terminal equipment life.

v. Advisable to charge these T/L along with their respective LRs during non-solar hours to minimize voltage stress on terminal equipment

vi. During low-demand periods and non-solar hours, these LRs are critical for maintaining system voltage stability. Hence, their outage should be done seasonally and reviewed monthly by Raj SLDC to determine whether a forced outage is required.

vii. In case of an outage beyond 6 months, FTC compliance through safety inspector may be ensured

viii. As requirements come up due to a lack of reactive compensation by RRVPNL, any equipment damage arising due to the unavailability of LRs, will rest solely with RRVPNL.

A.11.7 NRLDC representative highlighted that if any damage happens due to the opening of line reactors, then Rajasthan shall be responsible. Rajasthan SLDC agreed for the same.

A.11.8 Rajasthan SLDC highlighted that the 400 kV S/C Bikaner-Merta line (Twin moose) has 50 MVAR non-switchable line reactors at both ends of the line (172 km). Therefore, it may be picked first for the opening of the reactor.

A.11.9 After deliberation, it was decided that taking out reactors may not be done at once, but rather it may be done as per seasonal requirements. Rajasthan SLDC may take out the reactor after prior approval in the preceding month's OCC meeting.

Decision of the Forum:

Taking out reactors may not be done at once, rather it may be done as per seasonal requirements. Rajasthan SLDC may take out the reactor after prior approval in the preceding month's OCC meeting.

A.12. Backup O/C protection in lines at NTPC (agenda by NTPC)

A.12.1 NTPC representative stated that NTPC Dadri has Thermal generation (1820 MW),

Gas power generation (829.78 MW), & Solar(5MWp) generation capacity, amounting to a total of 2654.78MW of power generation capacity.

A.12.2 In addition to generation capacity, ±500kV, 1500MW, HVDC Rihand – Dadri Link operating with power flow from Rihand to Dadri Switchyard.

A.12.3 NTPC Dadri is a 400kV and 220kV Switchyard. 400kV Switchyard from NTPC Dadri is evacuating a total maximum power capacity of 4154.78MW.

A.12.4 NTPC Engineering has provided a guiding philosophy for lines at NTPC stations, in which 'fuse failure enabled phase over current protection' shall get enabled in case of VT fuse failure only and pickup value around 1.7 times the thermal rating of line conductors with time delay. Details are attached as **Annexure-A.XI.**

A.12.5 NTPC mentioned that 'fuse failure enabled phase over current protection' is already implemented in most of the stations of NTPC.

A.12.6 Forum observed that NTPC has already implemented the scheme without knowledge of NRPC. However, there is need to understand the scheme in detail and its effect on nearby sub-stations. Accordingly, it was decided to constitute a sub-group.

Decision of the Forum:

It was decided to constitute a sub-group for study on proposal of NTPC for 'fuse failure enabled phase over current protection'.

A.13. Frequent tripping of 70 kV HVDC Vindhyachal Pole 1 & 2 of POWERGRID due to auxiliary supply source issues (agenda by NRPC Secretariat)

A.13.1 EE (P), NRPC mentioned that 70 kV HVDC Vindhyachal Pole 1 & 2 of POWERGRID has failed several times in recent past.

A.13.2 Recent events are:

Element	Outage Time	Restoration Time	Cause of Outage (Reported by PGCIL)
VINDH HVDC B/B BLOCK-II	11/01/25 16:39	11/01/25 17:26	Taken in standby mode to avoid any tripping due to voltage dip/fluctuation in 6.6KV (3BB30) feeder as start-up of

			MDBFP in Unit#3 at NTPC.
VINDH HVDC B/B BLOCK-II	12/01/25 15:26	12/01/25 16:05	Taken in standby mode to avoid any tripping due to voltage dip/fluctuation in 6.6KV (3BB30) feeder as start-up of MDBFP in Unit#3 at NTPC.
VINDH HVDC B/B BLOCK-II	11/01/25 16:39	11/01/25 17:26	Taken in standby mode to avoid any tripping as on start-up of MDBFP in Unit#3 at NTPC Singrauli, the only available 6.6kV feeder to Block-1 will be subjected to voltage dip/fluctuation.
VINDH HVDC B/B BLOCK-I	07/02/25 11:29	07/02/25 12:28	Vindhyachal block-1 tripped at 11:29hrs on 07.02.25 due to disturbance in only available 6.6KV auxiliary feeder "3BA28" from Unit-3 catering to B1LB auxiliary transformer.The 6.6KV Auxiliary supply feeder "5BB29" catering to HVDC Block-1 auxiliary transformer B1LA is already out since 20-Jan-25 from NTPC end.
VINDH HVDC B/B BLOCK-I	01/03/25 15:01	01/03/25 16:29	Tripped due to a voltage dip in only available 6.6KV auxiliary supply feeder B1LA due to the start of the Boiler Feed Pump by NTPC VSTPP.
VINDH HVDC B/B BLOCK-I	30/07/25 20:25	31/07/25 00:46	Tripped along with 400 KV Vindhyachal(PG)-Vindhyachal(NT) (PG) feeder-1 & 2 due to tripping of both auxiliary supply on NTPC Vindhyachal units.
VINDH HVDC B/B BLOCK-II	30/07/25 20:25	31/07/25 00:47	Tripped along with 400 KV Vindhyachal(PG)-Vindhyachal(NT) (PG)

			feeder-1 & 2 due to tripping of both auxiliary supply on NTPC Vindhyachal units.

A.13.3 NLDC vide letter dated 21.08.2025 has given detailed report (**Annexure-A.XII**) on tripping of 30.07.2025.

A.13.4 POWERGRID, NR-3 mentioned that they are facing voltage dip / fluctuation in 6.6KV (3BB30) feeder at Vindhyachal due to start -up of MDBFP in Unit#3 at NTPC.

A.13.5 NTPC Vindhyachal mentioned that they have not observed any voltage dip / fluctuation at their end.

A.13.6 POWERGRID, NR-3 mentioned that it may be case that NTPC is not affected due to fluctuations but HVDC is being affected as it is sensitive.

A.13.7 EE (P), NRPC stated POWERGRID to explore options for two separate and distinct sources of supply for auxiliaries at HVDC Vindhyachal.

A.13.8 POWERGRID, NR-3 mentioned that they have two separate feeders from NTPC from their two different units. It was stable, but in the recent past, it has created issues.

A.13.9 MS, NRPC stated to constitute a sub-group for understanding the issue and recommendation thereon.

Decision of the Forum:

A sub-group may be constituted for understanding the issue and recommendations thereon.

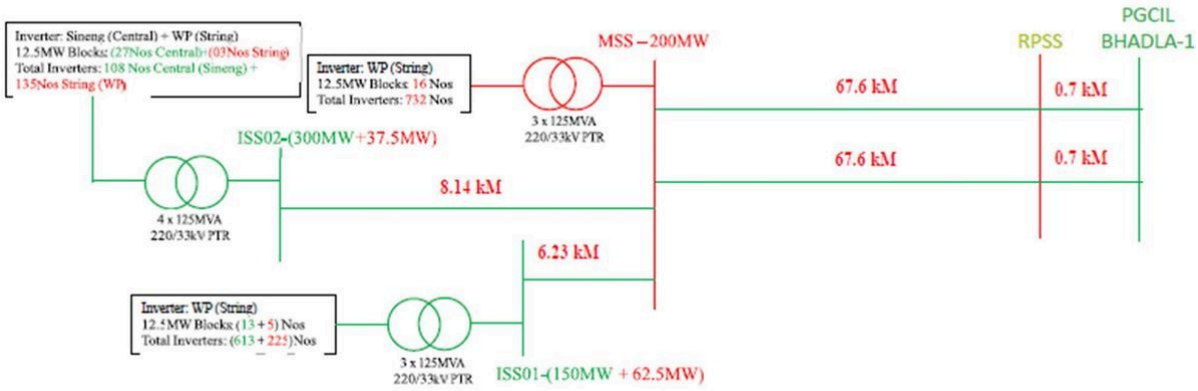
A.14. SPS Proposal for ESUCRL 750 MW Solar Park at ISS-1, ISS-2, MSS and RPSS substation (agenda by ESSEL)

A.14.1 ESSEL representative presented that as per the transmission system connectivity, total 750 MW Power evacuation (Aggregated Power from MSS, ISS-1 and ISS-2) is envisaged to be flow from MSS to PGCIL Bhadla substation via RPSS through Double circuit transmission line.

A.14.2 Following 220 kV Transmission System / Network exists at ISS-1, ISS-2, MSS,

RPSS,

PGCIL Bhadla-1 S/S for Power Evacuation:



A.14.3 During N-1 Line Contingency, between MSS to RPSS or RPSS to PGCIL Bhadla-1 S/S, total power being evacuated will be shifted to a single line, which may be more than its current carrying capacity as per the real-time power evacuation scenario.

A.14.4 To avoid such a scenario for a longer duration and prevent overloading of a single transmission line, appropriate SPS need to be designed to limit the power evacuation during N-1 contingency.

A.14.5 SPS proposal of ESSEL is attached as **Annexure-A.XIII.**

A.14.6 After deliberation, SPS was approved.

Decision of the Forum:

SPS proposal was approved.

Part-B: Agenda by NRLDC

B.1 Status of remedial actions recommended during previous PSC meetings (agenda by NRLDC)

B.1.1 As per the discussion in previous PSC meetings, necessary remedial actions were recommended based on the analysis and discussion of the grid events. It is expected that necessary actions would have taken place. In view of the same, a mail dt 13.08.2025 has also been sent from NRLDC to constituents requesting to share the status of remedial actions taken. The list of points discussed in the 62nd PSC meeting

is attached as Annexure-B.I of the agenda.

B.1.2 NRLDC representative presented all the points and a discussion was held with all the respective constituents. Constituents were requested to apprise the status of the remedial actions. Updated status on the basis of the discussion held in the 62nd PSC meeting is attached as **Annexure-B.I.** Further, concerned members were requested to take expeditious corrective actions and resolve the issues at the earliest.

B.1.3 On 17.08.2025 at 03:03 hrs, multiple elements tripping occurred at Khodri HEP and Majri(HP). As per NRLDC SCADA data, ~85 MW generation loss at Khodri HEP and ~135 MW load loss in HP control area occurred during the event. In view of frequent multiple elements tripping in the complex, leading to generation loss and load loss, it is again requested to take expeditious corrective actions and make the protection system at Khodri, Chhibro and Majri complex healthy so that such unwanted multiple elements tripping events and generation/load loss can be avoided.

B.1.4 NRLDC representative informed that multiple trippings at 220 kV Khodri (UK) had occurred twice during the last two months, wherein the generating units of Khodri (UK) also tripped along with the tripping of any outgoing feeders from Khodri. The protection settings of the units at Khodri end may be reviewed, and remedial action may be taken at the earliest.

Decision of the Forum:

PSC forum requested all the concerned members to take necessary corrective actions at their, actions need to be expedited, and healthiness of protection & control system need to be ensured.

B.2 Multiple elements tripping events in Northern region in the month of June-July 2025 (agenda by NRLDC)

B.2.1 A total of 42 grid events occurred during the months of June and July 2025 of which 23 are of GD-1 category, 10 are of GI-I category and 09 are of GI-2 Category. The tripping report of all the events has been issued by NRLDC.

B.2.2 Maximum delayed clearance of fault observed in the tripping event at 220/33kV RSDCL PSS2 RE station at 13:46 hrs on 04th July 2025 (As per PMU at Bhadla2(PG), R-Y phase to phase fault with delayed fault clearing time of 1200 msec is observed).

B.2.3 Delayed clearance of fault (more than 100ms for 400kV and 160ms for 220kV system)

was observed in a total of 11 events out of 42 grid events that occurred in these two months. In 09 (no.) of grid events, there were no faults in the grid.

B.2.4 ***As*** per ***IEGC clause 37.2 (c), Disturbance Recorder (DR), station Event Logger (EL), Data Acquisition System (DAS) shall be submitted within 24 hrs of the event and as per IEGC clause 37.2 (e), the user shall submit a detailed report in the case of grid disturbance or grid incidence within one (1) week of the occurrence of event to RLDC and RPC.***

B.2.5 NRLDC requested utilities share DR/EL and the detailed report of the tripping events as per the timeline mentioned in IEGC 2023 and share the same with NRLDC, NRPC and PSC forum. Remedial actions taken by constituents to avoid such multiple elements tripping may also be included in the detailed report.

B.2.6 Members stated that delay occurred due to non-submission of DR/EL & tripping details from site however they are taking continuous follow up actions to ensure timely completion of tripping analysis within stipulated timeline.

B.2.7 ***PSC forum requested members to take necessary preventive measures to avoid such grid incidents / disturbances in future and report actions taken by respective utilities in OCC & PSC forum. Moreover, utilities may impress upon all concerned for providing the Preliminary Report, DR/EL & detailed report of the events to RLDC in line with the regulations.***

B.2.8 The list of major tripping events that occurred during June-July 2025 is attached as **Annexure-B.II of the agenda**. Concerned constituents/utilities were requested to share the detailed analysis of the tripping elements along with the status of remedial action taken/to be taken.

B.2.9 **Utilities were requested to prepare a detailed analysis report and present the event details during the 62nd PSC meeting. Events involving more than one utility may be jointly prepared and presented.**

B.2.10 **Discussion during the meeting:**

Tripping Events

A. Multiple elements tripping at 220/132kV Kaithal(HV) at 00:20 hrs on 10.06.2025

NRLDC representative shared the following observations w.r.t the tripping event:

i) The exact location and nature of the fault needs to be shared.
ii) Reason of the delayed clearance of the fault also needs to be shared.
iii) The exact reason and sequence of protection operated during tripping need to be shared.
iv) DR/EL along with the tripping report not received yet from Haryana and POWERGRID end. Details need to be shared at the earliest.
v) Tripping of elements is not recorded in SCADA SOE. Availability of SCADA SOE data need to be ensured.
vi) Reason of the significant quantum of load drop in Haryana control area during the event need to be shared.
vii) Remedial action taken report to be shared.

HVPNL representative present the tripping analysis of the event. Major findings were as follows:

i) B-phase 220 kV CT of 220/132 kV, 160 MVA TF T-1 found damaged and also Y & B-Phase Bus conductor found broken, hence created bus-bar fault.
ii) During checking of 220kV Bus Bar protection relay at 220kV S/Stn. Kaithal, it was observed that the DC supply MCB found tripped and hence, the Bus Bar protection didn't operate and all the 220kV Circuits tripped from the remote end in Zone-2.
iii) Further, as per the event logs in the relays and on checking of yard of 220kV Kaithal S/Stn and as conveyed by the substation staff, that at 00:20 hrs on 10.06.2025, a heavy sound and spark was observed in 220kV yard and snapping of the 220kV jack bus conductor which fell on 220kV Bus-1, resulting into a complete blackout at 220kV S/Stn. Kaithal.
iv) As remedial action taken, DC fault of 220 kV Bus-bar protection circuit was rectified and put back in circuit. Now the Bus-bar protection relay is healthy.

PSC Recommendations:

- *Healthiness of bus bar protection and protection relays and other auxiliary equipment needs to be ensured at 220/132kV Kaithal(HV).*
- *Moreover, all utilities are requested to ensure the healthiness of bus bar protection in the substations of 220kV level and above within their control area.*

B. Multiple elements tripping at 220kV Maharanibagh(DTL) & 220/66kV Pragati(DTL) at 03:48 hrs on 15.06.2025

NRLDC representative shared the following observations w.r.t the tripping event:

i) At 03:48 hrs, 220kV Maharanibagh-Gajipur Line-1&2 tripped on Y-N fault. Observations w.r.t. tripping are as follows:

a. Relay flags related to fault location and distance protection initiation are not available.

b. Reason of tripping of both the lines on a single Y-N fault yet to be ascertained. In DR files, “BB OPTD” flag is there; the reason for its initiation also needs to be identified.

c. Fault cleared with the delay of ~200msec, the reason of the delayed clearance of the fault also needs to be identified.

ii) It is also observed that all the DR files, i.e., bus bar relay DR of Pragati end, line protection relay DR w.r.t. Maharanibagh lines tripping, are not in the standard format. DRs nomenclature are not as per standard, time is not GPS synced. Therefore, standardization of recording instruments (DR/EL) needs to be ensured.

iii) Station Event logger file of 220kV Maharanibagh and 220kV Pragati(DTL) has not been shared yet. It also needs to be extracted for further analysis of the event.

iv) Details of remedial action taken to avoid such events in the future along with a detailed analysis of the event, need to be shared.

DTL representative present the tripping analysis of the event. Major findings were as follows:

i) 220kV Maharanibagh is basically 220kV side of 400/220kV Maharani-bagh (PG) station with a double main bus scheme is connected to 220kV Gazipur, Lodhi Road, Pragati, Sarita Vihar, Masjid Moth, Trauma Centre and Electric lane.

ii) 220/66kV S/Stn Pragati (DTL) also has a double main bus scheme is connected to 220kV Park Street, IP, Maharani Bagh and Sarita Vihar.

iii) Multiple tripping occurred during the period 03:48 hrs – 03:55 hrs on 15.06.2025 due to a heavy windstorm/ thunderstorm and rain in the Eastern Delhi region.

iv) At 03:48 hrs, 220kV Gazipur Ckt-I and II distance relay picked up on Y-E fault, Fault current of 6.26kA, but got tripped after 200ms on BB as per the available DR at 220kV S/Stn Maharani Bagh.

v) At 03:52 hrs., Y-N Ground fault of 29 kA magnitude occurred in 220 kV Bus-1 at 220kV S/Stn Pragati, thereby tripping all the connected elements of Bus-1 as well as 220 kV Bus coupler on Bus differential Zone-1 operation.

vi) After 41 ms of operation of Bus-1 differential, another fault of 16.8 kA magnitude occurred in the dead zone of Bus coupler Y-Ph (between CT and breaker), and since the check zone (Zone-6) was already high, it resulted tripping of all the connected elements of Bus-2 on Bus differential Zone-2 operation.

vii) Both the above faults were cleared in 100 ms (along with CB opening time).

viii) At 03:52 hrs. 220kV Pragati Ckt-2 at 220kV S/Stn Maharani bagh got tripped on Zone-1 as Main-2 Siemens make relay over-reached and got tripped due to Bus Fault at 220kV S/Stn Pragati. Settings have been revised.

ix) At 03:55 hrs. 220kV Lodhi Road Ckt-2 at 220kV Maharanibagh tripped on distance protection Zone-1 , B-N fault, Fault current of 17.4kA.

x) Distance Relays sensed Zone-2 start during heavy storm conditions but both Gazipur Ckt-I and Ckt-II tripped through BB as per the DR avail-

able. The peripheral unit (PU) of ABB makes a Bus-Bar Protection Scheme, which is an old scheme that wrongly issued tripping commands to the circuits in 200ms. After checking the connections, some of the connections that were found to be loose were tightened and the problem has been rectified.

PSC Recommendations:

- *The healthiness of bus bar protection needs to be ensured. The old REB 500 scheme needs to be upgraded & replaced by PGCIL in coordination with DTL.*
- *Distance protection settings need to be reviewed at 220kV Maharanibagh-Pragati Ckt-2.*
- *DR nomenclatures need to be corrected and time synchronisation issue need to be resolved at the earliest at Maharanibagh.*

C. Multiple elements tripping at 220/132kV Pampore(J&K) at 23:25 hrs on 20.06.2025

NRLDC representative shared the following observations w.r.t. tripping event:

i) The exact location of the fault and the nature of the protection operated need to be shared.

ii) Why did both 220kV line trip from the Wagoora end? Time delay setting of Z-2 at Wagoora end also needs to be shared as the line tripped within ~160msec.

iii) SCADA data was not available for 220/132kV Pampore(PDD JK) S/s during the event. Tripping is also not recorded in SCADA SOE. Availability and healthiness of SCADA data need to be ensured.

iv) DR/EL (.dat/.cfg file) along with tripping report of the tripped elements at the Pampore(J&K) end need to be shared.

v) Remedial action taken report need to be shared.

J&K representative was not present during the meeting.

POWERGRID representative informed that zone-2 settings at Wagoora end of 220 KV Wagoora(PG)-Pampore(PDD) (PG) D/C need to be revised to 160 ms in view of protection healthiness issue (delayed fault clearance from Pampore end during past events) at Pampore end. ***PSC forum agreed for the same.***

PSC Recommendations:

- *DR/EL along with detailed tripping report along with remedial action taken details need to be shared within one week.*
- *Healthiness of protection system and other auxiliary equipments need to be ensured at 220/132kV Pampore(J&K).*
- *Line protection settings at 220/132kV Pampore(J&K) need to be re-viewed in line with NRPC Protection philosophy.*

D. Multiple elements tripping at 220/132kV Moga(PS), 220 kV /66kV Badhni kalan(PS) & 220/66 kV Himmatpura(PS) at 11:06 hrs on 01.07.2025

NRLDC representative shared the following observations w.r.t the tripping event:

i) Exact reason of tripping of 220kV Moga(PS)-Baghapurana Ckt-1 at 10:50 hrs need to be shared.
ii) Issue in O/C E/F relay at Moga(PS) of 220 KV Moga(PG)-Moga(PS) (PSTCL) Ckt-3 need to be addressed at the earliest.
iii) Connectivity issue in Main-2 relay at Moga(PS) end of 220kV Moga(PS)-Sadiq Ckt need to be resolved.
iv) Exact nature of protection operated need to be shared for 220 KV Moga(PG)-Moga(PS) (PSTCL) Ckt-2, 3 & 4 from PG end.
v) Exact reason of busbar protection operation at Ajitwal(PS) need to be shared.
vi) Exact reason and nature of protection operated need to be shared 220kV Badhni kalan-Himmatpura (PS) Ckt, 220kV GHTP-Himmatpura(PS) Ckt-1 & 2 and 220 KV Moga(PG)-Badhni kalan(PS) (PSTCL) Ckt-1

vii) SCADA data was freezed at 220/132kV Moga(PS) during the event. Avaialbility and healthiness of SCADA data need to be ensured.

viii) DR/EL (.dat/.cfg file) of all tripped elements along with detailed tripping report need to be shared.

ix) Remedial action taken report need to be shared.

PSTCL representative present the tripping analysis of the event. Major findings were as follows:

i) At 220 kV S/s Moga PSTCL, R-phase conductor of Baghapurana ckt-2 line conductor snapped and Line DPR cleared the fault in Zone-1 at 10:50 Hrs. AR operated successfully but due to presence of fault under re-claiming time 220 kV Moga – Baghapurana ckt-2 tripped from Moga end.

ii) 220 kV Moga PSTCL – Baghapurana ckt-1 also tripped from Moga end due to the operation of Main-2 relay for Zone-1 trip. 220 kV Moga – Baghapurana ckt-1 & 2 tripped from Baghapurana end.

iii) Busbar protection relay mal-operated at 220 kV Baghapurana end at 10:50 Hrs., reason of Busbar protection operation could not be con-firmed as no trip data was available in BBPS. Busbar checked for any false initiation and differential current and is now in a Healthy condition.

iv) 220 kV Himmatpura – GHTP Lehra ckt-1 tripped from lehra end at 10:50 Hrs. in zone-1.

v) At 11:06 Hrs. R-phase jumper of 220 kV Moga PSTCL – Moga PGCIL ckt-3 snapped and came in contact with Y-phase conductor. At Moga PSTCL end, only O/C E/F relay was in operation at the time of fault , which did not picked and line remain charged from Moga end and tripped from Moga PGCIL end only. Due to which fault clearance took more than 715 msec.

vi) 220 kV Moga PSTCL – Moga PGCIL ckt-2 also not tripped from Moga PSTCL end but total fault feeding time recorded was 246 msec. Line tripped from Moga PGCIL end only.

vii) 220 kV Moga PSTCL – Kotkaror ckt – 1 & 2 tripped from Moga end with Zone-4 timing thus cleared the fault under 240 msec.

viii) 220 kV Moga PSTCL – Sadiq tripped from Moga end and total fault feeding recorded was 44 msec, reason of tripping could not be identified due to connectivity issue in Main-2 relay.

ix) 220 kV Moga PSTCL – Moga PGCIL ckt- 4 tripped from both ends due to pilot wire protection operated at PG Moga end, no fault data available from Moga PSTCL end .

x) 220 kV Busbar protection at 220 kV Ajitwal S/s operated at 11:06 Hrs, due to which 220 kV PG Moga , Jagraon ckt-2 and Himmatpura line tripped from Ajitwal end.

xi) 220 kV Badhni kalan – PG Moga line tripped from Badhni end due to false operation of Main-2 relay in Zone-1.

xii) 220 kV Himmatpura – Lehra Mohabbat ckt-2 tripped at 11:06 Hrs. due to false tripping of Power Swing, which is now set to Power Swing Block only.

xiii) As remedial action taken,

a. 220 kV Moga PSTCL – Moga ckt-3 OC/EF relay did not clear the fault, issue was found in relay settings, now settings have been re-vised. Ckt-1, 2, 3 & 4 relay at PG Moga end are more sensitive to fault due to which Moga PSTCL – Moga PG ckt – 2, 3 & 4 tripped from PG Moga end only.

b. Commissioning of Line Differential for 220 kV Moga PSTCL – Moga PGCIL ckt-1 , ckt-3 & ckt-4 has been completed and will also work as Distance protection.

c. Due to mismatch in CT ratios of both ends of ckt-2, settings have been suggested by OEM, the approval of which is pending from PG-CIL end.

d. 220 kV Busbar protection at 220 kV Baghapurana has been checked for any false initiation and differential current and now in Healthy condition.

e. New Busbar Protection Panel has arrived at 220 kV Moga PSTCL and work of commissioning will start after paddy season.

f. 220 kV Badhni kalan end, PG Moga ckt Main-2 relay settings and Himmatpura end lehra ckt relay settings has been revised to avoid false tripping in future.

PSC Recommendations:

- *Healthiness of bus bar protection need to be ensured at Baghapurana and Ajitwal S/s.*
- *New busbar protection need to be installed at Moga PSTCL at the earliest.*
- *Line protection settings at 220/132kV Moga(PS), 220 kV /66kV Badhni kalan(PS) & 220/66 kV Himmatpura(PS) need to be reviewed in line with NRPC Protection philosophy.*
- *CT mismatch issue at both the ends of 220 kV Moga PSTCL – Moga ckt-2 need to be addressed and differential protection need to be installed at the earliest by PSTCL in co-ordination with PGCIL.*

E. Multiple elements tripping at 220kV Patparganj(DTL) at 17:31 hrs on 09.07.2025

NRLDC representative shared the following observations w.r.t. tripping event:

i) Exact nature, location and reason of fault need to be shared.
ii) Reason of tripping of 220 kV Rajghat-IPPOS (DTL) Ckt-1 & 2 and 104 MW GT-1 and 122 MW STG at Pragati (PPCL) need to be shared.
iii) SCADA data was freezed at 220kV Geeta Colony and Pragati(PPCL) during the event. Availability and healthiness of SCADA data need to be ensured.
iv) DR/EL (.dat/.cfg file) of all tripped elements along with detailed tripping report need to be shared.
v) Remedial action taken report need to be shared.

DTL representative present the tripping analysis of the event. Major findings were as follows:

i) During antecedent condition, 220 kV Bus-II at 220 kV Patparganj was connected with 220 kV Patparganj-Geeta colony ckt-I & II, 220 kV Patparganj-IP Ckt.-I & II, 220 kV Patparganj-Ghazipur ckt. and was feeding the load of 2 nos. 220/66 kV, 100 MVA Tr-I & II and 220 kV Bus-I at 220 kV Patparganj was connected with 220 kV Patparganj-Preet vihar ckt-I & II and was feeding the load of 2 nos. 220/33 kV, 100 MVA Tr-I & III. The 220 kV Bus coupler at Patparganj was in OFF position. 220 kV Bus-1 at Pragati was connected with IP Ckt.-I & II, 160 MVA Tr-I & II, GT#1 and STG. While 220 kV Bus-2 at Pragati was connected with M.Bagh ckt.-I & II, GT#2 and were feeding the load of Park street-I & II. The 220 kV Bus coupler at Pragati was in OFF condition. 220 kV Bus-1 at 220 kV IP was connected with Pragati ckt.-1, Patparganj ckt.-1, Rajghat ckt.-1 and was feeding the load of 220/33 kV 100 MVA Tr-1, while 220 kV Bus-2 at 220 kV IP was connected with Pragati ckt.-2, Patparganj ckt.-2, Rajghat ckt.-2 and was feeding the load of 2 nos. 220/33 kV 100 MVA Tr-2 & 3. The 220 kV Bus coupler at IP was in ON condition.

ii) Due to the 220 kV Bus-2 fault at Patparganj Sub-stn., both 220 kV Patparganj-IP ckt.-I & II tripped at Patparganj resulting islanding and load loss of GT#1 and STG at Pragati, which were connected to Bus-1 at Pragati.

iii) Due to islanding of GT#1 and STG at Pragati, 33 kV feeders, i.e. 33 kV Bay No. 1,5,7,9,13,17 25,37,4,6,10,18,24,28,30,42 at 220 kV IP Sub-station tripped on UFR at frequency-48.4 Hz.

iv) 20 kV IP-Patparganj ckt.-II and 220 kV IP-Rajghat ckt.-I & II at 220 kV IP Sub-stn. tripped on UFR due to further dip in frequency to 47.9 Hz.

v) As remedial action taken, Kite threads have been removed from the switchyard at different locations as a preventive measure to avoid such tripping.

PSC Recommendations:

- *Healthiness of protection system need to be ensured at 220kV Patparganj.*

- *Availability and healthiness of SCADA data at 220kV Geeta Colony(DTL) and Pragati(PPCL) need to be ensured.*

F. Multiple elements tripping at 220/66kV Narela(DTL) at 15:41 hrs on 10.07.2025

NRLDC representative shared the following observations w.r.t. tripping event:

i) Exact nature, location and reason of fault need to be shared.
ii) Reason of delayed clearance of fault need to be shared.
iii) SCADA data was freezed at 220/66kV Narela(DTL) during the event. Availability and healthiness of SCADA data need to be ensured.
iv) DR/EL (.dat/.cfg file) of all tripped elements, along with a detailed tripping report need to be shared.
v) Remedial action taken report need to be shared.

DTL representative present the tripping analysis of the event. Major findings were as follows:

i) During antecedent condition, both Mandola Ckt 1 and 2 were connected to same Bus at DTL Narela with Mandola Sub station as source of supply.
ii) At 15:43Hrs, Y phase Voltage transient (dip Vy=55kV for 50mSec) occurred which followed by fault in 220kV Narela-Mandola Ckt-2 due to C phase conductor snap sensed in Zone 2, location at 17.06 Km from Narela end at Tower T9. Consequently Mandola Ckt 2 got tripped from both ends.
iii) After tripping of 220kV Narela-Mandola Ckt-2, its load was automatically shared totally by 220kV Narela-Mandola Ckt-1 which continued for 20 seconds. After 20 Seconds, extra loading of 220kV Narela-Mandola Ckt-1 caused another fault and 1 Phase tripping of Ckt 1 occurred due to C phase conductor snap, location at 1 Km from Narela end at Tower T70 , which was detected in Zone 1 distance reach and after 1 Second dead time Ckt-1 got auto- reclosed successfully at DTL Narela end.

iv) Although 220kV Narela-Mandola Ckt-1 Blue phase conductor got grounded due to conductor snap but auto reclosure at Narela end got successful due to DTL Bus and line dead condition at the time of reclosure.

v) As remedial action taken, Zone 1 reach extended to 90% of PL till Tele-protection communication restoration.

PSC Recommendations:

- *Healthiness of protection system need to be ensured at 220kV Narela.*
- *Tele-protection communication need to be restored at 220kV Narela at the earliest.*
- *Line protection settings need to be reviewed at 220kV Narela-Mandola D/C as per NRPC protection philosophy.*
- *Availability and healthiness of SCADA data at 220kV Narela need to be ensured.*

G. Multiple elements tripping at 220kV Khodri(UK) and 220kV Chhibro(UK) at 12:28 hrs on 15.07.2025

NRLDC representative shared the following observations w.r.t. tripping event:

i) Reason of delayed clearance of fault need to be shared.

ii) Busbar protection need to be made healthy at Khodri at the earliest.

iii) Exact reason of non-operation of protection in 220 KV Khodri - Chhibro (UK) Ckt-1 need to be shared.

iv) Exact nature of protection operated in 220 KV Khodri - Chhibro (UK) Ckt-2 at Chhibro end need to be shared.

v) Direction E/F protection settings at Khodri end of 220 KV Khodri(UK)-Majri(HP) (UK) Ckt-2 need to be shared and reviewed.

vi) Reason of sensing the fault in zone-3 by Main-2 relay at Khodri end of 220 KV Sarsawan(UP)-Khodri(UK) (UP) Ckt need to be analysed.

vii) DR/EL(.dat/.cfg file) of all tripped units need to be shared along with detailed tripping report.

viii) Remedial action taken report need to be shared.

PTCUL representative present the tripping analysis of the event. Major findings were as follows:

i) During Antecedent condition 88 MW Power was being generated from Khodri and 199 MW Power was being evacuated from Chibro to Khodri through 220 kV Chibro-Khodri-Feeders.

ii) The test team and switchyard team were working jointly to trace the DC supply fault in control circuit of Khodri-Jhajhra Feeder Breaker (87). At around 12:28 hrs a heavy flashing was observed in its B phase insulator bushing. A loud sound was heard and all generation units and feeders connected at Khodri Power Station got tripped.

iii) All relays installed on generation units recorded heavy current and got tripped on Overcurrent protection. All feeders also tripped on Zone – 04 (protection of reverse side of circuit breaker). Since, all generation units at KPS were tripped, all the generation units at Chibro Power Station also tripped simultaneously on Overcurrent protection.

iv) After isolation of faulty section, restoration of the generation units and feeder was completed at 14:45 hrs. The electrical maintenance team checked for healthiness of post insulator & it was decided to replace the 'B' Phase isolator bushing with another one. Thereafter IR was taken and found 13 Giga ohm. Multiple operations of 220 KV Circuit breaker was performed with pole discrepancy protection checked, which was found satisfactory. Finally at 20:21 hrs. on dated 16.07.2025 feeder was normalized.

PSC Recommendations:

- *Healthiness of protection system and auxiliary equipments need to be ensured at 220kV Khodri(UK) and 220kV Chhibro(UK) at the earliest.*
- *Protection related issues need to be addressed in 220kV Khdori-Majri ckt-2 at the earliest.*
- *Units protection settings need to be reviewed at 220kV Khodri(UK) and 220kV Chhibro(UK).*

H. Multiple elements tripping at 220kV Khodri(UK) and 220kV Chhibro(UK) at 18:44 hrs on 20.07.2025

NRLDC representative shared the following observations w.r.t. tripping event:

i) Exact reason, nature and location of fault need to be shared.
ii) Exact nature of protection operated at 60 MW Unit-3 at Chhibro(UK) need to be shared.
iii) Exact reason of non-operation of protection in 220 KV Khodri - Chhibro (UK) Ckt-1 need to be shared.
iv) DR/EL(.dat/.cfg file) of all tripped units need to be shared along with detailed tripping report.
v) Remedial action taken report need to be shared.

PTCUL representative present the tripping analysis of the event. Major findings were as follows:

i) During Antecedent condition 88 MW Power was being generated from Khodri and 199 MW Power was being evacuated from Chibro to Khodri through 220 kV Chibro-Khodri-Feeders. U#2, U#4, 220 KV Feeder Chibro-Khodri-I(81) Feeder, 220kV Khodri-Sarsawa -II(83), 220kV Khodri-Mazri -I(86) Feeder,220 KV Khodri-Jhajra(87) were connected to 220kV Bus-1 at Khodri and U#1, U#3, 220 KV Feeder Chibro-Khodri-II(82), 220kV Khodri-Saharanpur -I(84), 220kV Khodri-Mazri -II(88) were connected to 220kV Bus-2 at Khodri.
ii) A heavy jerk was observed at 18:45 hrs on 220 KV Khodri-Mazri-I & II feeders and get tripped from remote end only. Unit #2,3 & 4 of khodri and 220 KV feeders Khodri-Saharanpur-II, Khodri-Chibro-II, Khodri-Mazri-II and 220/132 KV ICT also get tripped at same time due to this grid disturbance. All Numerical generator protection relays sensed standby earth fault(51N) and LBB operated on U#4 (DR attached), due to which Feeder no-82,84,88 & ICT(885) get de-energized.
iii) No anomaly found in control circuit of U#4 during checking. The closing and trip circuit was found in a healthy condition. All protection of feeders

and generating units were working normally. Thus at 19:53 hrs on date 20.07.25 all units were synchronised with grid.

PSC Recommendations:

- *Healthiness of protection system and auxiliary equipments need to be ensured at 220kV Khodri(UK) and 220kV Chhibro(UK) at the earliest.*
- *Protection related issues need to be addressed in 220kV Khdori-Majri ckt-2 at the earliest.*
- *Units protection settings need to be reviewed at 220kV Khodri(UK) and 220kV Chhibro(UK).*
- *Reason of LBB operation at Unit-4 at Khodri need to be analysed.*

I. Multiple elements tripping at 220/132kV Ziankote(J&K) at 10:18 hrs on 24.07.2025

NRLDC representative shared the following observations w.r.t. tripping event:

i) SCADA data of 220/132kV Ziankote(JK) S/s is not available. Availability and healthiness of the same need to be ensured.
ii) DR/EL (.dat/.cfg) file of all the tripped elements along with tripping report need to be shared from both the ends.
iii) Z-2 time delay setting at Amargarh (INDIGRID) end need to be reviewed and revised so that both the lines don't trip instantaneously.
iv) Remedial action taken report to be shared.

J&K representative was not present during the meeting.

PSC Recommendations:

- *DR/EL along with detailed tripping report along with remedial action taken details need to be shared within one week.*
- *Zone-2 settings need to be revised to 160ms at Amargarh end of 220kV Amargarh-Ziankote D/C.*
- *Healthiness of protection system and other auxiliary equipments need to be ensured at 220/132kV Ziankote(J&K).*

- *Line protection settings at 220/132kV Ziankote(J&K) need to be reviewed in line with NRPC Protection philosophy.*

J. Multiple elements tripping at 220/132kV Kangoo(HP) at 16:46 hrs on 27.07.2025

NRLDC representative shared the following observations w.r.t. tripping event:

i) Exact reason, location and nature of fault need to be shared.
ii) Exact reason of non-clearance of fault/LBB operation need to be analysed. LBB time delay settings need to be shared.
iii) DR/EL (.dat/.cfg file) of all tripped elements along with tripping report needs to be shared from both the ends.
iv) SCADA data at 220/132kV Kangoo(HP) S/s was suspected after the event. Availability and healthiness of SCADA data need to be ensured.
v) Remedial action taken report need to be shared.

HPPTCL representative present the tripping analysis of the event. Major findings were as follows:

i) As reported, at 16:46 hrs, B-N phase to earth fault occurred in 220kV Kangoo-Raruri(HP) Ckt with fault distance of 22.066km from Kangoo end. However, due to non-clearance of fault within time , LBB protection operated.
ii) Due to LBB operation, 220 KV Dehar(BB)-Kangoo(HP) (HP) Ckt and 220/132kV 80/100 MVA ICT at Kangoo(HP) tripped along with all the 132 kV elements connected at Kangoo(HP).
iii) Due to tripping of all 220kV and 132kV elements at Kangoo(HP), both 220kV and 132kV bus at Kangoo(HP) became dead and complete blackout occurred at 220.132kV Kangoo(HP) S/s.
iv) As remedial action taken, faulty relay at 220/132kV Kangoo(HP) has been replaced and issue is resolved.

PSC Recommendations:

- *Healthiness of protection system and auxiliary equipments need to be ensured at 220/132kV Kangoo(HP).*
- *Availability and healthiness of SCADA data at 220/132kV Kangoo(HP) need to be ensured.*
- *DR/EL (.dat/.cfg file) of all tripped needs to be shared from both the ends.*

Grid event analysis details of all the aforementioned grid incidents is attached as ***Annexure-B.II****.*

B.3 Frequent elements tripping during June-July 2025 (agenda by NRLDC)

B.3.1 The following transmission elements were frequently tripping during the month of June 2025:

S. NO.	Element Name	No. of forced outages	Utility/SLDC
1	250 MW (PSP) TEHRI HPS - UNIT 5	10	Tehri PSP
2	220 KV Meerut(PG)-Nara(UP) (PG) Ckt	7	PG/UP
3	220 KV Debari(RS)-RAPS_A(NP) (RS) Ckt-1	5	NPCIL/Rajasthan
4	220 KV RAPS_B(NP)-Sakatpura(RS) (RS) Ckt-1	4	NPCIL/Rajasthan
5	220 KV Sarsawan(UP)-Khodri(UK) (UP) Ckt-1	4	UP/UK

B.3.2 The following transmission elements were frequently tripping during the month of July 2025:

S. NO.	Element Name	No. of forced outages	Utility/SLDC
1	250 MW (PSP) TEHRI HPS - UNIT 5	12	Tehri PSP
2	250 MW (PSP) TEHRI HPS - UNIT 6	9	Tehri PSP
3	220 KV NAPP(NP)-Simbholi(UP) (UP) Ckt-1	8	NPCIL/UP
4	220 KV Nara(UP)-Roorkee(UK) (UP) Ckt-1	5	UP/UK
5	220 KV Panipat-Kurukshetra (BB) Ckt-1	5	BBMB

B.3.3 List of tripping is attached as Annexure-B.III of agenda.

B.3.4 NRLDC representative highlighted that frequent tripping of transmission elements affects the reliability and security of the grid. In view of the same, utilities were requested to analyse the root cause of the tripping and share the remedial measures taken/being taken in this respect.

B.3.5 NRLDC presented all the tripping incidents of all frequently tripped elements and asked respective constituents to share the root cause of frequent faults, A/R operation related status and details of remedial actions taken to avoid frequent tripping of line.

B.3.6 Transmission element wise details received from the constituents regarding reason of faults, any protection related issue and status of remedial actions have been attached as **Annexure-B.III.**

B.3.7 NRLDC representative emphasized that A/R (auto re-closer) issue was found in many of these tripping. All the utilities were sensitized to ensure healthiness/in service of A/R in 220 kV and above transmission lines in compliance to CEA Grid Standards. It was further informed that most of the tripping were of transient in nature but due to non-operation of A/R, it resulted into tripping of the transmission element thus reducing the reliability of the grid.

B.3.8 It was requested that all the utilities shall endeavour to keep auto re-closer in service and healthy condition of 220 kV and above voltage level transmission line. The issue of time syncing of DR/EL at many of the stations was also highlighted, constituents were requested to ensure the time syncing of DR/EL. In addition, utilities were requested to take necessary actions to ensure the right-of-way and other operation & maintenance issues to minimize the frequent faults in the line. All the utilities agreed on the same.

Decision of the Forum

PSC forum reiterated that frequent outages of transmission elements affect the reliability and security of the grid. Members were requested to investigate such frequent outages and share the suitable remedial measures taken/being taken in this respect.

B.4 Details of tripping of Inter-Regional lines from Northern Region for June-July'25 (agenda by NRLDC)

B.4.1 As A total of 23 inter-regional lines tripping occurred in the month of June-July 2025. The list is attached at Annexure-B.IV of agenda. The status of receipt of preliminary reports,

DR/EL within 24hrs of the event and fault clearing time as per PMU data has also been mentioned in the table. The non-receipt of DR/EL & preliminary report within 24hrs of the event from SLDCs / ISTS licensees / ISGSs is in violation of regulation 37.2(c) of IEGC and regulation 15(3) of CEA Grid Standards. As per regulations, all the utilities shall furnish the DR/EL, flag details & preliminary report to RLDC/RPC within 24hrs of the event. They shall also furnish the detailed investigation report within 7 days of the event if fault clearance time is higher than that mandated by CEA (Grid Standard) Regulations.

B.4.2 Members were requested to note and advise the concerned for taking corrective action to avoid such tripping as well as timely submission of the information.

B.4.3 NRLDC representative raised concern about the instability Detection protection at Champa end for HVDC Champa-Kurukshetra Poles due to design issues. POWERGRID(NR-I) representative informed that one committee was formed for detail investigation and observation and committee recommendation would be taken care.

B.4.4 Regarding tripping of 220 KV Modak(RS)-Bhanpura(MP) (MPSEB) Ckt-1, Rajasthan was requested to state the reason of 3-ph A/R during fault. Rajasthan representative informed that there was issue in CB and remedial action has been taken thereafter.

B.4.5 Regarding the tripping of 220 KV Auraiya(NT)-Mehgaon(MP) (MPSEB) Ckt-1, NRLDC representative stated that there was time sync issue in DR at Auraiya end. Detailed discussion was not possible due to unavailability of NTPC representative. DR time sync issue need to be resolved at the earliest.

Decision of the Forum

PSC forum recommended members to take necessary actions to minimise the tripping on inter regional line and ensure proper operation of protection system.

B.5 Necessity of standard operating procedure during any switching operation in view of multiple element tripping events at 220kV Salal(NHPC) on 15th July 2025 and 400/220 kV Panipat(BBMB) on 24th July 2025 (agenda by NRLDC)

B.5.1 Two number of multiple element tripping events i.e., at 220kV Salal(NHPC) on 15th July 2025 and at 400/220 kV Panipat(BBMB) on 24th July 2025 occurred during July 2025

months. Triggering incident for both the events were operation of isolators during ON LOAD condition which further led to heavy flashover and fault in system. Detailed analysis of these two events are attached as Annexure-B.V of agenda.

B.5.2 **220kV Salal(NHPC)**

NHPC representative informed the following:

i) During antecedent condition, all the 6 units and all 6 outgoing feeders were in operation.

ii) Load was reduced in U#4 for trash clearance and when load was around 70MW, opening commend was initiated but that time B-ph CB was stuck.

iii) At the same time pole discrepancy operated and LBB also initiated. Multiple attempts were made by the plant operator to open the CB of unit-4 however it couldn't open and LBB relay also didn't operate as per scheme.

iv) Further the plant operator made an attempt to open the u#4 isolators with the purpose of isolating the unit-4. However, as the isolator was opened in ON load condition, flashover occurred which resulted fault in system.

v) All the units got tripped. There was heavy damage in s/s equipment.

B.5.3 **400/220 kV Panipat(BBMB)**

BBMB representative informed the following:

i) 400/220/132/33kV Panipat(BB) has double main Bus arrangement at 220kV side. There are two 220kV bus i.e., Bus-1 & 2. Further, Bus-2 is divided into two-part Bus-2A & Bus-2B. 220/33kV 60 MVA Transformer-1 at Panipat(BB) was taken out (planned S/D) and isolator of Transformer-1 was to be opened for its isolation.

ii) Operator at 220kV Panipat S/s, inadvertently opened the 220kV side isolator of 220/33kV 60 MVA Transformer-2 at Panipat(BB) which was in charged condition.

iii) As isolator was opened in charged condition, heavy flashover occurred in isolator leading to R-Y phase to phase bus fault on 220kV Bus-2A.

iv) On this fault, bus bar protection operated, and all the elements connected to 220kV Bus-2A tripped. 220kV Bus coupler and sectionalise breaker opened, and fault got isolated from the system.

v) Due to tripping of 400/220kV 500 MVA ICT-2 (connected in Bus-2A), load got shifted on 400/220kV 450 MVA ICT-1 led to its overloading and ICT-1 tripped on overcurrent protection operation.

vi) Further, as source from 400kV side got lost, all the load at 220kV side was met through Ganguwal→Jagadhri→Pipli→Panipat→loads.

vii) Loading of 220kV Ganguwal-Jagadhri increased to 259 MW. Further at 09:58 hrs, 220kV Ganguwal-Jagadhri Ckt tripped on B-N fault.

viii) With the tripping of this Ckt, supply to 220/132kV Pipli(HR), 220/66kV Jagadhri(BBMB), 220/66kV Dhulkote(BBMB) and 220kV Rotak Road(BBMB) got lost.

ix) Further, at 10:11 hrs, 220kV Ckts at Panipat which were already dead, manually opened. Restoration work started at around 10:48 hrs and all the elements were revived by 11:30 hrs.

Decision of the Forum

PSC forum advised utilities to sensitize all the operators and strictly adhere to the Standard operating procedure during any switching operation and necessary instruction may be given to site operators regarding this. NHPC and BBMB were also requested to share the SOP during next PSC meeting for sensitizing all the utilities to avoid such kind of events in future.

B.6 Frequency response performance for the reportable events of month of June-July 2025 (agenda by NRLDC)

B.6.1 During the months of June-July 2025, 4 no. of reportable events were notified by NLDC for which FRC/ FRP need to be calculated. Description of the event is as given in the Table below:

S. No.	Event Date	Time (In hrs.)	Event Description	Starting Frequency (in Hz)	Nadir Frequency (in Hz)	End Frequency (in Hz)	*Δf(Hz)*	NR FRP during the even

								t
1	12-Jun e-25	13:34 hrs	As reported, at 13:34 hrs on 12th June 2025, generation loss event of 1633MW occurred in NR RE complex in Rajasthan. Hence generation loss of 1633 MW is considered for FRC/FRP Calculation.	50.006	49.822	49.944	-0.062	0.83
2	16-Jun e-25	11:51 hrs	As reported, at 11:51 hrs on 16th June 2025, generation loss event of 1322MW occurred in Bhutan. Hence, generation loss of 1322 MW is considered for FRC/FRP Calculation.	49.963	49.863	49.920	-0.043	0.83
3	22-July -25	19:46 hrs	As reported, at 19:46 hrs on 22nd July 2025, generation loss event of 1437MW occurred at Tehri, Koteshwar Hydro	49.942	49.832	49.874	-0.068	1.31

			generation complex in NR. Hence generation loss of 1437 MW is considered for FRC/FRP Calculation.					
4	29-July-25	14:55 hrs	As reported, at 14:55 hrs on 29th July 2025, generation loss event of 1100 MW occurred at ACME_Fatehgarh_I in Rajasthan RE complex . Hence, generation loss of 1100 MW is considered for FRC/FRP Calculation.	50.145	50.044	50.075	-0.70	0.95

B.6.2 As per IEGC 2023 Clause 30.8, "The primary response of the generating units shall be verified by the Load Despatch Centres (LDCs) during grid events. The concerned generating station shall furnish the requisite data to the LDCs within two days of notification of reportable event by the NLDC."

B.6.3 As per IEGC 2023 Clause 30.10.(n), "Each control area shall assess its frequency response characteristics and share the assessment with the concerned RLDC along with high resolution data of at least 1 (one) second for regional entity generating stations and energy storage systems and 10 (ten) seconds for the state control area."

B.6.4 As per sub-clause (a(v)) of clause (9) of IEGC 2023 Annexure-2, "All the SLDCs shall work out FRC for all the intra-state entities (for events indicated by the Regional Load

Despatch Centres) based on the HDR available at their respective SLDCs and submit the same to the respective RLDC within six (6) working days after the event. (Format as per Table-B)."

B.6.5 As per sub-clause (a(vi)) of clause (9) of IEGC 2023 Annexure-2, "All regional entity generating stations shall also assess the FRC for their respective stations and submit the same to the respective RLDC within six (6) working days. (Format as per Table-B). The high-resolution data (1 second or better resolution) of active power generation and frequency shall also be shared with RLDC."

B.6.6 Members are requested to share the FRC/FRP computation of their respective control area as per the timeline specified in IEGC 2023.

B.6.7 Frequency Response Performance (FRP) of generating stations for each reportable event are calculated based on the submitted high-resolution data from generating stations. However, the generating stations for which data is not received till 10th August 2025, FRC/FRP as per NRLDC HDR data is used for computation of Average Monthly Frequency Response Performance, Beta 'β' for Generating Stations.

B.6.8 From the FRP data, it is observed that FRP of many of the control areas are not satisfactory. Therefore, it is requested to review the FRC/FRP, governor actions of your respective control area, necessary actions may be taken for improvement in the FRC/FRP.

B.6.9 NRLDC representative mentioned that FRC computation and data submission is pending from Uttarakhand, J&K and Ladakh, Shree Cement, Singrauli, Anta, Auriya, Dardi, Budhil, Chamera-3, Dhauliganga, Sainj, Singoli Bhatwari, Sorang and Uri-2. Moreover, it was informed that frequency response performance of Uri, Chamera, Bairasiul, Bhakra, Budhil,Kishenganga, Koldam, Pong, Sewa, Sorang plants for the reportable events is not satisfactory.

B.6.10 NHPC confirmed that issue in extracting data for Uri-2 and Chamera-3 for FRC computation would be sorted out very shortly. They also informed that as both the stations are RoR and in absence of a head, sometimes their response is good and sometimes their response is poor.

B.6.11 BBMB representative informed that they will ensure that the status of FRC data submission and computation would be communicated to the respective team.

B.6.12 Status of details received from constituents and FRP values as considered for the events of June-July 2025 are attached as Annexure-B.VI of agenda.

B.6.13 ISGS were requested to confirm whether FGMO as per IEGC 2023 has been implemented at their respective stations or not. Updated list on the basis of details received is as follows:

Sl. No.	Entity	Governor Mode (FGMO as per IEGC 2023) (Yes or No)	Droop setting (%)	Remarks (if any)
1	Dadri-1 (TH)	Yes	6	
2	Dadri -2 (TH)	Yes	6	
3	Jhajjar (TH)	Yes	5	
4	Rihand-1 (TH)	Yes	5	
5	Rihand-2 (TH)	Yes	5	
6	Rihand-3 (TH)	Yes	5	
7	Shree Cement (TH)	Not received		
8	Singrauli (TH)	Yes	5	
9	Tanda-2 (TH)	Yes	6	
10	Unchahar-I (TH)	Yes	5	
11	Unchahar-II (TH)	Yes	5	
12	Unchahar-III (TH)	Yes	5	
13	Unchahar-IV (TH)	Yes	5	
14	Anta (G)			
15	Auraiya (G)	Not received		
16	Dadri (G)	Not received		
17	AD Hydro (H)	Yes	4	-
18	Bairasiul (H)	Yes	4	
19	Bhakra (H)	Not received		
20	Budhil (H)	Not received		
21	Chamera-1 (H)	Yes	5	
22	Chamera-2 (H)	Yes	5	
23	Chamera-3 (H)	Yes	4	
24	Dehar (H)	Not received		
25	Dhauliganga (H)	Yes	5	
26	Dulhasti (H)	Yes	5	
27	Karcham (H)	Yes	5	
28	Kishenganga	Yes	4	
29	Koldam (H)	Yes	9	
30	Koteswar (H)	Not received		
31	Malana-2 (H)	Not received		
32	Nathpa Jhakri (H)	Yes	9	
33	Parbati-2 (H)	Yes	4	
34	Parbati-3 (H)	Yes	4	
35	Pong (H)	Not received		
36	Rampur (H)	Not received		
37	Sainj (H)	Not received		
38	Salal (H)	Yes	5	

39	Sewa-II (H)	Yes	4	
40	Singoli Bhatwari (H)	Not received		
41	Sorang (H)	No	4	ROR, No storage
42	Tanakpur (H)	Yes	4	
43	Tehri (H)	Yes	4	
44	Uri-1 (H)	Yes	6	
45	Uri-2 (H)	Yes	5	

Confirmation is still pending from Shree Cement, Anta, Auraiya, Dadri(Gas), Bhakra, Budhil, Dehar, Koteshwar, Malana-2, Pong, Rampur, Sainj and Singoli Bhatwari.

Decision of the Forum:

PSC forum requested all the ISGS to confirm the staus of FGMO implementation as per IEGC 2023 at their respective stations. Constituents were also requested to share the details of the droop w.r.t. their generating stations. constituents were also requested to share the details of the droop w.r.t. their generating stations at the earliest. Members are requested to analyse the frequency response of their respective control area and share the FRC/FRP analysis of generating stations along with unit wise 01 sec data as per timeline for ensuring IEGC compliance.

B.7 Mock testing of System Protection Schemes (SPS) in Northern Region (agenda by NRLDC)

B.7.1 As per IEGC clause 16.2

''For the operational SPS, RLDC or NLDC, as the case may be, in consultation with the concerned RPC(s) shall perform regular load flow and dynamic studies and mock testing for reviewing SPS parameters & functions, at least once in a year. RLDC or NLDC shall share the report of such studies and mock testing including any short comings to respective RPC(s). The data for such studies shall be provided by CTU to the concerned RPC, RLDC and NLDC.''

B.7.2 As per IEGC clause 16.3

''The users and SLDCs shall report about the operation of SPS immediately and detailed report shall be submitted within three days of operation to the concerned RPC and RLDC in the format specified by the respective RPCs.''

B.7.3 There are 56 numbers of System Protection Scheme (SPS) approved in Northern Region. These SPS are implemented at major generation complexes, important evacuating transmission lines and ICTs which are N-1 non-compliant. System Protection Scheme Document of Northern Region has been revised/updated on 31st January, 2025.

B.7.4 SPS is designed to detect abnormal system conditions and take predetermined, corrective action to preserve system integrity and provide acceptable system performance. Therefore, correct operation of SPS as per designed logic is important to serve its purpose. To ensure this, mock testing of SPS needs to be conducted at a regular period. Clause 16.2 of IEGC 2023 also mandates the mock testing of SPS for reviewing SPS parameters & functions, at least once a year.

B.7.5 In this regard, communication has already been sent to constituents through NRLDC letter dated 01.05.2024, 21.02.2025, 05.03.2025, 04.04.2025 & 28.05.2025 and continuous follow up is being done in OCC & PSC meeting since May 2024.

B.7.6 During 2024-25, mock testing of 14 SPS out of total 55 SPS were not conducted. In view of high demand scenario during summer 2025-26, NLRDC vide letter dated 04.04.2025 requested all the concerned utility to conduct the mock testing of pending SPS by the end of April 2025. However, as reported, mock testing of 03 SPS out of pending 14 SPS have been done. In this regard, discussion was also held in 60th & 61st PSC meeting. PSC forum requested all the members to conduct the mock testing of all the SPS in their respective control area at the earliest.

B.7.7 Status of mock testing of all the SPS in NR is attached as **Annexure-B.VII** of the agenda.

B.7.8 In view of the above, members were requested to take the following actions:

i. Concerned constituents/utility are requested to conduct the mock testing of pending SPS (whose mock testing was not conducted in FY 2024-25) at the earliest.

ii. In compliance with IEGC clause 16.2, users shall ensure that mock testing

along with the review of SPS logic of all the SPS is conducted at least once a year. Hence utilities are also requested to share the tentative schedule and conduct the mock testing of SPS schemes in their respective control area w.r.t. FY 2025-26.

iii. Further In compliance with IEGC clause 16.3, users shall also share the detailed report of SPS operation in their respective control area within 3 days of its operation. Presently, no such report is being received.

B.7.9 During 60th PSC meeting, forum also decided to not disable the SPS where ICTs are now N-1 compliant after augmentation. It was decided that SPS may be kept enabled with logic based on loading instead of ICT tripping. Members may share the status in this regard.

B.7.10 Members were requested to revise the logic of SPS from TRIPPING based logic to LAODING based logic at stations where ICTs are now N-1 compliant after ICT augmentation. Members were requested to take necessary actions in this regard and share the confirmation.

B.7.11 NRLDC representative informed that SPS mock testing of Rosa has been conducted and report also shared.

B.7.12 Schedule is awaited for SPS mock testing of 400 kV Muzaffarpur-Gorakhpur D/C and 1500 MW HVDC Rihand-Dadri Bipole and the same need to be conducted at the earliest.

B.7.13 Schedule of SPS mock test of Bamnauli (DTL) , Agra (UPPTCL), at 400kV Rajpura (PSTCL), 400kV Mundka (DTL), 400kV Nehtaur(WUPPTCL) and Obra TPS are also awaited.

B.7.14 HP informed that SPS for Lahal Generation is no longer required.

B.7.15 POWERGRID informed that the SPS logic at Ballabhgarh and Greater Noida needs to be modified in line with the loading conditions.

B.7.16 UPPTCL representative informed that as confirmed at site, no SPS is in service at Narora station and requirement of SPS scheme mentioned in SPS document need to be reviewed once again.

B.7.17 As per information received from POWERGRID, Mock testing of SPS to relive transmission congestion in RE complex (Bhadla2) was conducted on 26th August 2025. Report of the same need to be shared.

B.7.18 NRLDC representative requested members to share the schedule for SPS mock testing w.r.t. their respective control area and to share the mock test report of SPS whose mock testing have already conducted.

Decision of the Forum:

PSC forum requested members to conduct the mock testing of SPS in their respective control area, share the tentative schedule of mock testing of SPS and share the report after conducting mock test..

B.8 Corrective action for healthiness of 500kV Mundra-Mahindergarh SPS (agenda by NRLDC)

B.8.1 On 17th May 2024 on outage of both pole (carrying total ~1500MW), SPS of 500kV HVDC Mundra-Mahindergarh inter regional link didn't operate. This issue was discussed during 51st PSC meeting and ADANI was requested to share the details w.r.t. SPS operation during the meeting.

B.8.2 Further, NRLDC in coordination with NLDC conducted an online discussion meeting with concerned stakeholders (SLDCs, ADANI, POWERGRID) on 12th August 2024, for further remedial actions required to make this SPS healthy.

B.8.3 Following actions were decided during the meeting:

i. POWERGRID, ADANI and concerned states were requested to identify the issue in communication links and take expeditious actions to make the all the communication link healthy. POWERGRID & ADANI shall review the healthiness of SPS system at different load centres and communication path between them in coordination with the SLDCs.

ii. States were requested to go through the details of load feeders mentioned in SPS document and share the changes / modifications as per present scenario and share the inputs w.r.t. unavailability in identified load feeders and load shedding. SLDCs shall share the revised updated feeder details (radial) along with expected average/peak load relief through respective feeders.

iii. SLDCs in coordination with their transmission and protection team shall share the status and healthiness of existing SPS system along with details of the availability of the communication path for the incorporation of proposed revised/additional feeders.

B.8.4 Load end details have been received from UP, Haryana, Punjab Rajasthan & Delhi. Details and communications are attached as **Annexure-B.VIII**. of agenda.

B.8.5 ADANI via mail dated 29.08.2024 has submitted the status of healthiness of communication network and hardware system at different locations on the basis of preliminary inspection. As per details submitted, counter status was found OFF at Alwar, Ratangarh, Gobindgarh, Malerkotla, Bamnauli, Shamli and Dhanonda.

B.8.6 Details of nodal officer of different substation involved in SPS scheme has already been shared with ADANI team for coordination and further remedial actions.

B.8.7 During 53rd PSC meeting, ADANI was requested to coordinate with the respective states to rectify the issues in the SPS system and share the status of remedial action taken / planned to be taken. Desired remedial actions need to be expedited.

B.8.8 ADANI agreed for the same and stated that update would be given within 01 week. However, no detail received yet from ADANI.

B.8.9 During discussion in 55th PSC meeting it was decided that ADANI shall take lead in rectification work as this SPS scheme was commissioned by them. Protection nodal officers from States will provide possible necessary assistance from their end. Further, states were also requested to ensure incorporation of revised decided feeders during work at their stations. States representative assured to provide all necessary coordination from their end.

B.8.10 During 56th PSC meeting, ADANI was requested to apprise the forum about the present status of remedial actions. ADANI representative stated that they have raised service order to COMTEL (OEM) for approval. After approval of this service order, COMTEL engineers will visit all the sites in coordination with nodal officers from respective stations. It is expected that identification of issues and estimate hardware requirement will be completed by the end April 2025. Thereafter, after financial approval, rectification of issues will be done. ADANI was requested to ensure completion of whole work before summer 2025. State representatives were also requested to coordinate with the ADANI team and ensure incorporation of identified revised feeders for load relief in SPS.

B.8.11 Further, through mail dt 3rd April 2025, ADANI has informed that they awarded the rectification work service to M/s COMTEL for survey and restoration of possible elements installed at the locations and engineers from M/s COMTEL shall be visiting

respective stations as per the schedule.

B.8.12 During 57th PSC meeting, ADANI representative informed that visit by COMTEL engineers at all the sites is completed and COMTEL will submit the report within 10 days.

B.8.13 ADANI was requested to share the report at the earliest and make Action Plan accordingly to ensure completion of whole work before summer 2025.

B.8.14 ADANI agreed to take expeditious actions and to share the action plan at the earliest.

B.8.15 During 58th PSC meeting, ADANI representative shared the observations made by COMTEL engineers and informed that it would at least require 6 months to complete the work.

B.8.16 NRLDC CGM (SO) highlighted that in view of envisaged growth in demand in next summer season, it is important to ensure rectification of issues and healthiness of SPS.

B.8.17 ADANI representative further informed that the cost implication in this case is estimated as approx. Rs. 1.5 Cr. Till now they have conducted a technical assessment and made a cost estimation. They will look into the regulatory aspect of the same for finalising the action plan.

B.8.18 During 59th PSC meeting, ADANI representative informed that they are doing discussions with ULDC for allocation of necessary links between locations. They have also initiated internal approval for placing necessary orders to the partner for execution of upgradation activity. They are expecting to complete the execution within 4-5 months in collaboration with all the stakeholders from respective utilities and ULDC team. Communication from ATIL in this regard is also sent to NRLDC through letter dated 10th April 2025.

B.8.19 PSC forum emphasized that considering the growing energy demands in summer season, healthiness of 500kV Mundra-Mahindergarh SPS is of utmost importance for secure & reliable grid operation. State representatives were also requested to coordinate with the ADANI team and also ensure incorporation of identified revised feeders for load relief in SPS. Desired remedial actions need to be expedited.

B.8.20 During 60th PSC meeting, ADANI representative informed that internal approval is taken for placing the order and order will be released to vendor by end of June-July 2025. They have expedited the execution of upgradation activity and now it is expected to get completed by August 2025.

B.8.21 NRLDC representative requested to share weekly progress report once the execution work starts and ADANI agreed for the same.

B.8.22 ADANI is requested to apprise the forum about identified issues at various stations, action plan and progress in rectification work.

B.8.23 During 61st PSC meeting, ADANI representative informed that order will be released by 1st week of July to the vendor for completion of work. The vendor has given 06 (six) months' timeline for completion of whole work however, we will follow up with the vendor and try to complete the whole work within 04 months.

B.8.24 NRLDC representative requested ADANI to expedite the necessary actions at their end as corrective actions has already been delayed. It was also requested to give action plan of corrective actions for smooth coordination and actions. Weekly progress and status of actions may also be shared.

B.8.25 Further, through mail dt 30th July 2025, ADANI has informed that order has been placed with vendor for the procurement and development of the scheme on new devices and they also shared the timeline for the upcoming broader steps which has evolved based on discussions held with the vendor.

B.8.26 During 62nd PSC meeting, ADANI confirmed the following:

i. The system is expected to be ready by the partner and complete the Factory Acceptance Test (FAT) by 15th September 2025.

ii. Following the FAT, the material will be shipped to various sites and installed by 30th October 2025. Concerned constituents need to ensure the material is kept in a safe and secure area till commissioning at the original location.

iii. Implementation of the communication channel with the assistance of ULDC is also scheduled for completion parallelly by 30th October 2025.

iv. Testing of the installation and wiring will be carried out by 15th November 2025. The same shall require support from respective site representatives.

v. Testing of the communication link between Mahindergarh and other locations is planned for completion by 30th November 2025.

vi. Finally, the testing of the SPS scheme is expected to be completed by 31st December 2025.

Decision of the Forum:

PSC forum emphasized the importance of 500kV Mundra-Mahindergarh SPS and its healthiness is important to ensure rectification of issues in SPS system. ADANI was requested to expedite the necessary actions at their end. It was also requested to share weekly progress and status of actions. State representatives were also requested to coordinate with the ADANI team and also ensure incorporation of identified revised feeders for load relief in SPS. Desired remedial actions need to be expedited.

B.9 Confirmation of regarding implementation of proposed Overvoltage protection setting by committee (agenda by NRLDC)

B.9.1 A committee was formed by NRPC during 52nd PSC meeting held on 20th September 2024 to review the Overvoltage Protection settings of 400kV and 765kV transmission lines in Northern Region. This committee was formed for compliance of the recommendation given by the committee formed by CEA for analysis of Grid incident occurred on 17th June 2024. The committee reviewed the Overvoltage Protection settings of 400kV and 765kV transmission lines in Northern Region, finalized the protection settings for overvoltage protection and proposed the revised overvoltage protection settings. The proposed Overvoltage protection settings were discussed and approved in 58th Protection Sub-Committee (PSC) meeting held on 26th March 2025. The PSC forum requested all to implement the proposed overvoltage protection settings in 400kV and 765kV transmission lines in their respective control area. Details of the revised overvoltage protection setting to be implemented is attached as **Annexure-B.IX.** of agenda.

B.9.2 Further, the agenda in this regard was again discussed in 230th OCC meeting and 60th & 61st PSC meeting. It was observed that many members are yet to confirm the implementation of revised overvoltage settings.

B.9.3 Status of confirmation received from UPPTCL, HVPNL, DTL, Lalitpur TPS (LPGCL), NHPC (Chamera-I &II, Uri-I& II, Dulhasti HEP), POWERGRID NR-1, NUPPL and Rampur HEP. SLDC Punjab vide mail dt 5th June 2025 informed that over-voltage settings implementation will take 3-4 months.

B.9.4 During 61st PSC meeting, PSTCL representative stated that due to shortage of

manpower in protection team, 3–4-month time is required for implementation of revised OV settings.

B.9.5 PSC forum suggested PSTCL to address the issue and propose to form separate protection wing so that protection-related compliance and grid event analysis may be done within stipulated time frame

B.9.6 All members were requested to ensure the implementation of proposed overvoltage settings in their control area at the earliest to avoid any unwanted tripping during the ongoing high-demand scenario. In this regard, e-mail communication was also sent on 07.05.2025 & 03.06.2025 to all members.

B.9.7 During 62nd PSC meeting, the NRLDC representative stated that the status of confirmation from POWERGRID NR-2, POWERGRID NR-3, Adani, Rajasthan, J&K, Punjab, Uttarakhand, HP, BBMB, Indigrid, APCPL, NTPC and RE Plants are yet to be received.

B.9.8 PSTCL representative confirmed that work will be completed before the next PSC meeting.

B.9.9 NRLDC representative also highlighted that during recent tripping events, voltage mismatch was found between PMU and DR data for 765kV Agra-Jhatikara Ckt and 765kV Agra-Fathepur Ckt-1. CVT Error need to be checked at Agra end and O/V setting at Agra end need to be reviewed. Line CVT may be replaced if required to avoid tripping in future.

B.9.10 PSC forum emphasised to resolve this issue within 15days and inform to NRLDC & NRPC.

Decision of the Forum:

PSC forum requested all the members to share the confirmation regarding implementation of revised overvoltage protection setting in 400kV and 765kV transmission lines in their respective control area at the earliest and send a confirmation regarding this to NRPC and NRLDC.

B.10 Confirmation Status of connected load relief quantum during operation of UFR and df/dt (agenda by NRLDC)

B.10.1 UFRs and df/dt are envisaged to take care of sudden contingencies arising out of the

outage of generation stations or the separation of inter-regional lines. UFRs settings are for steady state operation of the Grid at a considerably low frequency and df/dt settings are for dynamic change when the frequency falls suddenly with jerks.

B.10.2 **In view of the above, SLDCs are requested to share the list of feeders mapped for UFR and df/dt along with feeder-wise planned load relief quantum. SLDCs are also requested to share details of mapped/telemetered stage-wise quantum of load relief on UFR and df/dt operation against the planned quantum.** Data is to be furnished in the format attached as **Annexure-B.X of the agenda.**

B.10.3 Further, this is to highlight that on 25.04.2025 at 21:26 hrs, a significant quantum of load loss (~425 MW) occurred in Punjab control area during a fault incident at 400kV Malerkotla(PG). As reported, load loss occurred due to df/dt operation in Punjab control area.

B.10.4 **In view of recent events due to df/dt operation, major review of UFR and df/dt settings is required to avoid unwanted tripping of feeders and load loss in states.**

B.10.5 NRLDC representative shared the format to share the list of feeders mapped for UFR and df/dt along with feeder-wise planned load relief quantum and also the format to share details of mapped/telemetered stage-wise quantum of load relief on UFR and df/dt operation against the planned quantum.

Decision of the Forum:

PSC forum requested to SLDCs to share the details as per the given format at the earliest.

B.11 Multiple elements tripping at 400/220kV Kashipur(UK) at 04:39 hrs & 05:27 hrs on 18.08.2025 (agenda by NRLDC)

B.11.1 On 18.08.2025 at 04:39 hrs & 05:27 hrs, multiple elements tripping occurred at 400/220kV Kashipur(UK). Approx. 260 MW load of Uttarakhand control area affected during the event.

B.11.2 As reported, at 04:39 hrs, Y-N fault occurred on 220kV Kashipur-Jafarpur line. On this fault, A/R attempt was taken however 3-ph tripping didn't occur after dead time on permanent fault. This further led to tripping of 400/220kV ICT-1&2 at Kashipur(UK). Again at 05:27 hrs, both ICTs tripped during charging of 220kV Kashipur-Jafarpur line

due to persistent fault.

B.11.3 400kV Moradabad-Kashipur Line also tripped at 05:27 hrs on distance protection operation in Z-1 from Moradabad end. Reason of tripping of the line on fault at 220kV side of Kashipur need to be identified. In case of any issue in protection settings, necessary corrections need to be done.

B.11.4 From above tripping event, it is suspected that there is some issue in protection setting / logic of distance relay of 220kV Kashipur-Jafarpur line. Reason of the same need to be identified.

B.11.5 In view of above, SLDC-Uttarakhand / PTCUL and SLDC-UP/ UPPTCL are requested to analyse the tripping events and share the detailed analysis. In case of any shortcoming in the protection system and its coordination, necessary corrective actions need to be taken. Confirmation w.r.t. action taken was also requested.

B.11.6 PTCUL representative informed the following:

i) At 04:39:13.817 hrs, the Kashipur distance relay correctly detected an L2–Earth (Y-N phase to earth) fault within Zone-1 reach of the 220 kV Jafarpur–Kashipur line and issued a trip command with Auto-Reclose (AR) initiation. In parallel, both 315 MVA transformers at Kashipur registered overcurrent pickup, indicating heavy fault current contribution from the Kashipur bus.

ii) Following the AR dead time of approximately one second, the reclosure attempt was unsuccessful because the Kashipur breaker did not operate owing to failure in its Group-1 auxiliary relay circuit, which is responsible for extending the three-phase trip command. On the opposite terminal, the Jafarpur end distance protection also detected the Y-phase fault (approx. 10 km from JFR) . Abnormal L2 overvoltage was sensed, and the JFR breaker operated successfully, partially isolating the fault from its end.

iii) Since the Kashipur breaker remained non-operative, the fault continued to be electrically connected to the Kashipur bus, maintaining high fault current flow. This prolonged fault condition resulted in the tripping of both 315 MVA transformers on overcurrent protection, thereby removing major transformation capacity from the node. In addition, the Special Protection Scheme (SPS) was triggered, which tripped the 220 kV Kashipur–Pantnagar and 132 kV Kashipur–Jaspur lines to contain the system disturbance and prevent further instability.

iv) As the fault remained in the network for an extended duration, the 220 kV Pantnagar–Kashipur line tripped in Zone-3 after 800 ms , consistent with the IDMT characteristic calculation, which shows the fault persisted for nearly 1.6 seconds before clearance. The fault was eventually isolated from the Pantnagar–Jafarpur corridor, following which supply conditions at Pantnagar remained stable.

v) Later, at 05:27:21.254 hrs, a re-energisation attempt was carried out on the JFR–Kashipur line. However, since the fault was permanent, the Kashipur breaker tripped instantaneously on protection, and both 315 MVA transformers again tripped on overcurrent due to the heavy inflow of fault current. Simultaneously, the 400 kV Kashipur–Moradabad line tripped from Kashipur end, indicating the spread of disturbance into the 400 kV network during this unsuccessful energisation attempt.

vi) Subsequent patrolling confirmed the fault location at Tower No. 134 (approximately 44 km from Kashipur / ~10 km from Jafarpur), where a suspension clamp failure caused the conductor to drop onto the B-phase cross-arm, creating a sustained L2–E fault. The disturbance was aggravated by the non-operation of the Kashipur breaker under primary distance protection command, forcing the system to rely on SPS tripping through Group-B auxiliary relay for clearance.

vii) This event sequence highlights the dual nature of the disturbance:

1. Mechanical cause – suspension clamp failure leading to a permanent fault, and
2. Protection coordination deficiency – failure of the Kashipur breaker to operate on the main trip path due to auxiliary relay malfunction, resulting in delayed clearance, repeated transformer trippings, SPS intervention, and Zone-3 operation of the Pantnagar–Kashipur line.

viii) The overall impact was significant, with multiple transformer outages, line trippings across 220 kV and 400 kV levels, and heavy stress on the Kashipur bus. The event underscores the necessity for auxiliary relay redundancy, continuous supervision of trip circuits, and scheme modifications to ensure that breaker operation is assured under all protection commands.

Decision of the Forum:

PSC forum recommended to address the issue in auxiliary relay and relay may be replaced if needed. Further, it was advised to all utilities to ensure healthiness of protection system along with auxiliary equipments and also ensure relay redundancy to avoid such kind of events in future.

Part-C: Agenda for final approval of protection settings by PSC Forum for FTCs which have been provisionally allowed by NRLDC/SLDCs

C.1. First Time Charging of transmission lines/Bays/Transformer/Reactor etc. by NRLDC

C.1.1 NRLDC has submitted the FTCs allowed in the month of **June-July 2025**. The same may be found on the NRPC website: http://164.100.60.165/meetings/prsub.html

C.1.2 As per the approved procedure of NRPC, utilities have to put up an agenda in the PSC forum for final approval of settings.

C.1.3 The Following utility has submitted an agenda for approval of settings:

i. POWERGRID/NR-1
ii. POWERGRID/NR-2
iii. ADANI
iv. ESSEL
v. GHATAMPUR THERMAL PLANT
vi. HVPN
vii. HPSLDC
viii. Gurgaon Palwal Transmission Limited (“GPTL”)
ix. AMBUJA CEMENT LIMITED

C.1.4 However, none of the settings have been put up by following utilities:

i. KHIDRAT
ii. EDEN
iii. ACME

iv. SERENTICA
v. SJVN GREEN
vi. XL XERGI

C.1.5 These all submitted settings are available at the NRPC website: http://164.100.60.165/meetings/prsub.html.

C.1.6 It is to highlight that, as per the decisions of the 54th PSC meeting:

Quote

NRLDC shall give provisional protection clearance during FTC on conditional basis subject to submission of agenda in next Protection Sub-Committee meetings (not later than 2nd next PSC meeting). If utility does not put up the agenda within time, further FTC clearance would not be granted to the concerned.

Unquote

C.1.7 After deliberation, the forum approved the settings proposed by utilities. Ghatampur plant was asked to align V/F setting as per the philosophy.

Decision of the Forum:

Forum approved the settings proposed by utilities. Utilities were asked to submit the agenda in a timely manner for final approval of protection settings.

C.2. First Time Charging of transmission lines/Bays/Transformer/Reactor etc. by SLDCs

C.2.1 HVPN has submitted settings for charging completed in June-July 2025.

C.2.2 HPSLDC has submitted settings for charging of Kuther HEP.

C.2.3 All submitted settings are available at the NRPC website: http://164.100.60.165/meetings/prsub.html.

C.2.4 No details of other state-level FTC have been received in the NRPC Secretariat.

C.2.5 After deliberation, the forum approved the settings proposed by utilities.

Decision of the Forum:

Forum approved the settings proposed by utilities. Utilities were asked to submit the agenda in a timely manner for final approval of protection settings.

*****

Members of Protection Sub-Committee (FY 25-26)

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24	PTCUL	SE(T&C)	setandchld@gmail.com
25	PSTCL	Chief Engineer (P&M)	ce-pm@pstcl.org
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53	UT of Chandigarh	Executive Engineer	elop2-chd@nic.in
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* *Organizations from where nominations are not received for PSC, memebers of NRPC have been mentioned. Nomination for PSC forum may be sent at the earliest.*

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15	Adani Hybrid Energy Jaisalmer Two Ltd.	
16	Adani Hybrid Energy Jaisalmer Three Ltd.	
17	Adani Hybrid Energy Jaisalmer Four Ltd.	
18	Adani Renewable Energy (RJ) limited Rawara	
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20	Adani Solar Enegry Four Private Limited	
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27	Adani Solar Energy RJ Two Pvt. Ltd. (Devikot)	
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32	AMP Energy Green Six Pvt. Ltd.	
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36	Avaada Sunrays Pvt. Ltd.	
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53	SINGRAULI SOLAR	
54	Anta Solar	
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57	NTPC Kolayat_400kV	
58	Nedan Solar NTPC	
59	NTPC Nokhra_300MW	
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63	ReNew Solar Urja Private Limited	
64	Renew Sun Bright Pvt. Ltd. (RSBPL)	
65	Renew Sun Waves Private Limited (RSEJ4L)	
66	Renew Surya Partap Pvt. Ltd.	
67	Renew Surya Ravi Pvt. Ltd.	
68	Renew Surya Roshni Pvt. Ltd.	
69	Renew Surya Vihan Pvt. Ltd.	
70	Renew Surya Ayaan Pvt. Ltd.	
71	RENEW SOLAR POWER Pvt. Ltd. Bikaner	

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3	Parbati Koldam Transmission Company Limited		
4	Patran Transmission Company Ltd		
5	NRSS-XXXI(B) Transmission Ltd	SEKURA	neeraj.verma@energy-sel.com
6	NRSS XXXVI Transmission Ltd	TATA POWER	rajnishmehrotra@tatapower.com
7	AD Hydro Power Limited	-	sumitgarg@lnjbhilwara.com
8	Aravali Power Company Private Limited		amit.hooda01@apcpl.co.in
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11	Bikaner Khetri Transmission Limited		

Annexure-P

62nd Protection Sub-Committee Meeting on 26.08.2025 (10:30 AM)				
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Annexure-A.I

Status of action taken on decisions of 61st PSC

S.N.	Agenda No.	Agenda	Decision of 61st PSC	Status of action Taken
1	A.4	Intimation of performance of SPS (agenda by NRPC Secretariat	SLDCs may submit protection performance indices for SPS on a monthly basis by 7th date of each month in the same format as that of protection performance indices of elements (lines/ICT etc).	Agenda discussed in 62nd PSC meeting and direction was given to utilities and SLDCs for reporting of indices.
2	B.8	Corrective action for healthiness of 500kV Mundra-Mahindergarh SPS (agenda by NRLDC)	ADANI was requested to expedite the necessary actions at their end. It was also requested to give action plan of corrective actions for smooth coordination and actions. Weekly progress and status of actions may also be shared. State representatives were also requested to coordinate with the ADANI team and also ensure incorporation of identified revised feeders for load relief in SPS. Desired remedial actions need to be expedited.	Agenda was discussed in 62nd PSC meeting and M/s ADANI apprised action plan.
3	Table Agenda	Multiple elements tripping event in Delhi control area on 15.06.2025(agenda by NRLDC)	PSC forum requested DTL to review of protection system at affected substations to avoid undesired tripping in future. Expeditious remedial measures to avoid frequent tripping events in future and for revival of transmission elements (ICTs) need to be taken	Agenda was discussed in 62nd PSC meeting and remedial measures suggested.

Annexure-A.II

Status of perfomance indices reporting of June 2025 (Last date of submission 07.07.2025)							
S. No.	**Utility**		**Received Status (Yes/No)**	**Vide mail dated**	**Remarks**	**Indices less than 1 (Yes/No)**	**Reason submitted and corrective action taken**
1	PGCIL	Central Government owned Transmission Company	Yes	06.07.2025	NR-1	NO	NA
			Yes	07.07.2025	NR-2	YES	YES
			Yes	08.07.2025	NR-3	NO	NA
2	NTPC	Central Generating Company	Yes	09.07.2025	Anta	YES	YES
					Auriya		
			Yes	03.07.2025	Dadri	NO	NA
			Yes	10.07.2025	Koldam	NO	NA
					Rihand		
			Yes	11.07.2025	Singrauli	NO	NA
			Yes	13.07.2025	Unchahar	NO	NA
			Yes	04.07.2025	Tanda	NO	NA
3	BBMB		Yes	21.07.2025	-	NO	NA
4	THDC		Yes	07.07.2025	Tehri	Yes	YES
					Koteshwar		
5	SJVN		Yes	05.07.2025	RHPS	NO	NA
			Yes	05.07.2025	NJHPS	NO	NA
6	NHPC		Yes	01.07.2025	-	NO	NA
7	NPCIL				RAPS-A		
			Yes	07.07.2025	RAPS-B	NO	NA
			Yes	04.07.2025	RAPS-C(5&6)	NO	NA
			Yes	02.09.2025	RAP -D (7 & 8)		
					NAPS-1&2		
8	DTL	State Transmission Utility					
9	HVPNL		Yes	07.07.2025	-	YES	YES
10	RRVPNL		Yes	04.07.2025	-	YES	YES
11	UPPTCL		Yes	02.07.2025	Meerut Circle	NO	NA
			Yes	03.07.2025	Agra Circle		
			Yes	02.07.2025	Jhansi Circle	NO	NA
			Yes	03.07.2025	Prayagraj Circle	YES	YES
			Yes	03.07.2025	Gorakhpur Circle		
			Yes	03.07.2025	Lucknow Circle		
12	PTCUL		Yes	05.07.2025	Kumaon	NO	NA
					Garhwal		
13	PSTCL		Yes	18.08.2025		yes	no
14	HPPTCL		Yes	05.07.2025	-	NO	NA
15	JKPTCL		Yes	01.07.2025	Jammu	NO	NA
			Yes	01.07.2025	Kashmir	NO	NA
16	IPGCL		Yes	04.07.2025	PPS-I	NO	NA
			Yes	04.07.2025	PPS-III, Bawana	NO	NA
17	HPGCL		Yes	12.07.2025	PTPS, Panipat	NO	NA
			Yes	12.07.2025	DCRTPP, Yamunanagar	NO	NA
			Yes	12.07.2025	RGTPP (Khedar)	NO	NA
18	RRVUNL		YES	07.07.2025	KTPS	NO	NA

Status of perfomance indices reporting of June 2025 (Last date of submission 07.07.2025)							
S. No.	**Utility**		**Received Status (Yes/No)**	**Vide mail dated**	**Remarks**	**Indices less than 1 (Yes/No)**	**Reason submitted and corrective action taken**
			YES	07.07.2025	kATPP, Jhalawar	NO	NA
			YES	07.07.2025	CSCTPP Chhabra	NO	NA
			YES	07.07.2025	RGTPP, Ramgarh	NO	NA
			YES	07.07.2025	Ctpp,Chhabra	NO	NA
			Yes	01.07.2025	DCCPP, Dholpur	NO	NA
			YES	07.07.2025	STPS Suratgarh	NO	NA
			YES	07.07.2025	SSCTPS Suratgarh	NO	NA
18	UPRVUNL	State Generating Company	Yes	23.08.2025	Parichha B (220 kV)		
			Yes	01.07.2025	Parichha C (400 kV)	NO	NA
			Yes	02.07.2025	DTPS Anpara	NO	NA
			Yes	23.08.2025	Obra A & B		
			Yes	23.08.2025	Obra C		
					Harduaganj 400 kV		
			Yes	23.08.2025	Ghatampur 765 kV		
			Yes	23.08.2025	Anpara-A&B		
			Yes	23.08.2025	Panki TPS		
			Yes	23.08.2025	Jawaharpur		
19	UJVNL		Yes	02.07.2025	Dharasu	NO	NA
			Yes	02.07.2025	Tiloth	NO	NA
					Khodri		
					Chibro		
					Vyasi		
20	HPPCL		YES	05.07.2025	Kashang HEP	NO	NA
			YES	05.07.2025	Sawara Kuddu	NO	NA
			YES	05.07.2025	Sainj	NO	NA
21	PSPCL	State Generating Company & State owned Distribution Company	Yes	03.07.2025	RSD	NO	NA
			Yes	11.07.2025	GGSTPS, Rupnagar	NO	NA
			YES	01.07.2025	GVK Power Goindwal Shahib Ltd.	NO	NA
					GHSTPS, Lehra Mohabbat		
22	HPSEBL	Distribution company having Transmission connectivity ownership	YES	05.07.2025	Hamirpur Circle	NO	NA
			YES	05.07.2025	Shimla Circle	NO	NA
23	Prayagraj Power Generation Co. Ltd.		YES	01.07.2025		YES	YES
24	Aravali Power Company Pvt. Ltd						
25	Apraava Energy Private Limited		YES	21.07.2025		NO	NA
26	Talwandi Sabo Power Ltd.		YES	02.07.2025		NO	NA
27	Nabha Power Limited		YES	01.07.2025		NO	NA
28	MEIL Anpara Energy Ltd (Anpara-C)						
29	Rosa Power Supply Company Ltd		YES	04.07.2025		NO	NA
30	Lalitpur Power Generation Company Ltd		YES	02.07.2025		NO	NA
31	MEJA Urja Nigam Ltd.						

Status of perfomance indices reporting of June 2025 (Last date of submission 07.07.2025)							
S. No.	**Utility**		**Received Status (Yes/No)**	**Vide mail dated**	**Remarks**	**Indices less than 1 (Yes/No)**	**Reason submitted and corrective action taken**
32	Adani Power Rajasthan Limited		YES	05.07.2025	Kawai	NO	NA
33	JSW Energy Ltd. (KWHEP)		YES	03.07.2025		NO	NA
	ISTS Transmission Utilities						
#REF!	INDIGRID						
#REF!	ADHPL		Yes	07.07.2025	220 kV Prini	No	Na
#REF!	Adani Transmission Limited	AESL	Yes	11.07.2025		No	Na
#REF!	Bikaner Khetri Transmission Limited		Yes	11.07.2025		No	Na
#REF!	Fatehgarh Bhadla Transmission Limited		Yes	11.07.2025		No	Na
	State Utilities						
	Uttar Pradesh						
#REF!	Vishnuprayag Hydro Electric Plant (J.P.)						
#REF!	Alaknanda Hydro Electric Plant (GVK)		YES	08.07.2025		NO	NA
#REF!	Khara Power House (Khara)		YES	04.07.2025		NO	NA
#REF!	WUPPTCL		Yes	02.07.2025		No	NA
#REF!	SEUPPTCL						
#REF!	ATSCL	**AESL**	Yes	11.07.2025		No	Na
#REF!	GTL	**AESL**	Yes	11.07.2025		No	Na
#REF!	HPTSL	**AESL**	Yes	11.07.2025		No	Na
#REF!	MTSCL	**AESL**	Yes	11.07.2025		No	Na
#REF!	OCBTL	**AESL**	Yes	11.07.2025		No	Na
69	STSL	**AESL**	Yes	11.07.2025		No	Na
	Rajasthan						
70	Barsingsar Plant	**NLC**					
71	Rajwest Plant	**JSW**					

RE Utilities

72	ABC Renewable Pvt. Ltd		YES	07.07.2025		NO	NA
73	ACME Heeragarh powertech Pvt. Ltd						
74	ACME Chittorgarh Solar Energy Pvt Ltd						
75	AHEJOL-Hybrid-1 Madhopura	ADANI GREEN	YES	07.07.2025		NO	NA
76	AHEJ3L - Hybrid-2B 300MW	ADANI GREEN	YES	07.07.2025		NO	NA
77	AHEJFL(AEML_250)	ADANI GREEN	YES	07.07.2025		NO	NA
78	AHEJ4L(AEML-350)	ADANI GREEN	YES	07.07.2025		NO	NA
79	ASEJ2PL(Hapasar 300MW) SPC11PL	ADANI GREEN	YES	07.07.2025		NO	NA
80	Adani Renewable Energy (RJ) Limited Rawra 200	ADANI GREEN	YES	07.07.2025		NO	NA
81	Adani Solar Energy Four Limited SECI 50	ADANI GREEN	YES	07.07.2025		NO	NA
82	Adani Solar Energy Jodhpur Two Limited Merchant 50	ADANI GREEN	YES	07.07.2025		NO	NA
83	ASEJ05PL (RJ200)	ADANI GREEN	YES	07.07.2025		NO	NA
84	ASERJ2PL - Phalodi 150 MW	ADANI GREEN	YES	07.07.2025		NO	NA
85	ASERJ01PL-Pokhran 300 MW (SB energy six)	ADANI GREEN	YES	07.07.2025		NO	NA
86	AGE25L(Badi Sid)	ADANI GREEN	YES	07.07.2025		NO	NA

Status of perfomance indices reporting of June 2025 (Last date of submission 07.07.2025)							
S. No.	Utility		Received Status (Yes/No)	Vide mail dated	Remarks	Indices less than 1 (Yes/No)	Reason submitted and corrective action taken
87	Bhadla park - South block	ADANI GREEN	YES	07.07.2025		NO	NA
	AGE24L (Bhimsar)	ADANI GREEN					
	AHEJ2L - Hybrid-2A 300MW	ADANI GREEN					
	ASERJ2PL - Devikot 180 MW	ADANI GREEN					
88	ASEJOPL-Hybrid 450 MW	ADANI GREEN	YES	07.07.2025		NO	NA
89	Altra Xergi Pvt. Ltd.		YES	07.07.2025		NO	NA
90	AMP Energy Green Four Pvt. Ltd.		YES	05.07.2025		NO	NA
91	AMP Energy Green Five Pvt. Ltd.		YES	05.07.2025		NO	NA
	AMP Energy Green Six Pvt. Ltd.		YES	05.07.2025		NO	NA
92	Amplus Ages Private Limited	AmPlus Solar	YES	07.07.2025		NO	NA
93	Avaada RJHN_240MW	Avaada	YES	04.07.2025		NO	NA
94	Avaada sunce energy Pvt limited		YES	04.07.2025		NO	NA
95	Avaada Sunrays Pvt. Ltd.		YES	04.07.2025		NO	NA
96	Avaada Sustainable RJ Pvt. Ltd.		YES	04.07.2025		NO	NA
97	Ayana Renewable Power Three Private Limited						
98	Ayaana Renewable Power One Pvt. Ltd.						
99	Azure Power Forty One Pvt limited						
100	Azure Power Forty Three Pvt. Ltd._RSS						
101	Azure Maple Pvt. Ltd.						
102	AZURE POWER INDIA Pvt. Ltd., Bhadla						
103	Azure Power Thirty Four Pvt. Ltd.						
104	SB Energy Six Private Limited, Bhadla						
105	Clean Solar Power (Jodhpur) Pvt. Ltd.						
106	Clean Solar Power (Bhadla) Pvt. Ltd						
107	Eden Renewable Cite Private Limited						
108	Grian Energy private limited		YES	07.07.2025		NO	NA
109	Mahindra Renewable Private Limited						
110	Mega Surya Urja Pvt. Ltd. (MSUPL)						
111	AURAIYA Solar						
112	DADRI SOLAR						
113	SINGRAULI SOLAR						
114	Anta Solar						
115	Unchahar Solar						
116	NTPC Devikot Solar plant-1	NGEL	y	08.08.2025		n	na
117	NTPC Devikot Solar plant-2		y	08.08.2025		n	na
#REF!	SKB NTPC -1 (250MW)	NGEL	y	08.08.2025		n	na
#REF!	SKB NTPC-2 (300MW)		y	08.08.2025		n	na
#REF!	NTPC Nokhra_300MW		y	08.08.2025		Y	NO
#REF!	NTPC Fatehgarh 296MW		y	08.08.2025		n	na
#REF!	One Volt energy Pvt. Ltd.		YES	07.07.2025		NO	NA
#REF!	ReNew Solar Urja Private Limited	IndiGrid					

Status of perfomance indices reporting of June 2025 (Last date of submission 07.07.2025)							
S. No.	**Utility**		**Received Status (Yes/No)**	**Vide mail dated**	**Remarks**	**Indices less than 1 (Yes/No)**	**Reason submitted and corrective action taken**
#REF!	ReNew Solar Energy (Jharkhand Three) Private Limited	ReNew	YES	04.07.2025		NO	NA
#REF!	RENEW SOLAR POWER Pvt. Ltd. Bhadla		YES	04.07.2025		NO	NA
#REF!	Renew Sun Bright Pvt. Ltd. (RSBPL)		YES	04.07.2025		NO	NA
#REF!	Renew Surya Partap Pvt. Ltd.		YES	04.07.2025		NO	NA
#REF!	Renew Surya Ravi Pvt. Ltd.		YES	04.07.2025		NO	NA
#REF!	Renew Surya Roshni Pvt. Ltd.		YES	04.07.2025		NO	NA
#REF!	Renew Surya Vihan Pvt. Ltd.		YES	04.07.2025		NO	NA
#REF!	Renew Surya Ayaan Pvt. Ltd.		YES	04.07.2025		YES	YES
#REF!	Renew Solar Photovoltaic Pvt Ltd		YES	04.07.2025		NO	NA
#REF!	RENEW SOLAR POWER Pvt. Ltd. Bikaner						
#REF!	Rising Sun Energy-K Pvt. Ltd.						
#REF!	Serentica Renewables India 4 Private Limited						
#REF!	Solzen Urja Private Limited	Sekura	YES	07.07.2025		NO	NA
#REF!	Tata Power Green Energy Ltd. (TPGEL)	TATA POWER					
#REF!	Tata Power Renewable Energy Ltd. (TPREL)						
#REF!	Banderwala Solar Plant TP Surya Ltd.						
#REF!	Thar Surya Pvt. Ltd.						
#REF!	TP Surya Pvt. Ltd.						
#REF!	TRANSITION ENERGY SERVICES PRIVATE LIMITED						
#REF!	Transition Green Energy Private Limited						
#REF!	Transition Sustainable Energy Services Private Limited						

Status of perfomance indices reporting of July 2025 (Last date of submission 07.08.2025)							
S. No.	**Utility**		**Received Status (Yes/No)**	**Vide mail dated**	**Remarks**	**Indices less than 1 (Yes/No)**	**Reason submitted and corrective action taken**
1	PGCIL	Central Government owned Transmission Company	Y	07.08.2025	NR-1	No	NA
			y	12.08.2025	NR-2	yes	no
			Y	08.08.2025	NR-3	No	NA
2	NTPC				Anta		
					Auriya		
			y	12.08.2025	Dadri	No	NA
					Koldam		
					Rihand		
					Singrauli		
			Yes	01.08.2025	Unchahar	No	NA
			Y	05.08.2025	Tanda	No	NA
3	BBMB	Central Generating Company	Y	21.08.2025		No	NA
4	THDC		Yes	02.08.2025	Tehri	No	NA
			Y	06.08.2025	Tehri PSP	No	NA
			y	13.08.2025	Koteshwar	No	NA
5	SJVN		Y	06.08.2025	RHPS	YES	YES
			Y	06.08.2025	NJHPS	YES	YES
6	NHPC		Yes	01.08.2025	-	Yes	Yes
7	NPCIL		y	07.08.2025	RAPS-A	No	na
			Y	05.08.2025	RAPS-B	No	na
			Y	05.08.2025	RAPS-C(5&6)	No	na
			Y	02.08.2025	RAP -D (7 & 8)	NO	NA
					NAPS-1&2		
8	DTL	State Transmission Utility					
9	HVPNL		Yes	05.08.2025	-	No	NA
10	RRVPNL		Y	07.08.2025	-	YES	YES
11	UPPTCL		Yes	02.08.2025	Meerut Circle	No	NA
			Yes	04.08.2025	Agra Circle	No	NA
			Yes	01.08.2025	Jhansi Circle	No	NA
			Yes	04.08.2025	Prayagraj Circle	Yes	No
			Yes	04.08.2025	Gorakhpur Circle	No	NA
			Yes	04.08.2025	Lucknow Circle	No	NA
12	PTCUL		Yes	05.08.2025	Kumaon	No	NA
			Yes	05.08.2025	Garhwal	No	NA
13	PSTCL		Y	25.08.2025		yes	
14	HPPTCL		Y	05.08.2025	-	No	NA
15	JKPTCL	UT	Yes	05.08.2025	Jammu	No	NA
		UT	Yes	05.08.2025	Kashmir	No	NA
	Chandigarh Power Distribution Ltd	UT	Y	07.08.2025	220 Kv Kishangarh	No	NA
16	IPGCL		y	06.08.2025	PPS-I	No	NA
			y	06.08.2025	PPS-III, Bawana	No	NA
17	HPGCL		y	06.08.2025	PTPS, Panipat	No	NA
			y	06.08.2025	DCRTPP, Yamunanagar	No	NA
			y	06.08.2025	RGTPP (Khedar)	No	NA

Status of perfomance indices reporting of July 2025 (Last date of submission 07.08.2025)							
S. No.	**Utility**		**Received Status (Yes/No)**	**Vide mail dated**	**Remarks**	**Indices less than 1 (Yes/No)**	**Reason submitted and corrective action taken**
18	RRVUNL		Yes	01.08.2025	KTPS	No	NA
			Y	07.08.2025	kATPP, Jhalawar	No	NA
			Y	07.08.2025	CSCTPP Chhabra	No	NA
			Y	05.08.2025	RGTPP, Ramgarh	No	NA
			Y	07.08.2025	Ctpp,Chhabra	No	NA
			Yes	01.08.2025	DCCPP, Dholpur	No	NA
			Y	07.08.2025	STPS Suratgarh	No	NA
			Y	07.08.2025	SSCTPS Suratgarh	No	NA
18	UPRVUNL	State Generating Company	y	07.08.2025	Parichha B (220 kV)		
			Yes	01.08.2025	Parichha C (400 kV)	No	NA
			Yes	01.08.2025	DTPS Anpara	No	NA
			y	07.08.2025	Obra A & B	No	NA
			y	07.08.2025	Obra C	No	NA
			Y	25.08.2025	Harduaganj 400 kV	No	NA
			y	07.08.2025	Ghatampur 765 kV	No	NA
			y	07.08.2025	Anpara-A&B	No	NA
			y	07.08.2025	Panki TPS	No	NA
			y	07.08.2025	Jawaharpur	No	NA
19	UJVNL				Dharasu		
					Tiloth		
					Khodri		
					Chibro		
					Vyasi		
20	HPPCL		Y	21.08.2025	Kashang HEP	No	NA
			Y	21.08.2025	Sawara Kuddu	No	NA
			Y	21.08.2025	Sainj	No	NA
21	PSPCL	State Generating Company & State owned Distribution Company	Y	05.08.2025	RSD	No	NA
			Y	21.08.2025	GGSTPS, Rupnagar	No	NA
			Yes	01.08.2025	GVK Power Goindwal Shahib Ltd.	No	NA
			Y	06.08.2025	GHSTPS, Lehra Mohabbat	No	NA
22	HPSEBL	Distribution company having Transmission connectivity ownership	Yes	04.08.2025	Hamirpur Circle	No	NA
			Y	07.08.2025	Shimla Circle	No	NA
23	Prayagraj Power Generation Co. Ltd.		Yes	01.08.2025	-	No	NA
24	Aravali Power Company Pvt. Ltd						
25	Apraava Energy Private Limited		Y	06.08.2025		No	NA
26	Talwandi Sabo Power Ltd.		Y	06.08.2025		No	NA
27	Nabha Power Limited		Y	01.08.2025		No	NA
28	MEIL Anpara Energy Ltd (Anpara-C)						
29	Rosa Power Supply Company Ltd		Yes	04.08.2025		No	NA
30	Lalitpur Power Generation Company Ltd		Yes	06.08.2025		No	NA
31	MEJA Urja Nigam Ltd.						
32	Adani Power Rajasthan Limited		Y	05.08.2025	Kawai	No	NA
33	JSW Energy Ltd. (KWHEP)		Yes	04.08.2025		No	NA
	ISTS Transmission Utilities						
#REF!	INDIGRID						

Status of perfomance indices reporting of July 2025 (Last date of submission 07.08.2025)							
S. No.	**Utility**		**Received Status (Yes/No)**	**Vide mail dated**	**Remarks**	**Indices less than 1 (Yes/No)**	**Reason submitted and corrective action taken**
#REF!	ADHPL		Y	06.08.2025	220 kV Prini	No	NA
#REF!	Adani Transmission Limited	AESL	Y	06.08.2025		No	NA
#REF!	Bikaner Khetri Transmission Limited		Y	06.08.2025		No	NA
#REF!	Fatehgarh Bhadla Transmission Limited		Y	06.08.2025		No	NA
	State Utilities						
	Uttar Pradesh						
5	Vishnuprayag Hydro Electric Plant (J.P.)		Yes	01.08.2025		No	NA
6	Alaknanda Hydro Electric Plant (GVK)		Y	05.08.2025		N	NA
7	Khara Power House (Khara)		Y	04.08.2025		N	NA
8	WUPPTCL	MEIL	Y	02.08.2025		N	NA
9	SEUPPTCL	Resurgent Power	Y	07.08.2025		N	NA
#REF!	GTL	**AESL**	Y	06.08.2025		No	NA
#REF!	OCBTL	**AESL**	Y	06.08.2025		No	NA
69							
	Rajasthan						
70	Barsingsar Plant	**NLC**					
71	Rajwest Plant	**JSW**					
	ATSCL	**AESL**	Y	06.08.2025		No	NA
	HPTSL	**AESL**	Y	06.08.2025		No	NA
	STSL	**AESL**	Y	06.08.2025		No	NA
	MTSCL	**AESL**	Y	06.08.2025		No	
	RE Utilities						NA
72	ABC Renewable Pvt. Ltd		Y	07.08.2025		NO	
73	ACME Heeragarh powertech Pvt. Ltd						
74	ACME Chittorgarh Solar Energy Pvt Ltd						NA
75	AHEJOL-Hybrid-1 Madhopura	ADANI GREEN	Y	06.08.2025		No	NA
76	AHEJ3L - Hybrid-2B 300MW	ADANI GREEN	Y	06.08.2025		No	NA
77	AHEJFL(AEML_250)	ADANI GREEN	Y	06.08.2025		No	NA
78	AHEJ4L(AEML-350)	ADANI GREEN	Y	06.08.2025		No	NA
79	ASEJ2PL(Hapasar 300MW) SPC11PL	ADANI GREEN	Y	06.08.2025		No	NA
80	Adani Renewable Energy (RJ) Limited Rawra 200	ADANI GREEN	Y	06.08.2025		No	NA
81	Adani Solar Energy Four Limited SECI 50	ADANI GREEN	Y	06.08.2025		No	NA
82	Adani Solar Energy Jodhpur Two Limited Merchant 50	ADANI GREEN	Y	06.08.2025		No	NA
83	ASEJ05PL (RJ200)	ADANI GREEN	Y	06.08.2025		No	NA
84	ASERJ2PL - Phalodi 150 MW	ADANI GREEN	Y	06.08.2025		No	NA
85	ASERJ01PL-Pokhran 300 MW (SB energy six)	ADANI GREEN	Y	06.08.2025		No	NA
86	AGE25L(Badi Sid)	ADANI GREEN	Y	06.08.2025		No	NA
87	Bhadla park - South block	ADANI GREEN	Y	06.08.2025		No	NA
	AGE24L (Bhimsar)	ADANI GREEN	Y	06.08.2025		No	NA
	AHEJ2L - Hybrid-2A 300MW	ADANI GREEN	Y	06.08.2025		No	NA
	ASERJ2PL - Devikot 180 MW	ADANI GREEN	Y	06.08.2025		No	NA
88	ASEJOPL-Hybrid 450 MW	ADANI GREEN	Y	06.08.2025		No	NA
89	Altra Xergi Pvt. Ltd.		Yes	04.08.2025		N	NA
90	AMP Energy Green Four Pvt. Ltd.	AMPIN ENERGY	Y	07.08.2025		N	NA

Status of perfomance indices reporting of July 2025 (Last date of submission 07.08.2025)							
S. No.	Utility		Received Status (Yes/No)	Vide mail dated	Remarks	Indices less than 1 (Yes/No)	Reason submitted and corrective action taken
91	AMP Energy Green Five Pvt. Ltd.	AMPIN ENERGY	Y	07.08.2025		N	NA
	AMP Energy Green Six Pvt. Ltd.	AMPIN ENERGY	Y	07.08.2025		N	NA
92	Amplus Ages Private Limited	GENTARI	Y	07.08.2025		N	NA
93	Avaada RJHN_240MW	Avaada	Yes	04.08.2025		N	NA
94	Avaada sunce energy Pvt limited		Yes	04.08.2025		N	NA
95	Avaada Sunrays Pvt. Ltd.		Yes	04.08.2025		N	NA
96	Avaada Sustainable RJ Pvt. Ltd.		Yes	04.08.2025		N	
97	Ayana Renewable Power Three Private Limited						
98	Ayaana Renewable Power One Pvt. Ltd.						
99	Azure Power Forty One Pvt limited						
100	Azure Power Forty Three Pvt. Ltd._RSS						
101	Azure Maple Pvt. Ltd.						
102	AZURE POWER INDIA Pvt. Ltd., Bhadla						
103	Azure Power Thirty Four Pvt. Ltd.						
104	SB Energy Six Private Limited, Bhadla						
105	Clean Solar Power (Jodhpur) Pvt. Ltd.						
106	Clean Solar Power (Bhadla) Pvt. Ltd						
107	Eden Renewable Cite Private Limited						NA
108	Grian Energy private limited	GENTARI	Y	07.08.2025		N	
109	Mahindra Renewable Private Limited						
110	Mega Surya Urja Pvt. Ltd. (MSUPL)						
111	AURAIYA Solar						
112	DADRI SOLAR						
113	SINGRAULI SOLAR						
114	Anta Solar						
115	Unchahar Solar						na
116	NTPC Devikot Solar plant-1	NGEL	y	08.08.2025		n	na
117	NTPC Devikot Solar plant-2		y	08.08.2025		n	na
#REF!	SKB NTPC -1 (250MW)	NGEL	y	08.08.2025		n	na
#REF!	SKB NTPC-2 (300MW)		y	08.08.2025		n	na
#REF!	NTPC Nokhra_300MW		y	08.08.2025		n	na
#REF!	NTPC Fatehgarh 296MW		y	08.08.2025		n	NA
#REF!	One Volt energy Pvt. Ltd.	GENTARI	Y	07.08.2025		N	
#REF!	ReNew Solar Urja Private Limited	IndiGrid					
#REF!	ReNew Solar Energy (Jharkhand Three) Private Limited		Y	08.08.2025			
#REF!	RENEW SOLAR POWER Pvt. Ltd. Bhadla		N				
#REF!	Renew Sun Bright Pvt. Ltd. (RSBPL)		Y	08.08.2025			
#REF!	Renew Surya Partap Pvt. Ltd.	ReNew	Y	08.08.2025			
#REF!	Renew Surya Ravi Pvt. Ltd.		Y	08.08.2025			
#REF!	Renew Surya Roshni Pvt. Ltd.		Y	08.08.2025			
#REF!	Renew Surya Vihan Pvt. Ltd.		Y	08.08.2025			
#REF!	Renew Surya Ayaan Pvt. Ltd.		Y	20.08.2025			
#REF!	Renew Solar Photovoltaic Pvt Ltd		Y	20.08.2025			
#REF!	RENEW SOLAR POWER Pvt. Ltd. Bikaner		Y	08.08.2025			
#REF!	Rising Sun Energy-K Pvt. Ltd.						
#REF!	Serentica Renewables India 4 Private Limited						NA
#REF!	Solzen Urja Private Limited	Sekura	Y	05.08.2025		No	NA
#REF!	Tata Power Green Energy Ltd. (TPGEL)	TATA POWER	Y	06.08.2025		No	NA
#REF!	Tata Power Renewable Energy Ltd. (TPREL)		Y	06.08.2025		No	NA

Status of perfomance indices reporting of July 2025 (Last date of submission 07.08.2025)							
S. No.	**Utility**		**Received Status (Yes/No)**	**Vide mail dated**	**Remarks**	**Indices less than 1 (Yes/No)**	**Reason submitted and corrective action taken**
#REF!	Banderwala Solar Plant TP Surya Ltd.		Y	06.08.2025		No	
#REF!	Thar Surya Pvt. Ltd.						
#REF!	TP Surya Pvt. Ltd.						
#REF!	TRANSITION ENERGY SERVICES PRIVATE LIMITED						
#REF!	Transition Green Energy Private Limited						
#REF!	Transition Sustainable Energy Services Private Limited						

Annexure-A.III

Annexure-X

FormatNo.-PI-01

Reporting of performance indices for protection system

(forelementsconnected at 220KV and above)

Name of Utility: Tehri HEP,THDCIL

Month: June-2025

S.N.	Sub-station	Unit(SPS/LINE/ICT/GT/etc.)	Nc	Nf	Nu	Ni	Dependability Index(D)	Security Index(s)	Reliability Index(R)	Remarks
1.	TEHRI HPP	TEHRI-KOTESHWAR CKT-1	0	0	1	1	Not defined	0	0	On 28.06.2025 at 15:52 Hrs. 400KV Tehri Koteshwar Ckt-1 CB tripped due to LBB operation caused by DC earth leakage.

Justification for less than one index may be attached separately.

Nc is the number of correct operations at internal power System faults

Nf is the number of failures to operate at Internal power system faults

Nu is the number of unwanted Operations

Ni is the number of incorrect operations and Di is the sum of Nf and Nu

07/07/2025

सागर बागड़ा
Sagar Bagra
सहा. प्रबंधक (ओ.एण्ड.एम.)
Asst. Manager (O&M)
टीएचडीसीआईएल, टिहरी
THDCIL, Tehri

Annexure-X

Format No.-PI-01

Reporting of performance indices for protection system

(for elements connected at 220 kV and above)

Name of Utility: HVPNL

Month: June, 2025

S.N.	Substation	Unit (SPS/Line/ICT/GT/ etc)	Nc	Nf	Nu	Ni	Dependability Index (D=Nc/Nc+Nf)	Security Index (S=Nc/Nc+Nu)	Reliability Index (R=Nc/Nc+Ni)
M&P Division, Gurugram									
1	220KV B/Pur	220KV B/Pur to Sohna Road Ckt-1	**1**	**0**	**0**	**0**	**1**	**1**	**1**
2	220KV B/Pur	220KV B/Pur to Sohna Road Ckt-2	**1**	**0**	**0**	**0**	**1**	**1**	**1**
3	220KV Lula Ahir	220KV Dadri (BBMB)-Lula Ahir line	**1**	**0**	**0**	**0**	**1**	**1**	**1**
4	220KV GIS Transport Hub IMT Manesar	220KV GIS Transport Hub IMT Manesar-MSIL Ckt-2	**1**	**0**	**0**	**0**	**1**	**1**	**1**
5	220KV Sector-107 Gurugram	220/33KV 100MVA T-1	**1**	**0**	**0**	**0**	**1**	**1**	**1**
M&P Division, Faridabad									
1	220KV Palli	220KV Kadarpur-Palli Ckt-1	**0**	**0**	**1**	**1**	**0**	**1**	**1**
M&P Division, Hisar									
1	220 KV S/Stn. Bhuna	220 KV Fatehabad PG – Bhuna Line	**2**	**0**	**0**	**0**	**1**	**1**	**1**
2	220 KV S/Stn. Bhiwani	220 KV Bhiwani – Bhiwani PG Ckt. 01	**1**	**0**	**0**	**0**	**1**	**1**	**1**
3	220 KV S/Stn. Bhiwani	220 KV Bhiwani – Bhiwani PG Ckt. 02	**1**	**0**	**0**	**0**	**1**	**1**	**1**
M&P Division, Dhulkote									

1.	220 KV Baddi HP SLDC	220 KV Baddi- Pinjore Ckt.-1(12.06.2025)	**1**	**0**	**0**	**0**	**1**	**1**	**1**
2.	220 KV Baddi HP SLDC	220 KV Baddi- Pinjore Ckt.-2(12.06.2025)	**1**	**0**	**0**	**0**	**1**	**1**	**1**
3.	220 KV Pinjore	220 kV Pinjore-PG- Panchkula ckt-2(12.06.2025)	**1**	**0**	**0**	**0**	**1**	**1**	**1**
4.	220 KV Pinjore	220 kV Pinjore- Panchkula ckt-2(15.06.2025)	**1**	**0**	**0**	**0**	**1**	**1**	**1**
5.	220 KV Pinjore	220 kV Pinjore- PG-Panchkula ckt-1(18.06.2025)	**1**	**0**	**0**	**0**	**1**	**1**	**1**
6.	220 KV Pinjore	220 kV Pinjore- PG-Panchkula ckt-1(28.06.2025)	**1**	**0**	**0**	**0**	**1**	**1**	**1**
M&P Division, Rohtak									
1	220kV Chajjpur	220kV BBMB Sewah Panipat - Chajjpur Ckt.-2	**1**	**0**	**0**	**0**	**1**	**1**	**1**
2	220kV Mohana	220kV Mohana - Sonipat_PG Ckt.-2	**1**	**0**	**0**	**0**	**1**	**1**	**1**
M&P Division, Karnal									
1	220KV Substation kaithal	220KV Kaithal-PG-kaithal ckt-I	**2**	**0**	**0**	**0**	**1**	**1**	**1**
2	220KV Substation kaithal	220KV Kaithal-PG-kaithal ckt-I	**2**	**0**	**0**	**0**	**1**	**1**	**1**
3	220KV substation Pehowa	220KV Pehowa-PG Kurukshetra line	**1**	**0**	**0**	**0**	**1**	**1**	**1**

Note: Justification for less than one index may be attached separately.

Nc is the number of correct operations at internal power system faults

Nf is the number of failures to operate at internal power system faults

Nu is the number of unwanted operations

Ni is the number of incorrect operations and is the sum of Nf and Nu.

Sr. No.	Dated	Divn.	Name of sub/ station	Tripping /Breakdown element	Length of line	Duration of Tripping /Break down			Relays Operated along with Relay Data		Reasons of Tripping /break-down	Area Affected if any	Analysis of Tripping/Breakdown by designated committee.	Remarks if any.
						From (Hrs.)	To (Hrs.)	Total (Hrs.)	This end (Reporting Substation)	Other end (in case of line)				
1	15.06.2025	XEN TS Faridabad	220KV Palli	220KV Palli-Kadarpur Ckt-1	19Km	11:28	13:03	01:35	Not tripped	DPR, Z-3, D=48.15km, Y-ph, E/F & master86	Tripped when tried to close ckt breaker of Ckt-2	220KV Palli, 22no.11KV fdrs, 4no.industries, 3no.independent, 15no.Urban, Load affected=28MVA	The 220kV Pali – Kaderpur Ckt-1 tripped form 400kV Kaderpur end while trying to charge the 220kV Pali - Kaderpur Ckt-II from 220kV S/Stn. Pali end, which was already under breakdown.	The mixing of Bus PT supply in the DPS relays of both 220kV Pali - Kaderpur Ckt-1 & Ckt-2 be got attended on top priority to avoid unnecessary tripping of both circuits from 400kV kaderpur S/Stn. End.

U. P. POWER TRANSMISSION CORPORATION LIMITED
(A Govt. Of Uttar Pradesh Undertaking)
(उ0 प्र0 पावर ट्रॉसमीशन कारपारेशन लिमिटेड)
(उ0 प्र0 सरकार का उपकम)

Office of the Superintending Engineer
Electricity Test & Commissioning Circle
1st Floor, 132KV G.I.S. Old Power House
Substation, 1-A Kamala Nehru Road,
Prayagraj-211001
Email:- setncalbd@upptcl.org

UPPTCL

कार्यालय अधीक्षण अभियन्ता
विद्युत परीक्षण एवं परिचालन मण्डल,
प्रथम तल, 132के0वी0 जी0आई0एस0 ओल्ड पावर
हाउस उपकेन्द्र, 1–ए कमला नेहरू रोड,
प्रयागराज 211001
Email:-setncalbd@upptcl.org

No 572 /ET&CCPr/ Protection Date 1-7- 2025

Subject: - Calculation of Protection performance indices report for the month of June 2025.

(By Email.)

Chief Engineer(A)
Director Operation
U.P.Power Transmmision Corp. Ltd.,
Shakti Bhawan Extn.,
Lucknow.

Kindly find enclosed herewith the Calculation of Protection performance indices report of 220 KV and above Sub Stations for the month of June 2025, Under TSE Zone Prayagraj for your information and necessary action.

Encl.- As above

(S. K. Gupta)
Superintending Engineer

No 572 /ET&CCPr/ Protection Date 1-7- 2025

Copy forwarded to following for kind information and necessary action:-

1- Chief Engineer (TSE), U.P. Power Transmission Corporation Ltd., 57–George Town, Pragayraj.
2- Superintending Engineer (R&A) U.P. Power Transmission Corporation Ltd., Lucknow

(S. K. Gupta)
Superintending Engineer

ET&C CIRCLE, PRAYAGRAJ

Format No.-PI-01

Reporting of performance indices for protection system

(for elements connected at 220 KV and above)

Name of utility:UPPTCL

Month 06-2025

.N.	Sub-station	Unit (SPS/Line/ICT/GT/etc)	Nc	Nf	Nu	Ni	Dependability index (D) D=(Nc/(Nc+Nf))	Security Index (S) S=(Nc/(Nc+Nu	Relibality Index (R) R=(Nc/(Nc+Ni))	REMARK
1	220 KV S/S FATEHPUR	220 KV FATEHPUR-UNCHAHAR	0	0	0	0	0	0	0	
		220 KV FATEHPUR- PGCIL-I	0	0	0	0	0	0	0	
		220 KV FATEHPUR- PGCIL-II	0	0	0	0	0	0	0	
		220KV FATEHPUR-PRAYAGRAJ CANTT	1	0	0	0	1	1	1	
		220 KV FATEHPUR- SIRATHU	3	0	0	0	P	1	1	Due to fault in DC cable (negative earthed)
		220 KV FATEHPUR- BANDA	0	0	0	0	0	0	0	
		220 KV FATEHPUR- MALWAN	0	0	0	0	0	0	0	
		200 MVA ICT-I	0	0	0	0	0	0	0	
		200 MVA ICT-II	0	0	0	0	0	0	0	
2	220 KV SS Cantt	200 MVA T/F-I	0	0	0	0	0	0	0	
		200 MVA T/F-II	0	0	0	0	0	0	0	
		220KV REWA ROAD LINE	0	0	0	0	0	0	0	
		220KV FATEHPUR LINE	1	0	0	0	1	1	1	
3	220 KV Rewa Road	200 MVA T/F-I	0	0	0	0	0	0	0	
		200 MVA T/F-II	0	0	0	0	0	0	0	
		160 MVA T/F	0	0	0	0	0	0	0	
		220 KV MIRZAPUR	0	0	0	0	0	0	0	
		220KV OBRA-I	0	0	0	0	0	0	0	
		220KV OBRA-III	1	0	0	0	1	1	1	
		220KV PGCIL-I	0	0	0	0	0	0	0	
		220KV PGCIL-II	0	0	0	0	0	0	0	
		220KV CANTT	0	0	0	0	0	0	0	
		220KV SIRATHU	0	0	0	0	0	0	0	
4	400 KV SS SARNATH	400 KV Anpara L3 Line	0	0	0	0	0	0	0	
		400 KV Anpara-L5 Line	1	0	0	0	1	1	1	
		400 KV Azamgarh Line	0	0	0	0	0	0	0	
		400 KV Varanasi-I (PG) Line	0	0	0	0	0	0	0	
		400 KV VAranasi-II (PG) Line	0	0	0	0	0	0	0	
		400/220 KV 315 MVA ICT-I	0	0	0	0	0	0	0	
		400/220 KV 500 MVA ICT-II	0	0	0	0	0	0	0	
		400/220 KV 315 MVA ICT-III	0	0	0	0	0	0	0	
		400/220 KV 315 MVA ICT-IV	0	0	0	0	0	0	0	
		400KV 125 MVAR Reactor	0	0	0	0	0	0	0	
		220 KV Azamgarh-II Line	1	0	0	0	1	1	1	
		220 KV Bhaduara Line	0	0	0	0	0	0	0	
		220 KV Harhua Line	0	0	0	0	0	0	0	
		220 KV Gajokhar-I Line	0	0	0	0	0	0	0	
		220 KV Gajokhar-II Line	2	0	0	0	1	1	1	
		220 KV Ghazipur Line	0	0	0	0	0	0	0	
		220 KV Beerapatti TSS Feeder	0	0	0	0	0	0	0	
		220/132 KV 160 MVA TF-I	0	0	0	0	0	0	0	
		220/132 KV 200 MVA TF-I	0	0	0	0	0	0	0	
		220/132 KV 160 MVA TF-III	0	0	0	0	0	0	0	
5	220 kV Substation, Sahupuri	220 kV Obra Line	0	0	0	0	0	0	0	
		220 kV Robestganj Line (through Churk)	1	0	0	0	1	1	1	
		220 kV Bhadaura Line	0	0	0	0	0	0	0	
		220 kV Karamnasa Line	0	0	0	0	0	0	0	
		220 kV Raja ka Talab Line	0	0	0	0	0	0	0	
		220 kV Bhadohi (GIS) Line	0	0	0	0	0	0	0	
		220 kV Sahupuri-I (400 kV GIS Interconnector) Line	2	0	0	0	2	2	2	
		220 kV Sahupuri-II (400 kV GIS Interconnector) Line	1	0	0	0	1	1	1	
		200 MVA (220/132 kV) T/F-I	-	0	0	0	0	0	0	
		160 MVA (220/132 kV) T/F-II	1	0	0	0	1	1	1	
		200 MVA (220/132 kV) T/F-III	1	0	0	0	1	1	1	

ET&C CIRCLE, PRAYAGRAJ

Format No.-PI-01

Reporting of performance indices for protection system

(for elements connected at 220 KV and above)

Name of utility:UPPTCL

Month 06-2025

S.N.	Sub-station	Unit (SPS/Line/ICT/GT/etc)	Nc	Nf	Nu	Ni	Dependability index (D) D=(Nc/(Nc+Nf))	Security Index (S) S=(Nc/(Nc+Nu	Relibality Index (R) R=(Nc/(Nc+Ni))	REMARK
6	400 kV GIS Substation, Sahupuri	400 kV Biharsharif- I (PG) Line {with 63 MVAR Line Reactor}	1	0	2	2	1	0.33	0.33	This line tripped twice falsely (erratically) on A/R Lockout flag due to the malfunction of its unhealthy BCU as A/R function is enabled in BCU (MiCOM, C264)
		400 kV Biharsharif- II (PG) Line {with 63 MVAR Line Reactor}	-	-	-	-	-	-	-	
		400 kV Thathra-I (Varanasi-PG) Line	-	-	-	-	-	-	-	
		400 kV Thathra-II (Varanasi-PG) Line	1	-	-	-	1	1	1	
		500 MVA (400/220 kV) ICT-I	-	-	-	-	-	-	-	
		500 MVA (400/220 kV) ICT-II	-	-	-	-	-	-	-	
		125 MVAR (400 kV) Bus Reactor	-	-	-	-	-	-	-	
		220 kV Sahupuri- I (Interconnector) Line	2	-	-	-	2	2	2	
		220 kV Sahupuri- II (Interconnector) Line	1	-	-	-	1	1	1	
		220 kV Bhelupuri- I Line	-	-	-	-	-	-	-	
		220 kV Bhelupuri- II Line	-	-	-	-	-	-	-	
7	220 KV substation Bhelupur	60 MVA T_F-I	0	0	0	0	0	0	0	
		60 MVA T_F-II	0	0	0	0	0	0	0	
		60 MVA T_F-III	1	0	0	0	1	1	1	
		220 KV Sahupuri-I	0	0	0	0	0	0	0	
		220 KV Sahupuri-II	0	0	0	0	0	0	0	
8	220 KV substation Harahua	60 MVA T_F-I	1	0	0	0	1	1	1	
		60 MVA T_F-II	1	0	0	0	1	1	1	
		220 KV Azamgarh	0	0	0	0	0	0	0	
		220 KV Sarnath	0	0	0	0	0	0	0	
9	220 KV substation Gajokhar	160 MVA ICT-I	1	0	0	0	1	1	1	
		160 MVA ICT-II	1	0	0	0	1	1	1	
		220 KV Sarnath	2	0	0	0	1	1	1	
		220 KV Machhlisahar	0	0	0	0	0	0	0	
10	220 KV S/S Ghazipur	220KV Sarnath-Ghazipur Line	1	0	0	0	1	1	1	
		220KV Rasra-Ghazipur Line	1	0	0	0	1	1	1	
		220/ 132 KV , 160 MVA ICT 1	1	0	0	0	1	1	1	
		220/ 132 KV , 160 MVA ICT 2	1	0	0	0	1	1	1	
11	220KV Robertsganj	220KV Obra Line	0	0	0	0	0	0	0	
		220KV Churk-Sahupuri Line	1	0	0	0	1	1	1	
		160MVA T/F-I (220/132KV)	0	0	0	0	0	0	0	
		160MVA T/F-II (220/132KV)	0	0	0	0	0	0	0	
		TOTAL	**29**	**0**	**2**	**2**				

PERFORMANCES INDICES FROM TSE ZONE UPPTCL	Dependability index (D) D=(Nc/(Nc+Nf))	1
	Security Index (S) S=(Nc/(Nc+Nu))	0.935483871
	Relibality Index (R) R=(Nc/(Nc+Ni))	0.935483871

NOTE:- (i) Reason for performance indices less than unity is mentioned in above particular element remark.

Nc - No. of correct operations at internal power system faults
Nf - No. of failures to operate at internal power system faults
Nu - No. of unwanted operations
Ni - No. of incorrect operations, (Ni=Nf+Nu)

Suprintending Engineer

ET&C CIRCLE, PRAYAGRAJ

Format No.-PI-01

Reporting of performance indices for protection system

(for elements connected at 220 KV and above)

Name of utility:UPPTCL

Month 06-2025

S.N.	Sub-station	Unit (SPS/Line/ICT/GT/etc)	Nc	Nf	Nu	Ni	Dependability index (D) D=(Nc/(Nc+Nf))	Security Index (S) S=(Nc/(Nc+Nu))	Relibality Index (R) R=(Nc/(Nc+Ni))	REMARK
6	400 kV GIS Substation, Sahupuri	400 kV Biharsharif- I (PG) Line {with 63 MVAR Line Reactor}	1	0	2	2	1	0.33	0.33	This line tripped twice falsely (erraticely) on A/R Lockout flag due to the malfunction of its unhealthy BCU as A/R function is enabled in BCU (MiCOM, C264)
		TOTAL	**1**	**0**	**2**	**2**				

Suprintending Engineer

ET&C CIRCLE, PRAYAGRAJ

Format No.-PI-01

Reporting of performance indices of SPS

(for elements connected at 220 KV and above)

Name of utility:UPPTCL

Month 06-2025

S.N.	Sub-station	Unit (SPS/Line/ICT/GT/etc)	Nc	Nf	Nu	Ni	Dependability index (D) D=(Nc/(Nc+Nf))	Security Index (S) S=(Nc/(Nc+Nu))	Relibality Index (R) R=(Nc/(Nc+Ni))	REMARK
1	400 KV SS SARNATH	400 KV Anpara L3 Line	0	0	0	0	0	0	0	
2		400 KV Anpara-L5 Line	1	0	0	0	1	1	1	
3		400 KV Azamgarh Line	0	0	0	0	0	0	0	
4		400 KV Varanasi-I (PG) Line	0	0	0	0	0	0	0	
5		400 KV VAranasi-II (PG) Line	0	0	0	0	0	0	0	
6		400/220 KV 315 MVA ICT-I	0	0	0	0	0	0	0	
7		400/220 KV 500 MVA ICT-II	0	0	0	0	0	0	0	
8		400/220 KV 315 MVA ICT-III	0	0	0	0	0	0	0	
9		400/220 KV 315 MVA ICT-IV	0	0	0	0	0	0	0	
10		400KV 125 MVAR Reactor	0	0	0	0	0	0	0	
11		220 KV Azamgarh-II Line	1	0	0	0	1	1	1	
12		220 KV Bhaduara Line	0	0	0	0	0	0	0	
13		220 KV Harhua Line	0	0	0	0	0	0	0	
14		220 KV Gajokhar-I Line	0	0	0	0	0	0	0	
15		220 KV Gajokhar-II Line	2	0	0	0	1	1	1	
16		220 KV Ghazipur Line	0	0	0	0	0	0	0	
17		220 KV Beerapatti TSS Feeder	0	0	0	0	0	0	0	
18		220/132 KV 160 MVA TF-I	0	0	0	0	0	0	0	
19		220/132 KV 200 MVA TF-I	0	0	0	0	0	0	0	
20		220/132 KV 160 MVA TF-III	0	0	0	0	0	0	0	
		TOTAL	**4**	**0**	**0**	**0**				

PERFORMANCES INDICES FROM TSE ZONE UPPTCL	Dependability index (D) D=(Nc/(Nc+Nf))	1
	Security Index (S) S=(Nc/(Nc+Nu))	1
	Relibality Index (R) R=(Nc/(Nc+Ni))	1

NOTE:- (i) Reason for performance indices less than unity is mentioned in above particular element remark.

Nc - No. of correct operations at internal power system faults
Nf - No. of failures to operate at internal power system faults
Nu - No. of unwanted operations
Ni - No. of incorrect operations, (Ni=Nf+Nu)

Suprintending Engineer
ET&C CIRCLE PRAYAGRAJ

Performance Indices for Protection System

Punjab State Transmission Corporation Limited

June-2025

S.N.	Sub-Station	Unit (SPS/Line/ICT/GT/etc.)	Nc	Nf	Nu	Ni	Dependability Index (D)	Security Index (S)	Reliabilty Index (R)
1		220 kV Muktsar(400)-Abohar ckt.II	1	0	0	0	1	1	1
2		400 kV Makhu-Amritsar ckt.I	1	0	0	0	1	1	1
3		220 kV Makhu-Algon ckt.II	1	0	0	0	1	1	1
4		220 kV Makhu-Algon ckt.I	1	0	0	0	1	1	1
5		220 kV Doraha - PGCIL ckt	1	0	0	0	1	1	1
6		220 kV Jadla - RTP Ckt. 1	2	0	0	0	1	1	1
7		220 kV Jadla - RTP Ckt. 2	1	0	0	0	1	1	1
8		220 kV Dhandari - PGCIL Ckt. 1	1	0	0	0	1	1	1
9		220 kV Dhandari - PGCIL Ckt. 2	1	0	0	0	1	1	1
10	220 kV S/S Sahnewal	T-4 (220/66 Kv 160 MVA)	0	0	1	1	#DIV/0!	0	0
11		220 KV Ikolaha-Malerkotla line	1	0	0	0	1	1	1
12		220kv G-1 - Wazirabad (G5) Ckt. No.1	1	0	0	0	1	1	1
13		220kv G-1 - RTP Ckt. No.2	1	0	0	0	1	1	1
14	220 kv S/S G-1	220/66 KV, 100 MVA T/F T-6	1	0	0	0	1	1	1
15		220KV G5-RTP	1	0	1	1	1	0.5	0.5
16		220 kV Science City- Kanjli Ckt-2	1	0	0	0	1	1	1
17		220 kV Sultanpur-Chola Sahib Ckt	1	0	0	0	1	1	1
18		220 kV Rehana Jattan- Jamsher Line	2	0	0	0	1	1	1
19		220 kV Banga-Jadla Ckt	1	0	0	0	1	1	1
20		220 kV Sultanpur-Chola Sahib Ckt	1	0	0	0	1	1	1
21		220kV Malerkotla-Ikolaha	1	0	0	0	1	1	1
22	220kv S/S Malerkotla	160MVA PTF T-2	0	0	1	1	#DIV/0!	0	0
23		220 kv Nabha - Bhawinigarh ckt. No. 1	1	0	0	0	1	1	1
24	220 kV S/S Rajla	160 MVA T/F T-3	0	0	1	1	#DIV/0!	0	0
25		220 KV Patran-Banwala Ckt-1	1	0	0	0	1	1	1
26		220 kV Mohali 1 - RTP	1	0	0	0	1	1	1
27		220 kV Mohali 2 - Derabassi	1	0	0	0	1	1	1
28		220 kV Rajpura - Rajpura ckt-1	1	0	0	0	1	1	1
29	220 kVS/S Rajpura	220/66kV 100 MVA T/F T-5	1	0	0	0	1	1	1
30		220 kV Abohar Mukatsar Ckt-2	1	0	0	0	1	1	1
31	220 KV S/S Barnala	220/66 kV 100 MVA T/F T-3	1	0	1	1	1	0.5	0.5
32		220 kV Mansa Patran Line	1	0	0	0	1	1	1
33		220KV Moga -Sadiq Line	1	0	0	0	1	1	1
34	220 KV S/S Singhanwala	220/132 kV100 MVA T/F T-3	2	0	0	0	1	1	1
35	220 kV S/S Singhanwala	220/66 kV 100 MVA T/F T-6	1	0	0	0	1	1	1
36		220 kv Ghubaya-muktsar line	1	0	0	0	1	1	1
37		220kv ckt-1 Ghubaya-400kv muktsar	1	0	0	0	1	1	1
38		220kv ckt-2 Ghubaya-400kv muktsar	1	0	0	0	1	1	1
39	220KV S/S Sandhwan	220/66KV 100MVA PTF T-1	1	0	0	0	1	1	1
40		220KV Sadiq-Moga line	1	0	0	0	1	1	1
41	220 KV S/S Kotkaror	66 kV 160 MVA 220/66 kV PT/F T-7	1	0	0	0	1	1	1
42		220kV GVK/BTW Ckt-1	1	0	0	0	1	1	1
43	220KV Verpal	T2 (220/66 kV, 100 MVA) PTF	1	0	0	0	1	1	1
44		220 kV Verpal - Balachak Circuit No.-1	1	0	0	0	1	1	1
45		220 kV Naraingarh - Balachak Circuit No.-1	2	0	0	0	1	1	1
46		220 kV Naraingarh - Balachak Circuit No.-2	1	0	0	0	1	1	1
47		220 kV Khassa - Balachak Circuit No.-1	1	0	0	0	1	1	1
48		220 kV Khassa - Balachak Circuit No.-2	1	0	0	0	1	1	1
49		220 kV Khassa - Civil Line Circuit.	1	0	0	0	1	1	1
50		220KV Chohla Sahib - Sultanpur Circuit.	3	0	0	0	1	1	1
51		220kV Algon - Makhu Circuit No. 1	1	0	0	0	1	1	1
52		220 kV Sarna -Wadala Granthian Circuit No.-1	2	0	0	0	1	1	1
53		220 kV Sarna - Wadala Granthian Circuit No.-4	1	0	0	0	1	1	1
54		220 kV Gurdaspur - Sarna Circuit	1	0	0	0	1	1	1
55		220 kV Gurdaspur - Wadala Granthian Circuit	1	0	0	0	1	1	1
56	220 kV Sub Station, Gurdaspur	T-5 (220/66 KV 100 MVA) PTF	1	0	0	0	1	1	1
		Overall PPI of PSTCL	**60**	**0**	**5**	**5**	**1**	**0.923076923**	**0.92307692**

Performance Indices for Protection System										
Punjab State Transmission Corporation Limited										
June-2025										
S.N.	**Sub-Station**	**Unit (SPS/Line/ICT/GT/etc.)**	**Nc**	**Nf**	**Nu**	**Ni**	**Dependability Index (D)**	**Security Index (S)**	**Reliabilty Index (R)**	**Remarks**
1	400 kV Muktsar	220 kV Muktsar(400)-Abohar ckt.II	1	0	0	0	1	1	1	
400 kV Muktsar			**1**	**0**	**0**	**0**	**1**	**1**	**1**	
2	400 kV Makhu	400 kV Makhu-Amritsar ckt.I	1	0	0	0	1	1	1	
		220 kV Makhu-Algon ckt.II	1	0	0	0	1	1	1	
		220 kV Makhu-Algon ckt.I	1	0	0	0	1	1	1	
400 kV Makhu			**3**	**0**	**0**	**0**	**1**	**1**	**1**	
3	220 kV Doraha	220 kV Doraha - PGCIL ckt	1	0	0	0	1	1	1	
220 kV Doraha			**1**	**0**	**0**	**0**	**1**	**1**	**1**	
4	220 kV Jadla	220 kV Jadla - RTP Ckt. 1	2	0	0	0	1	1	1	
		220 kV Jadla - RTP Ckt. 2	1	0	0	0	1	1	1	
220 kV Jadla			**3**	**0**	**0**	**0**	**1**	**1**	**1**	
5	220 kV Dhandari - 1	220 kV Dhandari - PGCIL Ckt. 1	1	0	0	0	1	1	1	
		220 kV Dhandari - PGCIL Ckt. 2	1	0	0	0	1	1	1	
220 kV Dhandari - 1			**2**	**0**	**0**	**0**	**1**	**1**	**1**	
6	220 kV Sahnewal	T-4 (220/66 Kv 160 MVA)	0	0	1	1	0	0	0	Due to leakage from butterfly valve of NIFPES tank
220 kV Sahnewal			**0**	**0**	**1**	**1**	**0**	**0**	**0**	
7	220 kV Ikolaha	220 KV Ikolaha-Malerkotla line	1	0	0	0	1	1	1	
220 kV Ikolaha			**1**	**0**	**0**	**0**	**1**	**1**	**1**	
8	220 kV s/s G-1	220kv G-1 - Wazirabad (G5) Ckt. No.1	1	0	0	0	1	1	1	
		220kv G-1 - RTP Ckt. No.2	1	0	0	0	1	1	1	
		220/66 KV, 100 MVA T/F T-6	1	0	0	0	1	1	1	
220 kV s/s G-1			**3**	**0**	**0**	**0**	**1**	**1**	**1**	
9	220 kV s/s G-5	220KV G5-RTP	1	0	1	1	1	0.5	0.5	
220 kV s/s G-5			**1**	**0**	**1**	**1**	**1**	**0.5**	**0.5**	
10	220 kV S/S Science City	220 kV Science City- Kanjli Ckt-2	1	0	0	0	1	1	1	
220 kV S/S Science City			**1**	**0**	**0**	**0**	**1**	**1**	**1**	
11	220 kV S/S Sultanpur	220 kV Sultanpur-Chola Sahib Ckt	1	0	0	0	1	1	1	
220 kV S/S Sultanpur			**1**	**0**	**0**	**0**	**1**	**1**	**1**	
12	220 kV S/S Rehana Jattan	220 kV Rehana Jattan- Jamsher Line	2	0	0	0	1	1	1	
220 kV S/S Rehana Jattan			**2**	**0**	**0**	**0**	**1**	**1**	**1**	
13	220 kV Banga	220 kV Banga-Jadla Ckt	1	0	0	0	1	1	1	
220 kV Banga			**1**	**0**	**0**	**0**	**1**	**1**	**1**	
14	220 kV S/S Sultanpur	220 kV Sultanpur-Chola Sahib Ckt	1	0	0	0	1	1	1	
220 kV S/S Sultanpur			**1**	**0**	**0**	**0**	**1**	**1**	**1**	
15	220 kV S/S Malerkotla	220kV Malerkotla-Ikolaha	1	0	0	0	1	1	1	
		160MVA PTF T-2	0	0	1	1	0	0	0	B-phase capillary tube of winding gauge found damaged.
220 kV S/S Malerkotla			**1**	**0**	**1**	**1**	**1**	**0.5**	**0.5**	
16	220 kV S/S Nabha	220 kv Nabha - Bhawinigarh ckt. No. 1	1	0	0	0	1	1	1	
220 kV S/S Nabha			**1**	**0**	**0**	**0**	**1**	**1**	**1**	
17	220 kV S/S Rajla	160 MVA T/F T-3	0	0	1	1	0	0	0	PRV Relay operated, on checking found ingress of moisture in PRV terminal Box.
220 kV S/S Rajla			**0**	**0**	**1**	**1**	**0**	**0**	**0**	
18	220 kV S/S Patran	220 KV Patran-Banwala Ckt-1	1	0	0	0	1	1	1	
220 kV S/S Patran			**1**	**0**	**0**	**0**	**1**	**1**	**1**	
19	220 kV Mohali - 1	220 kV Mohali 1 - RTP	1	0	0	0	1	1	1	
220 kV Mohali - 1			**1**	**0**	**0**	**0**	**1**	**1**	**1**	
20	220 kV SEC-80 Mohali-2	220 kV Mohali 2 - Derabassi	1	0	0	0	1	1	1	
220 kV SEC-80 Mohali-2			**1**	**0**	**0**	**0**	**1**	**1**	**1**	
21	220 kV Rajpura	220 kV Rajpura - Rajpura ckt-1	1	0	0	0	1	1	1	
		220/66kV 100 MVA T/F T-5	1	0	0	0	1	1	1	
220 kV Rajpura			**2**	**0**	**0**	**0**	**1**	**1**	**1**	
22	220 kV S/S Abohar	220 kV Abohar Mukatsar Ckt-2	1	0	0	0	1	1	1	
220 kV S/S Abohar			**1**	**0**	**0**	**0**	**1**	**1**	**1**	

23	220 kV S/S Barnala	220/66 kV 100 MVA T/F T-3	1	0	1	1	1	0.5	0.5	Due to jerk of switching off operations of cooling Pumps. P/T/F charged at 18:10 hrs.
220 kV S/S Barnala			**1**	**0**	**1**	**1**	**1**	**0.5**	**0.5**	
24	220 kV S/S Mansa	220 kV Mansa Patran Line	1	0	0	0	1	1	1	
220 kV S/S Mansa			**1**	**0**	**0**	**0**	**1**	**1**	**1**	
25	220 kV S/S Singhanwala	220KV Moga -Sadiq LineLine	1	0	0	0	1	1	1	
		220/132 kV100 MVA T/F T-3	2	0	0	0	1	1	1	
		220/66 kV 100 MVA T/F T-6	1	0	0	0	1	1	1	
220 kV S/S Singhanwala			**4**	**0**	**0**	**0**	**1**	**1**	**1**	
26	220 kV S/S Ghubaya	220 kv Ghubaya-muktsar line	1	0	0	0	1	1	1	
		220kv ckt-1 Ghubaya-400kv muktsar	1	0	0	0	1	1	1	
		220kv ckt-2 Ghubaya-400kv muktsar	1	0	0	0	1	1	1	
220 kV S/S Ghubaya			**3**	**0**	**0**	**0**	**1**	**1**	**1**	
27	220 kV S/S Sandhwan	220/66KV 100MVA PTF T-1	1	0	0	0	1	1	1	
220 kV S/S Sandhwan			**1**	**0**	**0**	**0**	**1**	**1**	**1**	
28	220 kV S/S Sadiq	220KV Sadiq-Moga line	1	0	0	0	1	1	1	
220 kV S/S Sadiq			**1**	**0**	**0**	**0**	**1**	**1**	**1**	
29	220 kV S/S Kotkaror	66 kV 160 MVA 220/66 kV PT/F T-7	1	0	0	0	1	1	1	
220 kV S/S Kotkaror			**1**	**0**	**0**	**0**	**1**	**1**	**1**	
30	220 kV S /S Botian Wala	220kV GVK/BTW Ckt-1	1	0	0	0	1	1	1	
220 kV S /S Botian Wala			**1**	**0**	**0**	**0**	**1**	**1**	**1**	
31	220 kV Verpal	T2 (220/66 kV, 100 MVA) PTF	1	0	0	0	1	1	1	
		220 kV Balachak Circuit No.-1	1	0	0	0	1	1	1	
220 kV Verpal			**2**	**0**	**0**	**0**	**1**	**1**	**1**	
32	220 kV Nariangarh	220 kV Balachak Circuit No.-1	2	0	0	0	1	1	1	
		220 kV Balachak Circuit No.-2	1	0	0	0	1	1	1	
220 kV Nariangarh			**3**	**0**	**0**	**0**	**1**	**1**	**1**	
33	220 kV Khassa	220 kV Balachak Circuit No.-1	1	0	0	0	1	1	1	
		220 kV Balachak Circuit No.-2	1	0	0	0	1	1	1	
		220 kV Civil Line Circuit.	1	0	0	0	1	1	1	
220 kV Khassa			**3**	**0**	**0**	**0**	**1**	**1**	**1**	
34	220 kV Chohla sahib	220KV Sultanpur Circuit.	3	0	0	0	1	1	1	
220 kV Chohla sahib			**3**	**0**	**0**	**0**	**1**	**1**	**1**	
35	220 kV Algon kothi	220kV Makhu Circuit No. 1	1	0	0	0	1	1	1	
220 kV Algon kothi			**1**	**0**	**0**	**0**	**1**	**1**	**1**	
36	220 kV Sub Station, Sarna	220 kV Wadala Granthian Circuit No.-1	2	0	0	0	1	1	1	
		220 kV Wadala Granthian Circuit No.-4	1	0	0	0	1	1	1	
220 kV Sub Station, Sarna			**3**	**0**	**0**	**0**	**1**	**1**	**1**	
37	220 kV Sub Station, Gurdaspur	220 kV Sarna Circuit	1	0	0	0	1	1	1	
		220 kV Wadala Granthian Circuit	1	0	0	0	1	1	1	
		T-5 (220/66 KV 100 MVA) PTF	1	0	0	0	1	1	1	
220 kV Sub Station Gurdaspur			**3**	**0**	**0**	**0**	**1**	**1**	**1**	
38	220 kV Sub Station, Wadala Granthian	220 kV Sarna Circuit No.-1	1	0	0	0	1	1	1	
		220 kV Sarna Circuit No.-4	2	0	0	0	1	1	1	
		220 kV Gurdaspur Circuit	1	0	0	0	1	1	1	
220 kV Sub Station Wadala Granthian			**4**	**0**	**0**	**0**	**1**	**1**	**1**	

Tripping Details Punjab State Transmission Corporation Limited June-2025						Remarks
S.N.	**Sub-Station**	**Unit (SPS/Line/ICT/GT/etc.)**	**Date on which Power System Fault occurred**	**Local End Indications**	**Remote End Indications**	
1	400 kV S/S Muktsar	220 kV Muktsar(400)-Abohar ckt.II	14-06-20025 at 18.53 Hrs	Zone-I, B-ph, Fault Location-34 km	B-ph, Fault Distance-1.241 km	
2	400 kV S/S Makhu	400 kV Makhu-Amritsar ckt.I	27-06-2025 at 16.18 Hrs	Zone-I, Y-ph, Fault Distance-52.2 km	Zone-I, Y-ph, Fault Distance-9.39 km	
		220 kV Makhu-Algon ckt.II	29-06-2025 at 16.08 Hrs	Zone-I, B-ph	Zone-I, B-ph	
		220 kV Makhu-Algon ckt.I	29-06-2025 at 16.08 Hrs	Zone-I, B-ph	Not tripped	
3	220 kV Doraha	220 kV Doraha - PGCIL ckt	1/6/2025 AT 6:33	Zone - 1, Fault Location - 14.97 Km, R-Phase, Auto Reclose Blocked	Zone - 1, Fault Location - 4.56 Km, R-Phase, Auto Reclose Blocked	
4	220 kV Jadla	220 kV Jadla - RTP Ckt. 1	2/6/2025 AT 22:49	Zone - 1, Fault Location - 18.18 Km, B-Phase, Auto Reclose Blocked	Zone - 1, Fault Location - 20.83 Km, B-Phase, Auto Reclose Blocked	
		220 kV Jadla - RTP Ckt. 1	28/6/2025 AT 14:02	Zone - 1, Fault Location - ___ Km, R-Phase, Auto Reclose Blocked	Zone - 1, Fault Location - 18.75 Km, R-Phase, Auto Reclose Blocked	
		220 kV Jadla - RTP Ckt. 2	28/6/2025 AT 13:33	Zone - 1, Fault Location - 30.84 Km, YB-Phase, Auto Reclose Blocked	Zone - 1, Fault Location - 11.0 Km, YB-Phase, Auto Reclose Blocked	
5	220 kV Dhandari - 1	220 kV Dhandari - PGCIL Ckt. 1	24/6/2025 AT 5:16	Zone - 1, Fault Location - 3.172 Km, YB-Phase, Auto Reclose Blocked	Zone - 2, Fault Location - 19.6 Km, YB-Phase, Auto Reclose Blocked	
		220 kV Dhandari - PGCIL Ckt. 2	1/6/2025 AT 6:33	Zone - None, YB-Phase, Auto Reclose Blocked, Carrier receive	Zone - 1, Fault Location - 13.86 Km, B-Phase, Auto Reclose Blocked	
6	220 kV Sahnewal	T-4 (220/66 Kv 160 MVA)	24/6/2025 AT 5:54	Buchholz stage 1 and Buchholz stage 2	_____	Due to leakage from butterfly valve of NIFPES tank
7	220 kv s/s Ikolaha	220 KV Ikolaha-Malerkotla line	03.06.2025 at 19:43	Main-1 DPR Ia-4316.23 A Ib-4500.78 A Ic-222.18 A, Zone-1.	Main-1 DPR Ia- 9289A Ib- 9316A Ic-214 A, Zone-1. F.L-18.33 km	
8	220 kv s/s G-1	220kv G-1 - Wazirabad (G5) Ckt. No.1	20.06.2025 at 11:34	Main-1 DPR R ϕ Ia-189.7 A Ib-436.6 A Ic-421 A, Zone-1, F.L-55.50 mtr Main 2 Any trip ABC, Ia-421.1 A, Zone-1	Main-1 DPR Ia-0 A Ib-15.63 A Ic-0 A, Zone-1, F.L-372.6 mtr Main 2 O/C Y ϕ, Zone-1	
		220kv G-1 - RTP Ckt. No.2	28.06.2025 at 13:45	Main 2 DPR REL 670 Ia- 280.87 A, Ib-384.2 A, Ic-3013.81 A, In-3268.73 A, Zone-1, Main 1 DPR Micom P440 Zone- 1 trip, FL-19.87 KM	Ia- 264.3 A, Ib-399.6 A Ic-3.640 A, Zon3-1 B phase, F.L- 41.03 KM	
		220/66 KV, 100 MVA T/F T-6	03.06.2025 at 22:29	HV Side - REF, Master LV Side - Master		
9	220 kv s/s Wairabad(G5)	220KV G5-G1 Ckt No. 1	20.06.2025 at 11:34	Main-1 DPR Ia-0 A Ib-15.63 KA Ic-0 A, Zone-1, F.L-372.6 mtr Main 2 O/C Y ϕ, Zone-1	Main-1 DPR R ϕ Ia-189.7 A Ib-436.6 A Ic-421 A, Zone-1, F.L-55.50 mtr Main 2 Any trip ABC, Ia-421.1 A, Zone-1	
		220KV G5-RTP	20.06.2025 at 11:34	Main-1: DPR Ia=790.4A, Ib=2.633 KA, IC=541.1 A Main-2: DPR Y Phase	REL 670 Relay , A, B, C Phase, DTP Tripping, P 442 Relay A, b, c Phase	
		220KV G5-RTP	28.06.2025 at 13:45	Breaker tripped from G-5 end with CB PDR Trip indication	Not tripped	
10	220 KV S/S Science City	220 kV Science City- Kanjli Ckt-2	27.06.2025 at 23.45 Hrs	RYB-Phase, Z-1	RYB-Phase, Z-2	Coupling Capacitor damaged at 220 kv Science City end.
11	220 KV S/S Sultanpur	220 kV Sultanpur-Chola Sahib Ckt	03.06.2025 at 18.29 Hrs	B-Phase, Z-1, Ia=137.5 A, Ib=14.46 A, Ic= 6.268 kA, 15.03 Kms	RYB-Phase, Z-1, Ia=12.94 A, Ib=9.071 A, Ic= 8.394 kA, 9.842 Kms	Bad weather
12	220 kV S/S Rehana Jattan	220 kV Rehana Jattan- Jamsher Line	09.06.2025 at 13.05Hrs	DPR,B-ph,Z-1,15.90 km,Ic-288.2A	M-1,DPR,B-pg,Z-1,14.80km,Ic-5.157kA M-2,DPR B-pg,Z-1,7.0km,Ic-5.419kA	
		220 kV Rehana Jattan- Jamsher Line	09.06.2025 at 14.40 Hrs	DPR, B-ph, Z-1,16.01 km, Ia-352A, Ib-343 A, Ic-6.058kA	ON	B-ph Jumper damaged at Tower No. 124
13	220 kV Banga	220 kV Banga-Jadla Ckt	06.06.2025 at 09.54 Hrs	R-ph,Z-1,26.412km	R-ph Z-1,13.52 km	
14	220 KV S/S Sultanpur	220 kV Sultanpur-Chola Sahib Ckt	04.06.2025 at 13.37 Hrs	ON	RYB-Phase, Z-1, Ia-29.42A, Ib-100.8A, Ic-166.8A	
15	220KV S/S Malerkotla	220kV Malerkotla-Ikolaha	3.6.25 at 19.43 to 3.6.2025 at 22.23	DPR RY-phase H-Set Ia-9.216kA Ib-9.3kA Z-1 18.33KM	DPR RY-phase Ia-4.316kA Ib-4.5kA	
		160MVA PTF T-2	17.6.2025 at 15.24 to 17.6.2025 at 17.07	Transformer Winding Temperature High Alarm/Trip indications		B-phase capillary tube of winding gauge found damaged.

16	220KV S/S Nabha	220 kv Nabha - Bhawinigarh ckt. No. 1	15.06.2025 at 5.15 to 15.06.2025 to 08.09	DPR M-1 Z-1 B-phase 16.51kA 0KM & DPR M-2 Z-1 B-phase 1.3KM	DPR M-1 Z-1 A/R optd B-phase, Breaker autoreclose operated	
17	220 kV S/S Rajla	160 MVA T/F T-3	25.6.2025 at 13.00 to 25.6.2025 at 15.36	PRV Relay		PRV Relay operated, on checking found ingress of moisture in PRV terminal Box.
18	220KV S/S Patran	220 KV Patran-Banwala Ckt-1	26.6.2025 at14.19 to 27.6.25 at 0.56	Main-2 DPR,Zone-1 R & Y Phase, O/C Zone-1,R Phase 578A,Y Phase 558A & B Phase 546A Distance- 0 Km	Tripped from patran end only	
19	220 kV Mohali - 1	220 kV Mohali 1 - RTP	10.06.2025 at 13:52	Main-1 : Z1, Trip Phase A, Ia - 7.29 kA, Ib - 0.32 kA, Ic - 0.431 kA, Distance-13.7 km, Main-2: Started Phase AN, Tripped phase A, Z1, Ia-7.638 kA, Ib-340.2A, Ic - 438.9 A, Dist - 13.43 KM	Started Phase AN Z1, R-Phase, Dist - 35.5 KM, Ia - 4.283 kA, Ib - 333.18 A, Ic - 449 A	Bottom phase of line come in induction of 11 kV Line under tower span 101 -102
20	220 kV SEC-80 Mohali-2	220 kV Mohali 2 - Derabassi	17.06.2025 at 18:57	DPR Main-1, IL1-0.13kA, IL2-12.10 kA, IL3 - 11.80 kA, Z-1, distt - 0.8km, DPR Main-2, IL1 - 136.3A, IL2 - 11.25 kA, IL3 - 11.34 kA, Z-1, Dist - 774.7 mt.	DPR Main-1, Dist - 22.9 km, DPR Main-2, IL1 - 123 A, IL2 - 3.720 kA, Ic - 3.575 kA, Dist - 33.3 km	A metalic tape roll was thrown toward the line by children playing in public park
21	220 kV Rajpura	220 kV Rajpura - Rajpura ckt-1	27.06.2025 at 02:50	Auto reclosed Blocked, Master Trip	No tripping at other end	Transient fault, Line charged per pc instruction.
		220/66kV 100 MVA T/F T-5	30.06.2025 at 17:14	O/C R-ph.		Due to 66 kV Dhamgarh Line Fault
22	220 kV S/S Abohar	220 kV Abohar-Mukatsar ckt no.02	14-06-2025 at 18:53 hrs	Main-1, Zone-1, Dist- 34 km, Fault Current Ic: 4.25 KA Main-2, L1 (No fault current)	Zone-1 Distance=1.241 km, Fault Current: Ic 6.071 KA	Transient Fault
23	220 kV S/S Singhawala	220 kV Moga-Sadiq Line	11-06-2025 at 14:20 hrs	DPR Main-1 Operated. YN Phase Distance:- 74.5 km	Started Phase :YN Phase, Tripped Phase: RYB Phase , DPR Main-1 Operated , Fault Current: R phase- 559.6 A, Y phase 2.259 KA, B-260.2 A	
		220/132 kV 100 MVA P/T/F T-3	15-06-2025 at 17:37 hrs	HV side Indications: REF operated Fault current IA-0.149 KA, IB-0.159 KA, IC-0.198 KA, IN-0.088 KA, IG-0.130 KA LV side Indications: Master Trip Relay operated	N.A	After review the settings by Protection team Bathinda, try taken and P/T/F holds at 19:52. Again P/T/F tripped at 23:59 hrs then after compelete inspection by Protection team Bathinda It is found that the existing core of NCT was misbehaving then after changed the existing core with spare core P/T/F charged at 05:29 hrs. No supply affected.
		220/132 kV 100 MVA P/T/F T-3	15-06-2025 at 23:59 hrs	HV side Indications: REF operated Fault current IA-0.135 KA, IB-0.134 KA, IC-0.156 KA, IN-0.000 KA, IG-0.102 KA LV side Indications: Master Trip Relay operated	N.A	
		220/66 kV 100 MVA P/T/F T-6	19-06-2025 at 22:55 hrs	LV side Indications: REF and Master Trip Relay operated	N.A	Tripped while charging newly installed 20 MVA 66/11 Kv P/T/F T-7.Rectified the issue with NCT connections. Charged at 23:13 hrs.
24	220 kV S/S Mansa	220 kV Mansa-Patran CKT	22/06/2025 15:35 hrs	DPR Main-1 Operated Zone-1 Dist-25.78 km Y phase Highset Fault current R phase- 447 A, Y phase- 4557 KA , B Phase-602 A DPR Main-2 Operated Zone-1 Dist- 28.14 km Y phase Highset R phase- 690 A, Y phase- 4022 KA , B Phase-522 A	DPR Main-1 Operated Dist-41.6 km Y phase Highset Fault current Y phase- 3.77 KA DPR Main-2 Operated Dist- 42.1 km Y phase-2.58 KA	Due to a conductor of Tower (which is newly installed between Tower no.31&32 by TLSC, PSPCL Sangrur) came in range of these towers as sag is pending on that Tower. Line charged at 19:04 after Patrolling.
25	220 kV S/S Barnala	220/66 kV 100 MVA P/T/F T-3	29/06/2025 16:48 hrs	Main Buchholz trip relay operated	N.A	Due to jerk of switching off operations of cooling Pumps. P/T/F charged at 18:10 hrs.
26	220 kv S/S Ghubaya	220 kv Ghubaya-muktsar line	29/6/2025 at 16:50	220 kv Ghubaya - 220 muktsar line R-412A Y-560A B-3018A DPR-61meter		Bad weather Conditions
		220kv ckt-1 Ghubaya-400kv muktsar	29/6/2025 at 16:50	220kv ckt-1 (Ghubaya -400kv muktsar) R-356A Y-533A B-2956A Dpr-66.49 meter		Bad weather Conditions
		220kv ckt-2 Ghubaya-400kv muktsar	29/6/2025 at 16:50	220kv ckt-2 (Ghubaya -400kv muktsar) R-246A Y-125A B-3231A DPR-58meter		Bad weather Conditions

27	220KV S/S Sandhwan	220/66KV 100MVA PTF T-1	28/06/25 at 13:14	OLTC Bucholoz Trip		Tripped from 13:14 to 18:17 due to jerk while tripping of newly commissioned 66KV Capacitor bank.T/F charged at 18:17hrs after testing done by Protection team Ferozepur and receiving charging code from PC patiala.
28	220 KV S/S Sadiq	220KV Sadiq-Moga line	11/06/2025 at	Started phase:-BN phase Tripped Phase:-ABC phase DPR-1 Operated Zone-None R phase -559.6 A Y phase -2.259 KA B phase -260.2 A		Transient Fault
29	220 KV S/S Kotkaror	66 kV 160 MVA 220/66 kV PT/F T-7	29/06/2025 at 05:41	LV Side O/C Relay Fault Current:- Ia:- 483.4A Ib:- 644.3 A Ic:- 6.246 kA REF Relay:- 0.86 Amp Differential Relay Current:- 1W1A:- 140 mA 1W1B:- 189 mA 1W1C:- 2.30 A IW2A:- 137 mA 1W2B:- 188mA 1W2C:- 1.730 A No Supply Affected.		66 kV LV (66 kV) found B-Phase LV damaged
30	220 KV S S Botian Wala	220kV GVK/BTW Ckt-1	29/06/2025 at 16:35	DPR Relay operated Zone-1 started phase BC Fault location 33.61 KmIA= 53.85A IB= 5.545 kA IC = 5.564 kA		
31	220 KV Verpal	220 KV Verpal-Balachak-1	07.06.25 at 17.2	Zone-1 A phase DPR operated	*****	Found Nothing
		220/ 66 KV 100 MVA T-2	26.06.2025 at 06.15	Oil Temprature Trip	Control cable found defective somewhere from breaker to C&R panel	Power T/F charged after testing by Protection team and Instructions of PC Patiala
32	220 kV Naraingarh	220 KV Naraingarh-Balachak - 1	07.06.25 at 17.2	Zone-1,2 A phase DPR operated	*****	Y Phase Jumper found burnt
		220 KV Naraingarh-Balachak - 1	12.06.25 at 14.35	Zone-1ABC phase DPR operated	*****	Y Phase Jumper found burnt
		220 KV Naraingarh-Balachak - 2	12.06.25 at 14.35	Zone-1ABC phase DPR operated	*****	Found Nothing
33	220 kV Khassa	220 KV Khassa-Balachak-1	02.06.25 at 15.42	Zone-1 C phase DPR-1 operated, And Zone-1 CN phase DPR-2	*****	Disc String flashed
		220 KV Khassa-Balachak-2	07.06.25 at 17.2	Zone-1 A phase DPR operated	*****	Earth Wire Broken
		220 KV Khassa-Civil line	22.06.25 at 15.06	Zone-1 ABC phase DPR operated	*****	R Phase jumper burnt at tower no. 94.
34	220 kV Chohla Sahib	220 KV Chohla-Sultanpur	03.06.25 at 18.3	Zone-1 ABC phase DPR operated	*****	Found Nothing
		220 KV Chohla-Sultanpur	04.06.25 at 8.49	Zone-1 ABC phase DPR operated	*****	Found Nothing
		220 KV Chohla-Sultanpur	04.06.25 at 13.37	Zone-1 ABC phase DPR operated	*****	Found Nothing
35	220 kV Algon kothi	220 KV Algo-Makhu-2	29.06.25 at 16.08	Zone-1 B phase DPR operated	*****	Due to bad weather conditions
36	220 kV Sarna	220 kV WG Circuit No.-4	04.06.2025 at 11:59	DPR M-1, CN PHASE, Z1, FL - 3.87 kM Ic -12.24 KA + MTR 86	DPR M-1, C PHASE, Z2, + MTR 86	Due to very Bad & Stormy Weather
		220 kV WG Circuit No.-1	07.06.2025 at 10:26	DPR M1, AN PHASE, Z1, FAULT LOCATION 15.27KM, IA-5.836KA	DPR M1, AN PHASE, Z1, FAULT LOCATION 42.03KM, IA-2.413KA	No visible fault found during patrolling.
		220 kV WG Circuit No.-1	15.06.2025 at 12:55	DPR M1, BCN PHASE, Z1, FAULT LOCATION 42.04 KM, IC-3.337 KA	DPR M1, ABCN PHASE, Z1, FAULT LOCATION 1.68 KM, IC-15.84 KA	Due to breakdown of B-Ph conductor near tower no. 167
37	220 kV Gurdaspur	220 kV Sarna Circuit No.-4	04.06.2025 at 11:59	DPR M-1, C PHASE, Z2, + MTR 86	DPR M-1, CN PHASE, Z1, FL - 3.87 kM Ic - 12.24 KA + MTR 86	Due to very Bad & Stormy Weather
		220 kV Sarna Circuit No.-1	07.06.2025 at 10:26	DPR M1, AN PHASE, Z1, FAULT LOCATION 42.03KM, IA-2.413KA	DPR M1, AN PHASE, Z1, FAULT LOCATION 15.27KM, IA-5.836KA	No visible fault found during patrolling.
		220 kV Gurdaspur Circuit	14.06.2025 at 00:04	Main 1 Any trip phase CN Tripped phase ABC, Distance trip Zone 2	Main 2 Started phase CN, Tripped phase ABC	Due to very Bad & Stormy Weather
		220 kV Sarna Circuit No.-4	15.06.2025 at 12:55	DPR M1, ABCN PHASE, Z1, FAULT LOCATION 1.68 KM, IC-15.84 KA	DPR M1, BCN PHASE, Z1, FAULT LOCATION 42.04 KM, IC-3.337 KA	Due to breakdown of B-Ph conductor near tower no. 167
38	220 kV Sub Station, Gurdaspur	220 kV WG Circuit	14.06.2025 at 00:05	M1 DPR Z2, FL - 31.88 kM, Ic - 4.118 kA	-	Due to breaking of earth wire of 66 kV Galhri Feeder & come in the induction zone of 220 kV Circuits
		220 kV Sarna Circuit	14.06.2025 at 00:05	M1 DPR Z2, FL - 0.327 kM, Ic - 4.189 kA	-	Due to breaking of earth wire of 66 kV Galhri Feeder & come in the induction zone of 220 kV Circuits
		220/66 kV, 100 MVA PTF T5	18.06.2025 at 15:30	REF + MTR 86	Due to flash in the 11 kV Bus Bar of 66/11 kV, 20 MVA PTF T3	PTF Energised after protection testing & as per directions of PC Patiala.

न्यूक्लियर पावर कारपोरेशन ऑफ इण्डिया लिमिटेड
NUCLEAR POWER CORPORATION OF INDIA LIMITED
(भारत सरकार का उद्यम) (A Government of India Enterprise)
रावतभाटा राजस्थान साइट–7एवं8 Rawatbhata Rajasthan Site-7&8
फोन Tel: 01475–242372 फैक्स Fax:,01475–256871, ईमेल Email: rkmisra@npcil.co.in

सं.No.:रारास्थ-7एवं8/RRS-7&8/व.अ.अ.(वि.) SME(E)/2025/ दिनांक Date: 26 June 2025

Sub: - Reporting of Protection Performance Indices of 400 KV transmission lines emanating from RAPS-D (RAPS-7&8) for the month of May-2025.

1. 400kV KOTA-2 LINE:-

Dependability Index (D)	Security Index (S)	Reliability Index (R)	Remark
Nc = 0	Nc = 0	Nc =0	No outage reported.
Nf = 0	Nu = 0	Ni = 0	
D= Nc/Nc+Nf	S= Nc/Nc+Nu	R= Nc/Nc+Ni	
D=Not Applicable	S= Not Applicable	R= Not Applicable	

2. 400kV JAIPUR LINE:-

Dependability Index (D)	Security Index (S)	Reliability Index (R)	Remark
Nc = 0	Nc = 0	Nc =0	No outage reported.
Nf = 0	Nu = 0	Ni = 0	
D= Nc/Nc+Nf	S= Nc/Nc+Nu	R= Nc/Nc+Ni	
D= Not Applicable	S= Not Applicable	R= Not Applicable	

3. 400kV SHUJALPUR-1 LINE:-

Dependability Index (D)	Security Index (S)	Reliability Index (R)	Remark
Nc = 0	Nc = 0	Nc =0	No outage reported.
Nf = 0	Nu = 0	Ni = 0	
D= Nc/Nc+Nf	S= Nc/Nc+Nu	R= Nc/Nc+Ni	
D= Not Applicable	S= Not Applicable	R= Not Applicable	

4. 400kV SHUJALPUR-2 LINE:-

Dependability Index (D)	Security Index (S)	Reliability Index (R)	Remark
Nc = 0	Nc = 0	Nc = 0	No outage reported.
Nf = 0	Nu = 0	Ni = 0	
D= Nc/Nc+Nf	S= Nc/Nc+Nu	R= Nc/Nc+Ni	
D= Not Applicable	S= Not Applicable	R= Not Applicable	

Nomenclature:-

Nc=Number of correct operations at internal power system faults

Nf=Number of failure to operate at internal power system faults

Nu=Number of unwanted operations

Ni=Number of incorrect operations & sum of Nf & Nu

न्यूक्लियर पावर कारपोरेशन ऑफ इण्डिया लिमिटेड
NUCLEAR POWER CORPORATION OF INDIA LIMITED
(भारत सरकार का उद्यम) (A Government of India Enterprise)
रावतभाटा राजस्थान साइट–7एवं8 Rawatbhata Rajasthan Site-7&8
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D=Dependability index

S=Security index

R=Reliability index

Shaik Benazeer

SO/D (EMU)

RAPS-7&8

Through:

(R.K. Misra)

SME (E)

RAPS-7&8

To,

SE (O), NRPC, New Delhi

seo-nrpc@nic.in

CC:

SD/CS for kind information please

TSS/OS/MS

Sh. Ruchir v oza, ACE, HQ, NPCIL (rvoza@npcil.co.in)

STE(E&I)

File

Reporting of Performance Indices for Protection System

Name of Utility: Renew Surya Ayan Pvt Ltd, 300MW

Month: June'25

Sl No	Sub-station	Unit (SPS/Line/ICT/GT/etc)	Nc	Nf	Nu	Ni	Dependability Index(D)	Security Index (S)	Reliability Index (R)	Remarks
1	Fatehgarh-III (PG)	Line	-	-	-	-	-	-	-	No tripping faced.
2	Fatehgarh-III (PG)	ICT-1	0	0	1	1	-	0	0	PTR-01 tripped due to operation of OSR on 24th Jun 25. No abnormality observed during physical inspection at site. For detailed internal inspection of OLTC, visit by OLTC OEM (M/s CTR) has been planned on 06th Jul 25.
3	Fatehgarh-III (PG)	ICT-2	-	-	-	-	-	-	-	No tripping faced.

Nc is the number of correct operations at internal power system faults,
Nf is the number of failures to operate at internal power system faults,
Nu is the number of unwanted operations

S.No.	Substation	Element name	Total number of tripping	Nc	Nf	Nu	Ni	Dependability Index (D)	Security Index(S)	Reliability Index(R)
1	PPGCL, BARA	765/400KV 3X1500 MVA ICT 2	1	0	0	1	1	0	0	0

The Dependability Index defined as (D) = Nc/(Nc+Nf)

The Security Index defined as (S) = Nc/(Nc+Nu)

The Reliability Index defined as (R) = Nc/(Nc+Ni)

Nc is the number of correct operations at internal power system faults.

Nf is the number of failures to operate at internal power system faults.

Nu is the number of unwanted operations.

Ni is the number of incorrect operations and the sum of Nf and Nu.

*** PPI (Protection Performance indices) should be submitted only for tripped elements of any sub station (Example 1,2 & 3)**

*** In case of no tripping of any element in a sub station it is should be submitted as "Nil" (Example 4)**

*** In case of single tripping which is Nf or Nu, PPI will be "Zero" (Example 1)**

*** In case of PPI less than one, details for that tripping should be submitted seperately (Example "Remarks for less than one**

S.No.	Substation	Element name	Date & Time of the tripping	Categorization (F/U) F = Failures to operate at internal power system faults U = Unwanted operations	Reason for failures/Unwanted operation	Corrective action taken/ to be taken
1	BARA	765/400KV 3X1500 MVA ICT 2	On 15th June at 00:09:21:037 Hrs	U	•On 15th June at 00:09:21:037 Hrs, 765 kV Bara-Mainpuri Line-2 experienced a severe Y-ph to ground fault which was cleared by the distance protection relay as desired and also initiated auto-reclosure cycle. Line was successfully restored through auto reclosure process and sustained thereafter suggesting that fault was temporary in nature and got cleared. •The distance recorded by the relay was 180 meter suggesting that location of fault was either in our switchyard or very close to take off gantry Tripping of ICT-2 on REF protection: •While the line fault was being fed by ICT-2, it tripped on REF (Restricted Earth Fault) protection at 00:09:21:097 which resulted in operation of master trip relay on 765kV as well as 400kV side •Visual inspection of ICT-2 was carried out and was found normal. No other protection or field device alarms got triggered. •Since the fault was outside the REF zone, operation of REF protection needs to be further analysed with the help of relay records to	The matter has been discussed and relay file shared with M/s Schneider (OEM) to find the root cause. PPGCL asked to OEM to share the corrective action plan to avoid the future reoccurrence .

Performance Indices of Anta Gas Power Station for June-2025

Index. No.	Number of correct operations at internal power system faults(Nc)	Number of failures to operate at internal power system faults(Nf)	The Dependability Index(D=Nc/(Nc+Nf)
1	1	0	1

Index. No.	Number of correct operations at internal power system faults(Nc)	Number of unwanted operations (Nu)	The Security Index(S=Nc/(Nc+Nu)
2	1	1	0.5

Index. No.	Number of correct operations at internal power system faults(Nc)	Number of incorrect operations (Ni=Nf+Nu)	The Reliability Index (R=Nc/(Nc+Ni)
3	1	1	0.5

Number of Unwanted operation	Root cause	Corrective Action
Kota line breaker openend at Anta end on 29th June-25	Remote command relay maloperated and trip the breaker at Anta end.	The same relay checked and replaced with new one.

NOTE for reference of deciding parameters:

1) Nc = The number of correct operation of switchyard breakers (220kV and above) on protection to be counted i.e if the breaker has operated correctly on internal protection operation

2) Nf = The number of failure of switchyard breaker (220kV and above) to operate on its protection to be counted i.e if the breaker has not operated on internal protection operation (includes LBB operation etc)

3) Nu = The number of unwanted operation of switchyard breaker (220kV and above) without its own protection operation to be counted i.e if the breaker has opened without operation of its protection leading to tripping of other breaker or grid connected equipments

4) In case if the Nf or Nu is not zero/ index is less than 1, then the report alongwith reasons and corrective action plan to be discussed with COS & ROS before sending to RPC & RLDC.

5) The report shall be prepared by EMD (station) and share it to EEMG (station) which shall be sent to ROS for further submission to RLDC & RPC. However if there is any deviation as mentioned in (4) above then the report shall be submitted to COS for vetting before onward submission to RPC & RLDC.

Reason for Performance Indices less than Unity- June 2025 (RVPN)

Case-1 3*80 MVAR line reactor bank -2 of Phagi Ckt -2 at 765 KV ANTA on 03&04 .06.2025

No. of Unwanted operation –2

Reason of unwanted operation –

Cable damaged.

Corrective Action taken – YES

Damaged cable replaced.

Case-2 765 KV Phagi-Anta-1, 240 MVAR Line Reactor at 765 KV GSS PHAGI on 19, 20 & 21.06.2025

No. of Unwanted operation – 4

Reason of unwanted operation –

Due to problem in DC change over switch, which is found burnt.

Corrective Action taken – YES

DC change over switch replaced.

Case-3 400 KV Hindaun-Alwar line at 400 KV GSS HINDAUN on 13.06.2025

No. of Unwanted operation – 1

Reason of unwanted operation –

DT receive contact shorted due to mice urination.

Corrective Action taken – YES

Contacts cleaned and relay is healthy.

Case-4 400/220 KV 315 MVA ILT -4, Tie Circuit at 400KV GSS HEERAPURA on 14.06.2025

No. of Unwanted operation – 1

Reason of unwanted operation –

TC-1 & TC-2 wiring issue.

Corrective Action taken – YES

Wiring checked and problem rectified.

Case-5 220 KV DAUSA-MANDAWAR LINE at 220KV GSS DAUSA on 10.06.2025

No. of Unwanted operation – 1

Reason of unwanted operation –

QMho relay defective.

Corrective Action taken – YES

The defective relay has been replaced on dated 26.06.2025.

Case-6 220KV Bhawad- Soorpura -II Line at 220KV GSS Soorpura on 13.06.2025

No. of Unwanted operation – 1

Reason of unwanted operation –

Wiring issue.

Corrective Action taken – YES

The substation is going for Automation, hence some wiring issues arise sometimes, which has been rectified.

Case-7 220KV / 132 KV 100 MVA TRANSFORMER-I at 220 KV GSS KUKAS on 02.06.2025

No. of Unwanted operation – 1

Reason of unwanted operation –

Tripping remained connected on NDR relay.

Corrective Action taken – YES

Tripping removed from NDR relay.

Case-8 220/132KV, 100 MVA Transformer No-2, TELK Make at 220 kV GSS KANKROLI on 10.06.2025

No. of Unwanted operation – 1

Reason of unwanted operation –

MIT type REF relay defective.

Corrective Action taken – YES

REF relay replaced.

U. P. POWER TRANSMISSION CORPORATION LIMITED
(A Govt. Of Uttar Pradesh Undertaking)
(उ0 प्र0 पावर ट्रॉसमीशन कारपारेशन लिमिटेड)
(उ0 प्र0 सरकार का उपक्रम)

Office of the Superintending Engineer
Electricity Test & Commissioning Circle
1st Floor, 132KV G.I.S. Old Power House
Substation, 1-A Kamala Nehru Road,
Prayagraj-211001
Email:- setncalbd@upptcl.org

UPPTCL

कार्यालय अधीक्षण अभियन्ता
विद्युत परीक्षण एवं परिचालन मण्डल,
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हाउस उपकेन्द्र, 1–ए कमला नेहरू रोड,
प्रयागराज 211001
Email:-setncalbd@upptcl.org

No 643 /ET&CCPr/ Protection Date 02-08-2025

Subject: - Calculation of Protection performance indices report for the month of July 2025.

Chief Engineer(A) **(By Email.)**
Director Operation
U.P.Power Transmmision Corp. Ltd.,
Shakti Bhawan Extn.,
Lucknow.

Kindly find enclosed herewith the Calculation of Protection performance indices report of 220 KV and above Sub Stations for the month of July 2025, Under TSE Zone Prayagraj for your information and necessary action.

Encl.- As above

for M Ahmad
Superintending Engineer
o/c

No 643 /ET&CCPr/ Protection Date 02-08-2025

Copy forwarded to following for kind information and necessary action:-

1- Chief Engineer (TSE), U.P. Power Transmission Corporation Ltd., 57–George Town, Pragayraj.
2- Superintending Engineer (R&A) U.P. Power Transmission Corporation Ltd., Lucknow

M Ahmad
Superintending Engineer
o/c

ET&C CIRCLE, PRAYAGRAJ

Format No.-PI-01

Reporting of performance indices for protection system

(for elements connected at 220 KV and above)

Name of utility:UPPTCL

Month 07-2025

S.N.	Sub-station	Unit (SPS/Line/ICT/GT/etc)	Nc	Nf	Nu	Ni	Dependability index (D) D=(Nc/(Nc+Nf))	Security Index (S) S=(Nc/(Nc+Nu))	Relibality Index (R) R=(Nc/(Nc+Ni))	REMARK
1	220 KV S/S FATEHPUR	220 KV FATEHPUR- UNCHAHAR	0	0	0	0	0	0	0	
		220 KV FATEHPUR- PGCIL-I	**2**	**0**	**0**	**0**	**1**	**1**	**1**	**DUE TO BROKEN CONDUCTOR**
		220 KV FATEHPUR- PGCIL-II	0	0	0	0	0	0	0	
		220KV FATEHPUR- PRAYAGRAJ CANTT	0	0	0	0	0	0	0	
		220 KV FATEHPUR- SIRATHU	0	0	0	0	0	0	0	
		220 KV FATEHPUR- BANDA	**1**	**0**	**0**	**0**	**1**	**1**	**1**	
		220 KV FATEHPUR- MALWAN	0	0	0	0	0	0	0	
		200 MVA ICT-I	0	0	0	0	0	0	0	
		200 MVA ICT-II	0	0	0	0	0	0	0	
2	220 KV Jhunsi	**220 KV SARANGAPUR LINE**	**1**	**0**	**0**	**0**	**1**	**1**	**1**	
		220 KV PHOOLPUR LINE	0	0	0	0	0	0	0	
		200 MVA T/F-I	0	0	0	0	0	0	0	
		200 MVA T/F-II	0	0	0	0	0	0	0	
3	220 KV PRATAPGARH	220 KV SULTANPUR LINE	2	0	0	0	0	0	0	
		220 KV PHOOLPUR LINE	0	0	0	0	0	0	0	
		100 MVA T/F-I	0	0	0	0	0	0	0	
		100 MVA T/F-II	0	0	0	0	0	0	0	
		160 MVA T/F	0	0	0	0	0	0	0	
4	220 KV Rewa Road	200 MVA T/F-I	0	0	0	0	0	0	0	
		200 MVA T/F-II	0	0	0	0	0	0	0	
		160 MVA T/F	0	0	0	0	0	0	0	
		220 KV MIRZAPUR	**1**	**0**	**0**	**0**	**1**	**1**	**1**	
		220KV OBRA-I	**2**	**0**	**0**	**0**	**1**	**1**	**1**	
		220KV OBRA-III	0	0	0	0	0	0	0	
		220KV PGCIL-I	0	0	0	0	0	0	0	
		220KV PGCIL-II	0	0	0	0	0	0	0	
		220KV CANTT	0	0	0	0	0	0	0	
		220KV SIRATHU	0	0	0	0	0	0	0	
5	400 KV MASAULI	**200MVA ICT-I**	**1**	**0**	**0**	**0**	**1**	**1**	**1**	
		200MVA ICT-II	0	0	0	0	0	0	0	
		200MVA ICT-III	0	0	0	0	0	0	0	
		400KV MEJA LINE	0	0	0	0	0	0	0	
		400KV REWA ROAD LINE	0	0	0	0	0	0	0	
6	220KV Robertsganj	220KV Obra Line	1	0	0	0	1	1	1	
		220KV Churk-Sahupuri Line	0	0	0	0	0	0	0	
		160MVA T/F-I (220/132KV)	0	0	0	0	0	0	0	
		160MVA T/F-II (220/132KV)	0	0	0	0	0	0	0	
7	400 KV SS SARNATH	400 KV Anpara L3 Line	0	0	0	0	–	–	–	
		400 KV Anpara-L5 Line	0	0	0	0	–	–	–	
		400 KV Azamgarh Line	0	0	0	0	–	–	–	
		400 KV Varanasi-I (PG) Line	0	0	0	0	–	–	–	
		400 KV VAranasi-II (PG) Line	0	0	0	0	–	–	–	
		400/220 KV 315 MVA ICT-I	0	0	0	0	–	–	–	
		400/220 KV 500 MVA ICT-II	0	0	0	0	–	–	–	
		400/220 KV 315 MVA ICT-III	0	0	0	0	–	–	–	
		400/220 KV 315 MVA ICT-IV	0	0	0	0	–	–	–	
		400KV 125 MVAR Reactor	0	0	0	0	–	–	–	
		220 KV Azamgarh-II Line	0	0	0	0	–	–	–	
		220 KV Bhaduara Line	0	0	0	0	–	–	–	
		220 KV Harhua Line	0	0	0	0	–	–	–	
		220 KV Gajokhar-I Line	0	0	0	0	–	–	–	
		220 KV Gajokhar-II Line	0	0	0	0	–	–	–	
		220 KV Ghazipur Line	**1**	**0**	**0**	**0**	**1**	**1**	**1**	
		220 KV Beerapatti TSS Feeder	0	0	0	0	–	–	–	
		220/132 KV 160 MVA TF-I	0	0	0	0	–	–	–	
		220/132 KV 200 MVA TF-I	0	0	0	0	–	–	–	
		220/132 KV 160 MVA TF-III	0	0	0	0	–	–	–	
8	400 KV Sub-Station M.Shahar	**400 KV PGCIL-I Line**	**1**	**0**	**0**	**0**	**1**	**1**	**1**	
		400 KV PGCIL-II Line	0	0	0	0				
		400 KV Obra B Line	**1**	**0**	**0**	**0**	**1**	**1**	**1**	
		400 KV Obra C Line	0	0	0	0				
		400/220/33KV,315 MVA ICT - 1	0	0	0	0				
		400/220/33KV,315 MVA ICT - 3	0	0	0	0				
		220 KV JAUNPUR LINE	0	0	0	0				
		220 KV GAJOKHAR LINE	0	0	0	0				
		220 KV BHADOHI LINE	0	0	0	0				
		220 KV AZAMGARH-II LINE	**1**	**0**	**0**	**0**	**1**	**1**	**1**	
		220 KV JHOOSI LINE	0	0	0	0				
		220 KV PHULPUR LINE	0	0	0	0				
		220/ 132 KV , 160 MVA ICT I	0	0	0	0				
		220/ 132 KV , 160 MVA ICT II	0	0	0	0				

ET&C CIRCLE, PRAYAGRAJ

Format No.-PI-01

Reporting of performance indices for protection system

(for elements connected at 220 KV and above)

Name of utility:UPPTCL

Month 07-2025

S.N.	Sub-station	Unit (SPS/Line/ICT/GT/etc)	Nc	Nf	Nu	Ni	Dependability index (D) D=(Nc/(Nc+Nf))	Security Index (S) S=(Nc/(Nc+Nu))	Relibality Index (R) R=(Nc/(Nc+Ni))	REMARK
9	220 KV S/S Jaunpur	220 KV Jaunpur -M. Shahar (400KV) Line	0	0	0	0	-	-	-	-
		220 KV Jaunpur -Azamgarh line	0	0	0	0				
		220/ 132 KV , 160 MVA ICT 1	0	0	0	0				
		220/ 132 KV , 160 MVA ICT 2	0	0	0	0				
		220/ 132 KV , 160 MVA ICT 3	**1**	**0**	**0**	**0**	**1**	**1**	**1**	
10	220 KV substation Bhelupur	**60 MVA T F-I**	**1**	**0**	**0**	**0**	**1**	**1**	**1**	
		60 MVA T F-II	0	0	0	0	0	0	0	
		60 MVA T F-III	1	0	0	0	1	1	1	
		220 KV Sahupuri-I	0	0	0	0	0	0	0	
		220 KV Sahupuri-II	0	0	0	0	0	0	0	
11	220 KV substation Raja Ka Talab	160 MVA ICT-I	0	0	0	0	0	0	0	
		160 MVA ICT-II	0	0	0	0	0	0	0	
		220 KV Sahupuri	1	0	0	0	1	1	1	
		220 KV Bhadohi(GIS)	0	0	0	0	0	0	0	
	220 kV Substation, Sahupuri	**220 kV Obra Line**	-	-	-	-	-	-	-	
		220 kV Robestganj Line (through Churk)	-	-	-	-	-	-	-	
		220 kV Bhadaura Line	-	-	-	-	-	-	-	
		220 kV Karamnasa Line	**1**	**0**	**0**	**0**	**1**	**1**	**1**	
		220 kV Raja ka Talab Line	**1**	**0**	**0**	**0**	**1**	**1**	**1**	
		220 kV Bhadohi Line	-	-	-	-	-	-	-	
		220 kV Sahupuri-I (400 kV GIS Interconnector) Line	-	-	-	-	-	-	-	
		220 kV Sahupuri-II (400 kV GIS Interconnector) Line	-	-	-	-	-	-	-	
		200 MVA (220/132 kV) ICT-I	-	-	-	-	-	-	-	
		160 MVA (220/132 kV) ICT-II	**3**	**0**	**0**	**0**	**1**	**1**	**1**	
		200 MVA (220/132 kV) ICT-III	-	-	-	-	-	-	-	
	400 kV GIS Substation, Sahupuri	**400 kV Biharsharif-I (PG) Line {with 63 MVAR Line Reactor}**	**0**	**0**	**2**	**2**	-	**0**	**0**	This line tripped twice on 1st & 2nd July, 25 due to false A/R L/O command given by unhealthy (defective) BCU (MiCOM-C264).
		400 kV Biharsharif-I (PG) Line {with 63 MVAR Line Reactor}	-	-	-	-	-	-	-	
		400 kV Thathra-I (Varanasi-PG) Line	-	-	-	-	-	-	-	
		400 kV Thathra-II (Varanasi-PG) Line	-	-	-	-	-	-	-	
		500 MVA (400/220 kV) ICT-I	-	-	-	-	-	-	-	
		500 MVA (400/220 kV) ICT-II	-	-	-	-	-	-	-	
		125 MVAR (400 kV) Bus Reactor	-	-	-	-	-	-	-	
		220 kV Sahupuri- I (Interconnector) Line	-	-	-	-	-	-	-	
		220 kV Sahupuri- II (Interconnector) Line	-	-	-	-	-	-	-	
		220 kV Bhelupuri- I Line	**2**	**0**	**0**	**0**	**1**	**1**	**1**	
		220 kV Bhelupuri- II Line	-	-	-	-	-	-	-	
14	220 KV S/S Ghazipur	220KV Sarnath-Ghazipur Line	0	0	0	0				
		220KV Rasra-Ghazipur Line	0	0	0	0				
		220/ 132 KV , 160 MVA ICT 1	1	0	0	0	1	1	1	
		220/ 132 KV , 160 MVA ICT 2	0	0	0	0				
		TOTAL	**23**	**0**	**2**	**2**				

PERFORMANCES INDICES FROM TSE ZONE UPPTCL	Dependability index (D) D=(Nc/(Nc+Nf))	1
	Security Index (S) S=(Nc/(Nc+Nu))	0.92
	Relibality Index (R) R=(Nc/(Nc+Ni))	0.92

NOTE:- (i) Reason for performance indices less than unity is mentioned in above particular element remark.

Nc - No. of correct operations at internal power system faults

Nf - No. of failures to operate at internal power system faults

Nu - No. of unwanted operations

Ni - No. of incorrect operations, (Ni=Nf+Nu)

Suprintending Engineer

ET&C CIRCLE, PRAYAGRAJ

Format No.-PI-01

Reporting of performance indices for protection system

(for elements connected at 220 KV and above)

Name of utility:UPPTCL

Month 07-2025

S.N.	Sub-station	Unit (SPS/Line/ICT/GT/etc)	Nc	Nf	Nu	Ni	Dependability index (D) D=(Nc/(Nc+Nf))	Security Index (S) S=(Nc/(Nc+Nu))	Relibality Index (R) R=(Nc/(Nc+Ni))	REMARK
6	400 kV GIS Substation, Sahupuri	400 kV Biharsharif-I (PG) Line {with 63 MVAR Line Reactor}	0	0	2	2	-	0	0	This line tripped twice on 1st & 2nd July, 25 due to false A/R L/O command given by unhealthy (defective) BCU (MiCOM- C264).
		TOTAL	0	0	2	2				

for M Ahmad

Suprintending Engineer

Ashok
JE

MONTHLY SPS REPORT

E T&C CIRCLE PRAYAGRAJ

FORMAT NO.: PI-01

Reportinc of Performanc Indices of Protection System

(For elements connected at 220KV System and Above

Name of Utility: 400 KV SUBSTATION SARNATH UNDER E T&C DIVISION-I VARANASI

S.No.	Sub Station	Unit(SPS/Line/ICT/GT/etc	N_C	N_f	N_u	N_i	Dependebility Index(D) $D=\frac{N_C}{N_C+N_f}$	Security Index(S) $D=\frac{N_C}{N_C+N_u}$	Reliability Index $D=\frac{N_C}{N_C+N_i}$
		Jul-25							
1	400 KV SS SARNATH	400/220 KV 315 MVA ICT-I	0	0	0	0	_	_	_
2		400/220 KV 500 MVA ICT-II	0	0	0	0	_	_	_
3		400/220 KV 315 MVA ICT-III	0	0	0	0	_	_	_
4		400/220 KV 315 MVA ICT-IV	0	0	0	0	_	_	_
5		220 KV Azamgarh-II Line	0	0	0	0	_	_	_
6		220 KV Bhaduara Line	0	0	0	0	_	_	_
7		220 KV Harhua Line	0	0	0	0	_	_	_
8		220 KV Gajokhar-I Line	0	0	0	0	_	_	_
9		220 KV Gajokhar-II Line	0	0	0	0	_	_	_
10		220 KV Ghazipur Line	0	0	0	0	_	_	_
11		132 KV Saidpur	0	0	0	0	_	_	_
12		132 KV Kaithi	0	0	0	0	_	_	_
Month		01-Aug							
PERFORMANCES INDICES FROM TNE ZONE UPPTCL		Dependability index (D) D=(Nc/(Nc+Nf))	0	NOTE:- (i) Reason for performance indices less than unity is mentioned in above particular element remark.					
		Security Index (S) S=(Nc/(Nc+Nu))	0						
		Relibality Index (R) R=(Nc/(Nc+Ni))	0						

Nc - No. of correct operations at internal power system faults
Nf - No. of failures to operate at internal power system faults
Nu - No. of unwanted operations
Ni - No. of incorrect operations, (Ni=Nf+Nu)

for Suprintending Engineer

Reporting of Performance Indices for NHPC Power Stations In NR-Region
Month-JULY '2025

Sl No	Name of Utility	Name of PS	Elements (Line/ Unit)	From		To		Total Outage	Outage Reason	Nc	Nf	Nu	Ni	Dependability Index (D=Nc/(Nc+Nf))	Security Index (S=Nc/(Nc+Nu))	Reliability Index (R=Nc/(Nc+Ni))	Reason for wrong operation	Action Taken
1	NHPC Ltd	SALAL	220 KV Salal-Jammu Line#1	15-Jul-25	11:17	15-Jul-25	12:01	0:44	Master Trip Relay Operated	1	0	1	1	1	0.5	0.5	May be due to improper protecion scheme	To be checked at the earliest opportunity
2	NHPC Ltd	SALAL	220 KV Salal-Jammu Line#2	15-Jul-25	11:17	15-Jul-25	12:09	0:52	Busbar operated in R-Phase at Bus#A	1	0	0	0	1	1	1	NA	NA
3	NHPC Ltd	SALAL	220 KV Salal-Kishanpur Line#1	15-Jul-25	11:17	15-Jul-25	12:41	1:24	Busbar operated in R-Phase at Bus#A	1	0	0	0	1	1	1	NA	NA
4	NHPC Ltd	SALAL	220 KV Salal-Kishanpur Line#2	15-Jul-25	11:17	15-Jul-25	12:00	0:43	Master Trip Relay Operated	1	0	1	1	1	0.5	0.5	May be due to improper protecion scheme	To be checked at the earliest opportunity
5	NHPC Ltd	SALAL	220 KV Salal-Kishanpur Line#3	15-Jul-25	11:17	15-Jul-25	12:00	0:43	Master Trip Relay Operated	1	0	1	1	1	0.5	0.5	May be due to improper protecion scheme	To be checked at the earliest opportunity
6	NHPC Ltd	SALAL	220 KV Salal-Kishanpur Line#4	15-Jul-25	11:17	15-Jul-25	12:00	0:43	Busbar operated in R-Phase at Bus#A	1	0	0	0	1	1	1	NA	NA
7	NHPC Ltd	UR-II	400 KV Uri-II-Woogura Line#1	25-Jul-25	13:44	25-Jul-25	16:53	3:09	GIS Controller Fault	1	0	0	0	1	1	1	NA	NA
No Line tripping has been observed from other Power Stations of NHPC of NR region for Month of July'2025																		

Protection Performance Indices of Rampur HPS

Tripping of transmission line ckt Rampur-Nalagarh-2 of Rampur HPS on 14.07.2025.

Number of unwanted operations = 1

Reason for unwanted operation – SPS activated on case-1 i.e. load exceeds 900MW as malfunction by line transducer.

Corrective action – Faulty transducer was replaced with spare available during line shutdown.

Taken- Yes (Corrective action has been taken)

Tripping of Unit#1 of Rampur HPS on 25.07.2025.

Number of unwanted operations = 1

Reason for unwanted operation –Unit#1 tripped on transformer differential protection as malfunction by transformer protection relay RET650.

Corrective action –Relay RET650 was replaced with spare available during plant shutdown.

Taken- Yes (Corrective action has been taken)

NR222016	607083	220KV SALAL-JAMMU-I	7/15/2025 11:17	7/15/2025 12:01	00:00	00:44	00:00	00:00	NR-2507-2987	SBBU	Line remains charged from Jammu(JKPTCL) but tripped from Salal NPC due to problem in their Bay at Salal. As intimated by NHPC Salal, there was complete blackout of 220KV Yard at NHPC Salal caused by problem in machine 4. For reference, copy of email from NHPC indicating problem in their yard is attached	NC
NR222017	607084	220KV SALAL-JAMMU-II	7/15/2025 11:17	7/15/2025 12:09	00:00	00:52	00:00	00:00	NR-2507-2991	SBBU	Line remains charged from Jammu(JKPTCL) but tripped from Salal NPC due to problem in their Bay at Salal. As intimated by NHPC Salal, there was complete blackout of 220KV Yard at NHPC Salal caused by problem in machine 4. For reference, copy of email from NHPC indicating problem in their yard is attached	NC
NR222018	607079	220KV SALAL-KISHENPUR-I	7/15/2025 11:17	7/15/2025 12:41	00:00	01:24	00:00	00:00	NR2507-2988	SBBU	Line remains charged from Kishenpur but tripped from Salal NPC due to problem in their Bay at Salal. As intimated by NHPC Salal, there was complete blackout of 220KV Yard at NHPC Salal caused by problem in machine 4. For reference, voltage graph od Kishenpur end showing line in charged condition and copy of email from NHPC indicating problem in their yard is attached	NC
NR222019	607080	220KV SALAL-KISHENPUR-II	7/15/2025 11:17	7/15/2025 12:00	00:00	00:43	00:00	00:00	NR-2507-2989	SBBU	Line remains charged from Kishenpur but tripped from Salal NPC due to problem in their Bay at Salal. As intimated by NHPC Salal, there was complete blackout of 220KV Yard at NHPC Salal caused by problem in machine 4. For reference, voltage graph od Kishenpur end showing line in charged condition and copy of email from NHPC indicating problem in their yard is attached	NC
NR222020	607081	220KV SALAL-KISHENPUR-III	7/15/2025 11:17	7/15/2025 12:00	00:00	00:43	00:00	00:00	NR2507-2990	SBBU	Line remains charged from Kishenpur but tripped from Salal NPC due to problem in their Bay at Salal. As intimated by NHPC Salal, there was complete blackout of 220KV Yard at NHPC Salal caused by problem in machine 4. For reference, voltage graph od Kishenpur end showing line in charged condition and copy of email from NHPC indicating problem in their yard is attached	NC
NR222021	607082	220KV SALAL-KISHENPUR-IV	7/15/2025 11:17	7/15/2025 12:00	00:00	00:43	00:00	00:00	NR-2507-2999	SBBU	Line remains charged from Kishenpur but tripped from Salal NHPC due to problem in their Bay at Salal. As intimated by NHPC Salal, there was complete blackout of 220KV Yard at NHPC Salal caused by problem in machine 4. For reference, voltage graph od Kishenpur end showing line in charged condition and copy of email from NHPC indicating problem in their yard is attached	NC
NR222042	607054	220KV ALUSTENG-DRASS	7/10/2025 16:22	7/10/2025 17:28	00:00	00:00	01:06	00:00	NR2507-2082	LNCC	Line tripped on Y-N Fault due to heavy thunderstorm and lightning persisting in the area. During tower top patrolling, Flashover marks were noticed on arcing horn and corona ring at Loc No 200 indicating lightening. Fault Data Alustang:54.1kM,=2.19kA. Following documnets has been attached for reference: 1. Time tagged GPS photo of tower name plate. 2. GPS tagged photo of arcing horns showing flash marks 3. Relay fault location (Alustang) JKPTCL. 4. Tower Schedule and kmz file	NC
NR222042	607090	220KV ALUSTENG-DRASS	7/16/2025 13:42	7/16/2025 14:43	00:00	00:00	01:01	00:00	NR2507-3218	LNCC	Line tripped on R-B-N fault caused by falling of tree from about 30 meters from outer conductor from uphill side caused by huge land-sliding in Tower span 200-201. Falling, tree infringed with B-Ph (left) & R-Ph (top) phases conductors leading to the tripping of the line. Fault Data Drass: 65.12Km, Ir=0.300kA, Ib=0.471kA. Following documents has been attached for reference: 1.Time tag photo with GPS coordinate for nearest tower name plate 2. GPS tagged photo showing tripping due to falling of tree. 3.Drass(PG) Relay fault location of relay. 4.Tower Schedule and KMZ file.	NC
NR240051	607135	400KV URI 2-WAGOORA	7/25/2025 13:44	7/25/2025 16:53	00:00	03:09	00:00	00:00	NR2507-5181	SRMU	Line remains charged from Wagoora(PG) but tripped from Uri-2(NHPC) only due to problem in their Bay at URI. As intimated by NHPC, Mal functioning of GIS Controller at Uri-2 (NHPC) resulted in unwanted opening of CB. For reference, voltage graph of Wagoora end showing line in charged condition and copy of email from NHPC indicating problem in their yard is attached	NC
NR276504	607088	765KV MEERUT-MOGA	7/16/2025 9:29	7/16/2025 19:19	09:50	00:00	00:00	00:00	NR2507-3184	LHWT	Line tripped on Y-N fault due to failure of insulator V string at Loc No 02. Fault data Moga:336.6km, 2.53kA, Fault data Meerut : 0.46km, 23.9kA Y-ph (V string) polymer insulator decapped at tower no.02	NC
NR276504	607161	765KV MEERUT-MOGA	7/31/2025 1:13	7/31/2025 2:29	01:16	00:00	00:00	00:00	---	LEFT	Line tripped on Y-N fault due to jumper swing caused by heavy winds and thunderstorm persisting in the area. Fault Data Moga:90.6km,5.7kA,Fault data Meerat:222.2km,3.07Ka (M1).	NC
NR2ICT88	607006	CHANDIGARH 160 MVA ICT-I	02-07-2025 03:23	02-07-2025 06:56	03:33	00:00	00:00	00:00	NR2507-221	SRMT	ICT tripped on NRV trip.	NU

	Total tripping including LNCC & successful autoreclosures	12
NC	Nc is the number of correct operations at internal power system faults	12
NF	Nf is the number of failures to operate at internal power system faults,	0
NU	Nu is the number of unwanted operations,	1
NI	Ni is the number of incorrect operations and is the sum of Nf and Nu	0
	The Dependability Index defined as $D = Nc/(Nc+Nf)$	100.00%
	The Security Index defined as $S = Nc/(Nc+Nu)$	92.31%
	The Reliability Index defined as $R = Nc/(Nc+Ni)$	100.00%

PROTECTION PERFORMANCE INDICES PKATL

		NIL									NA

	Total tripping including LNCC & successful autoreclosures	
NC	Nc is the number of correct operations at internal power system faults	
NF	Nf is the number of failures to operate at internal power system faults,	
NU	Nu is the number of unwanted operations,	
NI	Ni is the number of incorrect operations and is the sum of Nf and Nu	
	The Dependability Index defined as $D = Nc/(Nc+Nf)$	
	The Security Index defined as $S = Nc/(Nc+Nu)$	
	The Reliability Index defined as $R = Nc/(Nc+Ni)$	

DATA CLASSIFICATION : CONTROLLED

PROTECTION PERFORMANCE INDICES POWERGRID NR2

NR222037	606153	220KV JALANDHAR-NEHRIAN (HPSEB)-II	6/25/2025 11:08	6/25/2025 11:08	00:00	00:00	00:00	00:00	------	LART	Line Auto reclosed successfully on transient R-N fault from both ends.	NC
NR240001	606149	400KV ABDULLAPUR-BAWANA-I	6/25/2025 5:35	6/25/2025 5:35	00:00	00:00	00:00	00:00	------	LART	Line Auto reclosed successfully on transient R-N fault from both ends.	NC
NR240011	606183	400KV CHAMERA1-JALANDHAR-II	30-06-2025 05:12	30-06-2025 05:12	00:00	00:00	00:00	00:00	--------	LART	Line Auto reclosed successfully on transient B-N fault from both ends.	NC
NR240013	606041	400KV DULHASTI-KISHENPUR-I	6/6/2025 13:33	6/6/2025 13:33	00:00	00:00	00:00	00:00	------	LART	Line Auto reclosed successfully on transient B-N fault from both ends.	NC
NR240049	606140	400KV LUDHIANA-PATIALA-II	6/22/2025 15:49	6/22/2025 15:49	00:00	00:00	00:00	00:00	--------	LART	Line Auto reclosed successfully on transient Y-N fault from both ends.	NC
NR240101	606150	400KV KURUKSHETRA-NAKODAR	6/25/2025 5:51	6/25/2025 5:51	00:00	00:00	00:00	00:00	------	LART	Line Auto reclosed successfully on transient B-N fault from both ends.	NC
NR240105	606103	400KV KAITHAL-BAGPAT-II	6/15/2025 2:58	6/15/2025 2:58	00:00	00:00	00:00	00:00	------	LART	Line Auto reclosed successfully on transient B-N fault from both ends.	NC
NR240114	606027	400KV AMRITSAR-JALANDHAR - II	6/4/2025 10:50	6/4/2025 10:50	00:00	00:00	00:00	00:00	------	LART	Line Auto reclosed successfully on transient R-N fault from both ends.	NC
NR240116	606173	400KV KAITHAL-MALERKOTLA	28-06-2025 01:15	28-06-2025 01:15	00:00	00:00	00:00	00:00	------	LART	Line Auto reclosed successfully on transient B-N fault from both ends.	NC
NR240117	606001	400KV DADRI-KAITHAL	6/1/2025 4:00	6/1/2025 4:00	00:00	00:00	00:00	00:00	-------	LART	Line auto reclosed successfully on Y-N fault from both ends. Fault data Kaithal end (AFAS): 136.267KM, Iy=3.39kA and Dadri end: 79.9km (Fault under NR1 jurisdiction).	NC
NR240121	606020	400KV KISHENPUR- NEW WANPOH-IV	6/3/2025 16:13	6/3/2025 16:13	00:00	00:00	00:00	00:00	--------	LART	Line Auto reclosed successfully on transient B-N fault from both ends.	NC
NR213202	606107	132KV SEWA2 - MAHANPUR	6/15/2025 15:24	6/15/2025 16:13	00:00	00:49	00:00	00:00	NR2506-4293	SRMU	Line succesfully Auto Reclosed from Mahanpur (JKPTCL) end on transient R-N fault but tripped from Sewa 2 (NHPC) due to maloperation of Auto reclose scheme at SEWA 2 end. Bay and Protection at Sewa(NHPC) is owned and maintained by NHPC. Fault data Sewa_2: B-N fault, FL=6.55KM, Ib=2.053KA, Following document has been attached for refrence: 1.Mahanpur(JKPTCL) end DR showing successful Auto Reclosure.	NC
NR213204	606171	132KV MAHANPUR - KATHUA	6/27/2025 22:03	28-06-2025 06:05	00:00	08:02	00:00	00:00	NR2506-6920	OMSU	Line tripped on B-N fault due to snaping of conductor of "220KV JKPTCL Line (D/C Thein-Ghatti) caused by failure of Tower/cross arm of JKPTCL line. Snapped conductor of JKPTCL Line has fallen on span 158-159 of "132KV Mahanpur-Kathua" and "132KV Sewa2-Kathua" lines resulting in line outage. Fault data Kathua(JKPTCL) 4.268KA, 2.42KM & Sewa2(NHPC): 1.03KA, 41.32KM. Lateron line taken under S/D by JKPTCL to replace snapped conductor. Following documents are attcahed for reference : 1. Relay fault distance data of Kathua end 2. Geotagged photo showing tower name plate 3. Geo tagged photo of snapped JKPTCL conductor 4. Tower schedule and KMZ File	NC
NR213205	606172	132KV SEWA2 - KATHUA	6/27/2025 22:03	28-06-2025 06:01	00:00	07:58	00:00	00:00	NR2506-6918	OMSU	Line tripped on B-N fault due to snaping of conductor of "220KV JKPTCL Line (D/C Thein-Ghatti) caused by failure of Tower/cross arm of JKPTCL line. Snapped conductor of JKPTCL Line has fallen on span 158-159 of "132KV Mahanpur-Kathua" and "132KV Sewa2-Kathua" lines resulting in line outage. Fault data Kathua(JKPTCL) 4.268KA, 2.42KM & Sewa2(NHPC): 1.03KA, 41.32KM. Lateron line taken under S/D by JKPTCL to replace snapped conductor. Following documents are attcahed for reference : 1. Relay fault distance data of Kathua end 2. Geotagged photo showing tower name plate 3. Geo tagged photo of snapped JKPTCL conductor 4. Tower schedule and KMZ File	NC
NR222020	606110	220KV SALAL-KISHENPUR-III	6/17/2025 22:08	6/18/2025 20:09	00:00	22:01	00:00	00:00	NR2506-4946	SEFU	As intimated by NHPC Salal, Line tripped due to sparking in wavetrap in their bay at NHPC. For reference, mail from NHPC indicating sparking in wavetrap is attached	NC	
NR222024	606128	220KV WAGOORA-PAMPORE-I	6/20/2025 23:24	6/21/2025 3:27	00:00	04:03	00:00	00:00	NR2506-5452	SEFU	Line tripped on operation of distance protection in Zone 2 caused by 220KV Bus fault in JKPTCL Substatin Pampore. Fault data Wagoora Main-1: FL=11.85 KM, Iy=5.678 KA. As intimated by JKPTCL Pampore, there was failur of 220/66KV Transformer at JKPTCL Station Pampore and fault was neirher cleared by transformer protection at pampore nor by or 220KV BB protection at JKPTCL Pampore. Following Documnets has been attached for reference: 1.Wagoora end DR showing operaion of distance protection in Z2 2. Wagoora end relay snap showing Z2 operated and fault distance 11.85KM against line length of 10.29km. 3. Mail from JKPTCL indicatig failure of Failure of Transformer at Pampore	NC	At JKPTCL S/S Pampore, neither Transformer protection operated nor BB operated
NR222025	606129	220KV WAGOORA-PAMPORE-II	6/20/2025 23:24	6/21/2025 3:26	00:00	04:02	00:00	00:00	NR2506-5453	SEFU	Line tripped on operation of distance protection in Zone 2 caused by 220KV Bus fault in JKPTCL Substatin Pampore. Fault data Wagoora Main-1: FL=11.85 KM, Iy=5.678 KA. As intimated by JKPTCL Pampore, there was failur of 220/66KV Transformer at JKPTCL Station Pampore and fault was neirher cleared by transformer protection at pampore nor by or 220KV BB protection at JKPTCL Pampore. Following Documnets has been attached for reference: 1.Wagoora end DR showing operaion of distance protection in Z2 2. Wagoora end relay snap showing Z2 operated and fault distance 11.76KM against line length of 10.29km. 3. Mail from JKPTCL indicatig failure of Failure of Transformer at Pampore	NC	At JKPTCL S/S Pampore, neither Transformer protection operated nor BB operated
NR240009	606040	400KV CHAMERA2-KISHENPUR	6/6/2025 11:40	6/6/2025 13:21	00:00	01:41	00:00	00:00	NR2506-1652	SEFU	Line remained charged from kishenpur(PG) and tripped from Chamera 2 (NHPC) . As per NHPC Chamera, line tripped due to maloperation in their Bay at Chamera. Following documents are attached for refrence: 1. Mail from Chamera 2 NHPC regarding problem in their bay at Chamera 2.Voltage and MVAR Graphs Kishenpur(PG) showing line in charge condition from Kishenpur(PG).	NC	
NR2ICT61	606062	MOGA 500MVA ICT-I	6/9/2025 20:20	6/10/2025 1:50	05:30	00:00	00:00	00:00	NR2506-2714	SICT	ICT tripped on operation of Bucholz protection	NU	

	Total tripping including LNCC & successful autoreclosures	19
NC	Nc is the number of correct operations at internal power system faults	18
NF	Nf is the number of failures to operate at internal power system faults,	0
NU	Nu is the number of unwanted operations,	1
NI	Ni is the number of incorrect operations and is the sum of Nf and Nu	1
	The Dependability Index defined as $D = Nc /(Nc+Nf)$	100.00%
	The Security Index defined as $S = Nc/(Nc+Nu)$	94.74%
	The Reliability Index defined as $R = Nc/ (Nc+Ni)$	94.74%

PROTECTION PERFORMANCE INDICES PKATL

		NIL								NA	

	Total tripping including LNCC & successful autoreclosures	
NC	Nc is the number of correct operations at internal power system faults	
NF	Nf is the number of failures to operate at internal power system faults,	
NU	Nu is the number of unwanted operations,	
NI	Ni is the number of incorrect operations and is the sum of Nf and Nu	
	The Dependability Index defined as $D = Nc /(Nc+Nf)$	
	The Security Index defined as $S = Nc/(Nc+Nu)$	
	The Reliability Index defined as $R = Nc/ (Nc+Ni)$	

Protection Performance Indices (PPI) for the Month of July 2025 of KPH, Khara.

S.No.	Substation	Element name	Date & Time of the Tripping	Categorization (F/U) F = Failures to operate at internal power system faults U = Unwanted operations	Reason for failures/Unwanted operation	Corrective action taken/ to be taken
1	Khara Power House (Khara)	220 KV Khara - Behat	07/07/2025, 14:15 Hrs	-	Distance Protection Z1	SOTF disabled after consultation with Testing & Commissioning Engineer.
2		220 KV Khara - Saharanpur (PG)	09/07/2025, 09:34 Hrs	-	Distance Protection Z1	
3		220 KV Khara - Saharanpur (PG)	25/07/2025, 10:24 Hrs	-	Distance Protection Z1	

Reason for Performance Indices less than Unity- July 2025 (RVPN)

Case-1 400 KV Bhensara - Akal Line at 400KV BHENSARA on 22.07.2025

No. of Unwanted operation –1

Reason of unwanted operation –

DT signal received at Bhensara end

Corrective Action taken – YES

Lizard found stuck at DT send contacts, which was removed and contacts cleaned.

Case-2 400 KV AKAL-JODHPUR LINE at 400 KV GSS AKAL on 22 & 23.07.2025

No. of Unwanted operation – 2

Reason of unwanted operation –

DT signal sent during testing by service engineer of OEM.

Corrective Action taken – YES

Working personnel was asked to disconnect any outgoing signal during testing.

Case-3 80 MVAR, 400 KV Bus Reactor at 400KV GSS BABAI on 07.07.2025

No. of Unwanted operation – 1

Reason of unwanted operation –

Due to water logging in auxiliary relays.

Corrective Action taken – YES

Auxiliary relays cleaned and proper packing has been done.

Case-4 400/220KV 315MVA ICT-III at 400 KV GSS AJMER on 15.07.2025

No. of Unwanted operation – 1

Reason of unwanted operation –

OSR cable defective.

Corrective Action taken – YES

Cable replaced.

Case-5 400KV/125Mvar Reactor at 400 KV GSS PACHPADRA on 19, 27 & 30.07.2025

No. of Unwanted operation – 3

Reason of unwanted operation –

Backup relay defective.

Corrective Action taken – YES

The defective relay has been replaced.

Case-6 220 kV SWM-Anta Line at 220KV GSS SWM on 05.07.2025

No. of Unwanted operation – 1

Reason of unwanted operation –

PT selection issue.

Corrective Action taken – YES

PT selection issue resolved.

Case-7 220 KV Ramgarh-Greenko Line at 400 KV GSS RAMGARH on 22.07.2025

No. of Unwanted operation – 1

Reason of unwanted operation –

Manual mistake during testing of bus bar protection.

Corrective Action taken – YES

Workmen were asked to work carefully.

Case-8 220/132 KV 100 MVA TR NO.NO.6 at 220KV GSS KHETRI on 10.07.2025

No. of Unwanted operation – 2

Reason of unwanted operation –

Cable defective.

Corrective Action taken – YES

Cable replaced.

Case-9 220/132 KV, 100 MVA, Transformer-II (T&R) at 220KV GSS PALI on 11.07.2025, 220/132KV 100MVA TRF.3rd at 220 MIA ALWAR on 13.07.2025 & 220/132 KV 100 MVA TR .NO.5 at 220 KV GSS KHETRI on 23.07.2025

No. of Unwanted operation – 3

Reason of unwanted operation –

Water logging during rain.

Corrective Action taken – YES

Relays cleaned and proper packing has been done.

Annexure-A.IV

Sl. No.	Month	SPS Operated	Details of SPS operated	No. of times operated in Month	No. of correct operations	No. of mal-operation	No. of times failed to operate	Remarks
1	May'25	SPS for safe evacuation of Lalitpur TPS Generation	1. i) At 15:32:37 hrs, B-N fault occurred on 765 KV Agra Fatehabad(UP)-Lalitpur(LPG) (UP) Ckt-1 and A/R started. At the same instant, 765 KV Agra Fatehabad(UP)-Lalitpur(LPG) (UP) Ckt-2 tripped on operation of OV stage-2 protection. As per DR of line, voltage of R-ph of 765kV Lalitpur-Agra Fatehabad line-II increased from 441kV to ~845kV for ~140msec. ii)Further, after dead time of A/R operation, 765 KV Agra Fatehabad(UP)-Lalitpur(LPG) (UP) Ckt-1 also tripped due to permanent nature of fault. iii)As per PMU at Agra765(PG), B-N phase to earth fault with delayed clearance of ~560msec is observed. iv)Due to tripping of both the 765kV evacuating lines, case-3 for SPS for safe evacuation of Lalitpur generation operated. As per SPS case-3, in case of tripping of both the 765kV lines, one 660MW unit, in this case unit-3 shall come to house load and remaining unit shall trip. 220kV lines to Lalitpur and Jhansi shall also trip. v)However, as 100MVA ST-2 already tripped at 15:26 hrs during LBB operation of 220kV Bus-1, BFP for Unit-3 was not available and therefore, 660MW Unit-3 also tripped along with 660MW Unit-1&2. 220kV line to Lalitpur(2nd ckt) also tripped on SPS operation. vi)Due to tripping of both the units and all the 220kV feeders on loss of evacuation path and SPS operation, complete 765/220kV Lalitpur S/s got blackout. vii)As per SCADA, generation loss of 1040MW at Lalitpur TPS (UP) and change in UP demand of ~90MW is observed. 2. i)At 13:49 hrs, 765 KV Agra Fatehabad(UP)-Lalitpur(LPG) (UP) Ckt-2 tripped on R-B phase to phase fault. ii)Further at 13:56hrs, 765 KV Agra Fatehabad(UP)-Lalitpur(LPG) (UP) Ckt-1 tripped on R-N phase to earth fault. iii)Due to tripping of both the 765kV evacuating lines, case-3 for SPS for safe evacuation of Lalitpur generation operated. As per SPS case-3, in case of tripping of both the 765kV lines, one 660MW unit (in this case unit-3 shall come to house load and remaining unit shall trip. 220kV lines to Lalitpur and Jhansi shall also trip. iv)As a result, 660 MW Lalitpur Unit-1 & Unit-2 tripped alongwith, 220 KV Lalitpur –Jhansi (UP) CKT, 220kV Lalitpur-Lalitpur220 ckt-2, 220kV Lalitpur-Lalitpur220 ckt-1 and 220 KV Lalitpur –Babina (UP) CKT tripped on SPS. v)As per SPS, the generation of 660MW Unit-3 reduced to 70MW for house load operation. vi)As per PMU at 765KV Agra(PG), two consecutive R-N phase to phase faults with fault clearing time of 120ms is observed.	1 03.05.2025 at 15:32hrs 2 11.05.2025 at 13:49hrs	2	0	0	**During 1st event:** As 100MVA ST-2 already tripped at 15:26 hrs during LBB operation of 220kV Bus-1, BFP for Unit-3 was not available and therefore, 660MW Unit-3 also tripped along with 660MW Unit-1&2. 220kV line to Lalitpur(2nd ckt) also tripped on SPS operation.
2	May'25	HVDC Rihand-Dadri SPS	i)As reported at 20:21 hrs, during multiple elments tripping event in Dadri, Meerut complex on subsequent line faults,500 kV HVDC Rihand-Dadri (PG) Ckt-1 and Ckt-2 tripped due to commutation failure. At the time of tripping 500 kV HVDC Rihand-Dadri (PG) Ckt-1 and Ckt-2 were carrying total ~1150 MW. As a result of tripping of both the ckt, SPS condition 2 operated. ii)As per details received from POWERGRID, as per logic if commutation failure persists for more than 2600 ms then the Protection shall issue a Y Trip to the converters. Since starting from 20:20:58:2785 Hrs. 12 successive commutation failures were detected at a gap of less than 500ms, at 20:21:00:8782 both Poles of the Rihand Dadri HVDC Link tripped on Commutation failure protection from HVDC Dadri S/s. iii)As per SPS case-2 operation, there should be load shed in load group-A, B, C & D and generation back down of total ~500 MW at Rihand & Singrauli TPS. As per SCADA data, generation backdown of ~335MW is observed in Rihand Stage I and Stage II. However, there wasn't any significant generation back down (only ~30MW) in Singrauli observed. At load stations also, no siginificatn load relief was observed as per SCADA. As per status received from sites, SPS signal was sent from POWERGRID (Dadri S/s) however SPS action didn't occur at multiple stations due to issue in SPS system at load stations end.	1 21.05.2025 at 20:21hrs	1	0	0	As per details received from SLDCs and POWERGRID, SPS signal was sent from POWERGRID (Dadri S/s) however SPS action didn't occur at multiple stations due to issue in SPS system at load stations end. Non-operation of SPS at Singrauli, Malerkotla, Muzaffarnagar, Modipuram, Panipat(HR). Confirmation from some of the load stations not received yet.
3	Jul'25	SPS for reliable evacuation of power from N. Jhakri, Rampur, Karcham Wangtoo, Sawra Kuddu, Baspa, Sorang and Naitwar Mori HEP	At 06:25 hrs, case-1 of "SPS for reliable evacuation of power from N. Jhakri, Rampur, Karcham Wangtoo, Sawra Kuddu, Baspa, Sorang and Naitwar Mori HEP" operated. As per SPS logic, condition for SPS case-1 operation is "Load on any of the lines at Jhakri, Rampur or Gumma towards Nallagarh or Panchkula exceeds 900 MW". However, loading on all the evacuating lines were within permissable limit (<900MW).	1 14.07.2025 at 06:25hrs	0	1		As confirmed, SPS operated due to faulty transducer of the 400kV Rampur–Nalagarh transmission line at the Rampur end and faulty transducer has been successfully replaced by the RHPS team
	Total			**4**	**3**	**1**	**0**	

Status of Internal Protection Audit Plan for FY 2025 -26								
S. No.	**NRPC Member**	**Category**	**Status**	**Schedule submitted as per utililty**	**Present Status Comlpleted (yes/no)**	**Report Submission Date by audit party**	**Discussion held in PSC meeting number**	**Compliance status**
1	PGCIL	Central Government owned Transmission Company	Received (NR-1,2,3)					
2	NTPC	Central Generating Company	Received					
3	BBMB		Received					
4	THDC		Received	Tehri- March, 2026 Koteshwar- December, 2025				
5	SJVN		Received (NJHPS, RHPS)					
6	NHPC		Received					
7	NPCIL		Received (RAP C)	July, 2025				
			Conducted (RAPS-1,2)	Jun-25			61	
8	Delhi SLDC	SLDC						
9	Haryana SLDC							
10	Rajasthan SLDC							
11	Uttar Pradesh SLDC		Received (Jaypee Vishnuprayag, WUPPTCL, SEUPPTCL, Alaknanda, GTL)	GTL- Jan'2026 & Feb'2026				
12	Uttarakhand SLDC							
13	Punjab SLDC							
14	Himachal Pradesh SLDC							
15	DTL	State Transmission Utility	Received					
16	HVPNL		Received					
17	RRVPNL		Received					
18	UPPTCL		Received (All zones)	Jan-March 2026				
19	PTCUL		Received	July-December 2025				
20	PSTCL							
21	HPPTCL		Received					
22	IPGCL	State Generating Company	Received (PPS-III, I)					
23	HPGCL		Received	Aug'25				
24	RRVUNL		Received					
25	UPRVUNL		Received (Anpara B)	Jun-25				
			Received (Obra A & B)	Jan - March 2026				
			Received (Anpara D)	May-25				
			Received (Harduaganj)	April -May 2025				
			Received (Harduaganj D)	April -May 2025				
			Received (Harduaganj E)	April -May 2025				
			Received (Parichha)	May-25				
			Received (Parichha Ext)	Feb-26				
			Received (Obra C)	Mar-26				
			Received (Jawaharpur)	Jul-25				
26	UJVNL		Received (Chibro)	Oct-25				
			Received (Khodri)	Nov-25				
			Received (Vyasi)	Dec-25				
			Received (Dharashu, Tiloth)					
27	HPPCL		Received (Kasheng HEP, Sawara Kuddu, Sainj)	Nov'25-Mar'26				
28	PSPCL	State Generating Company & State owned Distribution Company	Received (GHTP, GGSSTP, GATP, RSD)					
29	HPSEBL	Distribution company having Transmission connectivity ownership	Received					
30	Prayagraj Power Generation Co. Ltd.	IPP having more than 1000 MW installed capacity	Received	Aug'25				
31	Aravali Power Company Pvt. Ltd							
32	Apraava Energy Private Limited		Received	May'25				
33	Talwandi Sabo Power Ltd.		Received	May'25				
34	Nabha Power Limited		Received	May'25				
35	MEIL Anpara Energy Ltd		Received	May'25				
36	Rosa Power Supply Company Ltd		Received	Jan'26				
37	Lalitpur Power Generation Company Ltd		Received	Oct - Nov 2025				
38	MEJA Urja Nigam Ltd.							
39	Adani Power Rajasthan Limited							
40	JSW Energy Ltd. (KWHEP)		Received	Nov-25 to Feb 26				
41	UT of J&K	UT of Northern Region						
42	UT of Ladakh							
43	UT of Chandigarh							
	ISTS Transmission Utilities							

44	INDIGRID		Received	Aug-25 to March-26				
45	ADHPL							
46	Adani Transmission Limited		Received(400kV Mohindergarh SS)	October, 2025				
47	Bikaner Khetri Transmission Limited		Received (765 kV Bikaner and Khetri extension bays)	September, 2025				
48	Fatehgarh Bhadla Transmission Limited		Received (400 kV Fatehgarh SS)	September, 2025				
49	Powergrid Sikar Transmission Limited		Received	Sikar- August,25				
50	Powergrid Aligarh Sikar Transmission Limited		Received	Aligarh- April, 25 Sikar- August,25				
51	Powergrid Ajmer Phagi Transmission Limited		Received	March,2025				
52	Powergrid Bikaner Transmission System Limited		Received	Bikaner-II Feb,2025				
53	Powergrid Khetri Transmission System Limited		Received	Khetri-Feb,2025				
54	Powergrid Ramgarh Transmission Limited		Received	Fatehgarh-II Dec, 2025 Fatehgarh-III May, 2025				
55	Powergrid Fatehgarh Transmission Limited		Received	Fatehgarh-II Dec, 2025 Bhadla-II Jan, 2025				
56	Powergrid Bhadla Transmission Limited		Received	Fatehgarh-II Dec, 2025 Bhadla-II Jan, 2025				
57	Powergrid Meerut Simbhavli Transmission Limited		Received	Nov, 2025				
58	Powergrid Kala Amb Transmission Limited		Received	September, 2025				
	State Utilities							
	Uttar Pradesh							
59	Vishnuprayag Hydro Electric Plant (J.P.)		Received	Jun-25				
60	Alaknanda Hydro Electric Plant (GVK)		Received	Dec'25 -Mar'26				
61	Ghatampur TPS		Received	February, 26				
62	Khara Power House (Khara)		Received	Dec'25				
63	WUPPTCL		Received	Oct-25				
64	SEUPPTCL		Received	Jan-26				
65	ATSCL	**AESL**	Received (400/220KV Alwar SS)	September, 2025				
66	GTL	**AESL**	Received (765 kV Hapur extension bays**)**	September, 2025				
67	GTL	**AESL**	Received (765 kV Agra and Gr. Noida extension bays)	September, 2025				
68	HPTSL	**AESL**	Received (220kV Ranpur SS)	August, 2025				
69	MTSCL	**AESL**	Received (400/220/132KV Deedwana SS)	August, 2025				
70	OBTL	**AESL**	Received (400/220/132KV Badaun SS)	Jan'2026				
71	STSL	**AESL**						
	Rajasthan							
72	Barsingsar Plant	**NLC**						
73	Rajwest Plant	**JSW**						

	RE Utilities							
74	ABC Renewable Pvt. Ltd							
75	ACME Heeragarh powertech Pvt. Ltd		Received	Jun-25				
76	ACME Pholidi		Received	Jun-25				
77	ACME Deagarh		Received	Jun-25				
78	ACME Raisar		Received	Jun-25				
79	ACME Dhoulpar		Received	Jun-25				
80	ACME Chittorgarh Solar Energy Pvt Ltd							
81	Adani Hybrid Energy Jaisalmer One Ltd.		Received	Jul-25				
82	Adani Hybrid Energy Jaisalmer Two Ltd.		Received	Jul-25				
83	Adani Hybrid Energy Jaisalmer Three Ltd.		Received	Aug-25				
84	Adani Hybrid Energy Jaisalmer Four Ltd.		Received	Aug-25				
85	Adani Renewable Energy (RJ) limited Rawara		Received	Sep-25				
86	Adani Solar Energy Jaisalmer One Pvt. Ltd. 450MW (Solar)		Received	Oct-25				
87	Adani Solar Enegry Four Private Limited		Received	Sep-25				
88	Adani Hybrid Energy Jaisalmer Four Ltd. (AEML 2-350)		Received	Sep-25				
89	Adani Solar Energy Jaisalmer Two Private Limited Project Two		Received	Oct-25				
90	SB Energy Six Private Limited, Bhadla		Received	Oct-25				
91	Adani Solar Enegry Jodhpur Two Limited, Rawara		Received	Sep-25				
92	Adani Solar Energy RJ Two Pvt. Ltd. (Devikot)		Received	Nov-25				
93	Adani Solar Energy RJ Two Pvt. Ltd. (Phalodi)		Received	Nov-25				
94	Adani Green Energy 24 Limited (Bhimsar)		Received	Nov-25				
95	Adani Green Twenty-Five Limited (Badisid)		Received	Dec-25				
96	Altra Xergi Pvt. Ltd.							
97	AMP Energy Green Five Pvt. Ltd.		Received	Completed			62	
98	AMP Energy Green Six Pvt. Ltd.		Received	Completed			62	
99	Amplus Ages Private Limited							
100	Avaada RJHN_240MW		Received	Oct-25				
101	Avaada sunce energy Pvt limited		Received	Oct-25				
102	Avaada Sunrays Pvt. Ltd.		Received	Oct-25				
103	Avaada Sustainable RJ Pvt. Ltd.		Received	Oct-25				
104	Ayana Renewable Power Three Private Limited							
105	Ayaana Renewable Power One Pvt. Ltd.							
106	Azure Power Forty One Pvt limited							
107	Azure Power Forty Three Pvt. Ltd._RSS							
108	Azure Maple Pvt. Ltd.							
109	AZURE POWER INDIA Pvt. Ltd., Bhadla							
110	Azure Power Thirty Four Pvt. Ltd.							
111	Clean Solar Power (Jodhpur) Pvt. Ltd.							
112	Clean Solar Power (Bhadla) Pvt. Ltd							
113	Eden Renewable Cite Private Limited							
114	Grian Energy private limited							
115	Mahindra Renewable Private Limited							
116	Mega Surya Urja Pvt. Ltd. (MSUPL)							
117	AURAIYA Solar							
118	DADRI SOLAR							
119	SINGRAULI SOLAR							
120	Anta Solar							
121	Unchahar Solar							
122	NTPC Devikot Solar plant 240MW							
123	NTPC Kolayat_400kV							
124	Nedan Solar NTPC							
125	NTPC Nokhra 300MW							
126	One Volt energy Pvt. Ltd.							
127	ReNew Solar Energy (Jharkhand Three) Private Limited		Received	19-11-2025				
128	RENEW SOLAR POWER Pvt. Ltd. Bikaner		Received	17-11-2025				
129	ReNew Solar Urja Private Limited							
130	Renew Sun Bright Pvt. Ltd. (RSBPL)		Received	20-11-2025				
131	Renew Surya Partap Pvt. Ltd.		Received	21-11-2025				
132	Renew Surya Ravi Pvt. Ltd.		Received	18-11-2025				
133	Renew Surya Roshni Pvt. Ltd.		Received	24-11-2025				
134	Renew Surya Vihan Pvt. Ltd.		Received	28.11.2025				
135	Renew Surya Ayaan Pvt. Ltd.							
136	Renew Solar Photovoltaic Pvt Ltd		Received	25-11-2025				
137	Renew Hans Urja Pvt Ltd		Received	26-11-2025				
138	Renew Surya Jyoti Pvt Ltd		Received	27-11-2025				
139	RENEW SOLAR POWER Pvt. Ltd. Bhadla							
140	Rising Sun Energy-K Pvt. Ltd.							
141	Serentica Renewables India 4 Private Limited							
142	Solzen Urja Private Limited		Received	Oct-25				
143	Tata Power Green Energy Ltd. (TPGEL) (225MW)		Received	30-1-2026				

144	Tata Power Renewable Energy Ltd. (TPREL) (300MW)		Received	28-1-2026				
145	Thar Surya Pvt. Ltd.							
146	TP Surya Ltd., Noorsar (110MW)		Received	30-1-2026				
147	Banderwala Solar Plant TP Surya Ltd. (300MW)		Received	28-02-2026				
148	TRANSITION ENERGY SERVICES PRIVATE LIMITED							
149	Transition Green Energy Private Limited							
150	Transition Sustainable Energy Services Private Limited							

Annexure-A.VI

Status of 3rd Party Protection Audit Plan								
S. No.	**NRPC Member**	**Category**	**Status**	**Schedule submitted as per utililty**	**Present Status Comlpleted (yes/no)**	**Report Submission Date by audit party**	**Discussion held in PSC meeting number**	**Compliance status**
1	PGCIL	Central Government owned Transmission Company	Received (7 S/s of NR-1, 1 S/s of NR-2, 4 S/s of Nr-3)	By Jan 2025				
2	NTPC	Central Generating Company	Received (Singrauli, Rihand, Unchahar, Dadri, Dadri Gas, Auraiya Gas, Faridabad Gas, Anta Gas Power Station)	By Oct 2028				
			Received (Tanda)	By 17.07.2025				
3	BBMB		Received	Feb-27				
4	THDC		Received	March 2026-Tehri, F.Y. 2025-26- Koteshwar				
5	SJVN		Received	Nov-Dec 2025 for RHPS, Nov 24- March 25 for NJHPS				
6	NHPC		Received	FY-2025-26				
7	NPCIL		Completed (220kV) (NAPS)	Jan'25	Completed	18.01.2025	57	
			RAPS-C (6&&)	-	Completed	23.06.2025	Planned for 62	
8	Delhi SLDC	SLDC						
9	Haryana SLDC							
10	Rajasthan SLDC							
11	Uttar Pradesh SLDC		Received (Tanda extension)	17.07.2025				
			Received (Tanda)	17.07.2025				
12	Uttarakhand SLDC							
13	Punjab SLDC							
14	Himachal Pradesh SLDC							
15	DTL	State Transmission Utility	Received	September, 2025 to November, 2026				
16	HVPNL		Received	June-Oct 2025				
17	RRVPNL							
18	UPPTCL		Received	2025;	Under tendering; GKP-cpmpleed but report awaited			
19	PTCUL		Received	By Jan 2025				
20	PSTCL							
21	HPPTCL		Received	FY 25-26				
22	IPGCL	State Generating Company	Received (PPS-III)	FY 25-26				
23	HPGCL		Received	Oct'25				
24	RRVUNL		Received					
25	UPRVUNL		Obra-B	2026-27				
			Obra-C	Feb-26				
			Anpara D	2025	Under tendering			
			Anpara B	2025	Under tendering			
			Harduaganj	2025	Under tendering			
			Harduaganj D	2025	Under tendering			
			Parichha	2025	Under tendering			
			Parichha Ext	2025	Under tendering			
			Jawaharpur	2025	Under tendering			
			Paricha BTPS	2026				
			Panki	2025				
26	UJVNL		Dharasu		Completed in Nov, 2024		56	submitted
			Others					
27	HPPCL		Swara Kuddu	2026				
			Kashang HEP	FY 2025-26				
28	PSPCL	State Generating Company & State owned Distribution Company	Reeceived (GHTP)	Dec. 2025				
			Received (GATP)	May 2025				
			GGSSTP	2026				
			RSD/ Sahapur Kandi	Mar'26				
29	HPSEBL	Distribution company having Transmission connectivity ownership	Kunihar	Conducted			55	
			Upper Nangal	Conducted			61	
			Baddi	Conducted			61	
30	Prayagraj Power Generation Co. Ltd.	IPP having more than 1000 MW installed capacity	Received	Dec-24	Januray 2025	08.01.2025	59	
31	Aravali Power Company Pvt. Ltd							
32	Apraava Energy Private Limited		Received	By May, 2025				
33	Talwandi Sabo Power Ltd.		Conducted	Dec'22	completed	20.12.2024	60	
34	Nabha Power Limited		Received	By December, 2025				
35	MEIL Anpara Energy Ltd		Received	* May 2025				
36	Rosa Power Supply Company Ltd		Conducted	By 30.09.2024	08.08.2024	13.01.2025	57	
37	Lalitpur Power Generation Company Ltd		Conducted	26.03.2024				
38	MEJA Urja Nigam Ltd.		Conducted		Completed in Oct, 2024	22.03.2025	59	
39	Adani Power Rajasthan Limited		Conducted	November, 2024	Kawai		56	Pending
40	JSW Energy Ltd. (KWHEP)		Received	December 2024 to March 2025	Completed		57	Pending

41	UT of J&K	UT of Northern Region						
42	UT of Ladakh							
43	UT of Chandigarh							
	ISTS Transmission Utilities							
44	INDIGRID		Received (PTCL)	FY 25-26				
			Received (NRSS 29)	FY 24-25				
45	ADHPL		Received	* September 2026				
46	Adani Transmission Limited		Received (400kV Mohindergarh SS)	October, 2025				
47	Bikaner Khetri Transmission Limited		Received (765 kV Bikaner and Khetri extension bays)	September, 2025				
48	Fatehgarh Bhadla Transmission Limited		Received (400 kV Fatehgarh SS)	September, 2025				
49	Powergrid Sikar Transmission Limited							
50	Powergrid Aligarh Sikar Transmission Limited							
51	Powergrid Ajmer Phagi Transmission Limited							
52	Powergrid Bikaner Transmission System Limited							
53	Powergrid Khetri Transmission System Limited							
54	Powergrid Ramgarh Transmission Limited							
55	Powergrid Fatehgarh Transmission Limited							
56	Powergrid Bhadla Transmission Limited							
57	Powergrid Meerut Simbhavli Transmission Limited							
58	Powergrid Kala Amb Transmission Limited							
	State Utilities							
	Uttar Pradesh							
59	Vishnuprayag Hydro Electric Plant (J.P.)		Received	December, 2028				
60	Alaknanda Hydro Electric Plant (GVK)		Received	Mar-25				
61	Ghatampur TPS		Received	FY 27-28				
62	Khara Power House (Khara)		Received	Dec-25				
63	WUPPTCL		Conducted		Completed		59	
64	SEUPPTCL		Completed on Oct 2024		Completed		59	
65	ATSCL	**AESL**	Received (400/220KV Alwar SS)	September, 2025				
66	GTL	**AESL**	Received (765 kV Hapur extension bays)	September, 2025				
67	GTL	**AESL**	Received (765 kV Agra and Gr. Noida extension bays)	September, 2025				
68	HPTSL	**AESL**	Received (220kV Ranpur SS)	August, 2025				
69	MTSCL	**AESL**	Received (400/220/132KV Deedwana SS)	August, 2025				
70	OCBTL	**AESL**	Received (400/220/132KV Badaun SS)	FY 24-25	Completed			
71	STSL	**AESL**						
	Rajasthan							
72	Barsingsar Plant	**NLC**						
73	Rajwest Plant	**JSW**						
	RE Utilities							
74	ABC Renewable Pvt. Ltd							
75	ACME Heeragarh powertech Pvt. Ltd							
76	ACME Pholidi							
77	ACME Deagarh							
78	ACME Raisar							
79	ACME Dhoulpar							
80	ACME Chittorgarh Solar Energy Pvt Ltd							
81	Adani Hybrid Energy Jaisalmer One Ltd.							
82	Adani Hybrid Energy Jaisalmer Two Ltd.							
83	Adani Hybrid Energy Jaisalmer Three Ltd.							
84	Adani Hybrid Energy Jaisalmer Four Ltd.							
85	Adani Renewable Energy (RJ) limited Rawara							
86	Adani Solar Energy Jaisalmer One Pvt. Ltd. 450MW (Solar)							
87	Adani Solar Enegry Four Private Limited							
88	Adani Hybrid Energy Jaisalmer Four Ltd. (AEML 2-350)							
89	Adani Solar Energy Jaisalmer Two Private Limited Project Two							
90	SB Energy Six Private Limited, Bhadla							
91	Adani Solar Enegry Jodhpur Two Limited, Rawara							
92	Adani Solar Energy RJ Two Pvt. Ltd. (Devikot)							

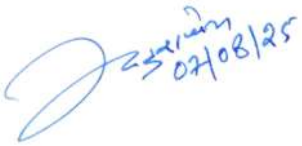
93	Adani Solar Energy RJ Two Pvt. Ltd. (Phalodi)							
94	Adani Green Energy 24 Limited (Bhimsar)							
95	Adani Green Twenty-Five Limited (Badisid)							
96	Altra Xergi Pvt. Ltd.		Conducted		Completed	03.02.2025-04.02.2025	60	
97	AMP Energy Green Five Pvt. Ltd.		Received	Nov-27				
98	AMP Energy Green Six Pvt. Ltd.		Received	Nov-27				
99	Amplus Ages Private Limited							
100	Avaada RJHN 240MW		Received	Aug-26				
101	Avaada sunce energy Pvt limited		Received	Aug-26				
102	Avaada Sunrays Pvt. Ltd.		Received	Aug-27				
103	Avaada Sustainable RJ Pvt. Ltd.		Received	Aug-26				
104	Ayana Renewable Power Three Private Limited		Conducted		18.05.2025		61	
105	Ayaana Renewable Power One Pvt. Ltd.		Conducted		09.03.2025		59	
106	Azure Power Forty One Pvt limited							
107	Azure Power Forty Three Pvt. Ltd. RSS							
108	Azure Maple Pvt. Ltd.							
109	AZURE POWER INDIA Pvt. Ltd., Bhadla							
110	Azure Power Thirty Four Pvt. Ltd.							
111	Clean Solar Power (Jodhpur) Pvt. Ltd.							
112	Clean Solar Power (Bhadla) Pvt. Ltd							
113	Eden Renewable Cite Private Limited							
114	Grian Energy private limited							
115	Mahindra Renewable Private Limited							
116	Mega Surya Urja Pvt. Ltd. (MSUPL)							
117	AURAIYA Solar							
118	DADRI SOLAR							
119	SINGRAULI SOLAR							
120	Anta Solar							
121	Unchahar Solar							
122	NTPC Devikot Solar plant 240MW							
123	NTPC Kolayat 400kV							
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126	One Volt energy Pvt. Ltd.							
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133	Renew Surya Roshni Pvt. Ltd.							
134	Renew Surya Vihan Pvt. Ltd.							
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136	Renew Solar Photovoltaic Pvt Ltd							
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144	TP Surya Ltd., Noorsar (110MW)		Received	31-03-2027				
145	Banderwala Solar Plant TP Surya Ltd. (300MW)		Received	31-03-2027				
146	TRANSITION ENERGY SERVICES PRIVATE LIMITED							
147	Transition Green Energy Private Limited							
148	Transition Sustainable Energy Services Private Limited							

REPORT OF THE COMMITTEE ON REVIEW OF PROTECTION SYSTEM AND LOAD MANAGEMENT IN RAPS, KTPS GENERATION COMPLEX

AUGUST 7, 2025

Report of Committee Constituted by NRPC for review of Protection System and Load management in RAPS, KTPS generation complex

NRPC had constituted a committee vide office order dated 06.06.2024 to analyse the issues responsible for the repeated cascade tripping of RAPS, KTPS generation complex. Members were nominated in the committee from NRPC, NLDC, NRLDC, NPCIL, RVPNL, RVUNL, POWERGRID and SLDC Rajasthan. After due deliberation in seven meetings, the committee hereby submits it's report to MS, NRPC.



Reeturaj Pandey



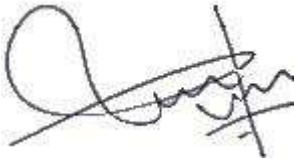
D K Jain



Harsh Singh



Manas Ranjan Chand



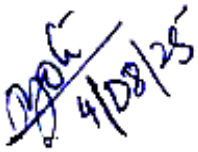
Raman Jain



M.P Sharma



Pankaj Pachoori



Jyoti Thakur



Deepak Kumar

Contents

ACKNOWLEDGEMENT 4
List of Committee Members 5
List of Contributors 5
Executive Summary 6
List of Abbreviations 9
Chapter 1: Introduction 10
Chapter 2: Overview of RAPS, KTPS generation complex 13
2.1 Network connectivity of the complex 13
2.2 RAPS auxiliary supply scheme and Auto Transfer Scheme (ATS) 14
2.3 RAPS House load operation 16
2.4 RAPS Islanding Operation 16
2.5 Xe-135 Reactor Poisoning in Nuclear Reactors 16
Chapter 3: Analysis of the Grid Events 19
3.1 Grid Event on 05.01.2024 at 05:16 hrs 19
3.1.1 Antecedent Condition 19
3.1.2 Sequence Of Events (SOE) and analysis 22
3.2 Grid Event on 29.03.2024 at 20:22 hrs 31
3.2.1 Antecedent Condition 32
3.2.2 Sequence Of Events (SOE) and analysis 33
Chapter 4: Observations from the Grid Events and Action taken 39
4.1 Observations 39
4.2 Action taken 40
Chapter 5: Load Flow Analysis 44
Chapter 6: Impact during Grid Event in the complex after revision in Network 49
Chapter 7: Review of Islanding Scheme in RAPS complex 51
Chapter 8: Committee Recommendations 52
Annexures 53

ACKNOWLEDGEMENT

The Committee acknowledges the contribution of various officers of NRPC, NRLDC, NLDC, NPCIL-HQ, RAPS, RVPNL, RVUNL and SLDC-Rajasthan who assisted the Committee in its deliberations.

The Committee would also like to acknowledge the assistance given by Protection Sub Committee of NRPC that has provided guidance in discussion of cause of grid events and remedial measures.

The Committee would like to acknowledge the guidance of Member Secretary, NRPC throuhout the process.

,

List of Committee Members

Advisory Members:

- Sh. V.K. Singh — Member (Power System), CEA
- Smt. Rishika Sharan — Member Secretary, NRPC
- Sh. D. K. Meena — SE (Protection), NRPC, Secretariat
- Sh. Somara Lakra — CGM, SO, NRLDC
- Sh. Mahavir Prasad Singh — DGM, SO, NRLDC

Committee Members:

1. Sh. Reeturaj Pandey, EE (Protection), NRPC Secretariat
2. Sh. D.K. Jain, SE (Protection Engg.), RVPN
3. Sh. Harsh Singh, Superintending Engineer, RVUNL
4. Sh. Raman Jain, Executive Engineer, RVUNL
5. Sh. M. P. Sharma, XEN (SOLD), Rajasthan SLDC
6. Smt. Jyoti Thakur, DGM, NPCIL
7. Sh. Manas R Chand, DGM, NLDC
8. Sh. Pankaj Pachoori, DGM, POWERGRID
9. Sh. Deepak Kumar, Dy. Mgr., NRLDC

List of Contributors

Northern Regional Power Committee (NRPC)

- Sh. Lokesh Agrawal — AEE, NRPC Secretariat

SLDC-Rajasthan

- Sh. Kamal Patidar — SE (SOLD), Rajasthan SLDC

Rajasthan Atomic Power Stations

- Sh. Samir Rai, TSS
- Sh. R.D. Yadav, SO/H
- Smt. Supriya, SME
- Sh. D.K. Shringi, SO/F

Executive Summary

1. On 05th January 2024, at 05:16hrs, cascade tripping of multiple elements occurred in RAPS, KTPS generation complex in Rajasthan control area leading to loss of total running generation of KTPS, RAPS (A, B & C) and other small hydro stations (Jawahar Sagar HEP & Rana Pratap Sagar HEP) in the complex. During antecedent condition, total generation in the complex was ~1365 MW i.e., RAPS A 200 MW, RAPS B 185 MW, KTPS 800 MW, Jawahar Sagar(JS) HEP 90 MW and Rana Pratap Sagar(RPS) HEP 90 MW. Half of the auxilliary supply of RAPP C (generating ~450 MW) was also being met through 220kV RAPP B in line with the auxilliary supply scheme at RAPP C. Antecedent weather condition was foggy and three (no.s) of 220kV lines in this complex tripped between 04:00hrs – 05:00 hrs on same day. Apart from this, three (no.s) of 220kV lines were not in service in the complex. Therefore, after tripping of three (no.s) of 220kV lines between 04:00hrs – 05:00 hrs, remaining lines in the complex became highly loaded and some of the lines were connected radially. Total generation of KTPS & RAPS (A & B) was evacuating through limited lines and connectivity to the grid was also very limited. At 05:15hrs, one 220kV line in the complex was manually opened for load management however it resulted into overloading of remaining 220kV lines. Thereafter, cascade tripping of two(no.s) of grid connected 220kV lines occurred due to overloading. Remaining 220kV lines in the complex were radially connected and thus overfrequency occurred in the compelx due to load generation imbalane (surplus generation). This had resulted in loss of complete generation in the complex i.e., 1815 MW (1365MW on overfrequency due to loss of evacuation path and 450 MW of RAPP C due to failure of Auto Transfer Scheme(ATS) at RAPS C.
2. Unit-2 at RAPS B came to the house load during the overfrequency however it couldn't be synced to the grid due to wiring related issue at RAPS B end, and unit operated at house laod for ~1.5 hours. Operation of ATS for changeover of auxilliary supply from 220kV to 400kV level at RAPS C was also not successful due to siginificant mismatch in frequency between 220kV & 400kV side. SCADA data of some of the elements were showing incorrectly and some of the data became suspected during the event. Autorecloser (A/R) also didn't operate in some of the lines on single phase to earth fault.
3. The analysis of this grid event and observations were discussed in 216th meeting of Operation Co-ordination Sub-Committee (OCC) of NRPC held on 14.02.2024. During the meeting, various remedial measures to be taken by SLDC-Rajasthan, RVPNL, RAPS A, B & C were discussed.
4. Again, on 29th March 2024, at 20:22 hrs a grid event (GD-1) of blackout of this complex occurred. During antecedent condition of this grid event, two no of 220kV lines were out on system constraints and one no of line was under shutdown. The complex was connected to the grid with five (no.s) of the 220kV lines. Most of the 220kV lines were operating in radial mode. Total generation in the complex was ~1587 MW i.e., RAPS A: 195 MW, RAPS B: 177 MW, KTPS: 1150 MW, JS HEP: 32 MW and RPS

HEP: 40 MW. Triggerring incident was damage of R-ph CT of one of the 220/132kV ICT at 220/132kV Kota Sakatpura S/s of Rajasthan that led to the occurrence of bus fault. Due to non-availbility of bus bar protection at 220kV bus at Kota Sakatpura , multilple 220kV lines tripped on reverse distance protection operation. Thereafter, cascade tripping of grid connected 220kV lines occurred due to overloading. Remaining 220kV lines in the complex were radially connected and thus overfrequency occurred in the compelx due to load generation imbalane (surplus generation). This event had resulted a complete loss of generation in the complex i.e., 2020 MW (1587MW on overfrequeny due to loss of evacuation path and 433 MW of RAPP C due to failure of ATS at RAPS C).

5. Unit-2 at RAPS B couldn't come to house load due to unsuccessful ATS operation due to issue in ATS logic. Operation of ATS for changeover of auxilliary supply from 220kV to 400kV level at RAPS C was also not successful due to siginificant mismatch in frequency between 220kV & 400kV side. Further, after outage of generation of RAPS B and KTPS on overfrequency, RAPS A got islanded with radial load of Debari and Chittorgarh. However, island got collapsed after operation of around 18 minutes.

6. During both the grid events i.e., 05th January 2024 and 29th March 2024, all the running units at RAPS A, B & C went under Xe-poisioning of reactors. Units were able to sync back to the grid only after 2-3 days of the grid events as large time period is required for complete poision out of Xe from the reactors.

7. Successive two grid events in just 3 months in RAPS, KTPS generation complex highlighted the weakness and constraints of this complex. The issue was discussed in 50th PSC meeting held on 29th April, 2024 and a committee was formed having members from NRPC Secretariat, NRLDC, NLDC, POWERGRID, NPCIL, RVUNL (KTPS) and RVPN. Committee was given the task of comprehensive review of protection system, load management, islanding scheme, SPS requirement, Auto Transfer Scheme at RAPS, and other related aspects in the RAPS, KTPS complex.

8. This report includes a detailed analysis of the event by the Committee constituted for the purpose. The analysis was supplimented by teams of SLDC Rajasthan, RVPNL, RUVNL, NPCIL/RAPS and NRPC Secretariat. Data and information about the event were gathered from the entities affected in the disturbance, and this was instrumental to the successful and timely completion of this analysis. This report uses terminology that is aligned with the extant CEA/CERC Regulations and NRPC protection Protocol. The analysis in the report is based on data available from load despatch centres, event records from substations, information received from various stakeholders and simulation studies. This report looks into the various aspects of these events including determination of the cause and recording of key findings and recommendations to ensure that occurrences of such events are avoided in future.

9. The analysis of the event was carried out as a comprehensive review of various aspects observed during the event. The report is focussed on following points:

    (i) Connectivity of the complex with the grid.

(ii) Review of protection system and its coordiantion.

(iii) Load management in the complex.

(iv) Review of Auto Transfer Scheme (ATS) at RAPS B & C.

(v) Contingency analysis in the complex.

(vi) Review of islanding scheme of RAPS.

10. The key observations and recommendations in the report are as below:

(i) Strengthening the connectivity of the complex with the grid.

(ii) Improvement in load management in the complex.

(iii) Improvement in working philosophy of ATS at RAPS B & C.

(iv) Contingency analysis after revision in network configuration.

(v) Revision in islanding scheme of RAPS.

List of Abbreviations

ATS: Auto Transfer Scheme

D/c: Double Circuit

G/L: Generation to Load

ICT: Inter-Connecting Transformer

IEGC: Indian Electricity Grid Code

ISGS: Inter-State Generating Station

ISTS: Inter State Transmission System

Intra-STS: Intra-State Transmission System

kA: kilo Ampere

km: kilo meter

kV: kilo Volt

ms: millisecond

MVA: Mega Volt Ampere

MVAr: Mega Volt Ampere reactive

MW: Mega Watt

NLDC: National Load Dispatch Centre

NRLDC: Northern Regional Load Despatch Centre

NRPC: Northern Regional Power Committee

OV: Over Voltage

P: Active Power

PMU: Phasor Measurement Unit

pu: per unit

Q: Reactive Power

RAPS: Rajasthan Atomic Power Station

S/c: Single Circuit

SCADA: Supervisory Control and Data Acquisition System

SLDC: State Load Despatch Centre

SOE: Sequence of Events

S/s: Sub-station

SUT: Start Up Transformer

Chapter 1: Introduction

1.1 On 05th January 2024, at 05:16hrs, cascade tripping of multiple elements occurred in RAPS, KTPS generation complex in Rajasthan control area led to loss of total running generation of KTPS, RAPS (A, B & C) and other small hydro stations (JS HEP & RPS HEP) in the complex. During antecedent condition, total generation in the complex was ~1365 MW i.e., RAPS A 200 MW, RAPS B 185 MW, KTPS 800 MW, Jawahar Sagar(JS) HEP 90 MW and Rana Pratap Sagar(RPS) HEP 90 MW. Half of the auxilliary supply of RAPP C (generating ~450 MW) was also being met through 220kV RAPP B in line with the auxilliary supply scheme at RAPP C. Antecedent weather condition was foggy and three (no.s) of 220kV lines in this complex tripped between 04:00hrs – 05:00 hrs on same day. Apart from this, three (no.s) of 220kV lines were not in service in the complex. Therefore, after tripping of three (no.s) of 220kV lines between 04:00hrs – 05:00 hrs, remaining lines in the complex were became highly loaded and some of the lines were connected radially. Total generation of KTPS & RAPS (A & B) was evacuating through limited lines and connectivity to the grid was also very limited. At 05:15hrs, one 220kV line in the complex was manually opened for load management however it resulted into overloading of remaining 220kV lines. Thereafter, cascade tripping of two(no.s) of grid connected 220kV lines occurred due to overloading. Remaining 220kV lines in the complex were radially connected and thus overfrequency occurred in the complex due to load generation imbalane (surplus generation). This had resulted in loss of complete generation in the complex i.e., 1815 MW (1365MW on overfrequency due to loss of evacuation path and 450 MW of RAPP C due to failure of Auto Transfer Scheme(ATS) at RAPS C.

1.2 Again, on 29th March 2024, at 20:22 hrs a grid event (GD-1) of blackout of this complex occurred. During antecedent condition of this grid event, two no of 220kV lines were out on system constraints.The complex was connected to the grid with five (nos) of the 220kV lines. Most of the 220kV lines were operating in radial mode . Total generation in the complex was ~1587 MW i.e., RAPS A: 195 MW, RAPS B: 177 MW, KTPS: 1150 MW, JS HEP: 32 MW and RPS HEP: 40 MW. Triggerring incident was damage of R-ph CT of one of the 220/132kV ICT at 220/132kV Kota Sakatpura S/s of Rajasthan that led to the occurrence of bus fault. Due to non-availbility of bus bar protection at 220kV bus at Kota Sakatpura, multilple 220kV lines tripped on reverse distance protection operation. Thereafter, cascade tripping of grid connected 220kV lines occurred due to overloading. Remaining 220kV lines in the complex were radially connected and thus overfrequency occurred in the compelx due to load generation imbalane (surplus generation). This event had resulted a complete loss of generation in the complex i.e., 2020 MW (1587MW on overfrequeny due to loss of evacuation path and 433 MW of RAPP C due to failure of ATS at RAPS C).

1.3 During the above two grid events i.e., 05th January 2024 and 29th March 2024, all the running units at RAPS A, B & C went under Xe-poisioning of reactors. Units were able to synchronized back to the grid only after 2-3 days of the grid events, as significant time period (56-72 hours) is required for complete poision out of Xe from the reactor.

1.4 Both the events were discussed in OCC and PSC forum of NRPC. Based on decision of 50th PSC meeting, NRPC constituted the committee for detailed analysis of the events and to give

recommendations for strengtening the realiability and security of this complex. Committee constituion order and MoM of 50th PSC meeting is attached as **Annexure-I.**

1.5 Terms of reference of the committee are as below:

- Comprehensive review of protection system of the complex.
- Review of load management within the generation complex.
- Review of Islanding scheme of RAPS_KTPS complex, SPS requirement, Auto Transfer Scheme at RAPS, and other related aspects**.**

1.6 The Committee held seven (no.) meetings. The 4th meeting of committee also comprised the site visit of KTPS & RAPS generating stations during 07-08 Oct 2024. Committee reviewed different operation and contingency related aspects in the complex i.e., strength of the connectivity of the complex with the grid, protection system and their coordination, Auto Transfer Scheme and house load operation of RAPS, island scheme and its operation, contigency analysis and auxulliary supply management at RAPS.

1.7 The Committee held seven meetings on following dates including field visit to RAPS_KTPS complex as mentioned below :

i. The first meeting of the Committee took place on 10st June 2024 at 11:00 Hrs via video conferencing.

ii. The second meeting of the Committee took place on 06th August 2024 at 11:00 Hrs via video conferencing.

iii. The third meeting of the Committee took place on 06th September 2024 at 11:00 Hrs at NRPC Secretariat, Katwaria Sarai, New Delhi.

iv. The fourth meeting of the Committee took place on 07th – 08th October 2024 at KTPS, Kota & RAPS site, Rawatbhata.

v. The fifth meeting of the Committee took place on 10th January 2025 at 11:00 Hrs via video conferencing.

vi. The sixth meeting of the Committee took place on 10th February 2025 at 11:00 Hrs via video conferencing.

vii. The seventh meeting of the Committee took place on 08th April 2025 at 15:00 Hrs via video conferencing.

1.8 **Suggestions** : The Committee analysed the root cause of cascade tripping and conducted system study in the RAPP-KTPS generation complex and associated evacuating lines. Accordingly, the committee suggested following:

- Network reconfiguration of RAPS_KTPS complex and enhancment of grid connectivity of evacuating lines.
- Closing the lines which are open on system constraints.
- Ensuring healthiness of bus bar system in the generation complex and grading of protection zone operating time.
- Review of ATS at RAPP B & C.
- Periodic checking of wiring issues of auxiliaries to avoid generation loss.

- Changes in existing islanding scheme.

1.9 **Recommendation**:

- Protection system and their proper coordination need to be ensured as per CEA grid standards, CEA Technical standards and RPC protection Philosophy. Any changes in the protection philosophy should only be done after prior approval from NRPC.
- Necessary preventive and corrective measures need to be taken by RVPNL to minimise the frequent tripping of 220kV lines evacuation from RAPS.
- As mandated by IEGC 2023, conducting Annual Self Protection Audit and Third-Party Protection Audit also need to be ensured.
- SLDC-Rajasthan shall also ensure the proper load management in the complex as per network condition to avoid any cascade tripping.
- Further, proactive Intrastate Transmission planning for creating transmission adequacy in the complex is needed.
- Reliablilty of SCADA telemetry and alarm for control room operators to be ensured.
- The Auto Change Over of Auxiliary power supply of RAPP generators need to be ensured by proper perodic testings and software/logic changes.
- SLDC Rajasthan to review the RAPP A &B islanding schemes periodically and ensure G/L ratio proper for reliable island operation.

Chapter 2: Overview of RAPS, KTPS generation complex

2.1 Network connectivity of the complex

i) The network diagram of the RAPS, KTPS generation complex is shown below in Figure 1. Connected loas centres, evacuating lines and connectivity to the grid is also shown in network diagram.

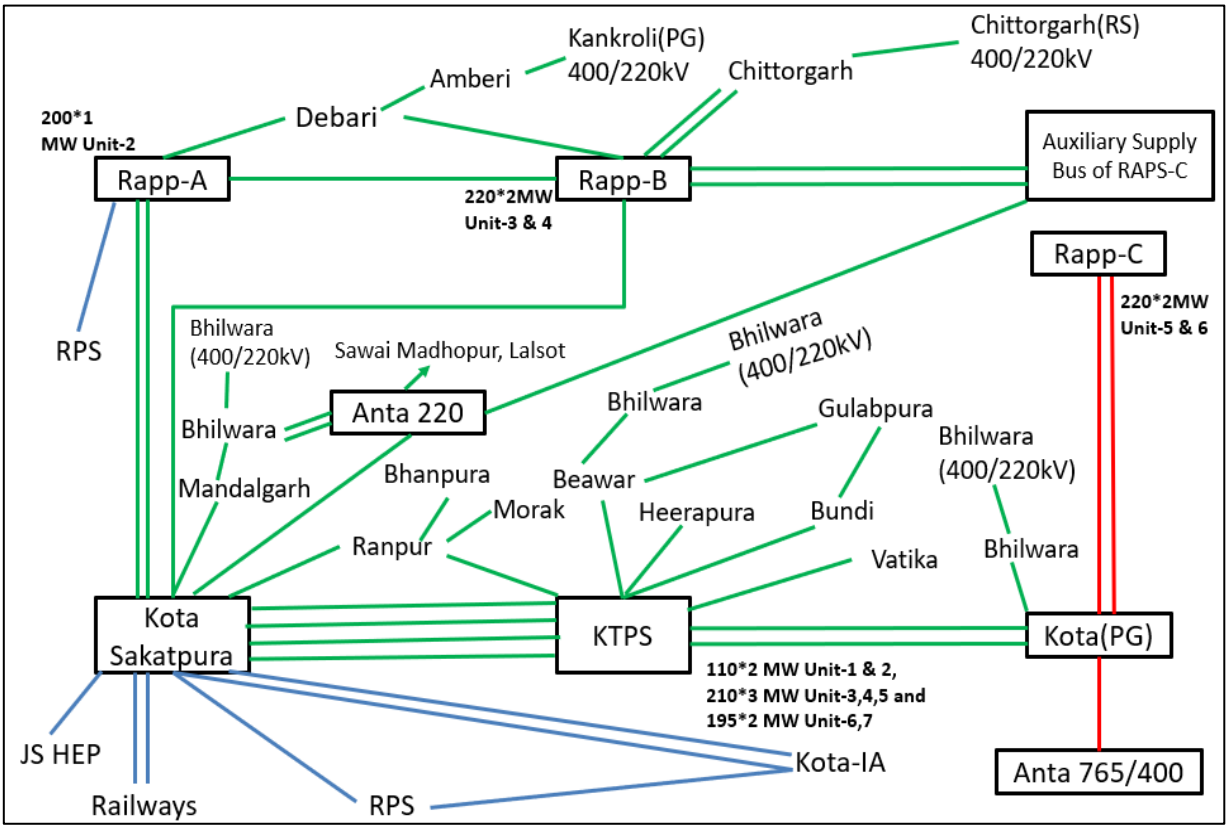


Figure 1: Network diagram of RAPS, KTPS generation complex

ii) Major generating stations in the complex are RAPS A & B and KTPS. Apart from this, two small hydro generating station i.e., JS HEP & RPS HEP are also connected in the complex. 220kV bus at RAPS C is also connected in the complex via tie lines through RAPS B and Anta(RS). Start Up Transformers (SUTs) of RAPS C are connected at this 220kV bus and generating units of RAPS C are connected at 400kV bus. There is no interconnection between 400kV & 220kV part of RAPS C. Summary of generating station in the complex is shown in below table:

Table 1: The Region Wise Demand and Generation

S. No	Name of Generating Station	Generation capacity
1.	RAPS-A	1*200MW = 200MW
2.	RAPS-B	2*220MW = 440MW
3.	RAPS-C	2*220MW = 440MW (only auxiliary supply bus is at 220kV side, generation is at 400kV side)
4.	KTPS	2*110MW, 3*210MW, 2*195MW = 1240MW

5.	Jawahar Sagar HEP	3*33MW = 99MW
6.	Rana Pratap Sagar HEP	4*43MW = 172MW

iii) The complex is connected to the grid through following path:
   a) 220kV RAPS A/B → Debari → Amberi → Kankroli(PG) (400/220kV)
   b) 220kV RAPS B → Chittorgarh → Chittorgarh(RS) (400/220kV)
   c) 220kV RAPS B → RAPS C → Anta(RS) → Bhilwara → Bhilwara(RS) (400/220kV)
   d) 220kV Kota Sakatpura → Mandalgarh → Bhilwara → Bhilwara(RS) (400/220kV)
   e) 220kV Kota Sakatpura → Anta(RS) → Bhilwara → Bhilwara(RS) (400/220kV)
   f) 220kV KTPS → Beawar → Bhilwara → Bhilwara(RS) (400/220kV)
   g) 220kV KTPS → Kota(PG) → Bhilwara → Bhilwara(RS) (400/220kV)

iv) To avoid overloading of 220kV Debari-Amberi line, this line is kept opened from Debari end. Therefore, 220kV Debari is being fed radially from RAPS A & B.

v) 220kV Chittorgarh was also being fed radially from RAPS-B by opening 220kV Chittorgarh(400kV)-Chittorgarh(220).

vi) 220kV Kota(PG)-KTPS D/C were also kept open since September 2023, lines were kept open on request of KTPS, on concern of hotspot related issues in KTPS switchyard due to heavy import of power from Kota(PG) end).

vii) All the stations i.e., RAPS A, RAPS B, RAPS C (220kV), KTPS and Kota Sakatpura have double main & transfer bus scheme.

2.2 RAPS auxiliary supply scheme and Auto Transfer Scheme (ATS)

i) The power supply to unit auxiliary loads are fed through two sources at 6.6kV level:
   a) One source is through SUT (Start-Up Transformer) 220kV/6.6kV.

   b) Second source is from Generator to UT (Unit Transformer) (16.5/6.6kV). In case, the Generator is shut down, then it is through GT. In case of RAPP-B, GT is 220kV /16.5kV) and in RAPP-C, GT is 400kV /16.5kV).

   c) The half of the auxiliary load is fed from SUT and another half through GT.

   d) 6.6kV Bus section breaker is provided to extend the power supply automatically from the healthy transformer in the event of failure of the other transformer by closing these bus section breakers. This is the design criteria of ATS.

   e) For successful ATS, the bus section breaker should be closed in less than 200msec to limit the transient current and voltages within safe limits and also to ensure smooth and quick acceleration of all motors without drawing excessive current from healthy source. Also voltage dip on faulty bus should be limited to prevent stalling and tripping of motors. This is called Fast transfer.

   f) Fast transfer is achieved by energizing the trip circuit of the secondary breaker of the faulty transformer and initiating closing of the bus section breaker. To avoid closing of bus section breaker before faulty transformer breaker is tripped,

minimum 2 cycle dead time is ensured between closing and tripping of the circuit breaker.

This dead time is small and doesn't lead to out of phase condition of the faulty supply with healthy supply and also dip in residual voltage is minimum thereby transient voltage and currents are minimum at the time of closing bus section breaker.

g) If fast transfer is not successful due to block by syn permissive, operation of bus under voltage will lockout relay will trip all loads of faulty transformer. Slow transfer will be initiated if following condition are satisfied:

i. Bus under voltage lock out relay operated.
ii. No protection operated on the bus.
iii. The faulty transformer side breaker is tripped.

On initiation of slow transfer, closing signal is given to bus coupler breaker. Thus supply will be restored in both section of 6.6kV switchgear. The restoration of supply to motors by closing respective breakers is to be done manually.

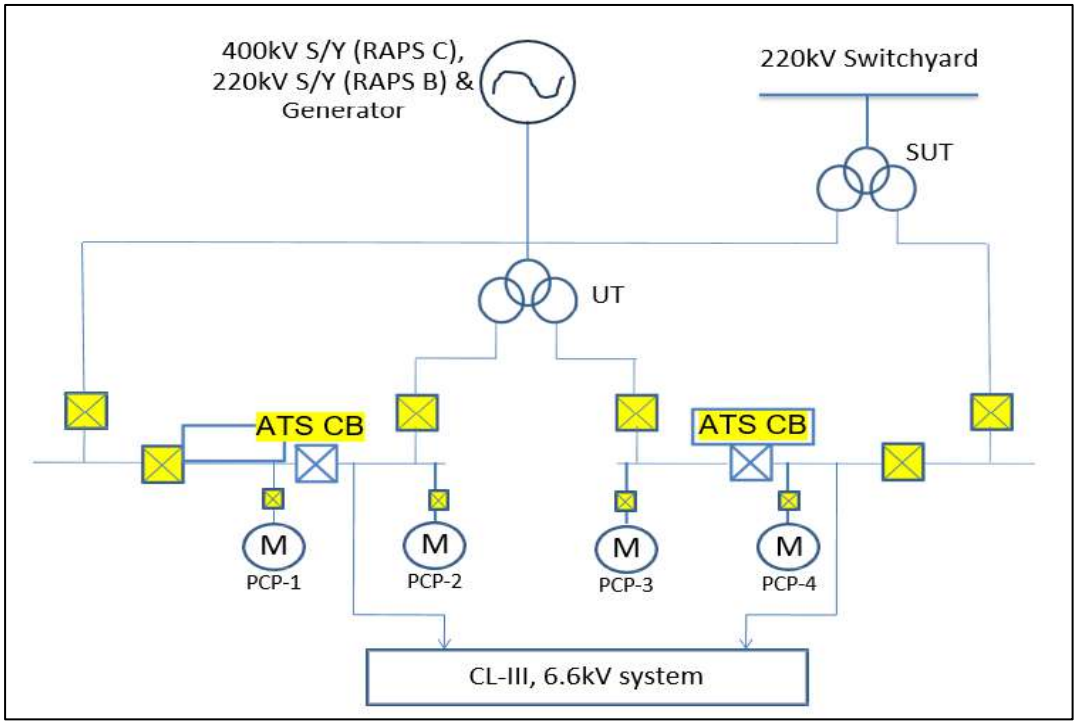


Fig.1 Auto Transfer Scheme (General)

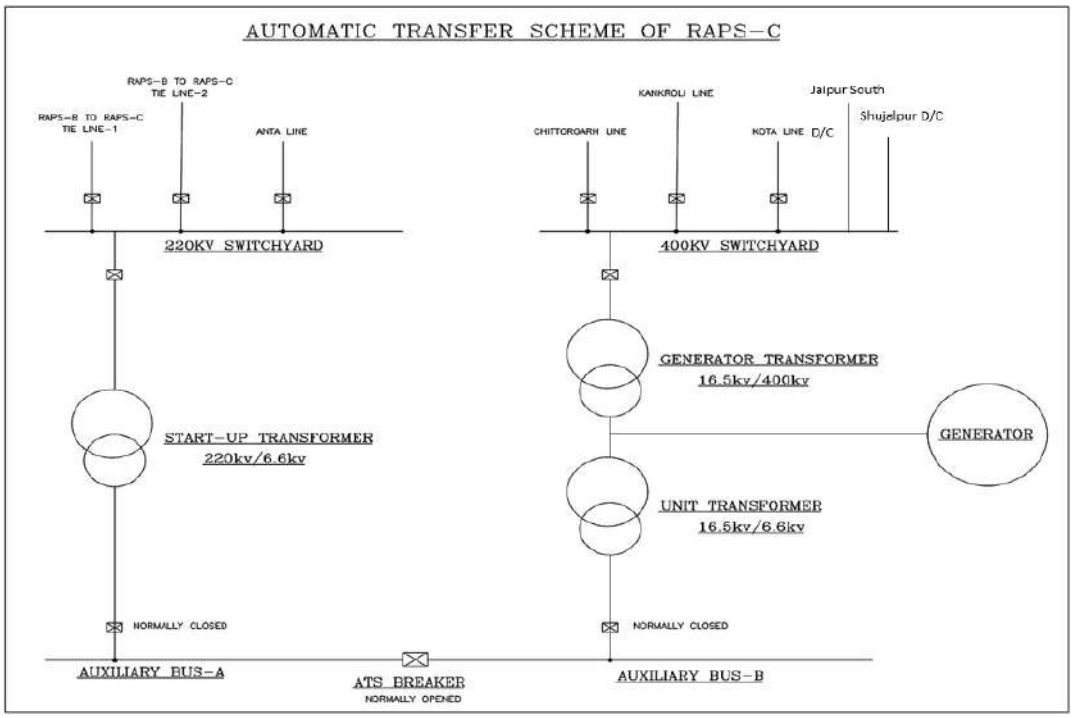


Fig.2 Auto Transfer Scheme at RAPS-C

2.3 RAPS House load operation

There is provision of house load operation of generating units at RAPS. House load operation triggers during grid disturbance and follows following criteria:

a. During Over frequency: at 51.5 Hz with 5 sec delay and 51.7 Hz instantaneously
b. During Under Frequency: at 47.5 Hz with 4 sec delay and 47.3 Hz instantaneously

2.4 RAPS Islanding Operation

i) To prevent tripping of RAPS units and poisoning out of the nuclear reactors during any grid disturbance, an island scheme is implemented in RAPS complex.
ii) The brief details of RAPS islanding scheme are as follows:
   a. Island subsystem: Generating units at RAPS A & B and loads of 220kV Debari, Chittorgarh, Sawa & Nimbahera.
   b. Island Generation: 640 MW (RAPS A Unit-1: 200 MW, RAPS B Unit 1 & 2: 220 MW each).
   c. Island Load: 618 MW (Load of load stations: 509 MW, Auxiliary load of RAPS; 110 MW)
   d. Island setting: Triggering frequency 48 Hz.
iii) Complete details of existing RAPS islanding scheme is attached as **Annexure-II.**

2.5 Xe-135 Reactor Poisoning in Nuclear Reactors

i) Xenon is a noble gas that has an atomic number of 54 and an atomic mass of 131.3 g/mol. It has nine stable isotopes and seven known radioactive isotopes. During a nuclear fission reaction process, a fissile nuclear fuel such as U-235 undergoes a chain of reactions as a result of capturing a thermal neutron. The captured neutron

distorts the U-235 nucleus and the electrostatic repulsion force overcomes the nuclear attraction causing a split into two fission fragments. This process is accompanied by energy release in the form of gamma rays as well as neutron emission. Some of the neutrons are released spontaneously while smaller numbers are delayed due to radioactive decay of certain fragments. The fission process produces several neutrons that play major role in sustaining the chain reactions. The fission process releases fragments of different mass numbers mainly around 90 and 140, most of which are radioactive. These fission fragments would decay, each with different half-life, to reach stable end products. Therefore, there would be a series of fragments decay that are inevitable. It is important to keep the chain reaction sustained to ensure neutrons growth to the desired level to deliver the required power output.

ii) One critical stage of the fission reaction is the formation of I-135, a subsequence of Te-135 beta decay. The I-135 is a weak neutron absorber and has a half-life of ~6.7 hours. The beta decay of I-135 to Xe-135 introduces a very powerful neutron absorber product. Xe-135 has a large cross section of 2.6 million barns. This is about 5128 times higher than the thermal cross-section of U-235, which is 507 barns. A barn is equivalent to 10-28 m2. This makes it an effective neutron absorber with a high interaction probability with the thermal neutrons. Xe-135 is produced with about 5% probability from every fission process but with 95% probability from I-135 decay. Xe-135 has a half-life of 9.1 hours. Increase in Xe-135 concentration in the reactor stops the neutron growth due its large cross-section. Absorption causes the formation of a stable isotope, Xe-136. The neutron population decreases and the chain reaction stops. The reactor eventually shuts down due to xenon accumulation. Understanding how to deal with the produced Xe-135 is essential to keep the reaction chain sustainable and the neutron flux at desired rate.

iii) When operating a new reactor, the startup stage initially has no trace xenon, and the reactor is maintained critical at a low power level. Small traces of Xe-135 are detected afterwards as a direct product of fission process. As the power level is increased, Xe-135 starts to build up. It eventually reaches an equilibrium level. Negative reactivity is delivered due to Xe-135 growth, and it is proportional to the power level. To maintain criticality, the control rods (absorbers) are withdrawn so the reactor remains critical. This keeps the negative impact of the Xe-135 under control. The destruction of Xe-135 occurs mainly via neutron absorption. Most of it is burned off due to neutron flux forming Xe-136 (weak absorber) and the rest due to beta decay forming Cs-135.

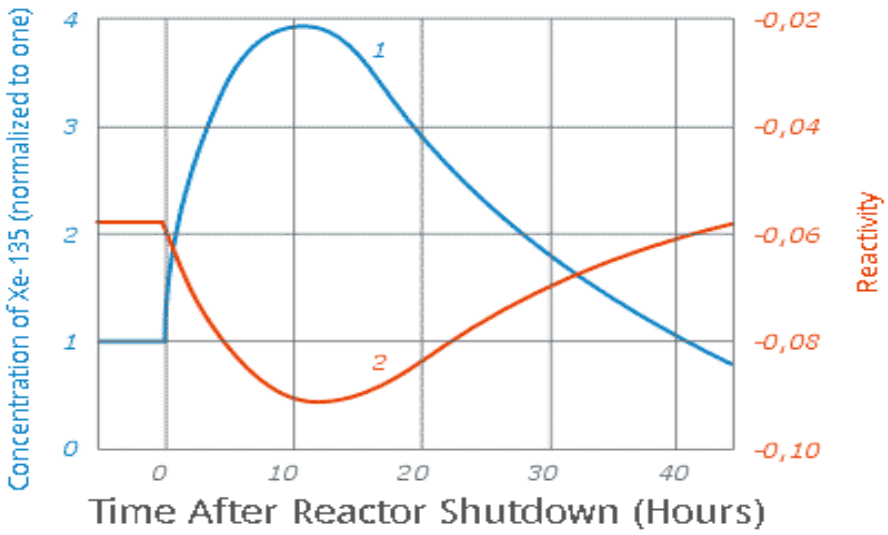


Fig 3 Xe-135 concentration in the reactor and neutrons reactivity

iv) The poisoning of Xe-135 arises when the reactor is shut down, see Fig.4. The neutron flux (reactivity) decreases drastically (point 2 in Fig.4) while Xe-135 production increases due to the continuous decay of I-135 see Fig.4. The poisoning increases, therefore, and reaches a peak value few hours after shutting down the reactor, see point 1 in Fig.4. Once the reactor enters what is known as the xenon dead time it would be impossible to restart it. The poison must be allowed to decay, and such a process may take few days before the restart becomes possible. As a result, a shortage in power supply can suddenly occur to major electrical grids leading to blackout.

Source: http://large.stanford.edu/courses/2014/ph241/alnoaimi2/

Chapter 3: Analysis of the Grid Events

3.1 Grid Event on 05.01.2024 at 05:16 hrs

On 05th January 2024, at 05:16hrs, cascade tripping of multiple elements occurred in RAPS, KTPS generation complex in Rajasthan control area leading to loss of total running generation of KTPS, RAPS (A, B & C) and other small hydro stations (JS HEP & RPS HEP) in the complex. During antecedent condition, total generation in the complex was ~1365 MW i.e., RAPS A 200 MW, RAPS B 185 MW, KTPS 800 MW, Jawahar Sagar(JS) HEP 90 MW and Rana Pratap Sagar(RPS) HEP 90 MW. Half of the auxilliary supply of RAPP C (generating ~450 MW) was also being met through 220kV RAPP B in line with the auxilliary supply scheme at RAPP C. Antecedent weather condition was foggy and three (no.s) of 220kV lines in this complex tripped between 04:00hrs – 05:00 hrs on same day. Apart from this, three (no.s) of 220kV lines were not in service in the complex. Therefore, after tripping of three (no.s) of 220kV lines between 04:00hrs – 05:00 hrs, remaining lines in the complex were became highly loaded and some of the lines were connected radially. Total generation of KTPS & RAPS (A & B) was evacuating through limited lines and connectivity to the grid was also very limited. At 05:15hrs, one 220kV line in the complex was manually opened for load management however it resulted into overloading of remaining 220kV lines. Thereafter, cascade tripping of two(no.s) of grid connected 220kV lines occurred due to overloading. Remaining 220kV lines in the complex were radially connected and thus overfrequency occurred in the compelx due to load generation imbalane (surplus generation). This had resulted in loss of complete generation in the complex i.e., 1815 MW (1365MW on overfrequency due to loss of evacuation path and 450 MW of RAPP C due to failure of Auto Transfer Scheme(ATS) at RAPS C.

3.1.1 Antecedent Condition

During the antecedent condition, the following lines were out of service:

i. 220kV Kota(PG)-KTPS(RVUN) (RS) Ckt-1 & 2 (lines were kept out since 09th Sept 2023 on request of KTPS, as intimated by KTPS, hotspot related issue arises due to heavy import of power from Kota(PG) end).
ii. 220kV KTPS-Heerapura Ckt (tripped on 01-01-2024 on phase to earth fault; as reported insulator disc punctured and jumper fell on location no. 199; line charged at 13:58hrs on 06-01-2024).
iii. 220kV KTPS-Beawar Ckt (tripped at 04:05hrs of 05.01.2024 on R–N phase to earth fault).
iv. 220 KV Anta(NT)-Sakatpura(RS) (RS) Ckt (tripped at 04:43hrs of 05.01.2024 on B-N fault, A/R operated at Sakatpura end, 3-ph trip from Anta end) (DR of Sakatpura end is shown in Fig.5).

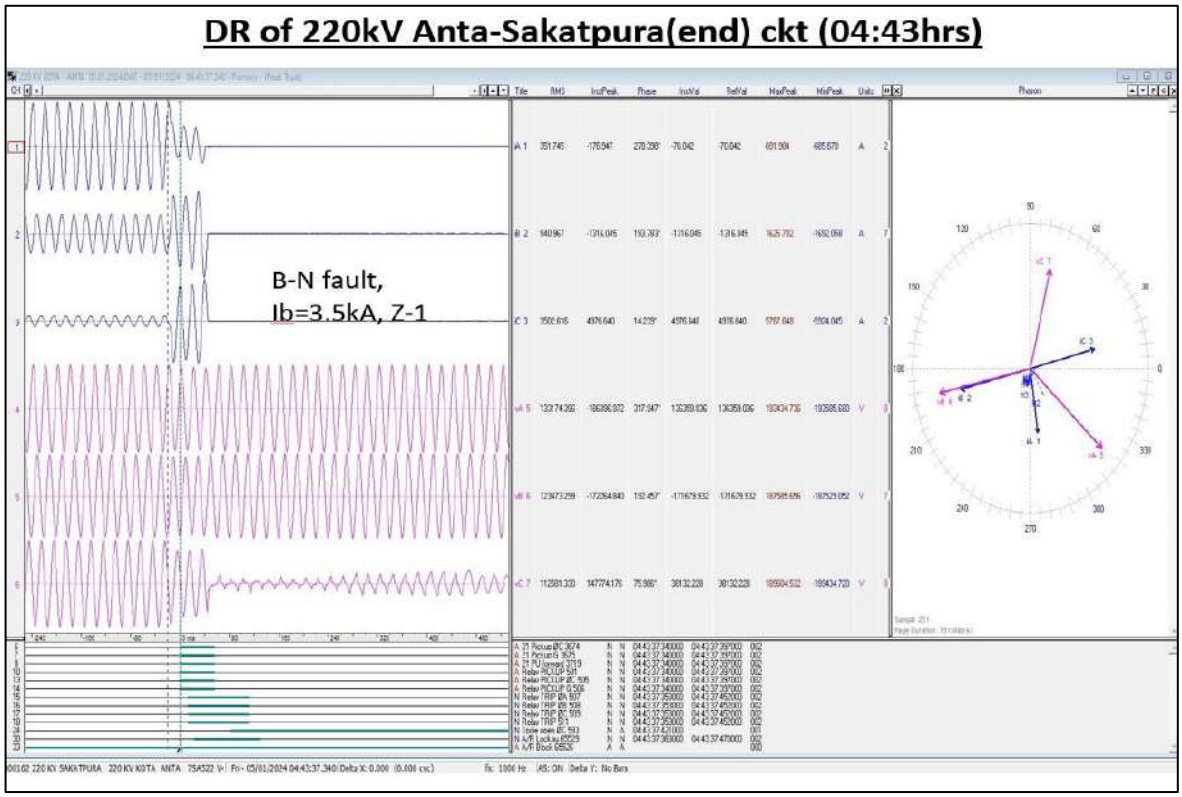


Fig.4 DR of 220kV Anta-Sakatpura(end) ckt (04:43hrs)

v. 220 KV Debari(RS)-RAPS_A(NP) (RS) Ckt (tripped at 04:57 hrs of 05.01.2024 on B-N fault, A/R off in line) ((DR of RAPS-A end is shown in Fig.6)

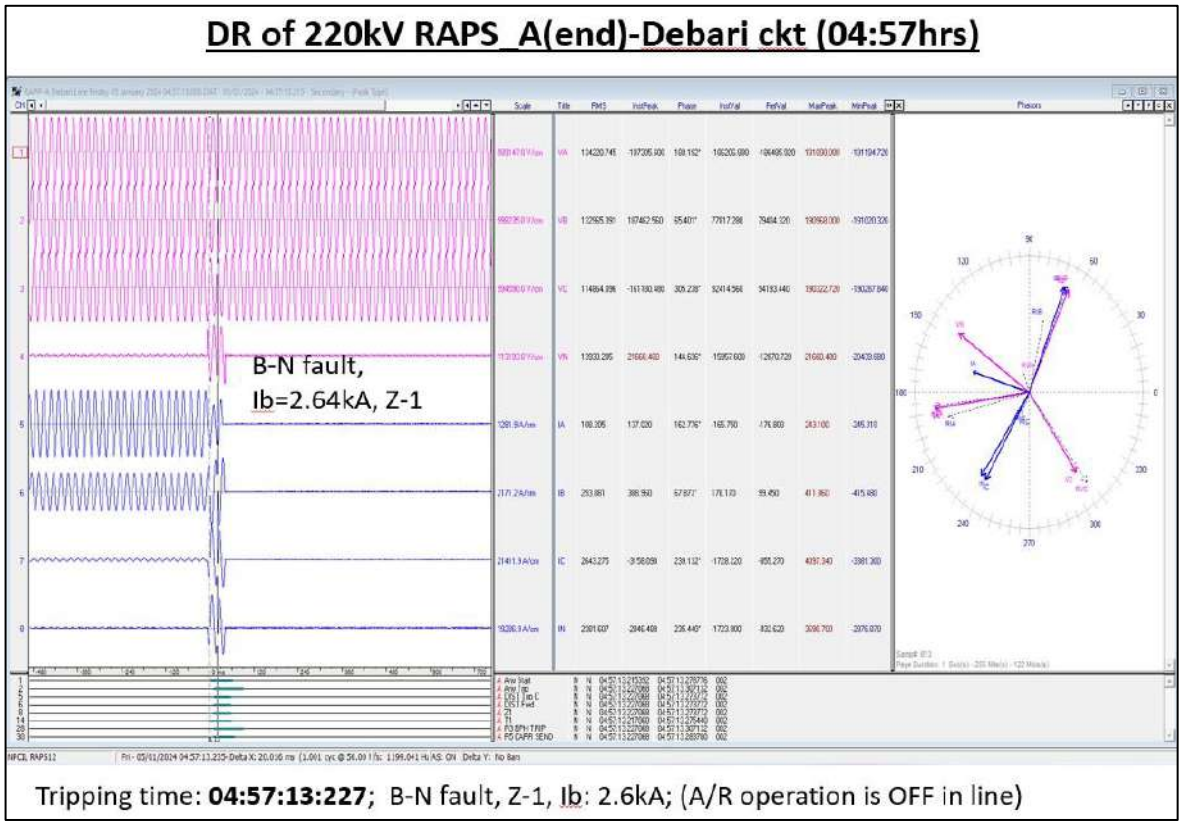


Fig.5 DR of 220kV RAPS_A(end)-Debari ckt (04:57hrs)

vi. Due to tripping of aforementioned lines, loading of remaining lines increased. As per SCADA, at 05:15 hrs, 220kV KTPS-Bundi Ckt, 220kV KTPS-Vatika Ckt, 220kV RAPS-A-RAPS-B Ckt and 220kV RAPS-C-Anta220 Ckt were carrying 288MW, 214MW, 273MW and 289MW respectively and limited connectivity with the grid via 220kV Vatika, Bundi-Gulabpura and Anta was available (Refer Fig.7)

During antecedent condition, the following units were under service:

i. 110MW Unit-1, 210MW Unit 4 & 5 and 195MW Unit 6 & 7 at 220kV KTPS (generating total ~800MW),
ii. 200MW Unit-2 at RAPS-A (generating ~200MW),
iii. 220MW Unit-4 at RAPS-B (generating ~185MW),
iv. 220MW Unit-5 & 6 at RAPS-C (generating total ~450MW),
v. 43MW Unit-1, 3 & 4 at RPS HEP (generating total ~90MW)
vi. 33MW Unit-1, 2 & 3 at JS HEP (generating total ~90MW).

Antecedent scenario of the network complex is shown in Fig.7.

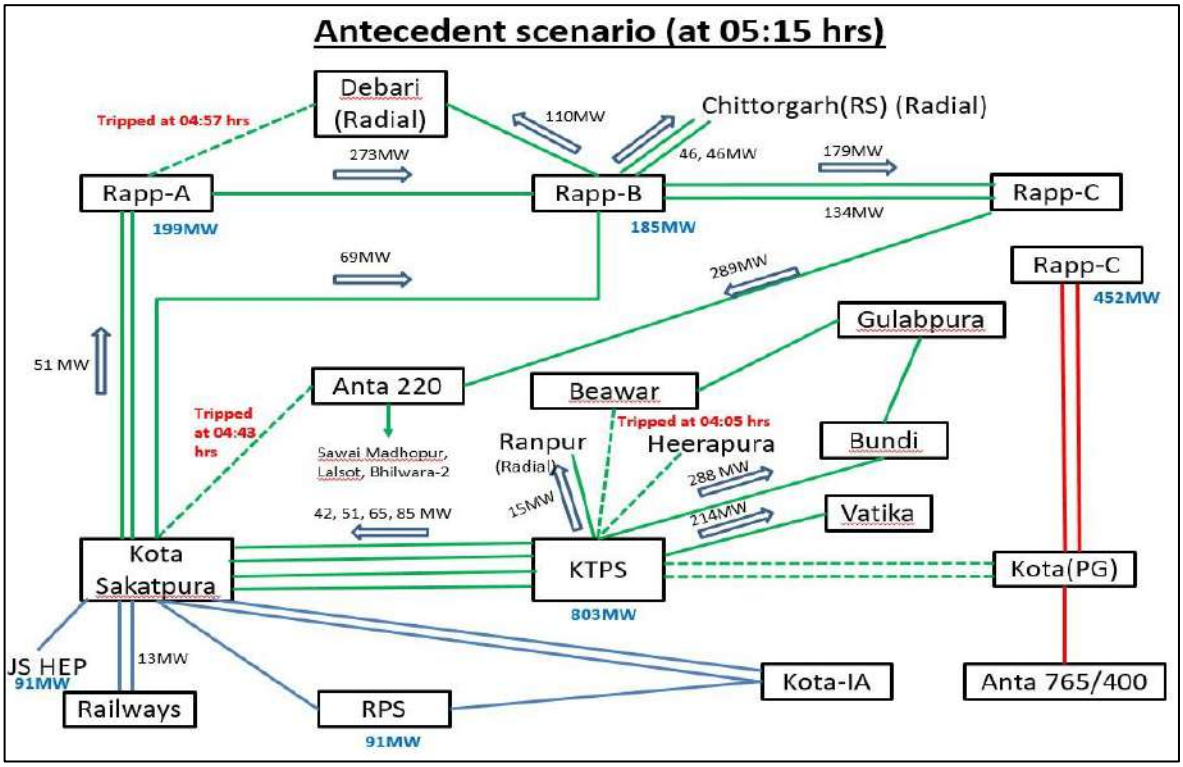


Fig.6 Antecedent scenario of the network complex

3.1.2 Sequence Of Events (SOE) and analysis

i. Sequence of event is mentioned as below:

S. No.	Time	Event	Remarks
1	04:05 hrs	220kV KTPS-Beawar line tripped on R-N fault	-
2	04:43 hrs	220 KV Anta(NT)-Sakatpura(RS) (RS) Ckt tripped on B-N fault	A/R non operation at Anta end
3	04:57 hrs	220 KV Debari(RS)-RAPS_A(NP) (RS) Ckt tripped on B-N fault	A/R OFF in line
4	After tripping of above lines, loading of remaining lines increased. Line loading at 05:15 hrs: 220kV KTPS-Bundi Ckt =**288 MW**, 220kV KTPS-Vatika Ckt=**214 MW**, 220kV RAPS-A-RAPS-B Ckt=**273 MW** and 220kV RAPS-C-Anta220 Ckt =**289 MW**		
5	05:15:56 hrs	220kV Bundi-Gulabpura (RS) ckt was manually opened on SLDC instruction	-
6	05:16 hrs	220kV KTPS-Vatika Ckt tripped on overcurrent (ph current: 800-850A)	-
7	05:16:03:855 hrs	220kV RAPS-C(NP)-Anta(NT) ckt tripped on load enroachment (Z-1 Dist. Prot.), ph current increased from 1000A to 1750A within 600msec.	Last grid-connected line in the complex
8	Island formed with generation of RAPS A & B, KTPS and radial load of Debari, Chittorgarh, Ranpur, Bundi etc. Due to load generation imbalance, frequency rose to 51.63 Hz		
9	05:16:06 hrs	SUT at RAPS C, RAPS B unit-3, RAPS A unit-II and KTPS units tripped on overfrequency. RAPS-B unit-4 came on house load.	Frequency recorded at RAPS A was ~53Hz.
10	06:50 hrs	RAPS B unit-4 tripped, couldn't able to restored back to grid mode due to issue at RAPS B end	-

ii. Triggering incident scenario is shown in Fig.8.

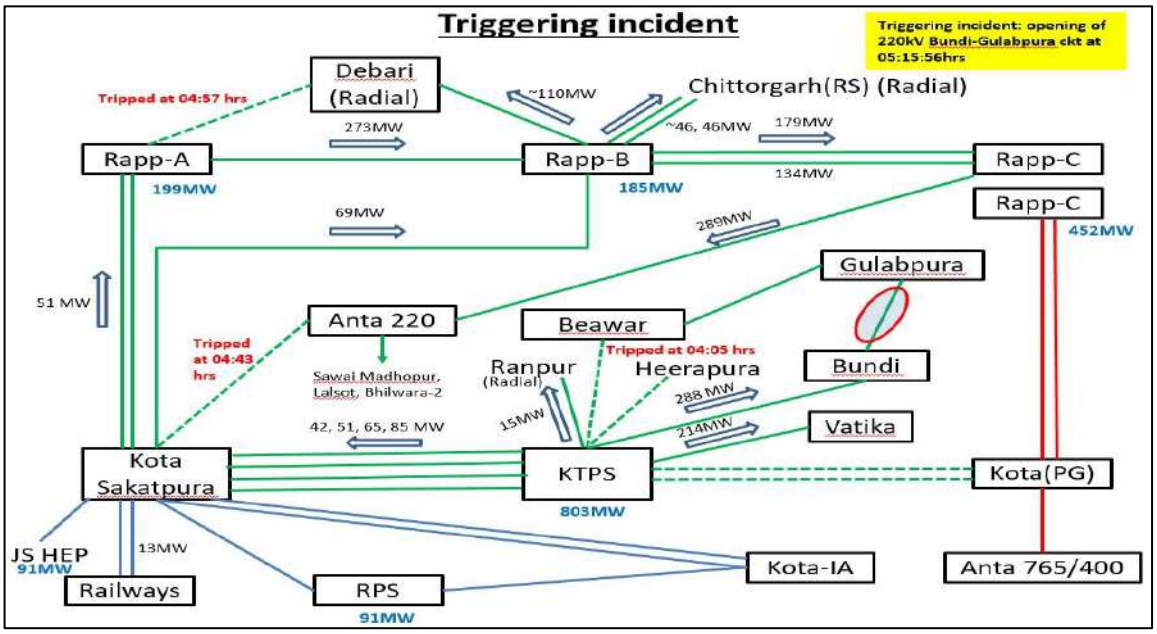


Fig.7 Triggering Incident Scenario

iii. At 05:15:56 hrs, 220kV Bundi-Gulabpura (RS) ckt was manually opened on SLDC instruction to avoid line tripping on overloading. Scenario after opening of 220kV Bundi-Gulabpura ckt is shown in Fig.9.

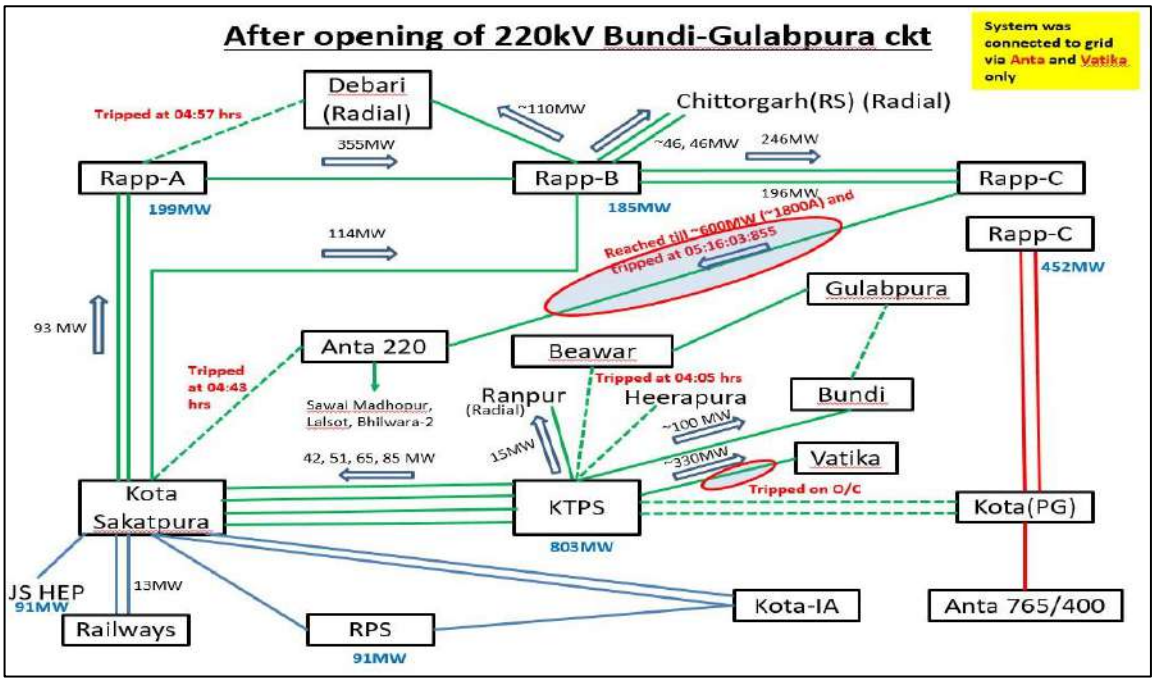


Fig.8 Scenario after opening of 220kV Bundi-Gulabpura ckt

iv. After this, as per DR shown in Fig.10, 220kV KTPS-Vatika Ckt current reached ~850A (~360MW) and tripped on over-current protection operation from KTPS end. Further within ~500msec, as per DR shown in Fig.11, 220kV RAPS-C(NP)-Anta(NT) ckt current reached from ~1000A to ~1750A (~660MW) and line tripped due to Z-1 distance protection operation on load encroachment.

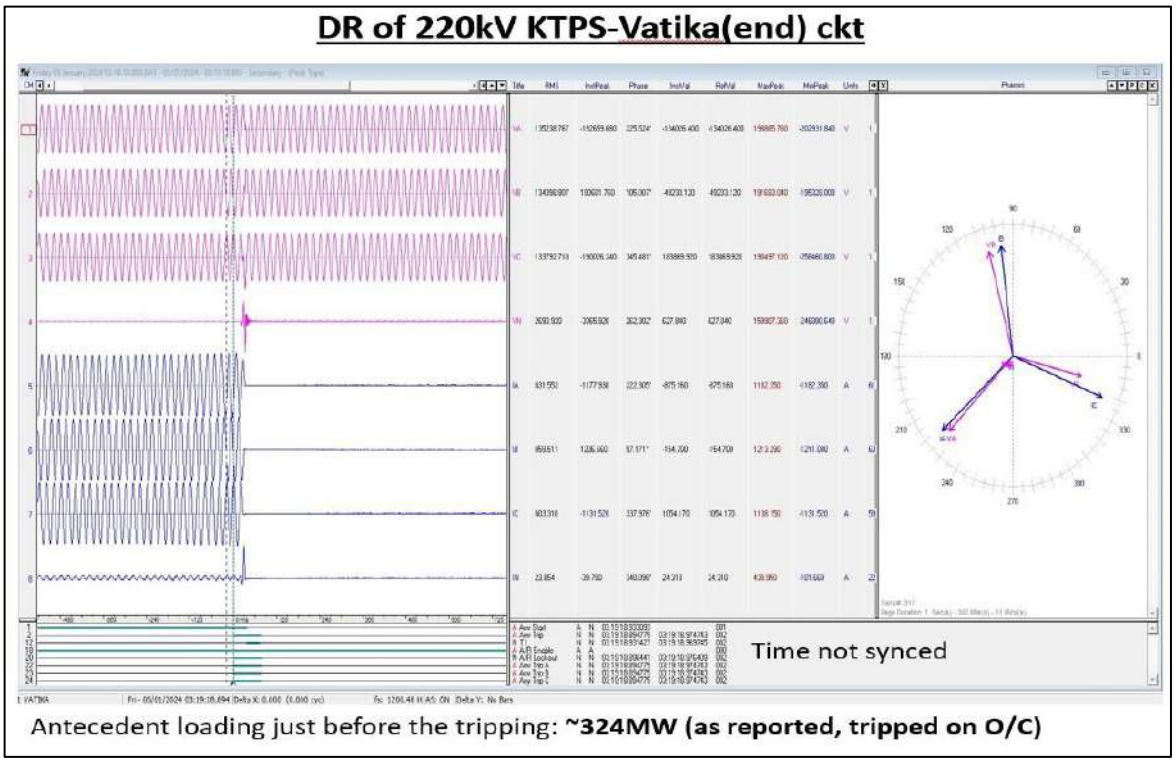


Fig.9 DR of 220kV KTPS-Vatika(end) ckt

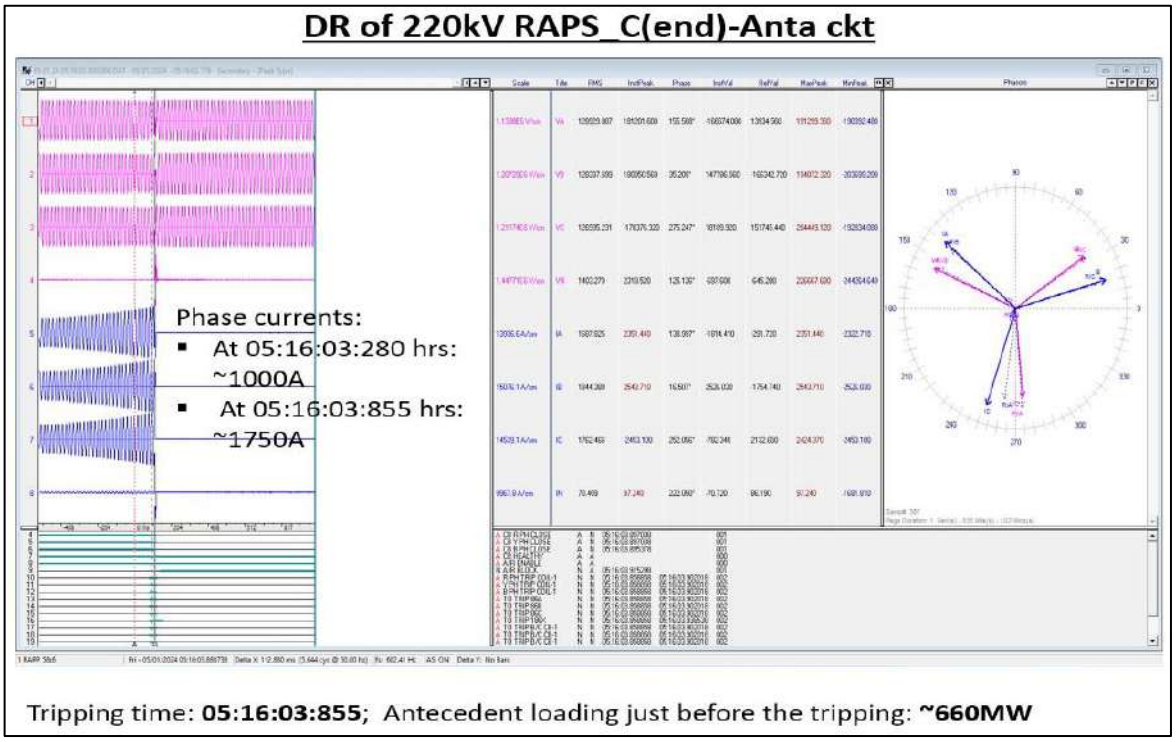


Fig.10 DR of 220kV RAPS_C(end)-Anta ckt

v. Due to tripping of 220kV KTPS-Vatika Ckt and 220kV RAPS-C(NP)-Anta(NT) ckt, connectivity to main load centre was cut off. Only radial load available for RAPS-A, RAPS-B and KTPS generation was 220kV Debari and 220kV Chittorgarh and system got isolated from main Grid. Island formation scenario is shown in Fig.12.

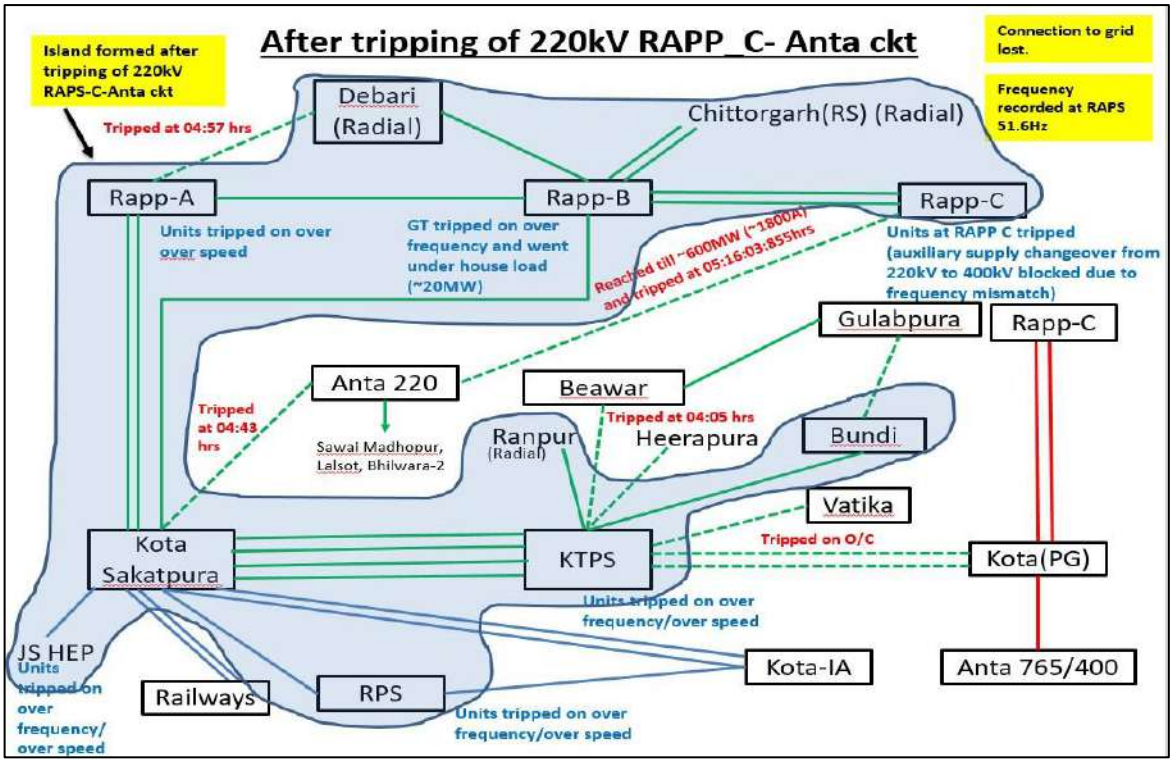


Fig.11 Island formation Scenario

vi. Above load generation scenario led to over frequency in the subsystem. As per details shared by RAPS-B, frequency reached to 51.63Hz.

vii. RAPS-A unit-2 (no provision to come to house load) and KTPS Units also tripped on over frequency protection. Screenshot of digital recording system of RAPS-A during the event is shown in Fig.14.

viii. Subsequently, RAPS-B unit-4 tripped on over frequency (over frequency protection setting is 51.5Hz with 200msec time delay) and came to house load. RAPS-B unit-4 operated on house load for approx. 1.5 hours but couldn't be able to synchronise with the grid due to issue in turbine speeder gear. As per communication received from RAPS-B, MANUAL LOWER command for turbine speeder gear lowering could not be executed due to wiring deficiency. Generation plot of RAPS-B unit-4 (as shared by RAPS) is shown in Fig.13.

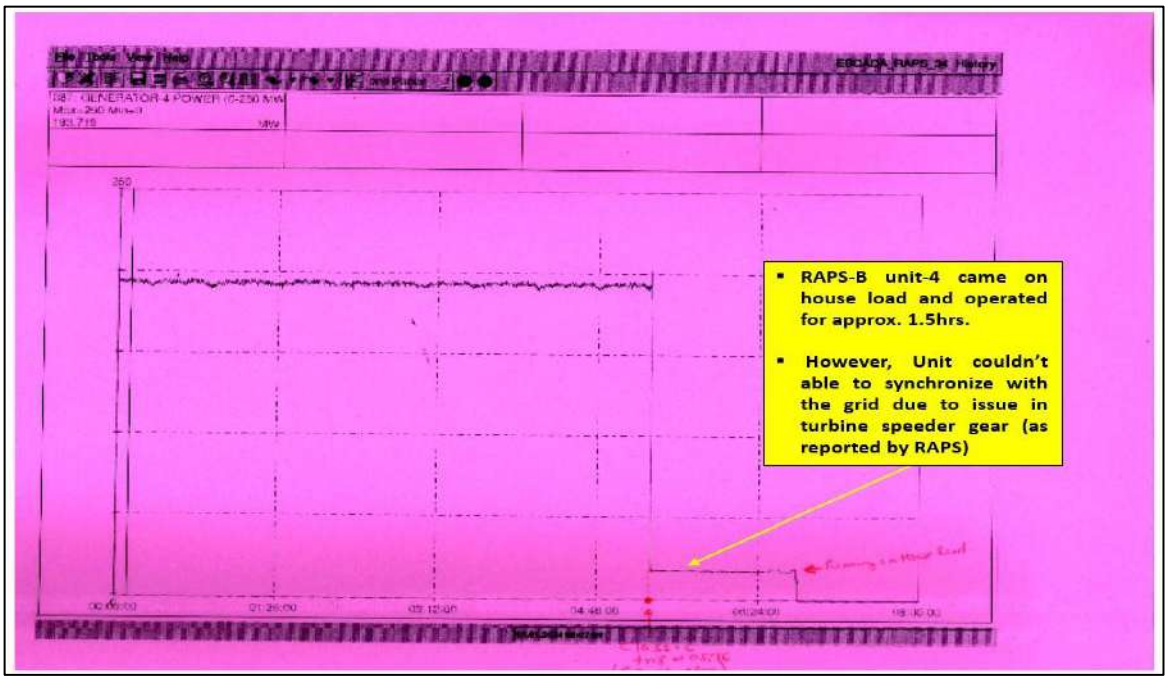


Fig.12 Generation plot of RAPS-B unit-4 (as shared by RAPS)



Fig.13 Digital recording system of RAPS-A during the event (as shared by RAPS)

ix. As reported, at the same time, HV and LV CBs of SUT-5 (connected at 220kV side of RAPS-C) tripped on over frequency protection and 6.6 kV buses of SUT-6 section got de-energised due to tripping of Units at RAPS-A and RAPS-B. RAPS-C unit-5&6 tripped due to loss of auxiliary supply. As reported, auxiliary supply changeover from 220kV to 400kV through Auto Transfer Scheme (ATS) got blocked due to frequency mismatch (frequency of 220 KV system increased to 53.2 Hz while frequency of 400 KV system remain 49.9 Hz).

x. The reactors of Unit-5 and Unit-6 at RAPS-C tripped on PHT pressure high at 05:16:08 hrs and 05:16:12 hrs respectively.

xi. As per PMU, no fault is observed in the system. PMU plot of frequency and phase voltage magnitude at Kota(PG) are shown in Fig.15 and 16 respectively.

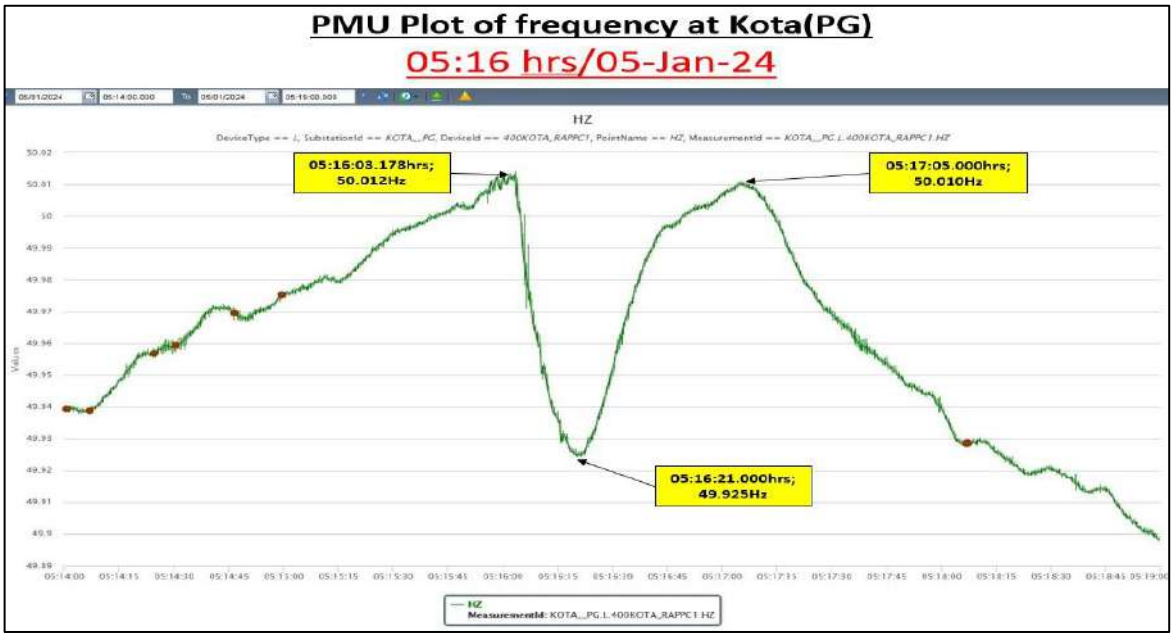


Fig.14 PMU plot of frequency at Kota(PG)

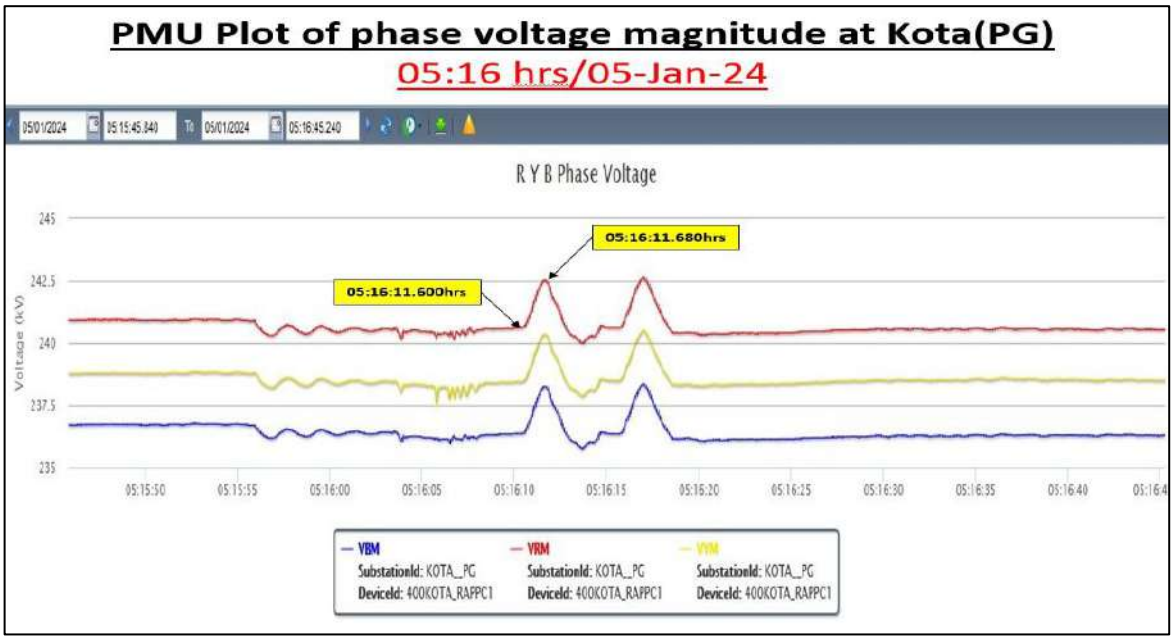


Fig.15 PMU plot of phase voltage magnitude at Kota(PG)

xii. As per SCADA, load loss of approx. 410 MW is observed in Rajasthan control area and total change in generation of approx. 1815MW is observed. SCADA Plot of Rajasthan demand during the event is shown in Fig.17. SCADA Plot of generation of KTPS, RAPS-A, RAPS-B, RAPS-C, RPS HEP and JS HEP during the event are shown in Fig.18, 19, 20, 21, 22, and 23 respectively.

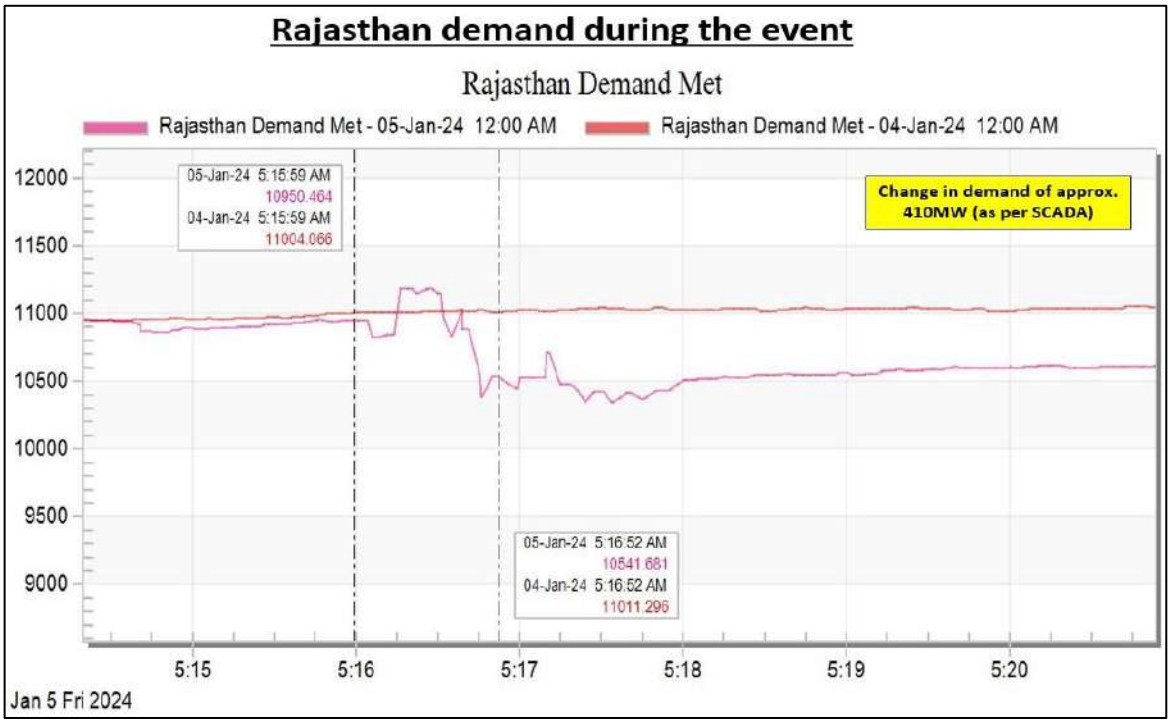


Fig.16 SCADA Plot of Rajasthan demand during the event

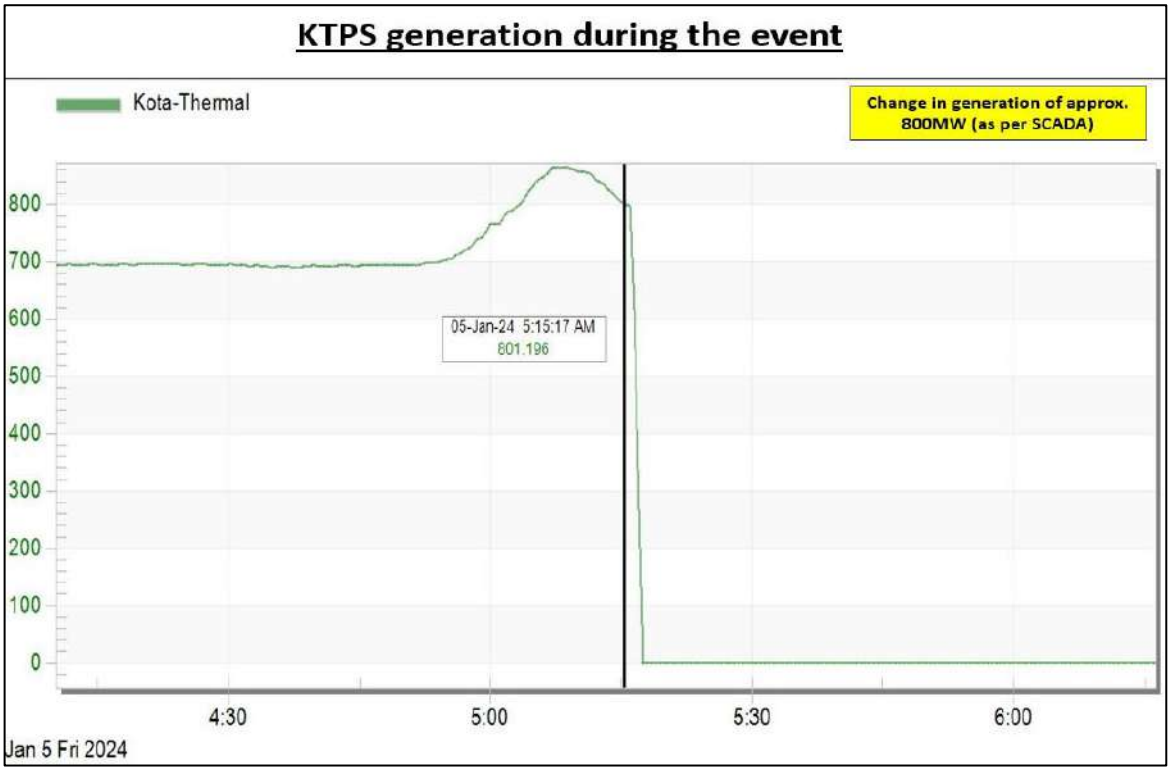


Fig.17 SCADA Plot of KTPS generation during the event

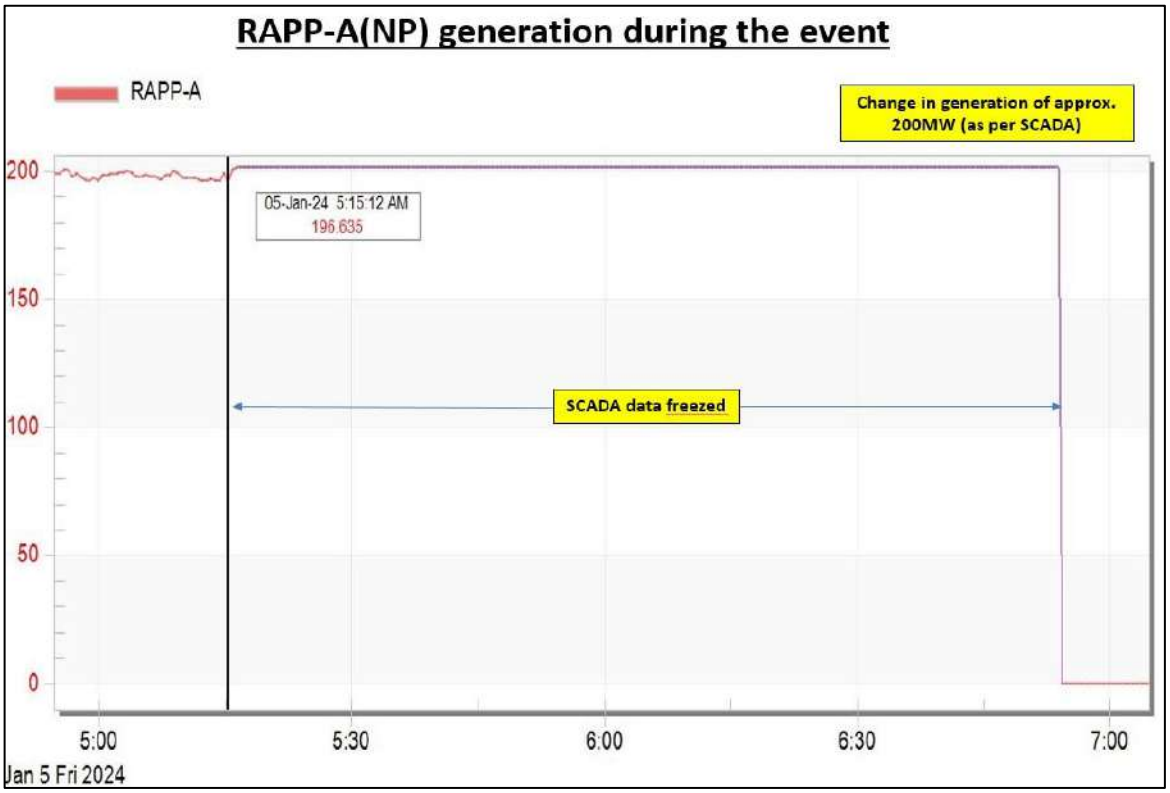


Fig.18 SCADA Plot of RAPS-A generation during the event

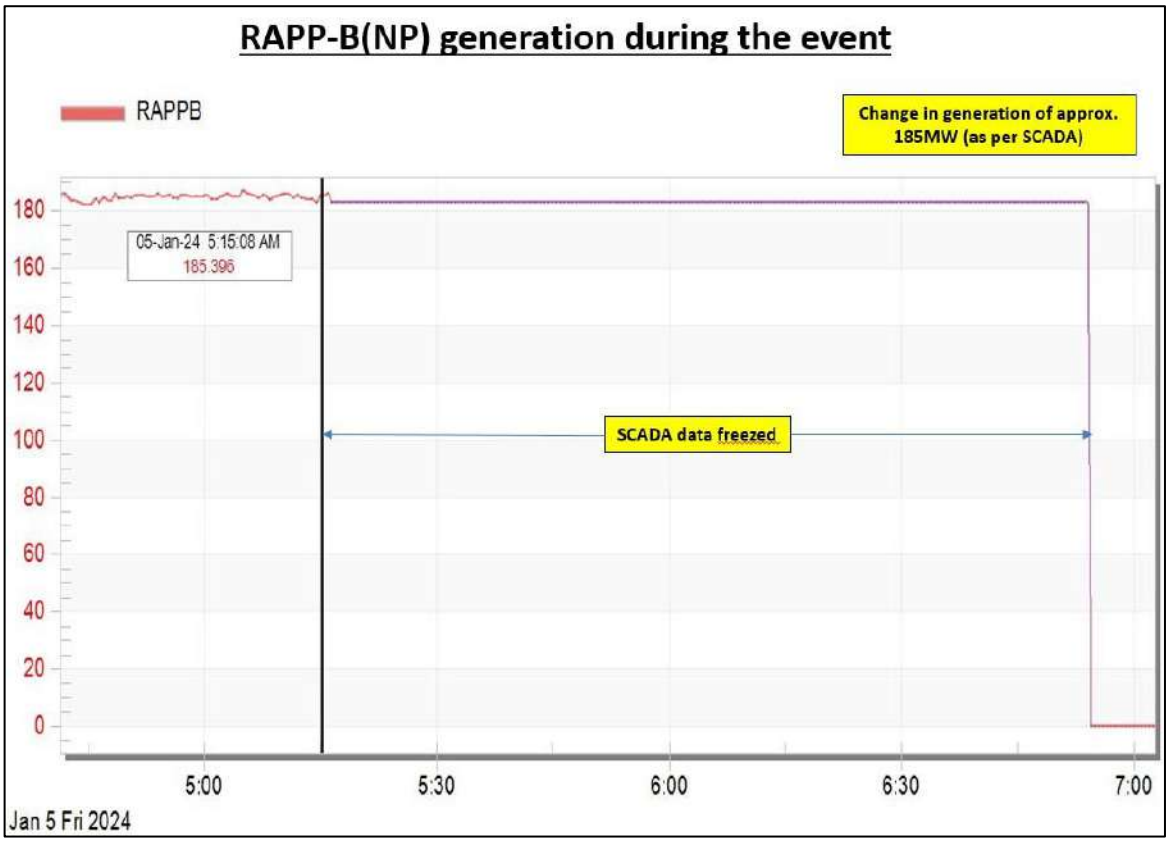


Fig.19 SCADA Plot of RAPS-B generation during the event

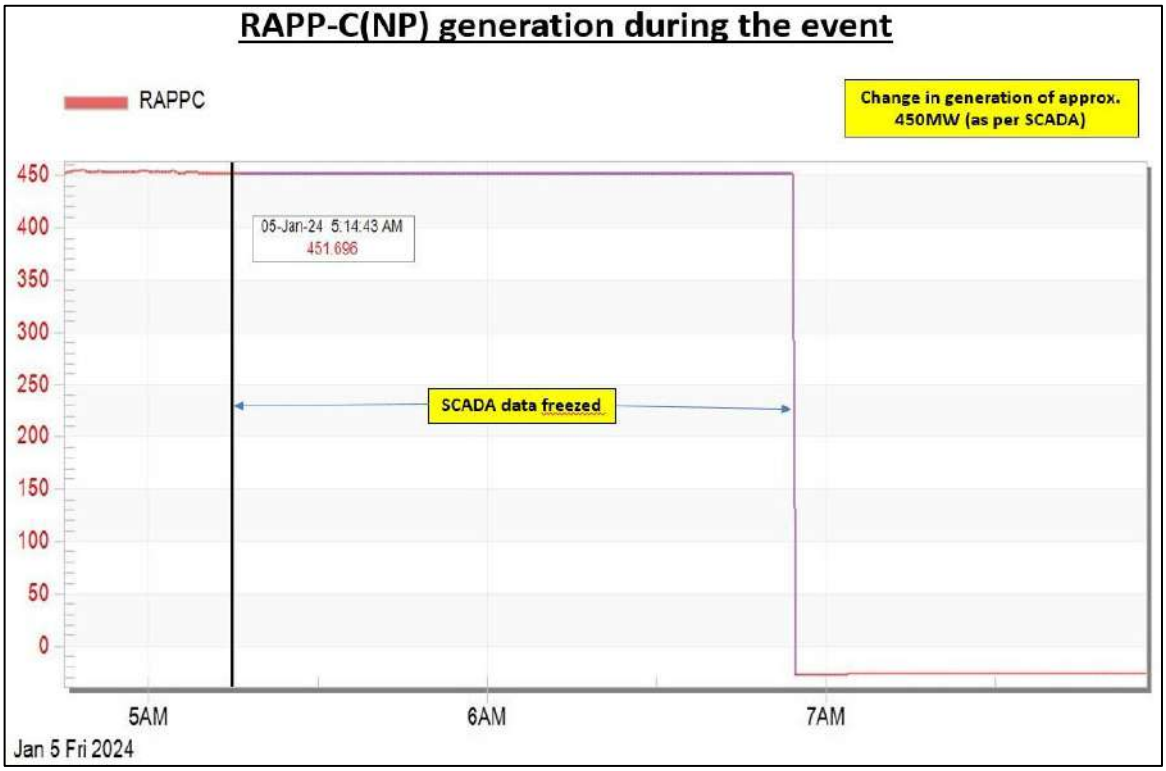


Fig.20 SCADA Plot of RAPS-C generation during the event

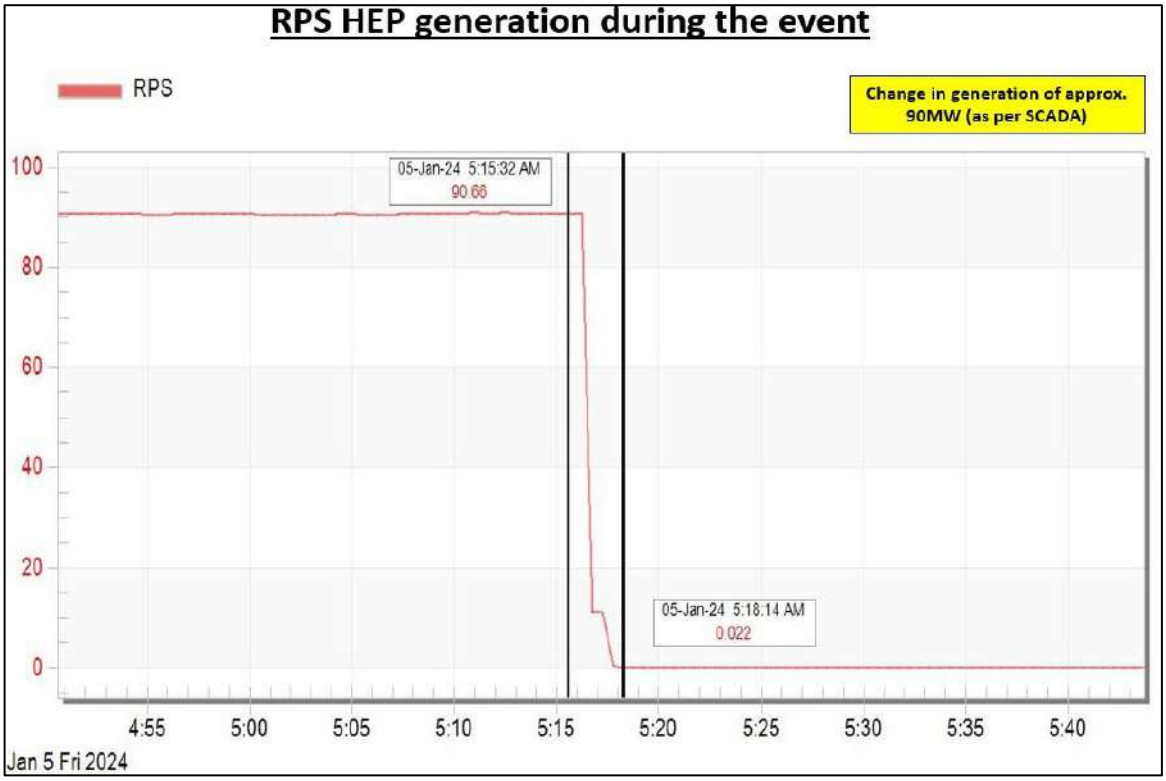


Fig.21 SCADA Plot of RPS HEP generation during the event

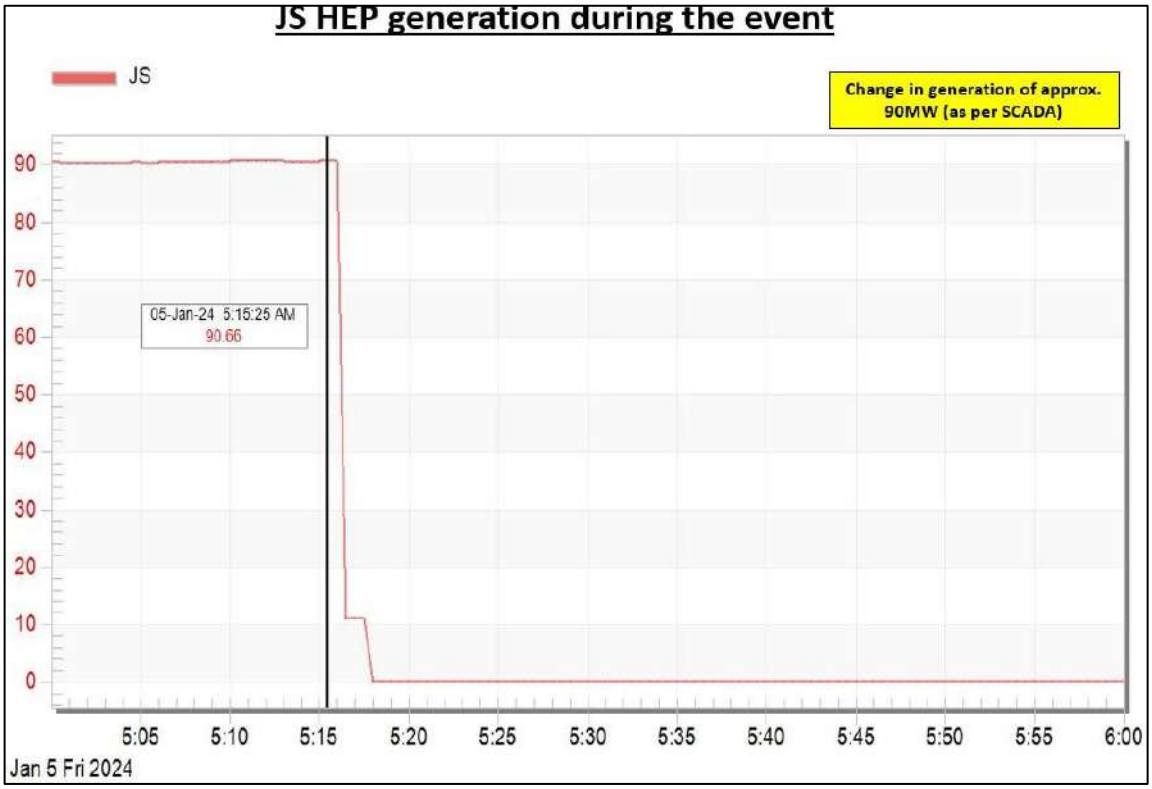


Fig.22 SCADA Plot of JS HEP generation during the event

xiii. During tripping event, auxiliary supply of RAPS-C DC power (DCPS) supply also tripped. And as battery backup of DCPS was not available, data reporting of RAPS-A, RAPS-B and RAPS-C hanged after tripping. (SCADA data of RAPS-A, RAPS-B and RAPS-C is communicating to NRLDC through Fibre optic. There is linear fibre optic between RAPS-A to RAPS-B and RAPS-B to RAPS-C, then from RAPS-C redundant communication path are available). On confirmation with ULDC it was informed that there is issue in DCPS battery bank of NPCIL.

3.2 Grid Event on 29.03.2024 at 20:22 hrs

Again, on 29th March 2024, at 20:22 hrs a grid event (GD-1) of blackout of this complex occurred. During antecedent condition of this grid event Two no of 220kV lines were out on system constraints and one no of line was under shutdown. The complex was connected to the grid with five (no.s) of the 220kV lines. Most of the 220kV lines were operating in radial mode. Total generation in the complex was ~1587 MW i.e., RAPS A: 195 MW, RAPS B: 177 MW, KTPS: 1150 MW, JS HEP: 32 MW and RPS HEP: 40 MW. Triggerring incident was damage of R-ph CT of one of the 220/132kV ICT at 220/132kV Kota Sakatpura S/s of Rajasthan led to the occurrence of bus fault. . Due to non-availbility of bus bar protection at 220kV bus at Kota Sakatpura, multilple 220kV lines tripped on reverse distance protection operation. Thereafter, cascade tripping of grid connected 220kV lines occurred due to overloading. Remaining 220kV lines in the complex were radially connected and thus overfrequency occurred in the compelx due to load generation imbalane (surplus generation). This event had resulted a complete loss of generation in the complex i.e., 2020 MW (1587MW on overfrequeny due to loss of evacuation path

and 433 MW of RAPP C due to failure of ATS at RAPS C).

3.2.1 Antecedent Condition

During the antecedent condition, the following lines were out of service:

i. 220kV Kota(PG)-KTPS(RVUN) (RS) Ckt-1 & 2 (Lines were out since 09th Sept'23, lines were kept out on request of KTPS, as intimated by KTPS, hotspot related issue arises due to heavy import of power from Kota(PG) end).
ii. 220kV KTPS-Vatika ckt was under shutdown.

During antecedent condition, the following units were under service:

i. 110MW Unit-1 & 2, 210MW Unit 3, 4 & 5 and 195MW Unit 6 & 7 at 220kV KTPS (generating total ~1150MW),
ii. 200MW Unit-2 at RAPS-A (generating ~195MW),
iii. 220MW Unit-4 at RAPS-B (generating ~170MW),
iv. 220MW Unit-5 & 6 at RAPS-C (generating total ~433MW),
v. 43MW Unit-1, 3 & 4 at RPS HEP (generating total ~40MW)
vi. 33MW Unit-1, 2 & 3 at JS HEP (generating total ~32MW).

Antecedent scenario of network complex:

During antecedent condition, all 07 units at KTPS were running and generating approx. 1150MW, power was evacuating through 220kV KTPS-Sakatpura ckt-1,2,3 & 4, 220kV KTPS-Beawar ckt, 220kV KTPS-Bundi ckt and 220kV KTPS-Heerapura ckt. 220kV KTPS-Vatika ckt was under shutdown and 220kV KTPS-Kota(PG) D/C was in opened condition. 200MW Unit-2 at RAPS-A was generating 195MW. RAPS-A generation was evacuating through 220kV RAPS-A-Debari ckt and 220kV RAPS-A-RAPS-B tie line. 220MW Unit-3 at RAPS-B was under shutdown and 220MW Unit-4 at RAPS-B was generating approx. 170MW. RAPS-B generation was evacuating through 220kV RAPS-B-Chittorgarh D/C, 220kV RAPS-B-Debari ckt and 220kV RAPS-B-RAPS-C D/C tie lines. RAPS-C is further connected to 220kV Anta. 220/132kV Kota Sakatpura is having double main transfer bus scheme and bus bar protection is not available there. RPS HEP (generating ~40MW) and Jawahar Sagar HEP (generating ~32MW) also connected at 132kV level at Kota Sakatpura.

Antecedent scenario of the network complex is shown in Fig.24.

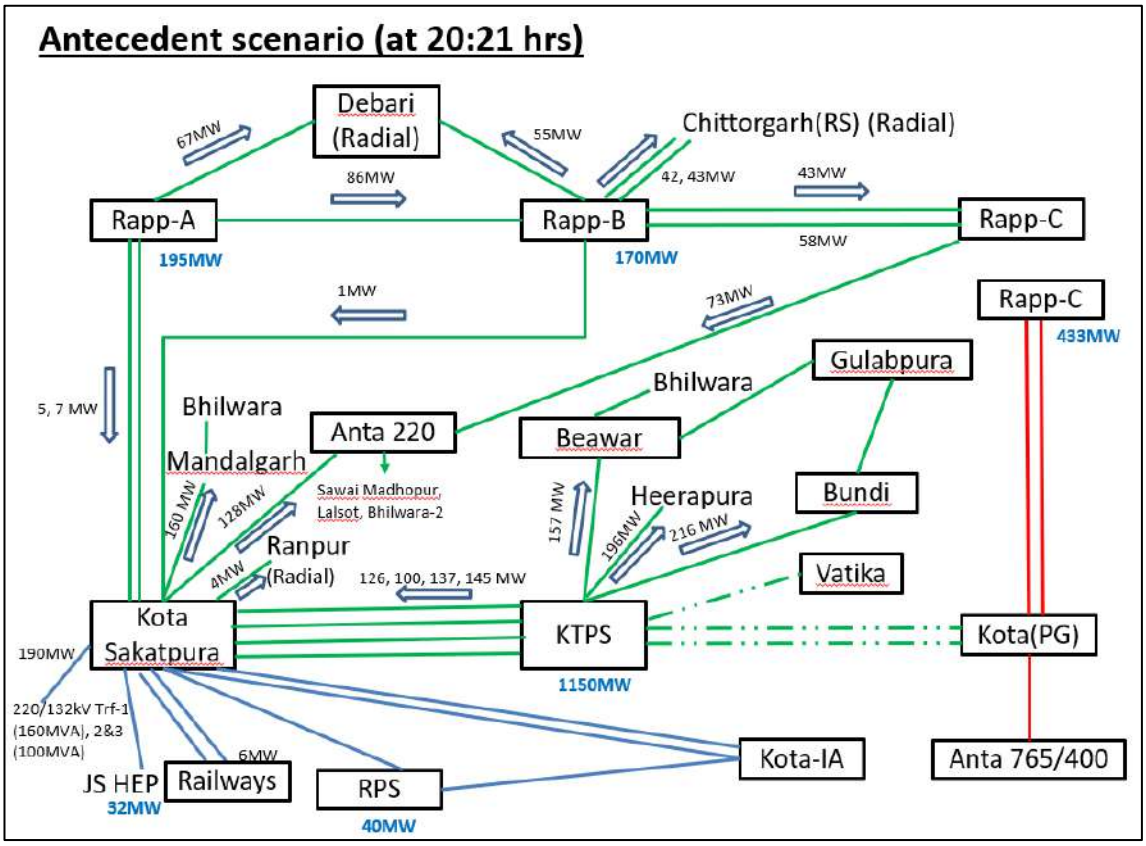


Fig.23 Antecedent scenario of the network complex

3.2.2 Sequence Of Events (SOE) and analysis

i. Sequence of event is mentioned as below:

S. No	Time	Event	Remarks
1	20:21:52 hrs	R-ph CT (220 kV side) of 220 kV/132 kV ICT-1 at Kota Sakatpura blasted and created bus fault. 220kV feeders to RAPS-A-I, Ranpur & Mandalgarh tripped from Kota Sakatpuraend in Z-4 and 220kV KTPS-Sakatpura ckt-1 & 3 tripped from KTPS end in Z-2.	Z-4 time delay setting at Kota Sakatpura:160 msec Z-2 time delay setting at KTPS of 220kV KTPS-Kota Sakatpura lines: 160 msec
2	After tripping of above lines, loading of remaining 220kV lines at KTPS & Kota Sakatpura increased significantly. Within approx. 600-700msec of fault, 220kV KTPS-Heerapura ckt, 220kV KTPS-Beawar ckt, 220kV KTPS-Bundi ckt, 220kV Bundi-Gulabpura ckt and 220kV Kota Sakatpura-Anta ckt tripped. Lines tripped on distance protection oepration during overloading condition /power swing.		
3	220kV RAPS-C-Anta ckt and 220kV RAPS-B-Kota Sakatpura ckt also tripped on Z-1 distance protection operation after power swing detection		
4	20:22:10 hrs	SUT-4 & GT-4 at RAPS-B, SUT-5 & SUT-6 at RAPS-C and KTPS units tripped on over frequency protection operation	Frequency reached above 51.5 Hz due to load generation imbalance
5	Island formed with RAPS-A unit-2 and load at 220kV Debari, 220kV Chittorgarh via 220kV RAPS-A-RAPS-B tie line and load at 220/132kV Kota Sakatpura via 220kV RAPS-A-Kota Sakatpura ckt-2		

6	20:29 hrs	Frequency dropped below 48Hz leading to operation of RAPS-A&B islanding scheme. As per scheme, 220kV RAPS-A-Kota Sakatpura ckt-2 tripped. Subsystem with RAPS-A unit-2 and load at Debari & Chittorgarh got islanded	Frequency recorded 47.8 Hz
7	20:47 hrs	Island collapsed due to tripping of RAPS-A unit-2 turbine generator on over fluxing (~112.5%),	Voltage recorded just before the tripping at RAPS_A was ~282kV

ii. Triggering incident: - R-ph CT (220 kV side) of 220 kV/132 kV ICT-1 at Kota Sakatpura blasted. 220kV feeders to RAPS-A ckt-1, Mandalgarh, KTPS ckt-1&3 and Anta ckt were connected at the same 220kV bus.

iii. Bus bar protection is not available at Kota Sakatpura S/s and Z-4 time delay setting is kept as 160msec. Z-2 time delay setting of 220kV KTPS-Sakatpura ckt-1,2,3 & 4 are also kept as 160msec at KTPS end due to non-availability of bus bar protection at Kota Sakatpura.

iv. On this fault, 220kV feeders to RAPS-A-I, Ranpur & Mandalgarh from Kota Sakatpura tripped on Z-4 distance protection at Kota Sakatpura end within approx. 200msec of fault. 220kV KTPS-Sakatpura ckt-1 & 3 also tripped on Z-2 distance protection operation at KTPS end within approx. 200msec of fault. 220/132kV ICT-1 at Kota Sakatpura also tripped on differential protection operation. Scenario after tripping of mentioned lines is shown in Fig.25. Fault bus also got isolated within ~200msec on tripped of bus sectionalizer on operation of O/C E/F protection.

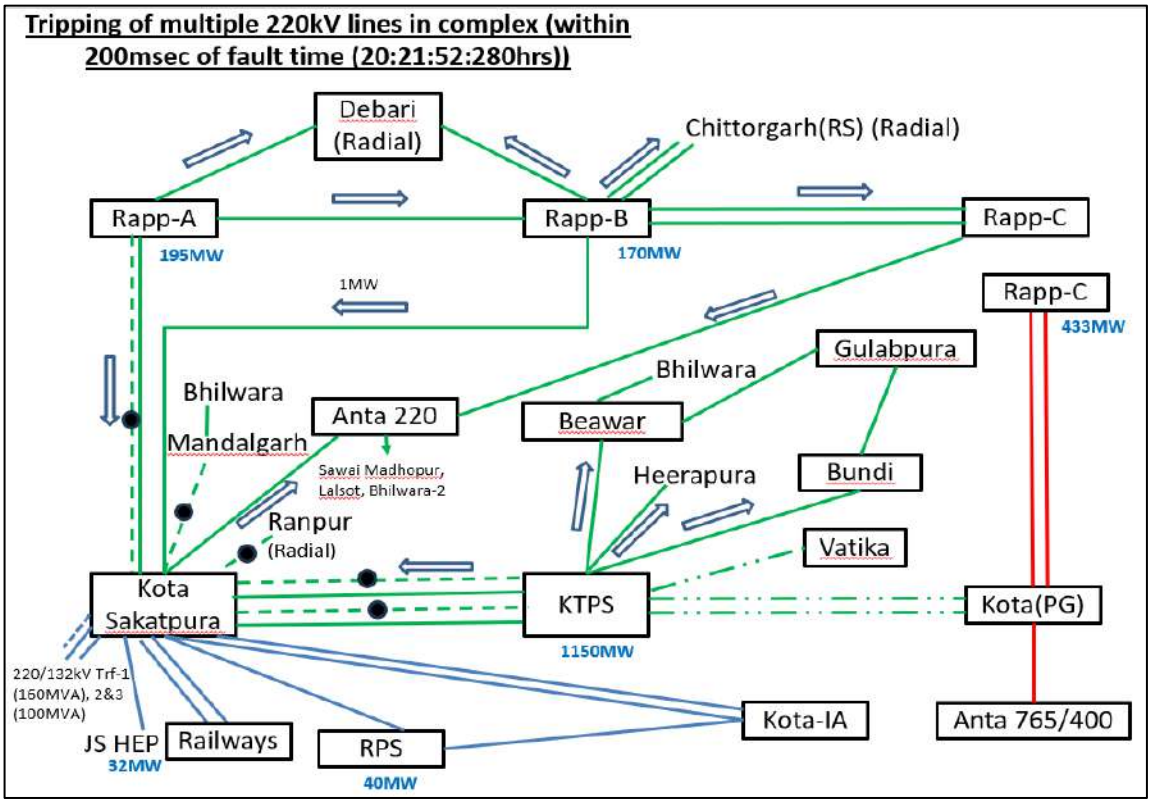


Fig.24 Tripping of multiple 220KV lines within 200msec of fault time

v. As per PMU plot of phase voltage of 220kV KTPS-Heerapura ckt (Fig 26), R-N fault converted into 3-ph fault with delayed clearance of 760msec is observed.

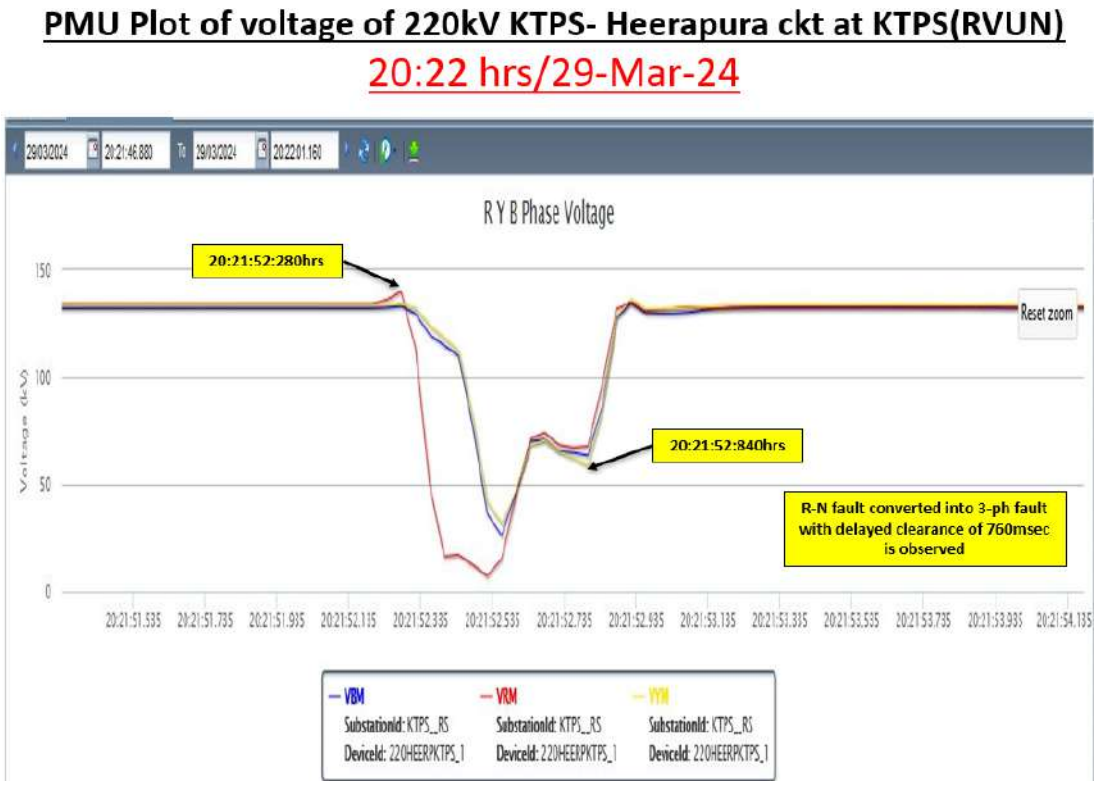


Fig.26 PMU plot of phase voltage of 220kV KTPS-Heerapura ckt

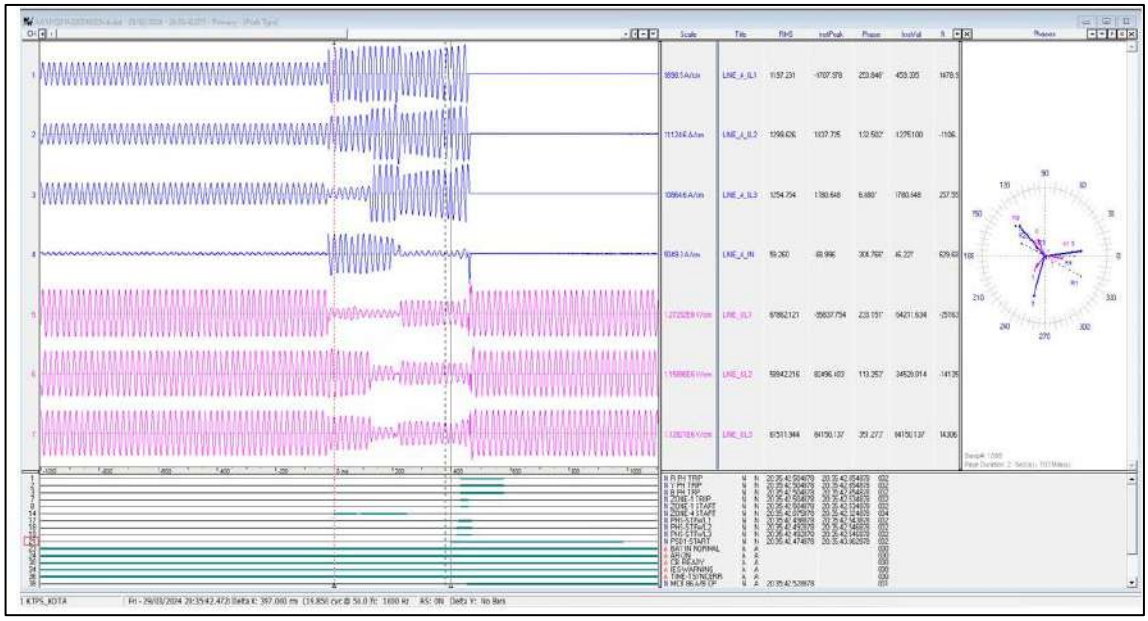


Fig.27 DR of 220kV KTPS-Sakatpura ckt at KTPS end

vi. As per DR of 220kV KTPS-Sakatpura ckt at KTPS end (Fig 27), R-N fault cleared within 200msec. Neutral current also reduced from ~450A to ~40A and distance protection also got reset. However, as remaining lines got significantly overloaded, further voltage dip in all three-phase occurred. Power swing also detected in 220kV lines due to significantly high loading (~400-500MW).

vii. Hence, after analysing PMU & DR data, it is observed that R-N fault cleared within 200msec. Further voltage dip is due to significantly high loading of 220kV lines.

viii. Due to tripping of aforementioned 220kV lines (as shown in Fig 25), loading of remaining 220kV lines at KTPS & Kota Sakatpura increased significantly. Within approx. 600-700msec of fault, 220kV KTPS-Heerapura ckt and 220kV KTPS-Beawar ckt tripped on Z-1 distance protection operation after power swing detection, 220kV KTPS-Bundi ckt & 220kV Bundi-Gulabpura ckt and 220kV Kota Sakatpura-Anta ckt tripped on distance protection operation suspected due to load encroachment. Scenario after tripping of mentioned lines is shown in Fig.28.

ix. Further, 220kV RAPS-C-Anta ckt and 220kV RAPS-B-Kota Sakatpura ckt also tripped on Z-1 distance protection operation after power swing detection (Fig.28).

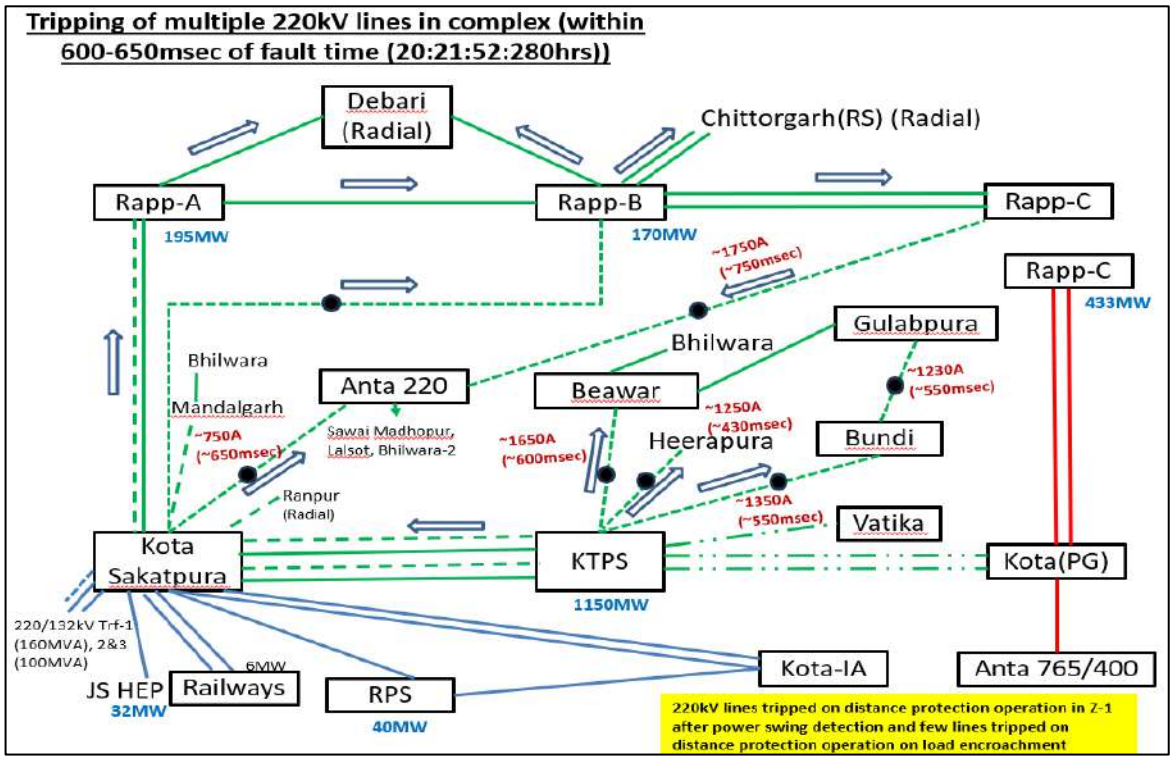


Fig.28 Tripping of multiple 220KV lines within 600-650msec of fault time

x. Further, at approx. 20:22:10hrs, SUT-4 at RAPS-B tripped on over frequency protection operation (setting: 51.5Hz with 200msec delay to initiate the ATS) followed by tripping of GT-4 (setting: 51.5Hz with 500msec delay). Auto transfer initiated however, ATS blocked, resulting in one PCP (Primary Coolant Pump) tripping followed by reactor tripping on PHT (Primary Heat Transport System) pressure high.

xi. At the same time, SUT-5 & SUT-6 at RAPS-C tripped on over frequency (51.5 Hz with 200 msec time delay to initiate the ATS). Auto transfer scheme initiated in both Unit-5 & 6 however it failed due to frequency mismatch between both the side of auxiliary bus. Subsequently reactors of RAPS-5&6 tripped on PHT pressure high. Highest frequency recorded at 220kV side was ~53.16Hz. DR of SUTs showing frequency profile is attached in **Annexure-III.**

xii. At the same time, all seven units of KTPS tripped on over frequency protection operation.

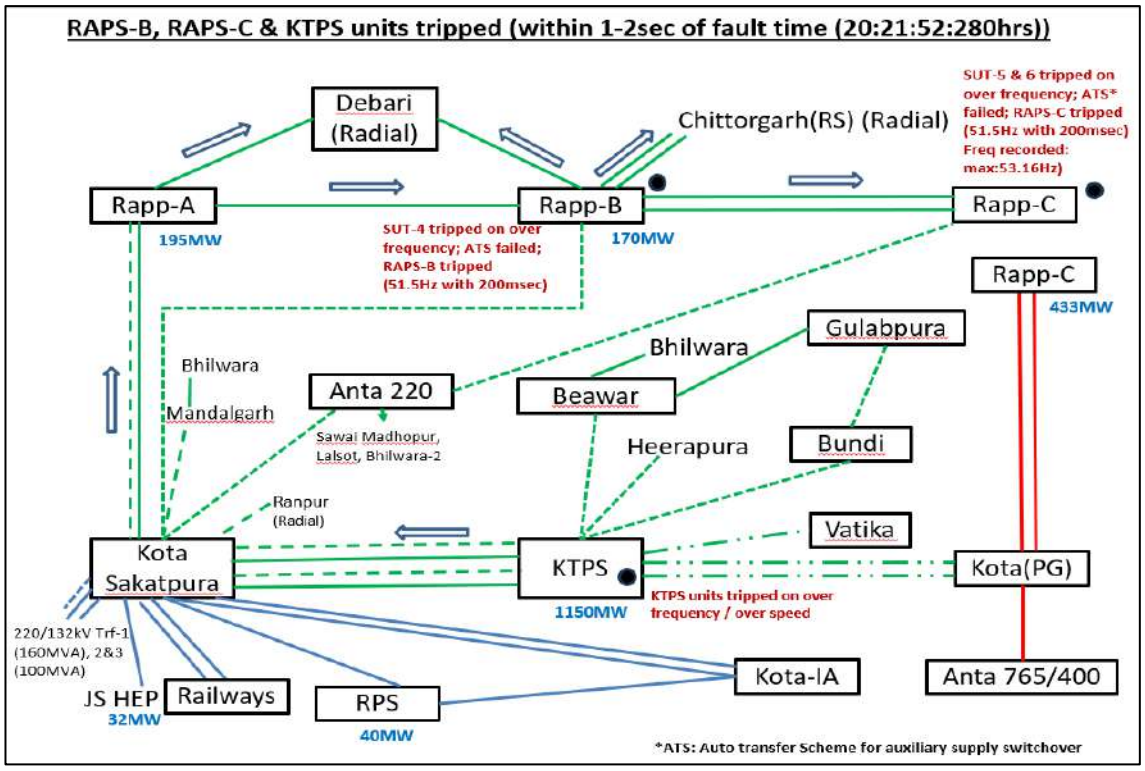


Fig.29 Tripping of units of RAPS-B, RAPS-C & KTPS within 1-2sec of fault time

xiii. After aforementioned trippings, only RAPS-A unit-2 was available which was feeding 220kV Debari, 220kV Chittorgarh via 220kV RAPS-A-RAPS-B tie line and load at 220/132kV Kota Sakatpura via 220kV RAPS-A-Kota Sakatpura ckt-2. It is suspected that this system was operating in island mode as there was no connectivity available with the grid. (Fig 30)

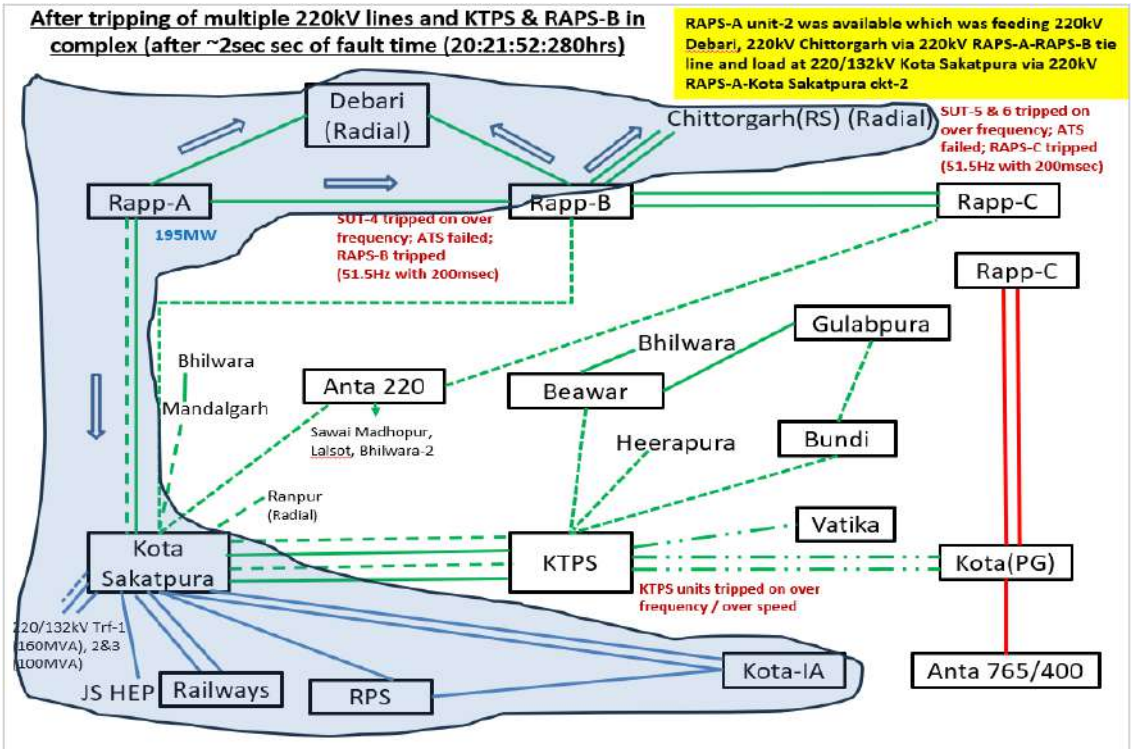


Fig.30 After tripping of RAPS, KTPS generation (after ~2sec of fault)

xiv. Further at 20:29hrs, frequency decreased to 47.8Hz and 220kV RAPS-A-Kota Sakatpura ckt-2 tripped on under frequency as per islanding scheme.

xv. With this tripping, system with RAPS-A unit-2 and load at Debari & Chittorgarh got islanded. RAPS-A generation was reduced to 160MW. Island operated till approx. 20:47hrs, frequency of island was maintained in the range of 51-52Hz and voltage was in the range of 230-240kV. Further, at ~20:47hrs, RAPS-A unit-2 turbine generator tripped on over fluxing (~112.5%), voltage recorded just before the tripping was ~282kV.

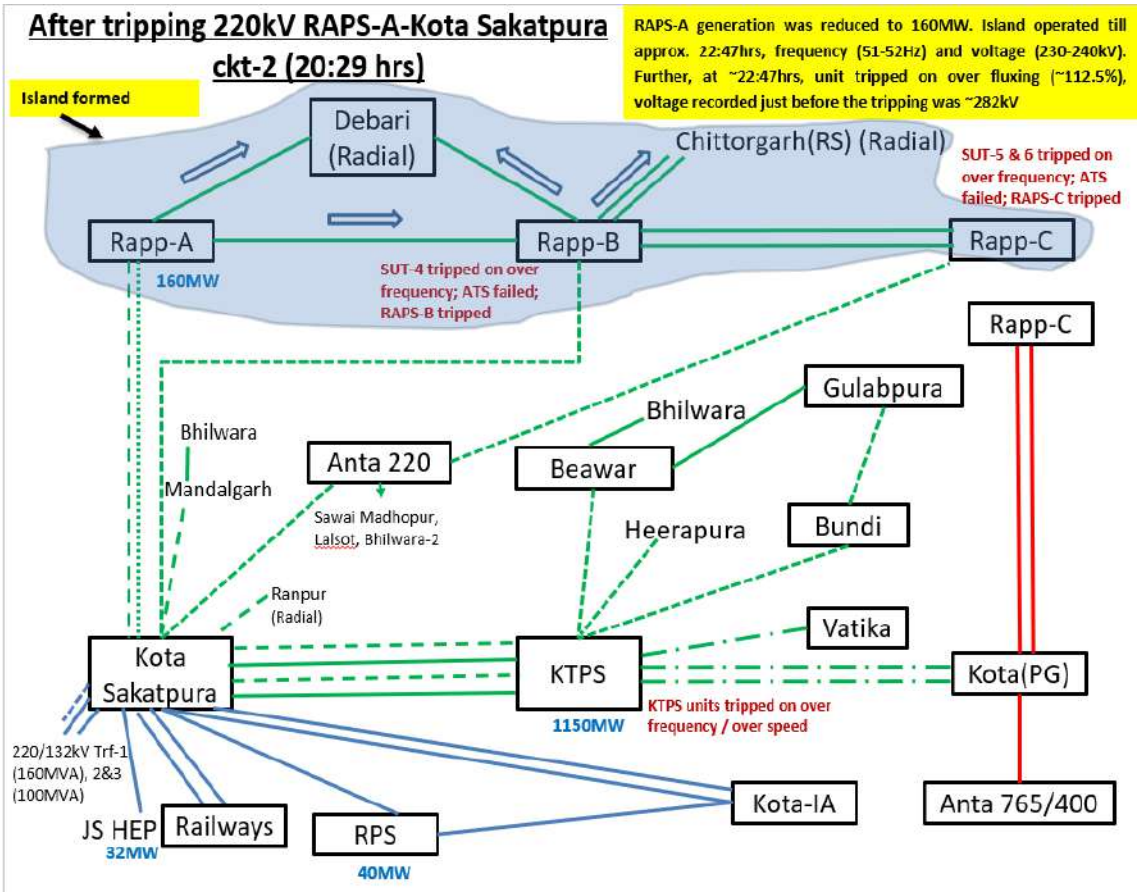


Fig.31 Island formation Scenario

xvi. As per SCADA, load loss of approx. 308 MW is observed in Rajasthan control area and total change in generation of approx. 2020MW is observed. Generation of KTPS, RAPS-A, RAPS-B, RAPS-C, RPS HEP and JS HEP affected during the vent.

DR file of all the tripped elements along with the SCADA & PMU plots w.r.t. both the grid events are attached as Annexure-III.

Chapter 4: Observations from the Grid Events and Action taken

4.1 Observations

i. **Limited connectivity of the complex with grid:**
   a. Most of the load stations were radially fed i.e., 220kV Debari, Chittorgarh, Ranpur.
   b. Complex was connected to grid at node point 220kV Anta and 400/220kV Bhilwara only. 220kV KTPS-Kota(PG) D/C were in opened condition since long which could have provided path for evacuation of generation in the complex during the event.
   c. In case of 1st grid event (05.01.2024), tripping of multiple lines during early morning hours on phase to earth fault (due to fog) further deteriorated the connectivity in the complex.

ii. **Overloading of transmission lines in the complex**
   a. Most of the load stations are connected through single circuit lines i.e., 220kV Vatika, Bundi, Heerapura etc. and feeders were running in overloaded conditions. In case of 1st grid event (05.01.2024), 220kV Bundi and Vatika were loaded at ~288MW & 214MW respectively.
   b. Tripping of adjacent lines in the complex led to cascade tripping during overloading conditions. If line loading would have maintained in permissible range, cascade tripping could be avoided. Timely instruction for generation backdown could also have avoided overloading in the complex.

iii. **Protection system related issues in the complex**
   a. During the 1st event (on 05.01.2024), in most of the lines tripped on single phase to earth fault, A/R operation at one or both the ends also not observed. Healthiness of A/R and its proper operation need to be ensured to avoid tripping of line on transient single phase to earth fault.
   b. During the 2nd event (on 29.03.2024), non-availability of bus bar protection at 220/132kV Kota Sakatpura S/s led to tripping of multiple bus at 220kV Anta Sakatpura S/s which triggered the grid event.
   c. Frequent tripping of 220kV lines evacuating from RAPS-A&B have been observed since long and it has been highlighted at various forums for necessary actions at Rajasthan(RVPNL) end. Poor reliability of evacuating lines from RAPS, affects the security of the complex.

iv. **Auto Transfer Scheme (ATS) and auxiliary supply system at RAPS**
   a. Half of the auxiliary supply of RAPS C (connected at 400kV side) is fed from 220kV side at RAPS B. During both the grid events, RAPS C units also tripped due to disturbance at 220kV side due to unsuccessful ATS operation due to frequency mismatch between 220kV & 400kV side during disturbance. As 220kV side of the complex is not completely stable, auxiliary supply system of RAPS C should be completely shifted from RAPS A & B complex.
   b. During the 1st event (on 05.01.2024), RAPS B unit successfully came to house load and operated for around ~1.5 hours. However, Unit couldn't be able to restore

back to grid mode due to some mechanical / wiring related issue at RAPS end. Provisions for the availability of alarms in the control room for such issues may be explored so that such issues can be attended beforehand and will help in decision making during real time scenario.

c. During the 2nd event (on 29.03.2024), RAPS B unit also couldn't able to come to house load due to unsuccessful switching of auxiliary supply due to issue in ATS operation logic. Operation logic of ATS should be robust, taking care of multiple possible scenarios to get desired feasible outcome through its operation.

v. Island operation scheme of RAPS complex

During the 2nd event (on 29.03.2024), the island scheme of RAPS operated when frequency in the complex touched 47.8Hz during the disturbance. Island operated for ~15 minutes and in islanded mode of operation, RAPP-A generator remained connected to radial load (165 MW) through RAPP-A and RAPP-B tie line with 4 no. of transmission lines (RAPP-A Debari, RAPP-B Debari, RAPP-B chhitorgarth-1 and 2).

a. The reason for island collapse was tripping of TG on over fluxing protection. During investigation, it was found that the instantaneous contact of over fluxing relay of (GTT21) was wired in trip lockout circuit instead of time delay contact.
b. It is also observed that actual connectivity and load operation in the complex differs significantly from the approved islanding scheme. To ensure the successful operation of the islanding scheme, actual connectivity and load profile should match the approved islanding scheme approximately.

vi. Suspected or Incorrect SCADA data

a. It was observed that the SCADA data of RAPS-A, B & C after the event freezed. Tripping status and MW flow value of few of the lines (220kB RAPS_A-Debari line from RAPS-A and 220kV RAPS_A-RAPS_B tie line from RAPS-A end) was showing incorrectly.
b. Tripping of all the elements were also not recorded in SCADA SOE.
c. Incorrect data and status during real time affect the real time decision making and unavailability of SCADA / SOE data of the event affects the grid event analysis.

4.2 Action taken

4.2.1 Review of Auto Transfer Scheme (ATS) at RAPS

In both the events, the role of ATS was important. RAPS-5&6 in both incidents tripped due to unsuccessful Auto Transfer due to frequency difference between the outgoing and incoming sources, i.e. the 220 kV - SUT fed buses were operating at high frequency, whereas Generator – UT fed buses were at nominal frequency.

RAPS-3 was under project mode (planned shutdown) during both incidents. On 5th January 2024, RAPS-4 came on house load, but tripped on process parameter, whereas on 29.03.2024, ATS was successful but subsequently UT LVCB tripped as tie CB between RAPS-4 & RAPS-3 was closed.

As per existing logic, whenever tie CB between units at 6.6 kV levels is closed, the ATS of the unit is blocked. The logic was temporarily modified till RAPS-3 was under project mode. On 26/7/2024 RAPS-3 synchronized to the grid and actual logic is restored.

NPCIL reviewed the ATS scheme and following changes have been incorporated to ensure the successful ATS operation and successful transfer of auxiliary supply shall occur:

i. RAPS-5&6 shall modify the software of BTS-2000 relay to ensure that the ATS shall take places within 200msec:

   The earlier version of BTS software did not attempt any types of transfers if it encountered "BTS not ready" situation at the first instant after the initiation. Whereas, the modified logic continuously checks for BTS permissiveness for the entire BTS period of 700 msec.

   This software upgradation work has been done in ATS system of unit-5 at RAPS C and pending in unit-6 at RAPS C.

ii. Initiation of ATS at RAPS C prior to the suspected major grid events based on following condition:
   a) On over frequency and under frequency or when 220kV RAPS-Anta line gets overloaded up to ~250MW or Anta line trips on load encroachment.
   b) When phase difference between both the auxiliary power supply (6.6kV power supply from SUT (220kV side) and 6.6kV power supply from GT/UT (400kV side)) is less than or equal to 40degree.

   When both the above criteria meet then, ATS will be initiated. This logic has also been implemented in unit-5 at RAPS C and pending in unit-6 at RAPS C. This logic will ensure that transfer of auxiliary supply occur before the major disturbance or parameter variations at 220kV side.

The aforementioned changes in Auto Transfer Scheme (ATS) will enhance the chances of its successful operation. Changes in ATS scheme for one unit of RAPS-C is under design stage by NPCIL.

4.2.2 Action Taken on protection related issues:

i. Generator over flux protection in RAPS-A Unit has been reviewed and corrected.
ii. Bus bar protection at 220kV Kota Sakatpura S/s was commissioned on 09.07.2024.
iii. Time delay setting in Z-2 distance protection in 220kV KTPS-Kota Sakatpura lines have been revised to 200 msec which was earlier 160msec.
iv. Replacement of earth wire and insulators, installation of bird guard are being done by RVPNL in 220kV RAPS_A-Kota Sakatpura D/C and 220kV RAPS_B-Kota Sakatpura line. This will help in minimizing frequent tripping of line.

4.2.3 Action Taken on network re-configuration:

i. Following changes have been done in the complex. It has enhanced the connectivity in the complex and also provided enough paths for evacuation of the generation in complex.
   a. 220kV KTPS-Kota(PG) D/C was closed
   b. 220kV Chittorgarh-Chittorgarh(400/220kV) line was closed along with 220kV Chittorgarh-Sewa Line and 220kV Chittorgarh-Hamirgarh line.
   c. 220 kV Kota Sakatpura-Mandalgarh line was closed and integrated operation at 220 kV GSS Mandalgarh & Bhilwara started
   d. Split bus arrangement at 220 kV GSS Sakatpura (220kV Bus-D is separated from 220 kV Bus-A, B & C)
   e. Load of 220kV Ranpur S/s & Morak S/s are being directly fed from Bhanpura S/s (Western Region). Connectivity of Ranpur from KTPS and Kota Sakatpura has been shifted to separate bus.

ii. Impact of changes done in the complex is described in below table:

S. No	Network changes done	Date of changes done	Impact of network changes in the complex
1.	Closing of 220 kV S/C Sakatpura-Mandalgarh line alongwith integrated operation at 220 kV GSS Mandalgarh & Bhilwara	04.03.2024	i. Previously 220 kV GSS Mandalgarh was radially fed from 400 kV GSS Kota(PG) through 220 kV S/C Kota(PG)-Bhilwara(split bus)-Mandalgarh line. ii. After closing of 220 kV S/C Sakatpura-Mandalgarh line system at Mandalgarh along with integrated operation at Mandalgarh & Bhilwara additional power flow line is available which reduce the power flow from Sakatpura to RAPP generation complex in emergent system conditions.
2.	Closing of 400 kV D/C KTPS-Kota(PG) line (charged at 220 kV voltage level	01.04.2024	i. Thermal Capacity of 400 kV D/C KTPS-Kota(PG) line (charged at 220 KV voltage level) : 476 MVA/ckt (1250 Amp CTs are installed on the line). ii. In emergent system condition by-directional power flow has been observed on 220 kV D/C KTPS-Kota(PG) line which provide the stability in the KTPS & RAPP Generation complex in normal as well as in emergent system conditions.
	Closing of 220kV Chittorgarh-Chittorgarh(400/220kV)		i. This creates 220 kV ring system at 220 kV GSS Chittorgarh and reduces the over loading on 220 kV S/C RAPP(C)-Anta line in

3.	line along with 220kV Chittorgarh-Sewa Line and 220kV Chittorgarh-Hamirgarh line	17.04.2024 & 16.07.2024	normal condition as well as in emergent conditions. ii. Power flow on 220 kV D/C RAPP(B)-Chittorgarh line increased. iii. Previously 220 kV GSS Debari (approx. Load 150-200 MW) and Chittorgarh (approx. Load 150-200 MW) was radially connected from RAPP Complex and in emergent conditions whenever power was flow from Sakatpura to RAPP complex, 220 kV S/C RAPP_C-Anta line was used to trip on overload. Now additional power which is injected in RAPP complex from Sakatpura is distributed/shared in three 220 kV circuits viz. 220 kV D/C RAPP(B)-Chittorgarh line and 220 kV S/C RAPP(C)-Anta line and reduce the possibility of outage of 220 kV S/C RAPP(C)-Anta line on overload which was observed during the incident of 05.01.2024 and 29.03.2024.
4.	Creation of additional 220 kV S/C KTPS-Ranpur (Bus-2)– Sakatpura(Bus-D)- Dahra line by utilizing opened 220 kV S/C KTPS-Ranpur line & 220 kV S/C Ranpur – Sakatpura line and Split bus arrangement at 220 kV GSS Sakatpura (Bus-D is separated from 220 kV Bus-A,B &C)	18.04.2024	i. This creates additional evacuation line from KTPS upto extent of 220 kV GSS Dahra load (150 to 200 MW) ii. Split bus arrangement at 220 kV GSS Sakatpura reduce the no. of outage of 220 kV lines at Sakatpura under in emergent system conditions

Chapter 5: Load Flow Analysis

5.1 A system study on PSSE (load flow and contingency analysis) was done in the complex to review the effect of revised connectivity in the complex. Details of the study conducted is described below.

i. Load flow study and contingency analysis was performed for some emergent system conditions for following two scenarios:
   a. Scenario-A: Without additional connectivity (as per table-1) in KTPS & RAPP generation complex
   b. Scenario-B: With additional connectivity (as per table-1) in KTPS & RAPP generation complex

ii. Parameters considered for base case are as follows:
   a. Rajasthan Demand: 16000 MW
   b. Intra State Solar Power Generation in Rajasthan: 3662.30 MW (IC: 4946.50 MW) (74.03% of IC)
   c. Intra State Wind Power Generation in Rajasthan: 586.57 MW (IC: 4342.94 MW) (13.5% of IC)
   d. Thermal power generation in Rajasthan (excluding Auxiliary consumption): 5989.49 MW (9645.5 MW) (62.09% of IC)
   e. Hydro power generation in Rajasthan (excluding Auxiliary consumption): 68 MW (IC: 411 MW) (16% of IC) Inter State Solar Power Generation in Rajasthan: 10772.03 MW (IC: 17716.906 MW) (60.80% of IC)
   f. Tie line flows in Rajasthan Control area: 4598.9 MW
   g. Generation profile considered in the complex is as per below table:

S. No.	Name of Power PLant	Installed Capacity (MW)	Net Generation (Excluding aux. consumption) (MW)	% Generation	Remark
A	**Kota Thermal Power Station**				
1	Unit-1	110	99	90	-
2	Unit-2	110	99	90	-
3	Unit-3	210	189	90	-
4	Unit-4	210	189	90	-
5	Unit-5	210	189	90	-
6	Unit-6	195	176	90	-
7	Unit-7	195	176	90	-
	Total(A)	**1240**	**1117**	**90**	-
B	**Nuclear Power Stations**				
	RAPP-A				
	Unit-2	200	180	90	-
	RAPP-B				
	Unit-3	220	198	90	-
	Unit-4	220	198	90	-
	RAPP-C				
	Unit-5	220	198	90	-
	Unit-6	220	198	90	-
C	**Anta GAS THERMAL POWER STATION**				
i	Unit-1	88.71	RSD		
ii	Unit-2	88.71	RSD		
iii	Unit-3	88.71	RSD		
iv	Unit-4	153.2	RSD		
v	Anta GTPS Solar Generation	87.5	0 MW		

iii. Study result of different contingencies considered along with the observations for both the scenarios is described in below table:

S. No	Case / Contingency	Scenario	
1.	Base Case	A	i. Power flow from RAPP Complex to Sakatpura: 112 MW ii. Reverse power flow (from Sakatpura to RAPP Complex): 0 MW iii. Line loading profile: Loading of all the 220kV Line is within limit
		B	i. Power flow from RAPP Complex to Sakatpura: 108 MW ii. Reverse power flow (from Sakatpura to RAPP Complex): 0 MW iii. Line loading profile: Loading of all the 220kV lines is within limit
2.		A	i. Power flow from RAPP Complex to Sakatpura: 0 MW ii. Reverse power flow (from Sakatpura to RAPP Complex): 14 MW iii. Line loading profile: Overloading in following lines:

	Outage of 220 KV S/C Sakatpura-Anta GTPS line		a. 220kV S/C RAPP(C)-Anta GTPS line: 300 MW b. 220kV S/C KTPS-Heerapura line: 224 MW c. 220kV S/C KTPS-Bundi line: 239 MW
		B	i. Power flow from RAPP Complex to Sakatpura: 42 MW ii. Reverse power flow (from Sakatpura to RAPP Complex): 0 MW iii. Line loading profile: Loading of all the 220kV Line is within limit a. 220kV S/C RAPP(C)-Anta GTPS line: 186 MW b. 220kV S/C KTPS-Heerapura line: 134 MW c. 220kV S/C KTPS-Bundi line: 139 MW
3.	Outage of 220 kV S/C KTPS-Heerapura line	A	i. Power flow from RAPP Complex to Sakatpura: 72 MW ii. Reverse power flow (from Sakatpura to RAPP Complex): 0 MW iii. Line loading profile: Overloading in following lines: a. 220kV S/C RAPP(C)-Anta GTPS line: 214 MW b. 220kV S/C KTPS-Bundi line: 248 MW c. 220 KV S/C Sakatpura-Anta GTPS Line: 291 MW
		B	i. Power flow from RAPP Complex to Sakatpura: 72 MW ii. Reverse power flow (from Sakatpura to RAPP Complex): 0 MW iii. Line loading profile: Loading of all the 220kV Line is within limit a. 220kV S/C RAPP(C)-Anta GTPS line: 129 MW b. 220kV S/C KTPS-Bundi line: 176 MW c. 220 KV S/C Sakatpura-Anta GTPS Line: 166 MW
4.	Outage of 220 KV S/C KTPS-Beawar line	A	i. Power flow from RAPP Complex to Sakatpura: 92 MW ii. Reverse power flow (from Sakatpura to RAPP Complex): 0 MW iii. Line loading profile: Overloading in following lines: a. 220kV S/C KTPS-Bundi line: 247 MW b. 220 KV S/C Sakatpura-Anta GTPS Line: 259 MW

		B	i. Power flow from RAPP Complex to Sakatpura: 98 MW ii. Reverse power flow (from Sakatpura to RAPP Complex): 0 MW iv. Line loading profile: Loading of all the 220kV Line is within limit a. 220kV S/C KTPS-Bundi line: 183 MW b. 220 KV S/C Sakatpura-Anta GTPS Line: 159 MW
5.	Outage of all three circuits between Sakatpura-RAPP generation complex	A	i. Power flow from RAPP Complex to Sakatpura: 0 MW ii. Reverse power flow (from Sakatpura to RAPP Complex): 0 MW iii. Line loading profile: Overloading in following lines: a. 220 KV S/C Sakatpura-Anta GTPS Line: 286 MW
		B	i. Power flow from RAPP Complex to Sakatpura: 0 MW ii. Reverse power flow (from Sakatpura to RAPP Complex): 0 MW iii. Line loading profile: Loading of all the 220kV Line is within limit a. 220 KV S/C Sakatpura-Anta GTPS Line: 171 MW
6.	Outage of 220 kV S/C Sakatpura-Anta GTPS line and 220 kV S/C KTPS-Heerapura line	A	i. Power flow from RAPP Complex to Sakatpura: 0 MW ii. Reverse power flow (from Sakatpura to RAPP Complex): 114 MW iii. Line loading profile: Overloading in following lines: a. 220kV S/C RAPP(C)-Anta GTPS line: 399 MW b. 220kV S/C KTPS-Bundi line: 218 MW c. 220 KV S/C KTPS-Beawar line: 214 MW
		B	i. Power flow from RAPP Complex to Sakatpura: 12 MW ii. Reverse power flow (from Sakatpura to RAPP Complex): 0 MW iii. Line loading profile: Loading of all the 220kV Line is within limit a. 220kV S/C RAPP(C)-Anta GTPS line: 196 MW b. 220kV S/C KTPS-Bundi line: 183 MW c. 220 KV S/C KTPS-Beawar line: 88 MW

iv. There was concern that due to closing of 220kV KTPS-Kota(PG) D/C, there would be heavy power import from Kota(PG) to KTPS during some scenarios. This will create the hotspot related issues in KTPS switchyard. To review the same, RVPNL studied the different scenarios, and the observations are as follows:

a) Block wise Power flow on 220 kV KTPS-Kota(PG) D/C line during period of 21.5.2024 to 21.6.2024 (total 3072 blocks) were reviewed. Observation are as follows:

- It was observed that out of 3072 blocks, in 2330 blocks (76%), KTPS was exporting power to Kota(PG) and in 742 blocks (24%), there was power import at KTPS.
- Maximum loading on 220 kV KTPS-Kota(PG) D/C line during export from KTPS observed was 272 MW on 07.06.2024 at 19:30 hrs. and maximum loading during import at KTPS observed was 243 MW on 26.05.2024 at 10.45 hrs.
- Import at KTPS was observed either during outage of units at KTPS or during reduced generation operation.

b) RVPNL also conducted load flow and contingency analysis in the complex to study the effect on loading of 220 kV KTPS-Kota(PG) D/C line. Contingencies considered were outage of units and tripping of 220kV lines in the complex. Observation are as follows:

- Load flow during non solar hours: power export in the range of ~60 MW from KTPS to Kota(PG) is observed.
- Load flow during maximum solar generation and peak demand condition: power import in the range of ~170 MW at KTPS from Kota(PG) is observed.
- Contingency analysis during non solar hours: under outage of one unit at KTPS, power import at KTPS was ~42MW, under outage of two units at KTPS, power import at KTPS was ~146MW and under outage of 220kV lines in the complex, there was export from KTPS.

Load flow and contingency analysis report performed by RVPNL in the complex is attached as **Annexure-IV.**

Chapter 6: Impact during Grid Event in the complex after revision in Network

A multiple elements tripping event occurred on 21.06.2024 during which multiple 220kV lines tripped on fault during inclement weather condition. However, loading of the remaining adjacent 220kV lines remained within limit and no cascade tripping occurred. The recent changes done in the RAPS, KTPS generation complex provided alternate paths for the power evacuation which helped in avoiding overloading of remaining 220kV lines. The load profile of the complex during antecedent condition of the event and post event is shown below in Fig 32.

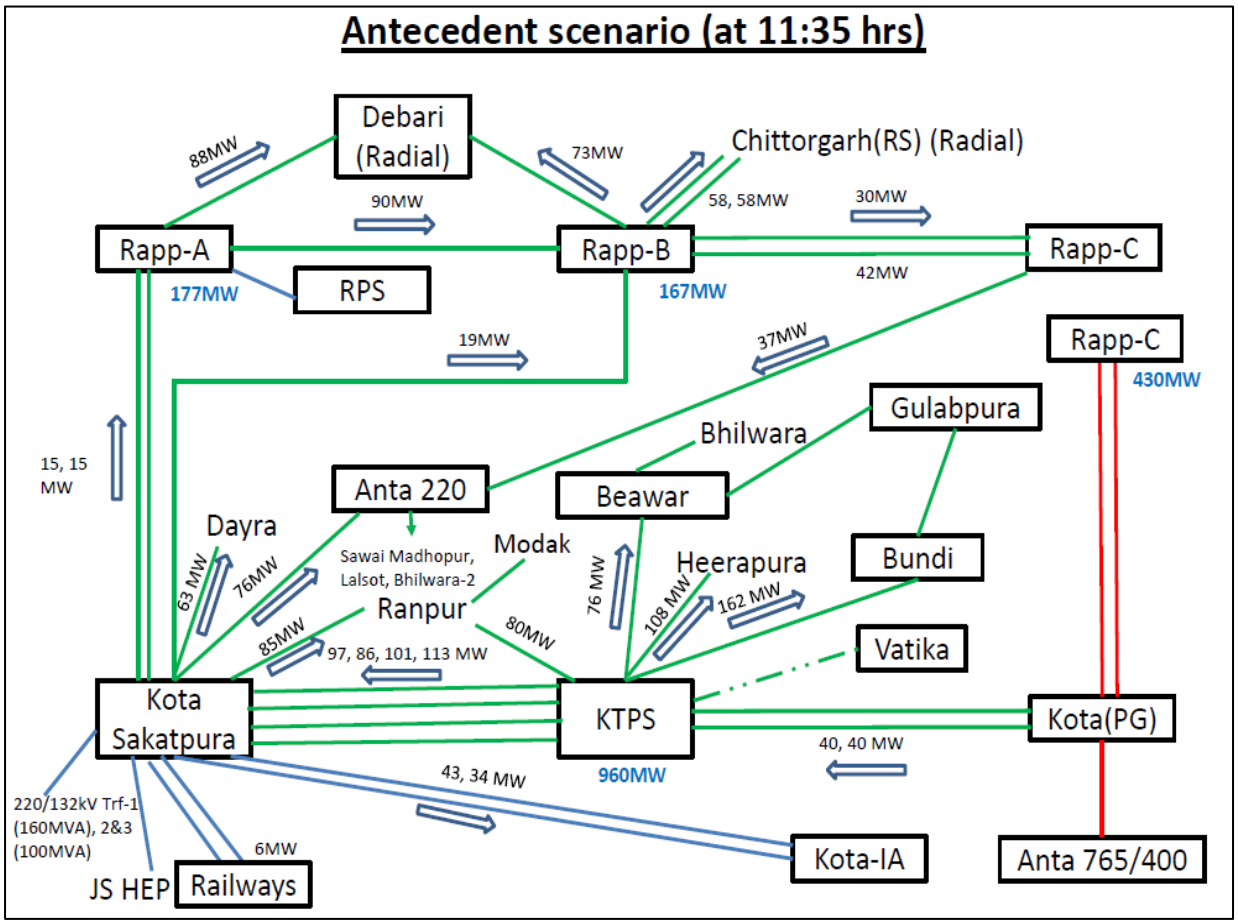


Fig. 32: load profile of the complex during antecedent condition

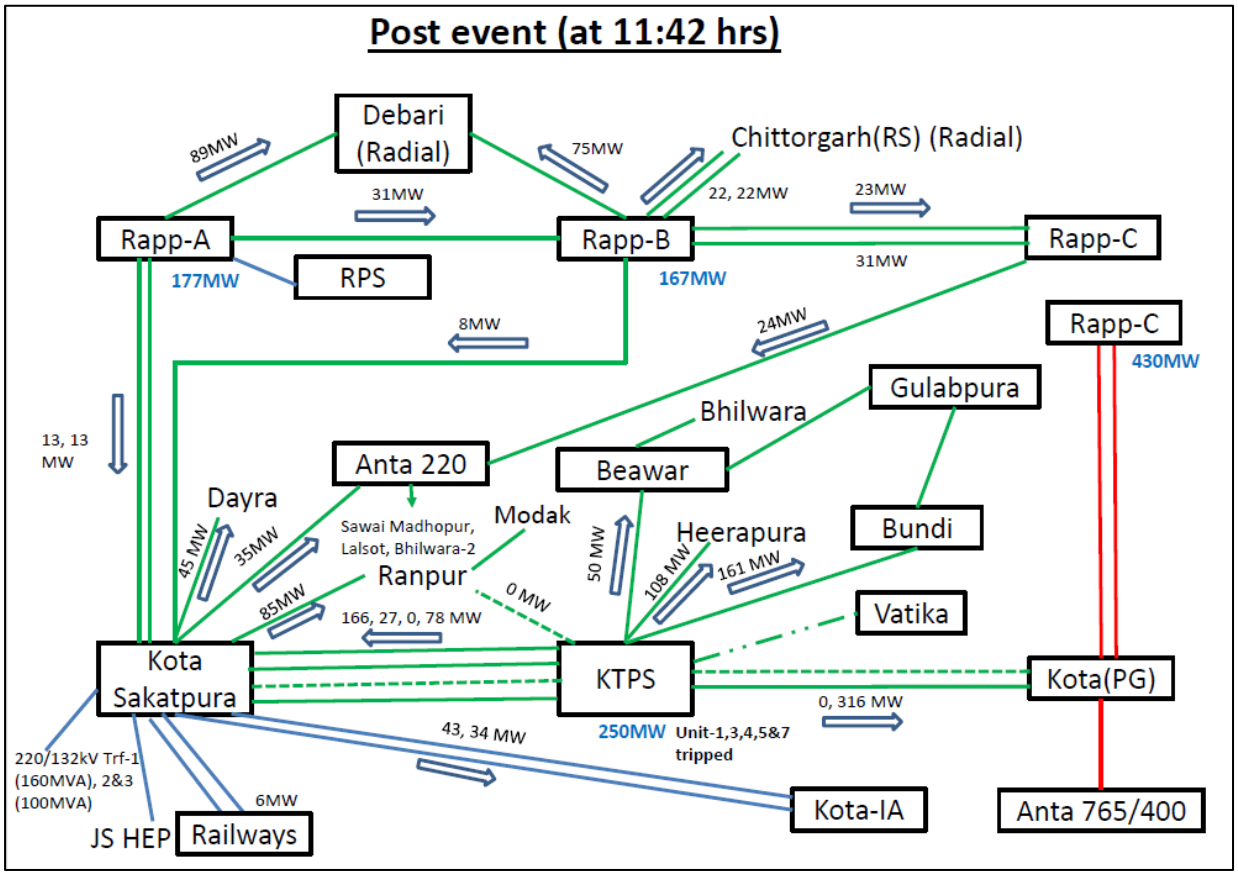


Fig. 33: loading of lines

From the above fig 33, it is evident that loading of the remaining 220kV lines increased however, it was in safe limit. After recent changes in the network, most of the radial loads were connected in grid mode. The changes in the network provided alternate paths for power evacuation i.e., loading of 220kV KTPS-Kota(PG) D/C changed from 80 MW towards KTPS to 316 MW towards Kota(PG). This ensured that loading of tie lines at RAPS remained in safe limit and no major grid event occurred. It shows that recent changes in the network are ensuring the reliability and security of the RAPS, KTPS complex.

Chapter 7: Review of Islanding Scheme in RAPS complex

It is observed that actual connectivity and load operation in the RAPS complex differs significantly from the approved islanding scheme.

During the 2nd event (on 29.03.2024), the island scheme of RAPS operated when frequency in the complex touched 47.8Hz during the disturbance. Island operated for ~15 minutes and in islanded mode of operation, RAPP-A generator remained connected to radial load (165 MW) through RAPP-A and RAPP-B tie line with 4 no. of transmission lines (RAPP-A Debari, RAPP-B Debari, RAPP-B chhitorgarth-1 and 2).

The reason for island collapse was tripping of TG on over fluxing protection. During investigation, it was found that the instantaneous contact of over fluxing relay of (GTT21) was wired in trip lockout circuit instead of time delay contact.

To ensure the successful operation of the islanding scheme, actual connectivity and load profile should match the approved islanding scheme approximately.

Committee in coordination with RVPNL reviewed the previous islanding scheme, analysed the present scenario and the following changes have been proposed:

i. 220kV Chittorgarh has already been connected to the grid. Further, it is proposed to connect the other load stations which are further connected in remote end of Chittorgarh to ensure the availability of sufficient load during any grid event.
ii. Load profile has been reviewed comprehensively. Peak and off-peak hours load profile, average and maximum demand value of 1st seven days of each quarter has been analysed. Average and maximum demand of peak hours are considered to reach the nearest possible load quantum during the island operation.
iii. It is also observed that actual average and maximum demand value was significantly different from what was approved in previous island scheme.
iv. There are many industrial load feeder at load stations which are having their own generation. RVPNL has informed that these industries generally draw the power from their own generation but in case of tripping of their own generation, they start drawing power from grid. Due to inadvertent nature of load demand at these industry feeders, such feeders are proposed to be kept out of island. Other industries with load of constant demand nature are included in the load.
v. RVPNL shall ensure that operative / blocked status of load feeders will be monitored and set as per the planned network condition. This is to ensure generation load balance during island formation.
vi. The brief details of RAPS islanding scheme are as follows:
    e. Island subsystem: Generating units at RAPS A & B and loads of 220kV Debari, Chittorgarh, Sawa, Nimbahera and Hamirgarh.
    f. Island Generation: 640 MW (RAPS A Unit-1: 200 MW, RAPS B Unit 1 & 2: 220 MW each).
    g. Island Load: 577 MW (Load of load stations: 507 MW, Auxiliary load of RAPS-A & B:70 MW (RAPS C auxiliary load excluded)
    h. Island setting: Triggering frequency 48.0 Hz.

Complete details of proposed RAPS islanding scheme in attached as **Annexure**-**V.**

Chapter 8: Committee Recommendations

i. Strong connectivity in the complex:

a) The number of changes in the connectivity in the complex have strengthened the complex. Radial paths have been minimised, and alternate evacuation paths have been made. With the changes in the complex, reliability of the complex has been improved. However, it needs to be ensured that any future changes in the connectivity in the complex should be done after load flow and contingency analysis in the complex.

b) The changes affecting the reliability in the complex should be avoided or to be done after comprehensive discussion among concern stakeholders. SLDC-Rajasthan shall also ensure the proper load management in the complex as per network condition to avoid any cascade tripping.

c) Further, proactive Intrastate Transmission planning for creating transmission adequacy in the complex is needed.

ii. Healthiness of protection system:

a) Protection system and their proper coordination need to be ensured. It is also to be ensured that protection system and their settings are kept in line with the standards and protection philosophy. Any changes in the protection philosophy should only be done after prior approval from NRPC.

b) Necessary preventive and corrective measures need to be taken by RVPNL to minimise the frequent tripping of 220kV lines evacuation from RAPS.

c) As mandated by IEGC, conducting Annual Self Protection Audit and Third-Party Protection Audit also need to be ensured.

iii. Healthiness of SCADA data and telemetry:

a) Telemetry of SCADA data and its healthiness is necessary for decision making during real time grid operation. Non availability of complete SCADA data and issue of wrong / unhealthy data have been observed due to unhealthy RTUs at site. Concerned may take expeditious actions to make all the RTUs in the complex healthy and ensure availability and healthiness of SCADA data of the complex.

b) Further, it is also observed that there is no PMU at RAPS A, B and Rajasthan stations in the complex. Nearest PMU is at Kota(PG) at 400kV level. As this complex is critical and frequent events have also been observed in this complex. Therefore, RAPS and Rajasthan may plan for Installation of PMU at 220kV level in the complex so that high resolution data of the complex may be captured which will be useful in monitoring and event analysis.

iv. Healthiness of ATS, protection & control system at RAPS:

a) The changes done in the ATS i.e., relay software upgradation, ATS logic review etc. will enhance the chances of successful ATS operation. However, the

upgradation in ATS is pending in Unit-6 at RAPS C. Expeditious implementation of necessary changes in ATS in Unit-6 at RAPPS C need to be ensured.

b) Necessary system for alarms / control panel annunciation to alert the control room operators at RAPS regarding any deficiency in control system or auxiliary system may also be explored. It will help in better decision making by control room operators at RAPS. Further, periodic review of ATS also need to be done.

v. Island subsystem and its operation:

a) Load generation balance in RAPS island scheme has been reviewed comprehensively. Necessary changes in network configuration and load profile of island scheme have been done to ensure the feasibility of island subsystem. Further, SLDC-Rajasthan shall ensure that the load generation balance in island subsystem (feasible G/L) is maintained all the time.

b) SCADA display of RAPS island subsystem along with telemetry of all the involved substations need to be ensured. RAPS may also explore the possibility to have the island subsystem network, data telemetry at their control room.

c) Island system and its operational logic also need to be reviewed on periodic basis.

---x---

Annexure-I

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

दिनांक: 06/06/2024

सेवा में,
As per attached list (via e-mail)

विषय:- Constitution of committee to review the protection system and load management in the KTPS, RAPS generation complex-reg.

Reference is invited to discussion held in the 50th PSC meeting (held on 29.04.2024) to review the protection system and load management in the KTPS, RAPS generation complex, wherein, it was decided that a committee may be formed having members from NRPC Secretariat, NRLDC, NLDC, POWERGRID, NPCIL, RVUNL (KTPS) and RVPN.

Based on received nominations, committee is formed having members as below-

1. Sh. Reeturaj Pandey, EE (Protection), NRPC Secretariat
2. Sh. D.K. Jain, SE (Protection Engg.), RVPN
3. Sh. M. P. Sharma, XEN (SOLD), Rajasthan SLDC
4. Sh. Harsh Singh, Superintending Engineer, RVUNL
5. Sh. Raman Jain, Executive Engineer, RVUNL
6. Smt. Jyoti Thakur, DGM, NPCIL
7. Sh. Manas R Chand, DGM, NLDC
8. Sh. Pankaj Pachoori, DGM, POWERGRID
9. Sh. Deepak Kumar, Dy. Mgr., NRLDC

The committee shall comprehensively review the protection system (including power swing blocking settings), load management, islanding scheme, SPS requirement, Auto Transfer Scheme at RAPS, and other related aspects in the RAPS, KTPS complex.

First meeting of the committee has been scheduled on **10.06.2024 (11:00 Hrs.)** via video conferencing. Meeting link shall be shared separately.

Kindly make it convenient to attend the meeting.

Signed by Dharmendra Kumar Meena
Date: 07-06-2024 10:22:40

डी. के. मीणा
अधीक्षण अभियंता (संरक्षण)

List of addressee:

1. Sh. Reeturaj Pandey, EE (Protection), NRPC Secretariat (pandeyr.cea@gov.in)
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3. Sh. M. P. Sharma, XEN (SOLD), Rajasthan SLDC (se.sold@rvpn.co.in)
4. Sh. Harsh Singh, Superintending Engineer, RVUNL (segmktps@gmail.com)
5. Sh. Raman Jain, Executive Engineer, RVUNL (raman_49559@rvun.in)
6. Smt. Jyoti Thakur, DGM, NPCIL (jyotidahiya@npcil.co.in)
7. Sh. Manas R Chand DGM, NLDC (manas@grid-india.in)
8. Sh. Pankaj Pachoori, DGM, POWERGRID (pankaj.pachoori@powergrid.in)
9. Sh. Deepak Kumar, Dy. Mgr., NRLDC (deepak.kr@grid-india.in)

TCR response.

A.19.7 POWERGRID representative stated that they will take up with the GE whether such feature can be enabled in Active Power Control mode. It was also informed that some modification in TCR software has been done which will try to damp out the oscillations. Regarding installation of PMU for TCR, POWERGRID stated that they will plan to install the PMU for TCR at Kurukshetra.

Decision taken by Forum:

Forum requested POWERGRID to take effective remedial actions to avoid tripping of 800kV HVDC Champa-Kurukshetra inter-regional link which is very important link for fulfilling the Northern Region demand requirement.

A.20. Review of protection system and load management in KTPS, RAPS generation complex in view of event of complete outage of the complex on 5th Jan24 & 29th Mar24 (agenda by NRLDC)

A.20.1 NRLDC representative apprised that on 29th March at 20:22hrs, multiple elements tripping occurred in RAPS, KTPS generation complex. KTPS, RAPS-A, RAPS-B & RAPS-C generation station got blackout during this incident. Initiating incident was blast of R-ph CT at 220kV side of 220/132kV 160MVA ICT-1 at Kota Sakatpura (Raj). As bus bar protection is not available at Kota Sakatpura S/s, few of the 220kV lines tripped on Z-4 protection operation and Z-2 protection operation at Kota Sakatpura & KTPS respectively. Simultaneously, the remaining 220kV lines got significantly overloaded and tripped on distance protection operation during power swing. Thereafter due to lack of evacuation path, over frequency occurred in systems and KTPS units tripped on over frequency. SUTs at RAPS-B tripped for initiation of house load operation but it failed. SUTs of RAPS-C also tripped for switching of auxiliary supply to UTs but it also failed due to mismatch in frequency. It resulted in the tripping of RAPS-B & C units. Island formed with RAPS-A unit with the load of Debari and Chittorgarh which operated till 20:47hrs and later collapsed due to tripping of turbine generator on over fluxing. Detail analysis report of the tripping event is available on the link https://nrldc.in/Websitedata/Docs/Documents/Tripping%20Report/Preminilary%20Report/2024/03%20Mar/2024_03_29_KTPS_RAPS_%20Grid%20event.pdf

A.20.2 He added that similar events of blackout in KTSP, RAPS generation complex occurred on 05th Jaunuary'24. Frequent disturbance in this complex having significant quantum of nuclear generation is serious issue. Necessary remedial actions at RAPS, KTPS and RVPN end need to be expedited to avoid any such event in future. Detail analysis report of the tripping event is available on the link https://nrldc.in/Websitedata/Docs/Documents/Tripping%20Report/Preminilary%20Report/2024/01%20Jan/2024_01_05_Grid%20event%20at%20%20KTPS_RAPS_Rajasthan.pdf

A.20.3 Deliberation on 05th January'24 event was done during 216 OCC meeting. KTPS, RAPS & Rajasthan are requested to take necessary remedial actions to take necessary remedial actions share the details of remedial actions taken as agreed during discussion in 216 OCC meeting. Further, an online meeting was conducted on 05th April 2024, RAPS, KTPS & SLDC-Rajasthan agreed to take following remedial actions:

RAPS:

i. Over flux protection in generator at RAPS-A was 112.5% instantaneously. Now, the time delay has been kept as 4sec on recommendation of NPCIL design team.

ii. During the event, when frequency reached 51.5Hz, SUT of unit-4 at RAPS-B tripped and ATS breaker closed successfully. However, it got blocked as there is tie breaker connected to auxiliary bus feeding unit-3 auxiliary supply.

On recommendation of design team, a logic has been implemented in which tie breaker will also trip along with SUT incomer breaker so that ATS scheme will not get blocked. Further review of ATS logic at RAPS-B is being done by NPCIL design team.

iii. SUT-5&6 tripped on over frequency (51.5Hz with 200msec delay) and initiated the ATS to shift the total auxiliary load on UTs. However, due to mismatch in frequency at both the side of auxiliary bus, ATS failed and units at RAPS-C tripped. Review of ATS logic at RAPS-C is being done by NPCIL design team.

iv. RAPS-C will explore the possibility of keeping total auxiliary load at 400kV side.

v. RAPS will take necessary remedial actions to ensure the healthiness and availability of SCADA data.

Rajasthan:

i. Commissioning of bus bar protection at 220/132kV Kota Sakatpura S/s will be expedited. (Rajasthan informed that material has been arrived, commission is getting delayed to workmanship. It will be commissioned in 2.5-3 months).

ii. 220kV KTPS-Kota (PG) D/C will be kept in closed condition. Rajasthan will prepare a SOP for monitoring of import/export through these lines for any decision making required.

iii. Rajasthan will connect the 220kV Chittorgarh with the 400/220kV Chittorgarh. It will strengthen the connectivity of RAPS with the grid. The possibility to operate 220kV Debari in ring may also be explored. (During 219th OCC meeting, Rajasthan informed that 220kV Chittorgarh has been connected with 400/220kV Chittorgarh on 17th April).

iv. Separate display of RAPS, KTPS generation complex to be made at SLDC control room for effective decision monitoring and decision making. (During 219 OCC meeting, Rajasthan informed that separate display of RAPS, KTPS complex has been made and effective monitoring is being done.).

v. Faulty RTUs also need to be rectified at the earliest to ensure the healthiness and availability of SCADA data.

vi. Rajasthan will further explore the possible load management in this complex to avoid high overloading of 220kV lines.

A.20.4 NRLDC representative stated that in view of aforementioned grid disturbances in this complex, wherein all the reactors at RAPS-A, B & C tripped and went under poison out state, review of protection system and load management in the KTPS, RAPS generation complex (KTPS, RAPS-A, B & C and 220/132kV Kota Sakatpura) needs to be done. Implementation of suitable SPS in KTPS evacuation lines may be explored to address the high loading issue during contingencies in this complex. A separate committee may be formed at RPC forum to review the protection system and load management in the KTPS, RAPS generation complex and to recommend necessary remedial actions to avoid such major grid disturbance in this complex in future.

A.20.5 NPCIL representative stated that on outage of 220kV KTPS-Kota (PG) lines, power flow in 220kV lines from Kota Sakatpura to RAPS-A & B get reversed (towards RAPS) which leads to overloading of 220kV lines at RAPS. Necessary protection scheme may be implemented on the basis of power flow in these lines towards RAPS to actuate the ATS at RAPS-B & C before creation of over frequency scenario in this

complex. As RAPS Unit-7 would also probably commission by end of this year and RAPS Unit-8 during next year, strengthening of protection system in this complex is very much necessary. In addition, island scheme implemented in this complex also need to be reviewed.

A.20.6 RVPNL representative informed that there was O/C E/F protection implemented on bus sectionalizer of Bus-A&B with reduced operating time to isolate the bus during bus fault as bus bar protection is not there. However, it was leading to loss of evacuation path for generation. Now, tripping of bus sectionalizer on O/C E/F has been disabled. Implementation of bus bar protection is in process, same will be expedite.

Decision taken by Forum:

Forum decided to constitute a dedicated committee having members from NRPC, NLDC, NRLDC, NPCIL, RVUN (KTPS), RVPN and POWERGRID. The committee shall comprehensively review the protection system, load management, islanding scheme, SPS requirement, Auto Transfer Scheme at RAPS and other related aspects in the RAPS, KTPS complex. Committee shall visit the sites and submit the detailed report along with their findings/observations.

A.21. Grid disturbance in 220kV Kunihar, Baddi complex during Feb'24 (agenda by NRLDC)

A.21.1 NRLDC representative apprised that frequent event of multiple elements trippings have been reported in recent past (on 02nd Feb, 08th Feb and 16th Feb) in HP control area. Major affected substations were 220kV Kunihar, Baddi and Bhabha. Significant quantum of load in the range of 400-700MW affected during these grid events. Brief of events are attached as **Annexure- XXVIII**.

A.21.2 During Aug-Sept 2023 also, Grid events at Kunihar area were reported. Those events were discussed in 48th PSC meeting and PSC forum had recommended third party protection audit of Kunihar S/s. However, no update on the same have received and multiple events in recent past indicates that issues related to protection system and their coordination at these affected stations are still existing.

A.21.3 DR/EL and detail analysis of any of these events have not received from HP. Therefore, HP is requested to analyse the tripping events in detail and share following details w.r.t. all three grid events occurred in Feb'24:

II. RAPS-A/B islanding scheme

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RVPN
An ISO 9001:2000 Certified Company

No. RVPN/SE(P&P)/XEN-2(P&P)/AE-2/ F. /D 846 Jaipur, Dt. 19/2022

Member Secretary
Northern Regional Power Committee,
18-A, Shaheed Jeet Singh Marg, Katwaria Sarai,
New Delhi-110016

Sub: Updated Revised Islanding Schemes for the Rajasthan Atomic Power Station (RAPS-A & B) units.

Ref: 1. Email of NRPC dated 29.07.2021 addressed to the SE(SO&LD), RVPN, Jaipur and communicated to this office vide letter no. 623 dated 10.08.2021.
2. No. RVPN/SE(P&P)/XEN-2(P&P)/AE-2/D. 490 dated 06.06.2022

Dear Sir,

In reference to the above captioned subject and email dated 29.07.2021, revised Islanding Schemes for the Rajasthan Atomic Power Station (RAPS-A & B) units for consideration and approval was submitted to your office vide above referred letter dated 06.06.2022. This islanding scheme is updated after incorporating the suggestion and inputs received in the meeting held on dated 06.07.2022. Please find attached the updated revised Islanding Schemes for the Rajasthan Atomic Power Station (RAPS-A & B) units for consideration and approval.

Encl: as above

Your's faithfully,

(K. K. Meena)
Additional Chief Engineer (PP&D)

Copy to the following for information and necessary action please:-

1. The General Manager, NRLDC, 18-A, Shaheed Jeet Singh Marg, Katwaria Sarai, New Delhi-110016.
2. The Chief Engineer (LD/MPT&S), RVPN, Heerapura/Jaipur.
3. The Plant Head, Rajasthan Atomic Power Station (RAPS-A & B), Rawatbhata, Chittorgarh, Rajasthan.
4. The Superintending Engineer (Communication-Corporate Office/Automation) , RVPN, Heerapura/Jaipur.
5. The Superintenting Engineer (Opration), Northern Regional Power Committee, 18-A, Shaheed Jeet Singh Marg, Katwaria Sarai, New Delhi-110016.

Encl: as above

Additional Chief Engineer (PP&D)

REVISED ISLANDING SCHEME FOR RAPS-A&B

A. Objective: The Existing Islanding Scheme for RAPS-A&B was planned in 2013 but due to change in configuration of transmission lines and loads of the GSS, it is proposed to review and also revise the Islanding scheme for RAPS-A&B power plants.

B. Generation Details

a. RAPS-A

- The total generation of Unit-II is around 200 MW.
- Auxiliary load plus load of Heavy Water Plant is 30 MW.
- Net generation of unit-II is 170 MW.

b. RAPS-B

- The generation of Unit-III and Unit-IV is each around 220 MW. The total generation is around 440 MW if both units are running.
- Auxiliary load is 20 MW per unit, i.e. total 40 MW for both units of RAPS-B. Auxiliary consumption of 40 MW of the RAPS-C units is also fed from the RAPS-B units. Hence, total auxiliary consumption of RAPS-B & C is 80 MW.
- Net generation is 400 MW if both units of RAPS-B unit are running. Auxiliary load of RAPS-C (40 MW) is considered as load for RAPS-B units.

c. Auxiliary Load of RAPS-B, C & D

- Total auxiliary load includes the auxiliary load of both the units of RAPS-B + auxiliary load of the units of RAPS-C & RAPP-D (in future).
- Total auxiliary load will consists of 40 MW (RAPS-B both units) + 40 MW (RAPS-C) + 140 MW (RAPP-D in near future by 2025). This auxiliary consumption does not include auxiliary consumption of RAPS-A (40 MW).
- RAPP-D auxiliary consumption is higher because its each generating unit capacity is 700 MW.
- Total auxiliary consumption of RAPS-B & C for current scenario is 80 MW.
- Total auxiliary consumption of RAPS-A, B & C and heavy water plant for current scenario is 110 MW
- Total auxiliary consumption of RAPS-B, C & D for the scenario of 2025 will be 220 MW. Further, total auxiliary consumption of RAPS-A, B, C & D for the scenario of 2025 will be 250 MW.

C. Transmission System at RAPP-A&B

- 220 kV S/C RAPS-A - RAPS-B Line (3.00 km)
- 220 kV S/C RAPS-A - 220 kV GSS Debari line (192.70 km)

- 220 kV S/C RAPS-A - 220 kV GSS Kota (Sakatpura) Ckt-I (42.50 km)
- 220 kV S/C RAPS-A - 220 kV GSS Kota (Sakatpura) Ckt-II (42.50 km)
- 220 kV S/C RAPS-B - 220 kV GSS Debari line (198.00 km)
- 220 kV S/C RAPS-B - 220 kV GSS Chittorgargh line Ckt-I (95.00 km)
- 220 kV S/C RAPS-B - 220 kV GSS Chittorgargh line Ckt-II (95.00 km)
- 220 kV S/C RAPS-B - 220 kV GSS Kota (Sakatpura) Line (41.00 km)
- 220 kV S/C RAPS-B – RAPP-C Tie Line-I (2.00 km)
- 220 kV S/C RAPS-B – RAPP-C Tie Line-II (1.80 km)
- 220 kV S/C RAPS-C – Anta (80 km)
- 220 kV Switchyard for RAPS-C generators and RAPS-D generators is common.

D. Load Details

The identified load for island of RAPS-A&B is 508.94 MW which is placed at **Annexure-A.** Additional **40 MW load** on 220 kV bus of RAPS-C&D is also considered to represent the auxiliary load of RAPS-C. Additional load of **229.35 MW** is also identified which can be considered for lean load period. There are heavy seasonal variations of load in the region. Similarly, day and night load variations are also high in the region. Hence, islanding scheme is planned considering some of the transmission lines with both operative/blocked modes so that SLDC, Rajasthan can monitor and decide upon mode of the lines so as to match the load with generation in the island. Further, additional lines with blocked/operative status are also identified which helps to manage the load-generation during the lean load period.

E. Proposed Islanding Scheme

1. Islanding shall take place at 48.0 Hz without time delay.
2. Islanding is designed for the current scenario for load of 508.94 MW (including system losses) and additional 40MW auxiliary load of RAPS-C when all three units of RAPS-A&B are running. Further, if generation is low then load generation balance may be maintained by changing the blocked/operative status of the identified transmission lines depending on the available generation.
3. All the transmission lines with operative status may be operated at 48.0 Hz instantaneous to form Island.
4. Tie lines between RAPS-A & RAPS-B and RAPS-B & RAPS-C will be kept blocked during island formation.
5. If load in the network of island is very high and frequency is going further down then at RAPS-B unit-3 & unit-4 will come to house load at (47.5Hz + 5sec)* or 47.2 Hz instantaneous. Similarly, at RAPS-A, unit-2 will come to house load at 47.5 Hz+10 sec or 47.1 Hz instantaneous. If load is not managed as per requirement of RAPS units within 10

minute to 20 minute time period after taking the units on house load then RAPS units will be switched off.

6. If load in the network of island is very low and frequency is increasing after island formation then one or more units will be taken on house load at (51.5 Hz + 0.5 sec.)*. If load is not managed as per requirement of RAPS units within 10 minute to 20 minute time period after taking the units on house load then RAPS units will be switched off.
7. Blocked and operative status of all transmission lines of 220 kV and 132 kV voltage levels considered for the islanding are placed at **Annexure-B**. During the condition of light loads, the load-generation balance is to be maintained by changing the blocked/operative status of the additional lines which have also been identified to include additional GSS in the island.
8. A single line diagram of 400 kV network, 220 kV & 132 kV network is at **Annexure-C.**

* This is based on the reference document of RAPS for "Operating procedure for infrequent Event" indicating unit operation under high/low grid frequency (Copy enclosed for reference at **Annexure-D**).

F. Results of Load Flow Study

A load flow study is carried out considering the blocked and operative status of line included in **Annexure-B** as per SLD diagram indicated in **Annexure-C** for a total load of **508.94 MW** and considering **40 MW load** on 220 kV bus RAPS-C to represent the auxiliary load of RAPS-C. Including auxiliary load of RAPS-C, total load is **548.94 MW**. Power flow plot of the network included in the island is placed at **Exhibit-1**. The results of load flow study indicate the following load-generation balance:-

Generation	=	574.0786 MW
Load	=	546.84085 MW
Losses	=	27.2378 MW

It is observed that loading on all the lines and transformers included in the island of RAPS-A&B is normal and overloading is not observed.

G. Conclusion

Proposed islanding scheme is designed after detailed discussion with the field officers and officers from the MPT&S, Communications, Automations, LD and representative of RAPS-A&B plant. Based on the feedback/inputs of Officers and results of load flow studies, it is concluded that:

- Results of load flow study indicate that load generation balance can be maintained in the network considered for the island of RAPS-A & B.

- All the transmission lines included in the island will be equipped with under frequency relays (UFRs) and additional transmission lines are considered for the island to manage the load generation balance for different load scenario considering the large seasonal variations of load in the region.
- Proposed islanding scheme can be practically implemented on the transmission network of RVPN for the current scenario for load of **508.94 MW** (including system losses) when all three units of RAPS-A&B are running. However, continuous monitoring of load-generation balance is required and action to change status of UFRs from blocked to operative and vice-versa will be needed for load-generation balance during the event of change in generation and load.
- Islanding scheme is designed considering total auxiliary load of 110 MW which consists of 20 MW (Unit-II of RAPS-A) + 10 MW (Heavy water plant) + 40 MW (RAPS-B both units) + 40 MW (RAPS-C).
- Islanding scheme needs to be reviewed after commissioning of RAPP-D with auxiliary load of 140 MW (RAPP-D is expected to be commissioned in near future by 2025).

Annexure-A

Load on GSS considered in Islanding Scheme for RAPP-A&B

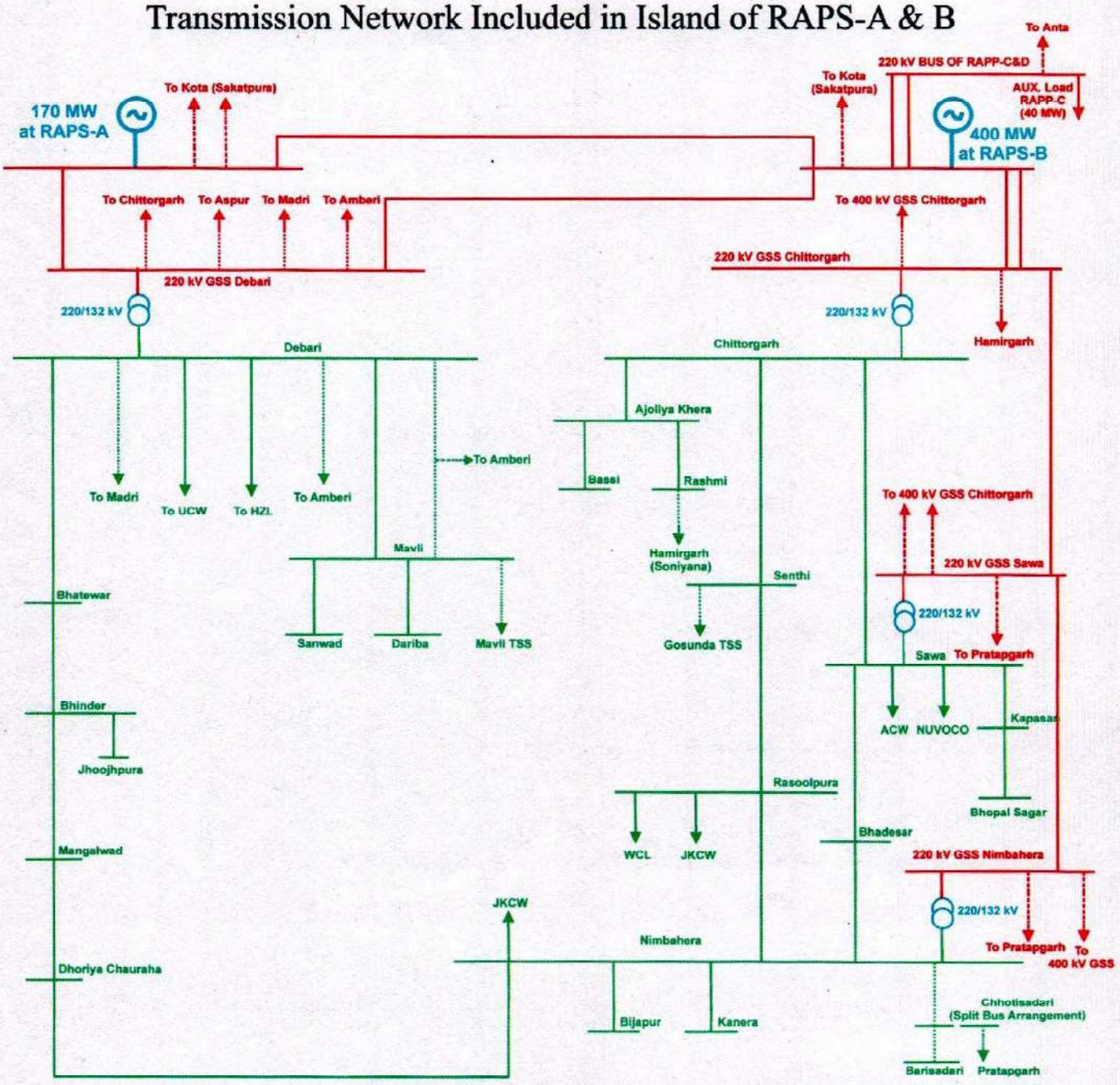
S. No.	Name of GSS	Maximum Load (MW)	Average Load (MW)
A	Gourp-A for 370 MW		
A.1	Load at 220 kV GSS Debari		
1	220 KV GSS Debari	26	16
2	132 KV GSS Mavli	26.28	12
3	132 KV GSS Sanwad	21.85	13
4	132 KV GSS Dariba	24.43	15
5	132 KV Hindustan Zinc Limited (Industry)	41	24.7
6	132 KV GSS Bhatewar	39.31	24.1
7	132 KV GSS Bhinder	23.09	14.37
8	132 KV GSS Jhojhpura	19.52	12.1
9	132 KV GSS UCW (Industry)	11	6.57
	Total (A.1)	**232.48**	**137.84**
A.2	Load at 220 kV GSS Chittorgarh		
10	220 KV GSS Chittorgarh	52	32
11	132 kV GSS Ajoliya Khera	38.35	24.41
12	132 kV GSS Rashmi	34.78	21.31
13	132 KV GSS Bassi	33.63	21.87
14	132 KV GSS Senthi	37.96	14
	Total (A.2)	**196.72**	**113.59**
A.3	Load at 220 kV GSS Sawa		
15	220 kV GSS Sawa	27	17
16	132 kV ACW at Sawa	16	10
17	132 kV NUVOCO at Sawa	21.5	13
18	132 kV GSS Kapasan	43.44	27.29
19	132 kV GSS Bhopal Sagar	14.88	9.09
20	132 kV GSS Bhadesar	37.19	23.32
	Total (A.3)	**160.01**	**99.7**
	Total (A)	**589.210**	**351.13**
B	Group-B		
B.1	Load at 220 kV GSS Nimbahera		
21	220 kV GSS Nimbahera	52.704	31.52
22	132 kV GSS Rasoolpura	15.55	10.22
23	132 kV WCL at Rasoolpura	45.52	28
24	132 kV JKCW at Rasoolpura	29.52	18.2
25	132 kV GSS Kanera	13.75	7.42
26	132 kV JKCW at Nimbahera	25.588	16.078
27	132 kV GSS Bijapur	15.55	10.52
28	132 kV GSS Mangalwad	39.73	24.25
29	132 kV GSS Dhoriya Choraha	19.29	11.6
	Total (B.1)	**313.982**	**157.808**
	Total (B)	**313.982**	**157.808**
	Total load (A+B)	**936.612**	**508.94**
C	Auxiliary load of RAPS-C	40.00	40.00
	Total load (A+B+C)	**976.61**	**548.94**
D	**Additional Load**		
30	132 kV GSS Barisadari	56.78	45.82
31	220 kV GSS Hamirgarh	85.02	71.74
32	132 kV line of RSWM Industries at 132 kV GSS Hamirgarh	6.65	6.41
33	132 kV GSS RIICO Growth Centre	22.78	14.37
34	132 kV line of Nitin Industries at 132 kV GSS Hamirgarh	22.49	16.58
35	132 kV GSS Chhotisadari	40.8	33.43
36	Gogunda TSS (connected to 132 kV GSS Senthi)	16	16
37	Mavli TSS (connected to 132 kV GSS Mavli	25	25
	Total C	**275.52**	**229.35**
	Total load (A+B+C)	**1252.13**	**778.29**

Annexure-B

	Transmission Lines and Status of Under Frequency Relays for RAPP-A&B Island	
S. No.	**Name of Line**	**Status**
A.	**Transmision Lines at RAPP-A**	
1	220 kV S/C RAPS-A-Kota (Sakatpura)Line Ckt-I	Operative
2	220 kV S/C RAPS-A-Kota (Sakatpura)Line Ckt-II	Operative
3	132 kV S/C RAPS-A to RAPS-B Line	Blocked
4	220 kV S/C Debari-RAPS-A Line	Blocked
B.	**Transmision Lines at RAPP-B**	
5	220 kV S/C RAPS-B-Kota (Sakatpura)Line Ckt-III	Operative
6	220 kV S/C RAPS-B-RAPS-C Tie line Ckt-I	Blocked
7	220 kV S/C RAPS-B-RAPS-C Tie line Ckt-II	Blocked
8	220 kV S/C RAPS-C-Anta line	Operative
9	220 kV S/C Chittorgarh (220 kV GSS)-RAPS-B line Ckt-I	Blocked
10	220 kV S/C Chittorgarh (220 kV GSS)-RAPS-B line Ckt-II	Blocked
11	220 kV S/C Debari-RAPS-B Line	Blocked
C.	**Transmision Lines at 220 kV GSS Debari**	
12	220 kV S/C Debari-Chittorgarh (400 kV GSS) Line	Operative
13	132 kV S/C Debari-Mavli Ckt-I Line	Blocked
14	132 kV S/C Debari-Nathdwara line with T-off at Mavli	Operative
15	132 kV S/C Debari-Bhatewar Line	Blocked
16	132 kV S/C Debari-Madri Line	Operative
17	132 kV S/C Debari-Amberi Line	Operative
18	132 kV S/C Debari-UCW Line	Blocked
19	132 kV S/C Debari-HZL Line	Blocked
20	132 kV S/C Mavli-Sanwad Line	Blocked
21	132 kV S/C Mavli-Dariba Line	Blocked
22	132 kV S/C Mavli-TSS Line	Operative
23	132 kV S/C Bhatewar-Bhinder Line	Blocked
24	132 kV S/C Bhinder-Jhoojhpura Line	Blocked
D.	**Transmision Lines at 220 kV GSS Chittorgrah**	
25	220 kV S/C Chittorgarh (220 kV GSS)-Hamirgarh line	Operative
26	220 kV S/C Chittorgarh (220 kV GSS)-Sawa line	Blocked
27	220 kV S/C Chittorgarh (440 kV GSS)-Chittorgarh (220 kV GSS) line	Operative
28	132 kV S/C Chittorgarh-Ajoliya Khera Line	Blocked
29	132 kV S/C Ajoliya Khera-Bassi Line	Blocked
30	132 kV S/C Ajoliya Khera-Rashmi Line	Blocked
31	132 kV S/C Rashmi-Hamirgarh (Soniyana) Line	Operative
32	132 kV S/C Chittorgarh-Senthi Line	Blocked
33	132 kV S/C Senthi-Gosunda TSS Line	Operative
34	132 kV S/C Senthi-Rasoolpura Line	Blocked
35	132 kV S/C Chittorgarh-Sawa Line	Blocked
E.	**Transmision Lines at 220 kV GSS Sawa**	
36	220 kV D/C Sawa-Chittorgarh (400 kV GSS) Line	Operative
37	220 kV S/C Sawa-Nimbahera Line	Blocked
38	132 kV S/C Sawa-BhadesarLine	Blocked

39	132 kV S/C Sawa-Kapasan Line	Blocked
40	132 kV S/C Kapasan-Bhopal Sagar Line	Blocked
41	132 kV S/C Sawa-ACW Line	Blocked
42	132 kV S/C Sawa-NUVOCO Line	Blocked
F.	**Transmision Lines at 220 kV GSS Nimbahera**	
43	220 kV S/C Nimbahera-Pratapgarh Line	Operative
44	220 kV S/C Nimbahera-Chittorgarh (400 kV GSS) Line	Operative
45	132 kV S/C Nimbahera-Bhadesar Line	Blocked
46	132 kV S/C Nimbahera-Rasoolpura Line	Blocked
47	132 kV S/C Rasoolpura-WCL Line	Blocked
48	132 kV S/C Rasoolpura-JKCW Line	Blocked
49	132 kV S/C Nimbahera-Kaneri Line	Blocked
50	132 kV S/C Nimbahera-JKCW Line	Blocked
51	132 kV S/C Nimbahera-Bijapur Line	Blocked
52	132 kV S/C Nimbahera-Chhotisadari Line	Operative
53	132 kV S/C Nimbahera-Dhoriya Chouraha Line	Blocked
54	132 kV S/C Dhoriya Chouraha-Mangalwad Line	Blocked/Operative
55	132 kV S/C Mangalwad-Bhinder Line	Blocked
Additional Lines to Install Under Frequency Relays		
56	220 kV S/C Hamirgarh-Bhilwara line	Blocked/Operative
57	132 kV S/C Hamirgarh-RIICO Bhilwara line	Blocked/Operative
58	132 kV S/C Hamirgarh (220 kV GSS)-RIICO Growth Centre line	Blocked/Operative
59	132 kV S/C Chhotisadari- Badisadari line	Blocked/Operative
60	132 kV S/C Chhotisadari-Pratapgarh line	Blocked/Operative
61	132 Kv S/C RIICO Growth (Hamirgarh)-Nitin Industries Line	Blocked/Operative
62	132 Kv S/C Hamirgarh(220 kV GSS)-RSWM Line	Blocked/Operative
Note:	At 220 kV GSS Debari, 220 kV Bus is split with 220 kV 2xS/C lines from RAPS-A&B alongwith 470 MVA, 220/132 kV transformer on one bus and rest of 220 kV lines on another bus. Therefore, 220 kV GSS Aspur, Madri and Amberi and 400 kV GSS Chittorgarh is not included in the island. If buses M1 and M2 at 220 kV GSS Debari are integrated then UFR relays are also required on following lines	
63	220 kV S/C Debari-Aspur Line	Operative
64	220 kV S/C Debari-Madri Line	Operative
65	220 kV S/C Debari-Amberi Line	Operative
Note:	Units of atomic power plant are critical generation units, hence it is required that all lines in the island with blocked status may also be equipped with UFR relay. This will help to shorten the boundary of the island during light load conditions.	

Transmission Network Included in Island of RAPS-A & B



	NUCLEAR POWER CORPORATION OF INDIA LIMITED RAJASTHAN ATOMIC POWER STATION		
	OPERATING PROCEDURE FOR INFREQUENT EVENT	USI: 50000	
		OPIE No. 15	Rev. 03
	UNIT OPERATION UNDER HIGH/LOW GRID FREQUENCY	Issue In: April 2019	
		Next Rev. Due: April 2024	

1.0 PURPOSE:

These guidelines are for unit operation during high or low grid frequency conditions (reference: station instruction no. 39B,). Variations in grid frequency away from normal band of operation (i.e. 49.8-50.2 Hz) occur due to change in demand/supply condition in grid (ie generating station connected to grid or tripping of generating station / load pickup or tripping), grid transients etc.

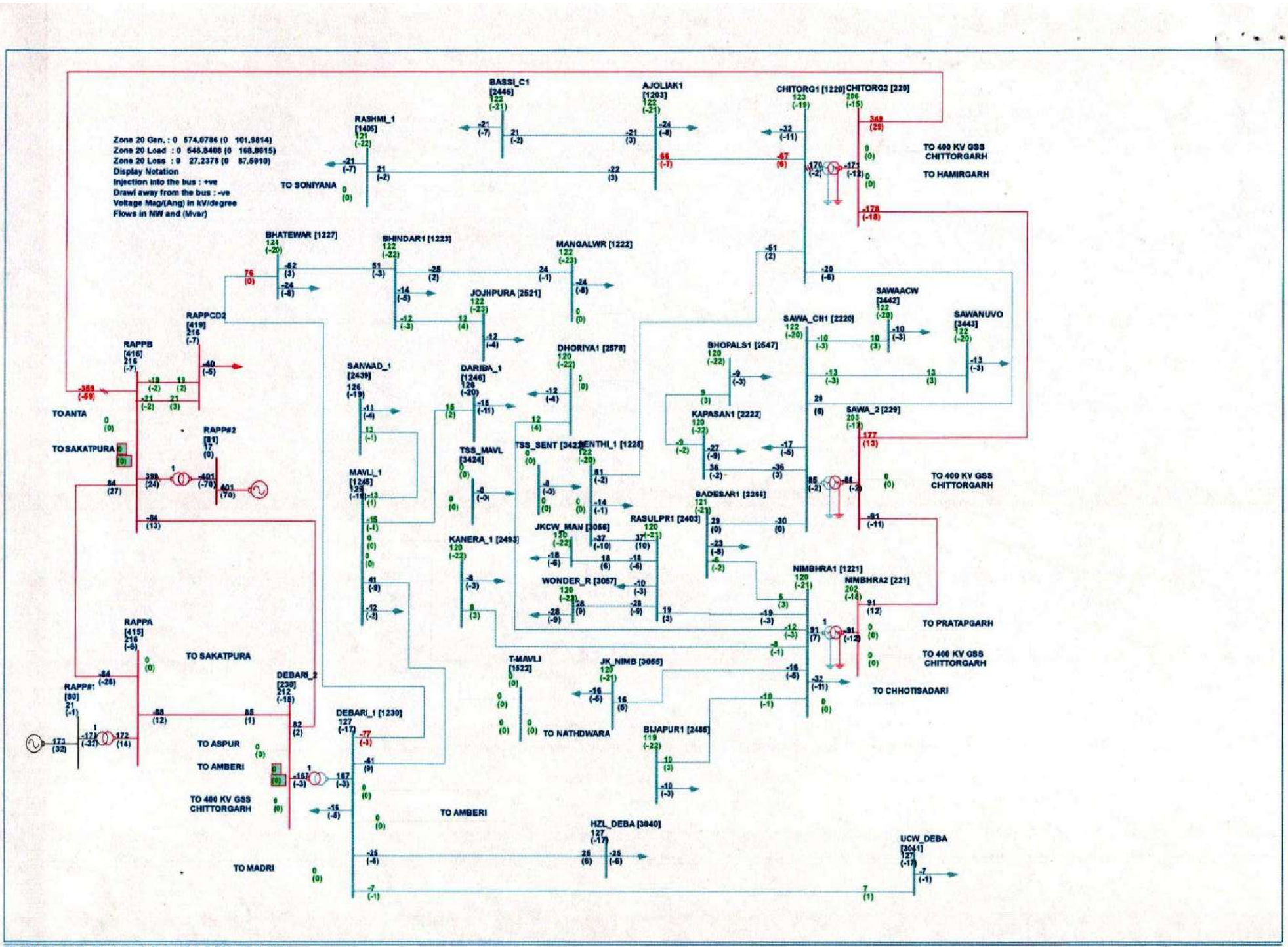
2.0 EFFECT ON STATION:

2.1 AUTO ACTIONS ON HIGH FREQUENCY

S. No.	Frequency (O/F Scenario)	Unit-3	Unit-4
1.	51.2Hz, INST	"412-Generator under/over frequency alarm" Alarm initiates	"412-Generator under/over frequency alarm" Alarm initiates
2.	51.5 Hz, INST	"Gen. over frequency trip timer initiated" alarm initiated	"Gen. over frequency trip timer initiated" alarm initiated
3.	51.5 Hz + 0.2 sec	SUT HV CB trip & ATS will initiate	SUT HV CB trip & ATS will initiate
4.	51.5 Hz + 0.5 sec	Class -C trip initiates	Class -C trip initiates
5.	51.5 Hz + 15 sec	Class -B trip initiates	---
6.	51.5 Hz + 20 sec	---	Class-B trip initiates

2.2 AUTO ACTIONS ON LOW FREQUENCY

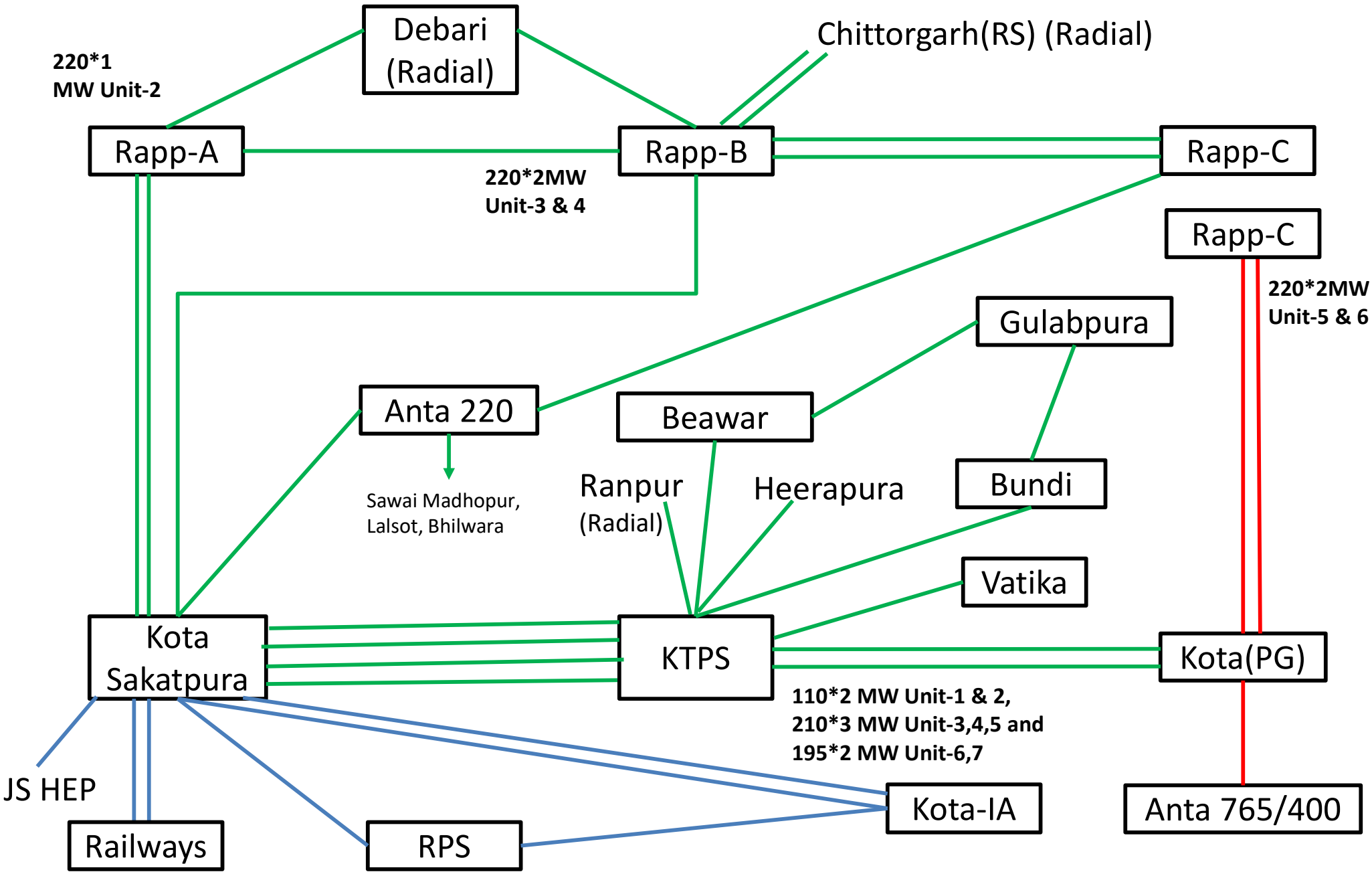
S. No.	Frequency (U/F Scenario)	Unit-3 & Unit-4
1.	48 Hz, INST	U/F Alarm initiates and Kota Line Will Trip and Anta Line Will Trip at RRS 5&6 End Rajasthan sub system separates from Northern grid (Chittor Ckt 1,Chittor Ckt 2 ,Udaipur Line and RRS 5&6 Tie Line Will remain Close)
2.	47.7 Hz + 5 Sec or 47.5 Hz, INST.	Speeder auto signal gets cut off.
3.	47.5 Hz + 3 Sec	SUT HV CB trips & ATS will initiate (Islanding unsuccessful, Prepares for House-load operation)
4.	47.5 Hz + 5 Sec	Class -C trip initiates (For House-load operation)


Zone 20 Gen. : 0 574.0786 (0 101.9814)
Zone 20 Load : 0 546.8408 (0 168.8615)
Zone 20 Loss : 0 27.2378 (0 87.5910)
Display Notation
Injection into the bus : +ve
Drawl away from the bus : -ve
Voltage Mag/(Ang) in kV/degree
Flows in MW and (Mvar)
BASSI_C1 [2446]
AJOLIAK1 [1203]
CHITORG1 [1220]
CHITORG2 [220]
RASHMI_1 [1405]
TO SONIYANA
TO 400 KV GSS CHITTORGARH
TO HAMIRGARH
BHATEWAR [1227]
BHINDAR1 [1223]
MANGALWR [1222]
JOJHPURA [2521]
SAWAACW [3442]
SAWANUVO [3443]
SAWA_CH1 [2220]
SAWA_2 [229]
RAPPCD2 [419]
RAPPB [416]
TO ANTA
SANWAD_1 [2439]
DARIBA_1 [1246]
DHORIYA1 [2578]
BHOPALS1 [2547]
KAPASAN1 [2222]
TSS_SENT [3423]
SENTHI_1 [1220]
TSS_MAVL [3424]
MAVLI_1 [1245]
BADESAR1 [2266]
RAPP#2 [81]
TO SAKATPURA
JKCW_MAN [3056]
RASULPR1 [2403]
KANERA_1 [2493]
WONDER_R [3057]
NIMBHRA1 [1221]
NIMBHRA2 [221]
TO PRATAPGARH
RAPPA [415]
T-MAVLI [1522]
JK_NIMB [3055]
DEBARI_2 [230]
RAPP#1 [80]
DEBARI_1 [1230]
TO NATHDWARA
BIJAPUR1 [2485]
TO CHHOTISADARI
TO ASPUR
TO AMBERI
HZL_DEBA [3040]
UCW_DEBA [3041]
TO MADRI

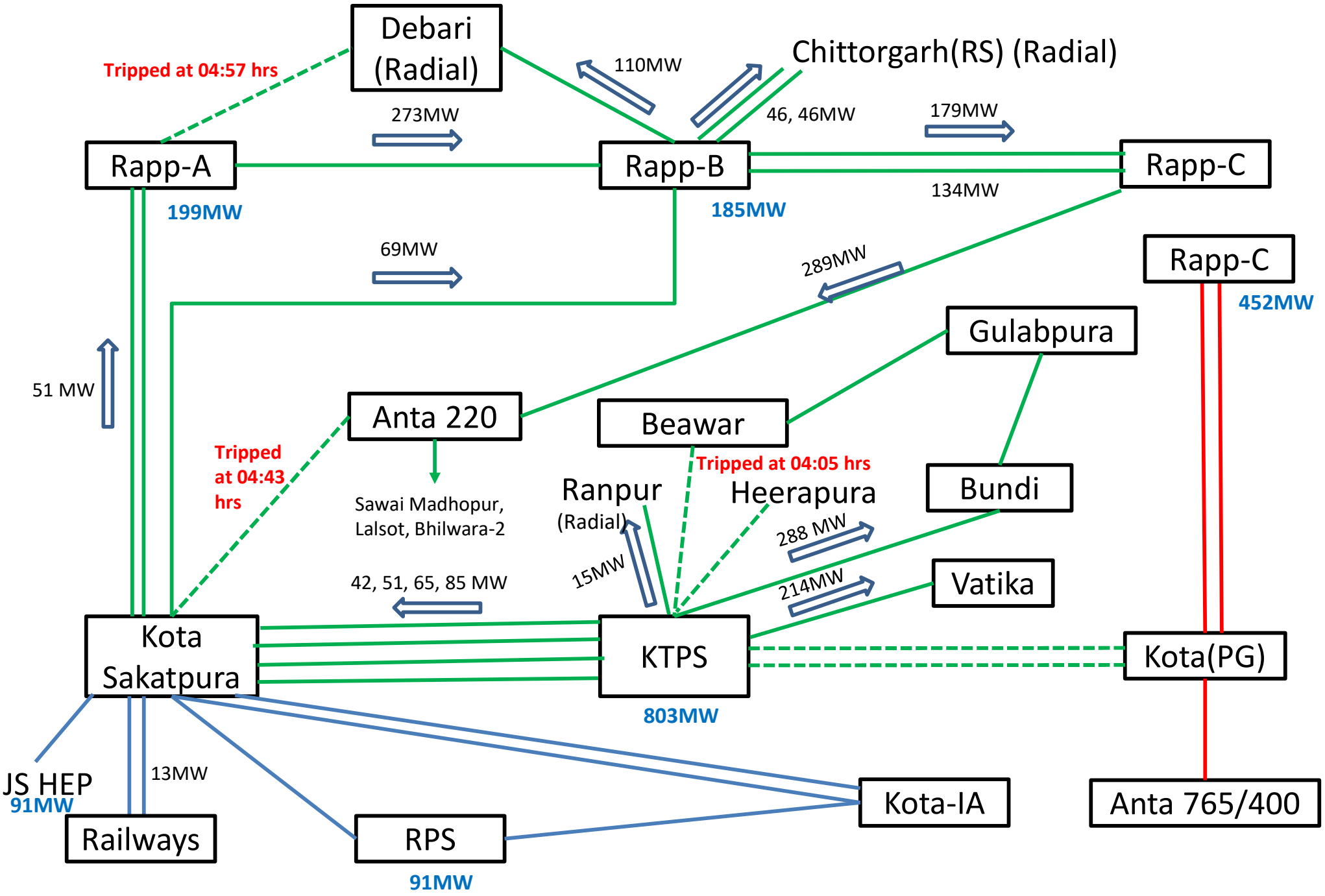
MULTIPLE ELEMENTS TRIPPING AT KTPS(RS), RAPP-A, RAPP-B AND RAPP-C

AT 05:16HRS ON 05TH JAN'2024

Connection Diagram between KTPS, RAPP-A, RAPP-B & RAPP-C

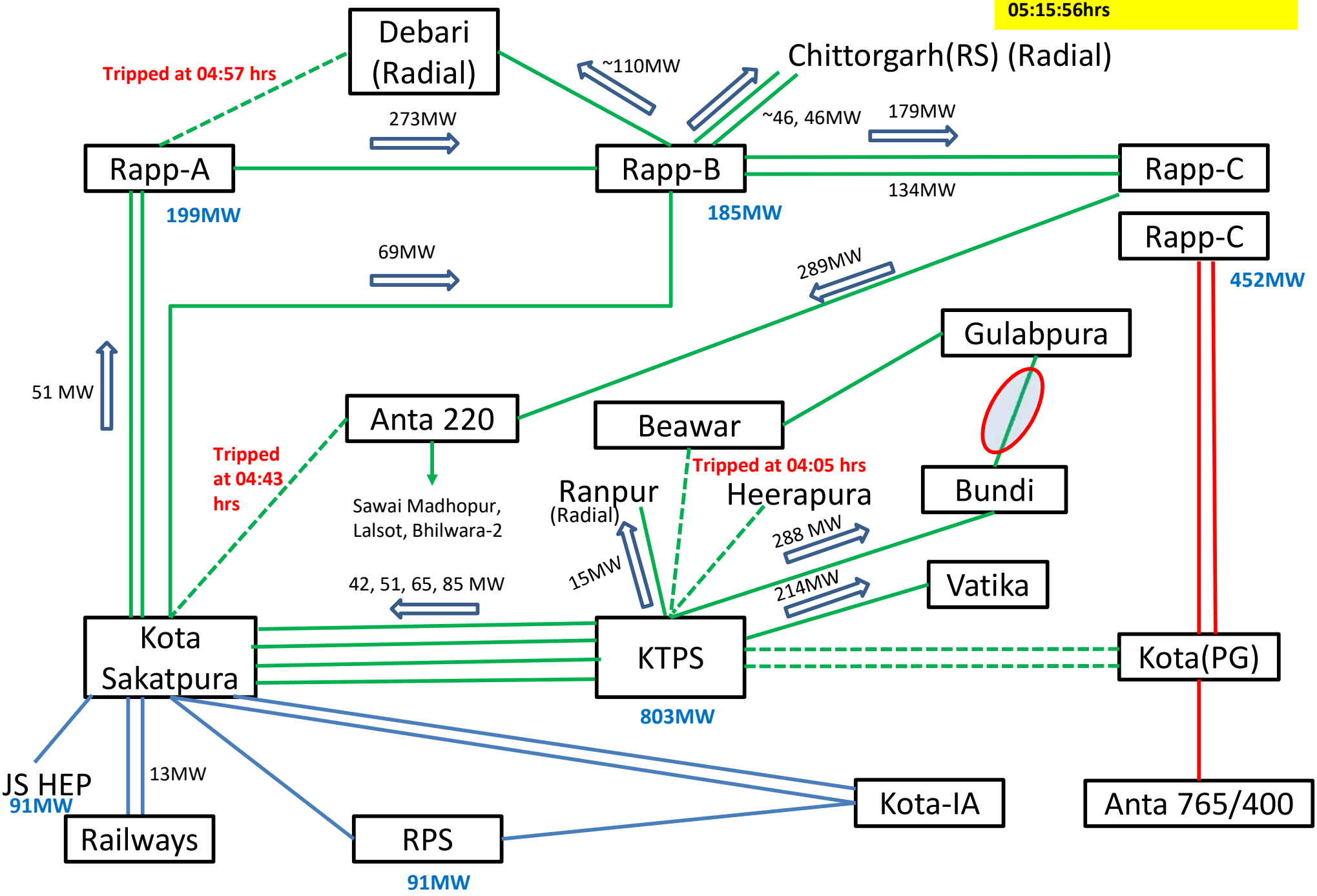


Antecedent scenario (at 05:15 hrs)



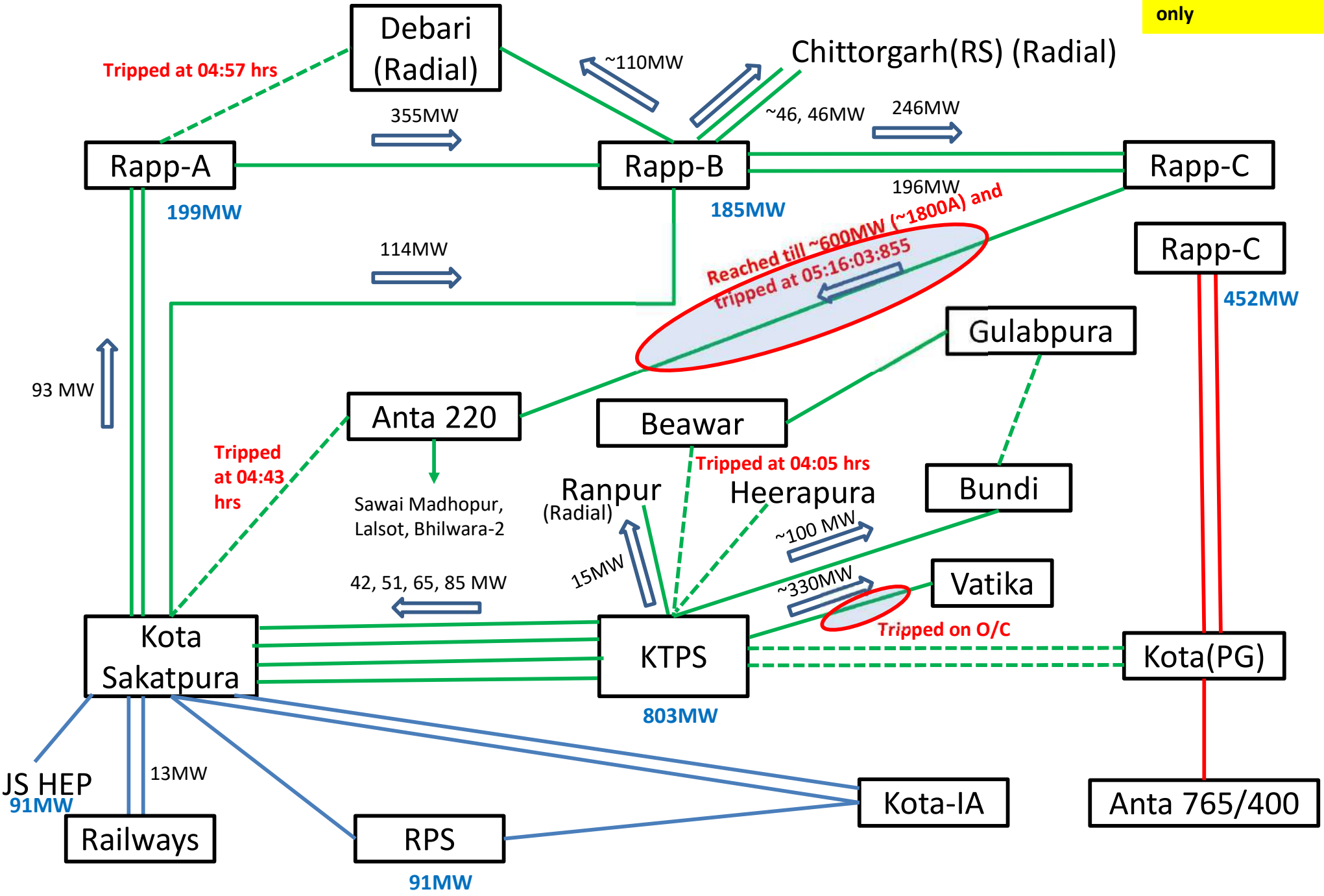
Triggering incident

Triggering incident: opening of 220kV Bundi-Gulabpura ckt at 05:15:56hrs



After opening of 220kV Bundi-Gulabpura ckt

System was connected to grid via Anta and Vatika only

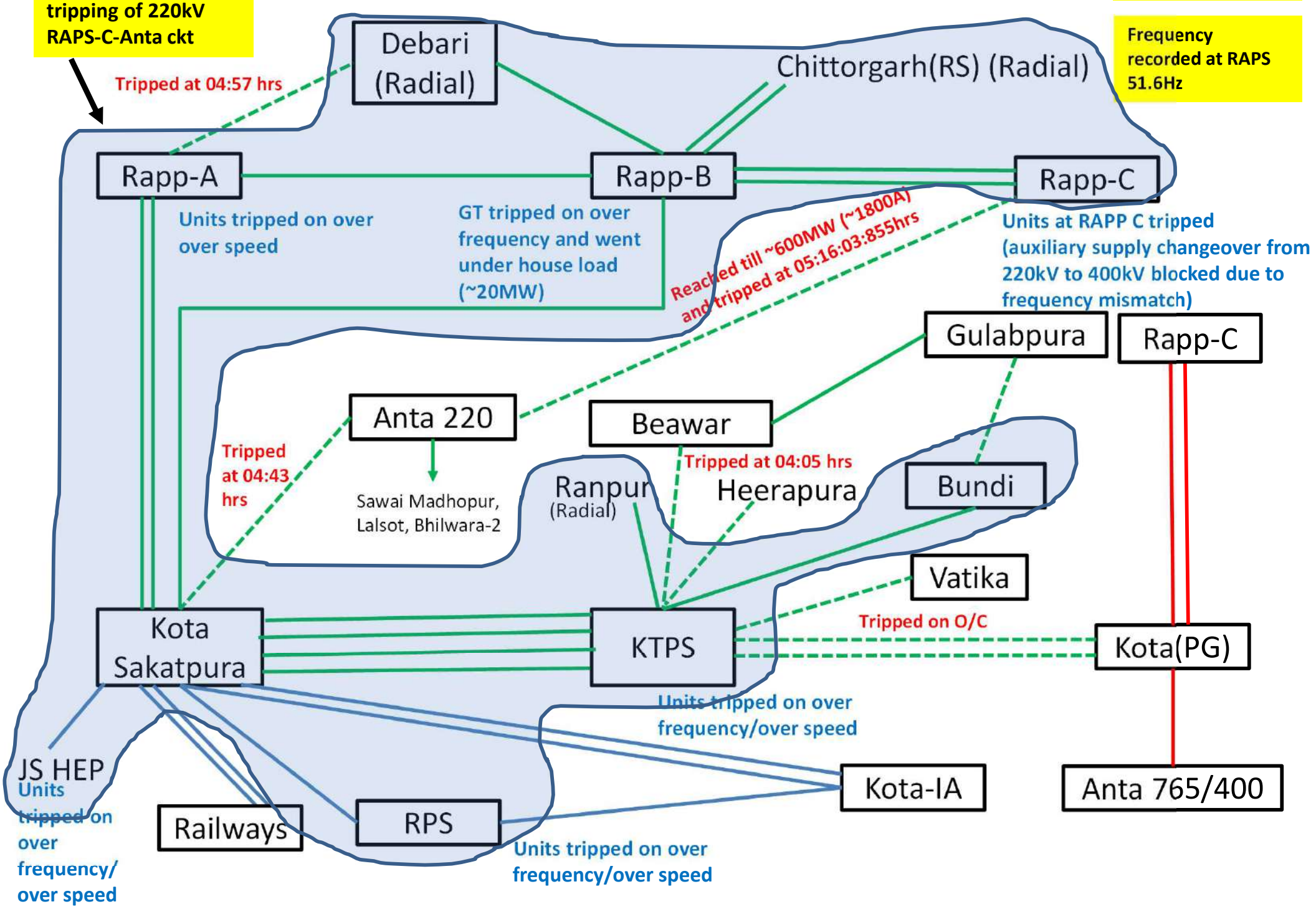


After tripping of 220kV RAPP_C- Anta ckt

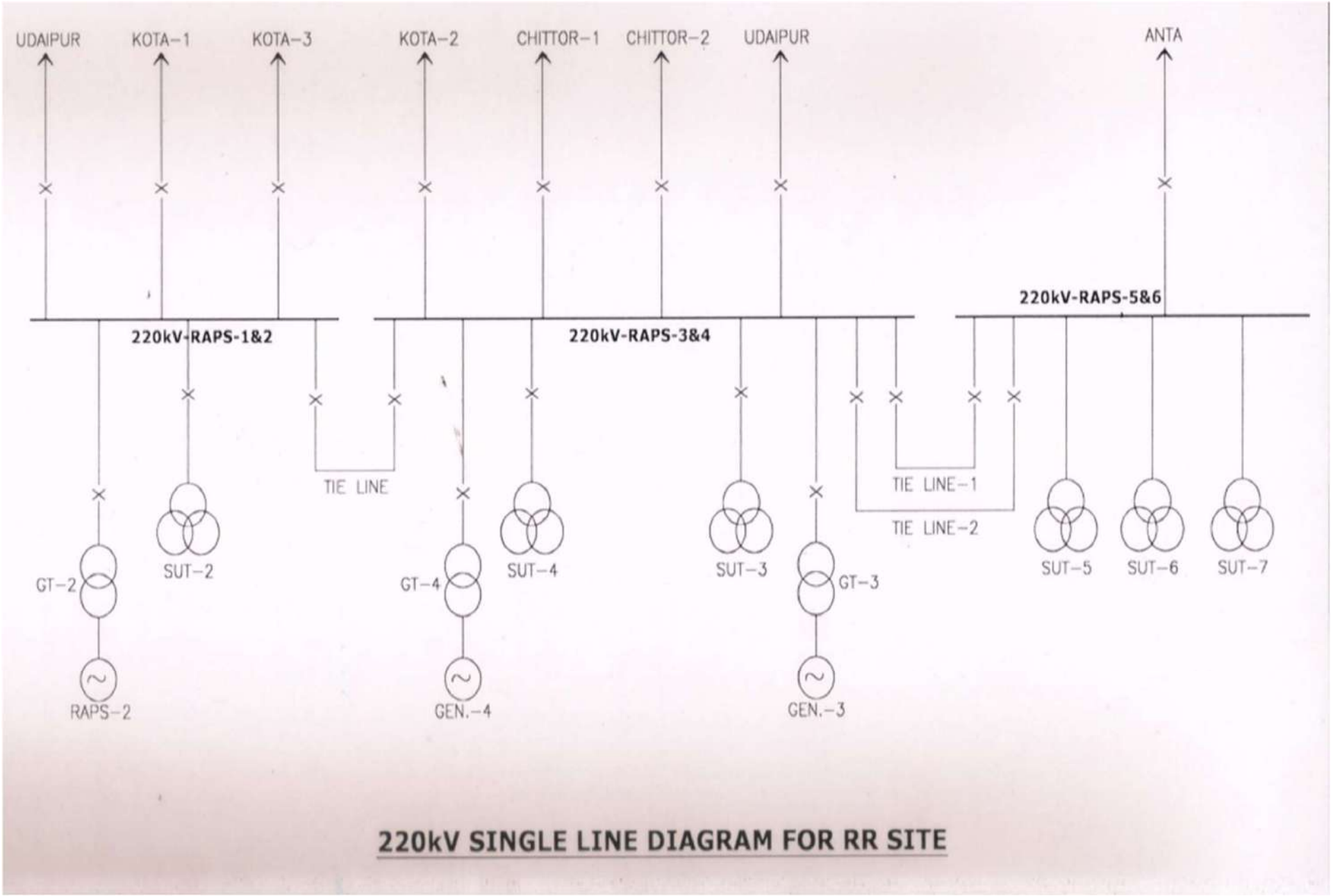
Island formed after tripping of 220kV RAPS-C-Anta ckt

Connection to grid lost.

Frequency recorded at RAPS 51.6Hz



SLD and connectivity of RAPS- A, RAPS-B & RAPS-C

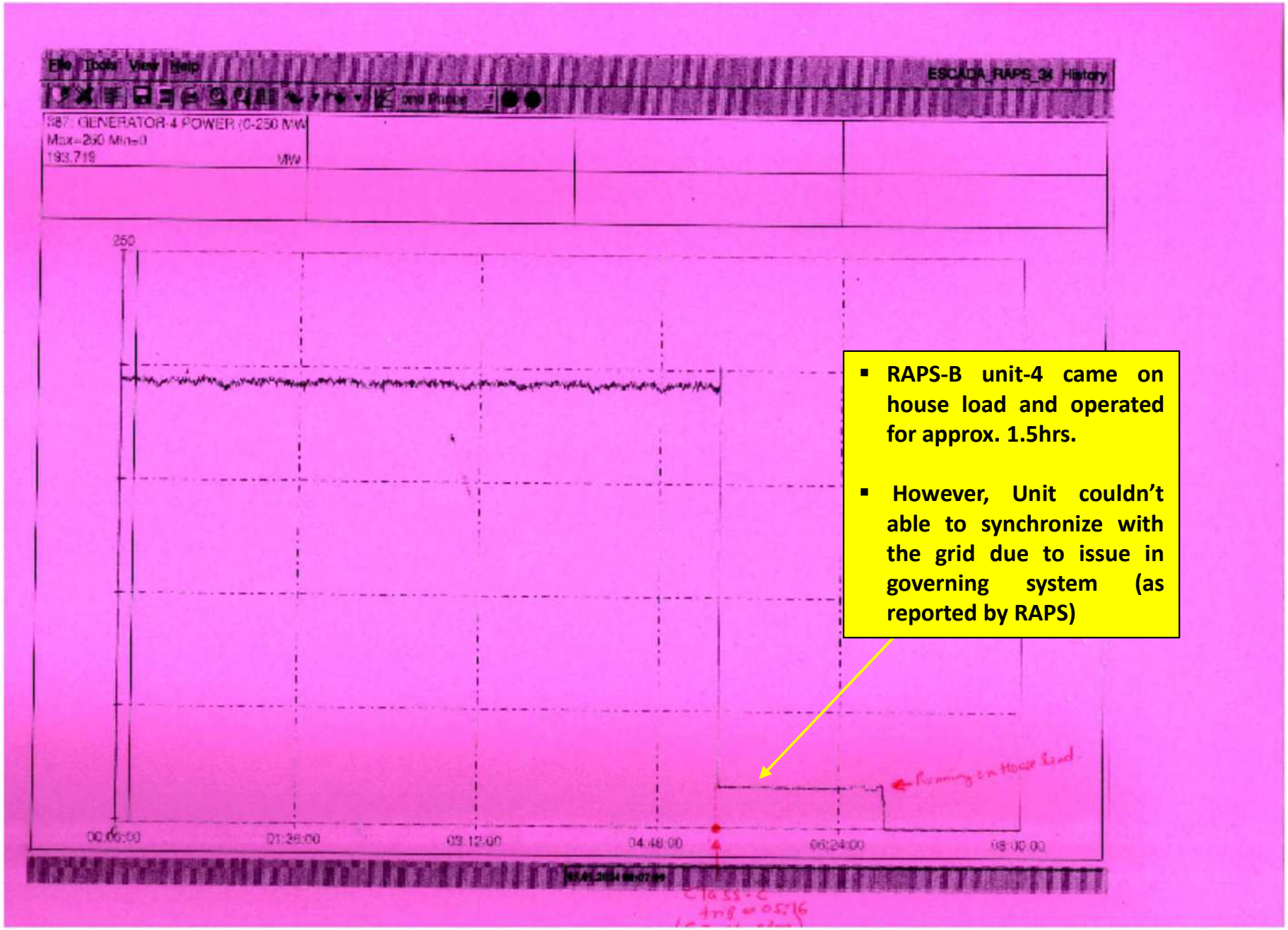


220kV SINGLE LINE DIAGRAM FOR RR SITE

Digital recording system of RAPS-A during the event (shared by RAPS)

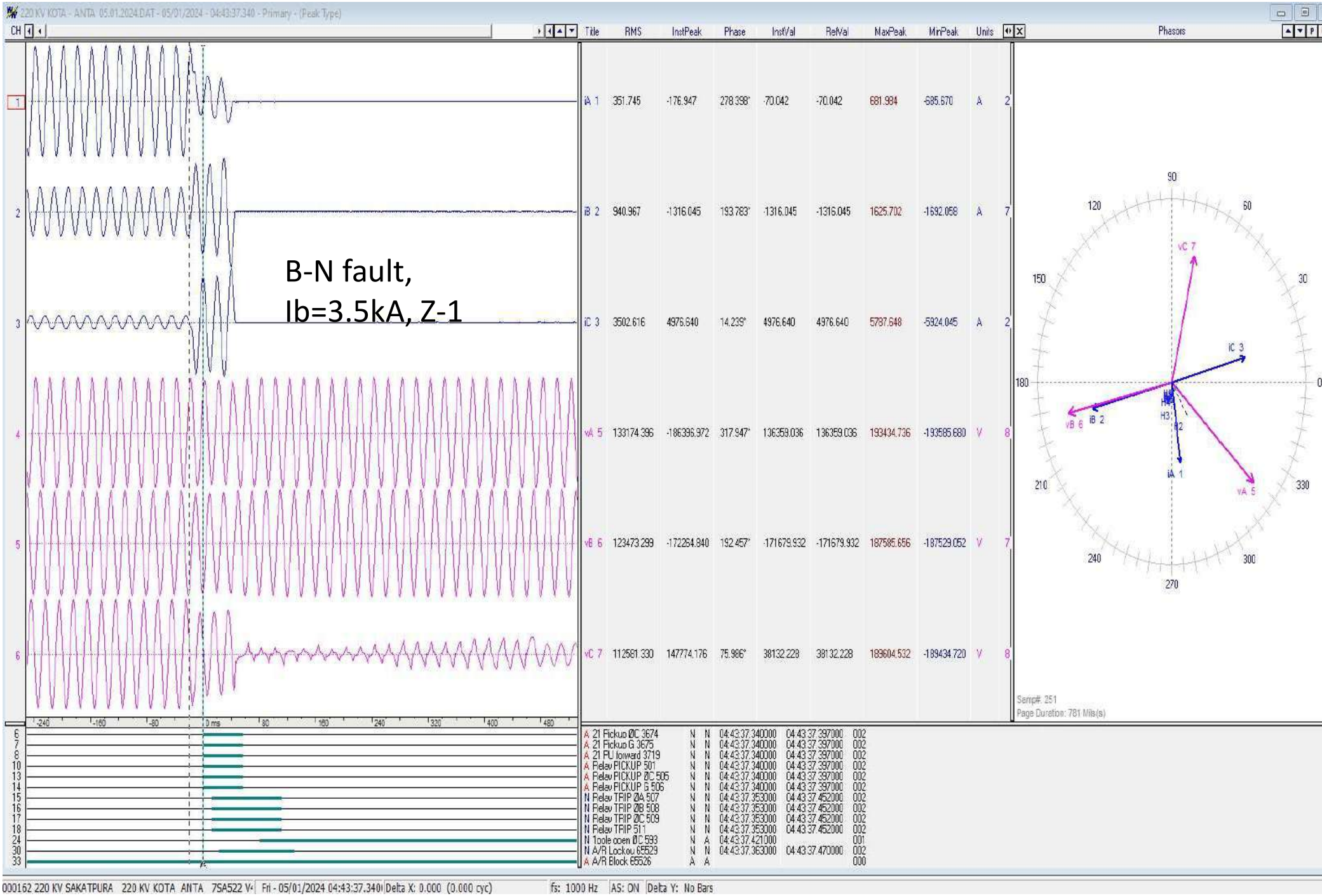


Generation plot of RAPS-B unit-4 (shared by RAPS)

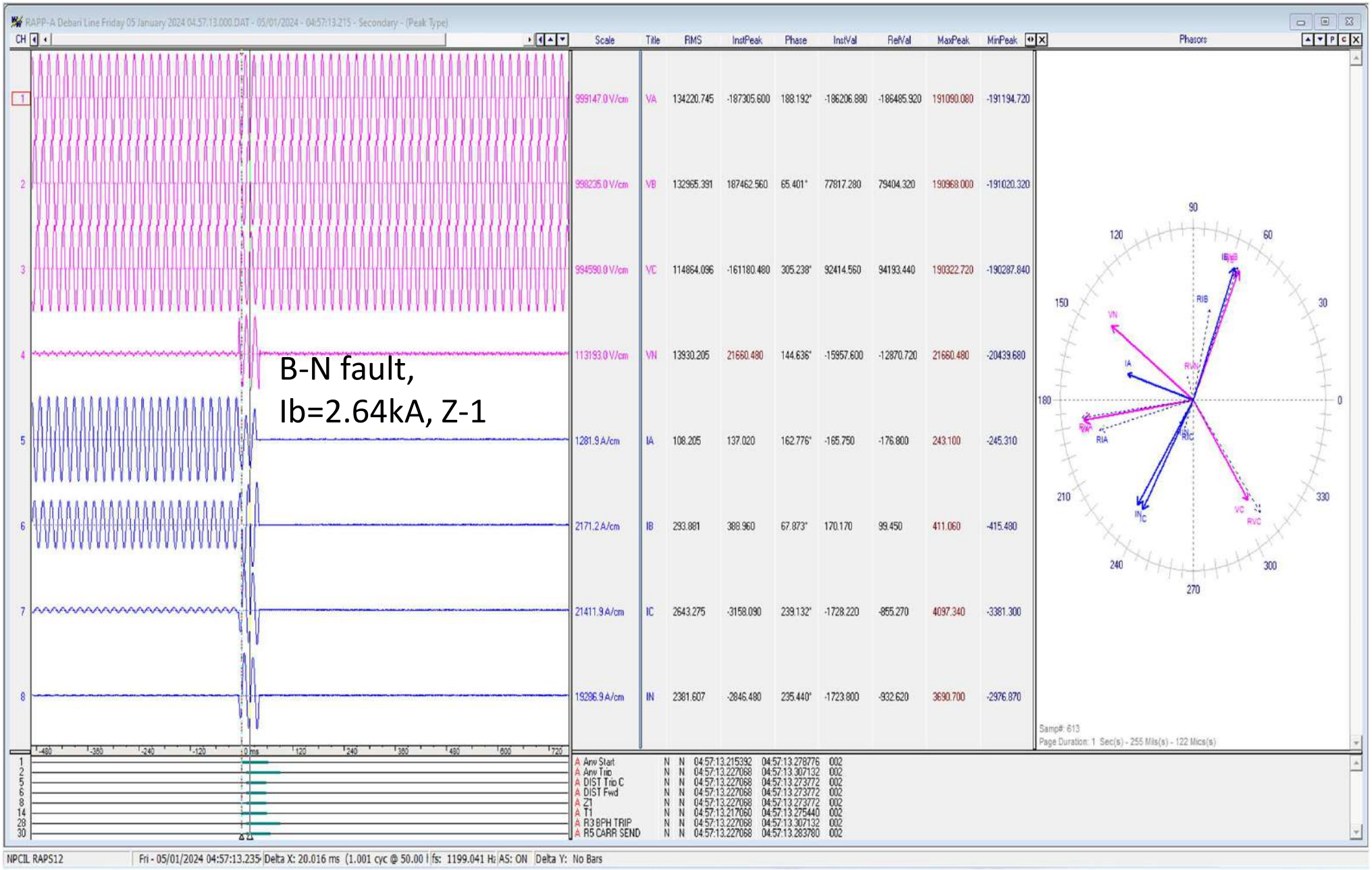


- **RAPS-B unit-4 came on house load and operated for approx. 1.5hrs.**
- **However, Unit couldn't able to synchronize with the grid due to issue in governing system (as reported by RAPS)**

DR of 220kV Anta-Sakatpura(end) ckt (04:43hrs)

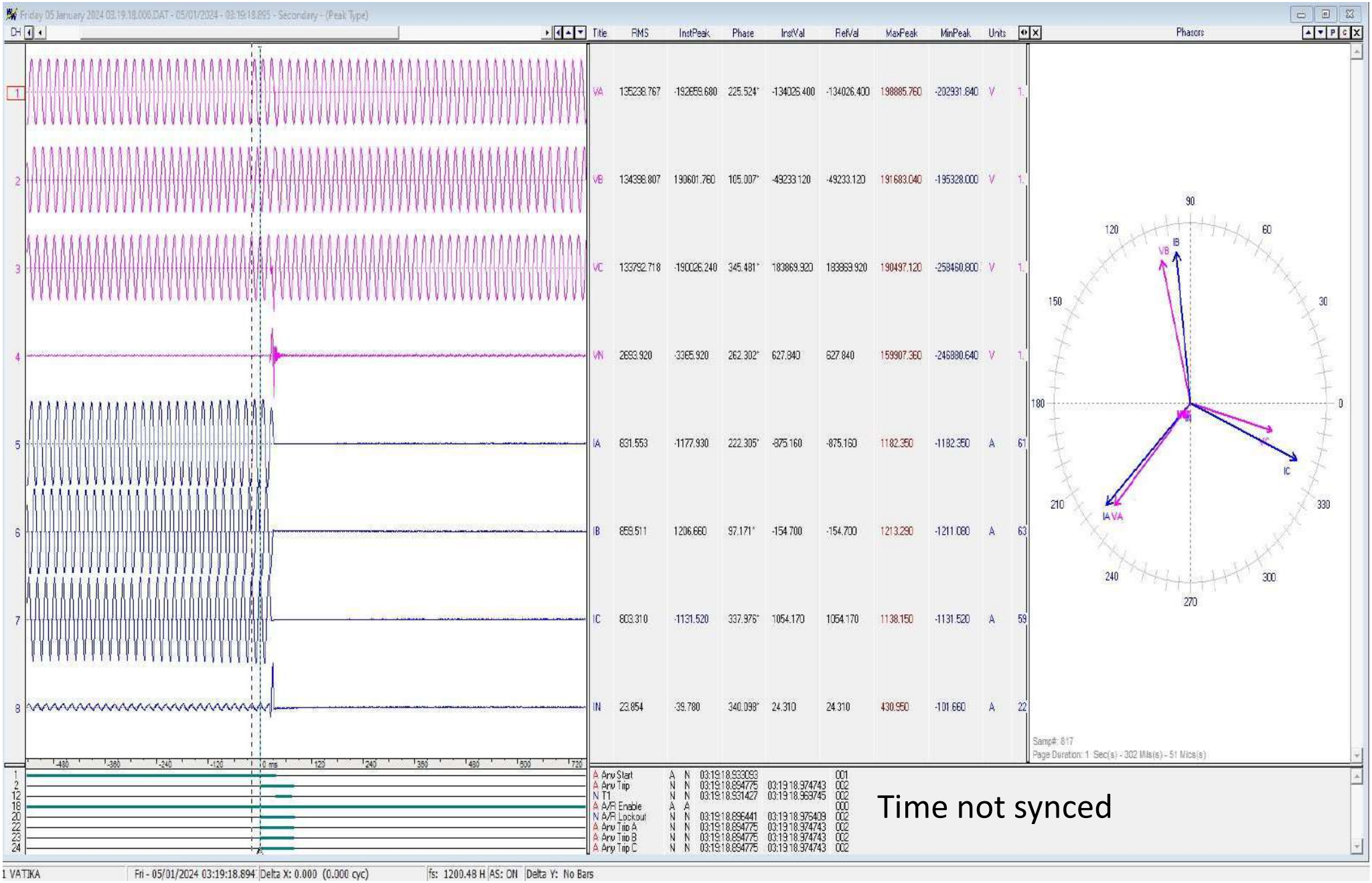


DR of 220kV RAPS_A(end)-Debari ckt



Tripping time: **04:57:13:227**; B-N fault, Z-1, Ib: 2.6kA; (A/R operation is OFF in line)

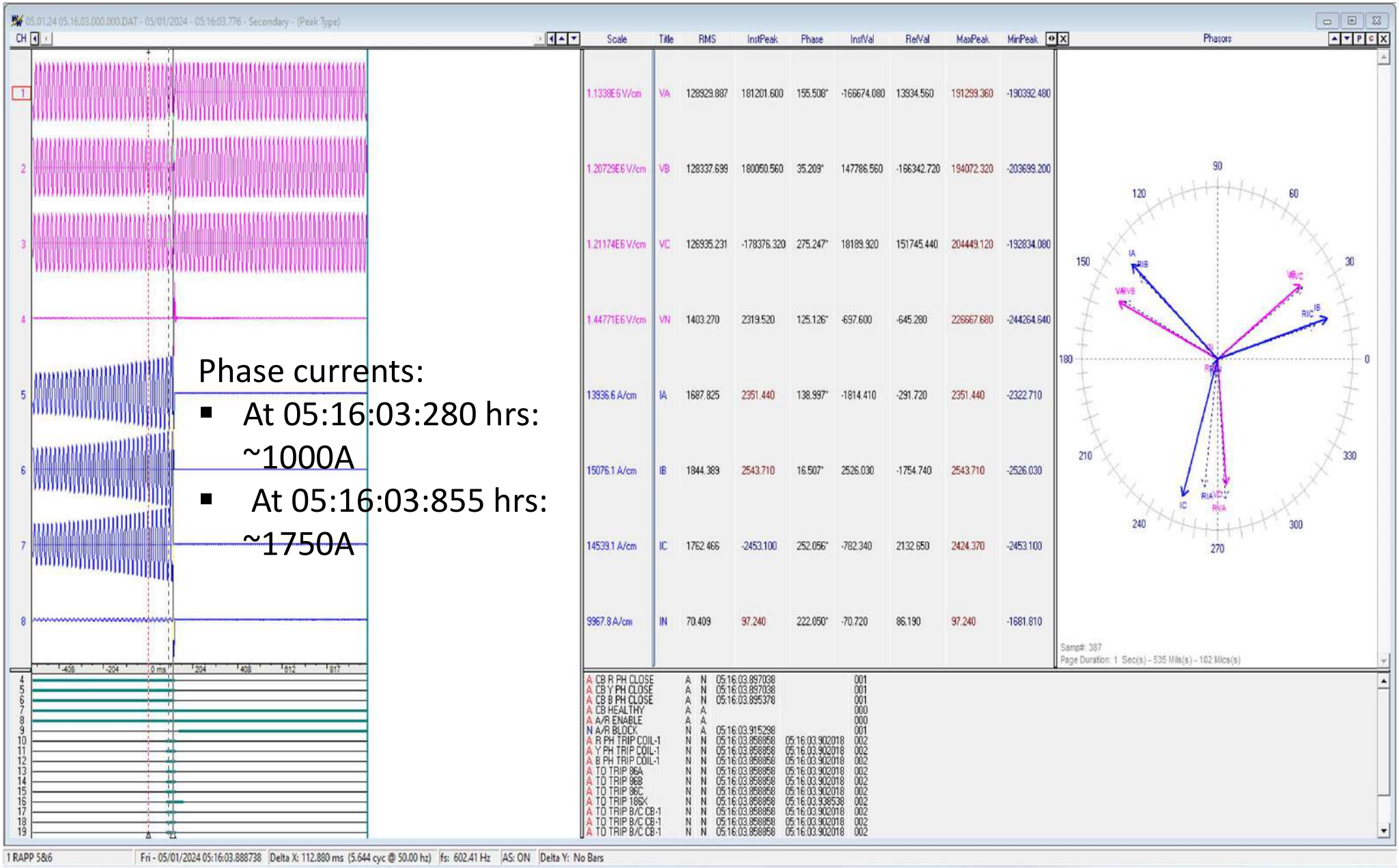
DR of 220kV KTPS-Vatika(end) ckt



Time not synced

Antecedent loading just before the tripping: **~324MW (as reported, tripped on O/C)**

DR of 220kV RAPS_C(end)-Anta ckt



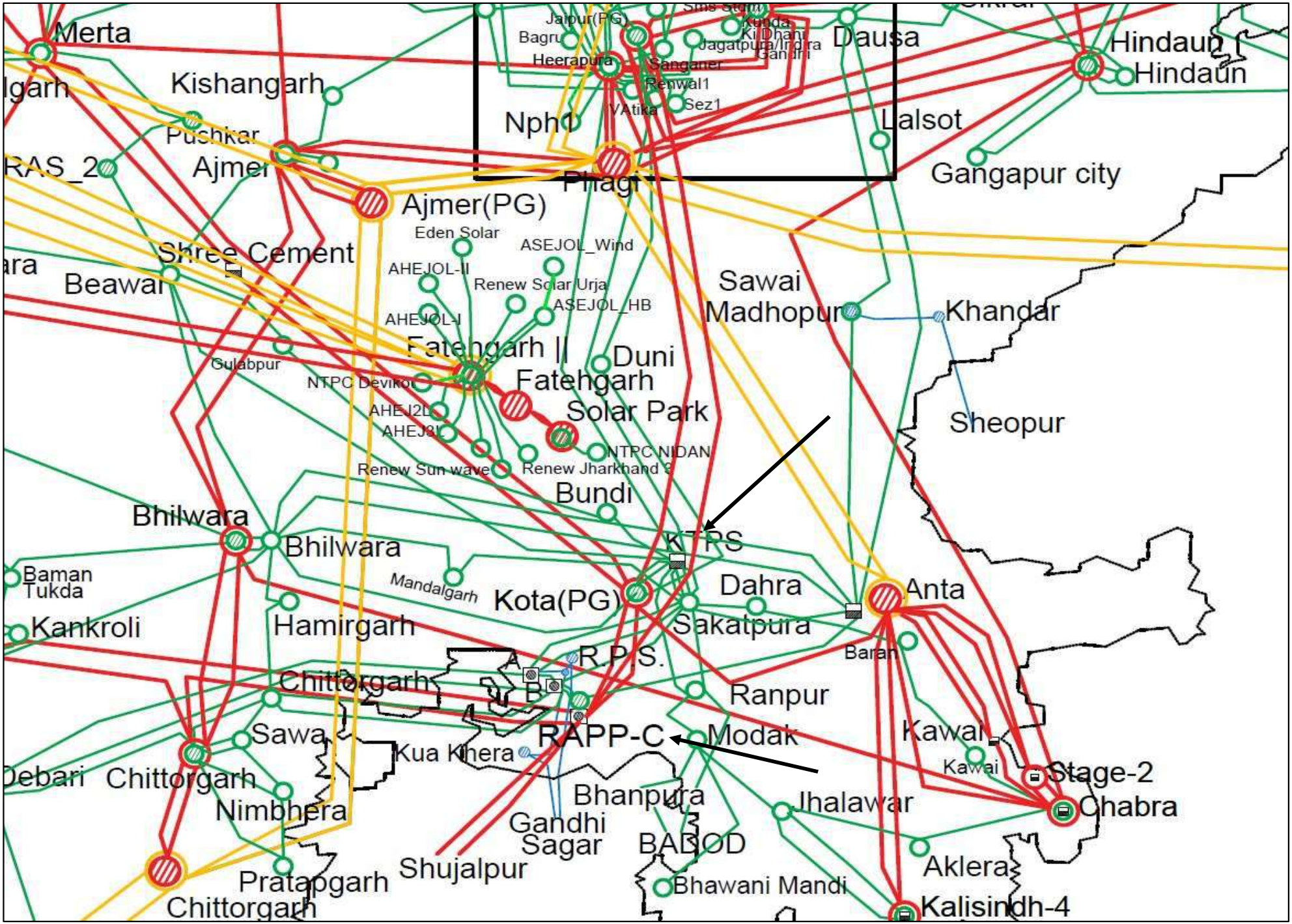
Tripping time: **05:16:03:855**; Antecedent loading just before the tripping: **~660MW**

SCADA SOE

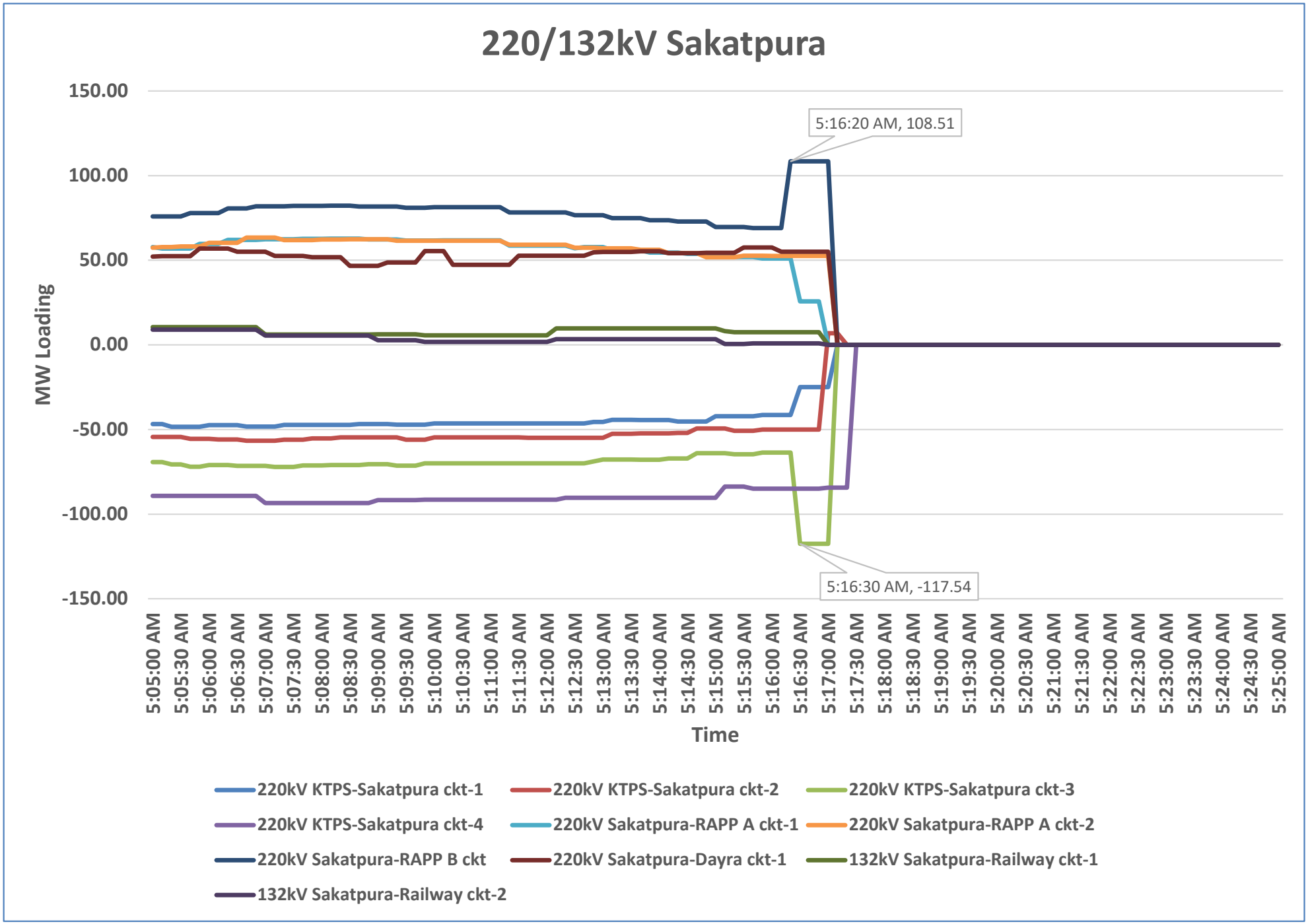
Time	Station Name	Voltage	Element Name	Element Type	Element Status	Remarks
05:15:55,853	GULPR_RS	220kV	02KTPS1	Circuit Breaker	disturbe	
05:15:56,058	GULPR_RS	220kV	02KTPS1	Circuit Breaker	Open	Line CB at Gulabpura(RS) end of 220kV Bundi(RS)-Gulabpura(RS) Ckt opened
05:16:03,939	RAPPC_NP	220kV	02ANTA	Circuit Breaker	Open	Line CB at Rapp-C(NP) end of 220kV RAPP-C(NP)-Anta(NT) Ckt opened
05:16:04,983	RAPPB_NP	220kV	07SUTR4	Circuit Breaker	Open	Line CB at Rapp-B(NP) end of 220kV RAPP-B(NP)-SUT4 Ckt opened
05:16:05,233	RAPPB_NP	220kV	06G4	Circuit Breaker	Open	CB at 220kV side of 220MW Unit-4 at Rapp-B(NP) opened
05:16:06,049	RAPPA_NP	220kV	11G2	Circuit Breaker	Open	CB at 220kV side of 220MW Unit-2 at Rapp-A(NP) opened
05:16:07,774	DYRA__RS	132kV	06ANTA	Circuit Breaker	disturbe	
05:16:08,572	DYRA__RS	132kV	11IA	Circuit Breaker	Open	Line CB at Dahara(RS) end of 132kV Dahara(RS)-Kota IA Ckt opened
05:16:08,609	DYRA__RS	220kV	04KOTAS	Circuit Breaker	disturbe	
05:16:08,611	DYRA__RS	220kV	02BARAN	Circuit Breaker	Open	Line CB at Dahara(RS) end of 220kV Dahara(RS)-Baran Ckt opened
05:16:08,742	RPS___RS	132kV	06MBC	Circuit Breaker	Open	Bus coupler CB at 132kV RPS(RS) opened
05:16:12,851	UCMNT_RS	132kV	02DEBAR1	Circuit Breaker	disturbe	
05:16:12,859	UCMNT_RS	132kV	02DEBAR1	Circuit Breaker	Open	Line CB at UCW(RS) end of 132kV UCW(RS)-Debari(RS) Ckt opened
05:16:15,666	RPS___RS	132kV	09U3	Circuit Breaker	Open	CB at 132kV side of 43MW Unit-3 at RPS(RS) opened
05:16:16,104	RPS___RS	132kV	10U4	Circuit Breaker	Open	CB at 132kV side of 43MW Unit-4 at RPS(RS) opened
05:16:22,001	RPS___RS	132kV	04U1	Circuit Breaker	Open	CB at 132kV side of 43MW Unit-1 at RPS(RS) opened

SLD/Network and Graphs

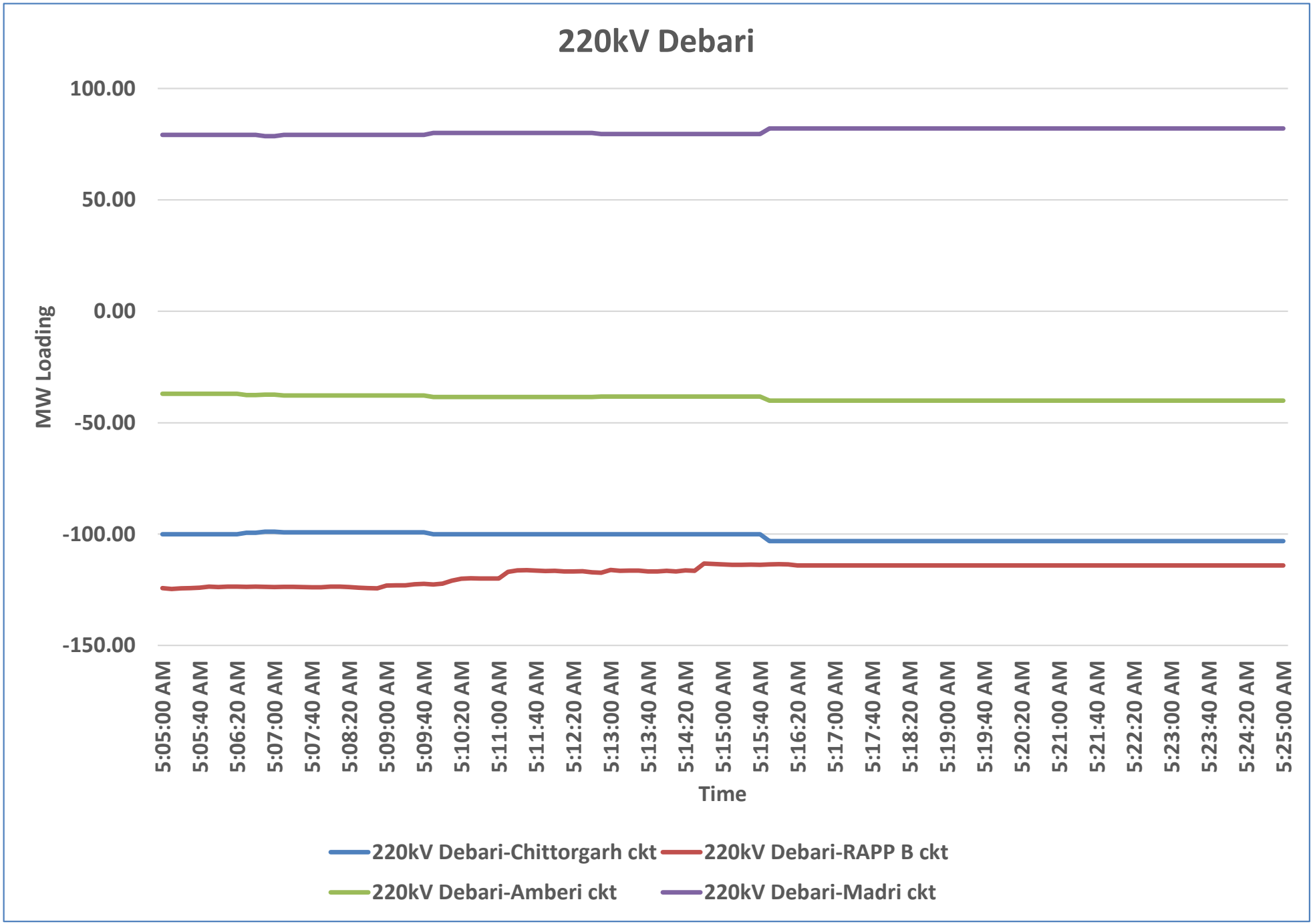
Network Diagram



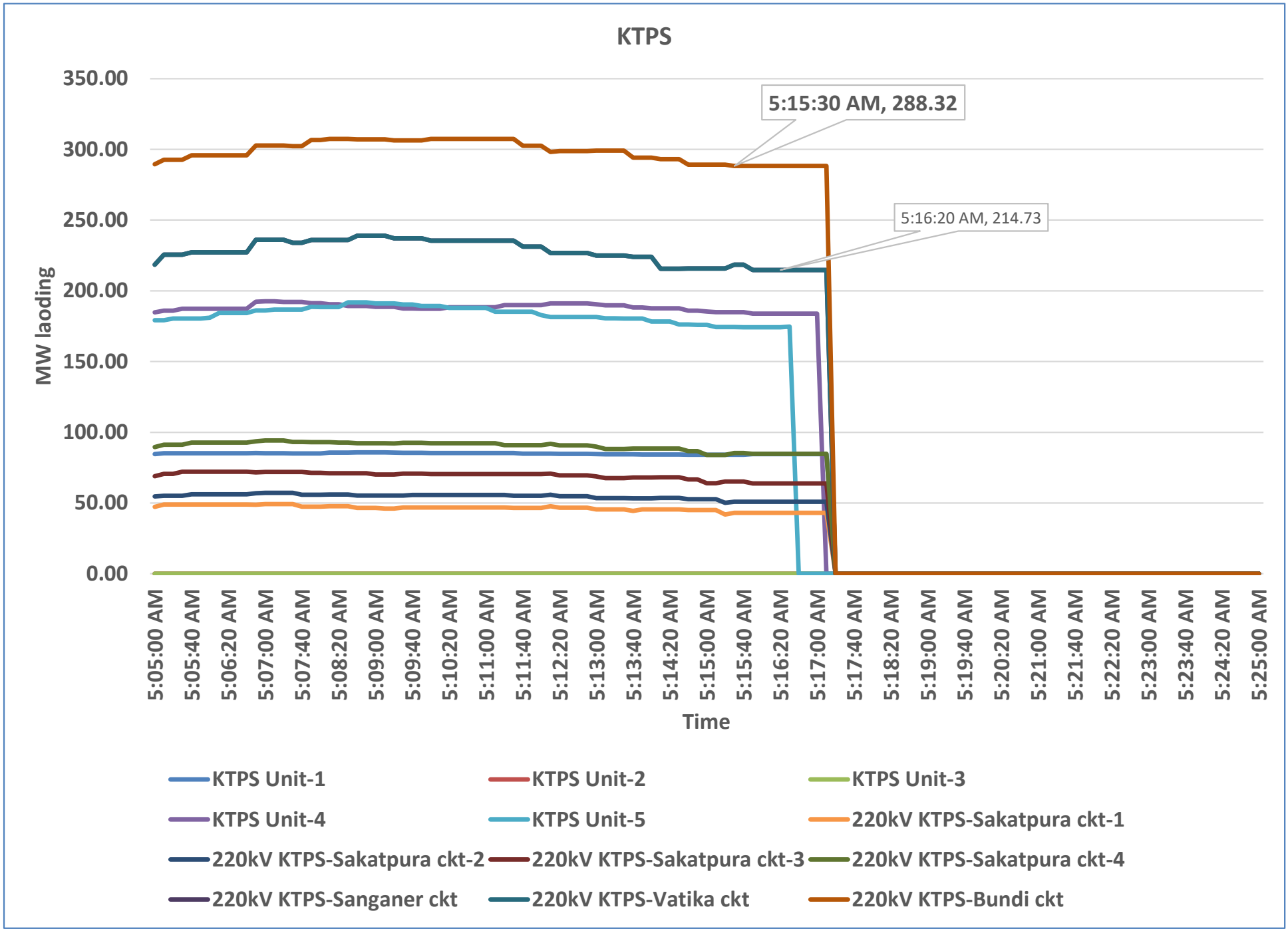
Element wise MW load flow



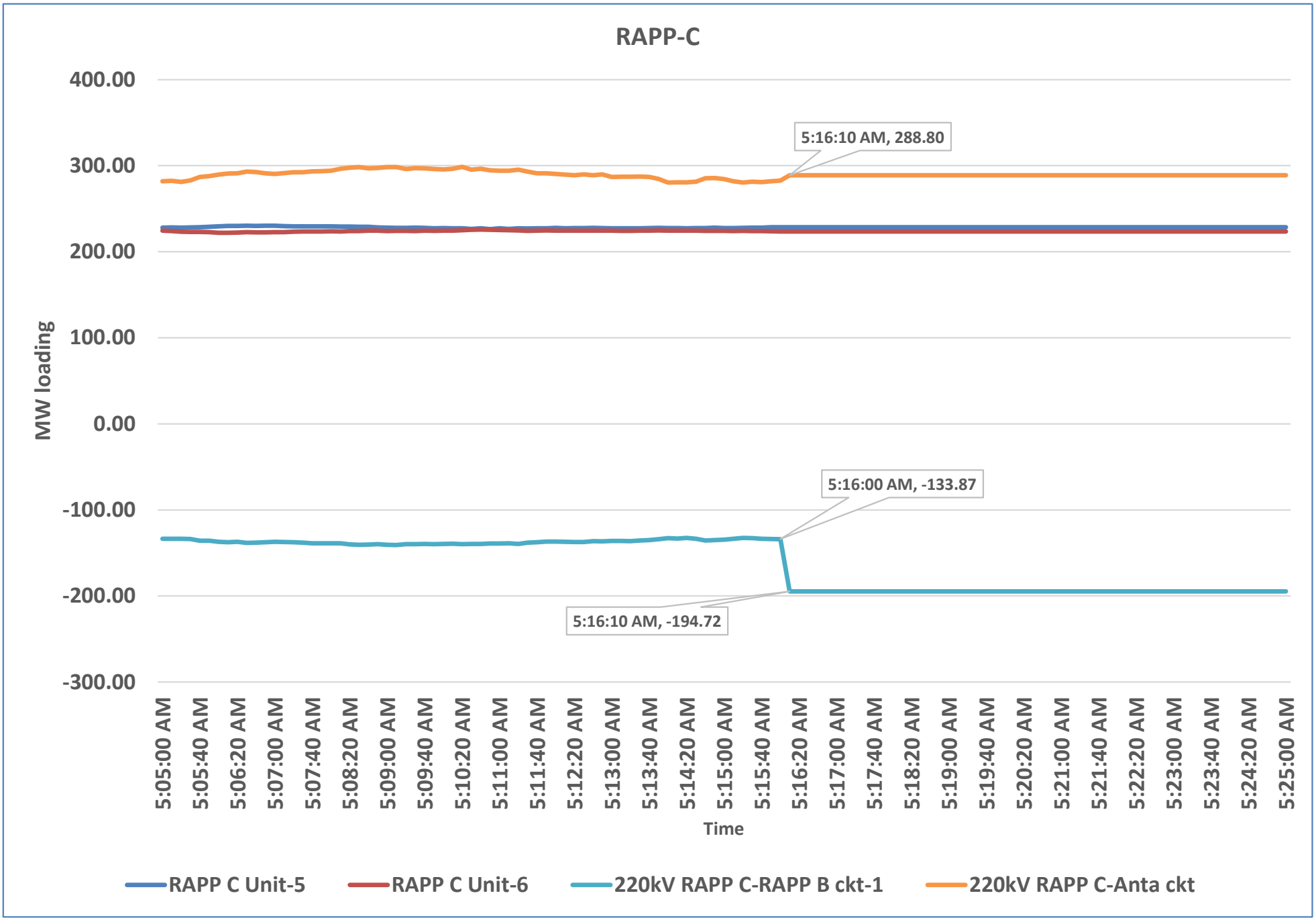
Element wise MW load flow



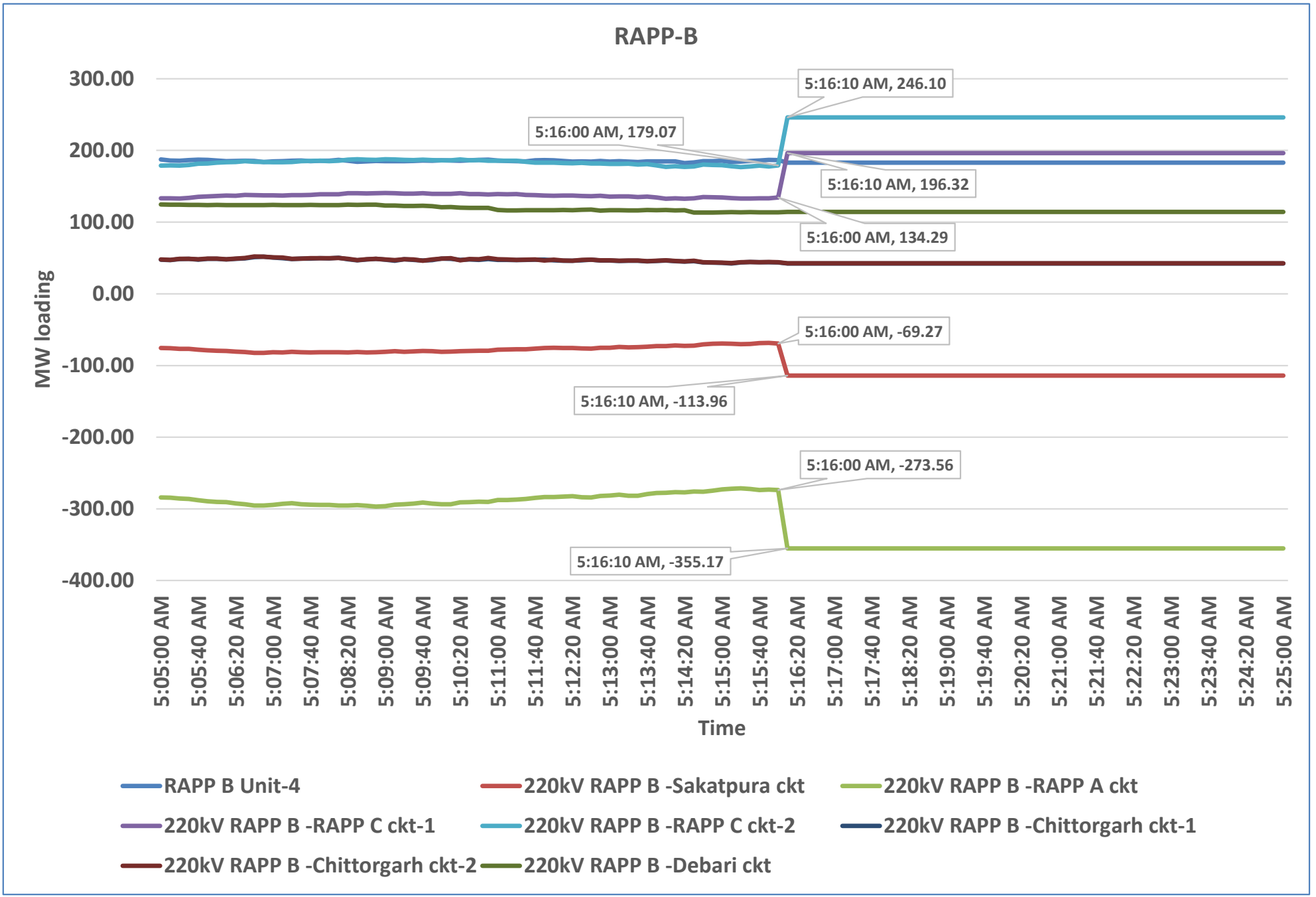
Element wise MW load flow



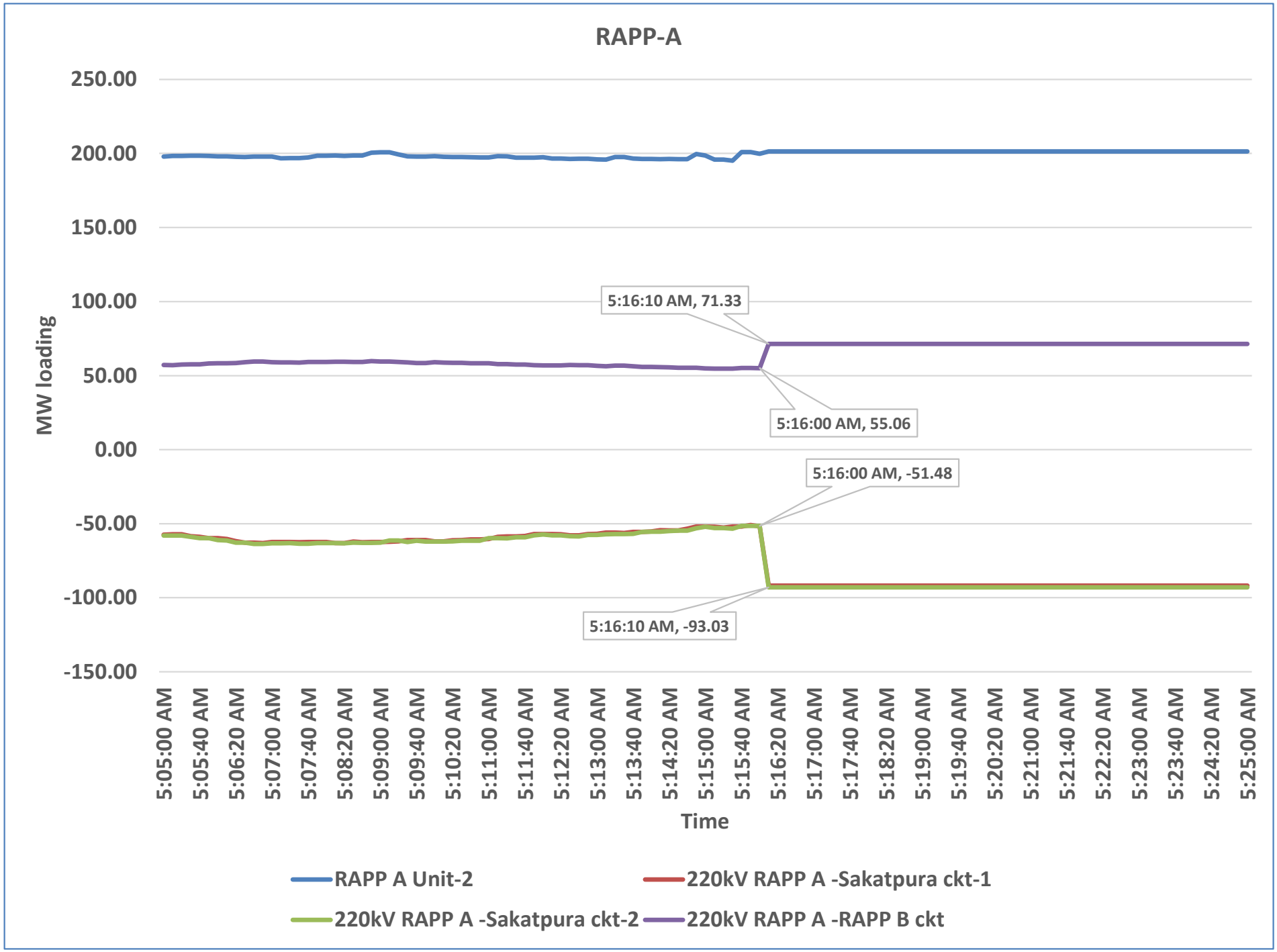
Element wise MW load flow



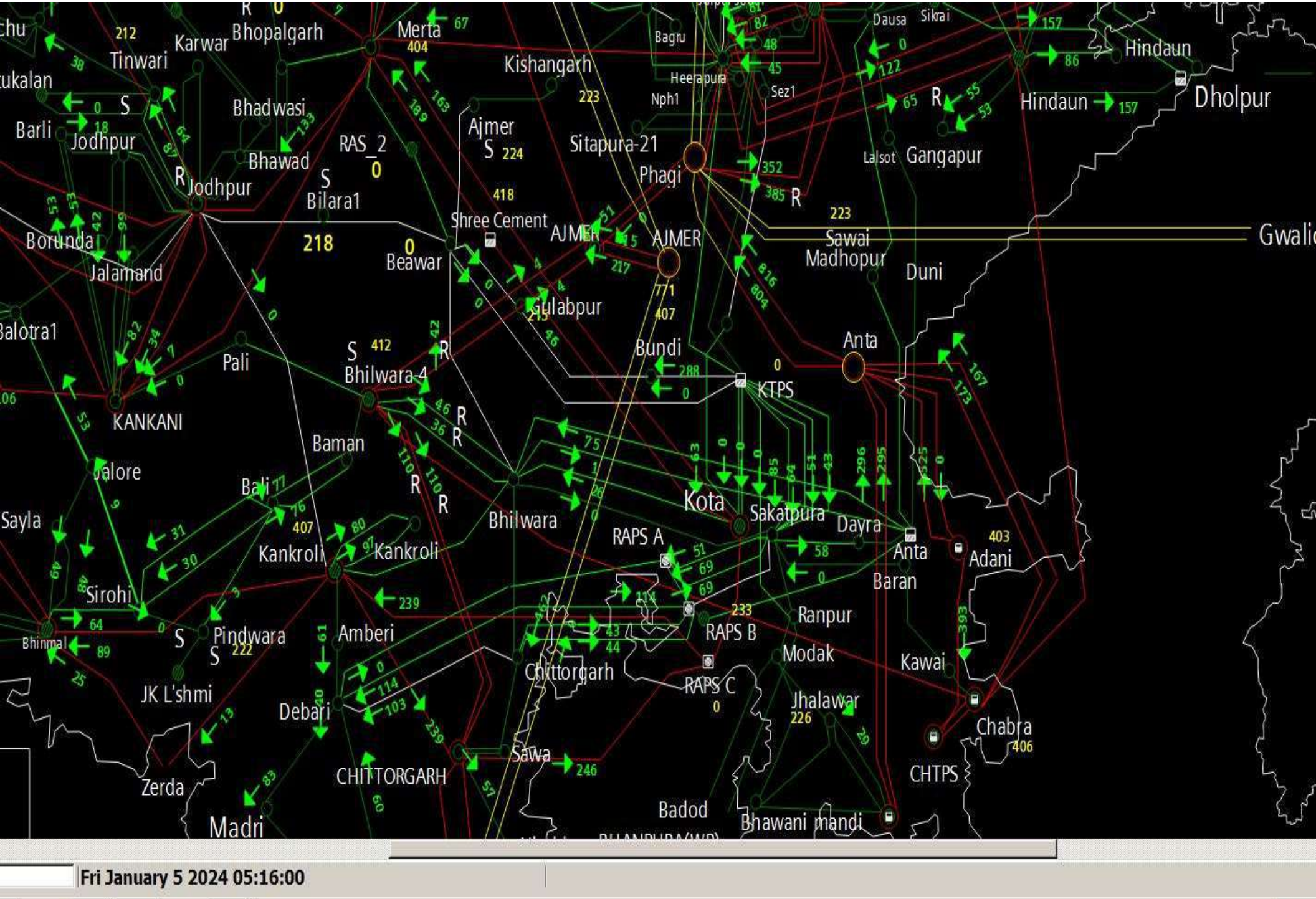
Element wise MW load flow



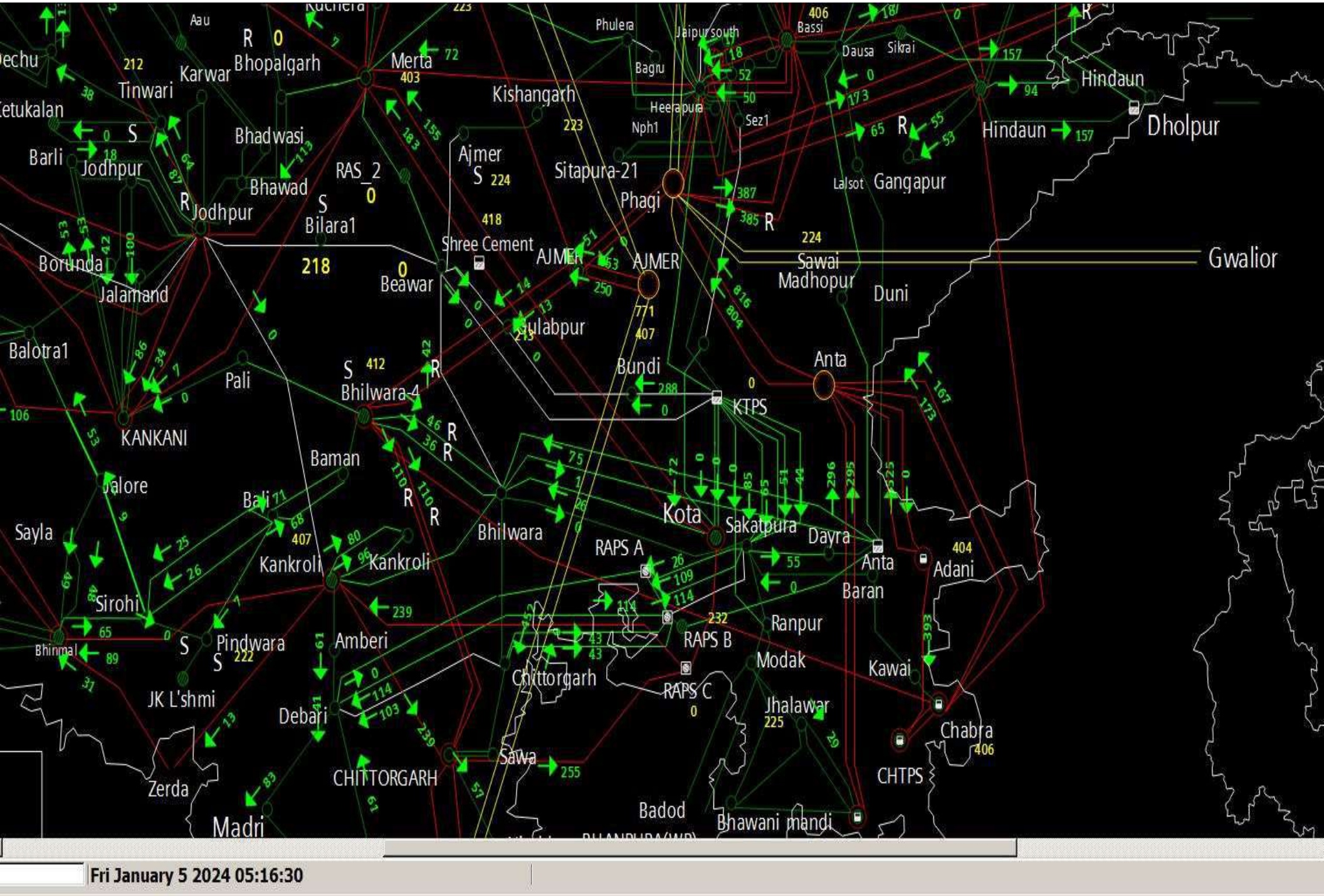
Element wise MW load flow



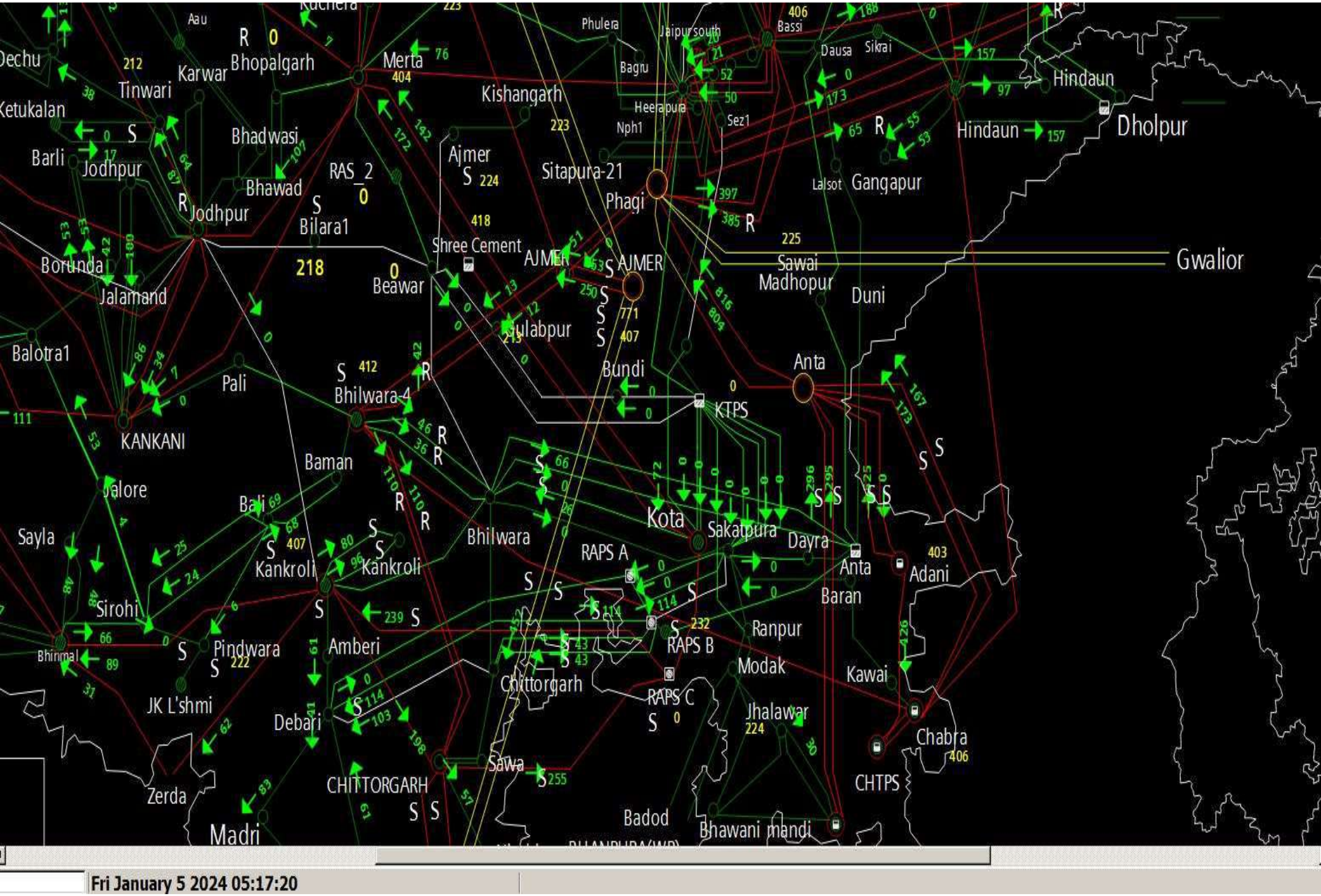
Network diagram @05:16:00hrs



Network diagram @05:16:30hrs

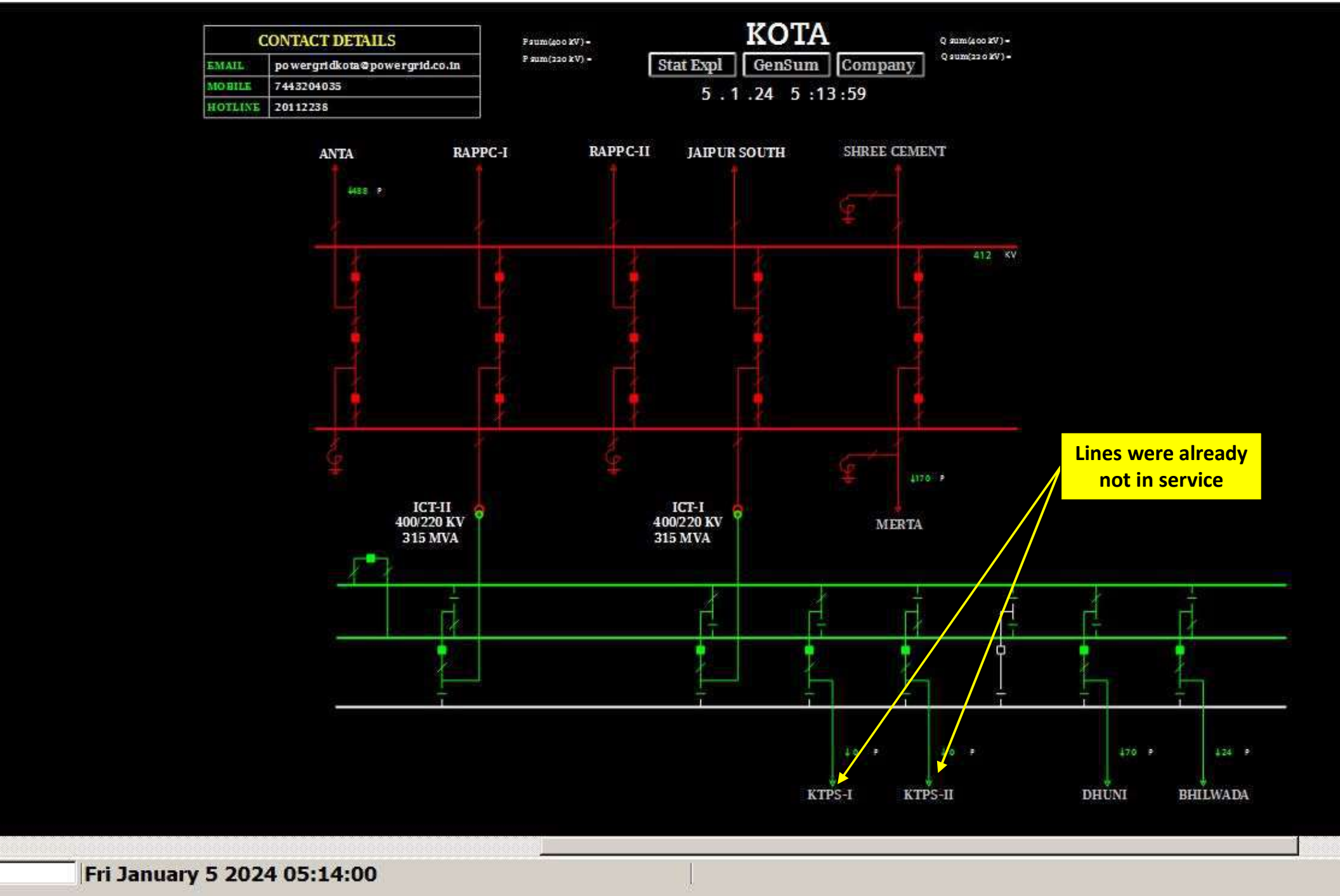


Network diagram @05:17:20hrs

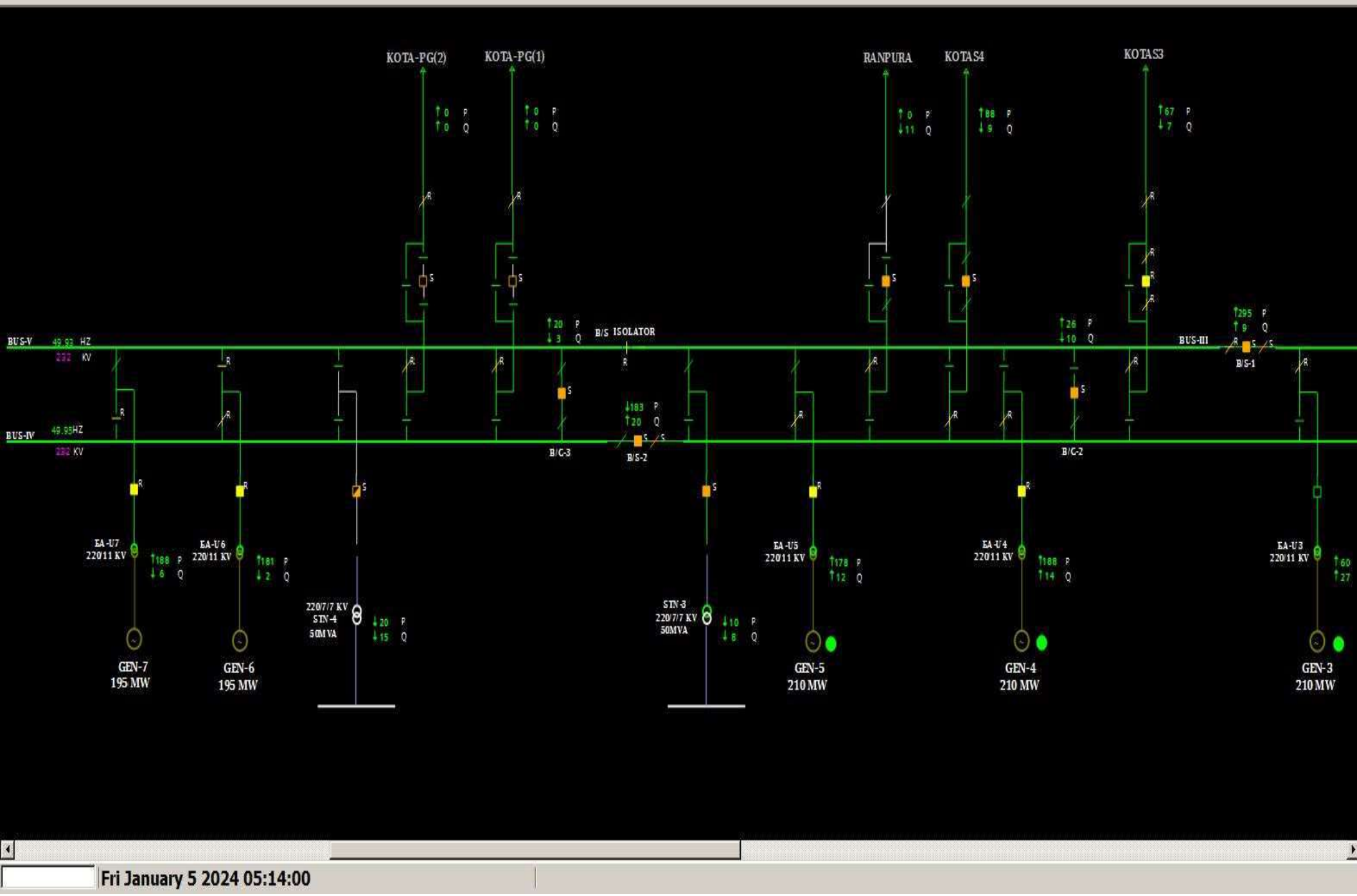


Fri January 5 2024 05:17:20

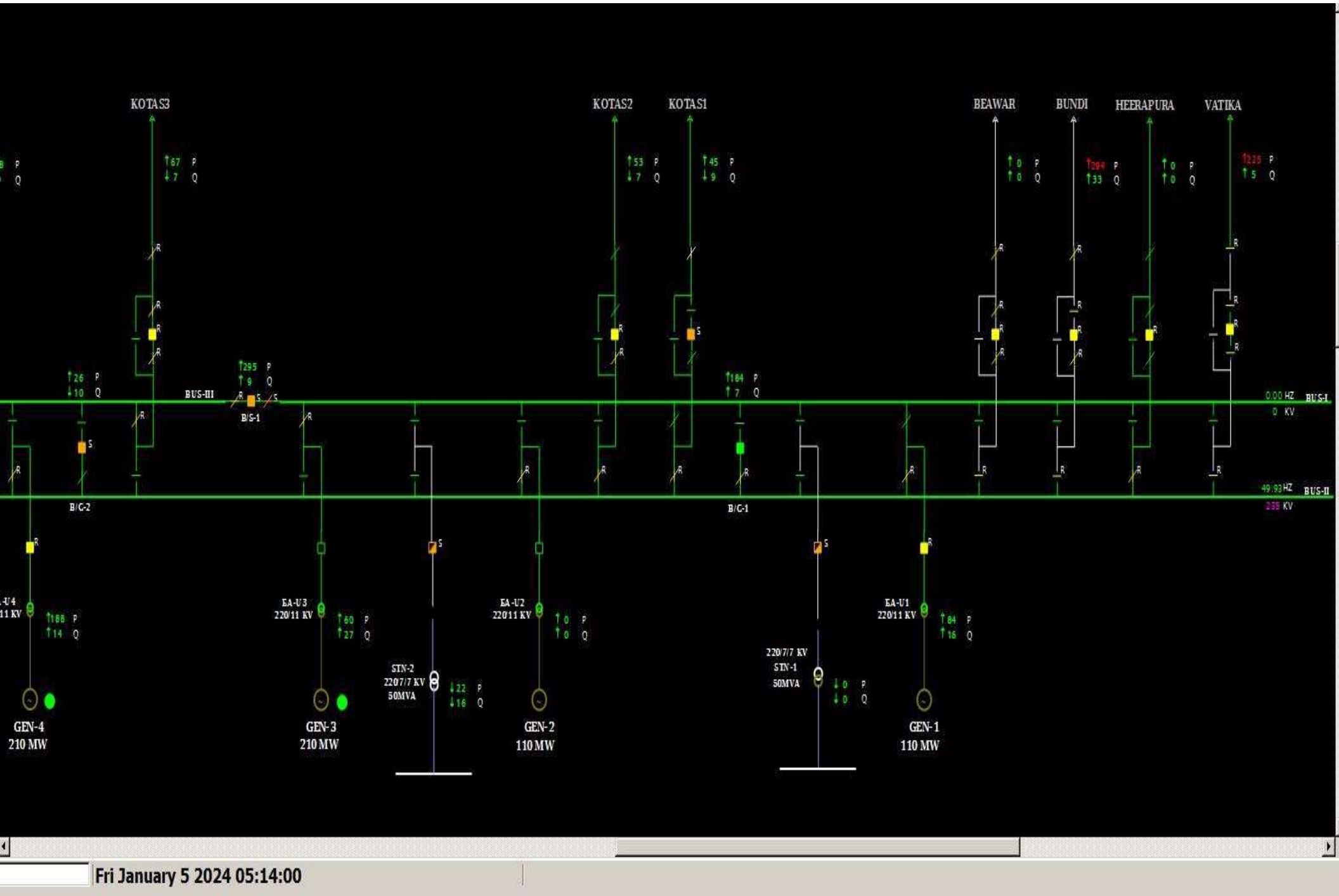
SLD of 400/220kV Kota(PG) before the event



SLD of 220kV KTPS before the event (1/2)

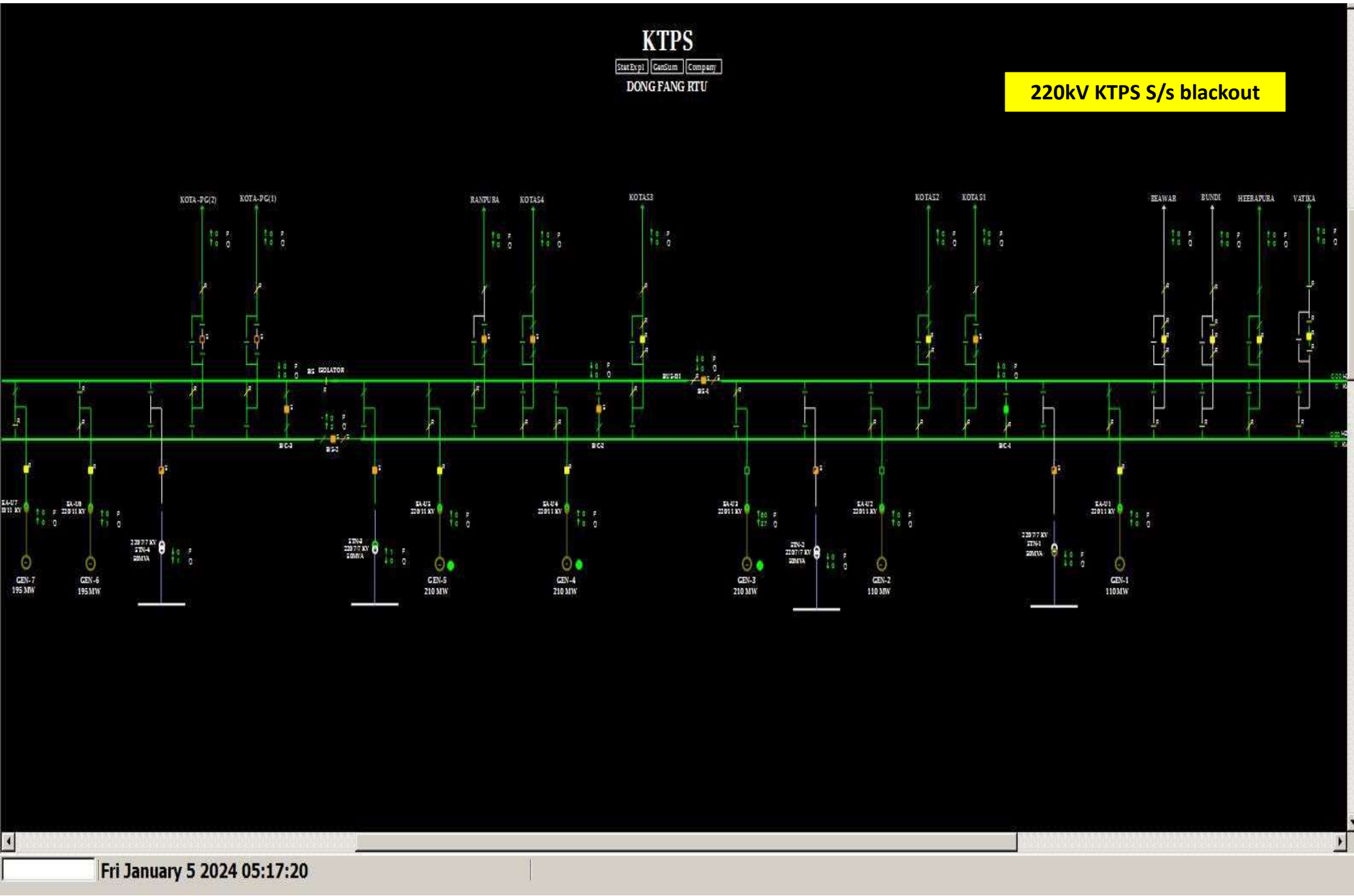


SLD of 220kV KTPS before the event (2/2)

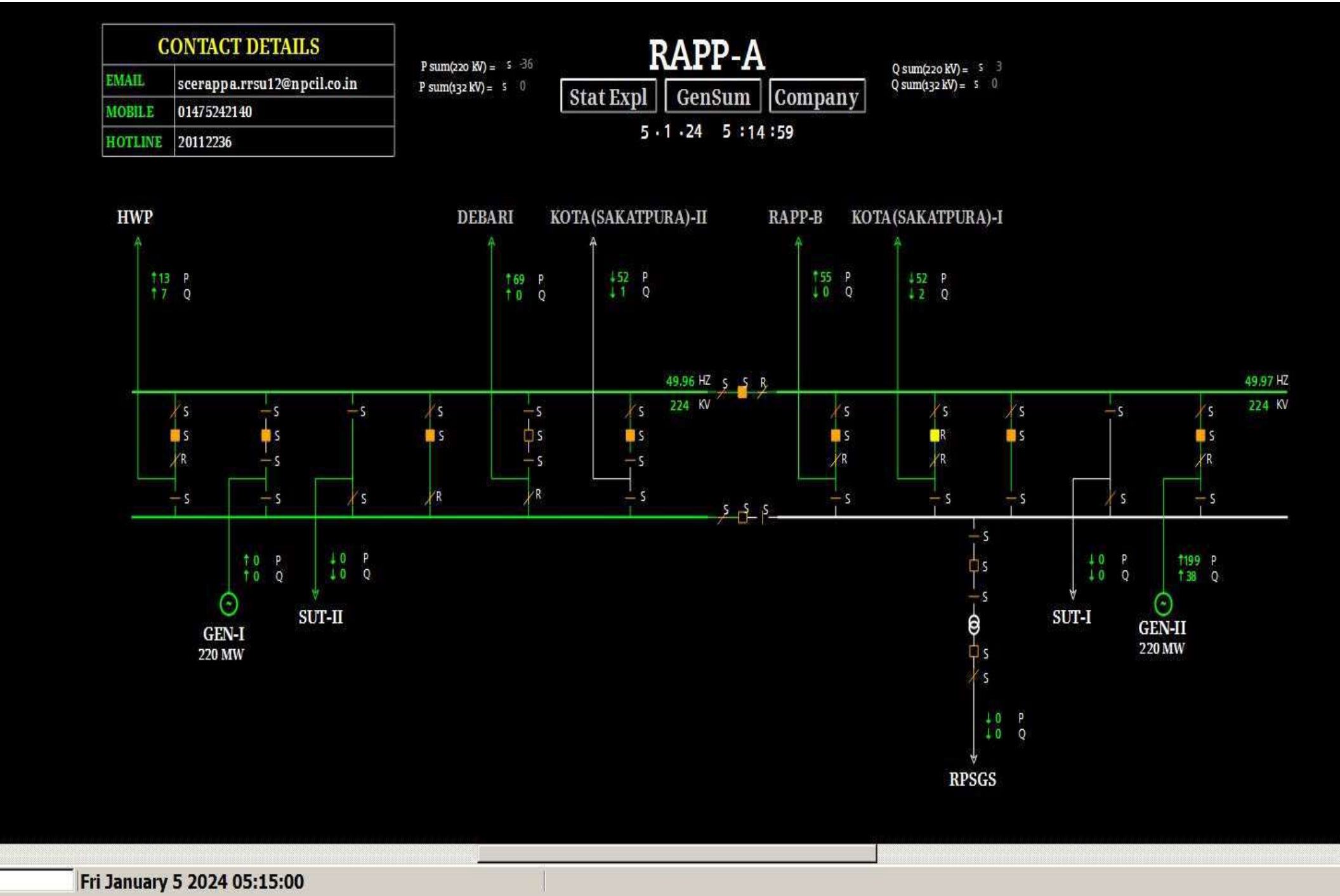


Fri January 5 2024 05:14:00

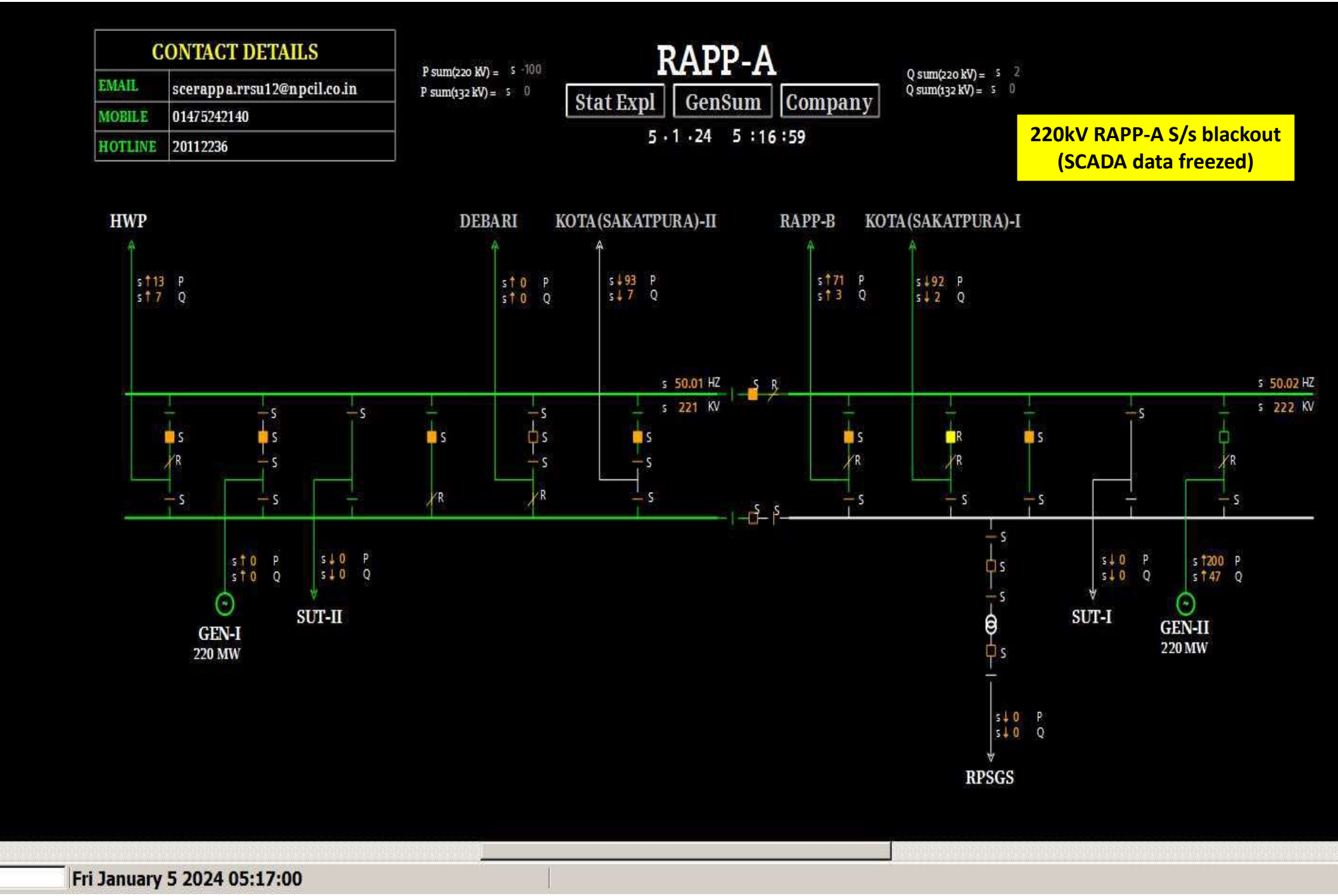
SLD of 220kV KTPS after the event



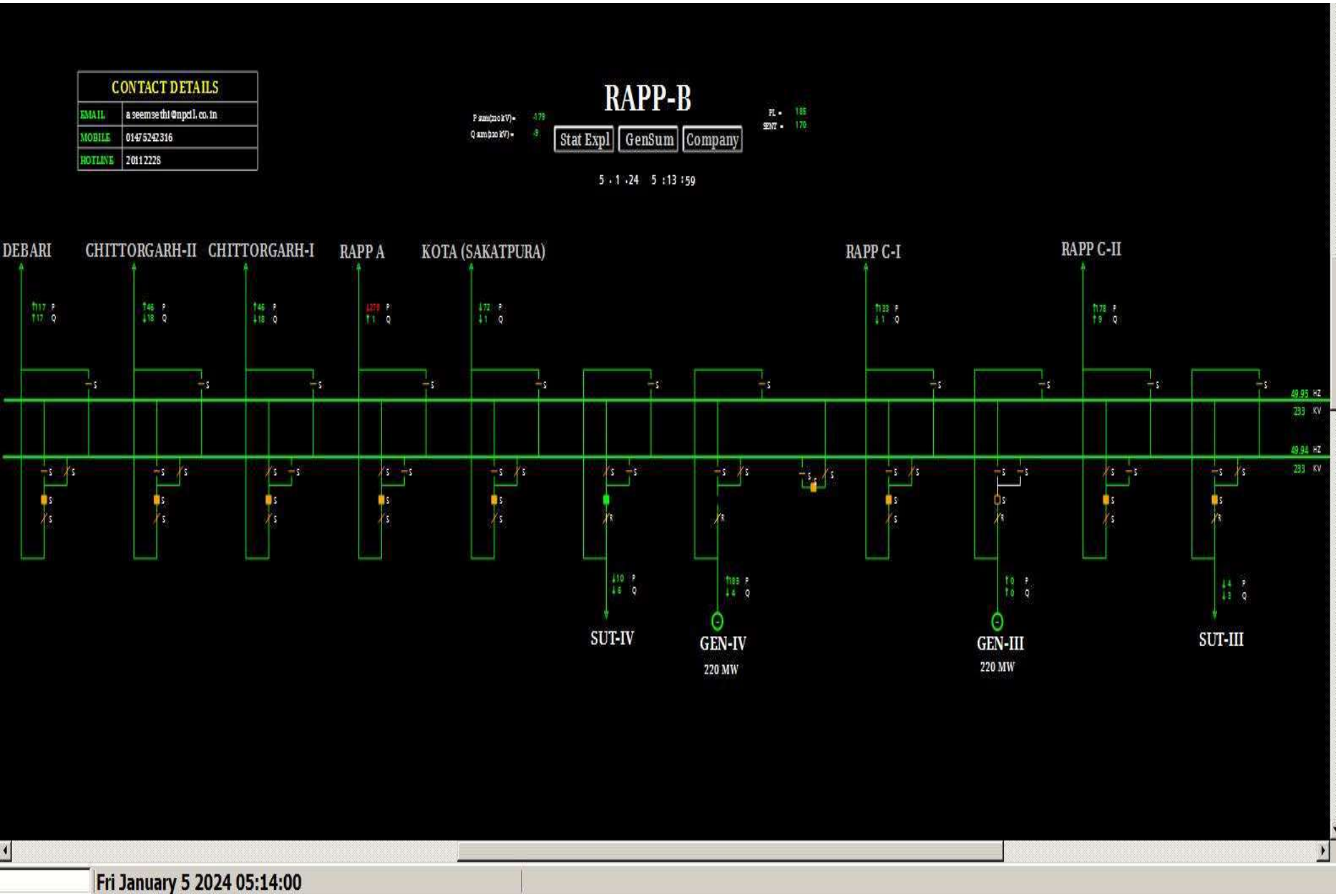
SLD of 220kV RAPP-A(NP) before the event



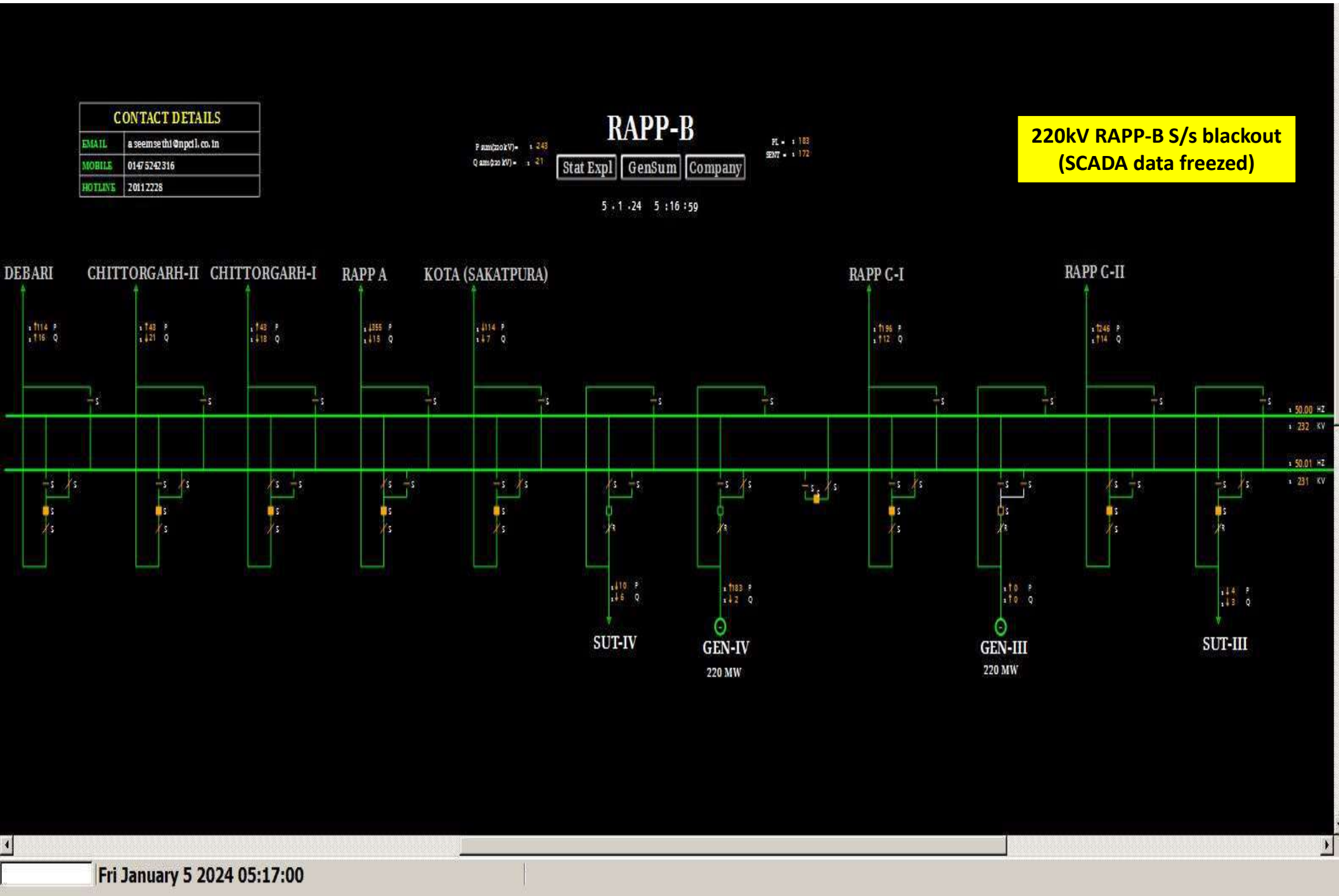
SLD of 220kV RAPP-A(NP) after the event



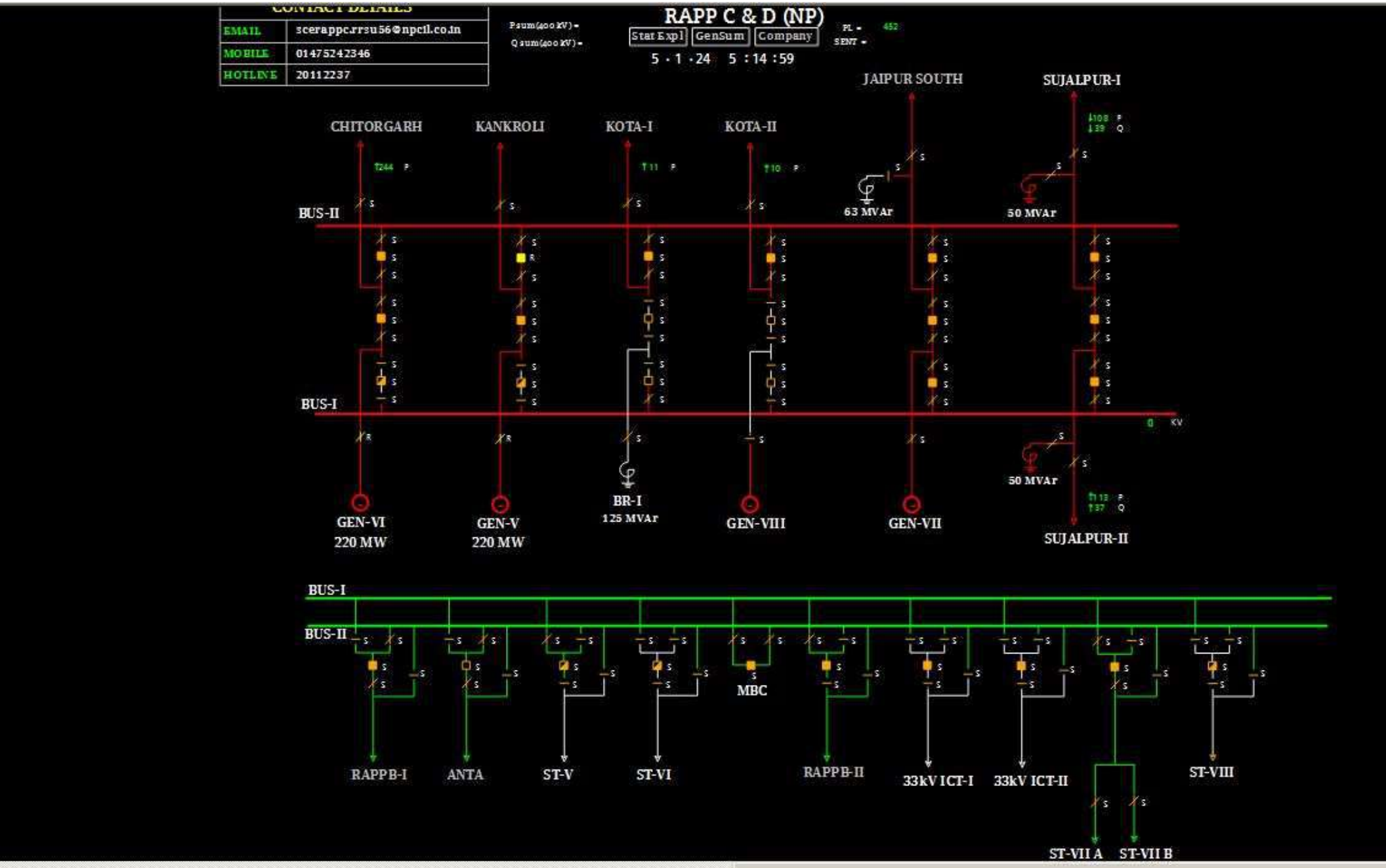
SLD of 220kV RAPP-B(NP) before the event



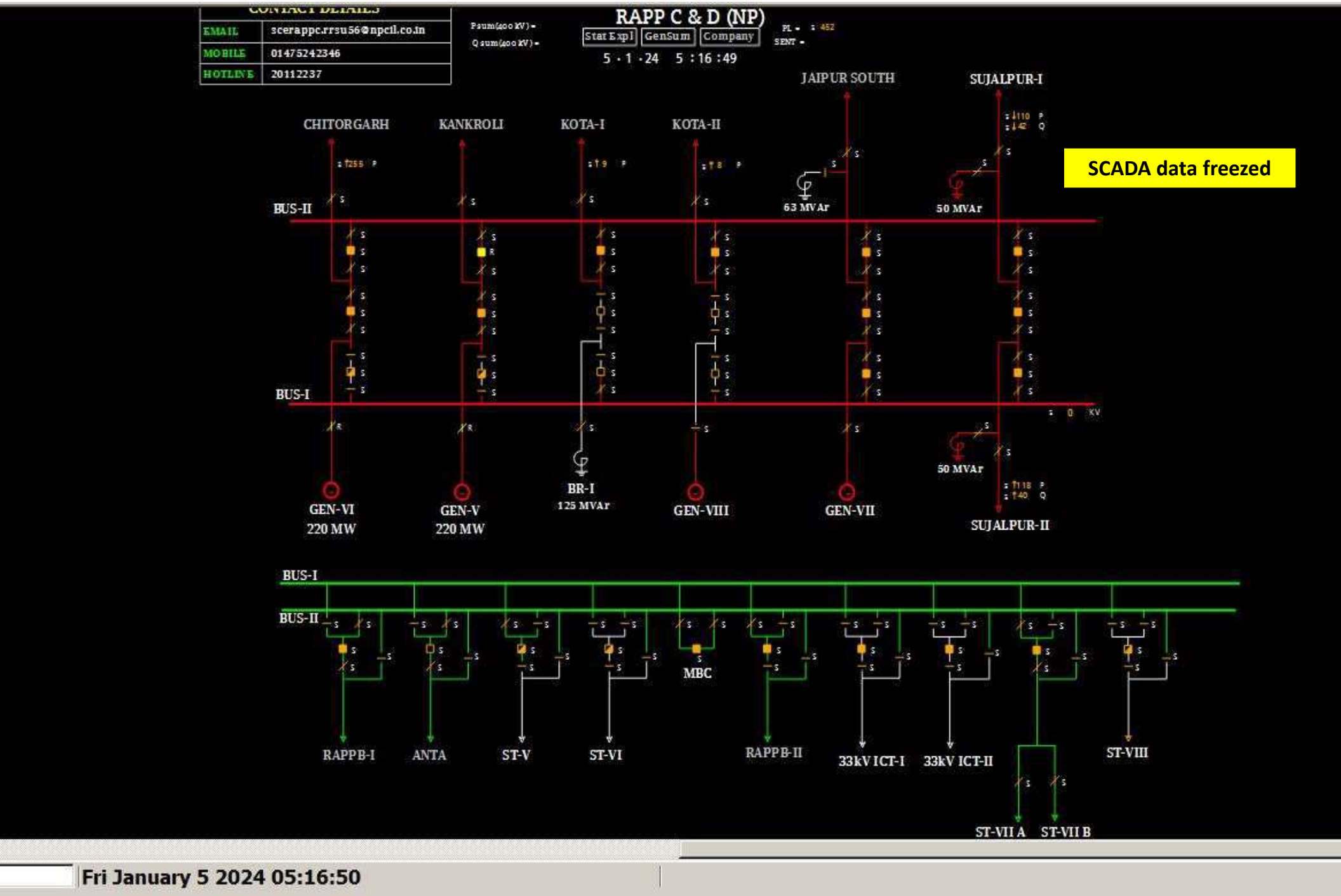
SLD of 220kV RAPP-B(NP) after the event



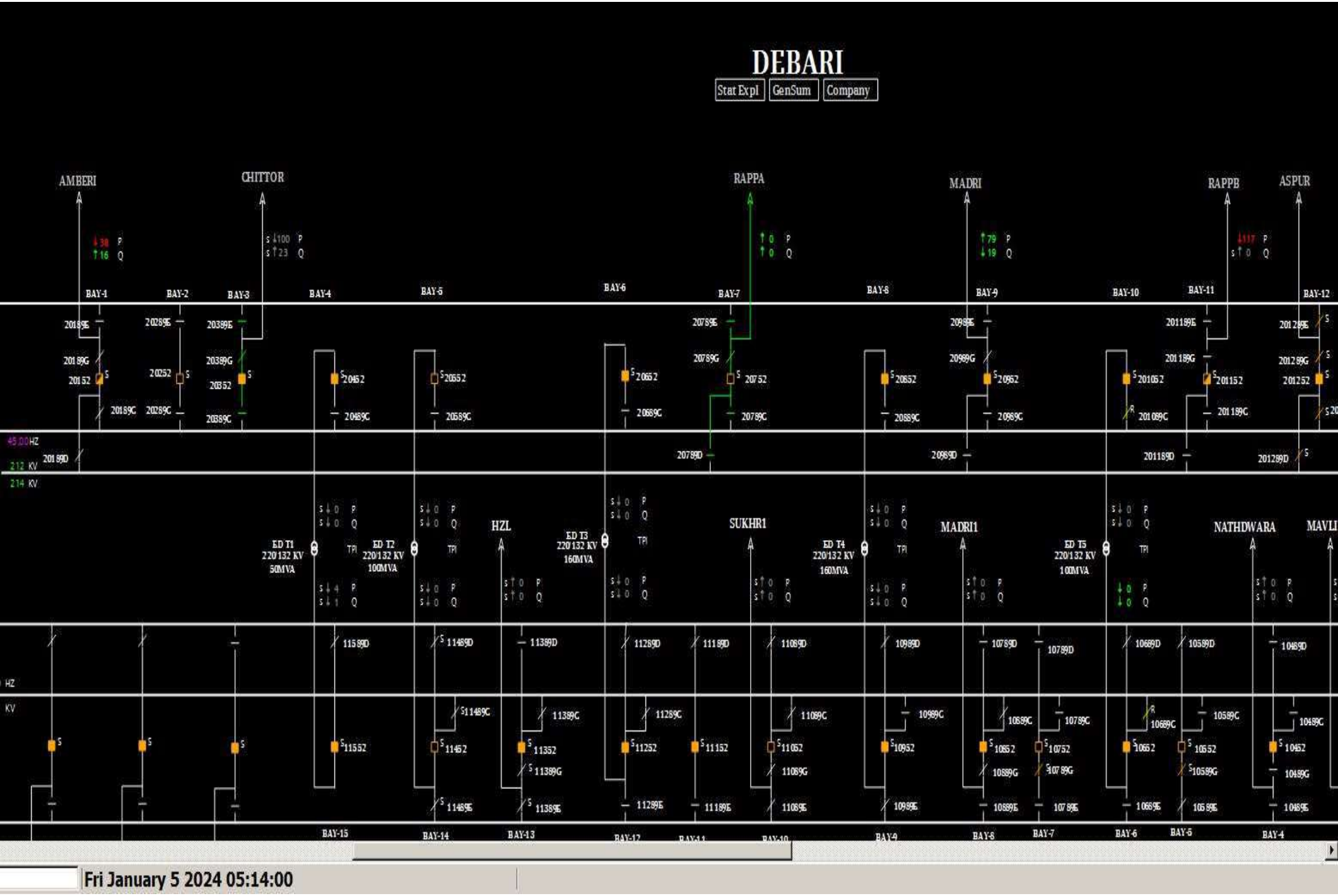
SLD of 400/220kV RAPP-C(NP) before the event



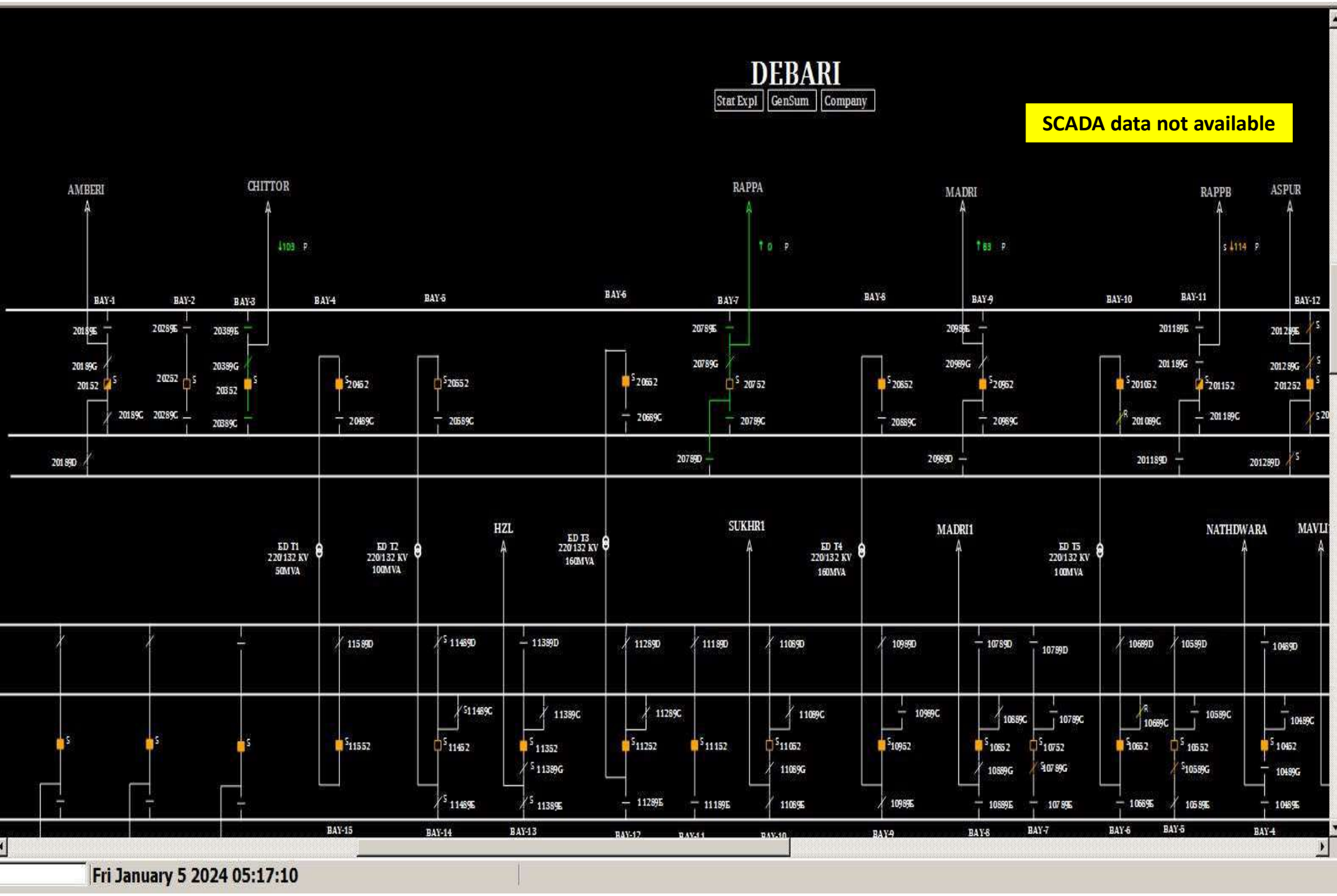
SLD of 400/220kV RAPP-C(NP) after the event



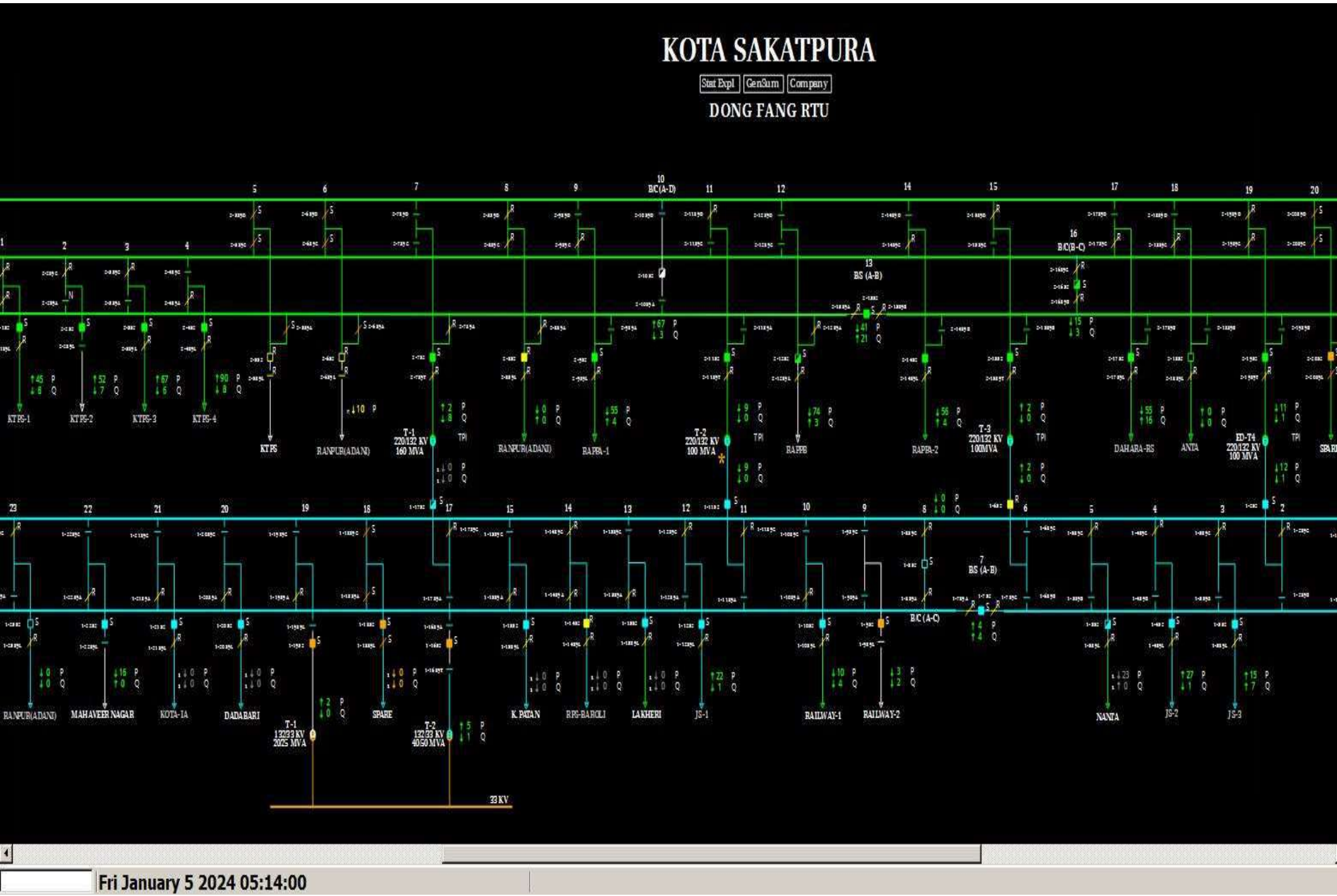
SLD of 220/132kV Debari(RS) before the event



SLD of 220/132kV Debari(RS) after the event

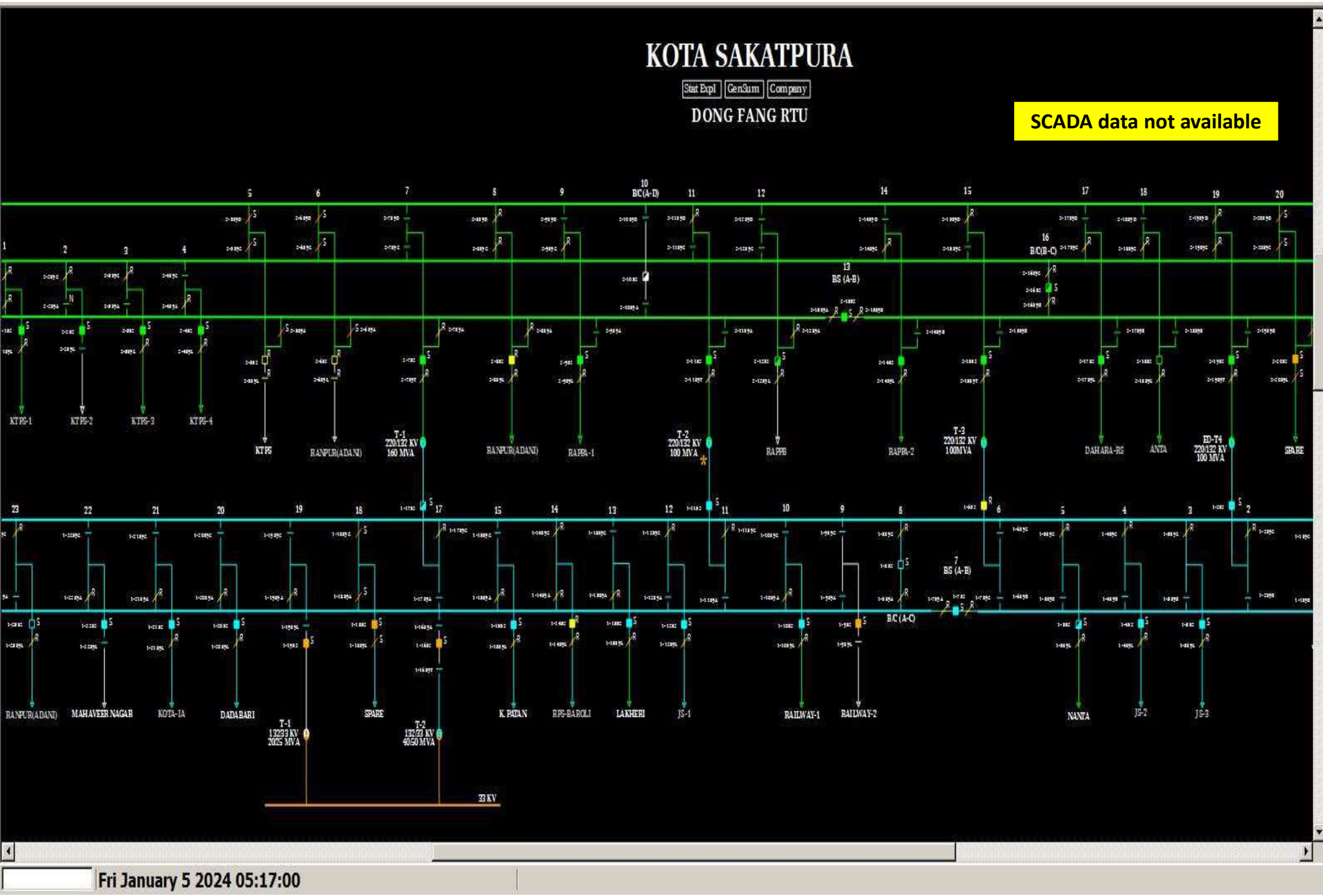


SLD of 220/132kV Kota Sakatpura(RS) before the event



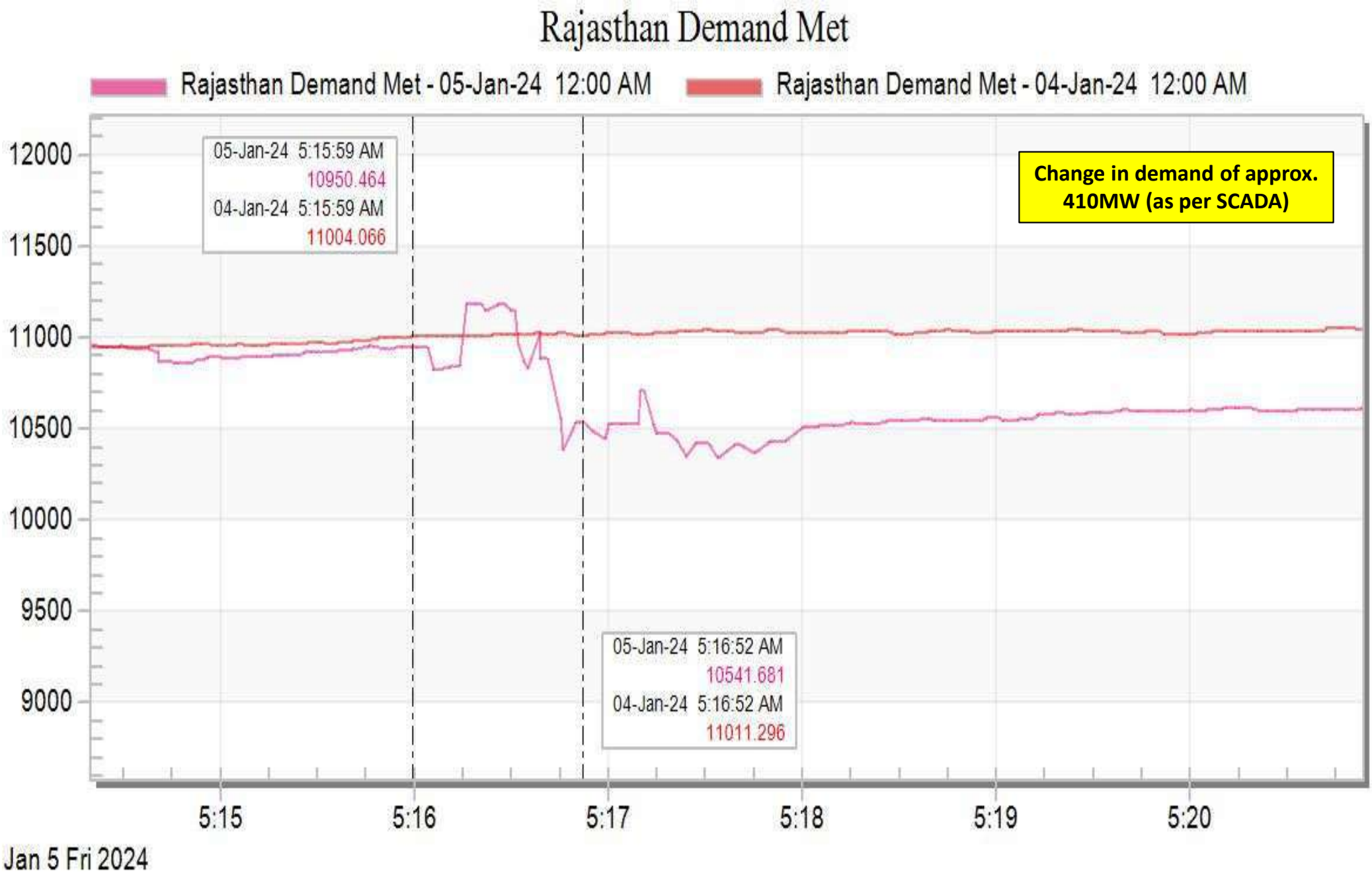
Fri January 5 2024 05:14:00

SLD of 220/132kV Kota Sakatpura(RS) after the event

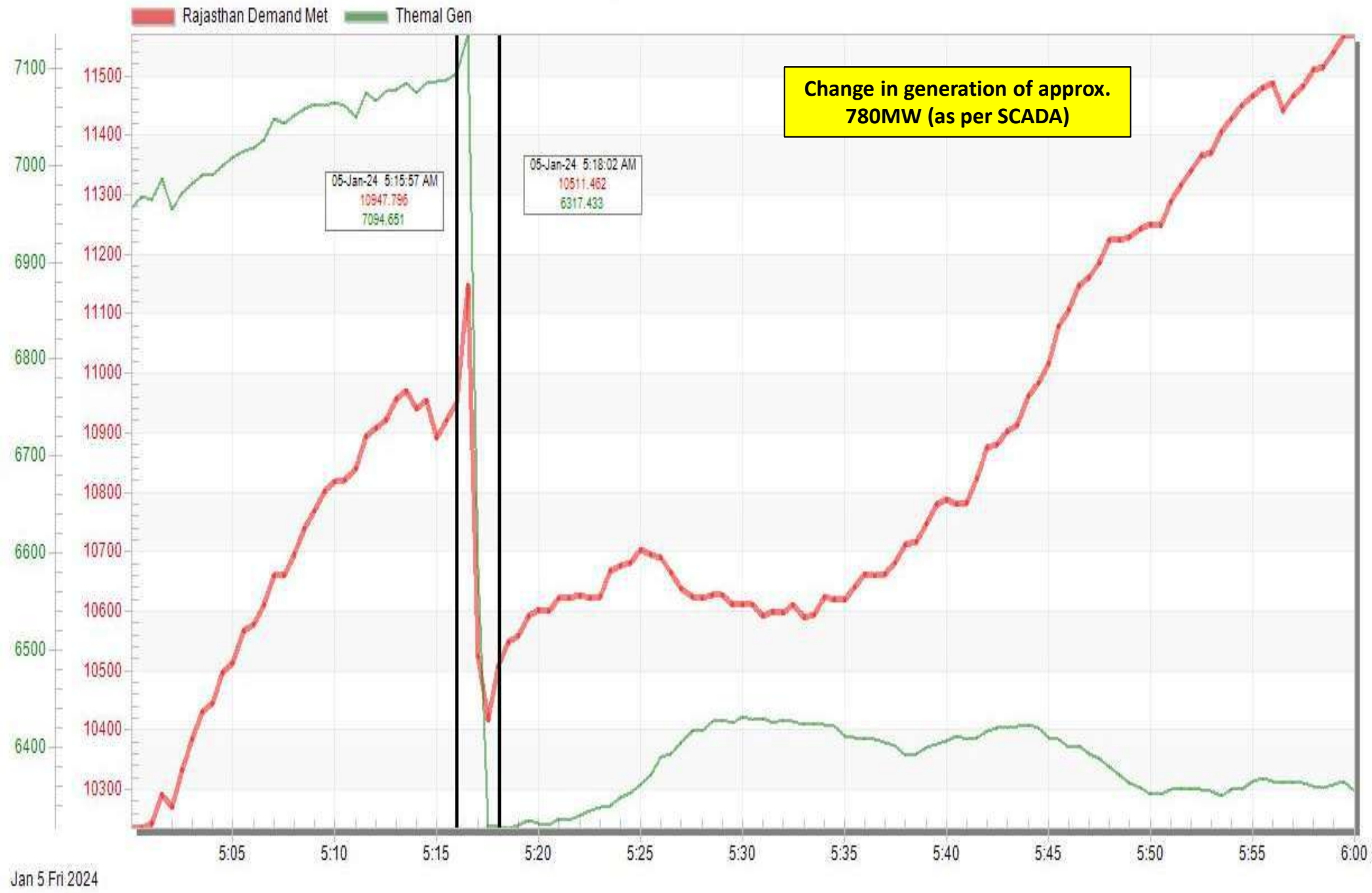


Fri January 5 2024 05:17:00

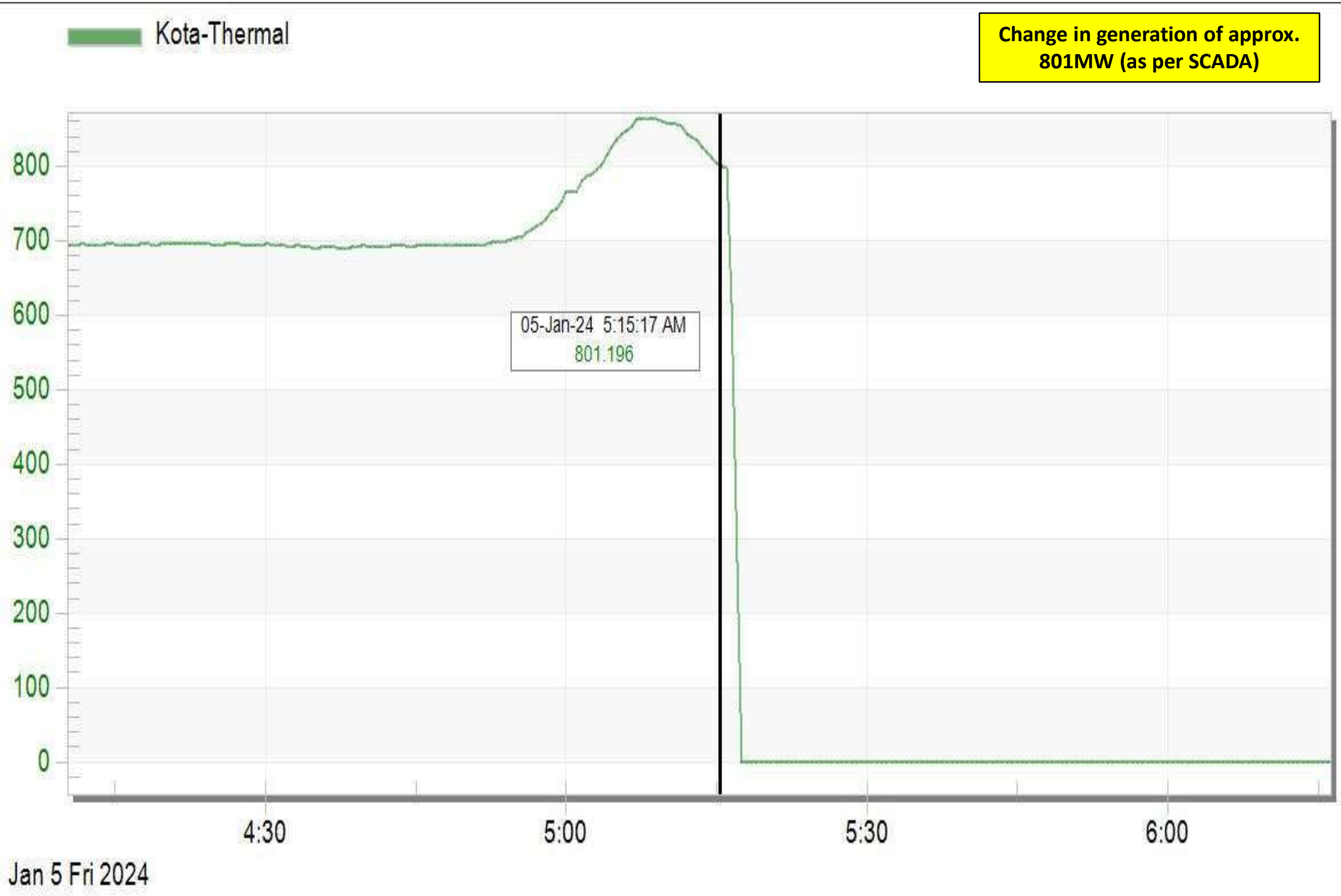
Rajasthan demand during the event



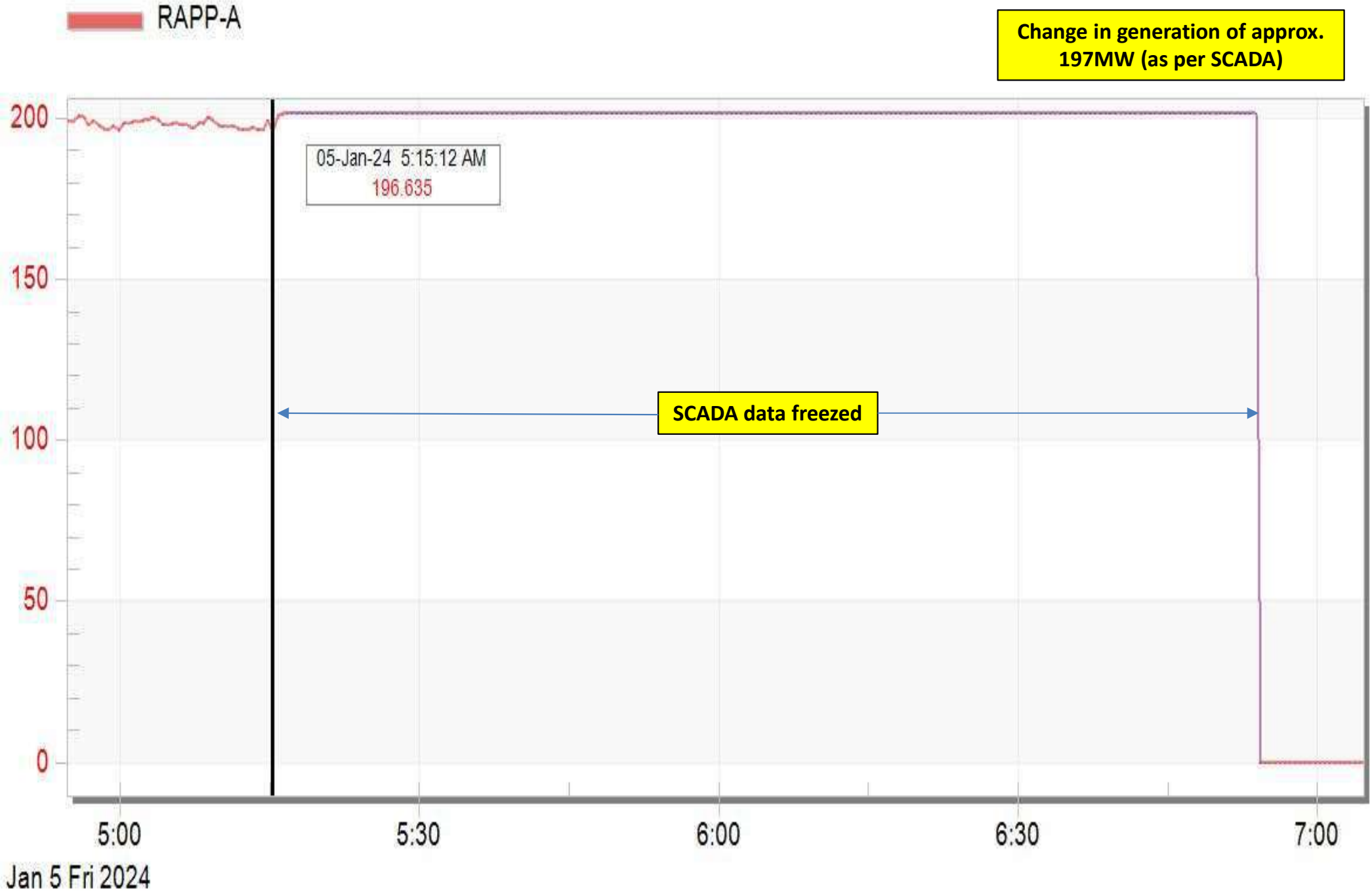
Rajasthan demand vs generation during the event



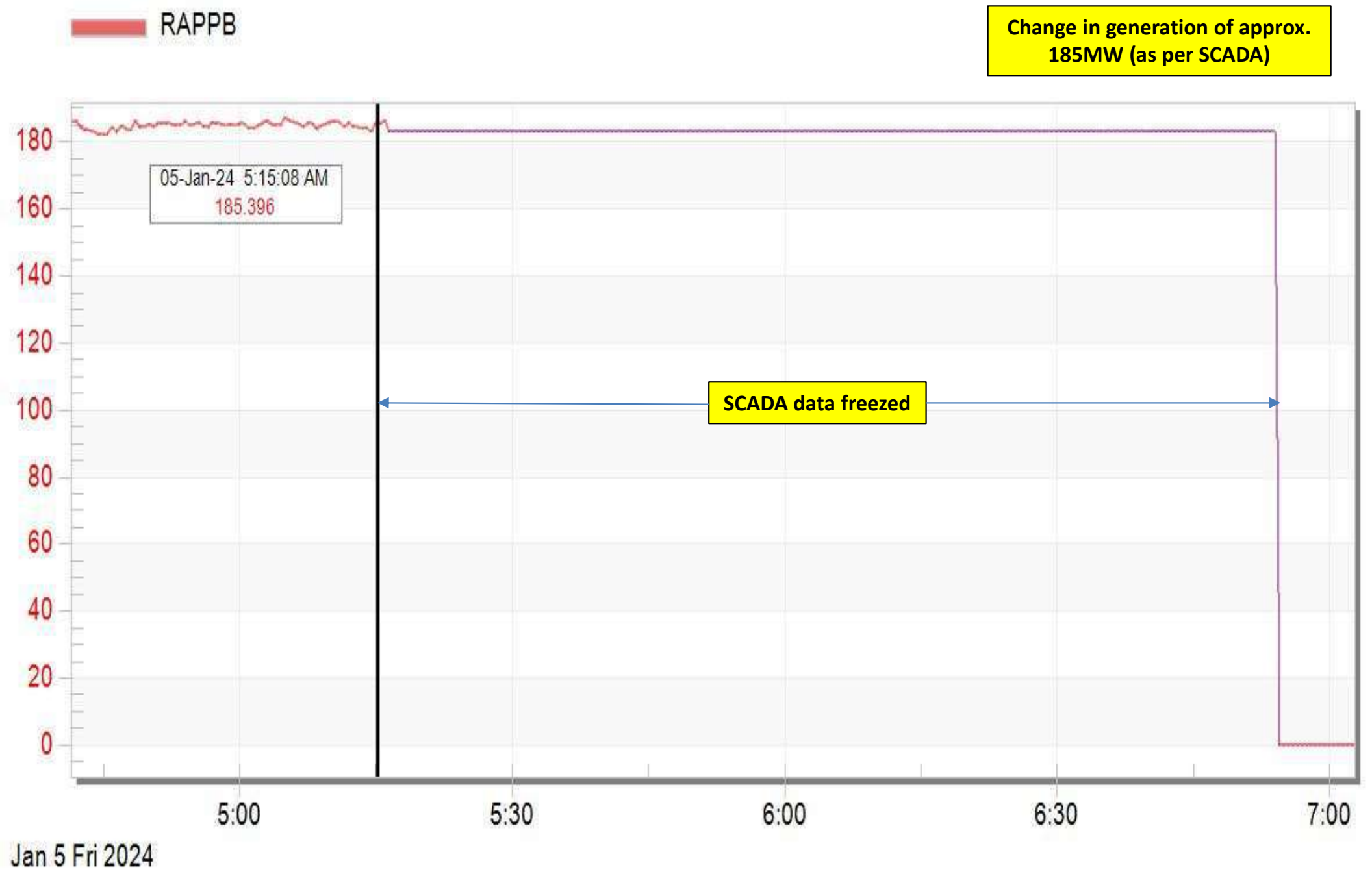
KTPS generation during the event



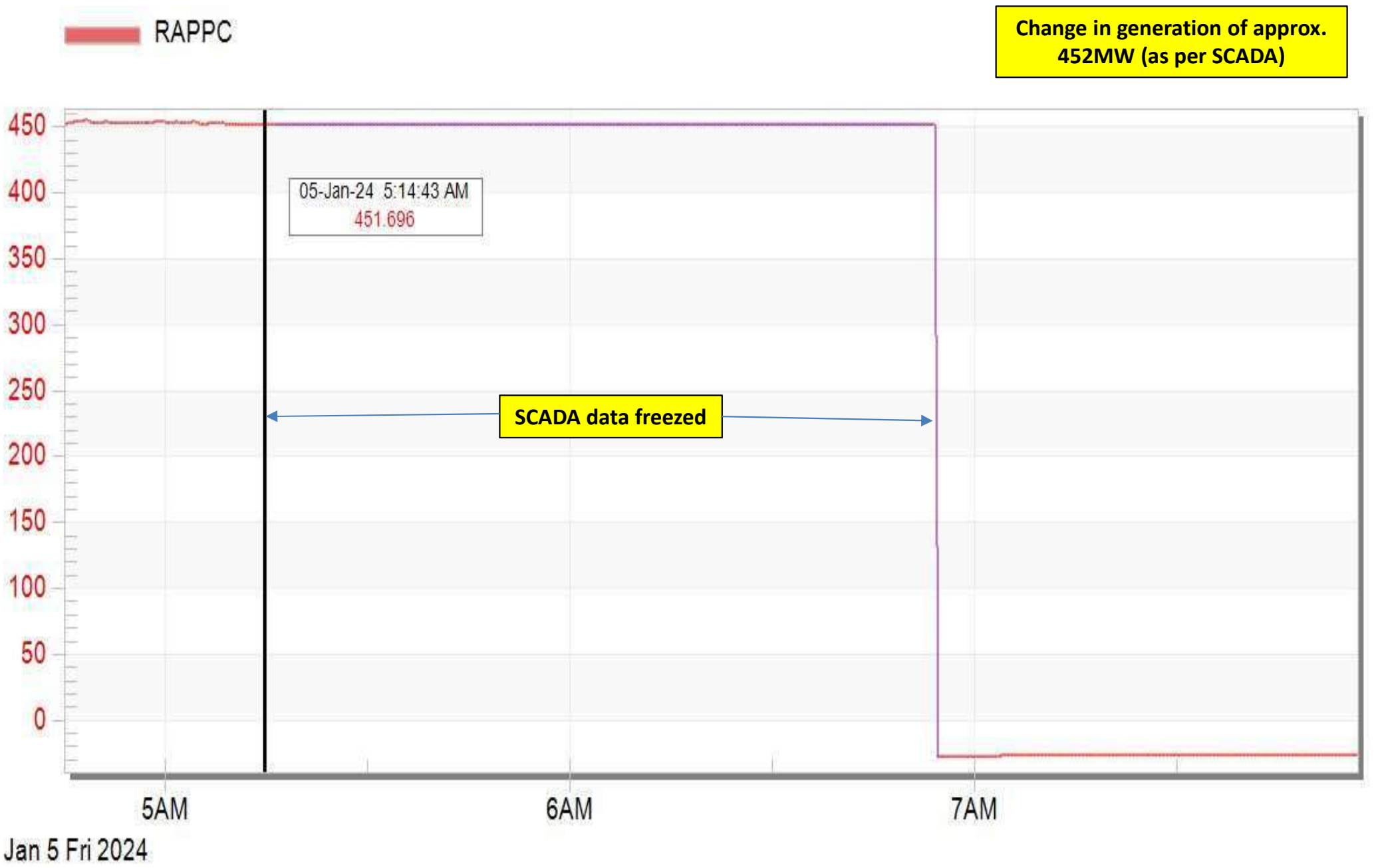
RAPP-A(NP) generation during the event



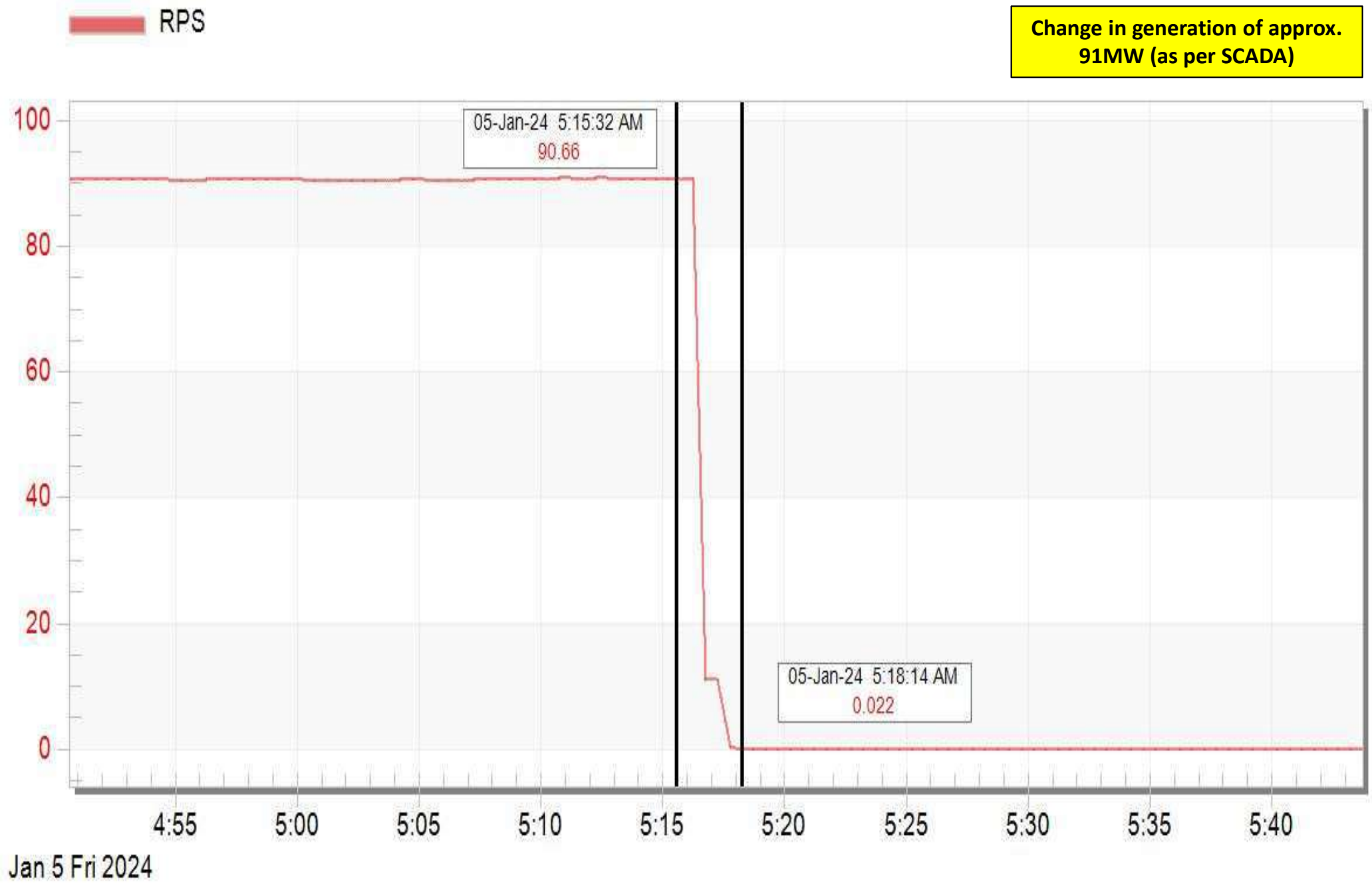
RAPP-B(NP) generation during the event



RAPP-C(NP) generation during the event

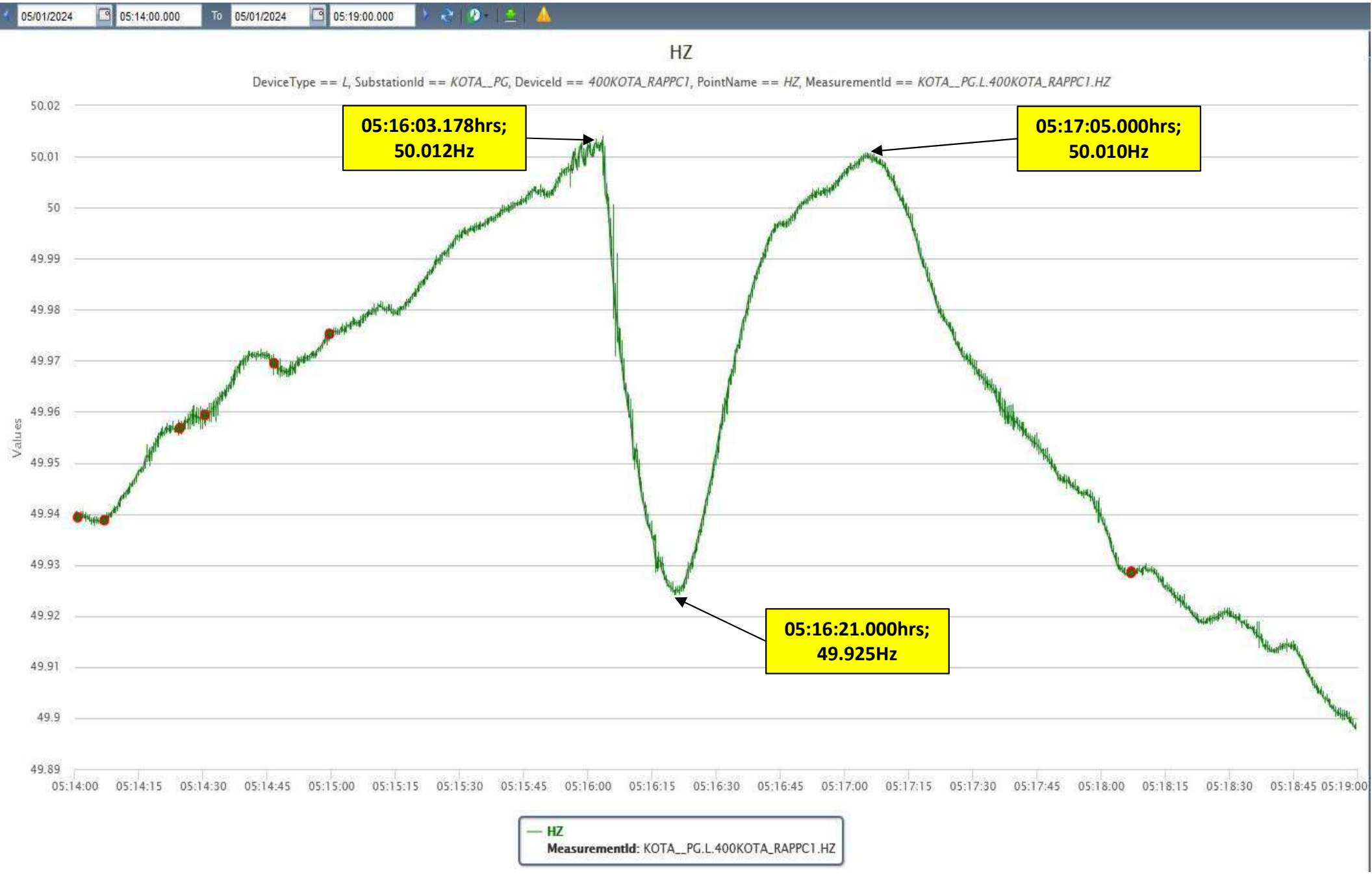


RPS HEP generation during the event



PMU Plot of frequency at Kota(PG)

05:16 hrs/05-Jan-24



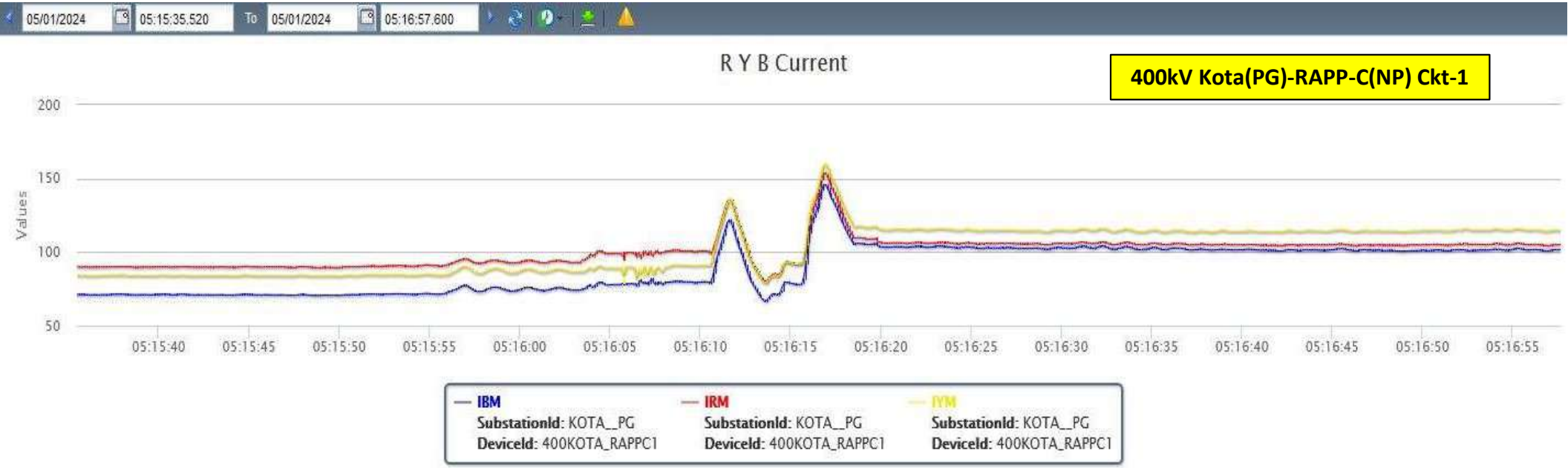
PMU Plot of phase voltage magnitude at Kota(PG)

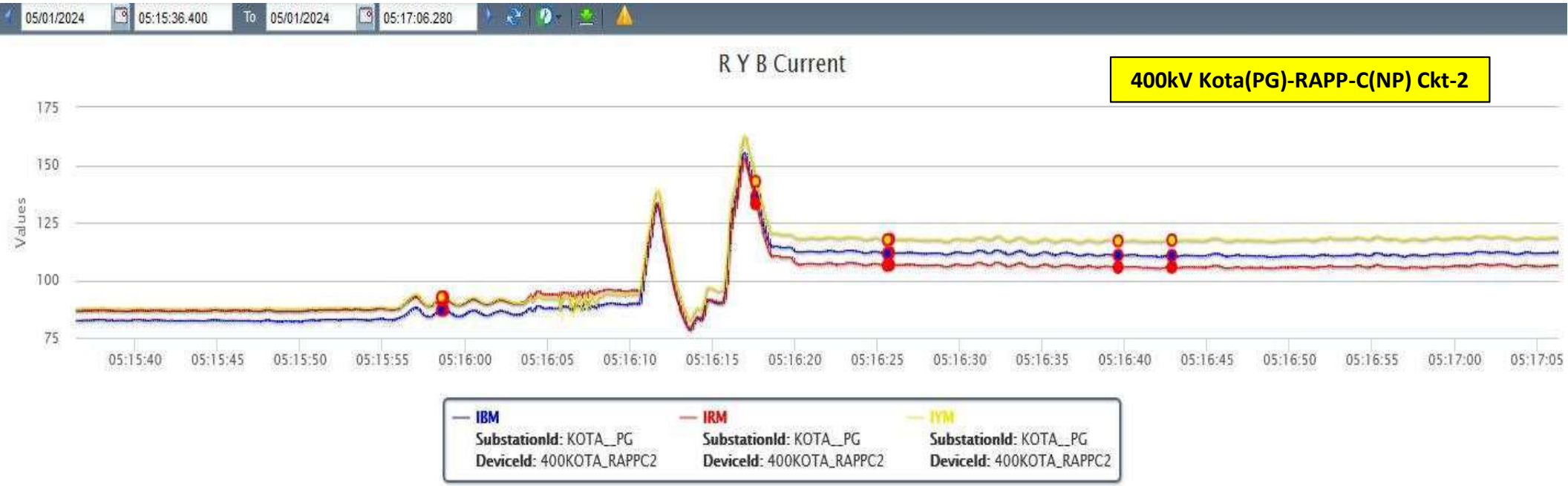
05:16 hrs/05-Jan-24



PMU Plot of phase current magnitude at Kota(PG)

05:16 hrs/05-Jan-24

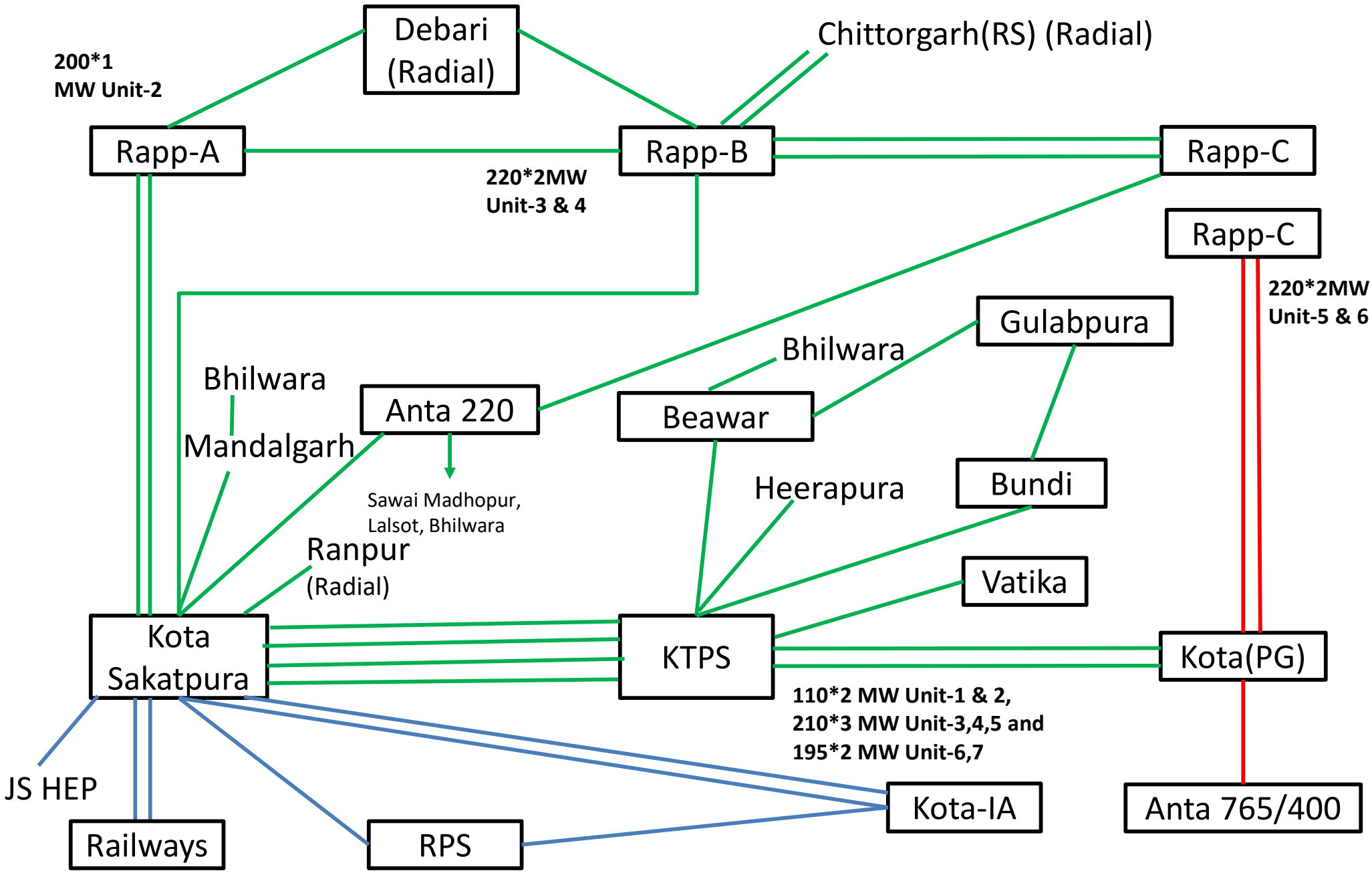




MULTIPLE ELEMENTS TRIPPING AT KTPS(RS), KOTA SAKATPURA, RAPP-A, RAPP-B AND RAPP-C

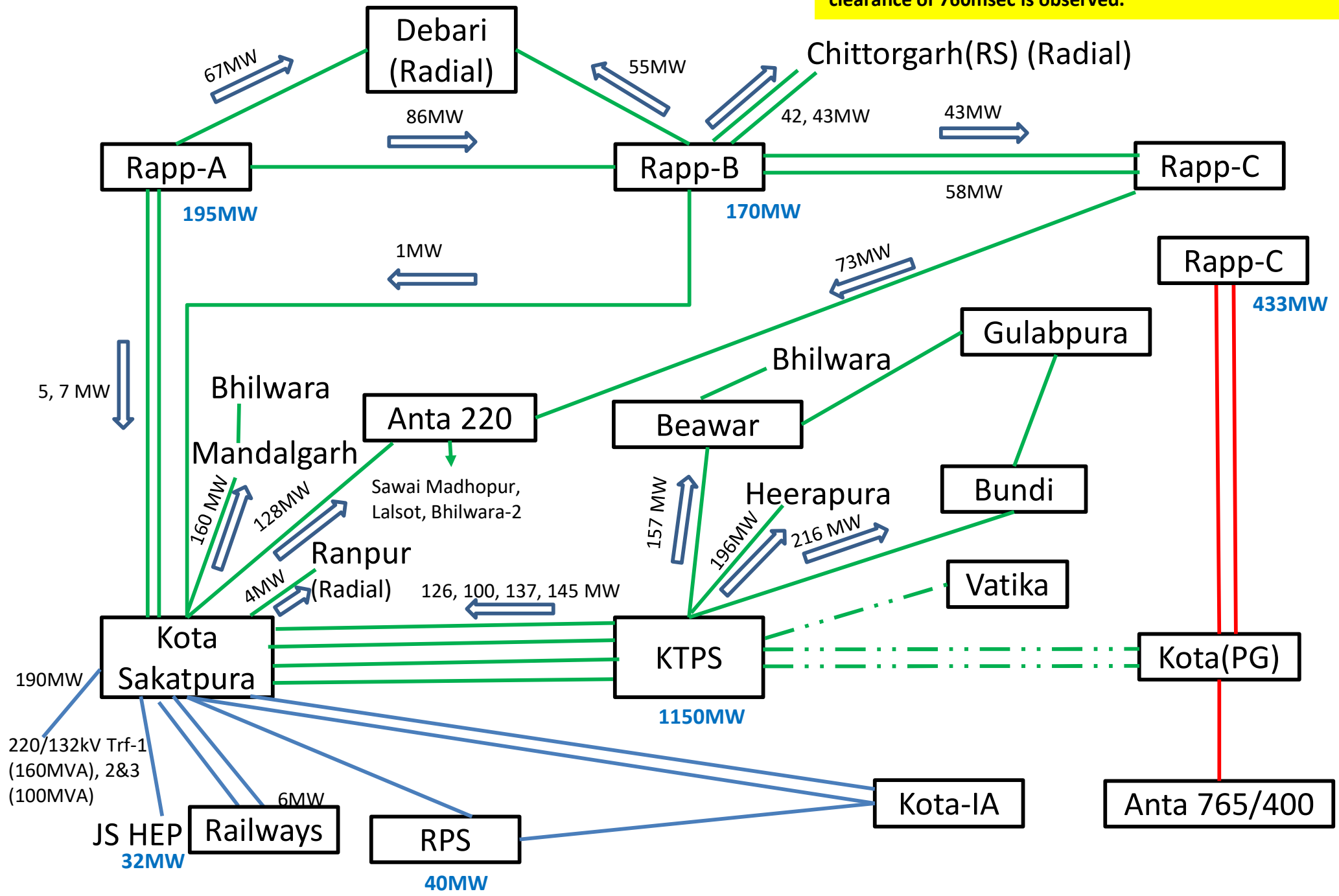
AT 20:22HRS ON 29TH MAR'2024

Connection Diagram between KTPS, RAPS generation complex



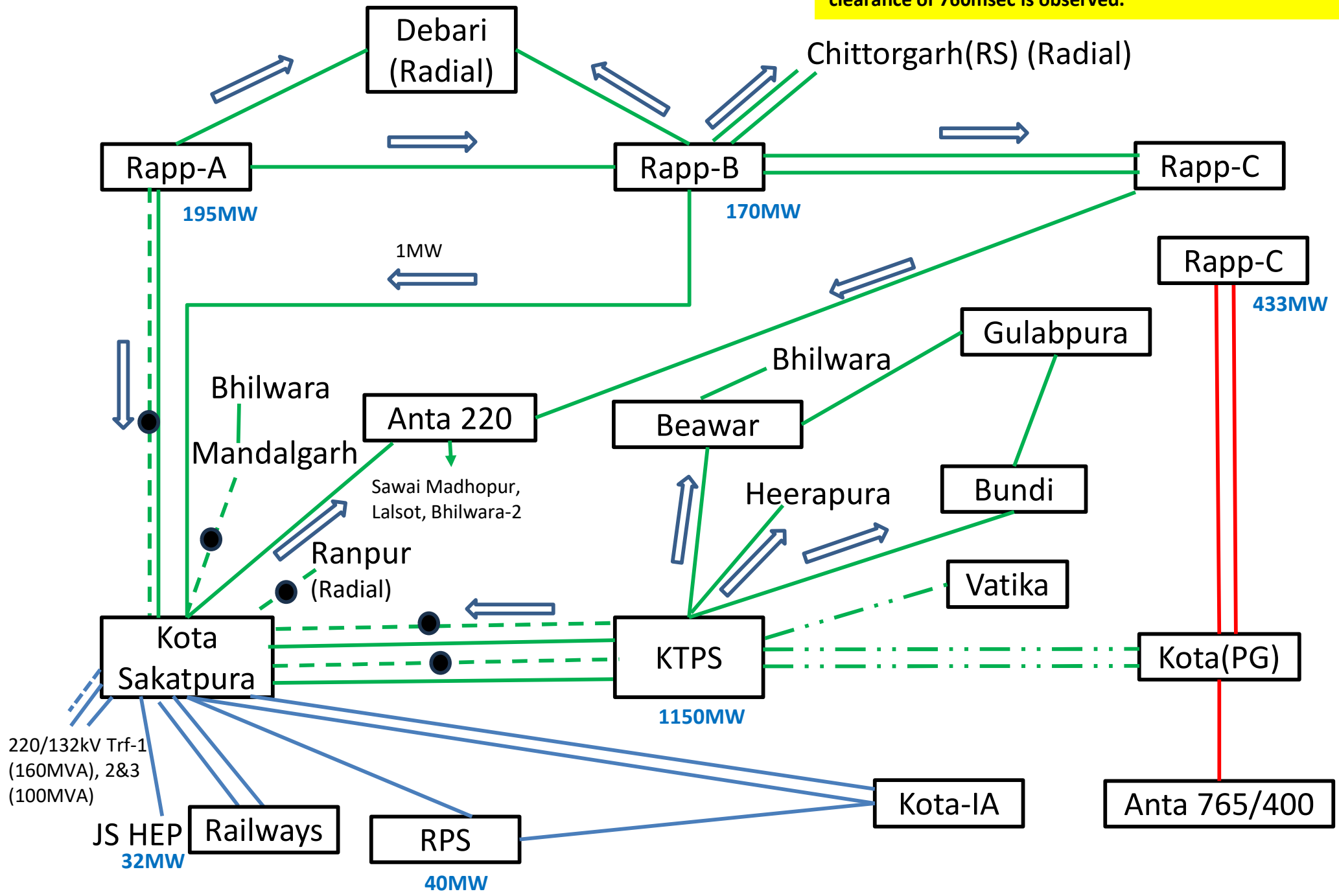
Antecedent scenario (at 20:21 hrs)

Triggering incident: R-ph CT (220 kV side) of 220 kV/132 kV ICT-1 at Kota Sakatpura blast. As per PMU, R-N fault at 20:21:52:280hrs converted into 3-ph fault with delayed clearance of 760msec is observed.



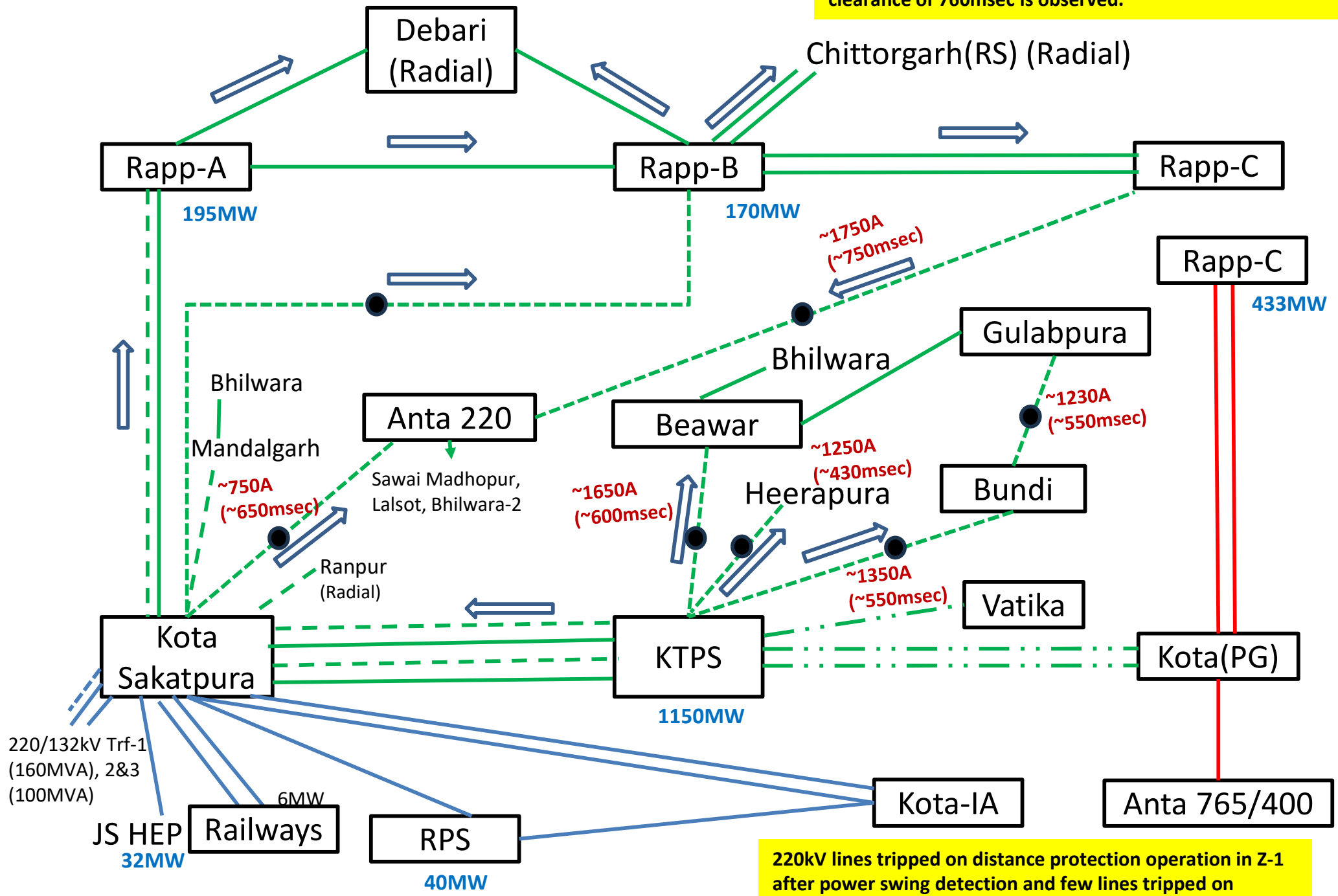
Tripping of multiple 220kV lines in complex (within 200msec of fault time (20:21:52:280hrs))

Triggering incident: R-ph CT (220 kV side) of 220 kV/132 kV ICT-1 at Kota Sakatpura blast. As per PMU, R-N fault at 20:21:52:280hrs converted into 3-ph fault with delayed clearance of 760msec is observed.



Tripping of multiple 220kV lines in complex (within 600-650msec of fault time (20:21:52:280hrs))

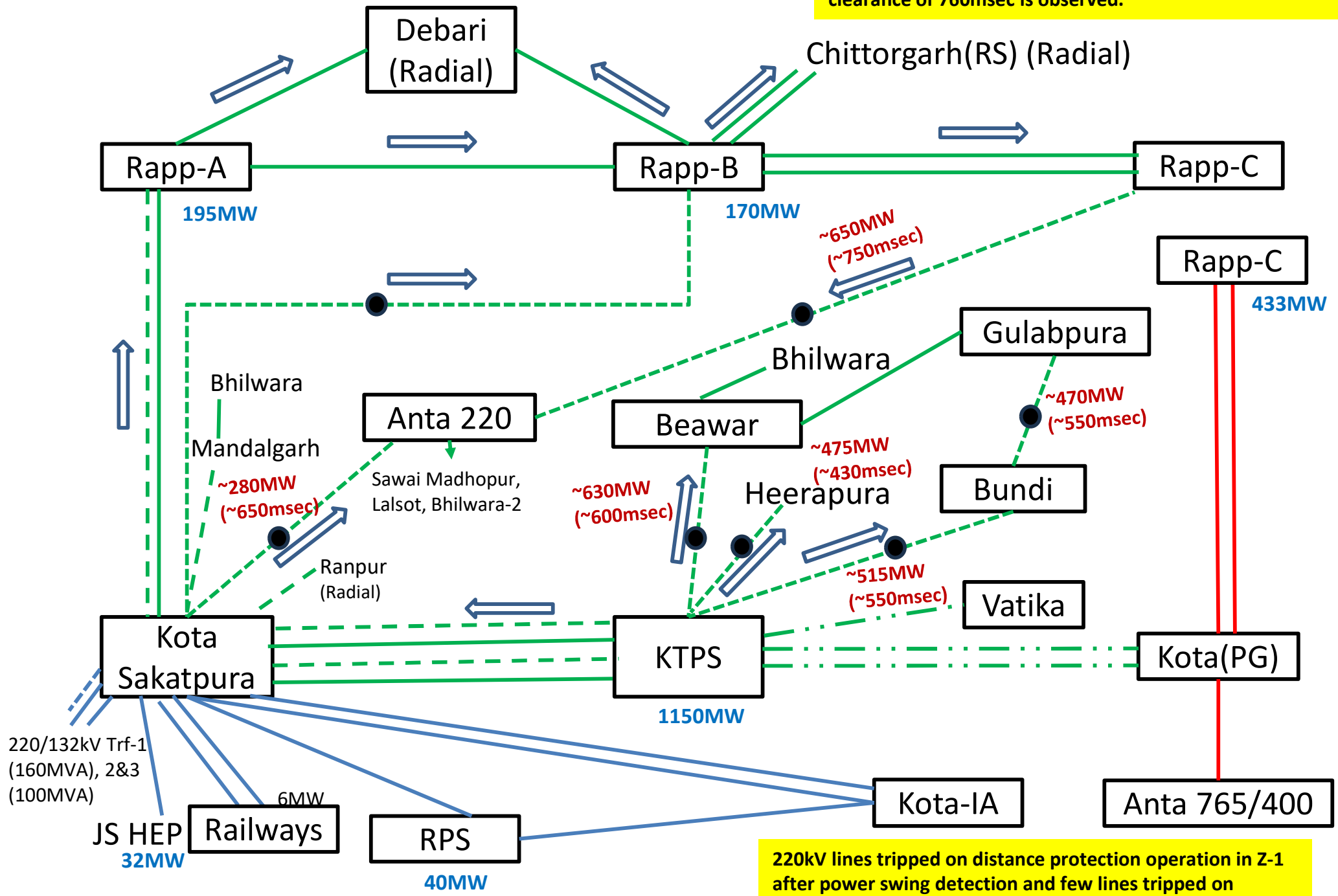
Triggering incident: R-ph CT (220 kV side) of 220 kV/132 kV ICT-1 at Kota Sakatpura blast. As per PMU, R-N fault at 20:21:52:280hrs converted into 3-ph fault with delayed clearance of 760msec is observed.



220kV lines tripped on distance protection operation in Z-1 after power swing detection and few lines tripped on distance protection operation on load encroachment

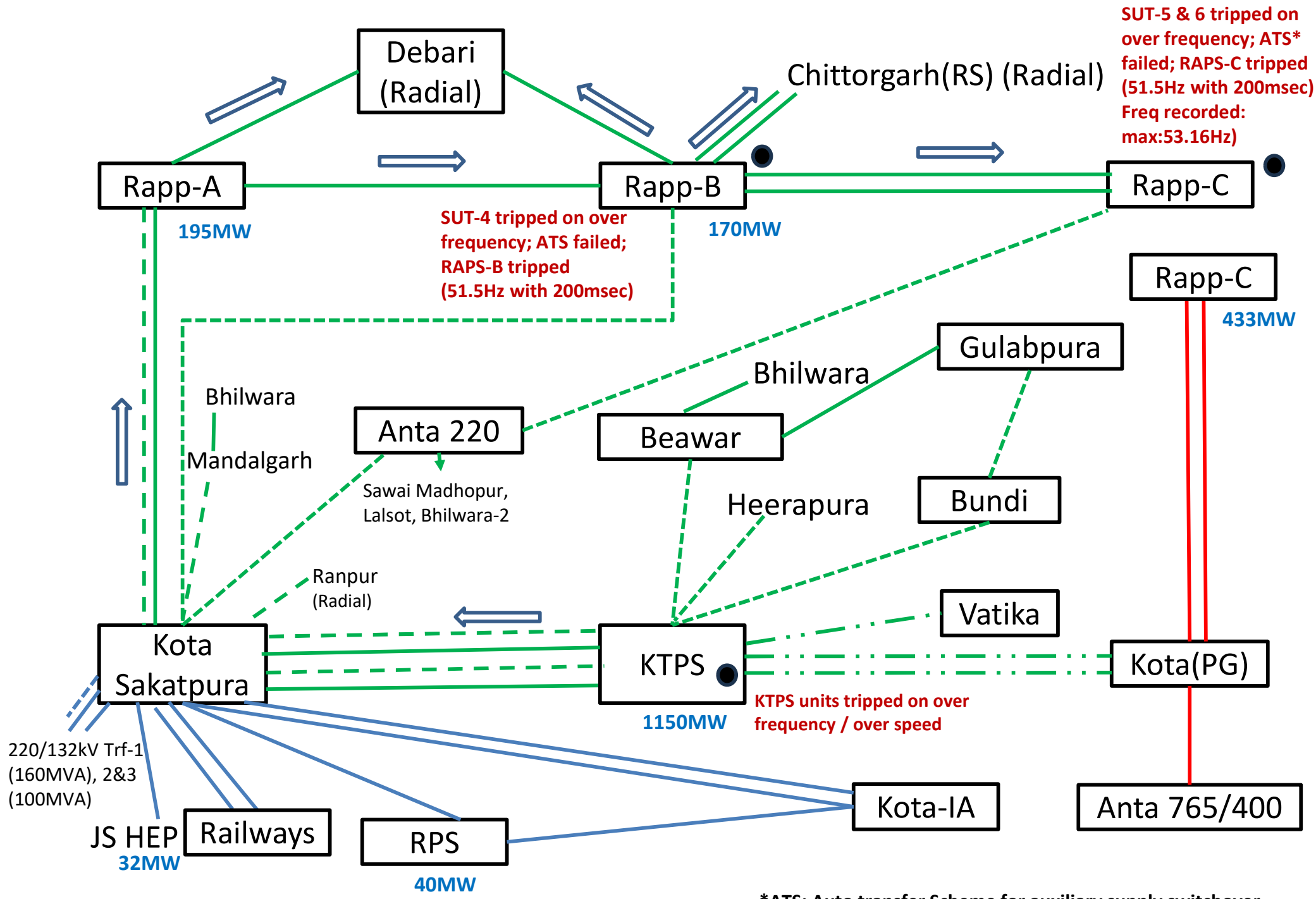
Tripping of multiple 220kV lines in complex (within 600-650msec of fault time (20:21:52:280hrs))

Triggering incident: R-ph CT (220 kV side) of 220 kV/132 kV ICT-1 at Kota Sakatpura blast. As per PMU, R-N fault at 20:21:52:280hrs converted into 3-ph fault with delayed clearance of 760msec is observed.



220kV lines tripped on distance protection operation in Z-1 after power swing detection and few lines tripped on distance protection operation on load encroachment

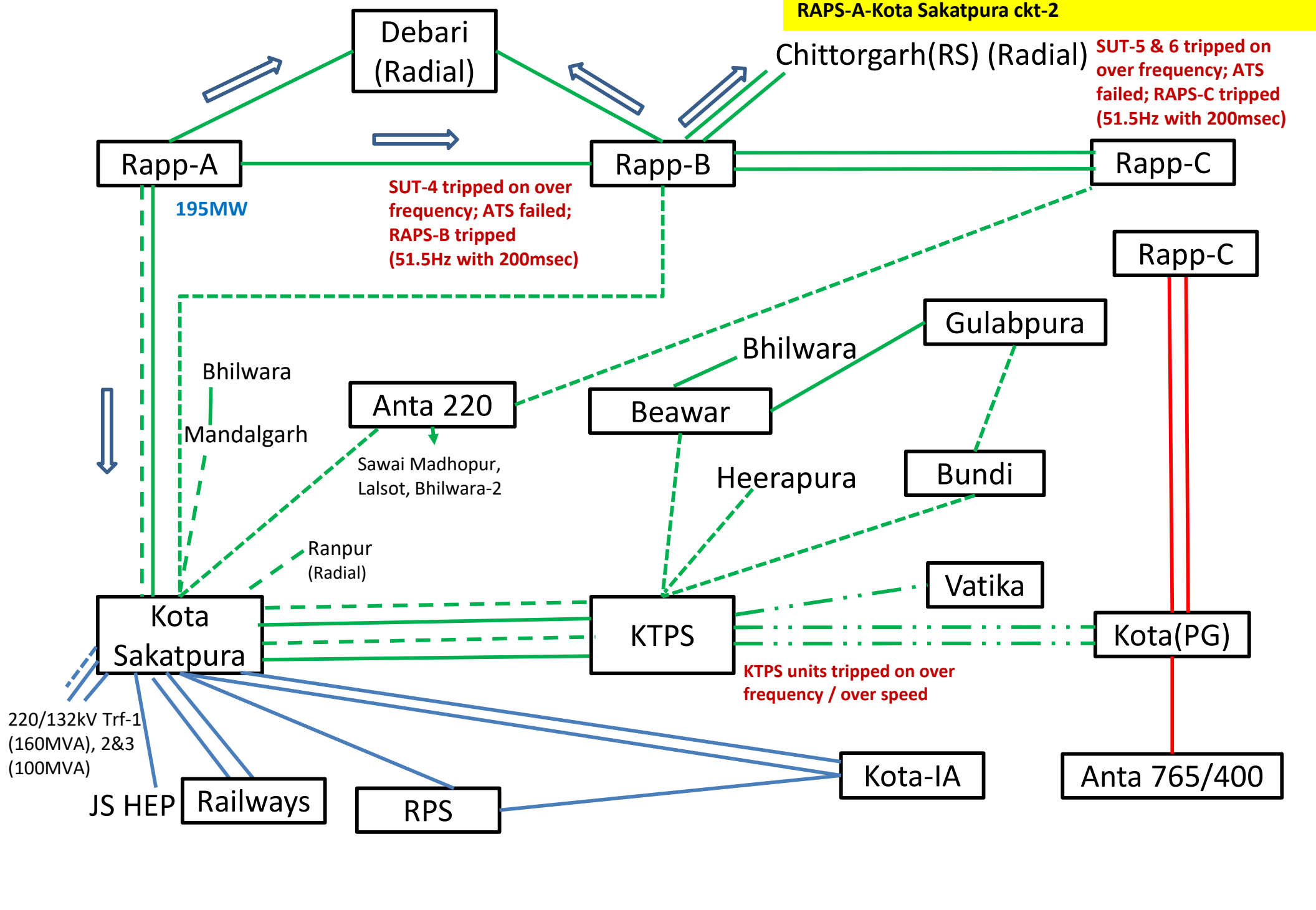
RAPS-B, RAPS-C & KTPS units tripped (within 1-2sec of fault time (20:21:52:280hrs))



*ATS: Auto transfer Scheme for auxiliary supply switchover

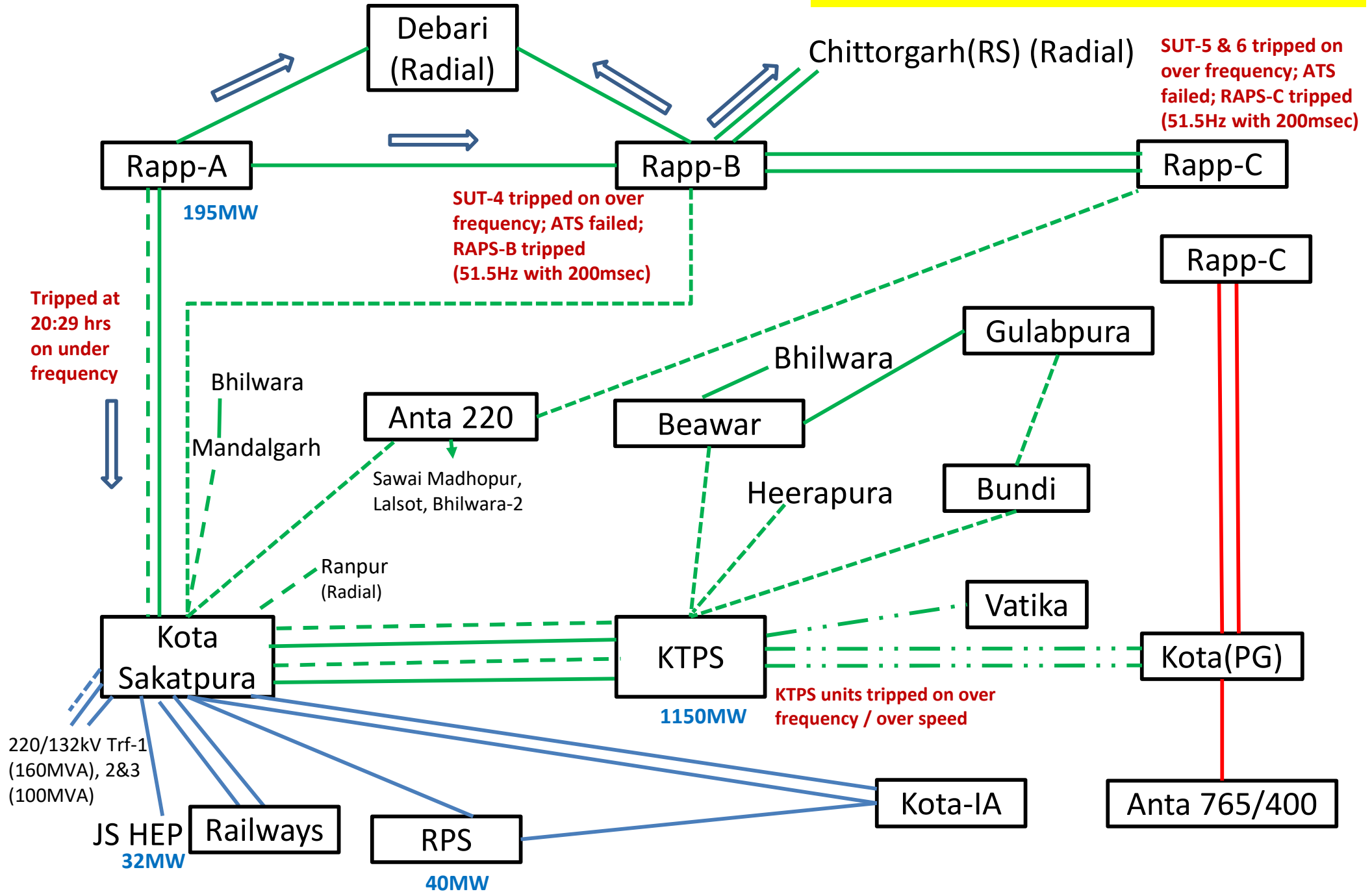
After tripping of multiple 220kV lines and KTPS & RAPS-B in complex (after ~2sec sec of fault time (20:21:52:280hrs)

RAPS-A unit-2 was available which was feeding 220kV Debari, 220kV Chittorgarh via 220kV RAPS-A-RAPS-B tie line and load at 220/132kV Kota Sakatpura via 220kV RAPS-A-Kota Sakatpura ckt-2



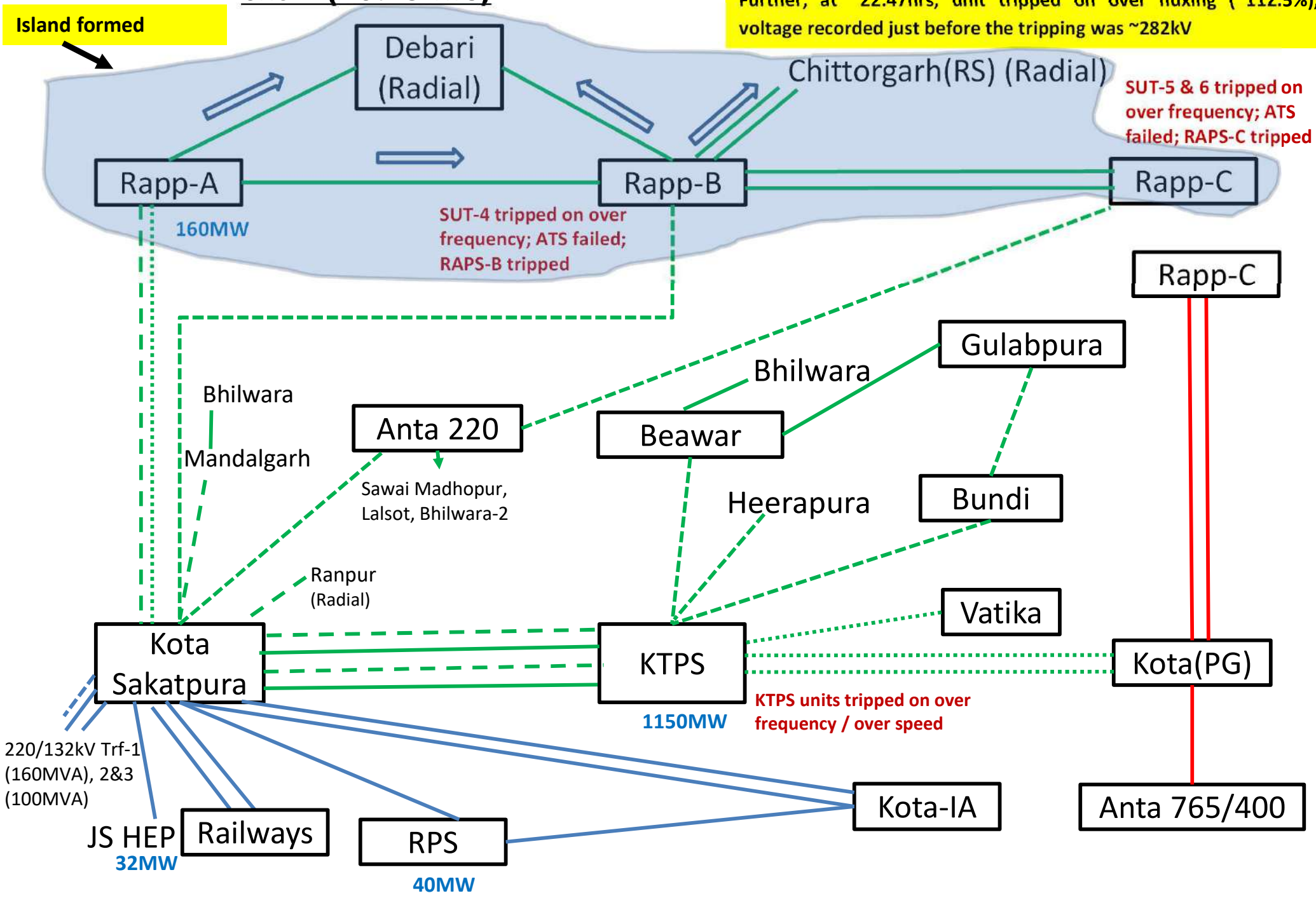
After tripping of multiple 220kV lines and KTPS & RAPS-B in complex (after ~2sec sec of fault time (20:21:52:280hrs)

Further at 20:29hrs, frequency decreased to 47.8Hz and 220kV RAPS-A-Kota Sakatpura ckt-2 tripped on under frequency as per islanding scheme.

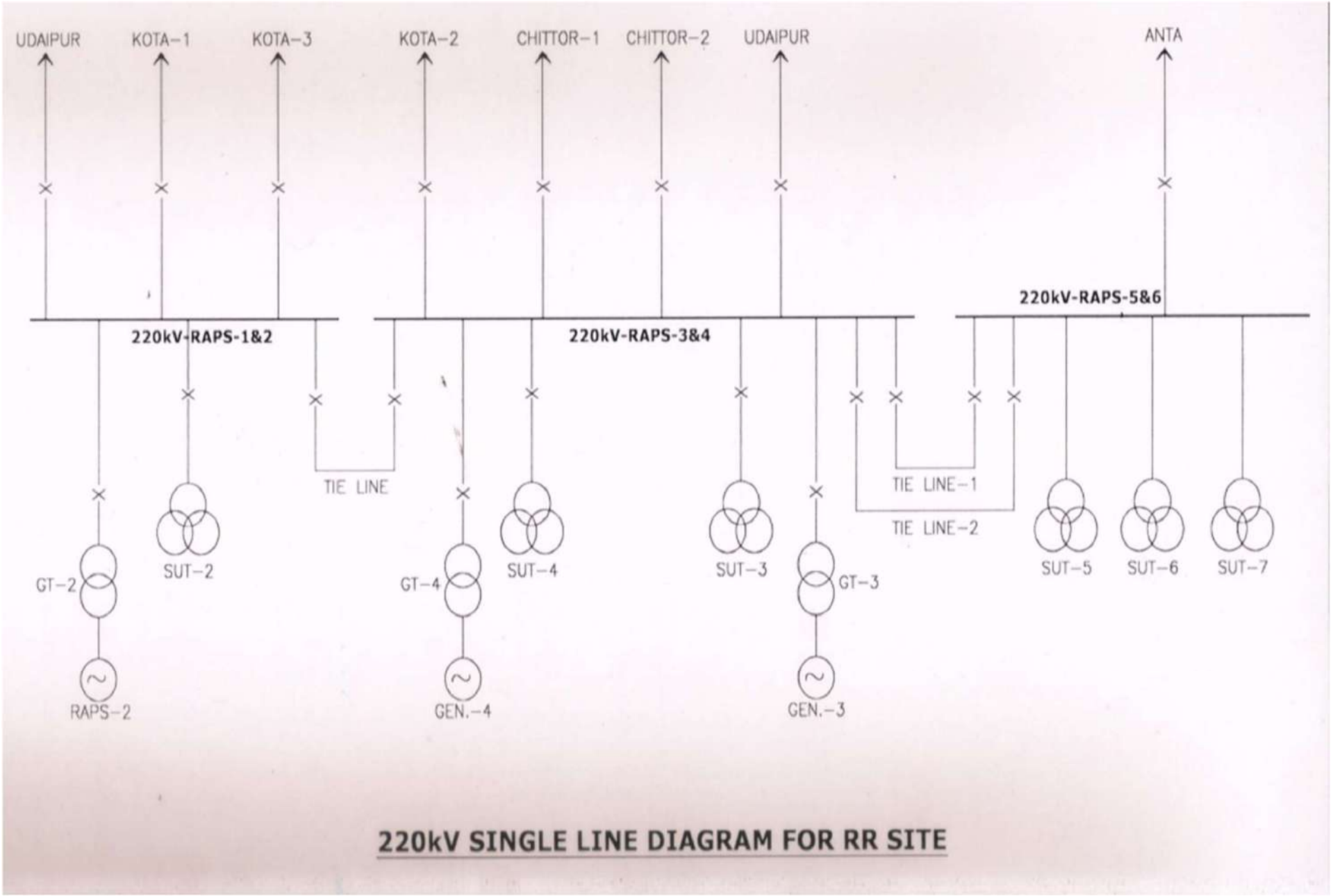


After tripping 220kV RAPS-A-Kota Sakatpura ckt-2 (20:29 hrs)

RAPS-A generation was reduced to 160MW. Island operated till approx. 22:47hrs, frequency (51-52Hz) and voltage (230-240kV). Further, at ~22:47hrs, unit tripped on over fluxing (~112.5%), voltage recorded just before the tripping was ~282kV

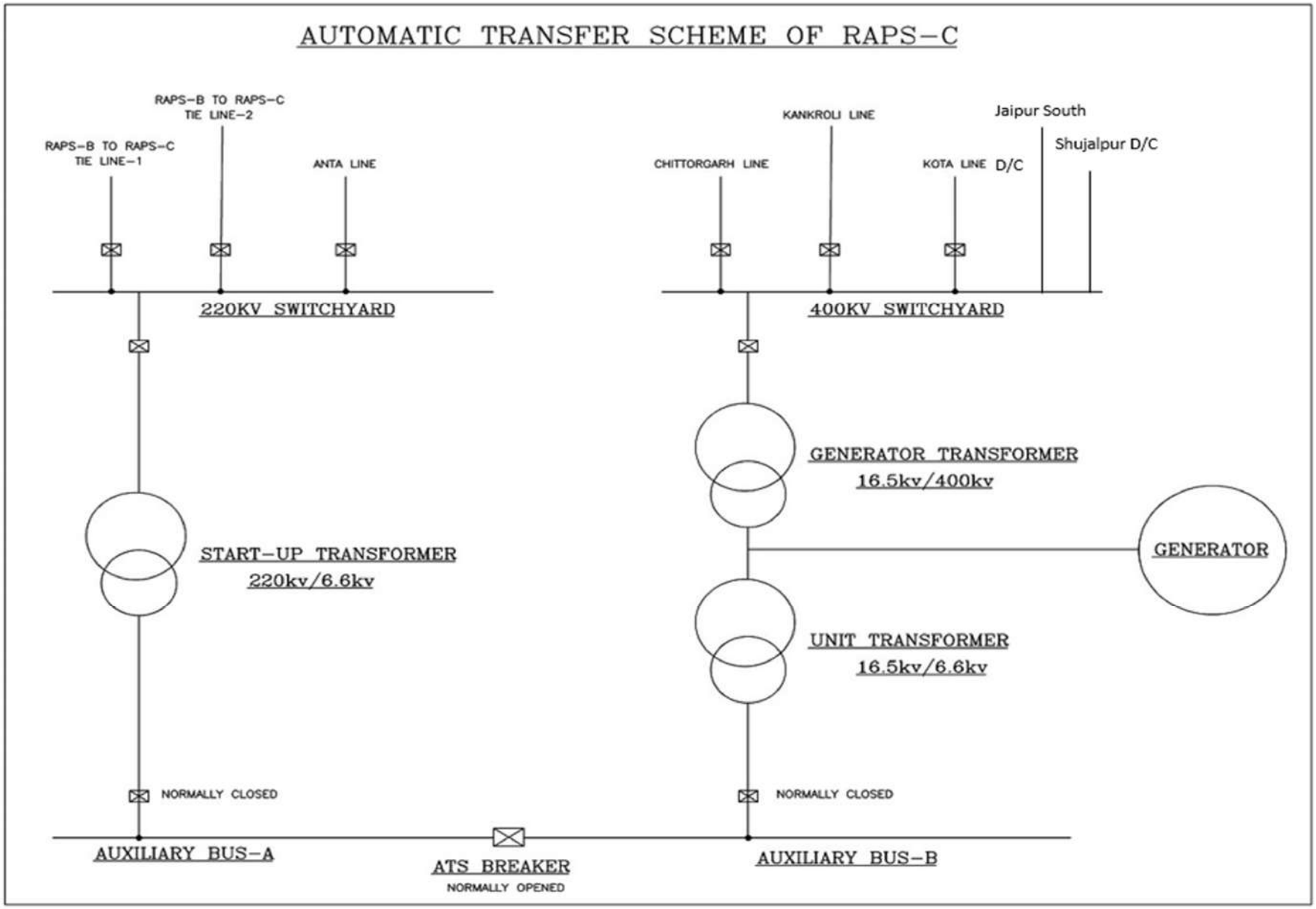


SLD and connectivity of RAPS- A, RAPS-B & RAPS-C

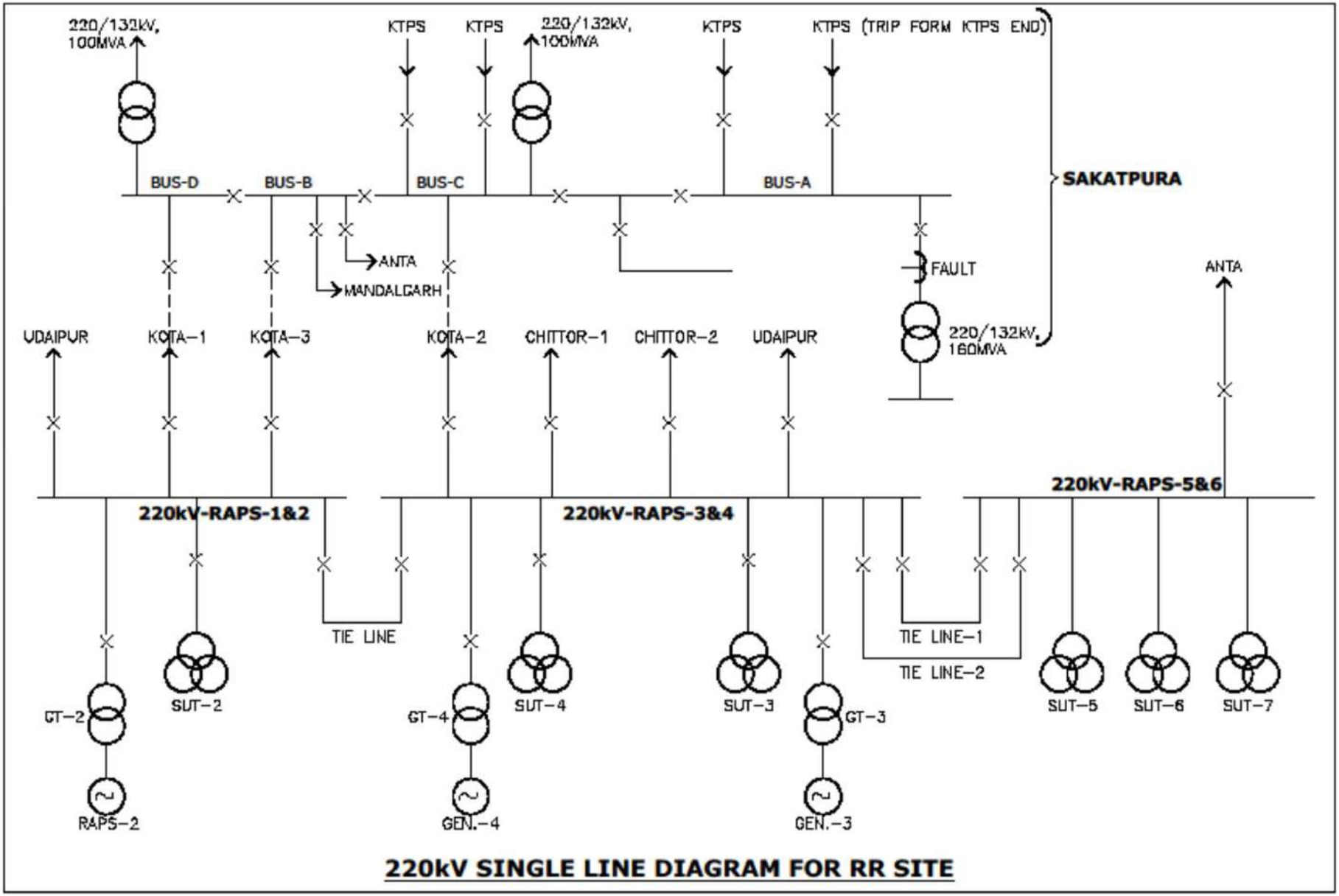


220kV SINGLE LINE DIAGRAM FOR RR SITE

Auto Transfer Scheme at RAPS-C

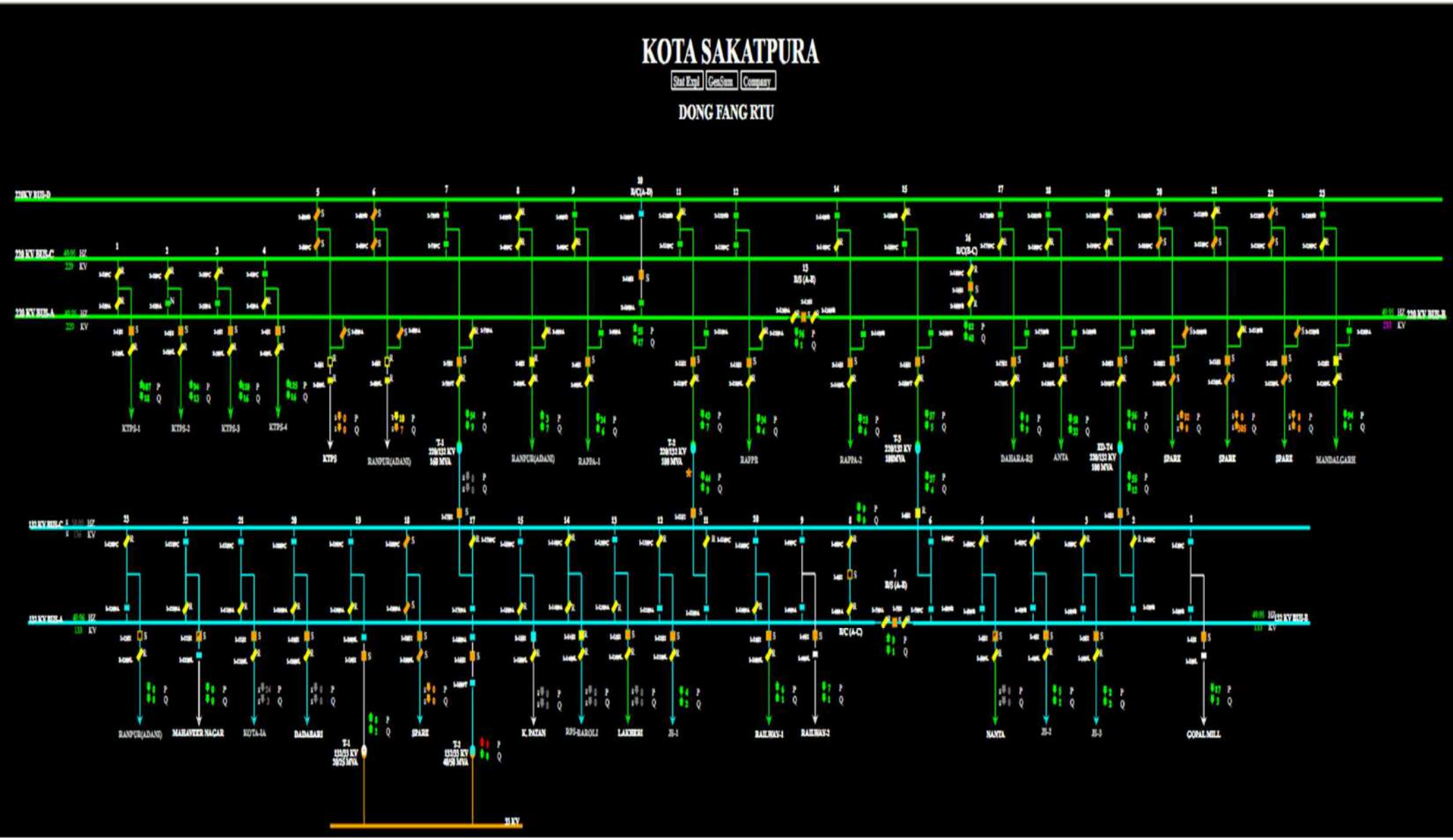


Auto Transfer Scheme at RAPS-C

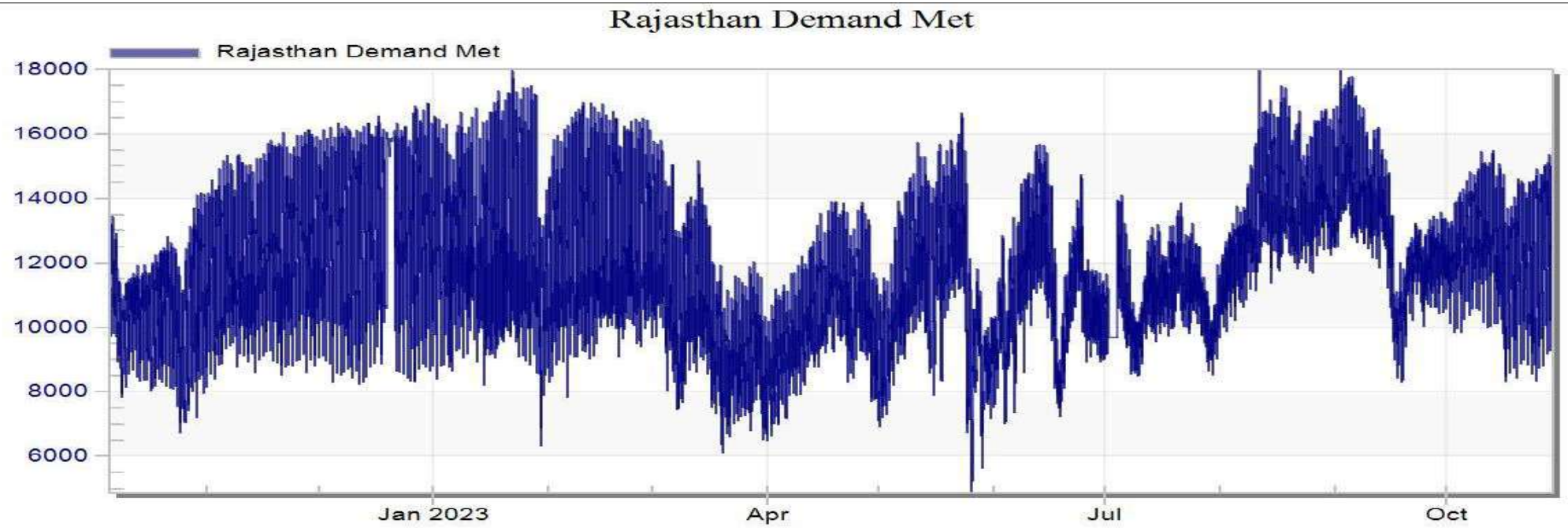


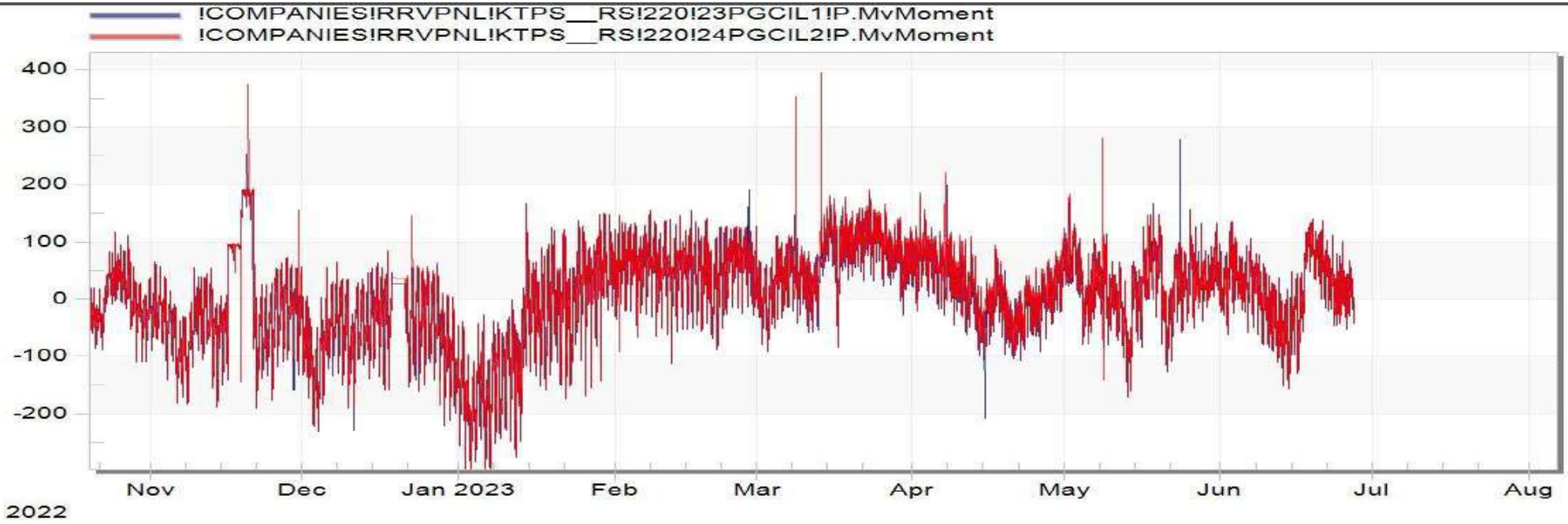
220kV SINGLE LINE DIAGRAM FOR RR SITE

SLD of 220/132kV Kota Sakatpura

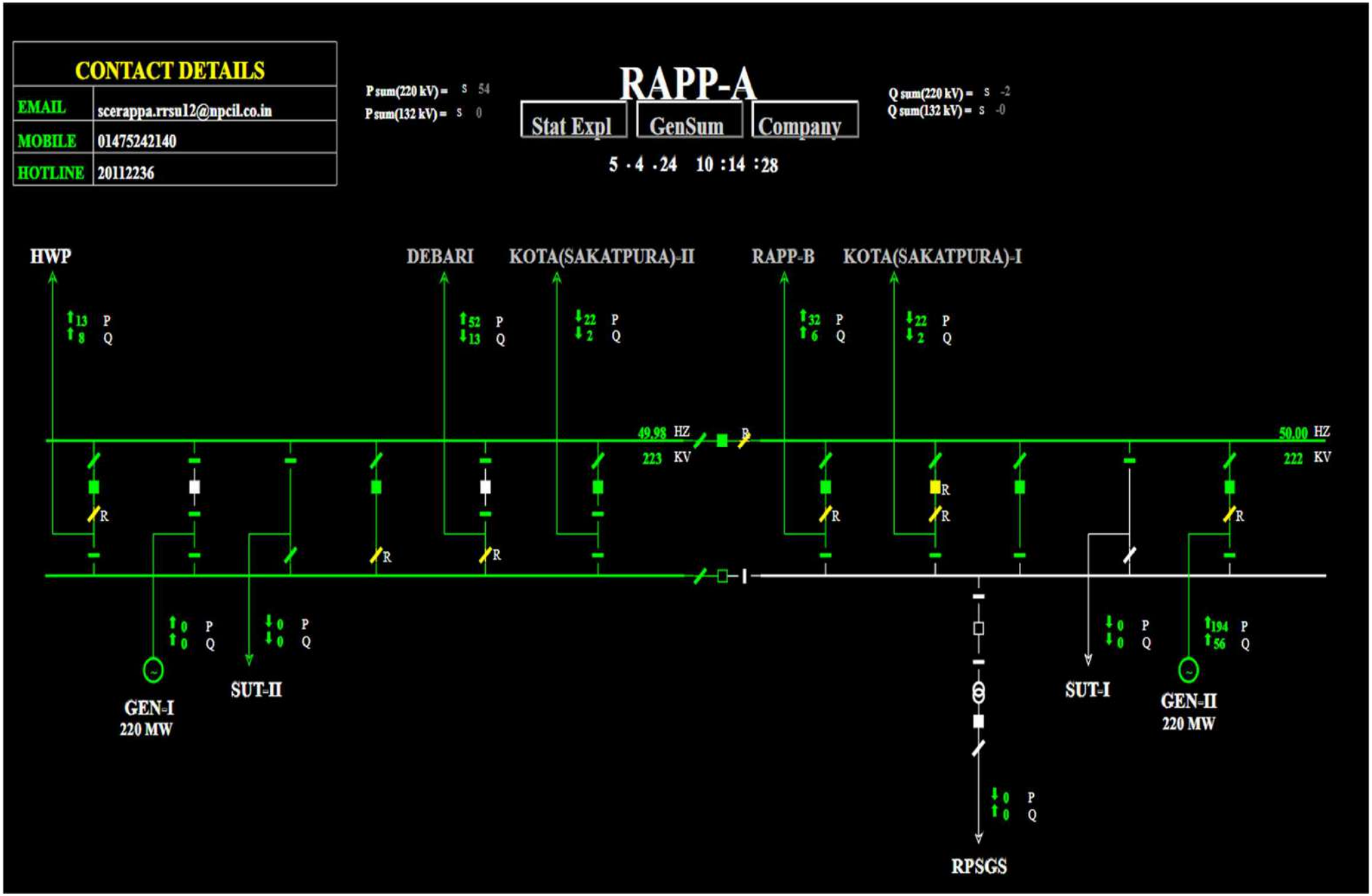


Loading pattern of 220kV KTPS-Kota(PG) D/C

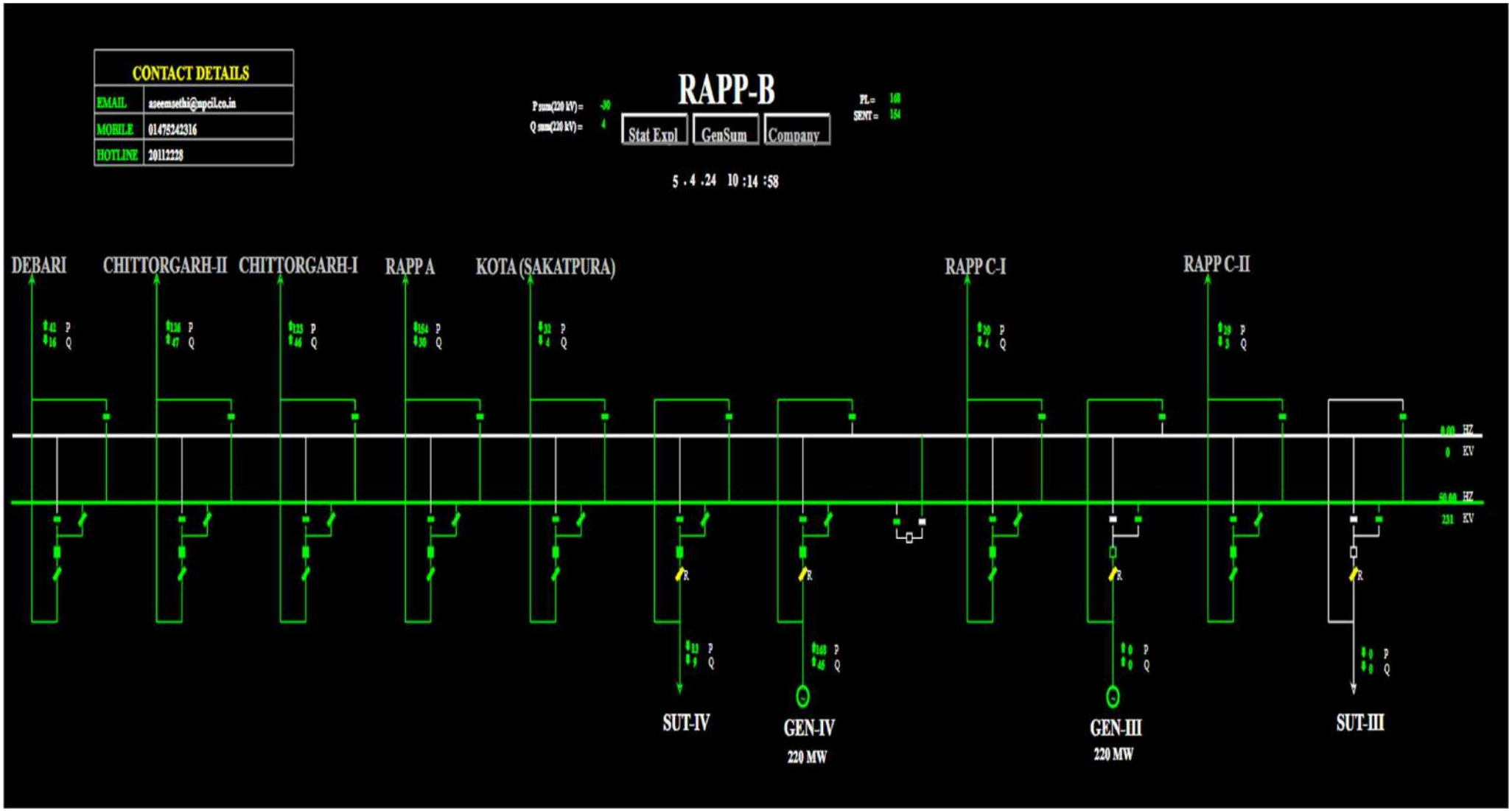




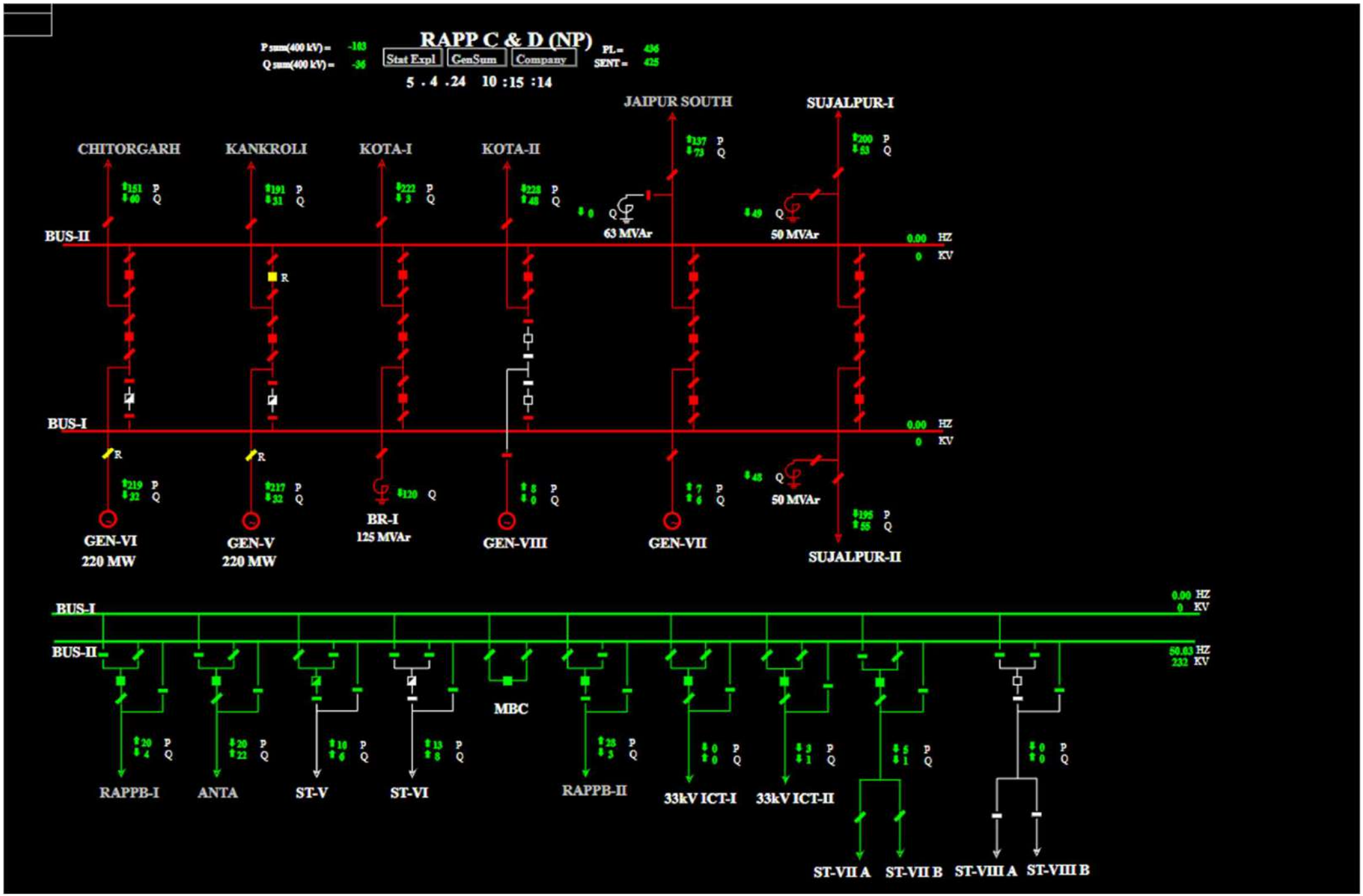
SLD of 220kV RAPS-A(NPCIL)



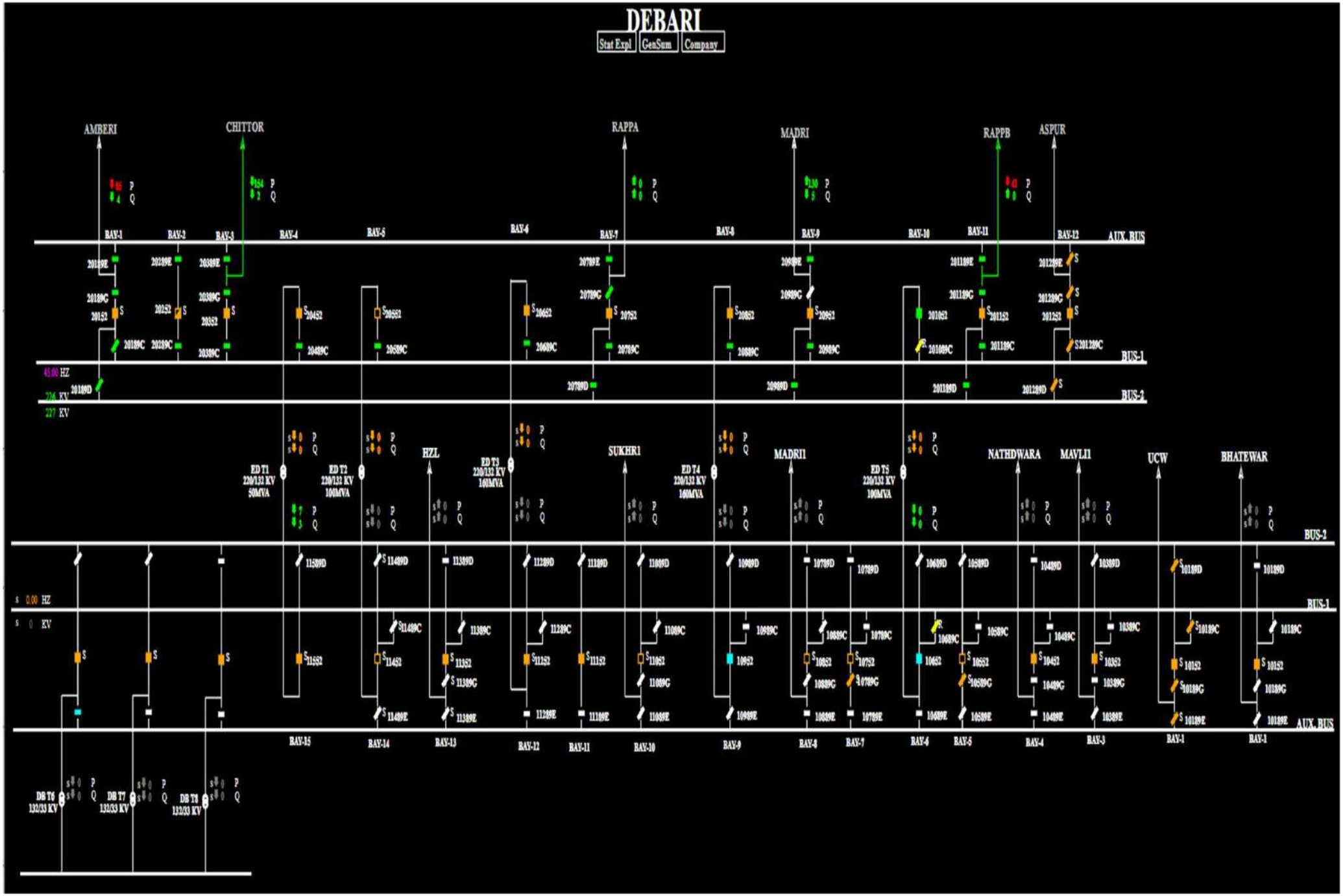
SLD of 220kV RAPS-B(NPCIL)



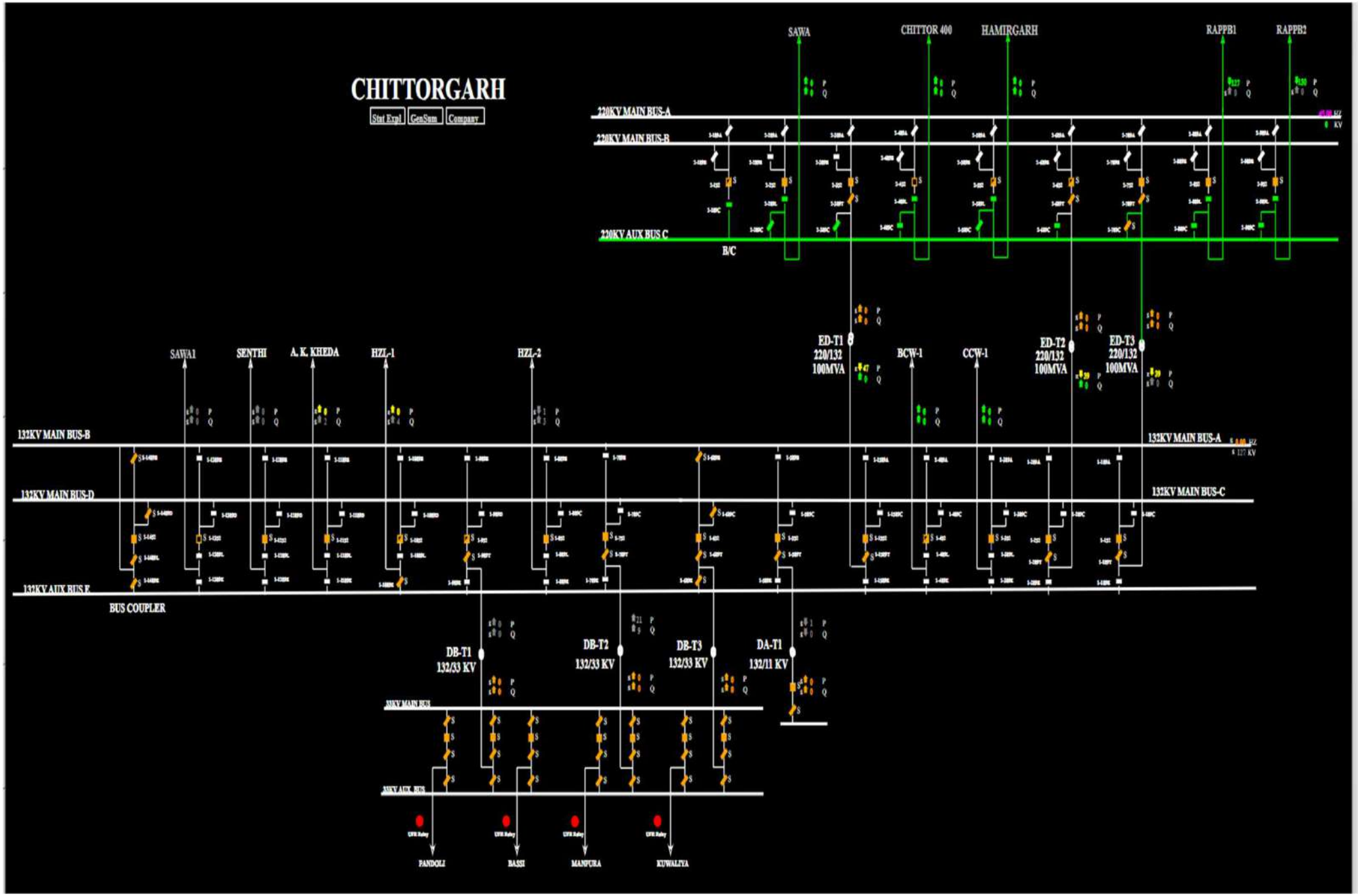
SLD of 220kV RAPS-C(NPCIL)



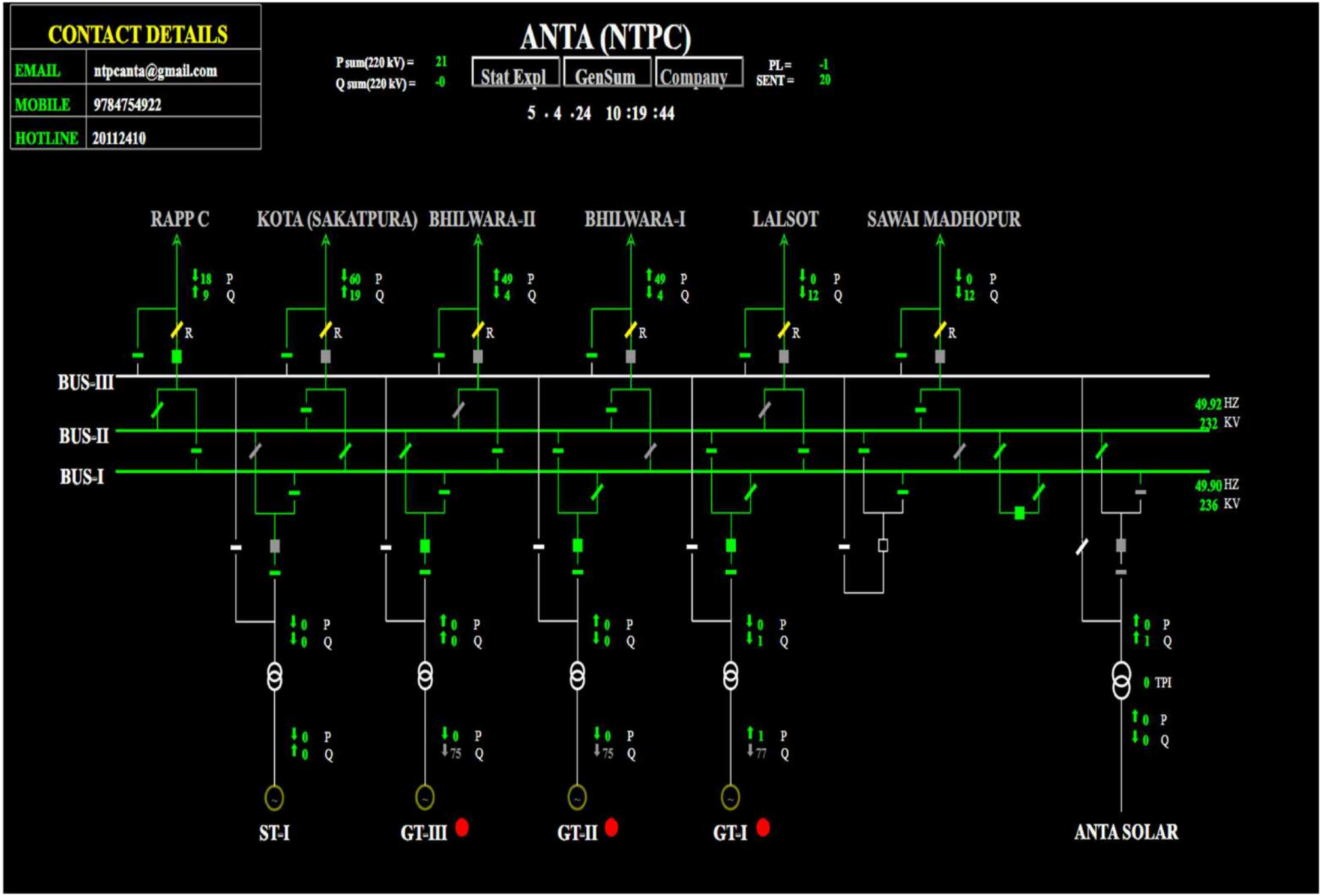
SLD of 220/132kV Debari



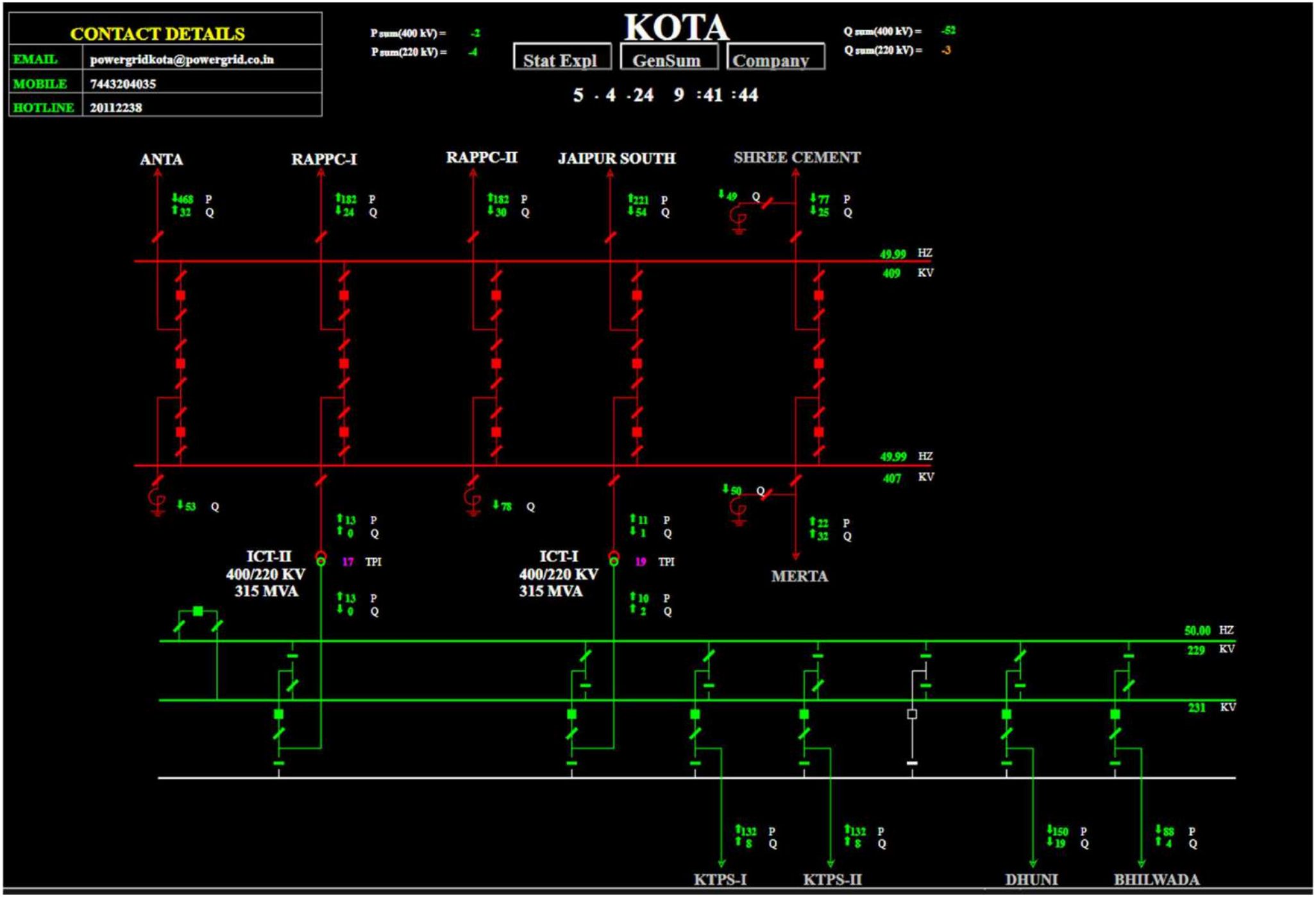
SLD of 220/132kV Chittorgarh



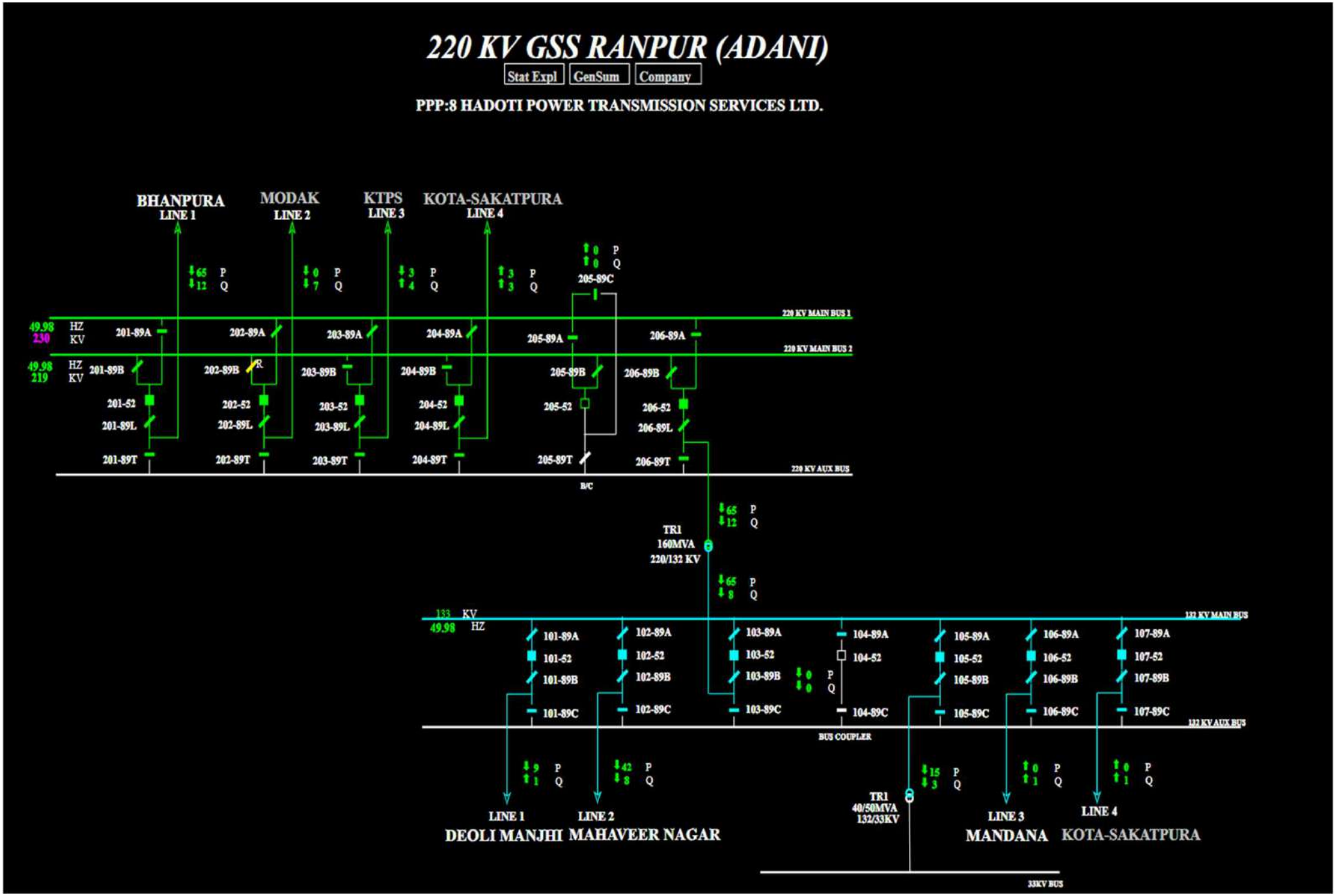
SLD of 220kV Anta(NTPC)



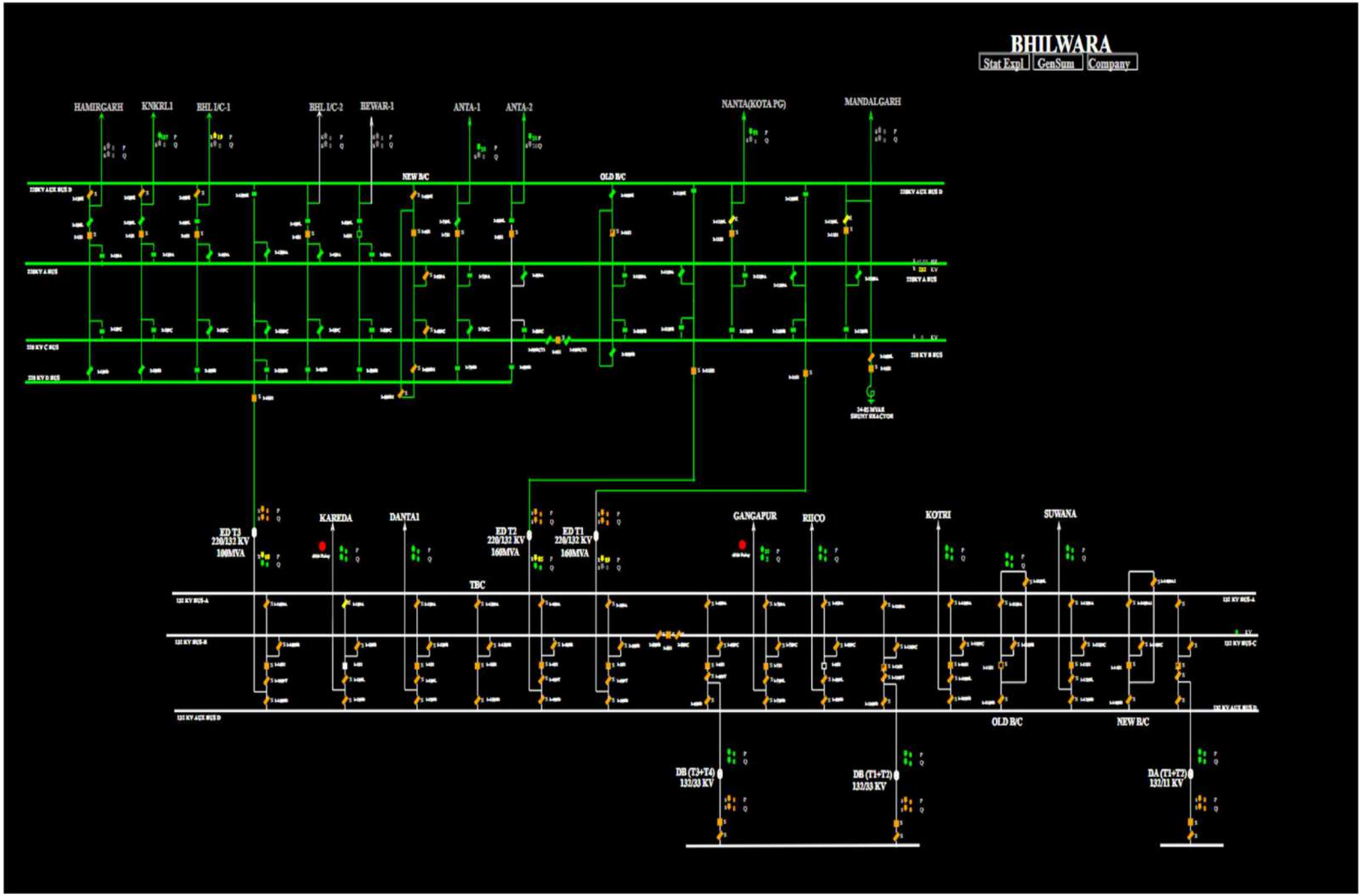
SLD of 400/220kV Kota(PG)



SLD of 220/132kV Ranpur

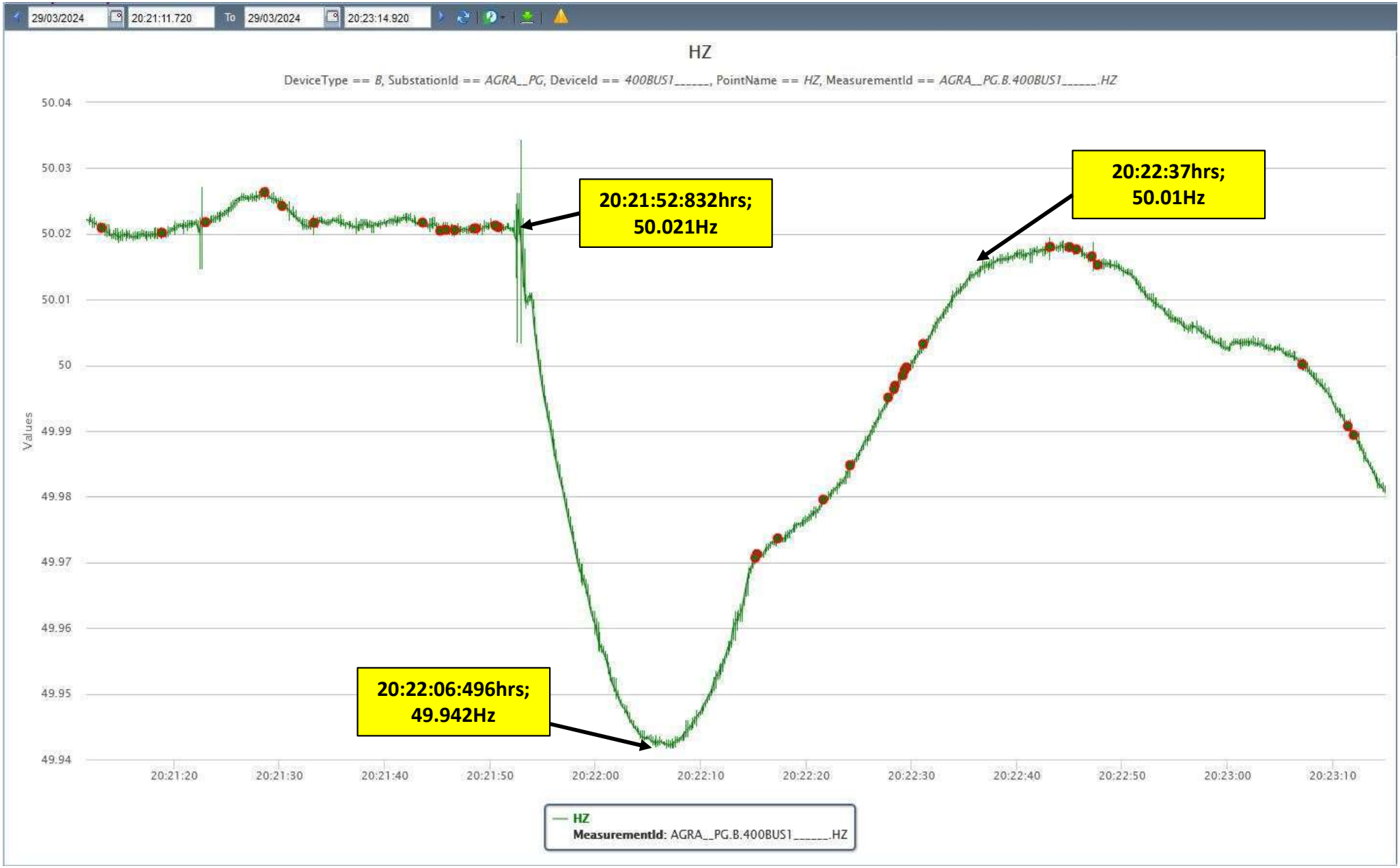


SLD of 220/132kV Bhilwara



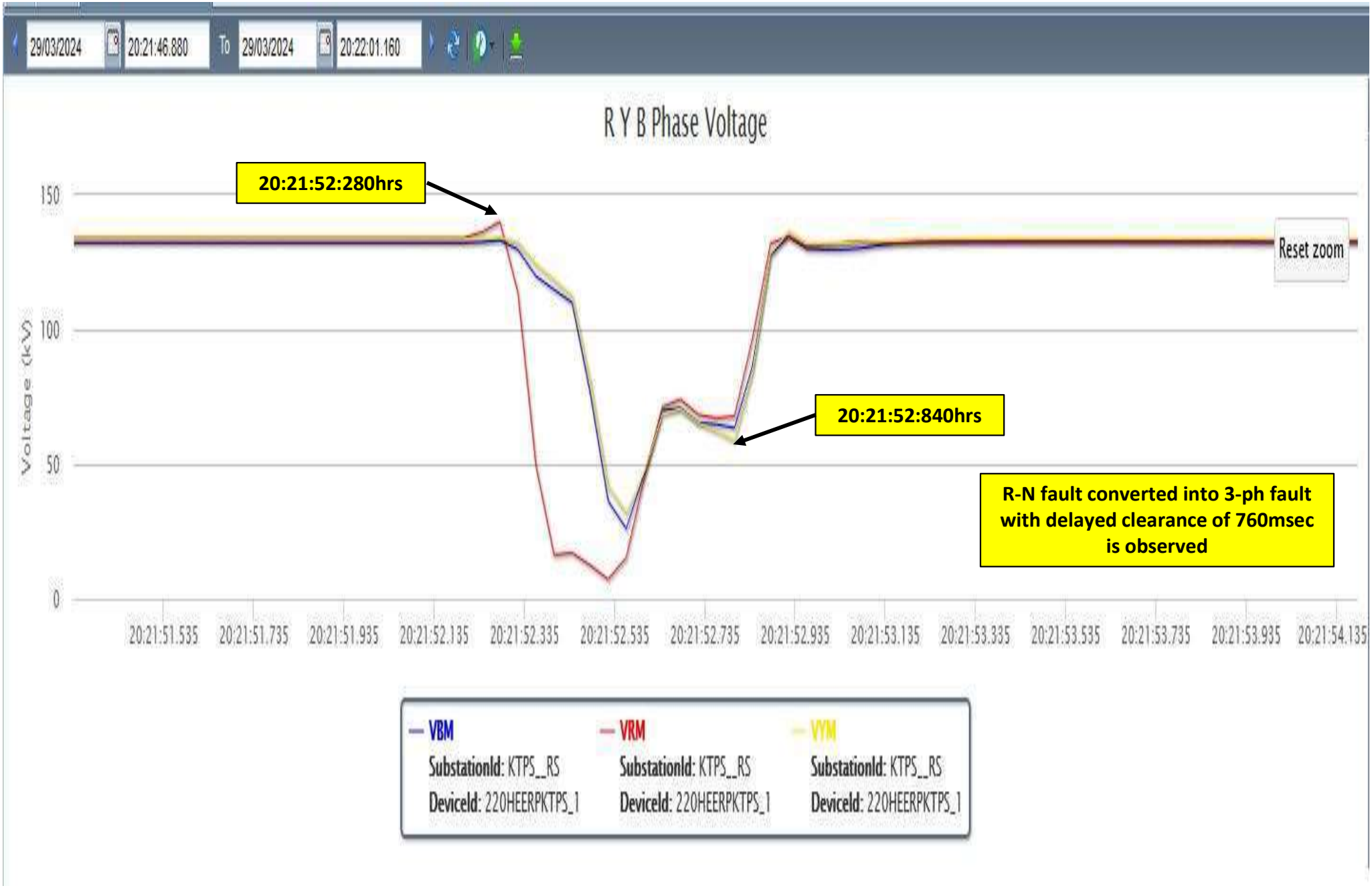
PMU Plot of frequency at Agra(PG)

20:22 hrs/29-Mar-24

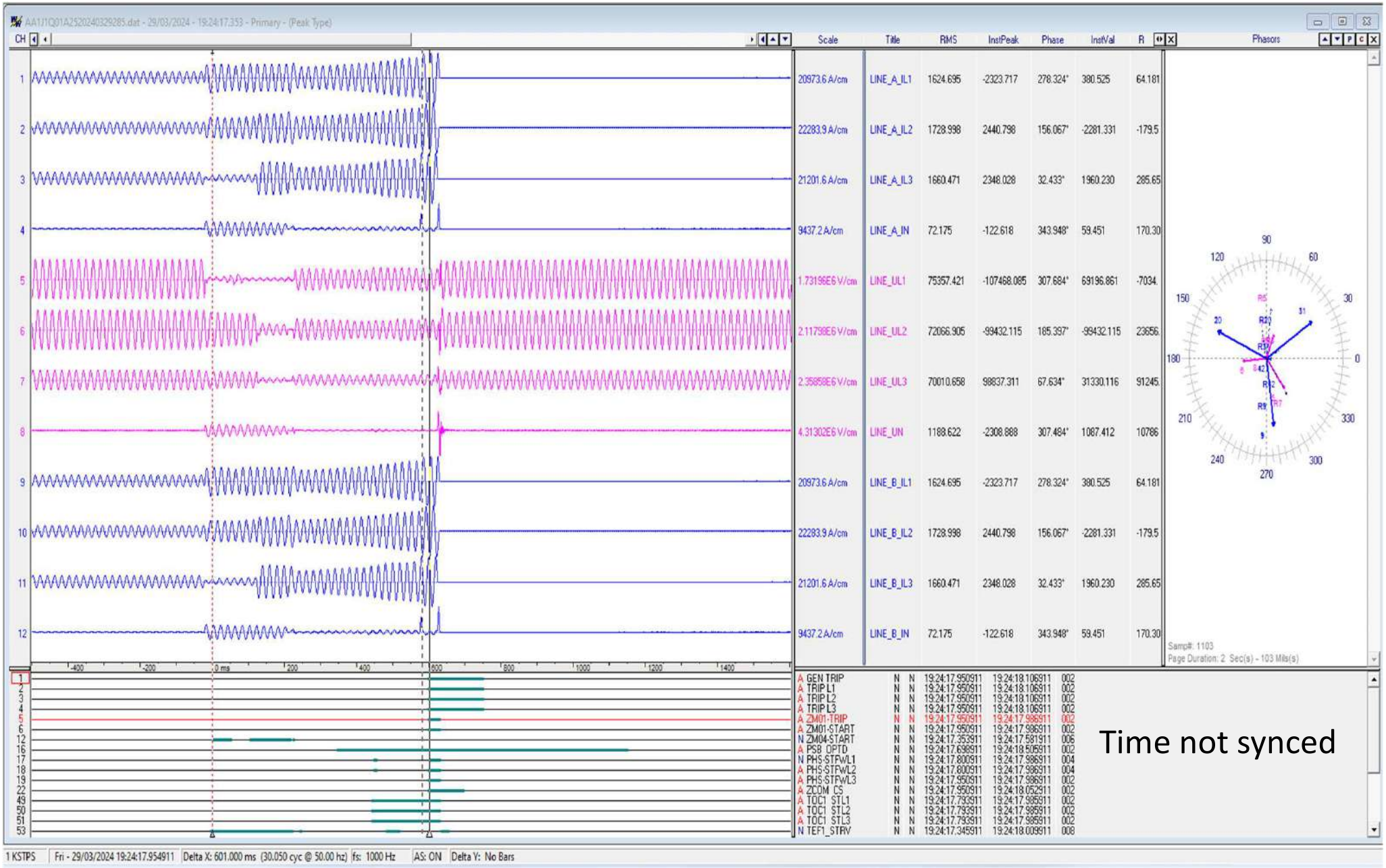


PMU Plot of voltage of 220kV KTPS-Heerapur ckt at KTPS(RVVN)

20:22 hrs/29-Mar-24



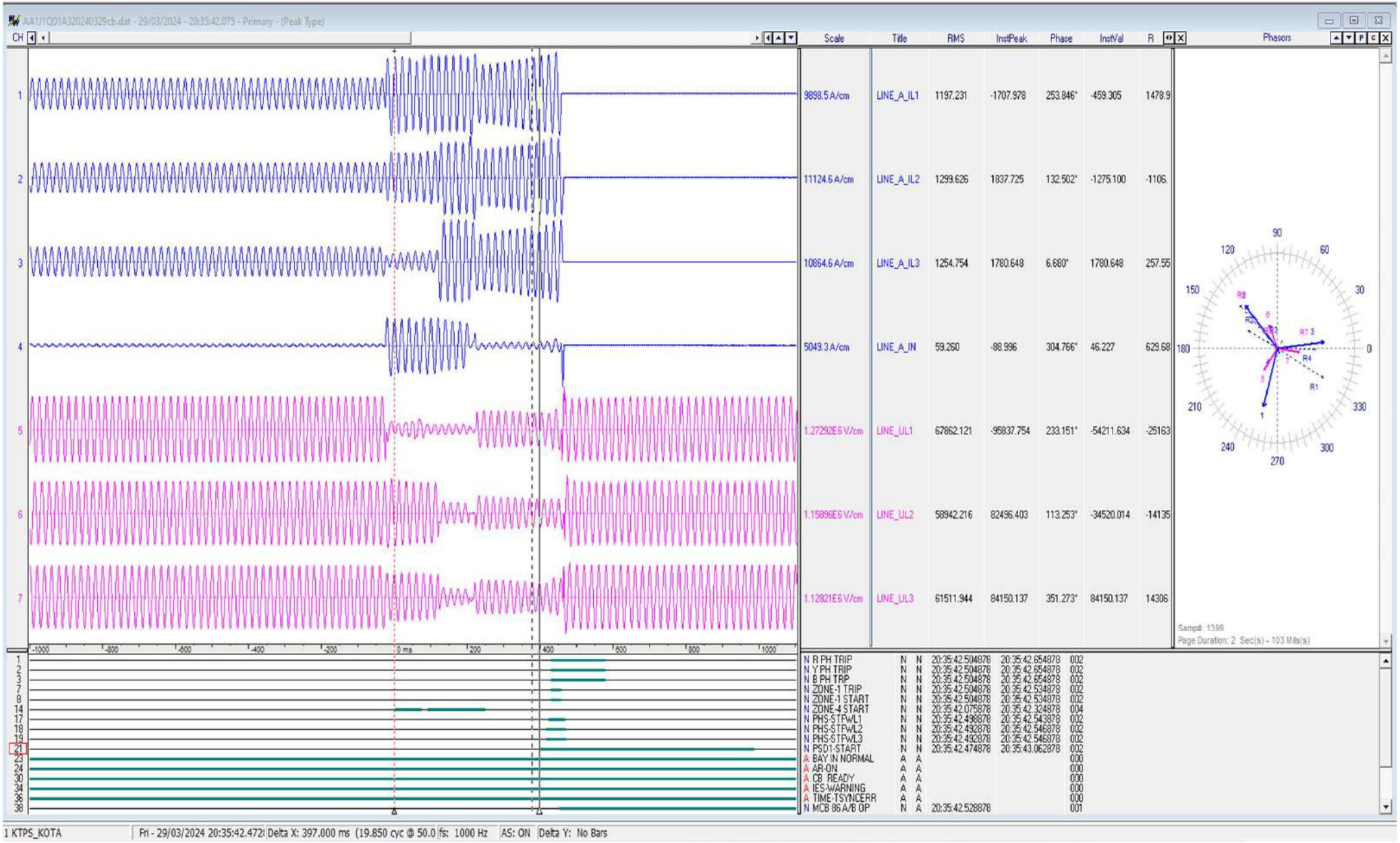
DR of 220kV KTPS(end)-Beawar ckt



Time not synced

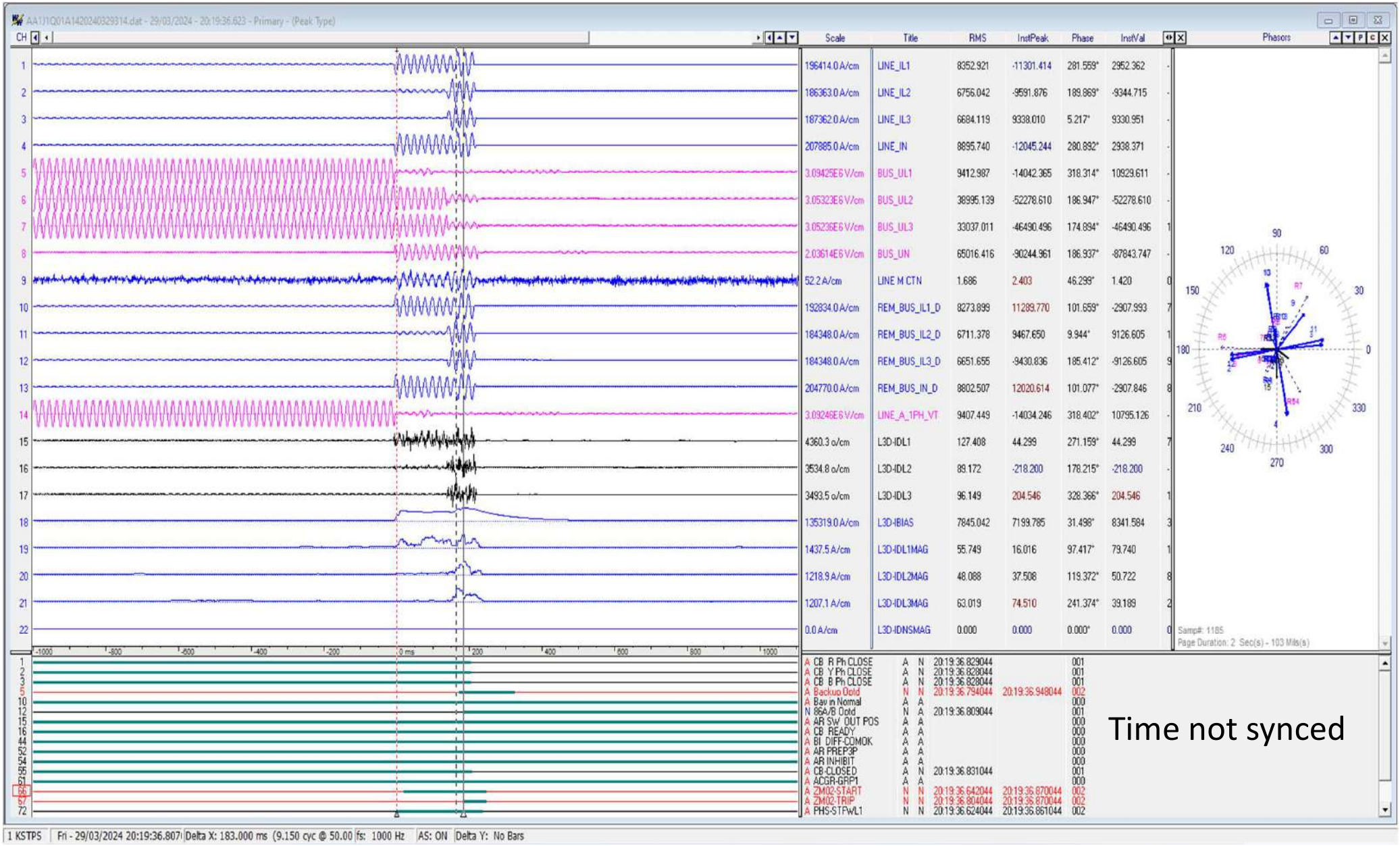
After ~350msec of R-N fault, power swing blocking operated and ~600msec of R-N fault, line tripped on Z-1 distance protection operation.

DR of 220kV KTPS(end)-Heerapura ckt



After ~400msec of R-N fault, power swing blocking operated and ~430msec of R-N fault, line tripped on Z-1 distance protection operation. Time not synced

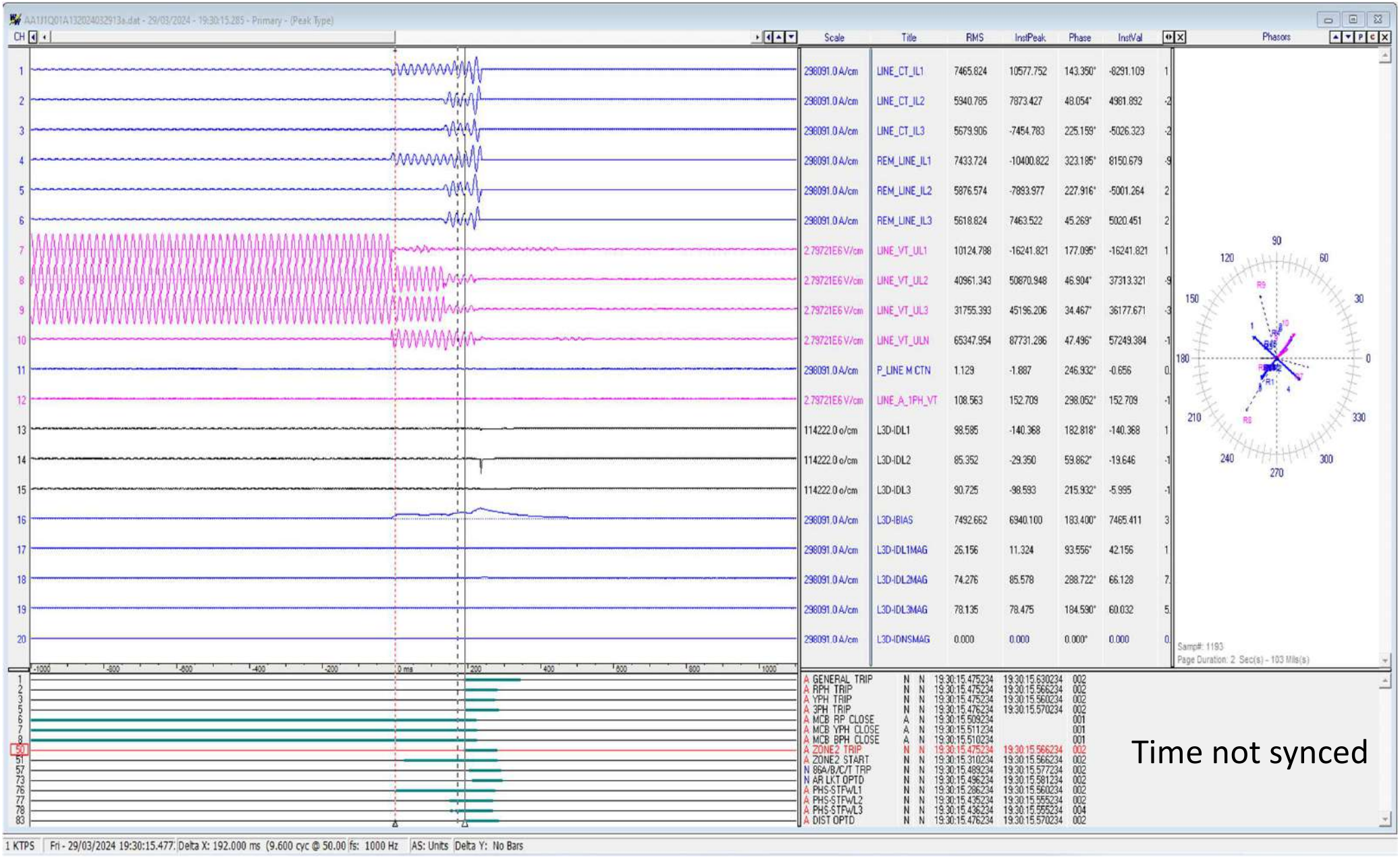
DR of 220kV KTPS(end)-Kota Sakatpura ckt-1



Time not synced

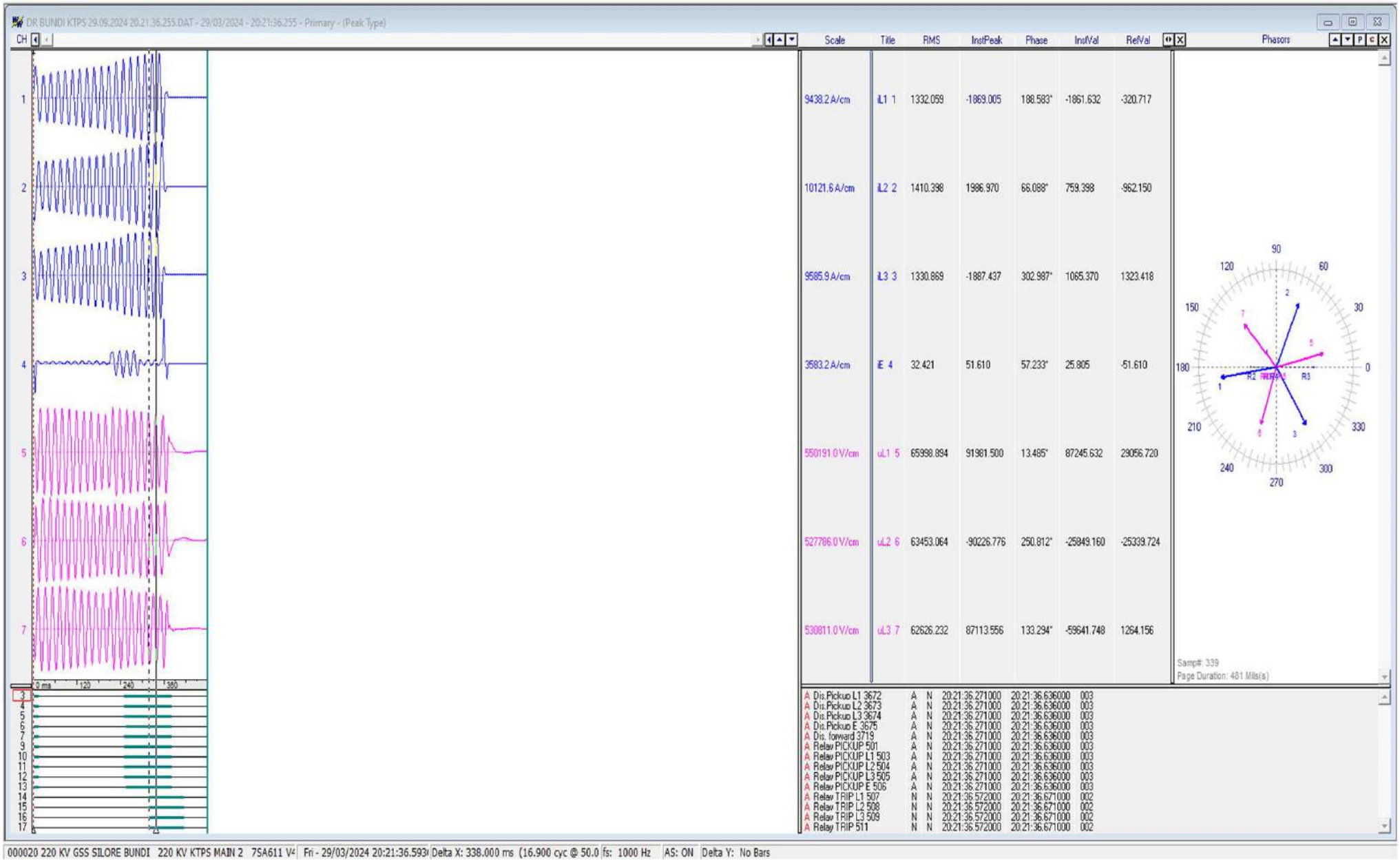
After ~20msec of R-N fault, distance protection sensed fault in Z-2 and after ~200msec of R-N fault, line tripped on Z-2 distance protection operation.

DR of 220kV KTPS(end)-Kota Sakatpura ckt-3



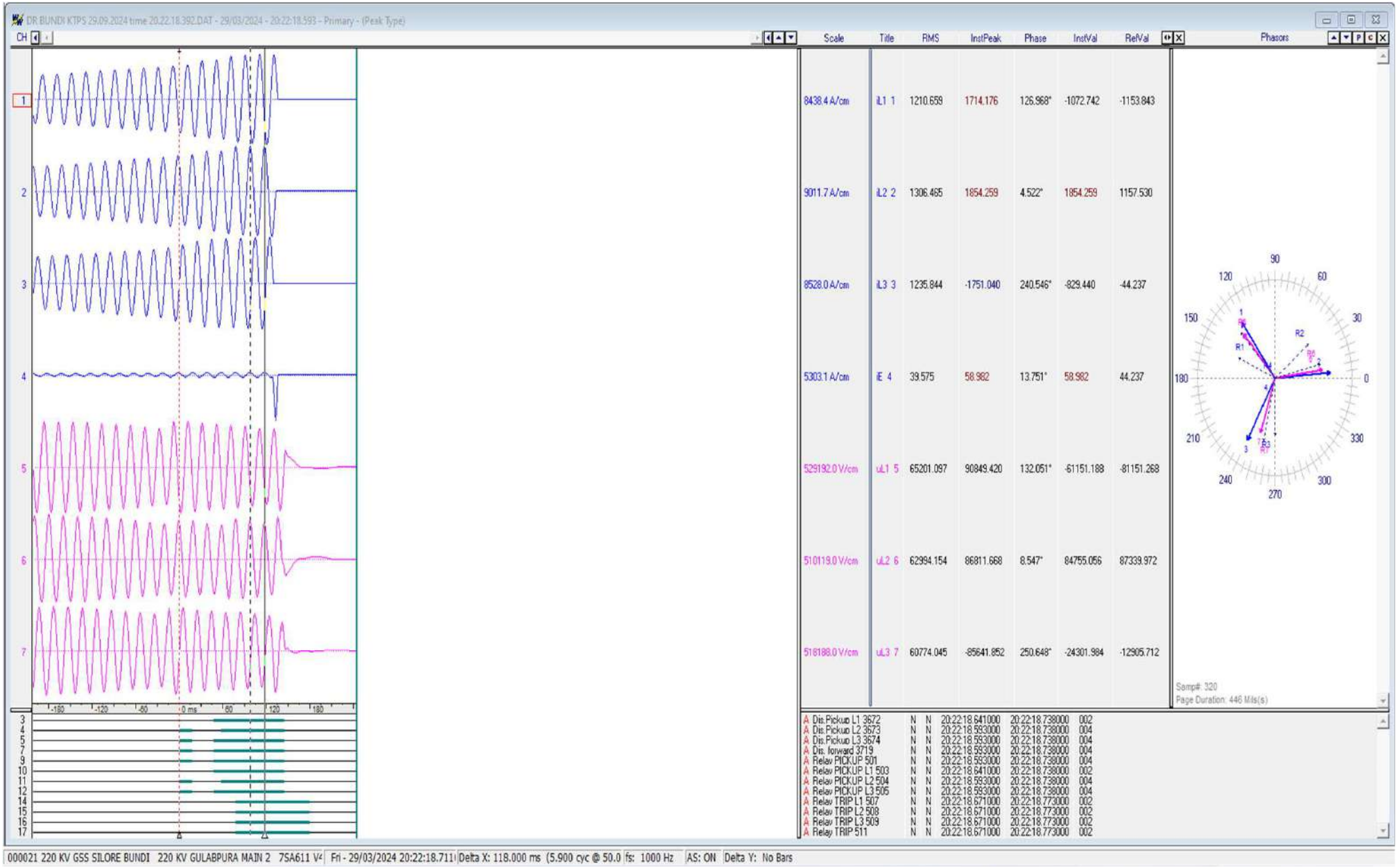
After ~20msec of R-N fault, distance protection sensed fault in Z-2 and after ~200msec of R-N fault, line tripped on Z-2 distance protection operation.

DR of 220kV KTPS-Bundi(end) ckt



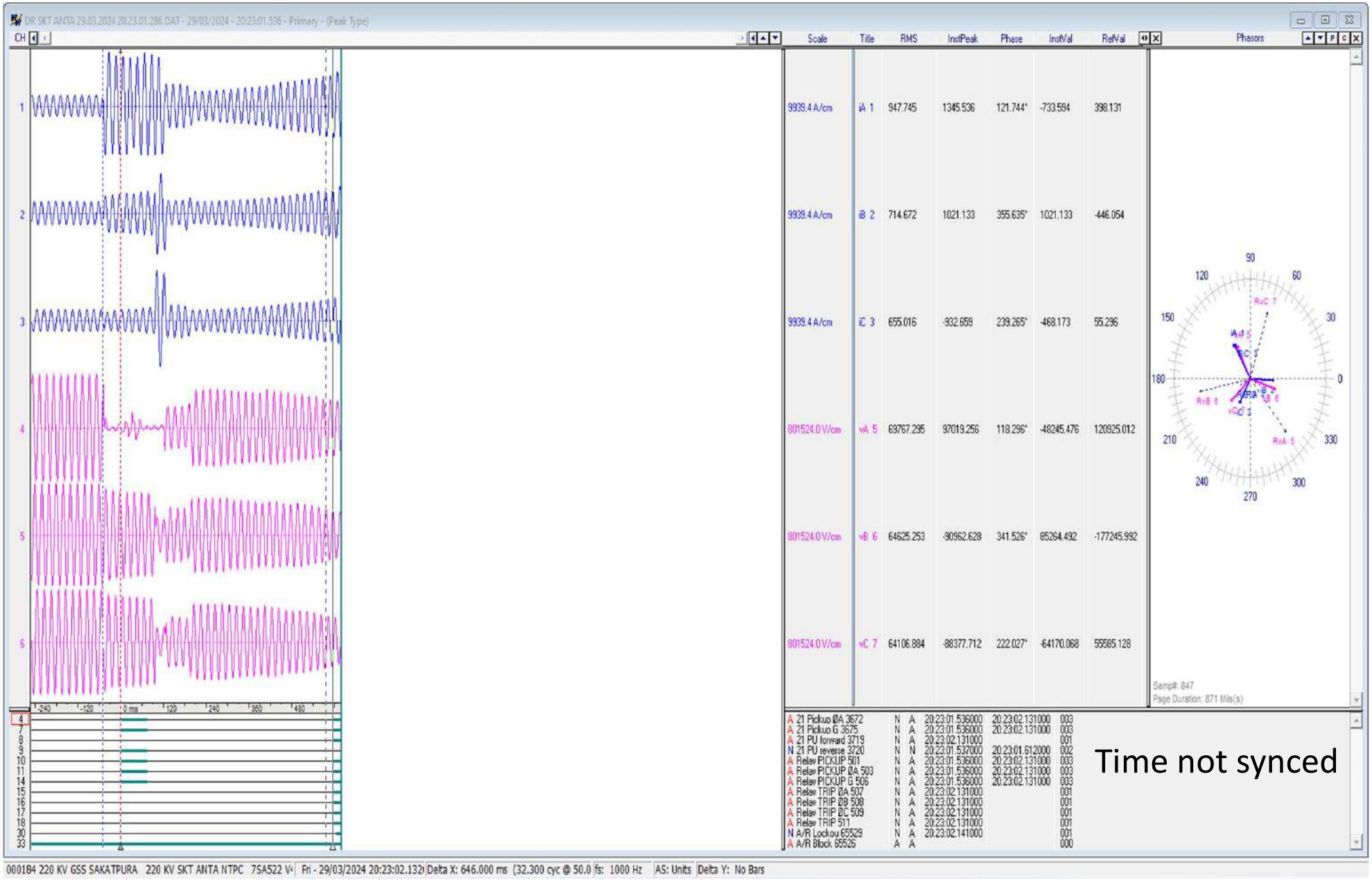
After ~550msec of R-N fault detection, line tripped on distance protection operation; phase currents in the range of 1330-1410A.

DR of 220kV Bundi(end)-Gulabpura ckt



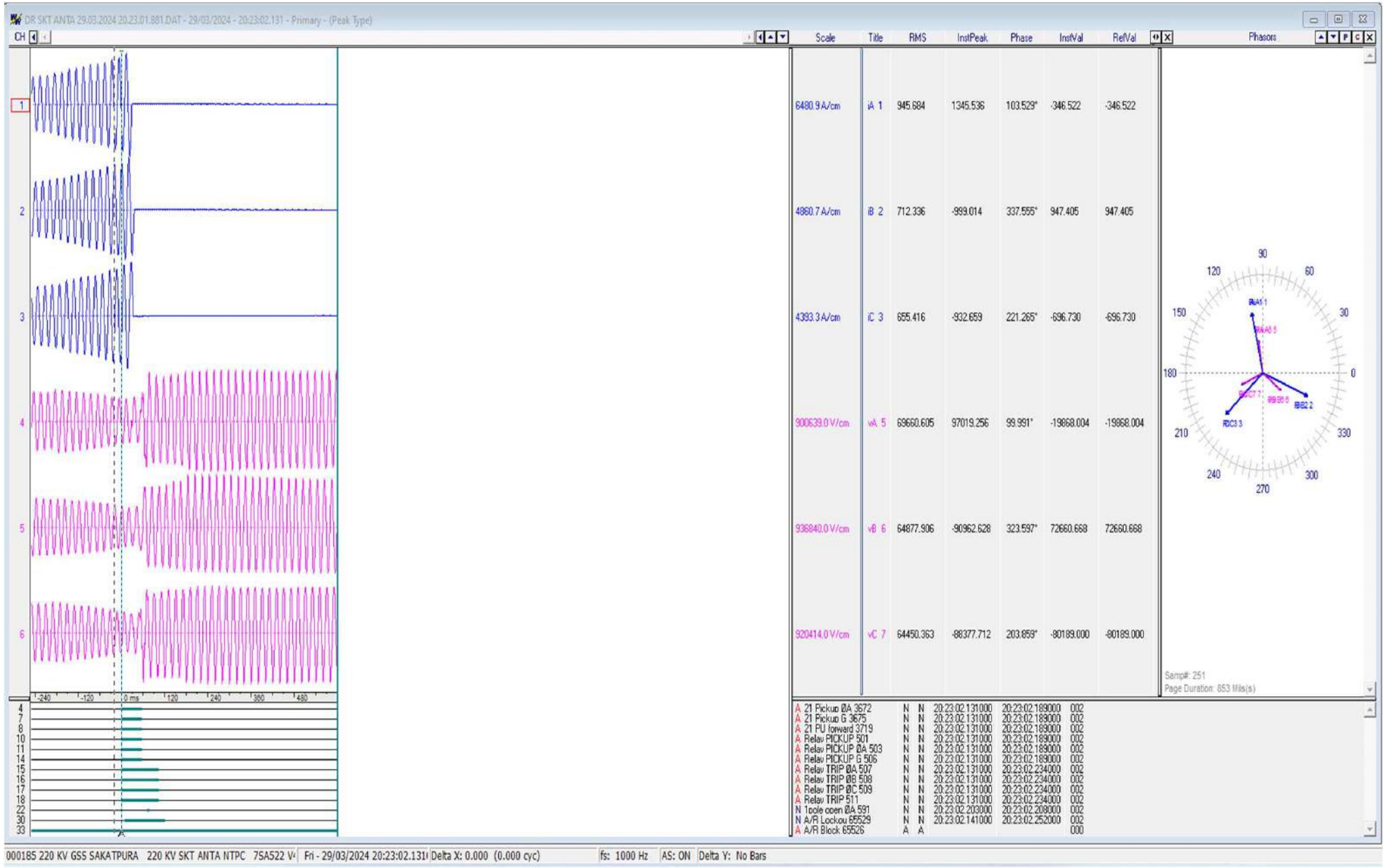
Line tripped on distance protection operation; phase currents in the range of 1200-1300A.

DR of 220kV Kota Sakatpura(end)-Anta ckt



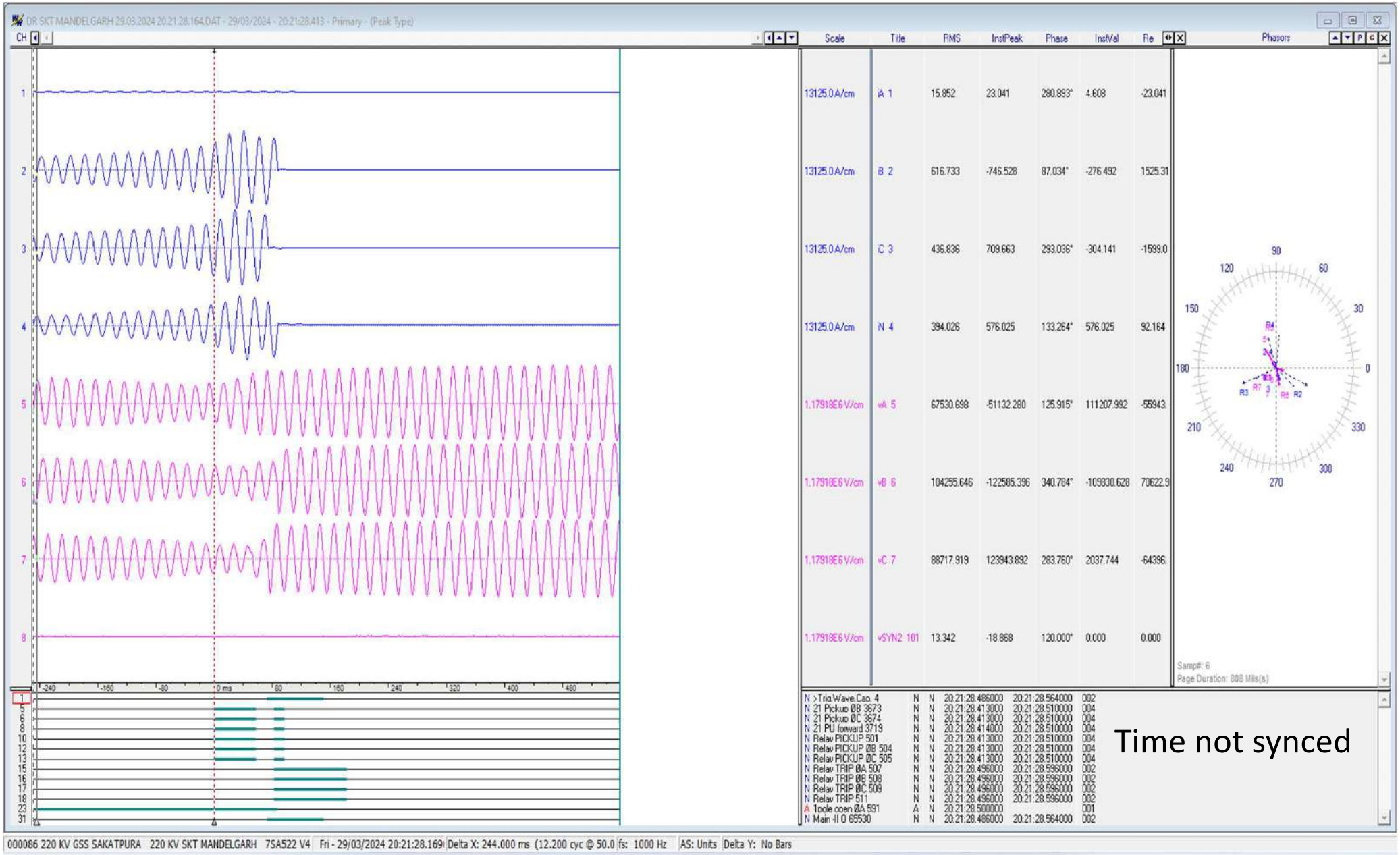
Sensed fault in Z-4 and reset and after ~650msec of R-N fault, line tripped on distance protection operation.

DR of 220kV Kota Sakatpura(end)-Anta ckt



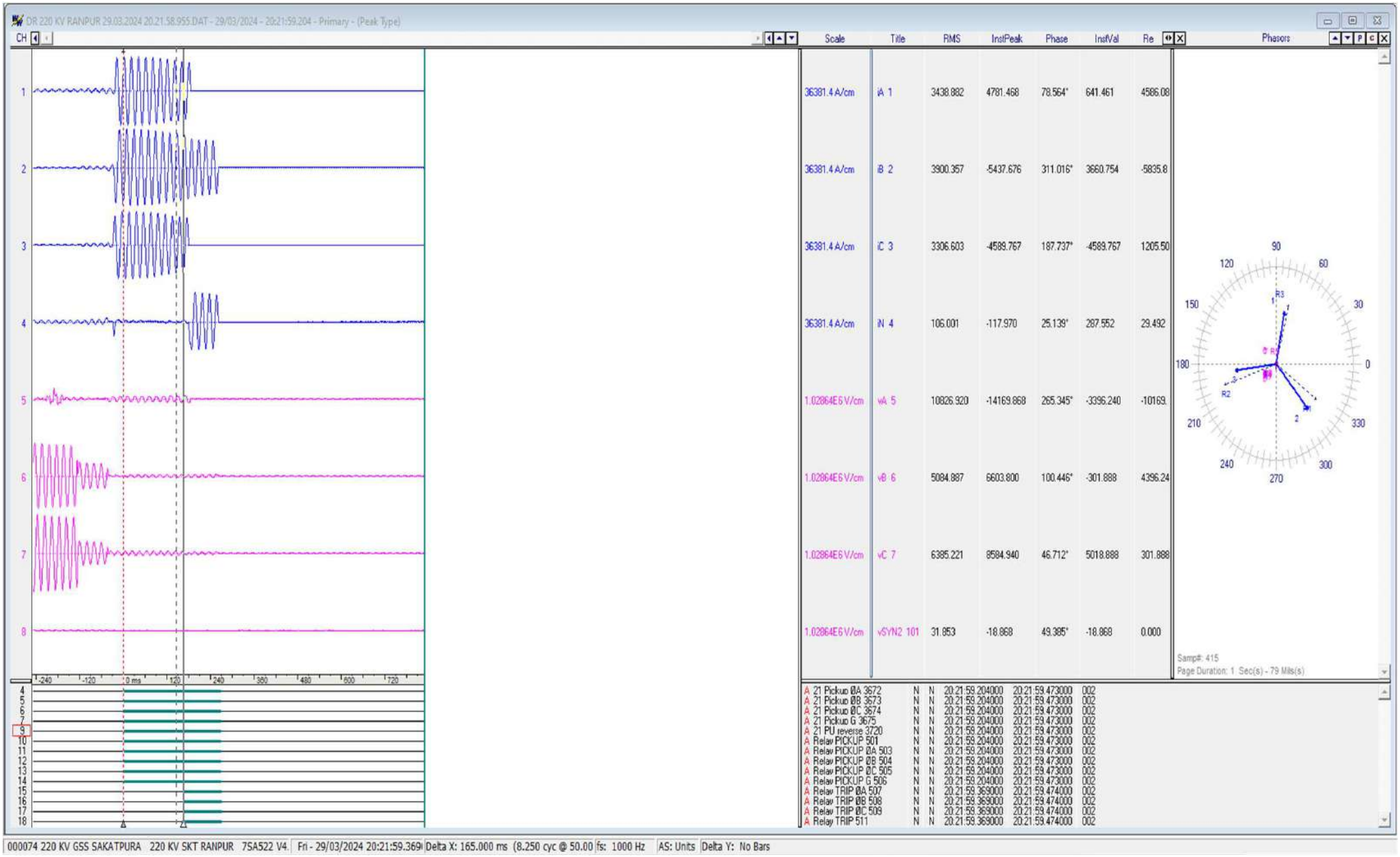
Sensed fault in Z-4 and reset and after ~650msec of R-N fault, line tripped on distance protection operation.

DR of 220kV Kota Sakatpura(end)-Mandalgarh ckt



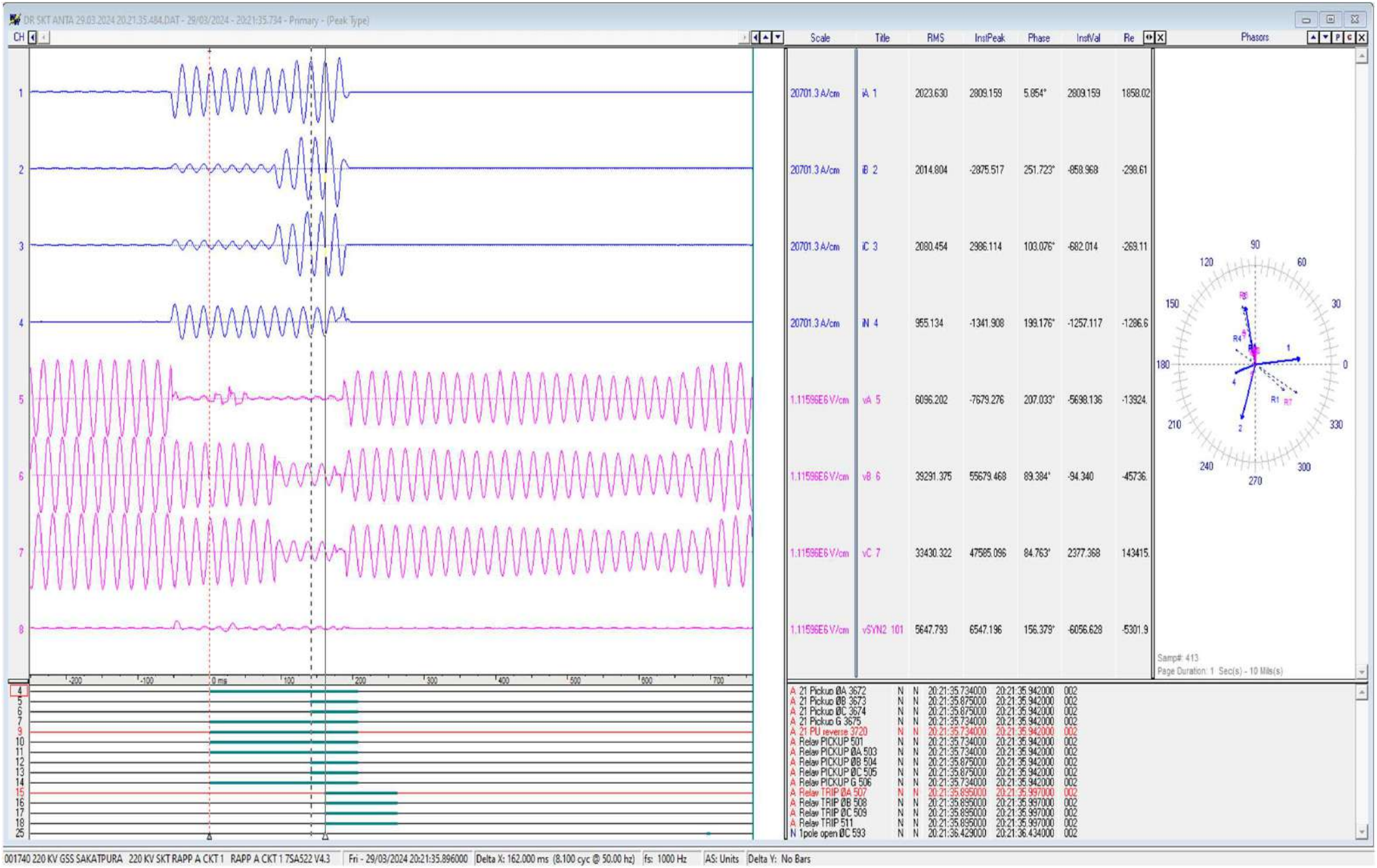
R-ph pole tripping followed by 3-ph trip observed.

DR of 220kV Kota Sakatpura(end)-Ranpur ckt



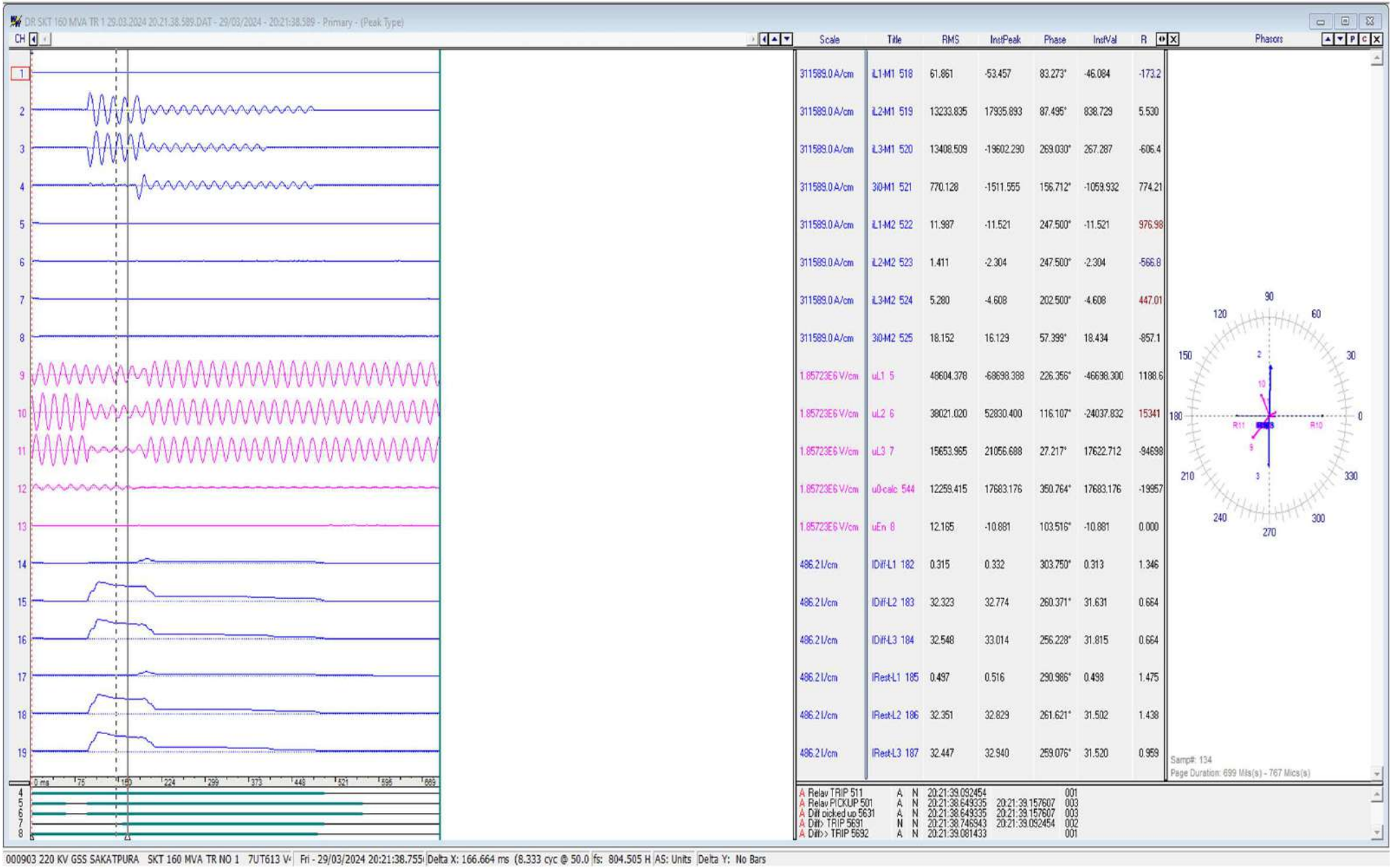
Fault sensed in Z-4, 3-ph trip after ~160msec of fault is observed.

DR of 220kV Kota Sakatpura(end)-RAPS-A ckt-1



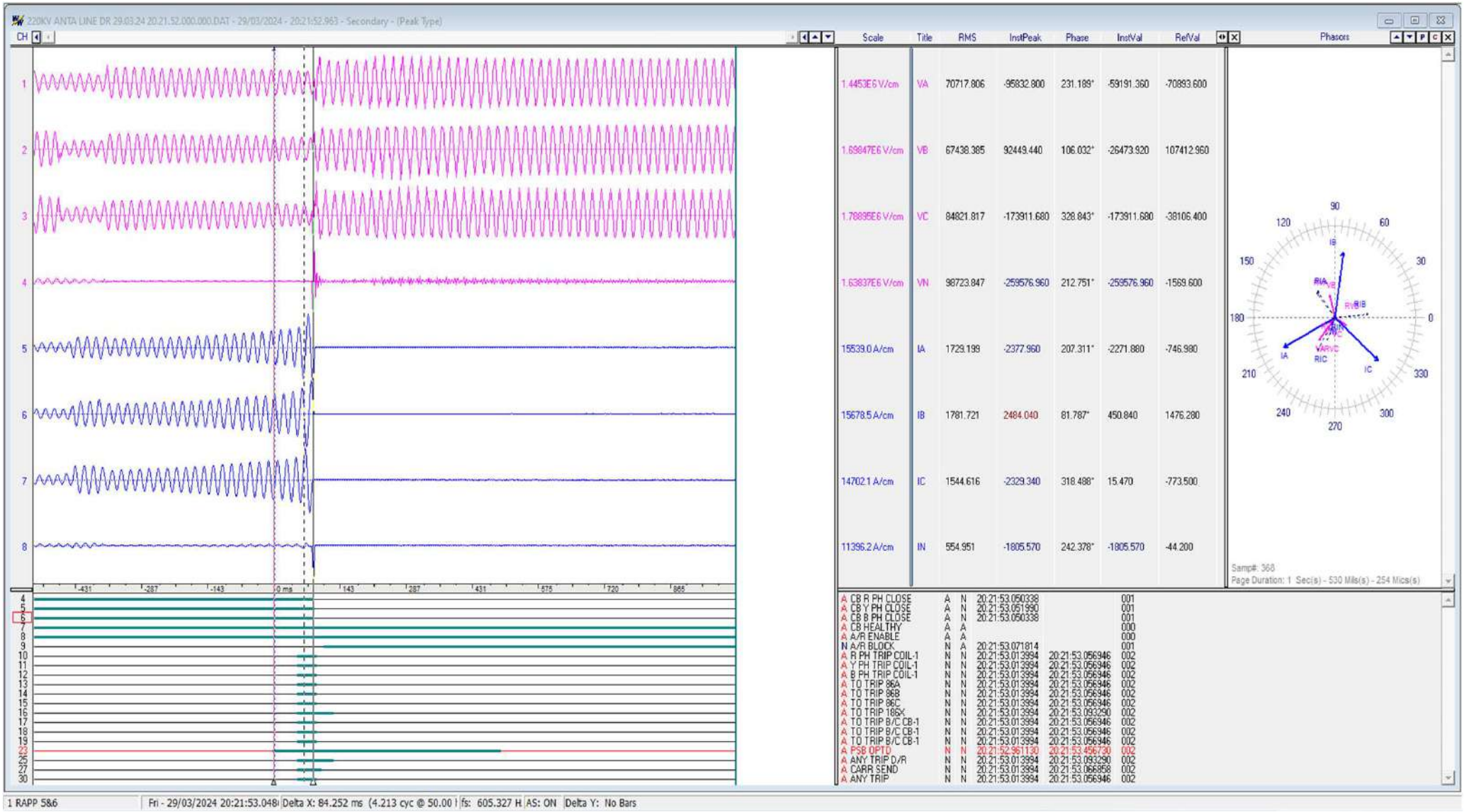
Fault sensed in Z-4, 3-ph trip after ~160msec of fault is observed.

DR of 220/132kV ICT-1 at Kota Sakatpura



Differential protection operated

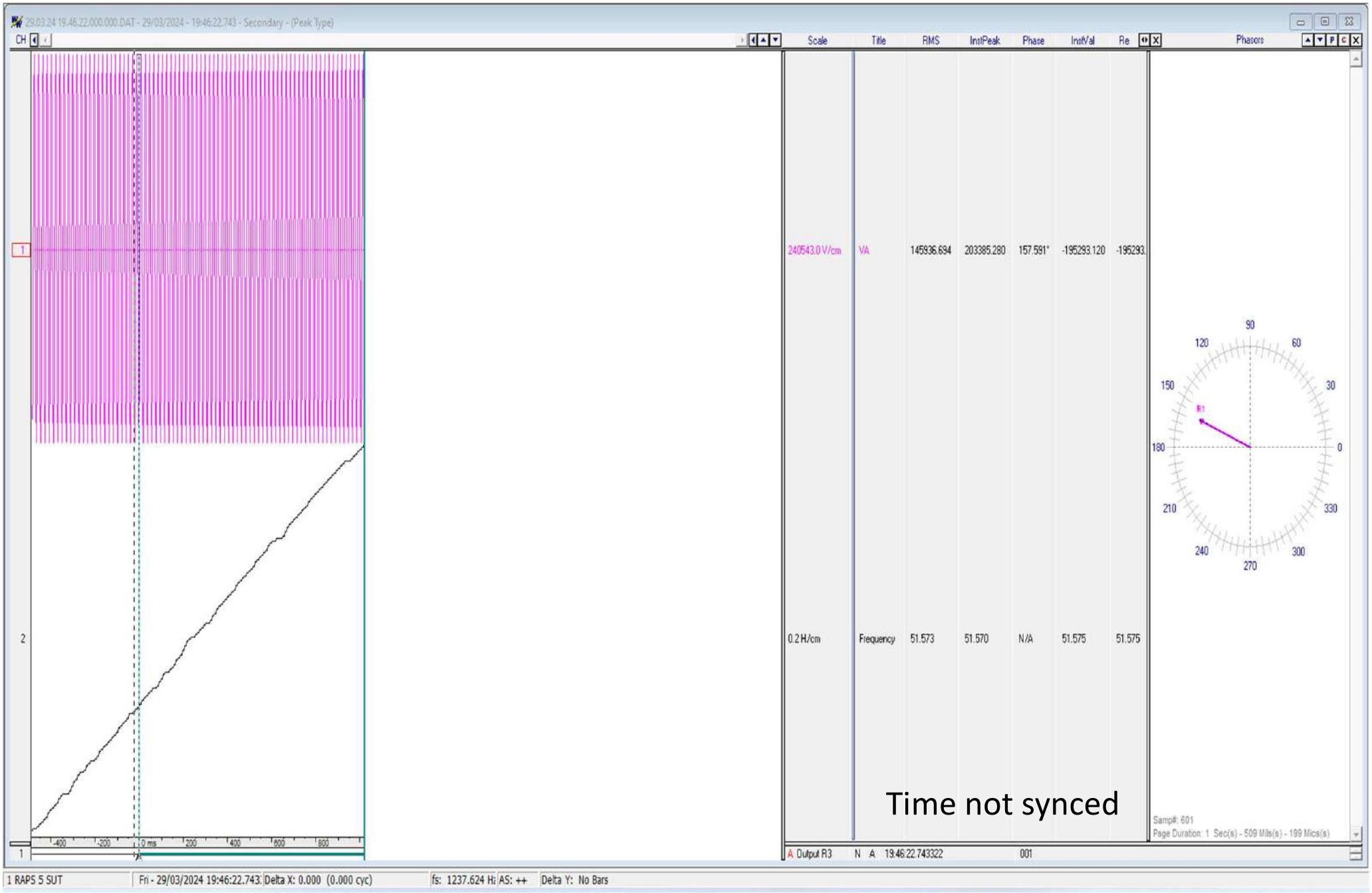
DR of 220kV RAPS_C(end)-Anta ckt



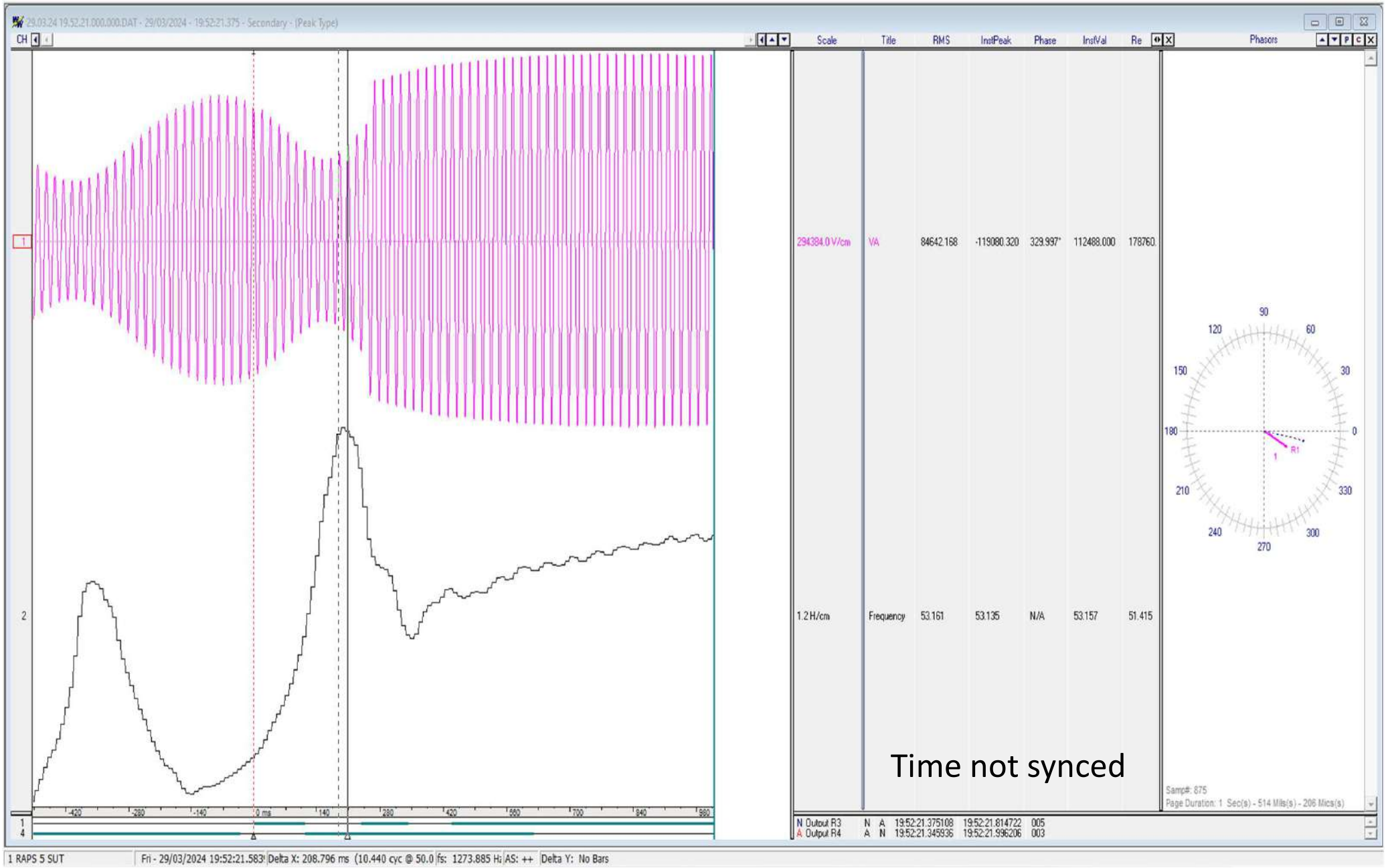
Phase currents:

- At 20:21:52:519 hrs: ~270-290A (~106MW)
- At 20:21:52:962 hrs: Power swing blocking operated: ~900-1000A (~350MW)
- At 20:21:53:048 hrs: ~1600-1800A (~650MW); breaker opened; Z-1 distance protection operated

DR of SUT-5 at RAPP-B

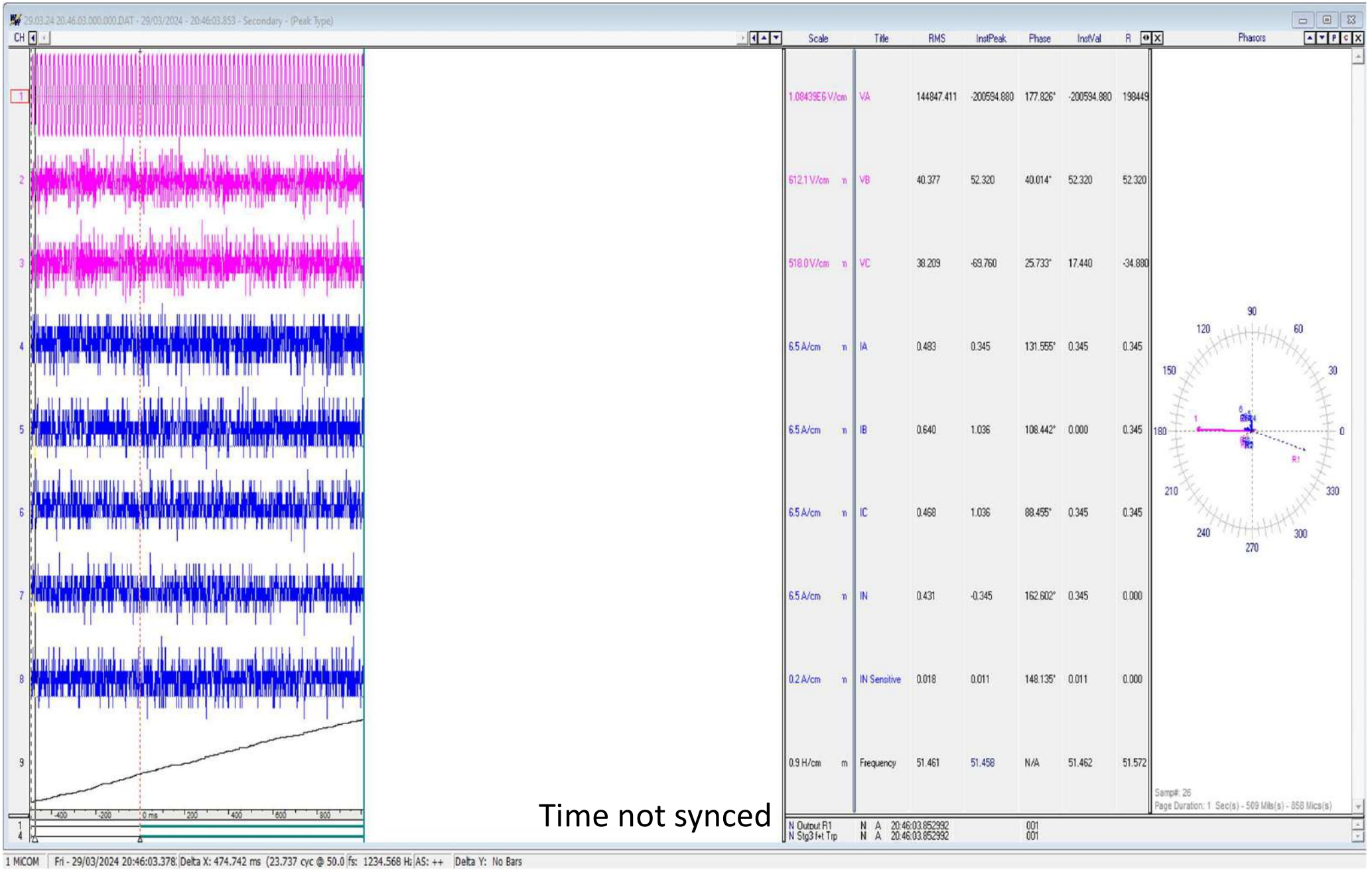


DR of SUT-5 at RAPP-B



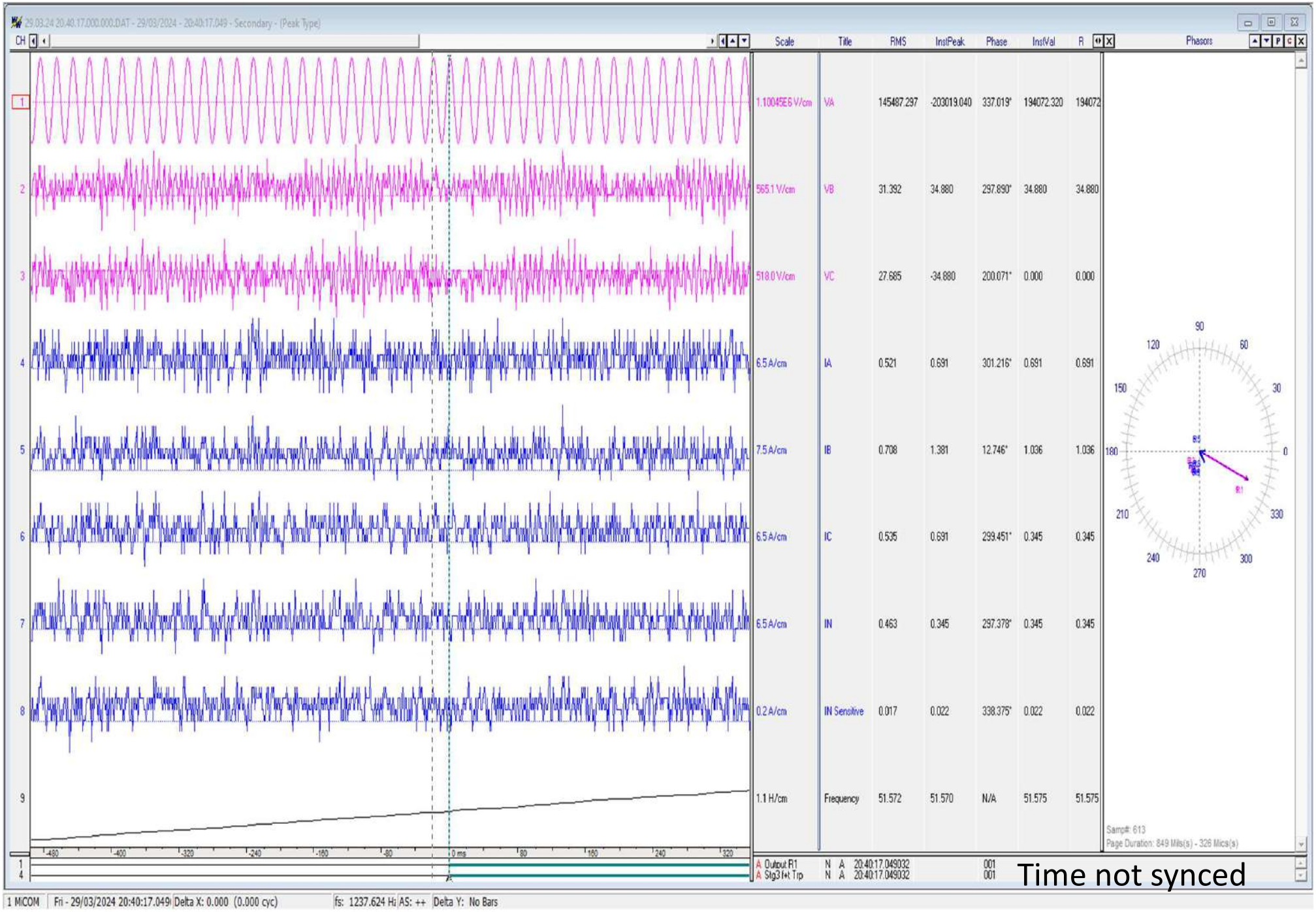
Max. frequency recorded:53.15Hz

DR of SUT-6 at RAPP-B



Time not synced

DR of SUT-6 at RAPP-B

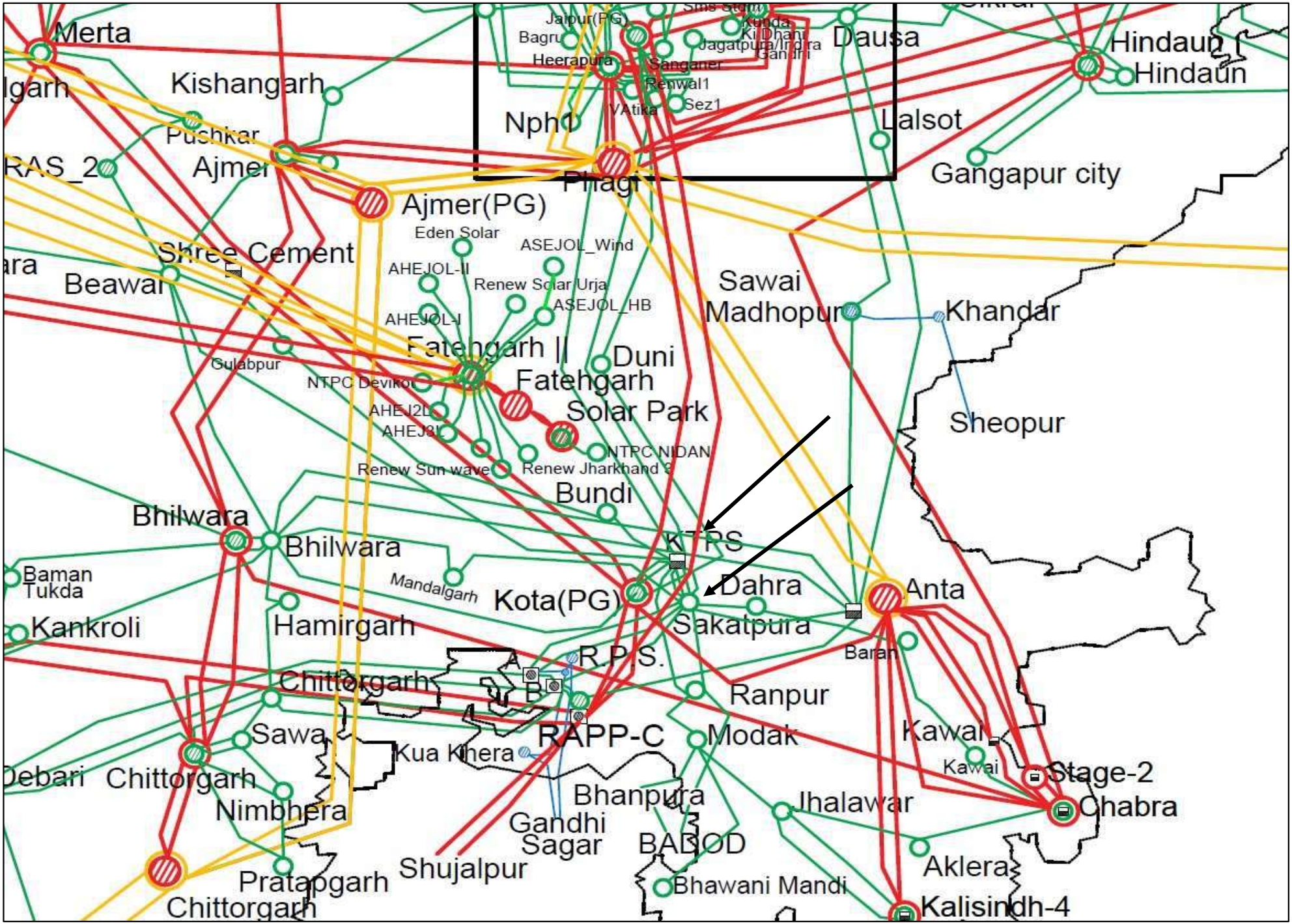


Time not synced

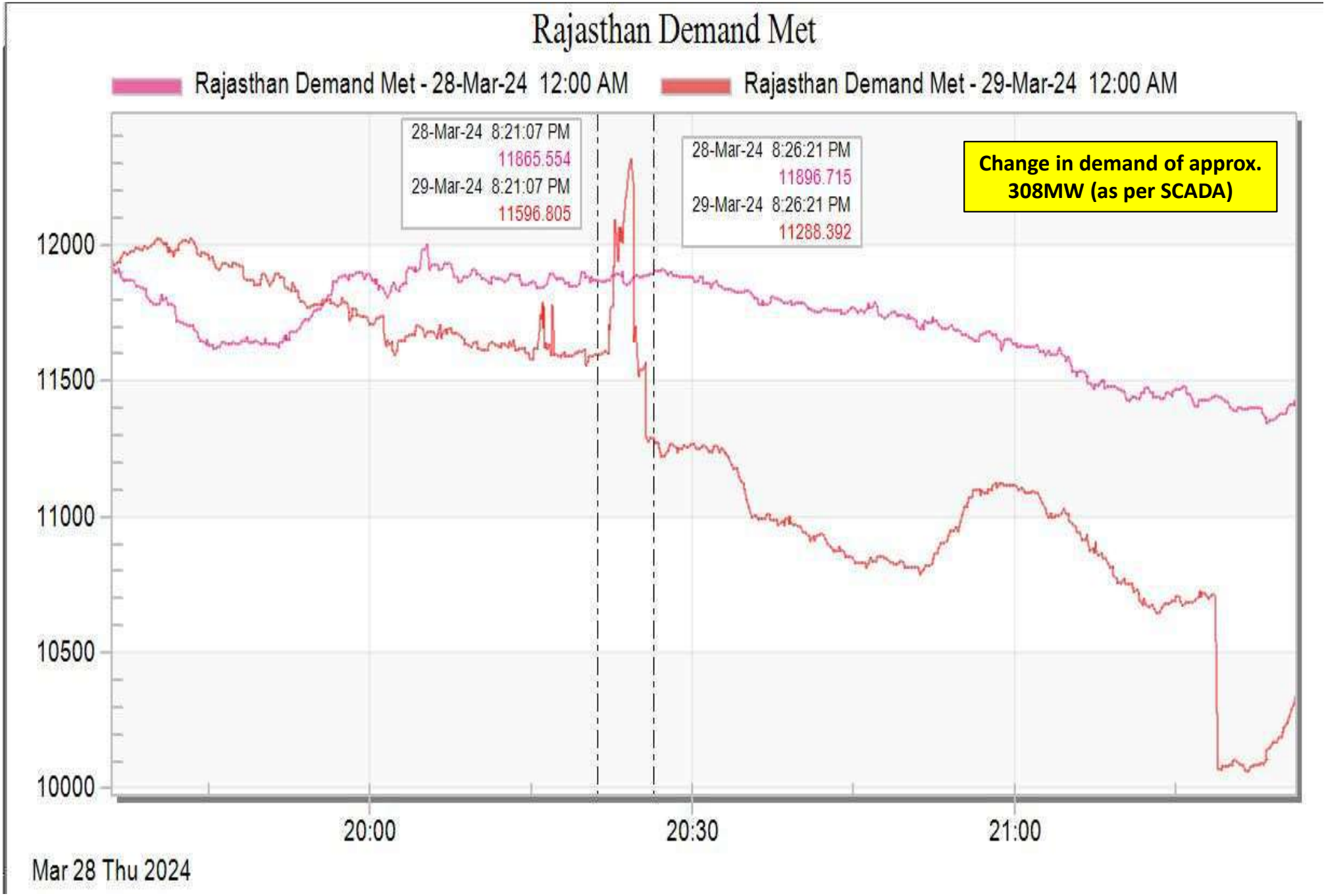
SCADA SOE

Time	Station Name	Voltage	Element	Element Type	Element Status	Remarks
20:21:51,605	KTPS	220kV	08KOTAS1	Circuit Breaker	Open	Line CB at KTPS end of 220kV KTPS-Sakatpura ckt-1
20:21:51,942	BUND2_R	220kV	04GULAB	Circuit Breaker	Open	Line CB at Bundi end of 220kV Bundi-Gulabpura ckt
20:21:51,953	BUND2_R	220kV	03KTPS	Circuit Breaker	Open	Line CB at Bundi end of 220kV Bundi-KTPS ckt opened
20:21:52,090	MANDL_R	220kV	02KOTAPG	Circuit Breaker	Open	Line CB at Manadalgarh end of 220kV Kota Sakatpura-
20:21:52,796	KTPS	220kV	10U2	Circuit Breaker	Open	KTPS Unit-2 CB opened
20:21:52,897	RANPR_R	220kV	04KOTAS	Circuit Breaker	disturbe	Line CB at Ranpur end of 220kV Kota Sakatpura-Ranpur
20:21:53,107	RAPP3 4	220kV	08KOTAS	Circuit Breaker	Open	Line CB at RAPS-B end of 220kV RAPS-B-Kota Sakatpura
20:21:58,259	KTPS	220kV	12U3	Circuit Breaker	Open	KTPS Unit-3 CB opened
20:21:58,685	KOTA	132kV	20DADAB	Circuit Breaker	Open	
20:21:58,685	KOTA	220kV	09RAPP1	Circuit Breaker	Open	Line CB at Kota Sakatpura end of 220kV RAPS-A-Kota
20:21:58,685	KOTA	220kV	18ANTA	Circuit Breaker	Open	Line CB at Kota Sakatpura end of 220kV Kota Sakatpura-
20:21:58,685	KOTA	132kV	17T1	Circuit Breaker	Open	
20:21:58,685	KOTA	220kV	16MBC	Circuit Breaker	Open	
20:21:58,685	KOTA	220kV	07T1	Circuit Breaker	Open	
20:21:58,685	KOTA	220kV	10MBC	Circuit Breaker	Open	
20:21:58,685	KOTA	220kV	13BS	Circuit Breaker	Open	
20:21:59,972	KOTA	132kV	07BS	Circuit Breaker	Open	
20:22:08,354	RPS	132kV	10U4	Circuit Breaker	Open	
20:22:09,249	RAPP3 4	220kV	07SUTR4	Circuit Breaker	Open	
20:22:09,858	RAPP3 4	220kV	06G4	Circuit Breaker	Open	

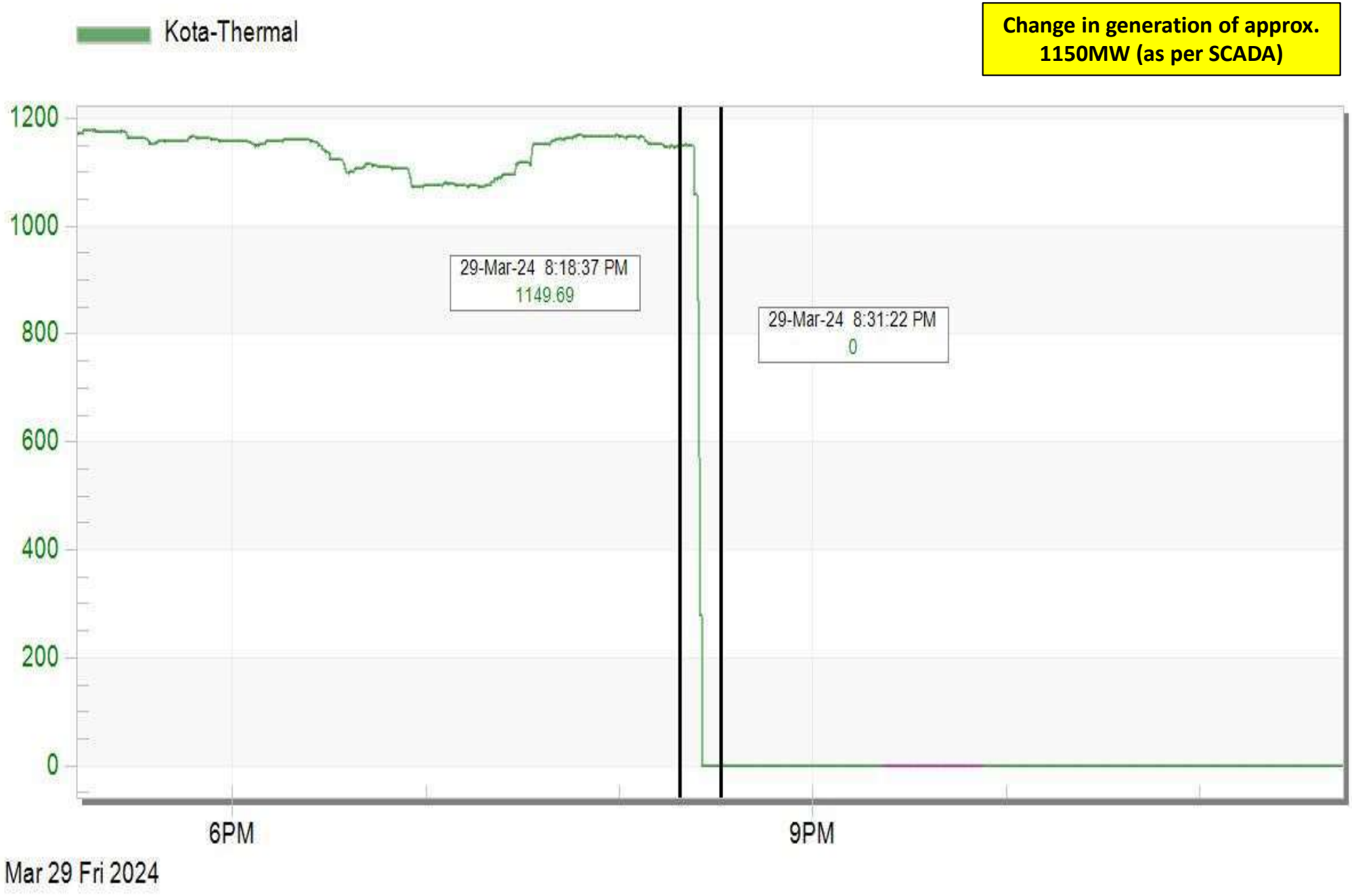
Network Diagram



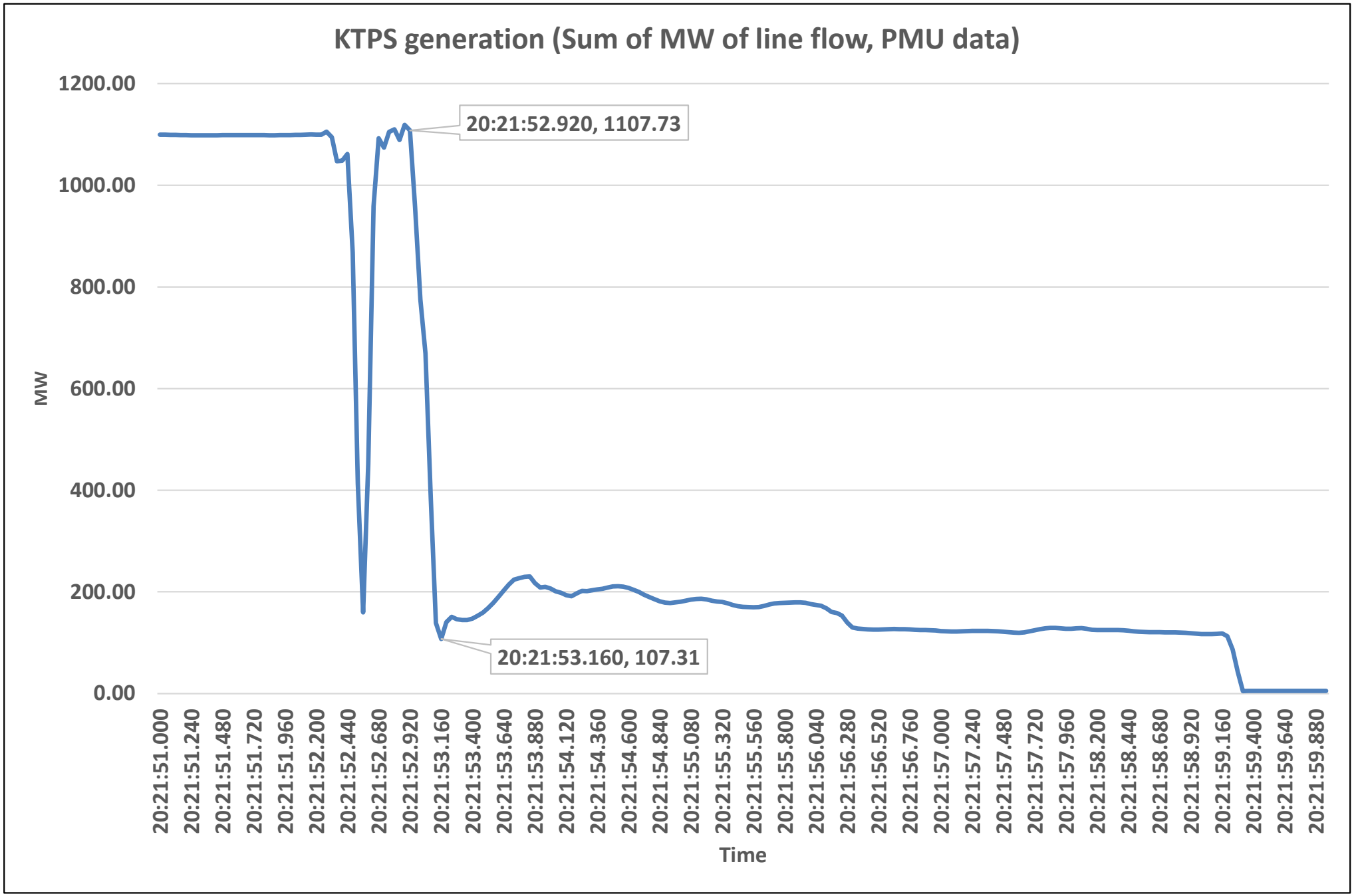
Rajasthan demand during the event



KTPS generation during the event(SCADA data)

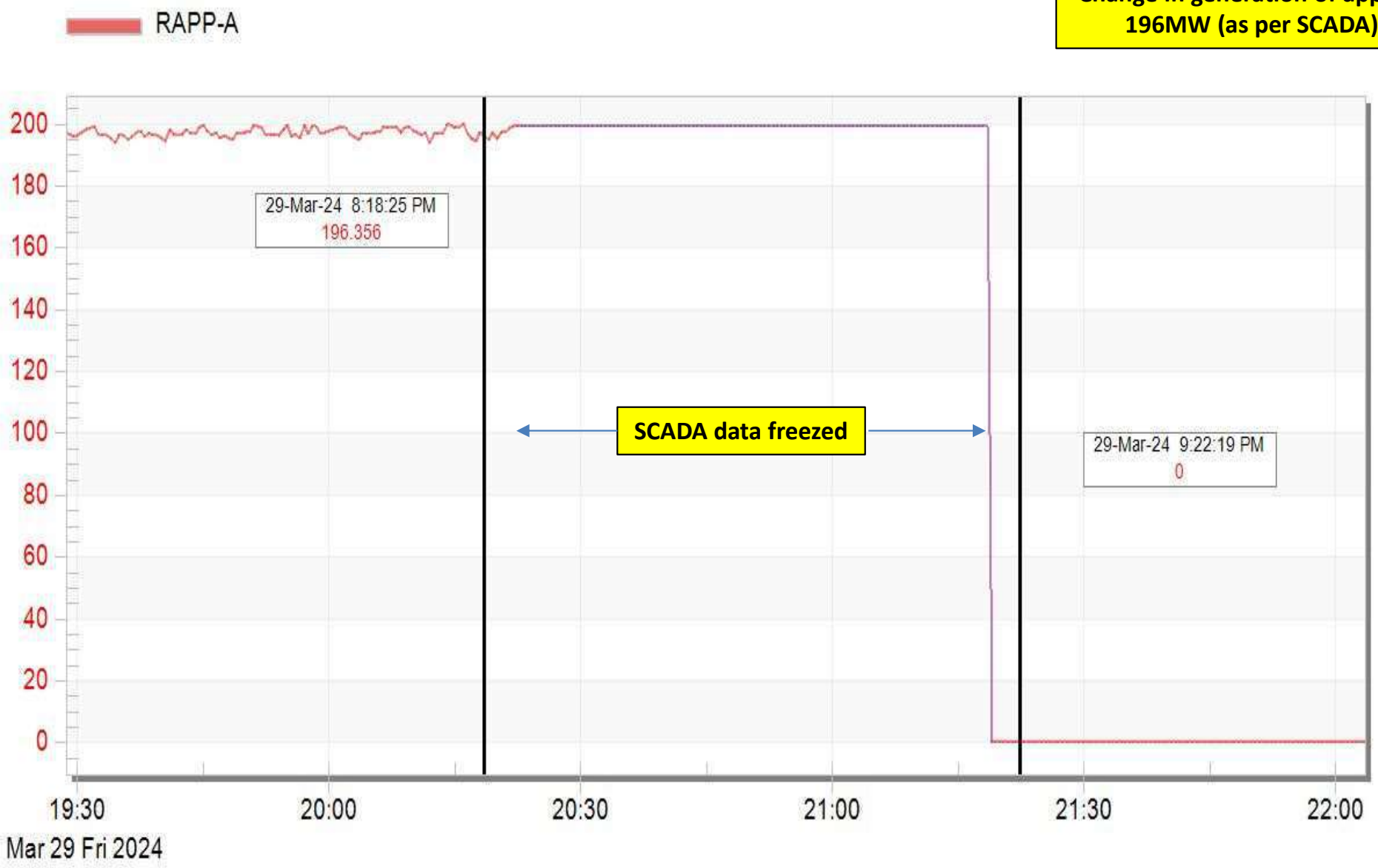


KTPS generation during the event (PMU data)

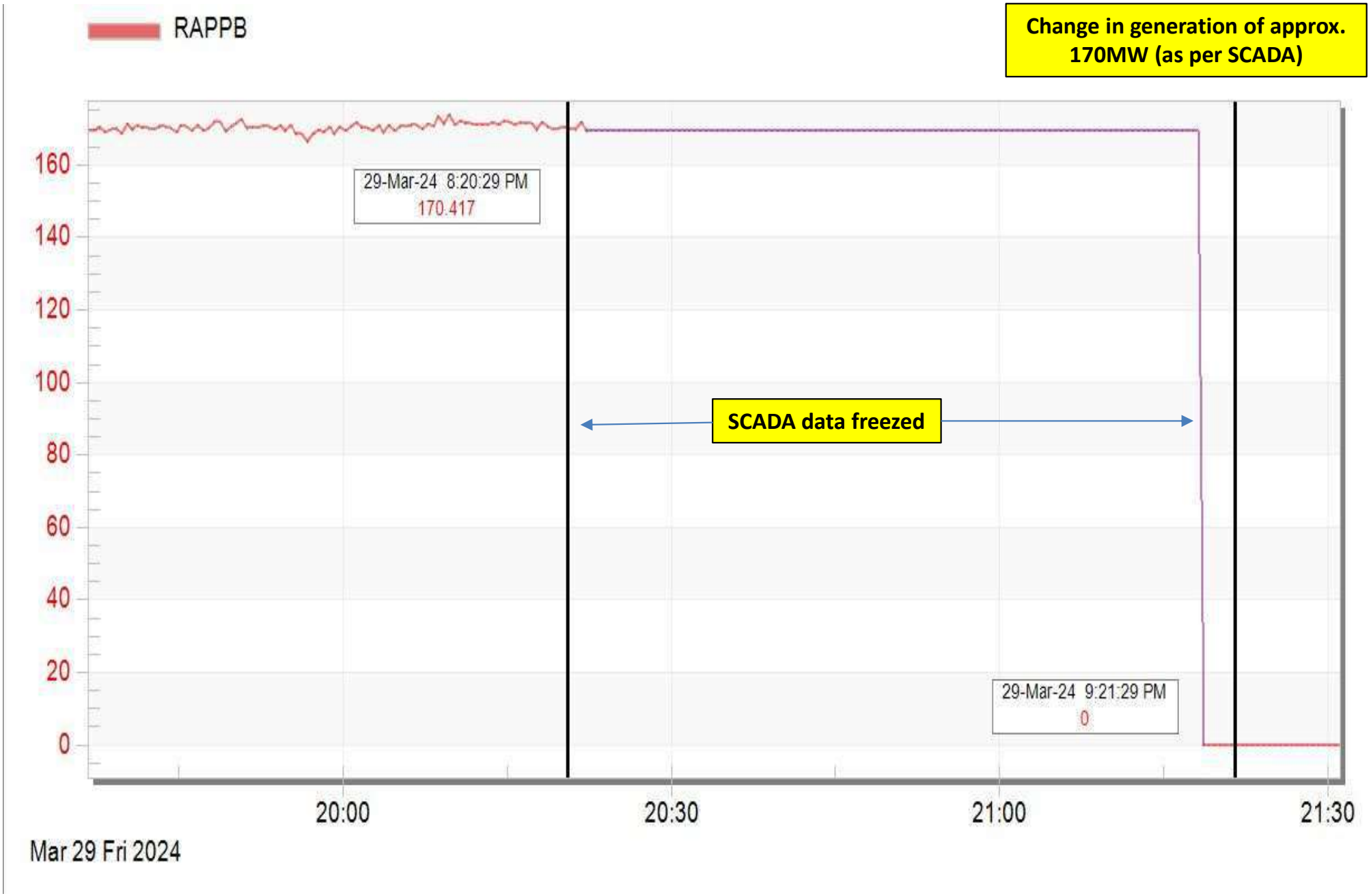


RAPP-A(NP) generation during the event

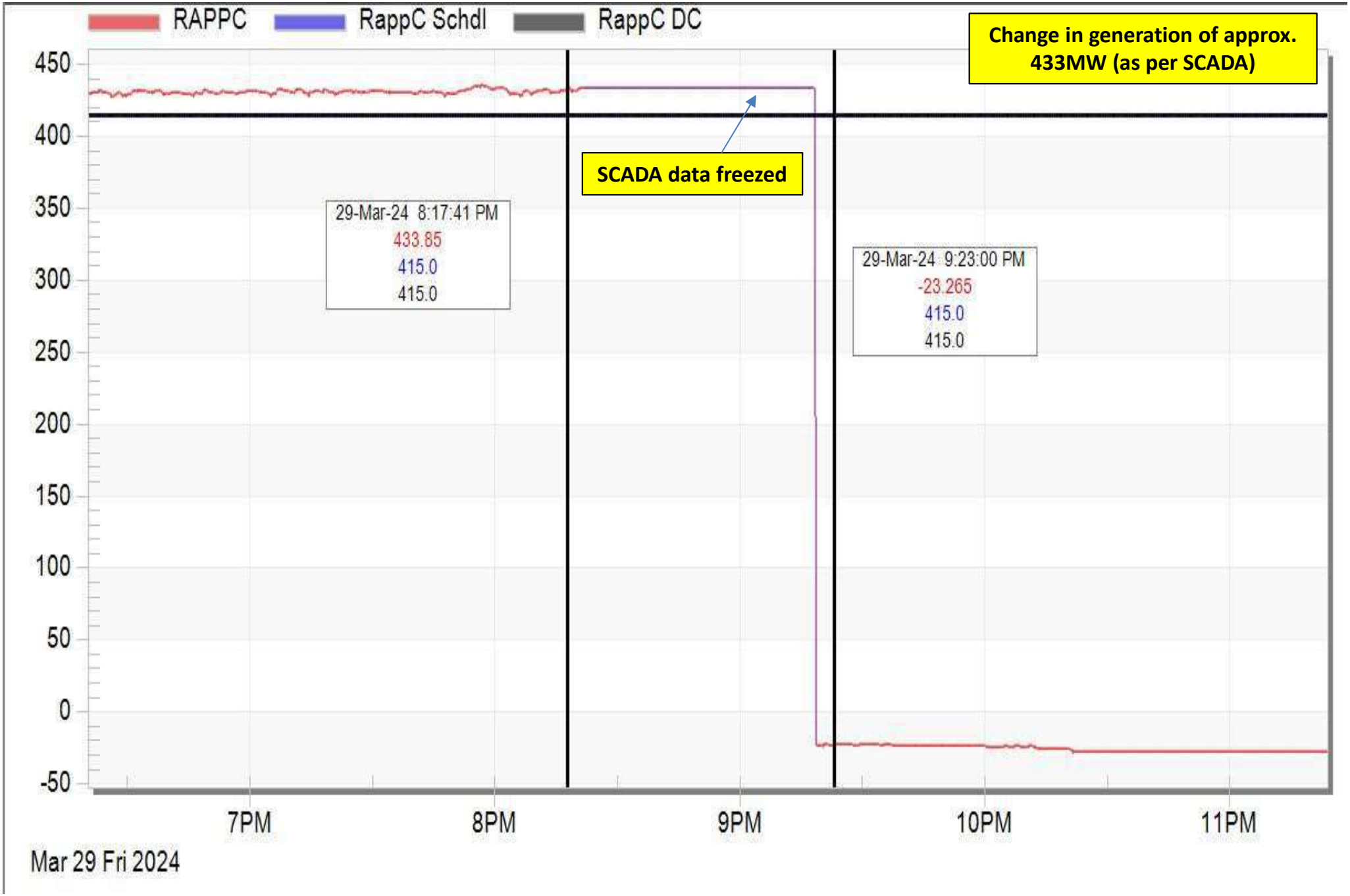
Change in generation of approx. 196MW (as per SCADA)



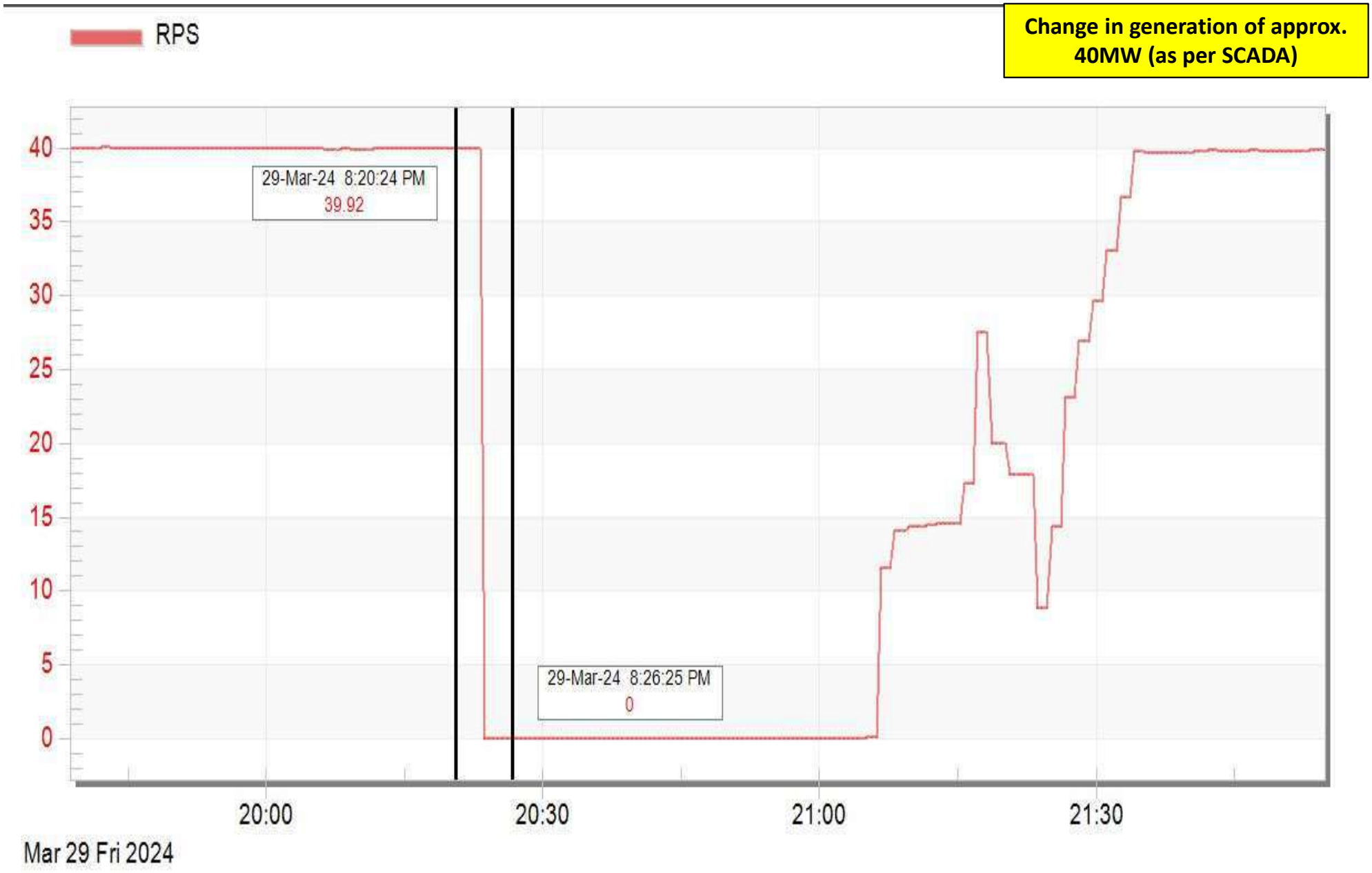
RAPP-B(NP) generation during the event



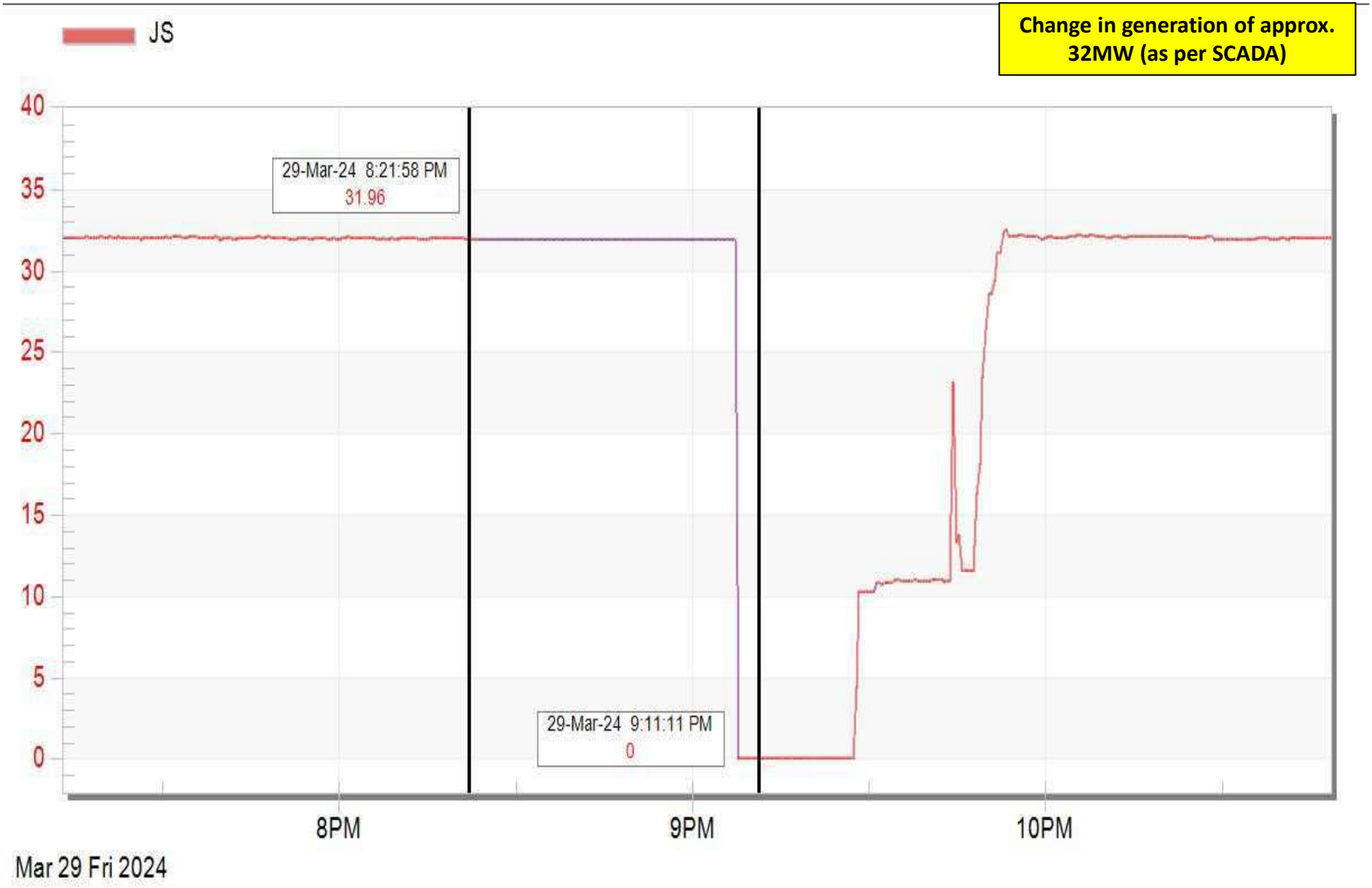
RAPP-C(NP) generation during the event



RPS HEP generation during the event



Jawahar Sagar HEP generation during the event



IMPACT OF ADDITIONAL CONNECTIVITY AND INTEGRATED OPERATION IN KTPS & RAPP GENERATION COMPLEX ON GRID STABILITY

In the 2nd meeting held on 6.8.2024 load flow study results submitted by SLDC Rajasthan (Appendix-A) was discussed & deliberated and it was observed that after cascade tripping incidents on 5.1.2024 at 5.17 hrs and later on 29.03.24 at 20.12 hrs additional connectivity has been created in RAPP & KTPS complex alongwith integrated operation which would be avoided in future such cascading tripping incidents in future .

In the meeting SLDC Rajasthan was requested to elaborate & evaluate the impact of created additional connectivity alongwith integrated operation in RAPP & KTPS generation complex on Grid stability under emergent system conditions.

1.0 Additional connectivity and integrated operation in KTPS & RAPP Generation complex

Additional connectivity and integrated operation in KTPS & RAPP Generation complex alongwith associated impact is tabulated hereunder :-

Table-1 :Impact of Additional connectivity on Grid Stability

S. No.	Particulars	Date	Remark
1	Closing of 220 kV S/C Sakatpura-Mandalgarh line alongwith integrated operation at 220 kV GSS Mandalgarh & Bhilwara	4.3.2024 at 10:20 hrs.	i. Previously 220 kV GSS Mandalgarh was radially fed from 400 kV GSS Kota(PG) through 220 kV S/C Kota(PG)-Bhilwara(split bus)-Mandalgarh line. ii. After closing of 220 kV S/C Sakatpura-Mandalgarh line system at Mandalgarh alongwith integrated operation at Mandalgarh & Bhilwara additional power flow line is available which reduce the power flow from Sakatpura to RAPP generation complex in emergent system conditions.
2	Closing of 400 kV D/C KTPS-Kota(PG) line (charged at 220 kV voltage level	1.4.2024 at 20 hrs.	iii. Thermal Capacity of 400 kV D/C KTPS-Kota(PG) line (charged at 220 KV voltage level) : 476 MVA/ckt (1250 Amp CTs are installed on the line). iv. In emergent system condition by-directional power flow has been observed on 220 kV D/C KTPS-Kota(PG) line which provide the stability in the KTPS & RAPP Generation complex in normal as well as in emergent system conditions.
3(i)	Closing of 220 kV S/C Chhittorgarh(220 kV GSS)-Chhittorgarh(400 kV GSS) line	17.4.2024 at 15:50 hrs.	i. This creates 220 kV ring system at 220 kV GSS Chhitorgarh and reduce the over loading on 220 kV S/C RAPP(C)-Anta line in normal condition as well as in emergent conditions. ii. Power flow on 220 kV D/C RAPP(B)-Chhittorgarh line increased. iii. Previously 220 kV GSS Debari (approx. Load 150-200 MW) and Chhitorgarh (approx. Load 150-200 MW) was radially connected from RAPP Complex and in emergent conditions whenever power was flow from Sakatpura to RAPP complex, 220 kV S/C RAPP©-Anta line was tripped on over load. Now additional power which inject in RAPP© complex from Sakatpura is distributed/shared in three 220 kV circuits viz. 220 kV D/C RAPP(B)-Chhitorgarh line and 220 kV S/C RAPP(C)-Anta line and reduce the possibility of outage of 220 kV S/C RAPP(C)-Anta line on over load which was observed in the incident of 5.1.2024 and 29.3.2024.
3(ii)	Closing of 220 kV S/C Chhittorgarh(220 kV GSS)- Sawa line	16.7.2024 at 13 hrs.	
3(iii)	Closing of 220 kV S/C Chhittorgarh(220 kV GSS)-Hamirgarh line	16.7.2024 at 13 hrs.	

4(i)	Creation of additional 220 kV S/C KTPS-Ranpur (Bus-2)– Sakatpura(Bus-D)-Dahra line by utilizing opened 220 kV S/C KTPS-Ranpur line & 220 kV S/C Ranpur – Sakatpura line	18.4.2024 at 13:54 hrs.	i. This creates additional evacuation line from KTPS upto extent of 220 kV GSS Dahra load (150 to 200 MW) ii. Split bus arrangement at 220 kV GSS Sakatpura reduce the no. of outage of 220 kV lines at Sakatpura under in emergent system conditions
4(ii)	Split bus arrangement at 220 kV GSS Sakatpura (Bus-D is separated from 220 kV Bus-A,B &C)		
5	Commissioning of 220 kV Bus Bar protection scheme at 220 kV GSS Sakatpura	16.7.2024 at 13 hrs.	i. Reduce the possibility of outage at 220 kV lines& generating units at RAPP and KTPS switchyard under 220 kV bus fault at Sakatpura. ii. on 14.8.2024 at 16:12 hrs. Y Phase CT of 220 KV Sakatpura-RAPP A CKT No. 1 burst and bus protection operated at 220 kV GSS Sakatpura .
6	Change of Zone-2 settings of 220 kV interconnectors between KTPS and 220 kV GSS Sakatpura	-	XEN(Protection & switchyard), KTPS intimated that Zone-2 settings of 220 kV interconnectors between KTPS and 220 kV GSS Sakatpura has been revised as under :- i. 220 kV interconnector - 1&3: 200 ms ii. 220 kV interconnector - 1&3: 240 ms Previously Zone-2 settings was 160 ms.

2.0 **LOAD FLOW STUDY**

Load flow studies have been performed for some emergent system conditions for following two scenario's :-

i. Scenario-1 : Without additional connectivity (as per table-1) at KTPS & RAPP generation complex
ii. Scenario-2 : With additional connectivity (as per table-1) at KTPS & RAPP generation complex

Load flow study results are discussed in the following paragraphs :-

2.1 Rajasthan Demand and Generation

- Rajasthan Demand : 16000 MW
- Intra State Solar Power Generation in Rajasthan : 3662.30 MW (IC : 4946.50 MW) (74.03% of IC)
- Intra State Wind Power Generation in Rajasthan : 586.57 MW (IC : 4342.94 MW) (13.5% of IC)
- Thermal power generation in Rajasthan(excluding Auxiliary consumption) : 5989.49 MW (9645.5 MW) (62.09% of IC)
- Hydro power generation in Rajasthan (excluding Auxiliary consumption) : 68 MW (411 MW) (16>54%)
- Inter State Solar Power Generation in Rajasthan : 10772.03 MW (IC : 17716.906 MW) (60.80% of IC)
- Tie line flows in Rajasthan Control area : 4598.9 MW

2.2 Generation in various Power Plants in Kota area

Table-2:Generation in Kota Area

S. No.	Name of Power PLant	Installed Capacity (MW)	Net Generation (Excluding aux. consumption) (MW)	% Generation	Remark
A	**Kota Thermal Power Station**				
1	Unit-1	110	99	90	-
2	Unit-2	110	99	90	-
3	Unit-3	210	189	90	-
4	Unit-4	210	189	90	-
5	Unit-5	210	189	90	-
6	Unit-6	195	176	90	-
7	Unit-7	195	176	90	-
	Total(A)	**1240**	**1117**	**90**	-
B	**Nuclear Power Power Stations**				
	RAPP-A				
	Unit-2	200	180	90	-
	RAPP-B				
	Unit-3	220	198	90	-
	Unit-4	220	198	90	-
	RAPP-C				
	Unit-5	220	198	90	-
	Unit-6	220	198	90	-
C	**Anta GAS THERMAL POWER STATION**				
i	Unit-1	88.71	RSD		
ii	Unit-2	88.71	RSD		
iii	Unit-3	88.71	RSD		
iv	Unit-4	153.2	RSD		
v	Anta GTPS Solar Generation	87.5	0 MW		

2.3 Load flow study in Base Case for Scenario-1 and Scenario-2

Load flow study results for Base Case in Scenario-1 and Scenario-2 are plotted at Exhibit-1A & Exhibit-1B respectively and tabulated here under :-

Table-3 : Power flow at in Base Case in Scenario-1 and Scenario-2

S. No.	Name of line	Power flow (MW) in Base Case	
		Scenario-1	Scenario-2
		Exhibit-1A	Exhibit-1B
A	**KTPS switchyard**		
1	220 kV S/C KTPS-Heerapura line	185	132
2	220 kV S/C KTPS-Beawar line	118	74
3	220 kV S/C KTPS-Bundi line	210	170
4	220 kV S/C KTPS-Ranpur line	OPEN	146
5	220 kV S/C KTPS-Vatika line	Under S/D	Under S/D
6	220 kV S/C KTPS-Sakatpura(bus-A) interconnector-1	141	119

7	220 kV S/C KTPS-Sakatpura(bus-A) interconnector-3	160	135
8	220 kV S/C KTPS-Sakatpura (bus-C) interconnector-2	141	119
9	220 kV S/C KTPS-Sakatpura (bus-C) interconnector-4	163	137
10	220 kV D/C KTPS-Kota(PG) line (400 kV line charged at 220 kV) (Ckt-1)	OPEN	42
11	220 kV D/C KTPS-Kota(PG) line (400 kV line charged at 220 kV) (Ckt-2)	OPEN	42
B	**RAPP(A) switchyard**		
1	220 kV S/C RAPP(A)-Debari line	66	66
2	220 kV S/C RAPP(A)-RAPP(B) line	38	40
3	220 kV D/C RAPP(A)-Sakatpura line (ckt-I)	38	37
4	220 kV D/C RAPP(A)-Sakatpura line (ckt-II)	38	37
C	**RAPP(B) switchyard**		
1	220 kV S/C RAPP(B)-Debari line	63	63
2	220 kV S/C RAPP(B)-RAPP(A) line	-38	-40
3	220 kV D/C RAPP(B)-RAPP(C) line (ckt-I)	87	62
4	220 kV D/C RAPP(B)-RAPP(C) line (ckt-II)	87	62
5	220 kV S/C RAPP(B)-Sakatpura line	36	34
6	220 kV D/C RAPP(B)-Chittorgarh line (ckt-I)	80	108
7	220 kV D/C RAPP(B)-Chittorgarh line (ckt-II)	80	108
8	220 kV S/C RAPP(C)-Anta GTPS line	174	124
D	**220 kV GSS Sakatpura**		
	220 kV Bus-A		
1	220 kV D/C Sakatpura-RAPP(A) line(Ckt-I)	-38	-37
2	220 kV S/C Sakatpura-KTPS interconnector-1	-141	-119
3	220 kV S/C Sakatpura-KTPS interconnector-3	-160	-135
4	220/132 kV Trf-1 (160 MVA) to 132 kV Bus-C	127	127
5	B/S between A& B-Closed	67	164
6	B/C between A& D-Opened	145	Open
	220 kV Bus-B		
1	220 kV D/C Sakatpura-RAPP(A) line(Ckt-II)	-38	-37
2	220 kV S/C Sakatpura-Mandalgarh line	OPEN	118
3	220 kV S/C Sakatpura-Anta GTPS line	224	153
4	B/S between B& A-Closed	-67	-164
5	B/C between B& C-Closed	-276	-228
6	220/132 kV Trf-3 (100 MVA) to 132 kV Bus-C	95	95
7	220/132 kV Trf-3 (100 MVA) to 132 kV Bus-B	62	62
	220 kV Bus-C		
1	220 kV S/C Sakatpura-KTPS interconnector-2	-141	-119

2	220 kV S/C Sakatpura-KTPS interconnector-4	-163	-137
3	220 kV S/C Sakatpura-RAPP(B) line	-36	-34
4	B/C between C& B-Closed	276	228
5	220/132 kV Trf-2 (100 MVA) to 132 kV Bus-A	63	63
	220 kV Bus-D		
1	220 kV S/C Sakatpura-Ranpur line	OPEN	-145
2	220 kV S/C Sakatpura-Dahra line	145	145
3	B/C between A& D	-145	open

From load flow study following points are observed :-

i. In Base Case-2 loading of 220 kV S/C RAPP(C)-Anta GTPS line is reduced to 124 MW as compared to 174 MW in Base Case-1.
ii. In Base Case-2 loading of 220 kV D/C RAPP(C)-Chhitorgarh line is increased to 216 MW as compared to 160 MW in Base Case-1.
iii. In Base Case-2 loading of 220 kV S/C KTPS-Bundi line is reduced to 170 MW as compared to 210 MW in Base Case-1.
iv. In Base Case-1 transmission lines are loaded as compared to Base Case-2
v. In Base Case-1 power flow from RAPP(C) Generation complex to Sakatpura is 112 MW and In Base Case-2 power flow from RAPP(C) Generation complex to Sakatpura is 108 MW

2.4 Case-1 (Contingency-1): Outage of 220 kV S/C Sakatpura-Anta GTPS line

Load flow study results for aforesaid contingency in Scenario-1 and Scenario-2 are plotted at Exhibit-2A & Exhibit-2B respectively and tabulated here under :-

Table-4: Power flow for outage of 220 kV S/C Sakatpura-Anta GTPS line

S. No.	Name of line	Power flow (MW) in Contingency-1	
		Scenario-1	Scenario-2
		Exhibit-2A	Exhibit-2B
A	**KTPS switchyard**		
1	220 kV S/C KTPS-Heerapura line	224	134
2	220 kV S/C KTPS-Beawar line	149	79
3	220 kV S/C KTPS-Bundi line	239	175
4	220 kV S/C KTPS-Ranpur line	OPEN	146
5	220 kV S/C KTPS-Vatika line	Under S/D	Under S/D
6	220 kV S/C KTPS-Sakatpura(bus-A) interconnector-1	118	101
7	220 kV S/C KTPS-Sakatpura(bus-A) interconnector-3	134	115
8	220 kV S/C KTPS-Sakatpura (bus-C) interconnector-2	118	101
9	220 kV S/C KTPS-Sakatpura (bus-C) interconnector-4	136	117
10	220 kV D/C KTPS-Kota(PG) line (400 kV line charged at 220 kV) (Ckt-1)	OPEN	71

11	220 kV D/C KTPS-Kota(PG) line (400 kV line charged at 220 kV) (Ckt-2)	OPEN	71
B	**RAPP(A) switchyard**		
1	220 kV S/C RAPP(A)-Debari line	67	67
2	220 kV S/C RAPP(A)-RAPP(B) line	113	80
3	220 kV D/C RAPP(A)-Sakatpura line (ckt-I)	00	17
4	220 kV D/C RAPP(A)-Sakatpura line (ckt-II)	00	17
C	**RAPP(B) switchyard**		
1	220 kV S/C RAPP(B)-Debari line	62	63
2	220 kV S/C RAPP(B)-RAPP(A) line	-113	-80
3	220 kV D/C RAPP(B)-RAPP(C) line (ckt-I)	150	93
4	220 kV D/C RAPP(B)-RAPP(C) line (ckt-II)	150	93
5	220 kV S/C RAPP(B)-Sakatpura line	-14	08
6	220 kV D/C RAPP(B)-Chittorgarh line (ckt-I)	80	111
7	220 kV D/C RAPP(B)-Chittorgarh line (ckt-II)	80	111
8	220 kV S/C RAPP(C)-Anta GTPS line	300	186
D	**220 kV GSS Sakatpura**		
	220 kV Bus-A		
1	220 kV D/C Sakatpura-RAPP(A) line(Ckt-I)	00	-17
2	220 kV S/C Sakatpura-KTPS interconnector-1	-118	-101
3	220 kV S/C Sakatpura-KTPS interconnector-3	-134	-115
4	220/132 kV Trf-1 (160 MVA) to 132 kV Bus-C	127	127
5	B/S between A& B-Closed	-20	106
6	B/C between A& D-Opened	145	Open
	220 kV Bus-B		
1	220 kV D/C Sakatpura-RAPP(A) line(Ckt-II)	00	-17
2	220 kV S/C Sakatpura-Mandalgarh line	OPEN	128
3	220 kV S/C Sakatpura-Anta GTPS line	TRIPPED	TRIPPED
4	B/S between B& A-Closed	20	-106
5	B/C between B& C-Closed	-177	-163
6	220/132 kV Trf-3 (100 MVA) to 132 kV Bus-C	95	95
7	220/132 kV Trf-3 (100 MVA) to 132 kV Bus-B	62	62
	220 kV Bus-C		
1	220 kV S/C Sakatpura-KTPS interconnector-2	-118	-101
2	220 kV S/C Sakatpura-KTPS interconnector-4	-136	-117
3	220 kV S/C Sakatpura-RAPP(B) line	14	-7
4	B/C between C& B-Closed	177	163
5	220/132 kV Trf-2 (100 MVA) to 132 kV Bus-A	63	63
	220 kV Bus-D		
1	220 kV S/C Sakatpura-Ranpur line	OPEN	-145
2	220 kV S/C Sakatpura-Dahra line	145	145
3	B/C between A& D	-145	open

From load flow study following points are observed :-

i. Under outage of 220 kV S/C Sakatpura-Anta GTPS line in Scenario-1, following lines are highly overloaded :-
   a. 220 kV S/C RAPP(C)-Anta GTPS line : 300 MW
   b. 220 kV S/C KTPS-Heerapura line : 224 MW
   c. 220 kV S/C KTPS-Bundi line : 239 MW
   d. There is reverse power flow of 14 MW from Sakatpura to RAPP generation complex. Power flow in Base Case-1 from RAPP to Sakatpura complex is 112 MW.

ii. Under outage of 220 kV S/C Sakatpura-Anta GTPS line in Scenario-2, line loadings are within limits:-
   a. 220 kV S/C RAPP(C)-Anta GTPS line : 186 MW
   b. 220 kV S/C KTPS-Heerapura line : 134 MW
   c. 220 kV S/C KTPS-Bundi line : 139 MW
   d. There is no reverse power flow from Sakatpura to RAPP generation complex. Power flow from RAPP to Sakatpura complex is reduced to 42 MW from 108 MW.

2.5 Case-2 (Contingency-2): Outage of 220 kV S/C KTPS-Heerapura line

Load flow study results for aforesaid contingency in Scenario-1 and Scenario-2 are plotted at Exhibit-3A & Exhibit-3B respectively and tabulated here under :-

Table-5: Power flow for outage of 220 kV S/C KTPS-Heerapura line

S. No.	Name of line	Power flow (MW) in Contingency-2	
		Scenario-1	Scenario-2
		Exhibit-3A	Exhibit-3B
A	**KTPS switchyard**		
1	220 kV S/C KTPS-Heerapura line	TRIPPED	TRIPPED
2	220 kV S/C KTPS-Beawar line	159	81
3	220 kV S/C KTPS-Bundi line	248	176
4	220 kV S/C KTPS-Ranpur line	OPEN	146
5	220 kV S/C KTPS-Vatika line	Under S/D	Under S/D
6	220 kV S/C KTPS-Sakatpura(bus-A) interconnector-1	166	129
7	220 kV S/C KTPS-Sakatpura(bus-A) interconnector-3	188	146
8	220 kV S/C KTPS-Sakatpura (bus-C) interconnector-2	166	129
9	220 kV S/C KTPS-Sakatpura (bus-C) interconnector-4	191	149
10	220 kV D/C KTPS-Kota(PG) line (400 kV line charged at 220 kV) (Ckt-1)	OPEN	80

11	220 kV D/C KTPS-Kota(PG) line (400 kV line charged at 220 kV) (Ckt-2)	OPEN	80
B	**RAPP(A) switchyard**		
1	220 kV S/C RAPP(A)-Debari line	66	66
2	220 kV S/C RAPP(A)-RAPP(B) line	62	53
3	220 kV D/C RAPP(A)-Sakatpura line (ckt-I)	26	30
4	220 kV D/C RAPP(A)-Sakatpura line (ckt-II)	26	30
C	**RAPP(B) switchyard**		
1	220 kV S/C RAPP(B)-Debari line	63	63
2	220 kV S/C RAPP(B)-RAPP(A) line	-62	-53
3	220 kV D/C RAPP(B)-RAPP(C) line (ckt-I)	107	64
4	220 kV D/C RAPP(B)-RAPP(C) line (ckt-II)	107	64
5	220 kV S/C RAPP(B)-Sakatpura line	20	26
6	220 kV D/C RAPP(B)-Chittorgarh line (ckt-I)	80	64
7	220 kV D/C RAPP(B)-Chittorgarh line (ckt-II)	80	64
8	220 kV S/C RAPP(C)-Anta GTPS line	214	129
D	**220 kV GSS Sakatpura**		
	220 kV Bus-A		
1	220 kV D/C Sakatpura-RAPP(A) line(Ckt-I)	-26	-30
2	220 kV S/C Sakatpura-KTPS interconnector-1	-166	-129
3	220 kV S/C Sakatpura-KTPS interconnector-3	-188	-146
4	220/132 kV Trf-1 (160 MVA) to 132 kV Bus-C	127	127
5	B/S between A& B-Closed	108	178
6	B/C between A& D-Opened	145	Open
	220 kV Bus-B		
1	220 kV D/C Sakatpura-RAPP(A) line(Ckt-II)	-26	-30
2	220 kV S/C Sakatpura-Mandalgarh line	OPEN	126
3	220 kV S/C Sakatpura-Anta GTPS line	291	166
4	B/S between B& A-Closed	-108	-240
5	B/C between B& C-Closed	-314	-178
6	220/132 kV Trf-3 (100 MVA) to 132 kV Bus-C	95	95
7	220/132 kV Trf-3 (100 MVA) to 132 kV Bus-B	62	62
	220 kV Bus-C		
1	220 kV S/C Sakatpura-KTPS interconnector-2	-166	-129
2	220 kV S/C Sakatpura-KTPS interconnector-4	-191	-149
3	220 kV S/C Sakatpura-RAPP(B) line	-20	-26
4	B/C between C& B-Closed	314	240
5	220/132 kV Trf-2 (100 MVA) to 132 kV Bus-A	63	63
	220 kV Bus-D		
1	220 kV S/C Sakatpura-Ranpur line	OPEN	-145
2	220 kV S/C Sakatpura-Dahra line	145	145
3	B/C between A& D	-145	open

From load flow study following points are observed :-

i. Under outage of 220 kV S/C KTPS-Heerapura line in Scenario-1, following lines are highly overloaded :-
   a. 220 kV S/C RAPP(C)-Anta GTPS line : 214 MW
   b. 220 kV S/C KTPS-Bundi line : 248 MW
   c. 220 kV S/C Sakatpura-Anta GTPS Line : 291 MW
   d. There is no reverse power flow from Sakatpura to RAPP generation complex. Power flow from RAPP to Sakatpura complex is reduced to 72 MW from 112 MW.

ii. Under outage of 220 kV S/C Sakatpura-Anta GTPS line in Scenario-2, line loadings are within limits:-
   a. 220 kV S/C RAPP(C)-Anta GTPS line : 129 MW
   b. 220 kV S/C KTPS-Bundi line : 176 MW
   c. 220 kV S/C Sakatpura-Anta GTPS Line : 166 MW
   d. There is no reverse power flow from Sakatpura to RAPP generation complex. Power flow from RAPP to Sakatpura complex is reduced to 86 MW from 108 MW.

2.6 Case-3 (Contingency-3): Outage of 220 kV S/C KTPS-Beawar line

Load flow study results for aforesaid contingency in Scenario-1 and Scenario-2 are plotted at Exhibit-4A & Exhibit-4B respectively and tabulated here under :-

Table-6: Power flow for outage of 220 kV S/C KTPS-Beawar line

S. No.	Name of line	Power flow (MW) in Contingency-3	
		Scenario-1	Scenario-2
		Exhibit-4A	Exhibit-4B
\A	**KTPS switchyard**		
1	220 kV S/C KTPS-Heerapura line	211	137
2	220 kV S/C KTPS-Beawar line	TRIPPED	TRIPPED
3	220 kV S/C KTPS-Bundi line	247	183
4	220 kV S/C KTPS-Ranpur line	OPEN	146
5	220 kV S/C KTPS-Vatika line	Under S/D	Under S/D
6	220 kV S/C KTPS-Sakatpura(bus-A) interconnector-1	154	129
7	220 kV S/C KTPS-Sakatpura(bus-A) interconnector-3	174	124
8	220 kV S/C KTPS-Sakatpura (bus-C) interconnector-2	154	124
9	220 kV S/C KTPS-Sakatpura (bus-C) interconnector-4	177	141

10	220 kV D/C KTPS-Kota(PG) line (400 kV line charged at 220 kV) (Ckt-1)	OPEN	59
11	220 kV D/C KTPS-Kota(PG) line (400 kV line charged at 220 kV) (Ckt-2)	OPEN	59
B	**RAPP(A) switchyard**		
1	220 kV S/C RAPP(A)-Debari line	66	66
2	220 kV S/C RAPP(A)-RAPP(B) line	50	47
3	220 kV D/C RAPP(A)-Sakatpura line (ckt-I)	32	34
4	220 kV D/C RAPP(A)-Sakatpura line (ckt-II)	32	34
C	**RAPP(B) switchyard**		
1	220 kV S/C RAPP(B)-Debari line	63	63
2	220 kV S/C RAPP(B)-RAPP(A) line	-50	-47
3	220 kV D/C RAPP(B)-RAPP(C) line (ckt-I)	97	63
4	220 kV D/C RAPP(B)-RAPP(C) line (ckt-II)	97	63
5	220 kV S/C RAPP(B)-Sakatpura line	28	30
6	220 kV D/C RAPP(B)-Chittorgarh line (ckt-I)	80	112
7	220 kV D/C RAPP(B)-Chittorgarh line (ckt-II)	80	112
8	220 kV S/C RAPP(C)-Anta GTPS line	195	126
D	**220 kV GSS Sakatpura**		
	220 kV Bus-A		
1	220 kV D/C Sakatpura-RAPP(A) line(Ckt-I)	-32	-33
2	220 kV S/C Sakatpura-KTPS interconnector-1	-153	-124
3	220 kV S/C Sakatpura-KTPS interconnector-3	-174	-141
4	220/132 kV Trf-1 (160 MVA) to 132 kV Bus-C	127	127
5	B/S between A& B-Closed	88	171
6	B/C between A& D-Opened	145	Open
	220 kV Bus-B		
1	220 kV D/C Sakatpura-RAPP(A) line(Ckt-II)	-32	-33
2	220 kV S/C Sakatpura-Mandalgarh line	OPEN	123
3	220 kV S/C Sakatpura-Anta GTPS line	259	159
4	B/S between B& A-Closed	-296	-235
5	B/C between B& C-Closed	-88	-171
6	220/132 kV Trf-3 (100 MVA) to 132 kV Bus-C	95	95
7	220/132 kV Trf-3 (100 MVA) to 132 kV Bus-B	62	62
	220 kV Bus-C		
1	220 kV S/C Sakatpura-KTPS interconnector-2	-153	-124
2	220 kV S/C Sakatpura-KTPS interconnector-4	-177	-143
3	220 kV S/C Sakatpura-RAPP(B) line	-28	-30
4	B/C between C& B-Closed	296	235
5	220/132 kV Trf-2 (100 MVA) to 132 kV Bus-A	63	63
	220 kV Bus-D		
1	220 kV S/C Sakatpura-Ranpur line	OPEN	-145

2	220 kV S/C Sakatpura-Dahra line	145	145
3	B/C between A& D	-145	open

From load flow study following points are observed :-

i. Under outage of 220 kV S/C KTPS-Bewar line in Scenario-1, following lines are highly overloaded :-
   a. 220 kV S/C KTPS-Bundi line : 247 MW
   b. 220 kV S/C Sakatpura-Anta GTPS Line : 259 MW
   c. There is no reverse power flow from Sakatpura to RAPP generation complex. Power flow from RAPP to Sakatpura complex is reduced to 92 MW from 112 MW.

ii. Under outage of 220 kV S/C Sakatpura-Anta GTPS line in Scenario-2, line loadings are within limits:-
   a. 220 kV S/C KTPS-Bundi line : 183 MW
   b. 220 kV S/C Sakatpura-Anta GTPS Line : 159 MW
   c. There is no reverse power flow from Sakatpura to RAPP generation complex. Power flow from RAPP to Sakatpura complex is reduced to 98 MW from 108 MW.

2.7 Case-4 (Contingency-4): Outage of all three circuits between Sakatpura & RAPP Generation complex

Load flow study results for aforesaid contingency in Scenario-1 and Scenario-2 are plotted at Exhibit-5A & Exhibit-5B respectively and tabulated here under :-

Table-7: Power flow for outage of all three circuits between Sakatpura and RAPP Generation complex

S. No.	Name of line	Power flow (MW) in Contingency-4	
		Scenario-1	Scenario-2
		Exhibit-5A	Exhibit-5B
\A	**KTPS switchyard**		
1	220 kV S/C KTPS-Heerapura line	171	126
2	220 kV S/C KTPS-Beawar line	106	69
3	220 kV S/C KTPS-Bundi line	200	165
4	220 kV S/C KTPS-Ranpur line	OPEN	146
5	220 kV S/C KTPS-Vatika line	Under S/D	Under S/D
6	220 kV S/C KTPS-Sakatpura(bus-A) interconnector-1	149	134
7	220 kV S/C KTPS-Sakatpura(bus-A) interconnector-3	169	155
8	220 kV S/C KTPS-Sakatpura (bus-C) interconnector-2	149	134
9	220 kV S/C KTPS-Sakatpura (bus-C) interconnector-4	172	155

10	220 kV D/C KTPS-Kota(PG) line (400 kV line charged at 220 kV) (Ckt-1)	OPEN	17
11	220 kV D/C KTPS-Kota(PG) line (400 kV line charged at 220 kV) (Ckt-2)	OPEN	17
B	**RAPP(A) switchyard**		
1	220 kV S/C RAPP(A)-Debari line	67	67
2	220 kV S/C RAPP(A)-RAPP(B) line	113	113
3	220 kV D/C RAPP(A)-Sakatpura line (ckt-I)	**TRIPPED**	**TRIPPED**
4	220 kV D/C RAPP(A)-Sakatpura line (ckt-II)	**TRIPPED**	**TRIPPED**
C	**RAPP(B) switchyard**		
1	220 kV S/C RAPP(B)-Debari line	62	62
2	220 kV S/C RAPP(B)-RAPP(A) line	-113	-113
3	220 kV D/C RAPP(B)-RAPP(C) line (ckt-I)	143	86
4	220 kV D/C RAPP(B)-RAPP(C) line (ckt-II)	143	86
5	220 kV S/C RAPP(B)-Sakatpura line	**TRIPPED**	**TRIPPED**
6	220 kV D/C RAPP(B)-Chittorgarh line (ckt-I)	80	138
7	220 kV D/C RAPP(B)-Chittorgarh line (ckt-II)	80	138
8	220 kV S/C RAPP(C)-Anta GTPS line	286	171
D	**220 kV GSS Sakatpura**		
	220 kV Bus-A		
1	220 kV D/C Sakatpura-RAPP(A) line(Ckt-I)	**TRIPPED**	**TRIPPED**
2	220 kV S/C Sakatpura-KTPS interconnector-1	-149	-134
3	220 kV S/C Sakatpura-KTPS interconnector-3	-169	-153
4	220/132 kV Trf-1 (160 MVA) to 132 kV Bus-C	127	127
5	B/S between A& B-Closed	46	153
6	B/C between A& D-Opened	145	Open
	220 kV Bus-B		
1	220 kV D/C Sakatpura-RAPP(A) line(Ckt-II)	**TRIPPED**	**TRIPPED**
2	220 kV S/C Sakatpura-Mandalgarh line	OPEN	123
3	220 kV S/C Sakatpura-Anta GTPS line	148	120
4	B/S between B& A-Closed	-46	-227
5	B/C between B& C-Closed	-258	-160
6	220/132 kV Trf-3 (100 MVA) to 132 kV Bus-C	95	95
7	220/132 kV Trf-3 (100 MVA) to 132 kV Bus-B	62	62
	220 kV Bus-C		
1	220 kV S/C Sakatpura-KTPS interconnector-2	-149	-134
2	220 kV S/C Sakatpura-KTPS interconnector-4	-172	-155
3	220 kV S/C Sakatpura-RAPP(B) line	**TRIPPED**	**TRIPPED**
4	B/C between C& B-Closed	258	227
5	220/132 kV Trf-2 (100 MVA) to 132 kV Bus-A	63	63
	220 kV Bus-D		

1	220 kV S/C Sakatpura-Ranpur line	OPEN	-145
2	220 kV S/C Sakatpura-Dahra line	145	145
3	B/C between A& D	-145	open

From load flow study following points are observed :-

i. Under outage of ALL 3 nos. 220 kV circuits between Sakatpura and RAPP Generation complex in Scenario-1, following lines are highly overloaded :-
   a. 220 kV S/C RAPP(C)-Anta GTPS Line : 286 MW

ii. Under outage of ALL 3 nos. 220 kV circuits between Sakatpura and RAPP Generation complex in Scenario-3, loading on all transmission lines are within limits.
   a. 220 kV S/C RAPP(C)-Anta GTPS Line : 171 MW.

iii. In Scenario-2 upto 70 MW reverse power flow from Sakatpura to RAPP generation complex power flow on all 220 kV lines emanating from RAPP Generation complex within limits. Load flow study results for 70 MW reverse power flow from Sakatpura to RAPP(C) generation complex are placed at Exbit-5B1.

2.7 Case-5 (Contingency-5): Outage of 220 kV S/C Sakatpura-Anta GTPS and KTPS-Heerapura line

Load flow study results for aforesaid contingency in Scenario-1 and Scenario-2 are plotted at Exhibit-6A & Exhibit-6B respectively and tabulated here under :-

Table-8: Power flow for outage of 220 kV S/C Sakatpura-Anta GTPS line and 220 kV S/C KTPS-Heerapura line

S. No.	Name of line	Power flow (MW) in Contingency-5	
		Scenario-1	Scenario-2
		Exhibit-6A	Exhibit-6B
\A	**KTPS switchyard**		
1	220 kV S/C KTPS-Heerapura line	TRIPPED	TRIPPED
2	220 kV S/C KTPS-Beawar line	214	88
3	220 kV S/C KTPS-Bundi line	298	183
4	220 kV S/C KTPS-Ranpur line	OPEN	146
5	220 kV S/C KTPS-Vatika line	Under S/D	Under S/D
6	220 kV S/C KTPS-Sakatpura(bus-A) interconnector-1	141	110
7	220 kV S/C KTPS-Sakatpura(bus-A) interconnector-3	160	125
8	220 kV S/C KTPS-Sakatpura (bus-C) interconnector-2	141	110
9	220 kV S/C KTPS-Sakatpura (bus-C) interconnector-4	163	127
10	220 kV D/C KTPS-Kota(PG) line (400 kV line charged at 220 kV) (Ckt-1)	OPEN	114
11	220 kV D/C KTPS-Kota(PG) line (400 kV line charged at 220 kV) (Ckt-2)	OPEN	114
B	**RAPP(A) switchyard**		

1	220 kV S/C RAPP(A)-Debari line	68	67
2	220 kV S/C RAPP(A)-RAPP(B) line	172	98
3	220 kV D/C RAPP(A)-Sakatpura line (ckt-I)	-30	8
4	220 kV D/C RAPP(A)-Sakatpura line (ckt-II)	-30	8
C	**RAPP(B) switchyard**		
1	220 kV S/C RAPP(B)-Debari line	61	62
2	220 kV S/C RAPP(B)-RAPP(A) line	-172	-97
3	220 kV D/C RAPP(B)-RAPP(C) line (ckt-I)	200	98
4	220 kV D/C RAPP(B)-RAPP(C) line (ckt-II)	200	98
5	220 kV S/C RAPP(B)-Sakatpura line	-54	-4
6	220 kV D/C RAPP(B)-Chittorgarh line (ckt-I)	80	119
7	220 kV D/C RAPP(B)-Chittorgarh line (ckt-II)	80	119
8	220 kV S/C RAPP(C)-Anta GTPS line	399	196
D	**220 kV GSS Sakatpura**		
	220 kV Bus-A		
1	220 kV D/C Sakatpura-RAPP(A) line(Ckt-I)	30	-8
2	220 kV S/C Sakatpura-KTPS interconnector-1	-141	-110
3	220 kV S/C Sakatpura-KTPS interconnector-3	-160	-125
4	220/132 kV Trf-1 (160 MVA) to 132 kV Bus-C	127	127
5	B/S between A& B-Closed	-1	116
6	B/C between A& D-Opened	145	Open
	220 kV Bus-B		
1	220 kV D/C Sakatpura-RAPP(A) line(Ckt-II)	30	-8
2	220 kV S/C Sakatpura-Mandalgarh line	OPEN	137
3	220 kV S/C Sakatpura-Anta GTPS line	Tripped	Tripped
4	B/S between B& A-Closed	1	-116
5	B/C between B& C-Closed	-187	-170
6	220/132 kV Trf-3 (100 MVA) to 132 kV Bus-C	95	95
7	220/132 kV Trf-3 (100 MVA) to 132 kV Bus-B	62	62
	220 kV Bus-C		
1	220 kV S/C Sakatpura-KTPS interconnector-2	-141	-110
2	220 kV S/C Sakatpura-KTPS interconnector-4	-163	-127
3	220 kV S/C Sakatpura-RAPP(B) line	54	04
4	B/C between C& B-Closed	187	170
5	220/132 kV Trf-2 (100 MVA) to 132 kV Bus-A	63	63
	220 kV Bus-D		
1	220 kV S/C Sakatpura-Ranpur line	OPEN	-145
2	220 kV S/C Sakatpura-Dahra line	145	145
3	B/C between A& D	-145	open

From load flow study following points are observed :-

i. Under outage of 220 kV S/C Sakatpura-Anta GTPS line and 220 kV S/C KTPS-Heerapura line in Scenario-1, following lines are highly overloaded :-
    a. 220 kV S/C RAPP(C)-Anta GTPS line : 399 MW
    b. 220 kV S/C KTPS-Bundi line : 298 MW
    c. 220 kV S/C KTPS-Beawar line : 214 MW
    d. There is reverse power flow of 114 MW from Sakatpura to RAPP generation complex. Power flow in Base Case-1 from RAPP to Sakatpura complex is 112 MW.

ii. Under outage of 220 kV S/C Sakatpura-Anta GTPS line and 220 kV S/C KTPS-Heerapura line in Scenario-2 loading on all lines are within limits:-
    a. 220 kV S/C RAPP(C)-Anta GTPS line : 196 MW
    b. 220 kV S/C KTPS-Bundi line : 183 MW
    c. 220 kV S/C KTPS-Beawar line : 88 MW
    d. There is no reverse power flow from Sakatpura to RAPP generation complex. Power flow from RAPP to Sakatpura complex is reduced to 12 MW from 108 MW.

3.0 CONCLUSION

Table-9

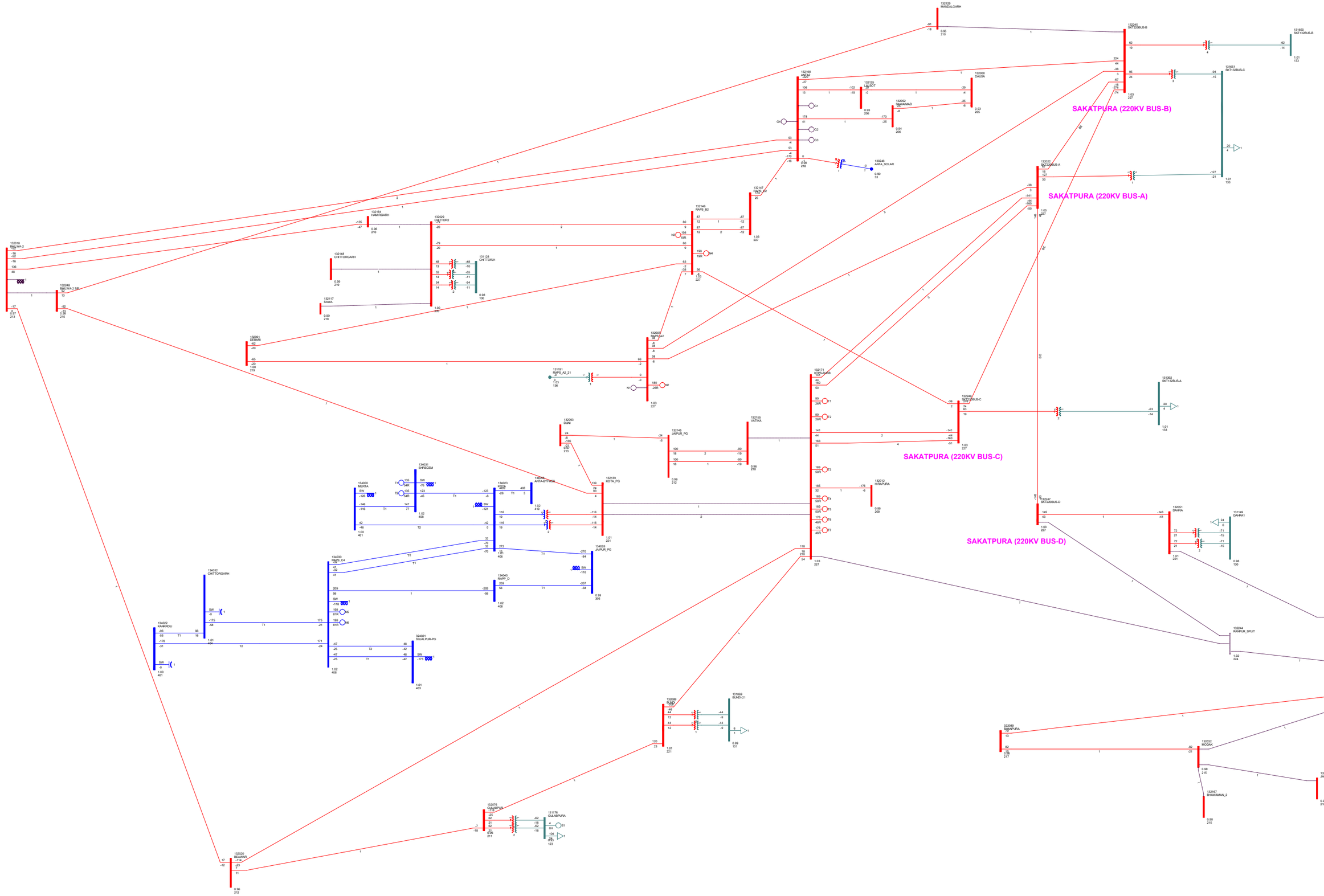
S. No.	Particulars of Case	Power flow from RAPP Complex to Sakatpura	Reverse power flow (from Sakatpura to RAPP Compex)	Ref	Remark
1A	**Base Case-1 (Scenario-1)**	**112 MW**	**-**	**Exhibit-1A**	**Power flow on all 220 KV lines are within limits.**
1B	**Base Case-2 (Scenario-2)**	**108 MW**	**-**	**Exhibit-1B**	
2A	**Outage of 220 KV S/C Sakatpura-Anta GTPS line(Scenario-1)**	**-**	**14 MW**	Exhibit-2A	Following lines are over loaded: a. 220 KV S/C RAPP(C)-Anta GTPS line : 300 MW b. 220 KV S/C KTPS-Heerapura line : 224 MW c. 220 KV S/C KTPS-Bundi line : 239 MW
2B	**Outage of 220 kV S/C Sakatpura-Anta GTPS line(Scenario-2)**	**42 MW**	**-**	Exhibit-2B	Loading on all lines are within limits:- a. 220 KV S/C RAPP(C)-Anta GTPS line : 186 MW b. 220 KV S/C KTPS-Heerapura line : 134 MW c. 220 KV S/C KTPS-Bundi line : 139 MW
3A	**Outage of 220 kV S/C KTPS-Heerapura line (Scenario-1)**	**72 MW**	**-**	Exhibit-3A	Following lines are over loaded: a. 220 KV S/C RAPP(C)-Anta GTPS line : 214 MW b. 220 KV S/C KTPS-Bundi line : 248 MW c. 220 KV S/C Sakatpura-Anta GTPS Line : 291 MW
3B	**Outage of 220 kV S/C KTPS-Heerapura line (Scenario-2)**	**86 MW**	**-**	Exhibit-3B	Loading on all lines are within limits:- a. 220 KV S/C RAPP(C)-Anta GTPS line : 129 MW b. 220 KV S/C KTPS-Bundi line : 176 MW c. 220 KV S/C Sakatpura-Anta GTPS Line : 166 MW
4A	**Outage of 220 KV S/C KTPS-Beawar line (Scenario-1)**	**92 MW**	**-**	Exhibit-4A	Following lines are over loaded: a. 220 KV S/C KTPS-Bundi line : 247 MW b. 220 KV S/C Sakatpura-Anta GTPS Line : 259 MW
4B	**Outage of 220 KV S/C KTPS-Beawar line (Scenario-1)**	**98 MW**	**-**	Exhibit-4B	Loading on all lines are within limits:- a. 220 KV S/C KTPS-Bundi line : 183 MW 220 KV S/C Sakatpura-Anta GTPS Line : 159 MW

S. No.	Particulars of Case	Power flow from RAPP Complex to Sakatpura	Reverse power flow (from Sakatpura to RAPP Compex)	Ref	Remark
5A	**Outage of ALL three circuits between Sakatpura-RAPP generation complex (Scenario-1)**	**-**	**-**	Exhibit-5A	Following lines are over loaded: a.220 kV S/C RAPP(C)-Anta GTPS line : 286 MW
5B	**Outage of ALL three circuits between Sakatpura-RAPP generation complex (Scenario-1)**	**-**	**-**	Exhibit-5B Exhibit-5B1	Loading on all lines are within limits:- a.220 kV S/C RAPP(C)-Anta GTPS line : 171 MW b.In Scenario-2 upto 70 MW reverse power flow from Sakatpura to RAPP generation complex power flow on all 220 kV lines emanating from RAPP Generation complex within limits.
6A	**Outage of 220 kV S/C Sakatpura-Anta GTPS line and 220 kV S/C KTPS-Heerapura line (Scenario-1)**	**-**	**114 MW**	Exhibit-6A	Following lines are over loaded: a. 220 kV S/C RAPP(C)-Anta GTPS line : 399 MW b. 220 kV S/C KTPS-Bundi line : 298 MW c. 220 kV S/C KTPS-Beawar line : 214 MW
6B	**Outage of 220 kV S/C Sakatpura-Anta GTPS line and 220 kV S/C KTPS-Heerapura line (Scenario-1)**	**12 MW**	**-**	Exhibit-6B	Loading on all lines are within limits:- a. 220 kV S/C RAPP(C)-Anta GTPS line : 196 MW b. 220 kV S/C KTPS-Bundi line : 183 MW c. 220 kV S/C KTPS-Beawar line : 88 MW

From load flow studies it is concluded that after cascade tripping incidents on 5.1.2024 at 5.17 hrs. and on 29.03.24 at 20.12 hrs. additional connectivity has been created in RAPP & KTPS complex alongwith integrated operation and accordingly transmission system is capable to sustain in various contingencies in the system. After integrated operation at 220 kV GSS Chhitorgarh power flow on 220 kV S/C RAPP(C)-Anta GTPS line in normal condition as well as emergent has been reduced significantly.

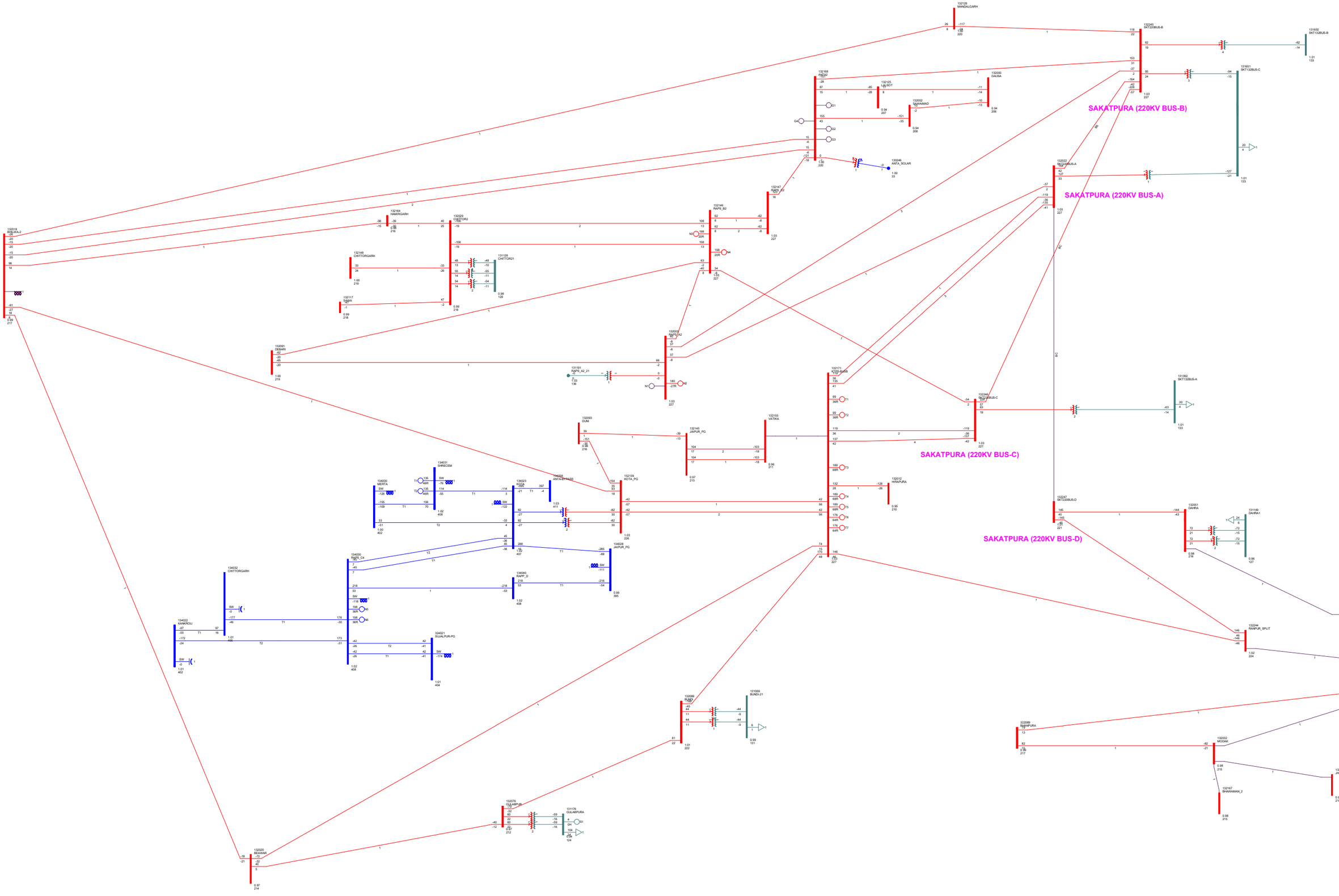
BASE CASE-1 : LOAD FLOW STUDY IN BASE CASE IN SCENARIO-1

EXHIBIT-1A



BASE CASE-2 : LOAD FLOW STUDY IN BASE CASE IN SCENARIO-2

EXHIBIT-1B



CASE-1A : LOAD FLOW STUDY IN SCENARIO-1 WITH OUTAGE OF 220 KV S/C SAKATPURA ANTA LINE EXHIBIT-2A

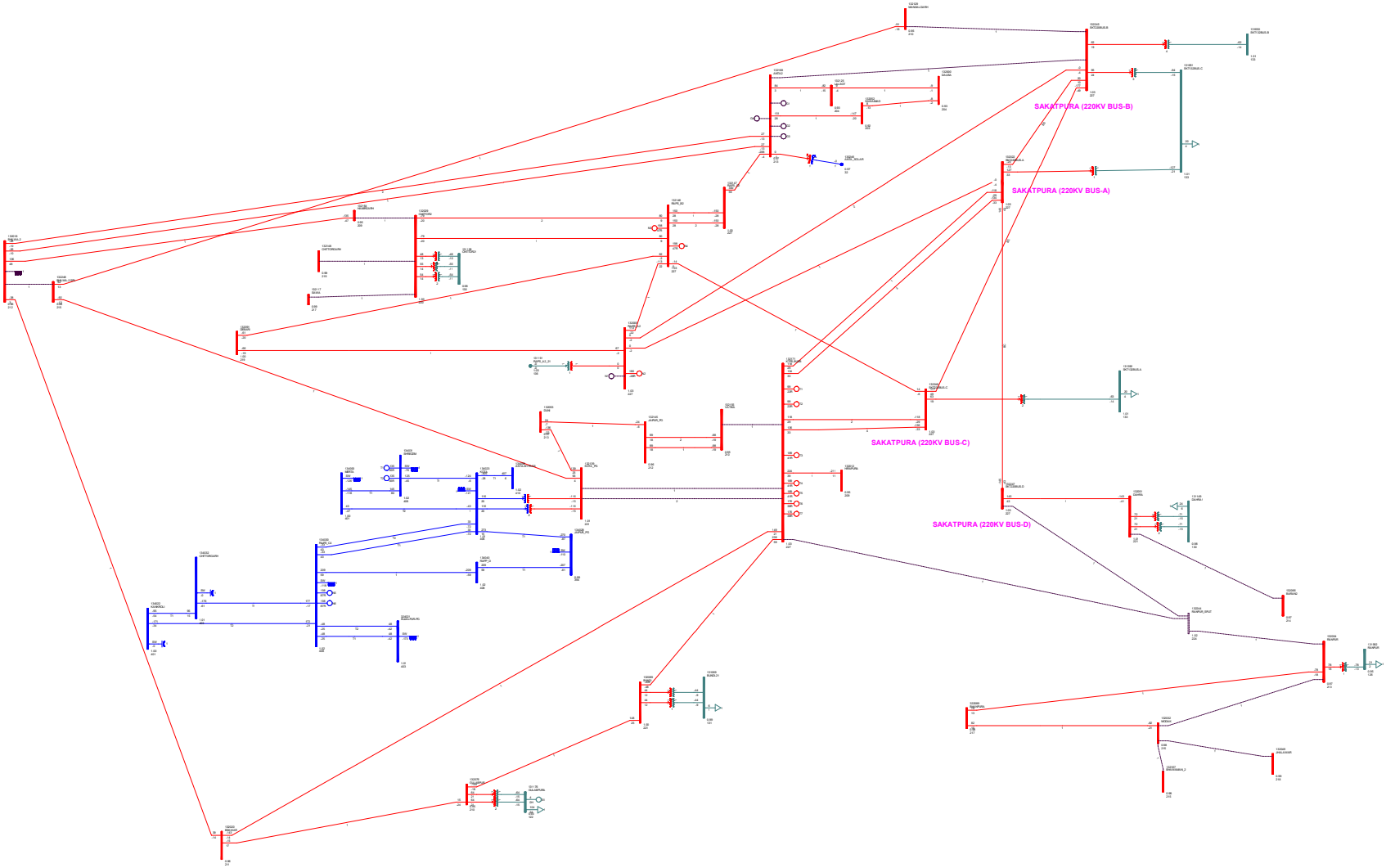
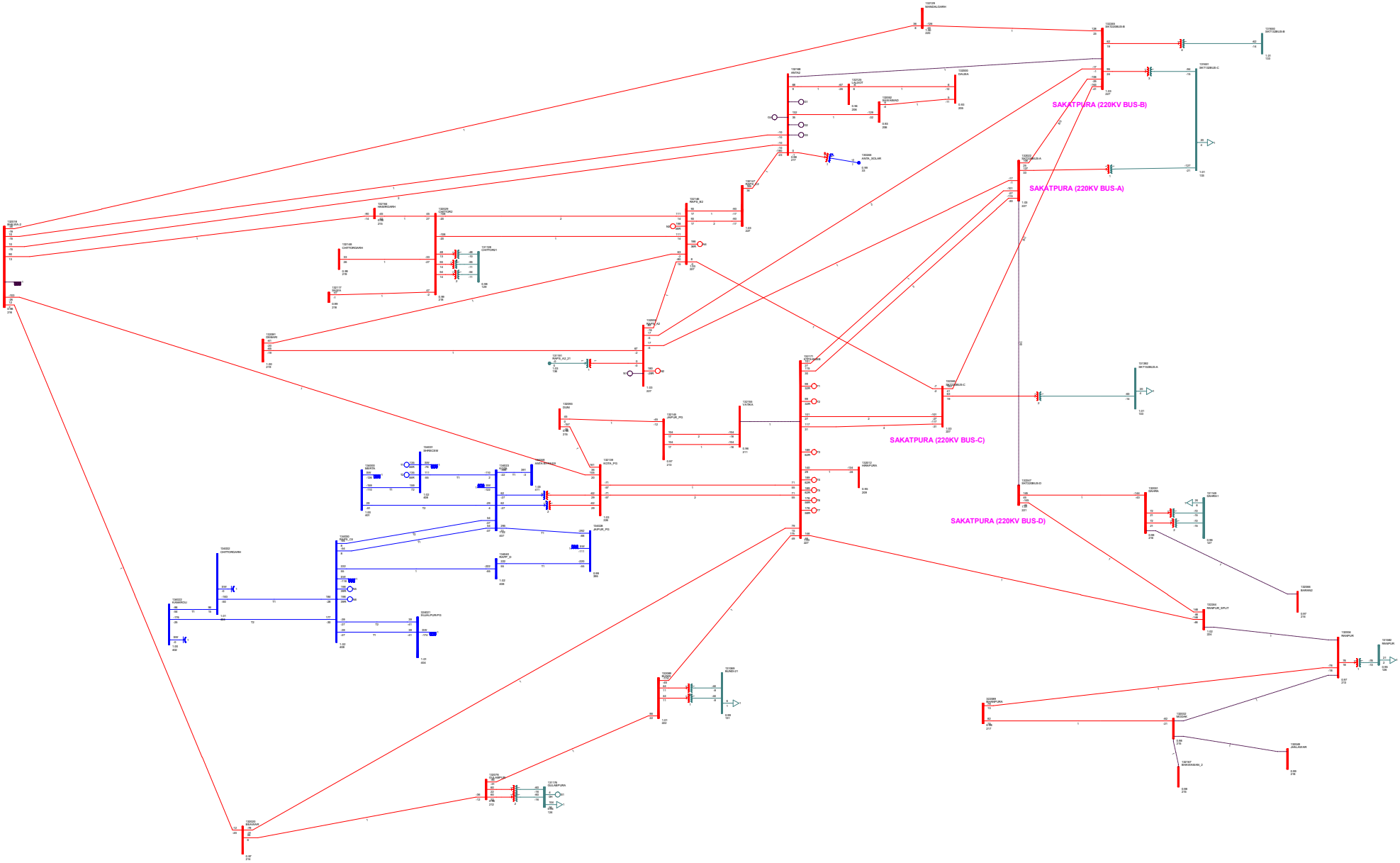


EXHIBIT-2B

CASE-1B : LOAD FLOW STUDY IN SCENARIO-2 WITH OUTAGE OF 220 KV S/C SAKATPURA ANTA LINE



CASE-2A : LOAD FLOW STUDY IN SCENARIO-1 WITH OUTAGE OF 220 KV S/C KTPS-HEERAPURA LINE EXHIBIT-3A

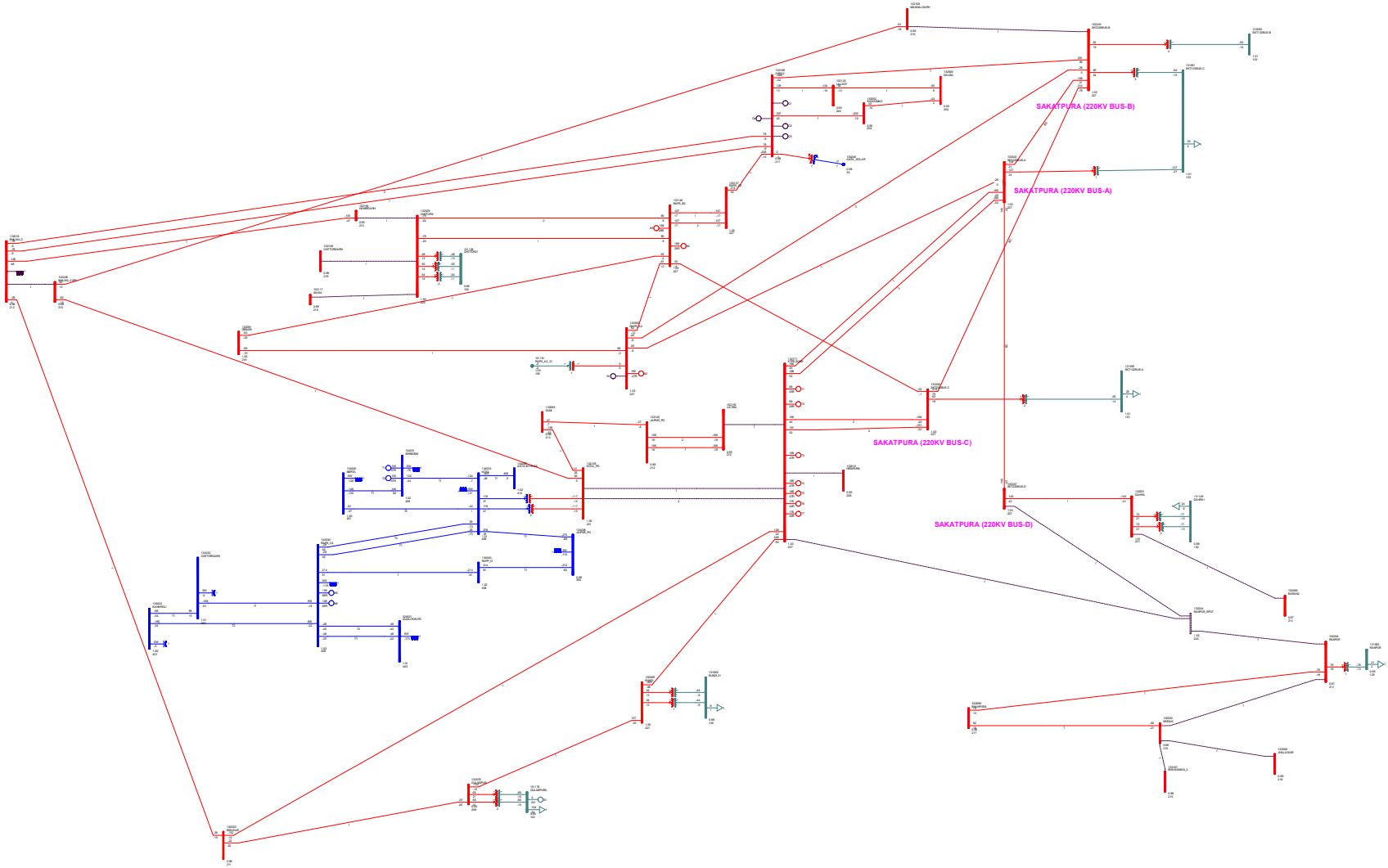
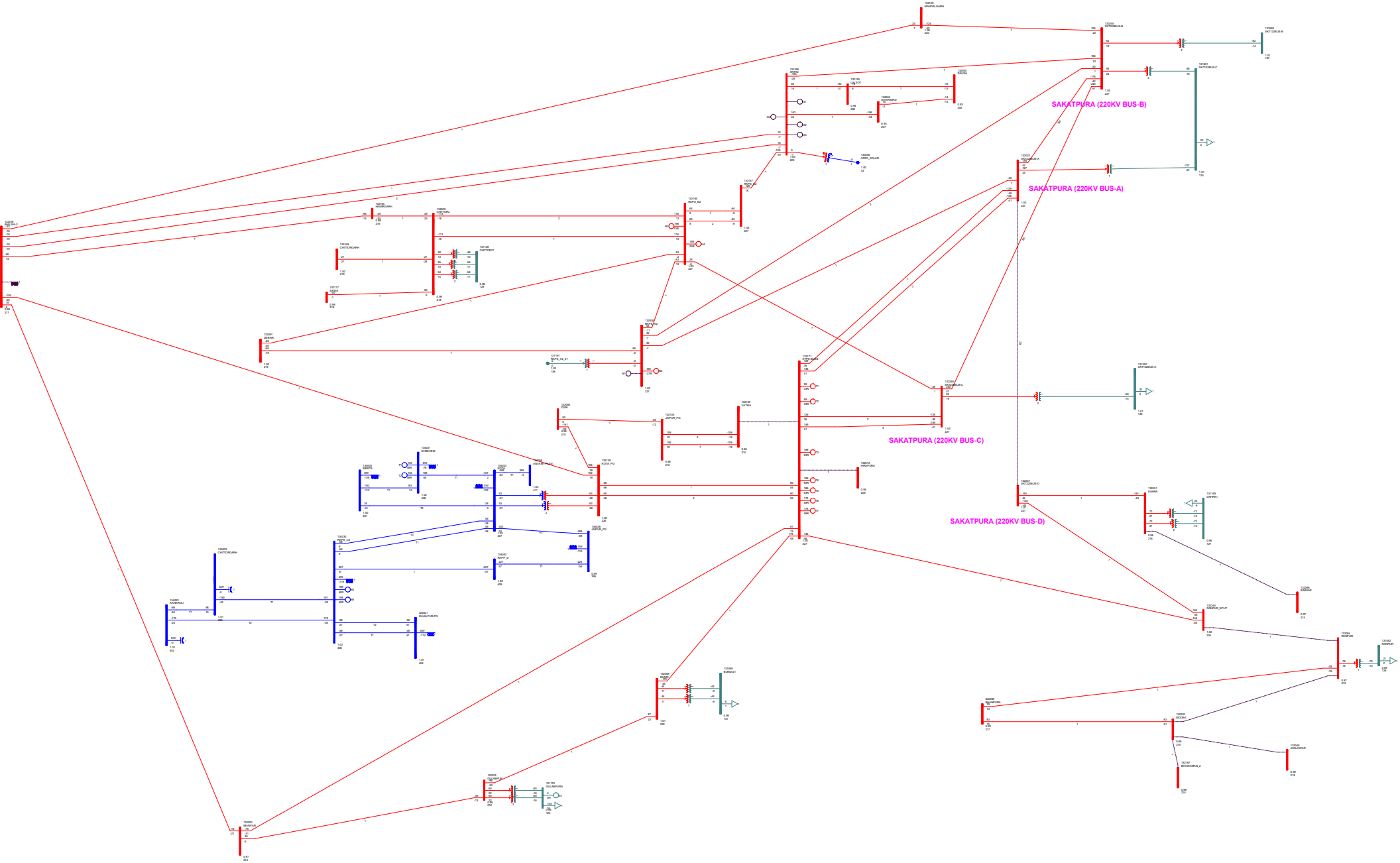


EXHIBIT-3B

CASE-3B : LOAD FLOW STUDY IN SCENARIO-2 WITH OUTAGE OF 220 KV S/C KTPS-HEERAPURA LINE



CASE-3A : LOAD FLOW STUDY IN SCENARIO-1 WITH OUTAGE OF 220 KV S/C KTPS-BEAWAR LINE EXHIBIT-4A

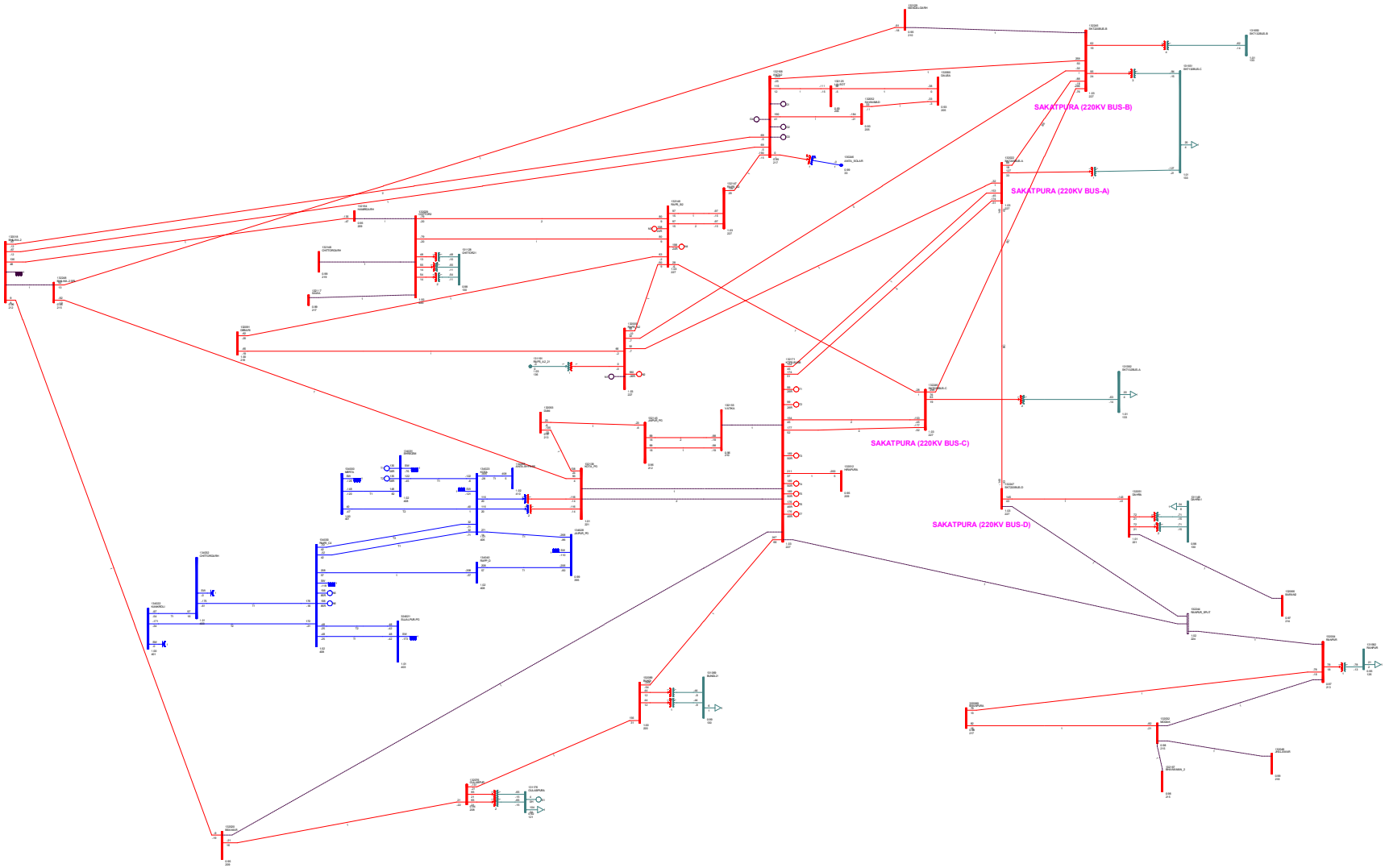


EXHIBIT-4B

CASE-3B : LOAD FLOW STUDY IN SCENARIO-2 WITH OUTAGE OF 220 KV S/C KTPS-BEAWAR LINE

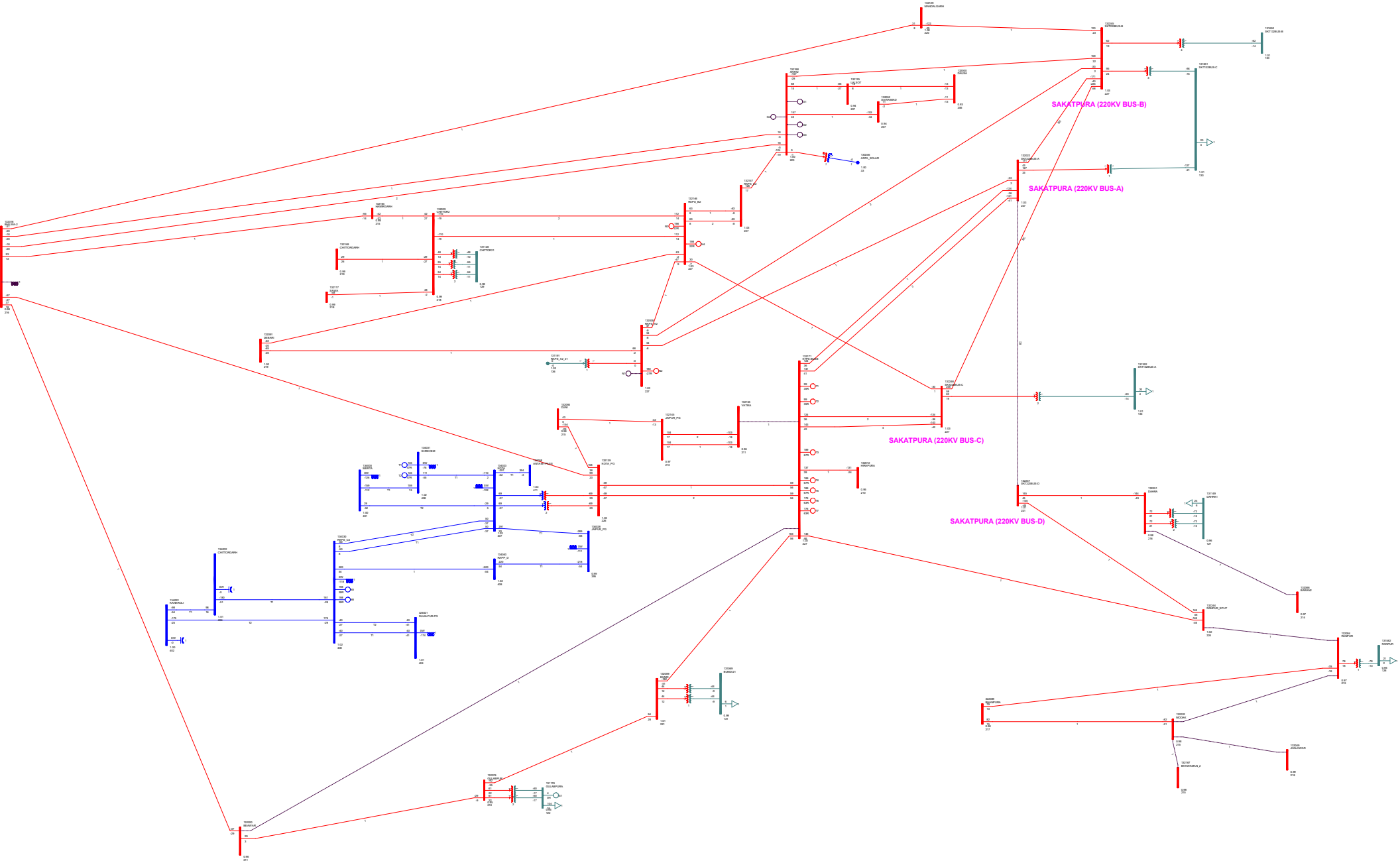


EXHIBIT-5A

CASE-4A : LOAD FLOW STUDY IN SCENARIO-1 WITH OUTAGE OF ALL THREE CIRCUITS BETWEEN SAKTPUA AND RAPP GENERATION COMPLEX

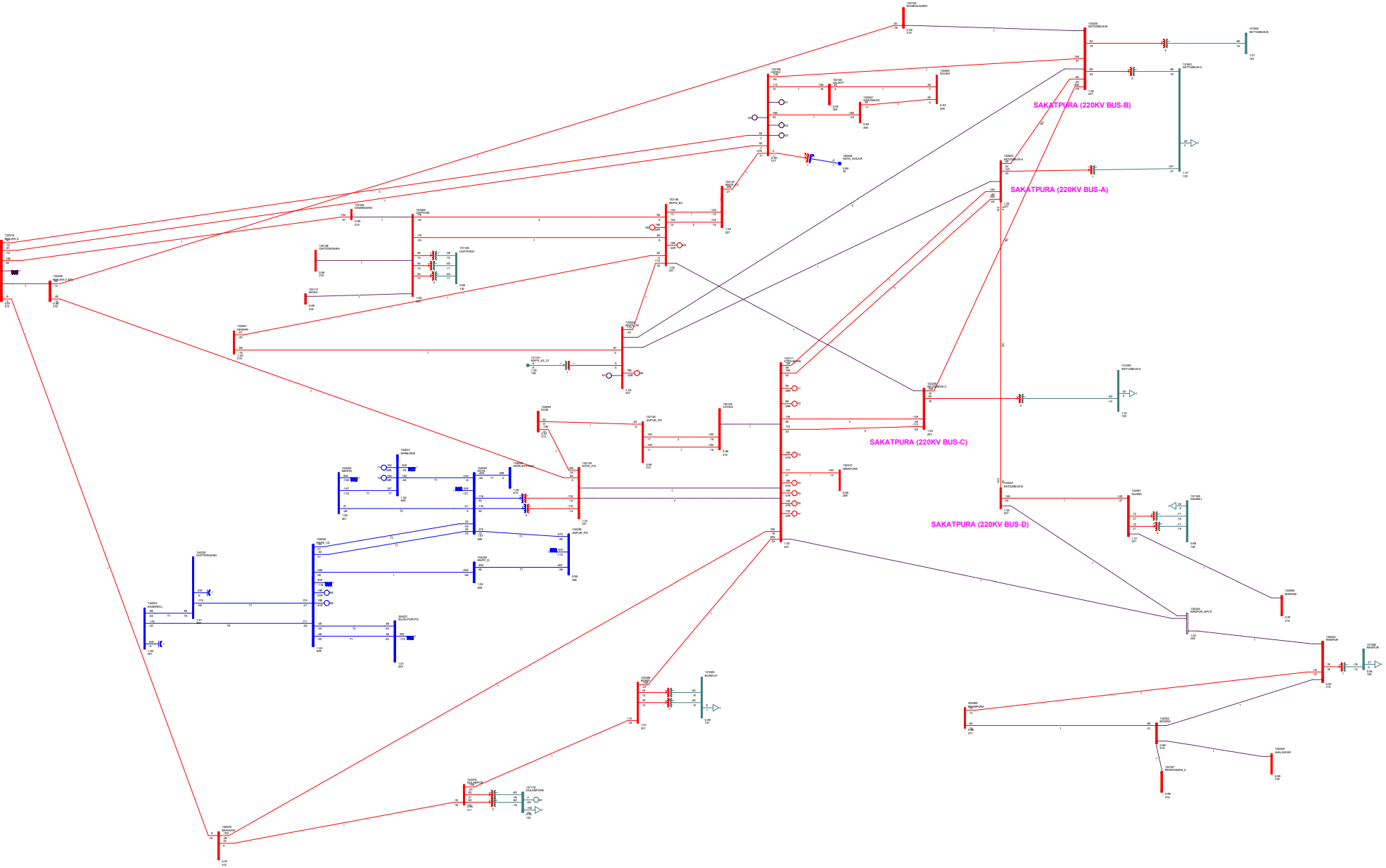


EXHIBIT-5B

CASE-4B : LOAD FLOW STUDY IN SCENARIO-2 WITH OUTAGE OF ALL THREE CIRCUITS BETWEEN SAKTPUA AND RAPP GENERATION COMPLEX

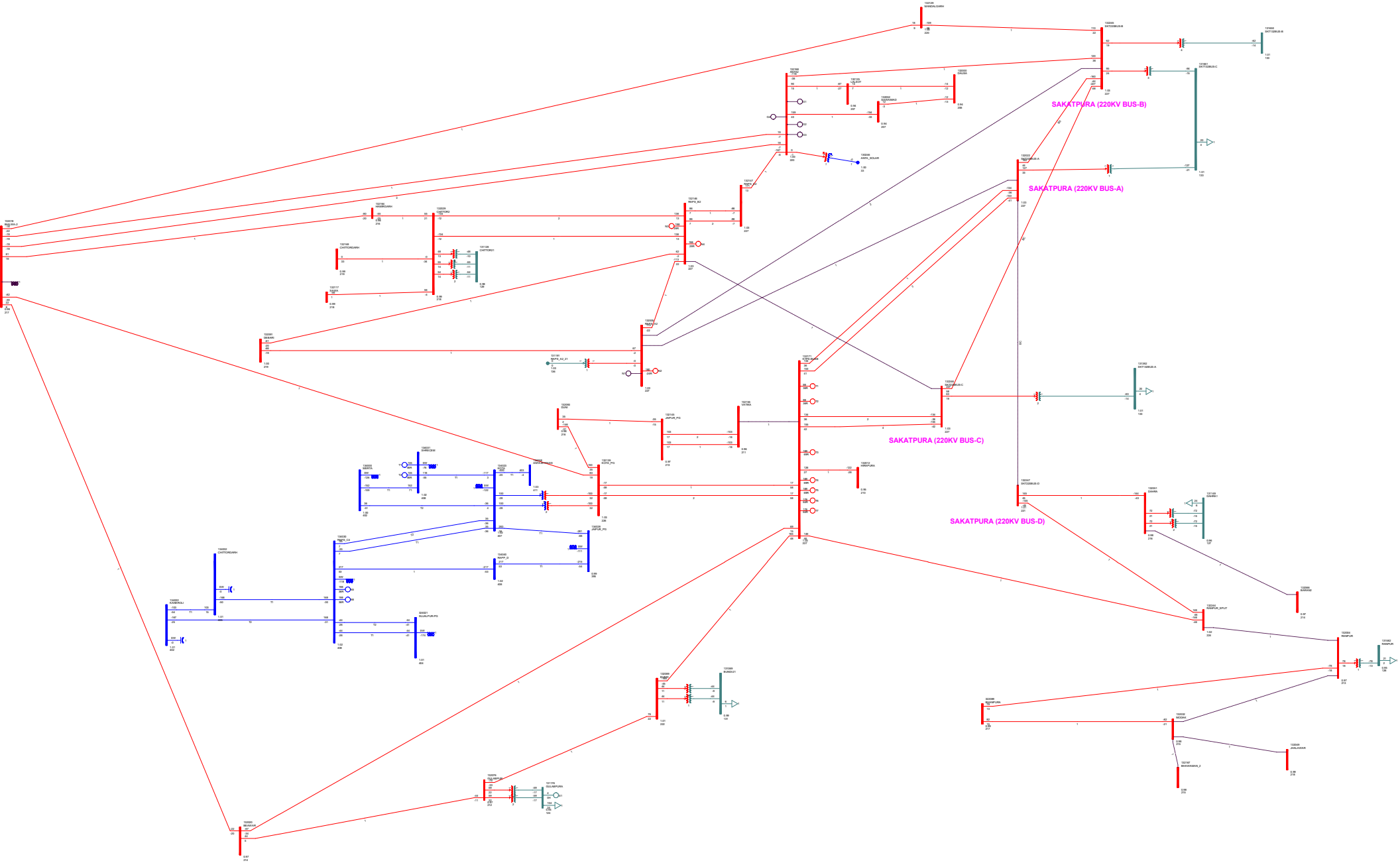


EXHIBIT-5B2

CASE-4B1 : LOAD FLOW STUDY IN SCENARIO-2 WITH OUTAGE OF ALL THREE CIRCUITS BETWEEN SAKTPUA AND RAPP GENERATION COMPLEX

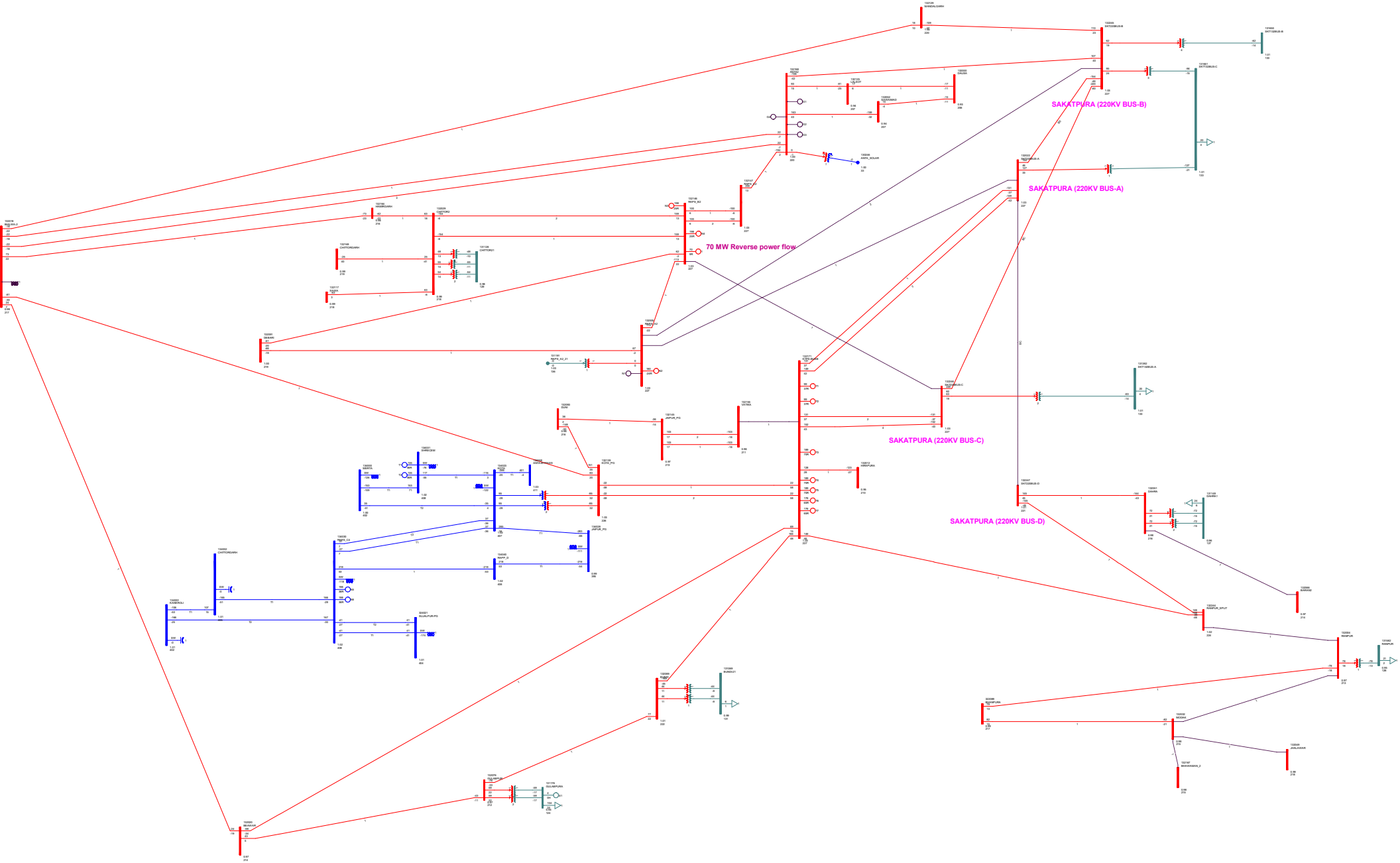


EXHIBIT-6A

CASE-6A : LOAD FLOW STUDY IN SCENARIO-1 WITH OUTAGE OF 220 KV S/C SAKATPURA-ANTA LINE AND KTPS-HEERAPURA LINE

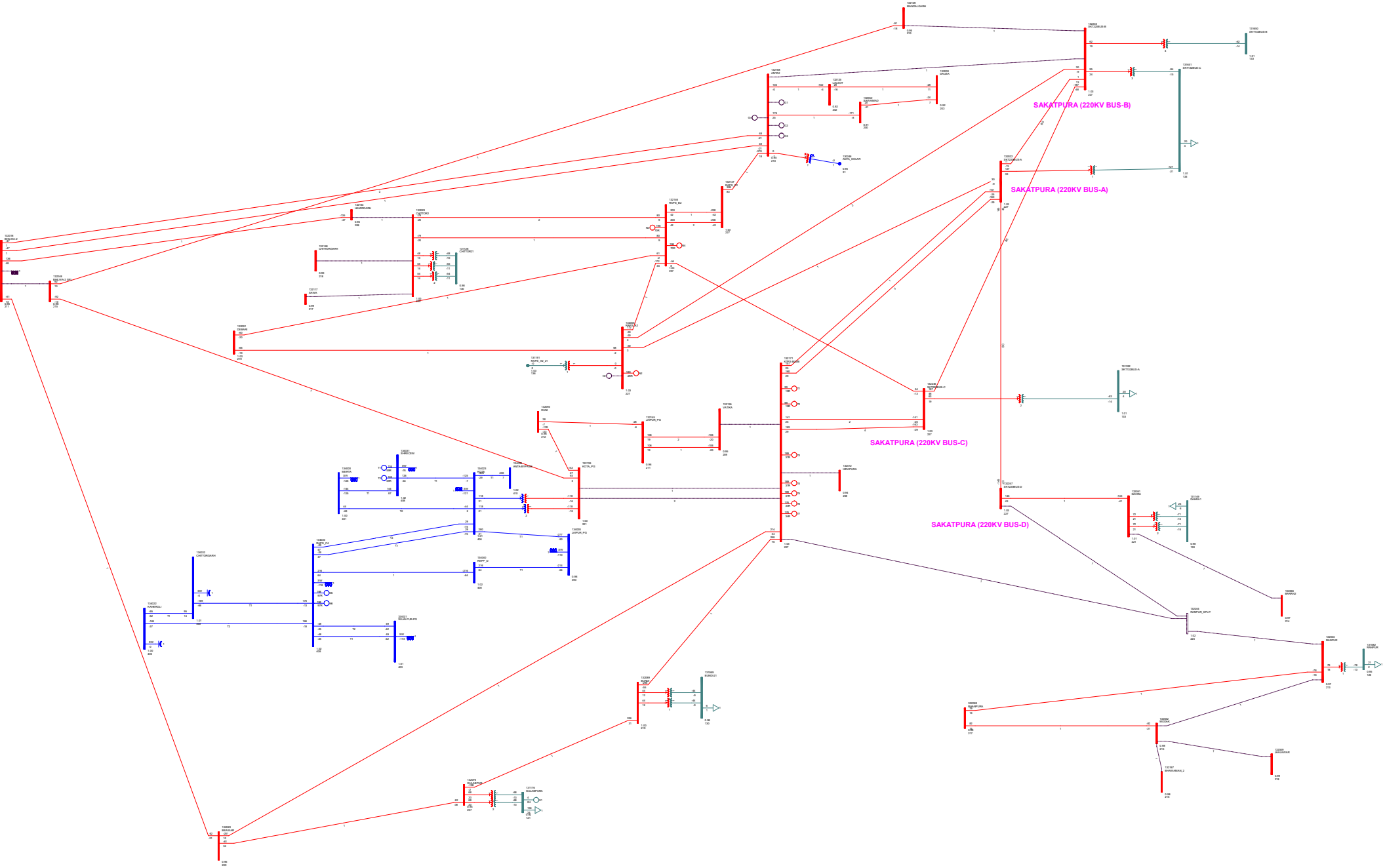
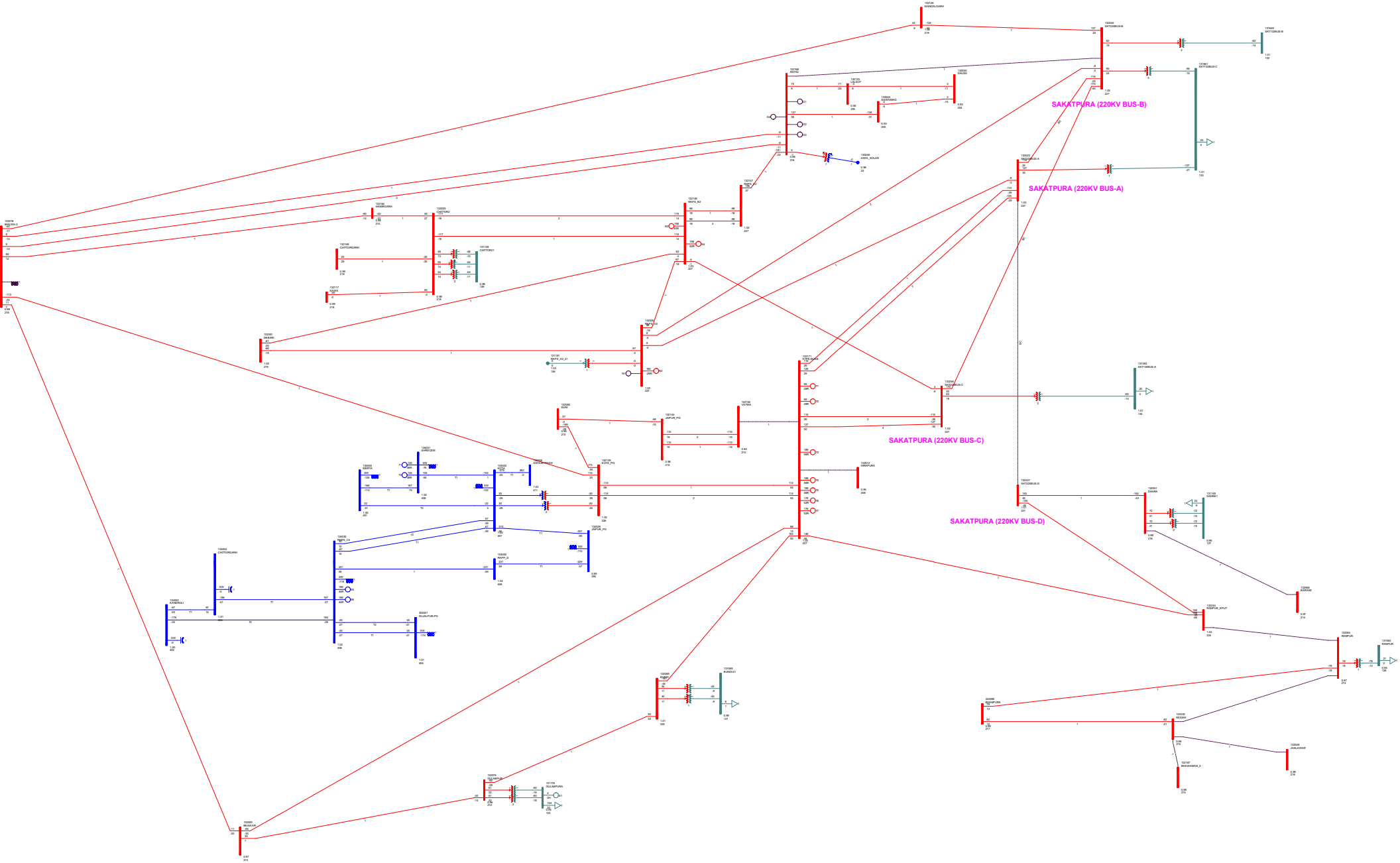


EXHIBIT-6B

CASE-6B : LOAD FLOW STUDY IN SCENARIO-2 WITH OUTAGE OF 220 KV S/C SAKATPURA-ANTA LINE AND KTPS-HEERAPURA LINE



APPENDIX-A

Load flow study in Solar and Non-solar Generation Conditions to assess power flow between 220 kV D/C Kota(PG)-KTPS line

1.0 Recorded Power Flow on 220 kV D/C Kota(PG)-KTPS line

i. Blockwise Power flow on 220 kV D/C KTPS-Kota(PG) line from 21.5.2024 to 21.6.2024 (total 3072 blocks) are placed at **Annexure-A**.

ii. Daywise Abstract of Power flow on 220 kV D/C KTPS-Kota(PG) line from 21.5.2024 to 21.6.2024 (total 3072 blocks) is placed at **Annexure-B** and tabulated hereunder :-

Table-1 : Max. / Minimum Power Exports/Imports on 220 kV D/C KTPS-Kota(PG) line from 21.5.2024 to 21.6.2024

S. No.	Date	No. of Blocks Export	No. of Blocks Import	Maximum Export (MW)	Maximum Import(MW)
1	21.5.2024	80	16	204.22	-87.76
2	22.5.2024	96	0	169.3	0
3	23.5.2024	95	1	85.15	-1.71
4	24.5.2024	91	5	75.54	-23.7
5	25.5.2024	13	83	33.92	-164.72
6	26.5.2024	24	72	94.02	-243.56
7	27.5.2024	32	64	108.22	-156.48
8	28.5.2024	44	52	166.64	-164.48
9	29.5.2024	64	32	133.86	-70.88
10	30.5.2024	67	29	122.08	-132.38
11	31.5.2024	31	65	113.84	-174.04
12	1.6.2024	57	39	179.4	-47.16
13	2.6.2024	39	57	115.44	-142.32
14	3.6.2024	85	11	163.14	-80.28
15	4.6.2024	81	15	191.94	-42.68
16	5.6.2024	87	9	159.04	-41.3
17	6.6.2024	51	45	170.24	-90.64
18	7.6.2024	89	7	272.82	-39.44
19	8.6.2024	96	0	211.54	0
20	9.6.2024	69	27	139.84	-65.36
21	10.6.2024	78	18	194.64	-64.28
22	11.6.2024	91	5	222.98	-14.3
23	12.6.2024	95	1	185.66	-7.54
24	13.6.2024	93	3	192.08	-14.84
25	14.6.2024	89	7	124.3	-28.44
26	15.6.2024	92	4	146.58	-19.8
27	16.6.2024	96	0	180.8	0
28	17.6.2024	94	2	171.68	-2.1
29	18.6.2024	87	9	174.16	-63.4
30	19.6.2024	96	0	162.06	0
31	20.6.2024	81	15	161.84	-78.14
32	21.6.2024	47	49	154.76	-241.4
	Total	2330	742		
	Maximum			272.82	-243.56
	Percentage	76	24		

It is noted out of 3072 blocks in 2330 blocks (76%) power is export at KTPS switchyard on 220 kV D/C KTPS-Kota(PG) line and in 742 blocks (24%) power is export at KTPS switchyard on 220 kV D/C KTPS-Kota(PG) line

iii. 5 nos. Conditions each for maximum Power EXPORT & IMPORT On 220 kV D/C KTPS-Kota(PG) line from 21.5.2024 to 21.6.2024 is placed at **Annexure-C** and tabulated hereunder :-

Table-2: 5 nos. Conditions of maximum Power EXPORT & IMPORT On 220 kV D/C KTPS-Kota(PG) line

S. No.	Date	Time (Hrs)	Maximum Export / Import (-) (MW)	KTPS GEN (IC : 1240 MW, Net Available : 1116 MW)			Raj Demand (MW)	Solar Gen. (MW)	Generation at KTPS
				MW	%	Generation less than from Net available			
A	**Maximum Export**								
1	7.6.2024	19:30-19:45	272.82	1064.71	86	51	12200	0	All units are in operation
2	11.6.2024	19:15-19:30	222.98	1039.33	84	77	12842	15	
3	8.6.2024	19:15-19:30	211.54	1076.5	87	40	12471	17	
4	21.5.2024	22:00-22:15	204.22	1096	88	20	13512	0	
5	10.6.2024	19:15-19:30	194.64	1049.58	85	66	12644	22	
B	**Maximum Import**								
1	26.5.2024	10:45-11:00	-243.56	712.49	57	404	16289	3376	All units are in operation and running on back down.
2	21.6.2024	11:45-12:00	-241.4	211.26	17	905	15344	3376	KTPS unit#1(110 MW) , unit #3 (210MW), unit #4 (210MW), unit #5, (210MW),unit #7 (210MW) tripped at 11:39 Hrs dt. 21.06.24 due to electrical fault.
3	31.5.2024	9:45-10:00	-174.04	849.15	68	267	16994	3059	KTPS unit #6 (195 MW) tripped at 2.23 hrs dt 31.05.24 due to suspected BTL.
4	25.5.2024	10:30-10:45	-164.72	727.56	59	388	17242	3136	KTPS unit #3 (210MW) tripped at 22.10 hrs dt 24.05.24 due to suspected BTL.
5	28.5.2024	6:30-6:45	-164.48	877.43	71	239	14731	179	All units are in operation and running on backdown.

From the blockwise power flow from 21.5.2024 to 21.6.2024 placed at Annexure-A, B& C and further tabulated at Table-1 & 2 following points are observed :-

i. Out of 3072 blocks in 2330 blocks (76%) power is export at KTPS switchyard on 220 kV D/C KTPS-Kota(PG) line and in 742 blocks (24%) power is export at KTPS switchyard on 220 kV D/C KTPS-Kota(PG) line

ii. Maximum export on 220 kV D/C KTPS-Kota(PG) line from KTPS is between 19 hrs. to 10 hrs . Maximum export recorded 272 MW on 7.6.2024 at 19:30 hrs.

iii. Maximum import on 220 kV D/C KTPS-Kota(PG) line at KTPS is between 6:30 hrs. to 11 hrs . Maximum import recorded 243 MW on 26.5.2024 at 10.45 hrs.

2.0 220 KV INTERCONNECTIONS WITH OPERATION ARRANGEMENT AT KTPS, RAPP(A), RAPP(B) & ANTA GTPS AND 220 KV GSS

I. KTPS switchyard

S. No.	Name of 220 kV interconnection	Remark
1	220 kV S/C KTPS-Heerapura line	in operation
2	220 kV S/C KTPS-Beawar line	
3	220 kV S/C KTPS-Bundi line	
4	220 kV S/C KTPS-Ranpur line	in operation Split 220 kV main bus-I&II arrangement at Ranpur. Bus-I is connected from KTPS and Sakatpura Bus-D. Further Bus-D at Sakatpura is connected from 220 kV GSS Dahra and 132 kV Bus-A through 100 MVA transformer.
5	220 kV S/C KTPS-Vatika line	Under shutdown for strengthening work of the line .
6	220 kV S/C KTPS-Sakatpura(bus-A) interconnector-1	in operation
7	220 kV S/C KTPS-Sakatpura (bus-C) interconnector-2	
8	220 kV S/C KTPS-Sakatpura(bus-A) interconnector-3	
9	220 kV S/C KTPS-Sakatpura (bus-C) interconnector-4	
10	220 kV D/C KTPS-Kota(PG) line (400 kV line charged at 220 kV) (Ckt-1)	
11	220 kV D/C KTPS-Kota(PG) line (400 kV line charged at 220 kV) (Ckt-2)	

II. RAPP(A) switchyard

S. No.	Name of 220 kV interconnection	Remark
1	220 kV S/C RAPP(A)-Debari line	in operation
2	220 kV S/C RAPP(A)-RAPP(B) line	
3	220 kV D/C RAPP(A)-Sakatpura line (ckt-I)	
4	220 kV D/C RAPP(A)-Sakatpura line (ckt-II)	

III. RAPP(B) switchyard

S. No.	Name of 220 kV interconnection	Remark
1	220 kV S/C RAPP(B)-Debari line	in operation
2	220 kV S/C RAPP(B)-RAPP(A) line	
3	220 kV D/C RAPP(B)-RAPP(C) line (ckt-I)	
4	220 kV D/C RAPP(B)-RAPP(C) line (ckt-II)	
5	220 kV S/C RAPP(B)-Sakatpura line	
6	220 kV D/C RAPP(B)-Chittorgarh line (ckt-I)	
7	220 kV D/C RAPP(B)-Chittorgarh line (ckt-II)	

iv. Anta GTPS switchyard

S. No.	Name of 220 kV interconnection	Remark
1	220 kV S/C Anta GTPS-Swaimadhopur line	in operation
2	220 kV S/C Anta GTPS-Lalsot line	
3	220 kV S/C Anta GTPS-RAPP(C) line	
4	220 kV D/C Anta GTPS-Bhilwara line (ckt-I)	
5	220 kV D/C Anta GTPS-Bhilwara line (ckt-II)	
6	90 MW Solar Power Plant	

IV. 220 kV GSS Sakatpura switchyard

i. Four nos. 220 kV bus viz. A,B,C,D are exists at 220 kV GSS Sakatpura

ii. 220 kV bus-A, B & C are in parallel

iii. 220 kV bus-D in isolated mode and connected from 220 kV circuits from Dahra & Ranpur/KTPS alongwith 100 MVA , 220 kV transformer-4

iv. Four nos. 132 kV bus viz. A,B,C are exists at 220 kV GSS Sakatpura. All 132 kV buses are operated in Isolated mode

v. 132 kV bus-A in in ring system through 132 kV S/C Sakatpura(bus-A)-RPS line

vi. 132 kV bus-B in in ring system through 132 kV S/C Sakatpura(bus-B)-Nanta-Talera-Bundi line

vii. 132 kV bus-C in in ring system through 132 kV Sakatpura(bus-C)-JS lines (three circuits)

viii. 220 kV Bus-A

a. 220 kV D/C Sakatpura-RAPP(A) line(Ckt-I)
b. 220 kV S/C Sakatpura-KTPS interconnector-1
c. 220 kV S/C Sakatpura-KTPS interconnector-3
d. 220/132 kV Trf-1 (160 MVA) to 132 kV Bus-C
e. B/S between A& B-Closed
f. B/C between A& D-Opened

ix. 220 kV Bus-B

a. 220 kV D/C Sakatpura-RAPP(A) line(Ckt-II)
b. 220 kV S/C Sakatpura-Mandalgarh line
c. B/S between B& A-Closed
d. B/C between B& C-Closed

x. 220 kV Bus-C

a. 220 kV S/C Sakatpura-KTPS interconnector-2
b. 220 kV S/C Sakatpura-KTPS interconnector-4
c. 220 kV S/C Sakatpura-RAPP(B) line
d. 220 kV S/C Sakatpura-Anta GTPS line

e. B/C between C& B-Closed
f. 220/132 kV Trf-2 (100 MVA) to 132 kV Bus-A
g. 220/132 kV Trf-3 (100 MVA) to 132 kV Bus-C

xi. 220 kV Bus-D
a. 220 kV S/C Sakatpura-Ranpur line
b. 220 kV S/C Sakatpura-Dahra line
c. 220/132 kV Trf-4 (100 MVA) to 132 kV Bus-A
d. B/C between A& D-Opened

V. 220 kV GSS Chhitorgarh switchyard

i. 220 kV interconnections

S. No.	Name of 220 kV interconnection	Remark
1	220 kV D/C Chhitorgarh-RAPP(B) line (Ckt-I)	in operation
2	220 kV D/C Chhitorgarh-RAPP(B) line (Ckt-II)	
3	220 kV S/C Chhitorgarh(220 kV GSS)- Chhitorgarh(400 kV GSS) line	
4	220 kV S/C Chhitorgarh-Sawa line	Kept OFF for power flow control /regulate loading on 400 kV transformers
5	220 kV S/C Chhitorgarh-Hamirgarh line	

ii. 132 kV system at 220 kV GSS Chhitorgarh is in radial mode

VI. 220 kV GSS Debari switchyard

i. 220 kV split bus arrangement
ii. From one bus 220 kV circuits from RAPP(A) & RAPP(B) are connected alongwith 220/132 kV transformers . 132 kV system at 220 kV GSS Debari is in radial mode
iii. From another bus 220 kV circuits from Chhitorgarh (400 kV GSS) & Amberi is connected alongwith interconnections from 220 kV GSS at Madri & Aspur

3.0 LOAD FLOW STUDY

Load flow studies have been performed for various scenarios on the PSSE file shared by the NRLDC for the condition corresponding to June 2024. Load flow study has been carried out for non-solar and maximum solar conditions and discussed in the following paragraphs

3.1 Scenario-1 (Case-1) : Non-Solar Generation Condition

- Rajasthan Demand : 14000 MW
- Intra State Solar Power Generation in Rajasthan : 0 MW (IC : 4546.5 MW)
- Intra State Wind Power Generation in Rajasthan : 432.7 MW (IC : 4327.27 MW) (10% of IC)
- Thermal power generation in Rajasthan(excluding Auxiliary consumption) : 8163.45 MW (9645.5 MW)
- Hydro power generation in Rajasthan (excluding Auxiliary consumption) : 140 MW (411 MW)

-
- Generation in Power Plants in Kota area

S. No.	Name of Power PLant	Installed Capacity (MW)	Net Generation (Excluding aux. consumption) (MW)	% Generation	Remark
A	**Kota Thermal Power Station**				
1	Unit-1	110	99	90	-
2	Unit-2	110	99	90	-
3	Unit-3	210	189	90	-
4	Unit-4	210	189	90	-
5	Unit-5	210	189	90	-
6	Unit-6	195	176	90	-
7	Unit-7	195	176	90	-
	Total(A)	**1240**	**1117**	**90**	**-**
B	**Nuclear Power Power Stations**				
	RAPP-A				
	Unit-2	200	180	90	-
	RAPP-B				
	Unit-3	220	0	0	Under S/D upto 9.7.2024 for replacement of reactors components
	Unit-4	220	198	90	-
	RAPP-C				
	Unit-5	220	198	90	-
	Unit-6	220	198	90	-
C	**Anta GAS THERMAL POWER STATION**				
i	Unit-1	88.71	RSD		
ii	Unit-2	88.71	RSD		
iii	Unit-3	88.71	RSD		
iv	Unit-4	153.2	RSD		

Load flow study results for Case-1 are plotted at Exhibit-1. Power flow in case-1 are tabulated here under :-

Table-1 : Power flow at KTPS in Non Solar Power Generation Condition

S. No.	Name of line	Power flow (MW)
A	**KTPS switchyard**	
1	220 kV S/C KTPS-Heerapura line	84
2	220 kV S/C KTPS-Beawar line	85
3	220 kV S/C KTPS-Bundi line	161
4	220 kV S/C KTPS-Ranpur line	142
5	220 kV S/C KTPS-Vatika line	Under S/D

6	220 kV S/C KTPS-Sakatpura(bus-A) interconnector-1	124
7	220 kV S/C KTPS-Sakatpura(bus-A) interconnector-3	141
8	220 kV S/C KTPS-Sakatpura (bus-C) interconnector-2	147
9	220 kV S/C KTPS-Sakatpura (bus-C) interconnector-4	170
10	220 kV D/C KTPS-Kota(PG) line (400 kV line charged at 220 kV) (Ckt-1)	30
11	220 kV D/C KTPS-Kota(PG) line (400 kV line charged at 220 kV) (Ckt-2)	30
B	**RAPP(A) switchyard**	
1	220 kV S/C RAPP(A)-Debari line	84
2	220 kV S/C RAPP(A)-RAPP(B) line	122
3	220 kV D/C RAPP(A)-Sakatpura line (ckt-I)	-13
4	220 kV D/C RAPP(A)-Sakatpura line (ckt-II)	-13
C	**RAPP(B) switchyard**	
1	220 kV S/C RAPP(B)-Debari line	78
2	220 kV S/C RAPP(B)-RAPP(A) line	-122
3	220 kV D/C RAPP(B)-RAPP(C) line (ckt-I)	51
4	220 kV D/C RAPP(B)-RAPP(C) line (ckt-II)	51
5	220 kV S/C RAPP(B)-Sakatpura line	-29
6	220 kV D/C RAPP(B)-Chittorgarh line (ckt-I)	84
7	220 kV D/C RAPP(B)-Chittorgarh line (ckt-II)	84
D	**220 kV GSS Sakatpura**	
	220 kV Bus-A	
1	220 kV D/C Sakatpura-RAPP(A) line(Ckt-I)	13
2	220 kV S/C Sakatpura-KTPS interconnector-1	-124
3	220 kV S/C Sakatpura-KTPS interconnector-3	-141
4	220/132 kV Trf-1 (160 MVA) to 132 kV Bus-C	84
5	B/S between A& B-Closed	169
6	B/C between A& D-Opened	open
	220 kV Bus-B	
1	220 kV D/C Sakatpura-RAPP(A) line(Ckt-II)	13
2	220 kV S/C Sakatpura-Mandalgarh line	125
3	B/S between B& A-Closed	-169
4	B/C between B& C-Closed	31
	220 kV Bus-C	
1	220 kV S/C Sakatpura-KTPS interconnector-2	-147
2	220 kV S/C Sakatpura-KTPS interconnector-4	-170
3	220 kV S/C Sakatpura-RAPP(B) line	29
4	220 kV S/C Sakatpura-Anta GTPS line	163

5	B/C between C& B-Closed	-31
6	220/132 kV Trf-2 (100 MVA) to 132 kV Bus-A	90
7	220/132 kV Trf-3 (100 MVA) to 132 kV Bus-C	66
	220 kV Bus-D	
1	220 kV S/C Sakatpura-Ranpur line	-141
2	220 kV S/C Sakatpura-Dahra line	108
3	220/132 kV Trf-4 (100 MVA) to 132 kV Bus-A	33
4	B/C between A& D-Opened	open

From load flow studies it is observed Power flow on 220 kV D/C KTPS-Kota(PG) line in case-1 is 60 MW (Export at KTPS)

3.2 Scenario-2 (Case-2) : maximum-Solar Generation & system peak demand Condition

- Rajasthan Demand : 17000 MW
- Intra State Solar Power Generation in Rajasthan : 3864 MW (IC : 4546.5 MW)
- Intra State Wind Power Generation in Rajasthan : 432.7 MW (IC : 4327.27 MW) (10% of IC)
- Thermal power generation in Rajasthan(excluding Auxiliary consumption) : 6642 MW (20% less than non solar generation condition)
- Hydro power generation in Rajasthan (excluding Auxiliary consumption) : 112 MW MW (20% less than non solar generation condition)
- 72 MW Solar Power Generation at Anta GTPS
- Generation at KTPS Power Plants

S. No.	Name of Power PLant	Installed Capacity (MW)	Net Generation (Excluding aux. consumption) (MW)	% Generation	Remark
A	**Kota Thermal Power Station**				
1	Unit-1	110	81	73	-
2	Unit-2	110	81	73	-
3	Unit-3	210	154	73	-
4	Unit-4	210	154	73	-
5	Unit-5	210	154	73	-
6	Unit-6	195	143	73	-
7	Unit-7	195	143	73	-
	Total(A)	**1240**	**910**	**73**	**-**

Load flow study results for Case-2 are plotted at Exhibit-2 and tabulated here under :-

Table-2 : Power flow at KTPS in Peak Solar Power Generation & Peak load in Raj System Condition

S. No.	Name of line	Power flow (MW)
A	**KTPS switchyard**	
1	220 kV S/C KTPS-Heerapura line	63
2	220 kV S/C KTPS-Beawar line	70
3	220 kV S/C KTPS-Bundi line	166
4	220 kV S/C KTPS-Ranpur line	170
5	220 kV S/C KTPS-Vatika line	Under S/D
6	220 kV S/C KTPS-Sakatpura(bus-A) interconnector-1	132
7	220 kV S/C KTPS-Sakatpura(bus-A) interconnector-3	150
8	220 kV S/C KTPS-Sakatpura (bus-C) interconnector-2	153
9	220 kV S/C KTPS-Sakatpura (bus-C) interconnector-4	177
10	220 kV D/C KTPS-Kota(PG) line (400 kV line charged at 220 kV) (Ckt-1)	-87
11	220 kV D/C KTPS-Kota(PG) line (400 kV line charged at 220 kV) (Ckt-2)	-87
B	**RAPP(A) switchyard**	
1	220 kV S/C RAPP(A)-Debari line	102
2	220 kV S/C RAPP(A)-RAPP(B) line	98
3	220 kV D/C RAPP(A)-Sakatpura line (ckt-I)	-10
4	220 kV D/C RAPP(A)-Sakatpura line (ckt-II)	-10
C	**RAPP(B) switchyard**	
1	220 kV S/C RAPP(B)-Debari line	96
2	220 kV S/C RAPP(B)-RAPP(A) line	-98
3	220 kV D/C RAPP(B)-RAPP(C) line (ckt-I)	43
4	220 kV D/C RAPP(B)-RAPP(C) line (ckt-II)	43
5	220 kV S/C RAPP(B)-Sakatpura line	-22
6	220 kV D/C RAPP(B)-Chittorgarh line (ckt-I)	68
7	220 kV D/C RAPP(B)-Chittorgarh line (ckt-II)	68
D	**220 kV GSS Sakatpura**	
	220 kV Bus-A	
1	220 kV D/C Sakatpura-RAPP(A) line(Ckt-I)	10
2	220 kV S/C Sakatpura-KTPS interconnector-1	-132
3	220 kV S/C Sakatpura-KTPS interconnector-3	-150
4	220/132 kV Trf-1 (160 MVA) to 132 kV Bus-C	108
5	B/S between A& B-Closed	163

6	B/C between A& D-Opened	open
	220 kV Bus-B	
1	220 kV D/C Sakatpura-RAPP(A) line(Ckt-II)	10
2	220 kV S/C Sakatpura-Mandalgarh line	127
3	B/S between B& A-Closed	-163
4	B/C between B& C-Closed	26
	220 kV Bus-C	
1	220 kV S/C Sakatpura-KTPS interconnector-2	-153
2	220 kV S/C Sakatpura-KTPS interconnector-4	-177
3	220 kV S/C Sakatpura-RAPP(B) line	22
4	220 kV S/C Sakatpura-Anta GTPS line	136
5	B/C between C& B-Closed	-26
6	220/132 kV Trf-2 (100 MVA) to 132 kV Bus-A	113
7	220/132 kV Trf-3 (100 MVA) to 132 kV Bus-C	85
	220 kV Bus-D	
1	220 kV S/C Sakatpura-Ranpur line	-168
2	220 kV S/C Sakatpura-Dahra line	132
3	220/132 kV Trf-4 (100 MVA) to 132 kV Bus-A	37
4	B/C between A& D-Opened	open

From load flow studies it is observed Power flow on 220 kV D/C KTPS-Kota(PG) line in case-2 is 174 MW (Import at KTPS)

3.3 Contingency Studies

Following contingency studies are performed in Case-1 :-

Contingency at KTPS

i. Contingency-1 (Case-1A, Exhibit-1A) : Outage of Unit-3 at KTPS.
ii. Contingency-2 (Case-1B, Exhibit-1B) : Outage of Unit-3 & 4 at KTPS.
iii. Contingency-3 (Case-1C, Exhibit-1C): Outage of 220 kV Interconnector-1 between KTPS &Sakatpura (bus-A)
iv. Contingency-4(Case-1D, Exhibit-1D): Outage of 220 kV Interconnector-2 between KTPS &Sakatpura (bus-C)
v. Contingency-5(Case-1E, Exhibit-1E): Outage of one circuit of 220 kV D/C KTPS-Kota(PG) line
vi. Contingency-6(Case-1F, Exhibit-1F): Outage of 220 kV S/C KTPS-Beawar line
vii. Contingency-7(Case-1G, Exhibit-1G): Outage of 220 kV S/C KTPS-Heerapura line
viii. Contingency-8(Case-1H, Exhibit-1H): Outage of 220 kV S/C KTPS-Ranpur line with 108 MW load throw off of 220 kV GSS Dahra

Contingency at RAPP(A)

i. Contingency-9(Case-1I, Exhibit-1I): Outage of 220 kV S/C RAPP(A)-Debari line
ii. Contingency-10(Case-1J, Exhibit-1J): Outage of 220 kV S/C RAPP(A)-RAPP(B) line
iii. Contingency-11(Case-1K, Exhibit-1K) : Outage of 220 kV D/C RAPP(A)-Sakatpura line

Contingency at RAPP(B)

i. Contingency-12(Case-1L, Exhibit-1L): Outage of 220 kV S/C RAPP(B)-Debari line
ii. Contingency-13(Case-1M, Exhibit-1M): Outage of 220 kV S/C RAPP(B)-Sakatpura line
iii. Contingency-14(Case-1N, Exhibit-1N) : Outage of 220 kV D/C RAPP(B)-Chhitorgarh line
iv. Contingency-15(Case-1O, Exhibit-1O): Outage of 220 kV D/C RAPP(B)-RAPP(C) line

Contingency at 400 kV GSS Kota(PG)

i. Contingency-16 (Case-1P, Exhibit-1P): Outage of one 315 MVA, 400/220 kV transformer at Kota(PG)
ii. Contingency-17 (Case-1Q, Exhibit-1Q) : Outage of 220 kV S/C Kota(PG)-Bhilwara line
iii. Contingency-18 (Case-1R, Exhibit-1R): Outage of 220 kV S/C Kota(PG)-Duni line
iv. Contingency-19 (Case-1S, Exhibit-1S): Outage of 400 kV S/C Kota(PG)-Anta –Chhabra TPS line
v. Contingency-20 (Case-1T, Exhibit-1T): Outage of 400 kV S/C Kota(PG)-Jaipur(PG) line
vi. Contingency-21 (Case-1U, Exhibit-1U): Outage of 400 kV S/C Kota(PG)-Merta line

Power flow in various contingency cases are plotted at Exhibit-1A to Exhibit-U and also tabulated at Annexure-1 to 4 as per following details :-

- Power flow in Base Case and various contingency at KTPS switchyard are tabulated at Annexure-1.
- Power flow in Base Case and various contingency at RAPP(A) switchyard are tabulated at Annexure-2.
- Power flow in Base Case and various contingency at RAPP(B) switchyard are tabulated at Annexure-3.
- Power flow in Base Case and various contingency at 400 kV GSS Kota(PG) are tabulated at Annexure-4.

From load flow studies following points are observed :-

- Contingency-1 : under outage of one unit at KTPS power import at KTPS is 42 MW.
- Contingency-2: under outage of two units at KTPS power import at KTPS is 146 MW.
- Under outage of any 220 kV line at KTPS, power export from KTPS switchyard is increased and extended upto the 122 MW under outage of 220 kV S/C KTPS-Ranpur line alongwith 108 MW load throw up of 220 kV GSS Ranpur.

ANNEXURE-A

BLOCKWISE Power flow on 220 kV D/C KTPS-Kota(PG) line from 21.5.2024 to 21.6.2024

S. No.	Time	KTPS KOTA PG-1 220KV	KTPS KOTA PG-2 220KV
	HRS	MW	MW
1	21-05-24 00:00	5.86	5.99
2	21-05-24 00:15	7.1	7.21
3	21-05-24 00:30	22.37	22.8
4	21-05-24 00:45	49.33	49.33
5	21-05-24 01:00	9.83	9.85
6	21-05-24 01:15	6.62	6.96
7	21-05-24 01:30	8.26	7.81
8	21-05-24 01:45	7.95	7.59
9	21-05-24 02:00	7.63	7.75
10	21-05-24 02:15	11.73	11.36
11	21-05-24 02:30	13.26	12.28
12	21-05-24 02:45	14.4	14.82
13	21-05-24 03:00	16.35	16.46
14	21-05-24 03:15	16.14	16.53
15	21-05-24 03:30	19.51	19.61
16	21-05-24 03:45	23.51	24.25
17	21-05-24 04:00	26.9	27.22
18	21-05-24 04:15	21.88	22.46
19	21-05-24 04:30	19.87	20.03
20	21-05-24 04:45	23.79	24.58
21	21-05-24 05:00	19.75	20.24
22	21-05-24 05:15	13.05	13.44
23	21-05-24 05:30	11.06	11.18
24	21-05-24 05:45	13.8	14.02
25	21-05-24 06:00	11.95	11.95
26	21-05-24 06:15	-6.29	-5.69
27	21-05-24 06:30	-4.84	-4.24
28	21-05-24 06:45	16.46	17.79
29	21-05-24 07:00	15.34	17.1
30	21-05-24 07:15	17.65	17.51
31	21-05-24 07:30	19.16	19.76
32	21-05-24 07:45	16.52	17.13
33	21-05-24 08:00	21.98	22.77
34	21-05-24 08:15	23.03	22.98
35	21-05-24 08:30	28.77	29.41
36	21-05-24 08:45	28.65	28.92
37	21-05-24 09:00	33.83	32.94
38	21-05-24 09:15	31.81	32.35
39	21-05-24 09:30	32.36	32.88
40	21-05-24 09:45	2.89	3.27
41	21-05-24 10:00	-13	-13.9
42	21-05-24 10:15	-14.71	-15.61
43	21-05-24 10:30	-12.9	-13.54
44	21-05-24 10:45	-11.85	-11.8
45	21-05-24 11:00	-3.19	-3.11
46	21-05-24 11:15	0.14	0.05
47	21-05-24 11:30	-0.87	-2.59
48	21-05-24 11:45	1.8	1.3
49	21-05-24 12:00	11.21	11.44
50	21-05-24 12:15	11.36	10.96
51	21-05-24 12:30	15.62	15.76

S. No.	Time	KTPS	KTPS
		KOTA PG-1	KOTA PG-2
		220KV	220KV
	HRS	MW	MW
52	21-05-24 12:45	58.42	58.21
53	21-05-24 13:00	27.46	27.97
54	21-05-24 13:15	-12.21	-11.46
55	21-05-24 13:30	-7.04	-6.06
56	21-05-24 13:45	-20.58	-20.01
57	21-05-24 14:00	-3.97	-3.32
58	21-05-24 14:15	14.81	15.12
59	21-05-24 14:30	16.09	16.33
60	21-05-24 14:45	19.9	20.45
61	21-05-24 15:00	11.11	12.1
62	21-05-24 15:15	-12.77	-10.72
63	21-05-24 15:30	-38.49	-33.63
64	21-05-24 15:45	-43.88	-42.9
65	21-05-24 16:00	-24.43	-23.16
66	21-05-24 16:15	15.06	15.69
67	21-05-24 16:30	32.72	32.55
68	21-05-24 16:45	31.62	31.86
69	21-05-24 17:00	35.9	36.53
70	21-05-24 17:15	39.41	39.01
71	21-05-24 17:30	39.4	39.7
72	21-05-24 17:45	51.24	51.1
73	21-05-24 18:00	35.86	35.87
74	21-05-24 18:15	14.63	15
75	21-05-24 18:30	31.58	32.05
76	21-05-24 18:45	57.72	58.1
77	21-05-24 19:00	61.62	62.34
78	21-05-24 19:15	64.11	63.88
79	21-05-24 19:30	81.11	80.72
80	21-05-24 19:45	87.43	87.57
81	21-05-24 20:00	99.17	98.95
82	21-05-24 20:15	99.58	100.07
83	21-05-24 20:30	99.37	99.11
84	21-05-24 20:45	92.64	92.67
85	21-05-24 21:00	85.99	86.06
86	21-05-24 21:15	88.37	88.69
87	21-05-24 21:30	91.74	91.41
88	21-05-24 21:45	92.83	92.47
89	21-05-24 22:00	102.11	102.29
90	21-05-24 22:15	100.37	100.09
91	21-05-24 22:30	98.63	98.75
92	21-05-24 22:45	93.06	93.31
93	21-05-24 23:00	88.56	89.04
94	21-05-24 23:15	84.09	83.9
95	21-05-24 23:30	79.63	79.39
96	21-05-24 23:45	62.86	62.75
21.5.2024	**No. of Blocks export**	**80**	**80**
	No. of Blocks Import	**16**	**16**
	Maximum export	**102.11**	**102.29**
	Maximum Import	**-43.88**	**-42.9**
1	22-05-24 00:00	59.37	59.81
2	22-05-24 00:15	56.81	56.7
3	22-05-24 00:30	58	58.16
4	22-05-24 00:45	50.56	50.54
5	22-05-24 01:00	53	52.77
6	22-05-24 01:15	54.28	54.29

S. No.	Time	KTPS	KTPS
		KOTA PG-1	KOTA PG-2
		220KV	220KV
	HRS	MW	MW
7	22-05-24 01:30	50.33	50.05
8	22-05-24 01:45	45.06	44.89
9	22-05-24 02:00	43.91	44.28
10	22-05-24 02:15	45.48	45.48
11	22-05-24 02:30	45.13	44.57
12	22-05-24 02:45	42.35	42.99
13	22-05-24 03:00	46.06	45.89
14	22-05-24 03:15	44.12	44.2
15	22-05-24 03:30	44.61	45.01
16	22-05-24 03:45	48.25	48.6
17	22-05-24 04:00	51.81	51.69
18	22-05-24 04:15	51.57	51.82
19	22-05-24 04:30	51.4	51.83
20	22-05-24 04:45	54.37	54.44
21	22-05-24 05:00	51.13	51.89
22	22-05-24 05:15	46.92	47.62
23	22-05-24 05:30	43.37	42.69
24	22-05-24 05:45	41.28	42.18
25	22-05-24 06:00	42.67	42.79
26	22-05-24 06:15	29.58	30.7
27	22-05-24 06:30	24.8	25.86
28	22-05-24 06:45	24.59	24.55
29	22-05-24 07:00	26.07	26.37
30	22-05-24 07:15	23.39	23.5
31	22-05-24 07:30	20.94	21.08
32	22-05-24 07:45	20.48	20.41
33	22-05-24 08:00	22.39	22.85
34	22-05-24 08:15	25.43	24.97
35	22-05-24 08:30	27.9	28.08
36	22-05-24 08:45	31.23	31.48
37	22-05-24 09:00	32.65	32.55
38	22-05-24 09:15	25.34	25.22
39	22-05-24 09:30	23.39	23.19
40	22-05-24 09:45	25.57	25.67
41	22-05-24 10:00	35.26	35.83
42	22-05-24 10:15	33.76	33.46
43	22-05-24 10:30	36.95	37.43
44	22-05-24 10:45	38.65	38.42
45	22-05-24 11:00	45.14	44.74
46	22-05-24 11:15	38.77	38.19
47	22-05-24 11:30	41.54	41.06
48	22-05-24 11:45	50.87	50.54
49	22-05-24 12:00	58.97	58.47
50	22-05-24 12:15	60.86	60.37
51	22-05-24 12:30	64.11	63.59
52	22-05-24 12:45	63.13	62.82
53	22-05-24 13:00	72.1	71.85
54	22-05-24 13:15	79.75	79.6
55	22-05-24 13:30	84.65	83.77
56	22-05-24 13:45	72.78	72.24
57	22-05-24 14:00	65.24	64.95
58	22-05-24 14:15	62.09	62.12
59	22-05-24 14:30	60.8	60.6
60	22-05-24 14:45	55.43	57.15
61	22-05-24 15:00	56.1	56.08

S. No.	Time	KTPS	KTPS
		KOTA PG-1	KOTA PG-2
		220KV	220KV
	HRS	MW	MW
62	22-05-24 15:15	55.3	55.09
63	22-05-24 15:30	56.71	56.67
64	22-05-24 15:45	61.85	61.54
65	22-05-24 16:00	54.19	54.03
66	22-05-24 16:15	52.37	52.77
67	22-05-24 16:30	52.17	52.11
68	22-05-24 16:45	49.79	49.92
69	22-05-24 17:00	52.09	52.94
70	22-05-24 17:15	50.04	50.5
71	22-05-24 17:30	58.55	58.79
72	22-05-24 17:45	59.01	59.24
73	22-05-24 18:00	69.93	70.43
74	22-05-24 18:15	75.33	75.46
75	22-05-24 18:30	78.77	78.77
76	22-05-24 18:45	77.95	78.61
77	22-05-24 19:00	82.96	83.77
78	22-05-24 19:15	80.14	79.88
79	22-05-24 19:30	77.38	77.54
80	22-05-24 19:45	74.75	75.74
81	22-05-24 20:00	75.72	75.26
82	22-05-24 20:15	75.42	75.71
83	22-05-24 20:30	75.5	75.63
84	22-05-24 20:45	80.47	80.9
85	22-05-24 21:00	79.73	79.45
86	22-05-24 21:15	79.1	78.7
87	22-05-24 21:30	79.64	79.19
88	22-05-24 21:45	67.03	67
89	22-05-24 22:00	79.23	79.63
90	22-05-24 22:15	80.81	80.75
91	22-05-24 22:30	82.53	80.76
92	22-05-24 22:45	83.95	83.83
93	22-05-24 23:00	79.62	79.99
94	22-05-24 23:15	75.16	75.67
95	22-05-24 23:30	74.92	75.1
96	22-05-24 23:45	68.91	68.8
22.5.2024	**No. of Blocks export**	**96**	**96**
	No. of Blocks Import	**0**	**0**
	Maximum export	**84.65**	**83.83**
	Maximum Import	**0**	**0**
1	23-05-24 00:00	62.18	61.3
2	23-05-24 00:15	57.04	56.94
3	23-05-24 00:30	51.07	50.93
4	23-05-24 00:45	48.85	48.53
5	23-05-24 01:00	47.75	47.62
6	23-05-24 01:15	45.97	46.34
7	23-05-24 01:30	45.44	45.27
8	23-05-24 01:45	45.62	45.52
9	23-05-24 02:00	14.11	14.09
10	23-05-24 02:15	-1.71	-1.49
11	23-05-24 02:30	16.5	16.69
12	23-05-24 02:45	47.21	47.64
13	23-05-24 03:00	54.43	53.59
14	23-05-24 03:15	56.9	56.87
15	23-05-24 03:30	58.02	58.22
16	23-05-24 03:45	59.17	59.29

S. No.	Time	KTPS	KTPS
		KOTA PG-1	KOTA PG-2
		220KV	220KV
	HRS	MW	MW
17	23-05-24 04:00	58.67	58.43
18	23-05-24 04:15	56.68	56.97
19	23-05-24 04:30	59.27	59.08
20	23-05-24 04:45	56.5	56.3
21	23-05-24 05:00	54.84	55.09
22	23-05-24 05:15	45.59	45.74
23	23-05-24 05:30	40.91	41.25
24	23-05-24 05:45	40.73	40.53
25	23-05-24 06:00	42.96	43.23
26	23-05-24 06:15	33.95	34.07
27	23-05-24 06:30	27.86	28.19
28	23-05-24 06:45	24.71	25.83
29	23-05-24 07:00	21.6	21.9
30	23-05-24 07:15	18.05	18.17
31	23-05-24 07:30	16.31	16.48
32	23-05-24 07:45	22.76	22.98
33	23-05-24 08:00	27.5	27.3
34	23-05-24 08:15	28.89	29.21
35	23-05-24 08:30	32.92	32.26
36	23-05-24 08:45	32.52	30.73
37	23-05-24 09:00	31.35	30.62
38	23-05-24 09:15	32.14	31.61
39	23-05-24 09:30	32.2	32.01
40	23-05-24 09:45	35.59	35.6
41	23-05-24 10:00	41.48	42.19
42	23-05-24 10:15	40.57	39.82
43	23-05-24 10:30	39.42	38.96
44	23-05-24 10:45	50.1	49.37
45	23-05-24 11:00	51.54	50.41
46	23-05-24 11:15	55.44	55.84
47	23-05-24 11:30	59.96	59.57
48	23-05-24 11:45	60.53	59.48
49	23-05-24 12:00	66.81	66.37
50	23-05-24 12:15	72.52	73.02
51	23-05-24 12:30	80.67	80.16
52	23-05-24 12:45	74.85	73.65
53	23-05-24 13:00	74.28	74.04
54	23-05-24 13:15	69.43	69.16
55	23-05-24 13:30	59.94	60.03
56	23-05-24 13:45	55.98	55.4
57	23-05-24 14:00	52.38	51.75
58	23-05-24 14:15	45.64	45.19
59	23-05-24 14:30	51.37	50.98
60	23-05-24 14:45	47.1	47.61
61	23-05-24 15:00	48.54	47.92
62	23-05-24 15:15	48.23	48.02
63	23-05-24 15:30	42.26	42.29
64	23-05-24 15:45	36.43	37.57
65	23-05-24 16:00	31.85	31.84
66	23-05-24 16:15	24.19	24.96
67	23-05-24 16:30	24.22	24.86
68	23-05-24 16:45	22.99	24.03
69	23-05-24 17:00	30.72	31.08
70	23-05-24 17:15	34.49	35.18
71	23-05-24 17:30	42.83	43.14

S. No.	Time	KTPS	KTPS
		KOTA PG-1	KOTA PG-2
		220KV	220KV
	HRS	MW	MW
72	23-05-24 17:45	48.46	49.01
73	23-05-24 18:00	58.27	58.42
74	23-05-24 18:15	72.43	72.98
75	23-05-24 18:30	74	74.15
76	23-05-24 18:45	75	75.22
77	23-05-24 19:00	80.83	79.94
78	23-05-24 19:15	82.2	83.26
79	23-05-24 19:30	78.61	79.25
80	23-05-24 19:45	80.53	80.7
81	23-05-24 20:00	84.07	84.08
82	23-05-24 20:15	81.47	81.56
83	23-05-24 20:30	76.89	76.26
84	23-05-24 20:45	74.23	74.4
85	23-05-24 21:00	78.06	78.72
86	23-05-24 21:15	74.9	75.12
87	23-05-24 21:30	81.14	81.47
88	23-05-24 21:45	85.15	85.11
89	23-05-24 22:00	83.14	84.1
90	23-05-24 22:15	77.31	77.3
91	23-05-24 22:30	82.78	83.03
92	23-05-24 22:45	84.82	85.2
93	23-05-24 23:00	82.78	82.03
94	23-05-24 23:15	81.97	81.87
95	23-05-24 23:30	77.08	77.23
96	23-05-24 23:45	75.26	75.25
23.5.2024	**No. of Blocks export**	**95**	**95**
	No. of Blocks Import	**1**	**1**
	Maximum export	**85.15**	**85.2**
	Maximum Import	**-1.71**	**-1.49**
1	24-05-24 00:00	70.55	71.88
2	24-05-24 00:15	64.47	64.92
3	24-05-24 00:30	53.01	52.82
4	24-05-24 00:45	43.03	43.11
5	24-05-24 01:00	40.69	40.81
6	24-05-24 01:15	39.41	39.63
7	24-05-24 01:30	37.52	37.57
8	24-05-24 01:45	37.17	37.8
9	24-05-24 02:00	37.46	37.55
10	24-05-24 02:15	36	35.96
11	24-05-24 02:30	35.78	36
12	24-05-24 02:45	40.92	41.21
13	24-05-24 03:00	37.1	37.15
14	24-05-24 03:15	38.91	39.15
15	24-05-24 03:30	41.16	41.71
16	24-05-24 03:45	45.66	46.05
17	24-05-24 04:00	48.06	48.31
18	24-05-24 04:15	46.44	47.33
19	24-05-24 04:30	39.2	39.78
20	24-05-24 04:45	37.67	38.36
21	24-05-24 05:00	32.98	33.68
22	24-05-24 05:15	29.82	30.13
23	24-05-24 05:30	28.99	29.38
24	24-05-24 05:45	34.92	34.54
25	24-05-24 06:00	33.87	34.46
26	24-05-24 06:15	22.05	22.23

S. No.	Time	KTPS	KTPS
		KOTA PG-1	KOTA PG-2
		220KV	220KV
	HRS	MW	MW
27	24-05-24 06:30	14.68	14.86
28	24-05-24 06:45	12.78	12.94
29	24-05-24 07:00	12.45	13
30	24-05-24 07:15	14.11	14.46
31	24-05-24 07:30	9.1	10.22
32	24-05-24 07:45	-4.54	-3.85
33	24-05-24 08:00	-0.09	0.23
34	24-05-24 08:15	-3.17	-2.78
35	24-05-24 08:30	5.26	5.38
36	24-05-24 08:45	8.4	8.51
37	24-05-24 09:00	8.79	8.42
38	24-05-24 09:15	11.38	11.14
39	24-05-24 09:30	19.03	19.43
40	24-05-24 09:45	17.45	17.92
41	24-05-24 10:00	21.34	21.57
42	24-05-24 10:15	20.61	20.46
43	24-05-24 10:30	24.54	24.3
44	24-05-24 10:45	27.79	27.66
45	24-05-24 11:00	37.95	37.12
46	24-05-24 11:15	39.07	38.98
47	24-05-24 11:30	46.61	46.55
48	24-05-24 11:45	44.17	44.38
49	24-05-24 12:00	51.51	51.48
50	24-05-24 12:15	49.14	49.46
51	24-05-24 12:30	49.12	48.8
52	24-05-24 12:45	44.7	44.41
53	24-05-24 13:00	48.3	48.06
54	24-05-24 13:15	44.14	44.54
55	24-05-24 13:30	41.34	41.92
56	24-05-24 13:45	41.23	41.13
57	24-05-24 14:00	38.21	38.48
58	24-05-24 14:15	30.92	30.73
59	24-05-24 14:30	29.9	29.74
60	24-05-24 14:45	30.55	30.68
61	24-05-24 15:00	28.25	28.56
62	24-05-24 15:15	25.18	25.4
63	24-05-24 15:30	26.32	26.37
64	24-05-24 15:45	24.47	24.66
65	24-05-24 16:00	22.7	22.42
66	24-05-24 16:15	13.14	13.41
67	24-05-24 16:30	3.01	3.93
68	24-05-24 16:45	-23.7	-23.21
69	24-05-24 17:00	-0.11	-0.21
70	24-05-24 17:15	15.6	15.16
71	24-05-24 17:30	23.15	23.47
72	24-05-24 17:45	31.12	31.72
73	24-05-24 18:00	41.28	41.8
74	24-05-24 18:15	55.98	55.89
75	24-05-24 18:30	60.94	62.45
76	24-05-24 18:45	59.53	60.5
77	24-05-24 19:00	60.09	60.21
78	24-05-24 19:15	56.08	57.16
79	24-05-24 19:30	61.23	62.13
80	24-05-24 19:45	70.96	71.17
81	24-05-24 20:00	72.99	72.68

S. No.	Time	KTPS	KTPS
		KOTA PG-1	KOTA PG-2
		220KV	220KV
	HRS	MW	MW
82	24-05-24 20:15	73.23	73.51
83	24-05-24 20:30	75.54	75.53
84	24-05-24 20:45	72.65	72.63
85	24-05-24 21:00	67	67.48
86	24-05-24 21:15	64.2	64.97
87	24-05-24 21:30	59.05	59.42
88	24-05-24 21:45	35.71	36.75
89	24-05-24 22:00	18.6	19.45
90	24-05-24 22:15	8.48	9.74
91	24-05-24 22:30	6.96	8.22
92	24-05-24 22:45	5.1	6.3
93	24-05-24 23:00	1.31	1.56
94	24-05-24 23:15	3.06	4.07
95	24-05-24 23:30	0.15	1.28
96	24-05-24 23:45	1.61	2.43
24.5.2024	**No. of Blocks export**	**91**	**92**
	No. of Blocks Import	**5**	**4**
	Maximum export	**75.54**	**75.53**
	Maximum Import	**-23.7**	**-23.21**
1	25-05-24 00:00	3.83	4.06
2	25-05-24 00:15	16.96	17.22
3	25-05-24 00:30	11.56	11.61
4	25-05-24 00:45	-10.42	-9.93
5	25-05-24 01:00	-20.24	-19.87
6	25-05-24 01:15	-18.32	-17.61
7	25-05-24 01:30	-15.94	-15.53
8	25-05-24 01:45	-16.38	-16
9	25-05-24 02:00	-11.74	-11.39
10	25-05-24 02:15	-9.48	-8.76
11	25-05-24 02:30	-7.44	-7.29
12	25-05-24 02:45	-7.15	-7.17
13	25-05-24 03:00	-8.2	-6.42
14	25-05-24 03:15	-8.44	-7.81
15	25-05-24 03:30	-9.34	-9.22
16	25-05-24 03:45	-4.57	-4.25
17	25-05-24 04:00	-4.08	-2.65
18	25-05-24 04:15	-4.76	-4.04
19	25-05-24 04:30	-6.2	-5.65
20	25-05-24 04:45	-6.68	-6.19
21	25-05-24 05:00	-11.12	-10.14
22	25-05-24 05:15	-17.37	-17.06
23	25-05-24 05:30	-20.22	-19.52
24	25-05-24 05:45	-18.1	-17.32
25	25-05-24 06:00	-19.91	-19.94
26	25-05-24 06:15	-26.6	-25.88
27	25-05-24 06:30	-23.76	-22.91
28	25-05-24 06:45	-25.82	-25.69
29	25-05-24 07:00	-31.39	-31.19
30	25-05-24 07:15	-39.24	-38.35
31	25-05-24 07:30	-39.41	-39.19
32	25-05-24 07:45	-38.67	-37.9
33	25-05-24 08:00	-33.94	-33.13
34	25-05-24 08:15	-38.72	-38.33
35	25-05-24 08:30	-53.28	-54.18
36	25-05-24 08:45	-53.47	-54

S. No.	Time	KTPS	KTPS
		KOTA PG-1	KOTA PG-2
		220KV	220KV
	HRS	MW	MW
37	25-05-24 09:00	-50.99	-51.86
38	25-05-24 09:15	-52.14	-52.75
39	25-05-24 09:30	-50.78	-51.96
40	25-05-24 09:45	-50.01	-51.08
41	25-05-24 10:00	-69.68	-69.67
42	25-05-24 10:15	-79.57	-80.17
43	25-05-24 10:30	-82.36	-83.13
44	25-05-24 10:45	-76.89	-77.72
45	25-05-24 11:00	-66.82	-67.44
46	25-05-24 11:15	-67.19	-67.64
47	25-05-24 11:30	-63.88	-64.42
48	25-05-24 11:45	-66.57	-66.59
49	25-05-24 12:00	-58.45	-59.1
50	25-05-24 12:15	-49.77	-50.24
51	25-05-24 12:30	-45.95	-46.5
52	25-05-24 12:45	-52.62	-52.36
53	25-05-24 13:00	-46.6	-46.86
54	25-05-24 13:15	-49.28	-49.92
55	25-05-24 13:30	-43.66	-44.25
56	25-05-24 13:45	-47.87	-48.83
57	25-05-24 14:00	-22.16	-23.06
58	25-05-24 14:15	-13.05	-13.48
59	25-05-24 14:30	-10.75	-10.65
60	25-05-24 14:45	-9.23	-8.58
61	25-05-24 15:00	-10.71	-10.54
62	25-05-24 15:15	-12.75	-13.75
63	25-05-24 15:30	-22.85	-23.15
64	25-05-24 15:45	-22.28	-22.89
65	25-05-24 16:00	-23.19	-23.47
66	25-05-24 16:15	-27.77	-28.58
67	25-05-24 16:30	-29.31	-28.84
68	25-05-24 16:45	-53.2	-52.7
69	25-05-24 17:00	-70.7	-71.38
70	25-05-24 17:15	-72.49	-72.52
71	25-05-24 17:30	-65.55	-65.64
72	25-05-24 17:45	-58.01	-57.2
73	25-05-24 18:00	-50.75	-51.46
74	25-05-24 18:15	-52.51	-52.7
75	25-05-24 18:30	-49.29	-49.31
76	25-05-24 18:45	-47.25	-47.44
77	25-05-24 19:00	-20.45	-20.55
78	25-05-24 19:15	1.4	1.16
79	25-05-24 19:30	12.34	4.64
80	25-05-24 19:45	4.41	4.58
81	25-05-24 20:00	3.15	2.89
82	25-05-24 20:15	-3.14	-2.84
83	25-05-24 20:30	-4.16	-4.23
84	25-05-24 20:45	-6.97	-7
85	25-05-24 21:00	-14.51	-14.16
86	25-05-24 21:15	-10.23	-10.51
87	25-05-24 21:30	-11.25	-10.92
88	25-05-24 21:45	-10.69	-10.07
89	25-05-24 22:00	-7.76	-7.38
90	25-05-24 22:15	-5.34	-4.68
91	25-05-24 22:30	8	8.11

S. No.	Time	KTPS	KTPS
		KOTA PG-1	KOTA PG-2
		220KV	220KV
	HRS	MW	MW
92	25-05-24 22:45	6.64	6.89
93	25-05-24 23:00	4.51	4.8
94	25-05-24 23:15	12	12.52
95	25-05-24 23:30	12.54	12.65
96	25-05-24 23:45	16.13	16.06
25.5.2024	**No. of Blocks export**	**13**	**13**
	No. of Blocks Import	**83**	**83**
	Maximum export	**16.96**	**17.22**
	Maximum Import	**-82.36**	**-83.13**
1	26-05-24 00:00	14.71	14.4
2	26-05-24 00:15	18.93	18.78
3	26-05-24 00:30	6.42	6.48
4	26-05-24 00:45	3.31	3.94
5	26-05-24 01:00	-11.24	-11.1
6	26-05-24 01:15	-23.51	-22.5
7	26-05-24 01:30	-37.96	-37.86
8	26-05-24 01:45	-43.03	-43.07
9	26-05-24 02:00	-44.74	-43.68
10	26-05-24 02:15	-43.64	-43.09
11	26-05-24 02:30	-42.72	-42.1
12	26-05-24 02:45	-37.86	-37.39
13	26-05-24 03:00	-41.66	-41.98
14	26-05-24 03:15	-44.16	-43.71
15	26-05-24 03:30	-46.26	-46.19
16	26-05-24 03:45	-44.34	-44.45
17	26-05-24 04:00	-41.31	-41.42
18	26-05-24 04:15	-42.18	-41.82
19	26-05-24 04:30	-43.95	-44.03
20	26-05-24 04:45	-43.16	-43.31
21	26-05-24 05:00	-48.84	-49.39
22	26-05-24 05:15	-56.74	-56.84
23	26-05-24 05:30	-56.04	-55.84
24	26-05-24 05:45	-54.22	-53.87
25	26-05-24 06:00	-52.7	-52.51
26	26-05-24 06:15	-59.32	-59.06
27	26-05-24 06:30	-68.47	-67.79
28	26-05-24 06:45	-66.65	-65.26
29	26-05-24 07:00	-72.38	-71.58
30	26-05-24 07:15	-71.72	-71.44
31	26-05-24 07:30	-71.94	-71.91
32	26-05-24 07:45	-76.85	-76.49
33	26-05-24 08:00	-68.52	-68.22
34	26-05-24 08:15	-63.93	-63.43
35	26-05-24 08:30	-62.68	-61.94
36	26-05-24 08:45	-62.04	-61.45
37	26-05-24 09:00	-61.18	-60.5
38	26-05-24 09:15	-66.19	-65.5
39	26-05-24 09:30	-61.48	-61.44
40	26-05-24 09:45	-63.33	-63.46
41	26-05-24 10:00	-57.52	-57.82
42	26-05-24 10:15	-95.81	-96.13
43	26-05-24 10:30	-106.52	-108.3
44	26-05-24 10:45	-121.78	-122.18
45	26-05-24 11:00	-116.88	-117.22
46	26-05-24 11:15	-105.17	-105.88

S. No.	Time	KTPS	KTPS
		KOTA PG-1	KOTA PG-2
		220KV	220KV
	HRS	MW	MW
47	26-05-24 11:30	-91.16	-91.45
48	26-05-24 11:45	-86.86	-86.97
49	26-05-24 12:00	-80.91	-81.12
50	26-05-24 12:15	-81.84	-81.97
51	26-05-24 12:30	-74.31	-75.96
52	26-05-24 12:45	-75.41	-75.99
53	26-05-24 13:00	-67.14	-67.16
54	26-05-24 13:15	-42.57	-42.36
55	26-05-24 13:30	-8.72	-10.64
56	26-05-24 13:45	-11.31	-11.56
57	26-05-24 14:00	-6.5	-6.32
58	26-05-24 14:15	3.43	3.09
59	26-05-24 14:30	-0.75	-0.96
60	26-05-24 14:45	5.88	4.81
61	26-05-24 15:00	1.04	0.98
62	26-05-24 15:15	3.11	3.01
63	26-05-24 15:30	-0.22	-0.36
64	26-05-24 15:45	-3.68	-3.96
65	26-05-24 16:00	-4.59	-4.56
66	26-05-24 16:15	-7.42	-7.44
67	26-05-24 16:30	10.35	10.33
68	26-05-24 16:45	16.92	17.38
69	26-05-24 17:00	26.38	26.98
70	26-05-24 17:15	-12.18	-11.02
71	26-05-24 17:30	-31.33	-30.83
72	26-05-24 17:45	-26.12	-26.27
73	26-05-24 18:00	-11.95	-12.18
74	26-05-24 18:15	-5.53	-5.31
75	26-05-24 18:30	-3.21	-3.07
76	26-05-24 18:45	12.41	12.66
77	26-05-24 19:00	17.06	17.5
78	26-05-24 19:15	47.01	47.17
79	26-05-24 19:30	43.83	44.01
80	26-05-24 19:45	39.63	39.61
81	26-05-24 20:00	40.5	39.55
82	26-05-24 20:15	40.93	40.5
83	26-05-24 20:30	12.85	12.73
84	26-05-24 20:45	-20.04	-19.38
85	26-05-24 21:00	2.81	2.16
86	26-05-24 21:15	11.24	11.06
87	26-05-24 21:30	14.74	14.19
88	26-05-24 21:45	17.22	16.75
89	26-05-24 22:00	18.1	18.22
90	26-05-24 22:15	-40.3	-40.35
91	26-05-24 22:30	-42.38	-42.37
92	26-05-24 22:45	-44.81	-44.5
93	26-05-24 23:00	-43.68	-44.14
94	26-05-24 23:15	-37.31	-36.88
95	26-05-24 23:30	-48.39	-48.32
96	26-05-24 23:45	-47.2	-47.62
26.5.2024	**No. of Blocks export**	**24**	**24**
	No. of Blocks Import	**72**	**72**
	Maximum export	**47.01**	**47.17**
	Maximum Import	**-121.78**	**-122.18**
1	27-05-24 00:00	-46.98	-46.71

S. No.	Time	KTPS	KTPS
		KOTA PG-1	KOTA PG-2
		220KV	220KV
	HRS	MW	MW
2	27-05-24 00:15	-48.16	-48.31
3	27-05-24 00:30	-45.09	-45.24
4	27-05-24 00:45	-44.38	-44.63
5	27-05-24 01:00	-41.56	-41.62
6	27-05-24 01:15	-37.06	-37.01
7	27-05-24 01:30	-58.95	-60.07
8	27-05-24 01:45	-59.57	-60.25
9	27-05-24 02:00	-68.25	-72.98
10	27-05-24 02:15	-60.02	-61.02
11	27-05-24 02:30	-76.89	-77.14
12	27-05-24 02:45	-78.24	-78.28
13	27-05-24 03:00	-75.27	-75.33
14	27-05-24 03:15	-71.56	-71.94
15	27-05-24 03:30	-67.85	-67.87
16	27-05-24 03:45	-63.23	-63.26
17	27-05-24 04:00	-64.41	-64.87
18	27-05-24 04:15	-66.82	-66.98
19	27-05-24 04:30	-66	-66.37
20	27-05-24 04:45	-68.91	-68.42
21	27-05-24 05:00	-56.78	-57.07
22	27-05-24 05:15	-32.68	-32.98
23	27-05-24 05:30	-33.11	-33.59
24	27-05-24 05:45	-37.05	-36.41
25	27-05-24 06:00	-35.58	-35.28
26	27-05-24 06:15	-15.55	-15
27	27-05-24 06:30	-1.72	-1.47
28	27-05-24 06:45	1.22	1.74
29	27-05-24 07:00	-32.38	-31.99
30	27-05-24 07:15	-54.81	-55.08
31	27-05-24 07:30	-55.01	-55.38
32	27-05-24 07:45	-19.35	-19.19
33	27-05-24 08:00	2.78	3.65
34	27-05-24 08:15	7.12	7.39
35	27-05-24 08:30	6.82	6.68
36	27-05-24 08:45	10.82	10.75
37	27-05-24 09:00	20.72	21.46
38	27-05-24 09:15	32.15	31.81
39	27-05-24 09:30	25.68	25.5
40	27-05-24 09:45	-17.74	-16.71
41	27-05-24 10:00	-24.57	-24.56
42	27-05-24 10:15	-26.05	-26.16
43	27-05-24 10:30	-32	-31.58
44	27-05-24 10:45	-32.25	-32.62
45	27-05-24 11:00	-27.57	-27.75
46	27-05-24 11:15	-31.87	-31.97
47	27-05-24 11:30	-36.11	-36.96
48	27-05-24 11:45	-37.26	-37.45
49	27-05-24 12:00	-31.22	-31.48
50	27-05-24 12:15	-27.71	-28.2
51	27-05-24 12:30	-26.96	-27.54
52	27-05-24 12:45	-22.82	-23.58
53	27-05-24 13:00	-20.24	-21.16
54	27-05-24 13:15	-6.51	-7.13
55	27-05-24 13:30	54.11	53.12
56	27-05-24 13:45	41.68	40.33

S. No.	Time	KTPS	KTPS
		KOTA PG-1	KOTA PG-2
		220KV	220KV
	HRS	MW	MW
57	27-05-24 14:00	48.11	48.13
58	27-05-24 14:15	40.69	40.04
59	27-05-24 14:30	22.7	22.49
60	27-05-24 14:45	30.73	30.05
61	27-05-24 15:00	16.83	16.82
62	27-05-24 15:15	21.04	20.51
63	27-05-24 15:30	15.88	15.34
64	27-05-24 15:45	-13.38	-13.79
65	27-05-24 16:00	-7.51	-7.97
66	27-05-24 16:15	-2.14	-2.77
67	27-05-24 16:30	14.52	14.76
68	27-05-24 16:45	17.84	17.66
69	27-05-24 17:00	20.64	20.15
70	27-05-24 17:15	4.73	4.2
71	27-05-24 17:30	-21.79	-21.85
72	27-05-24 17:45	-31.33	-30.4
73	27-05-24 18:00	-28.78	-28.23
74	27-05-24 18:15	-10.13	-10.53
75	27-05-24 18:30	17.25	17.35
76	27-05-24 18:45	23.66	23.84
77	27-05-24 19:00	37.67	37.99
78	27-05-24 19:15	37.65	37.12
79	27-05-24 19:30	34.73	34.59
80	27-05-24 19:45	24.59	23.98
81	27-05-24 20:00	27.11	27.18
82	27-05-24 20:15	23.82	23.77
83	27-05-24 20:30	16.38	16.96
84	27-05-24 20:45	18.86	18.83
85	27-05-24 21:00	29.59	28.41
86	27-05-24 21:15	-6.17	-7.68
87	27-05-24 21:30	-8.02	-8.05
88	27-05-24 21:45	-25.65	-25.7
89	27-05-24 22:00	-28.62	-28.5
90	27-05-24 22:15	-27.76	-27.75
91	27-05-24 22:30	-29.58	-28.87
92	27-05-24 22:45	-25.37	-24.57
93	27-05-24 23:00	-17.56	-17.57
94	27-05-24 23:15	-18.32	-18.41
95	27-05-24 23:30	-21.08	-21.1
96	27-05-24 23:45	-19.31	-19.53
27.5.2024	**No. of Blocks export**	**32**	**32**
	No. of Blocks Import	**64**	**64**
	Maximum export	**54.11**	**53.12**
	Maximum Import	**-78.24**	**-78.28**
1	28-05-24 00:00	-14.68	-15.41
2	28-05-24 00:15	7.47	6.53
3	28-05-24 00:30	0.96	0.61
4	28-05-24 00:45	-14.78	-14.55
5	28-05-24 01:00	-14.77	-14.91
6	28-05-24 01:15	-13.96	-13.55
7	28-05-24 01:30	-15.57	-15.59
8	28-05-24 01:45	-39.2	-39.74
9	28-05-24 02:00	-55.2	-54.92
10	28-05-24 02:15	-48.85	-49.36
11	28-05-24 02:30	-22.22	-22.54

S. No.	Time	KTPS	KTPS
		KOTA PG-1	KOTA PG-2
		220KV	220KV
	HRS	MW	MW
12	28-05-24 02:45	-10.37	-9.33
13	28-05-24 03:00	-8.48	-8.32
14	28-05-24 03:15	-4.38	-4.76
15	28-05-24 03:30	-4.68	-4.79
16	28-05-24 03:45	3.31	2.78
17	28-05-24 04:00	2.48	2.69
18	28-05-24 04:15	-0.98	-0.67
19	28-05-24 04:30	3.07	2.78
20	28-05-24 04:45	-3.44	-3.61
21	28-05-24 05:00	-14.23	-14.25
22	28-05-24 05:15	-17.93	-18.39
23	28-05-24 05:30	-20.06	-20.48
24	28-05-24 05:45	-25.66	-25.54
25	28-05-24 06:00	-24.47	-24.32
26	28-05-24 06:15	-67.94	-67.3
27	28-05-24 06:30	-82.24	-82.54
28	28-05-24 06:45	-78.13	-78.27
29	28-05-24 07:00	-73.04	-72.39
30	28-05-24 07:15	-33	-32.86
31	28-05-24 07:30	-20.03	-20.04
32	28-05-24 07:45	-9.63	-10.15
33	28-05-24 08:00	-35.5	-35.82
34	28-05-24 08:15	-40.25	-40.68
35	28-05-24 08:30	-36.62	-36.44
36	28-05-24 08:45	-29.5	-29.12
37	28-05-24 09:00	-26.56	-27.47
38	28-05-24 09:15	-35.2	-34.75
39	28-05-24 09:30	-35.32	-35.19
40	28-05-24 09:45	-29.65	-29.97
41	28-05-24 10:00	-13.64	-13.79
42	28-05-24 10:15	-7.31	-7.49
43	28-05-24 10:30	-11.01	-11.44
44	28-05-24 10:45	-2.83	-3.06
45	28-05-24 11:00	-9.32	-10.09
46	28-05-24 11:15	-30.35	-31.08
47	28-05-24 11:30	-33.89	-35.1
48	28-05-24 11:45	-38.55	-38.79
49	28-05-24 12:00	-33.21	-34.25
50	28-05-24 12:15	-31.91	-32.54
51	28-05-24 12:30	-30.31	-30.52
52	28-05-24 12:45	-27.83	-28.06
53	28-05-24 13:00	-21.77	-21.81
54	28-05-24 13:15	-19.92	-20.99
55	28-05-24 13:30	-11.93	-12.13
56	28-05-24 13:45	8.06	7.76
57	28-05-24 14:00	33.42	32.05
58	28-05-24 14:15	17.16	16.26
59	28-05-24 14:30	-5.68	-5.83
60	28-05-24 14:45	-6.31	-6.32
61	28-05-24 15:00	3.47	3.32
62	28-05-24 15:15	3.24	2.8
63	28-05-24 15:30	44.33	44.37
64	28-05-24 15:45	52.18	52.05
65	28-05-24 16:00	41.13	41.31
66	28-05-24 16:15	31.68	32.01

S. No.	Time	KTPS	KTPS
		KOTA PG-1	KOTA PG-2
		220KV	220KV
	HRS	MW	MW
67	28-05-24 16:30	32.01	30.9
68	28-05-24 16:45	37.82	37.39
69	28-05-24 17:00	48.16	48.52
70	28-05-24 17:15	43.23	43.57
71	28-05-24 17:30	47.48	47.71
72	28-05-24 17:45	66.88	66.87
73	28-05-24 18:00	65.87	66.35
74	28-05-24 18:15	73.9	73.97
75	28-05-24 18:30	73.27	73.28
76	28-05-24 18:45	63.37	63.07
77	28-05-24 19:00	75.39	75.34
78	28-05-24 19:15	83.32	83.44
79	28-05-24 19:30	66.35	65.93
80	28-05-24 19:45	61.08	61.14
81	28-05-24 20:00	59.22	59.23
82	28-05-24 20:15	55.91	56.22
83	28-05-24 20:30	56.18	54.35
84	28-05-24 20:45	46.34	46.28
85	28-05-24 21:00	44.52	44.48
86	28-05-24 21:15	37.48	37.29
87	28-05-24 21:30	43.34	43.9
88	28-05-24 21:45	42.64	42.37
89	28-05-24 22:00	39.15	39.67
90	28-05-24 22:15	33.85	33.7
91	28-05-24 22:30	31.07	30.48
92	28-05-24 22:45	27.62	26.61
93	28-05-24 23:00	23.57	23.73
94	28-05-24 23:15	20.6	21.29
95	28-05-24 23:30	21.05	20.95
96	28-05-24 23:45	24.39	23.82
28.5.2024	**No. of Blocks export**	**44**	**44**
	No. of Blocks Import	**52**	**52**
	Maximum export	**83.32**	**83.44**
	Maximum Import	**-82.24**	**-82.54**
1	29-05-24 00:00	28.67	28.41
2	29-05-24 00:15	29.5	29.38
3	29-05-24 00:30	28.2	27.49
4	29-05-24 00:45	28.94	28.52
5	29-05-24 01:00	29.18	28.92
6	29-05-24 01:15	30.13	29.61
7	29-05-24 01:30	6.7	6.96
8	29-05-24 01:45	-16	-15.53
9	29-05-24 02:00	-17.37	-16.95
10	29-05-24 02:15	-14.9	-15.09
11	29-05-24 02:30	-4.27	-5.09
12	29-05-24 02:45	25.95	25.67
13	29-05-24 03:00	37.14	36.93
14	29-05-24 03:15	34.07	34.25
15	29-05-24 03:30	7.38	6.77
16	29-05-24 03:45	-5.24	-6.05
17	29-05-24 04:00	-3.49	-3.23
18	29-05-24 04:15	-7.28	-6.24
19	29-05-24 04:30	-1.92	-2.31
20	29-05-24 04:45	-2.99	-3.4
21	29-05-24 05:00	-10.85	-10.93

S. No.	Time	KTPS	KTPS
		KOTA PG-1	KOTA PG-2
		220KV	220KV
	HRS	MW	MW
22	29-05-24 05:15	-19.63	-20.12
23	29-05-24 05:30	-22.75	-22.85
24	29-05-24 05:45	-20.11	-20.25
25	29-05-24 06:00	-21.54	-21.97
26	29-05-24 06:15	-28.91	-29.33
27	29-05-24 06:30	-34.14	-34.26
28	29-05-24 06:45	-34.67	-34.15
29	29-05-24 07:00	-34.34	-34.44
30	29-05-24 07:15	-34.12	-34
31	29-05-24 07:30	-35.44	-35.22
32	29-05-24 07:45	-30.84	-30.54
33	29-05-24 08:00	-13.45	-14.15
34	29-05-24 08:15	-14.05	-14.36
35	29-05-24 08:30	-11.87	-11.69
36	29-05-24 08:45	-12.49	-11.99
37	29-05-24 09:00	-11.7	-11.63
38	29-05-24 09:15	-8.68	-9
39	29-05-24 09:30	-10.03	-9.96
40	29-05-24 09:45	-6.67	-7.31
41	29-05-24 10:00	0.94	-0.29
42	29-05-24 10:15	-3.39	-3.91
43	29-05-24 10:30	-0.5	-0.96
44	29-05-24 10:45	-1.33	-1.26
45	29-05-24 11:00	1.58	1.06
46	29-05-24 11:15	4.64	3.93
47	29-05-24 11:30	8.87	8.55
48	29-05-24 11:45	19.25	18.67
49	29-05-24 12:00	50.55	50.04
50	29-05-24 12:15	62.49	61.24
51	29-05-24 12:30	66.93	65.06
52	29-05-24 12:45	56.81	56.37
53	29-05-24 13:00	53.29	52.15
54	29-05-24 13:15	48.78	48.46
55	29-05-24 13:30	47.27	46.6
56	29-05-24 13:45	46.64	46.08
57	29-05-24 14:00	42.02	41.37
58	29-05-24 14:15	34.82	34.25
59	29-05-24 14:30	33.52	32.96
60	29-05-24 14:45	28.5	28.16
61	29-05-24 15:00	20.92	20.92
62	29-05-24 15:15	22.66	22.44
63	29-05-24 15:30	16.06	16.46
64	29-05-24 15:45	19.39	18.49
65	29-05-24 16:00	11.34	11.08
66	29-05-24 16:15	10.29	10.29
67	29-05-24 16:30	5	5.22
68	29-05-24 16:45	7.94	7.45
69	29-05-24 17:00	5.54	5.62
70	29-05-24 17:15	14.25	14.74
71	29-05-24 17:30	51.53	51.37
72	29-05-24 17:45	62.52	62.54
73	29-05-24 18:00	54.25	54.85
74	29-05-24 18:15	44.57	44.78
75	29-05-24 18:30	56.17	56
76	29-05-24 18:45	57.74	57.86

S. No.	Time	KTPS	KTPS
		KOTA PG-1	KOTA PG-2
		220KV	220KV
	HRS	MW	MW
77	29-05-24 19:00	65.67	66.75
78	29-05-24 19:15	61.71	62.05
79	29-05-24 19:30	60.64	60.35
80	29-05-24 19:45	55.6	55.37
81	29-05-24 20:00	51.47	51.18
82	29-05-24 20:15	45.99	45.71
83	29-05-24 20:30	45.71	45.44
84	29-05-24 20:45	41.37	41.41
85	29-05-24 21:00	42.65	42.99
86	29-05-24 21:15	42.04	42.29
87	29-05-24 21:30	35.22	34.57
88	29-05-24 21:45	35.81	35.18
89	29-05-24 22:00	31.15	31.16
90	29-05-24 22:15	32.95	32.88
91	29-05-24 22:30	31.33	31.21
92	29-05-24 22:45	26.03	26.18
93	29-05-24 23:00	28.34	28.34
94	29-05-24 23:15	26.58	25.67
95	29-05-24 23:30	25.47	25.15
96	29-05-24 23:45	23.96	23.89
29.5.2024	**No. of Blocks export**	**64**	**63**
	No. of Blocks Import	**32**	**33**
	Maximum export	**66.93**	**66.75**
	Maximum Import	**-35.44**	**-35.22**
1	30-05-24 00:00	22.56	22.18
2	30-05-24 00:15	16.26	16.23
3	30-05-24 00:30	-13.59	-14.65
4	30-05-24 00:45	-27.49	-28.01
5	30-05-24 01:00	-28.22	-28.03
6	30-05-24 01:15	-20.02	-21.09
7	30-05-24 01:30	-9.01	-10.02
8	30-05-24 01:45	19.19	18.76
9	30-05-24 02:00	26.88	26.31
10	30-05-24 02:15	29.72	29.66
11	30-05-24 02:30	30.95	30.56
12	30-05-24 02:45	32.51	32.14
13	30-05-24 03:00	31.11	30.59
14	30-05-24 03:15	32.59	32.46
15	30-05-24 03:30	31.7	32.15
16	30-05-24 03:45	32.62	33.17
17	30-05-24 04:00	36.83	36.98
18	30-05-24 04:15	35.39	35.14
19	30-05-24 04:30	34.62	34.67
20	30-05-24 04:45	34.27	34.46
21	30-05-24 05:00	24.43	24.27
22	30-05-24 05:15	20.36	20.36
23	30-05-24 05:30	19.61	18.71
24	30-05-24 05:45	18.74	18.85
25	30-05-24 06:00	15.67	14.29
26	30-05-24 06:15	9.71	9.21
27	30-05-24 06:30	2.2	1.82
28	30-05-24 06:45	7.66	7.9
29	30-05-24 07:00	-12.15	-10
30	30-05-24 07:15	-52.67	-52.37
31	30-05-24 07:30	-59.63	-59.27

S. No.	Time	KTPS	KTPS
		KOTA PG-1	KOTA PG-2
		220KV	220KV
	HRS	MW	MW
32	30-05-24 07:45	-49.87	-50.03
33	30-05-24 08:00	-40.84	-41.49
34	30-05-24 08:15	-38.8	-38.82
35	30-05-24 08:30	-23.62	-23.59
36	30-05-24 08:45	-0.63	-0.33
37	30-05-24 09:00	-0.02	-0.08
38	30-05-24 09:15	1.68	1.42
39	30-05-24 09:30	5.85	5.35
40	30-05-24 09:45	3.82	3.27
41	30-05-24 10:00	8.02	7.86
42	30-05-24 10:15	7.9	7.33
43	30-05-24 10:30	12.29	12.04
44	30-05-24 10:45	15.87	15.64
45	30-05-24 11:00	20.73	20.64
46	30-05-24 11:15	14.22	13.92
47	30-05-24 11:30	15.84	15.4
48	30-05-24 11:45	13.28	13.18
49	30-05-24 12:00	25.93	25.26
50	30-05-24 12:15	23.43	23.19
51	30-05-24 12:30	19.4	18.69
52	30-05-24 12:45	16.68	16.2
53	30-05-24 13:00	19.92	19.58
54	30-05-24 13:15	23.47	23.58
55	30-05-24 13:30	22.2	21.54
56	30-05-24 13:45	3.46	2.98
57	30-05-24 14:00	-25.2	-24.31
58	30-05-24 14:15	-34.53	-33.72
59	30-05-24 14:30	-33.08	-32.33
60	30-05-24 14:45	-30.12	-29.37
61	30-05-24 15:00	-30.46	-29.93
62	30-05-24 15:15	-27.11	-26.72
63	30-05-24 15:30	-29.26	-28.34
64	30-05-24 15:45	-29.1	-27.88
65	30-05-24 16:00	-30.16	-29.1
66	30-05-24 16:15	-47.19	-46.79
67	30-05-24 16:30	-66.19	-65.23
68	30-05-24 16:45	-57.55	-57.42
69	30-05-24 17:00	-29.59	-28.4
70	30-05-24 17:15	-13.34	-12.39
71	30-05-24 17:30	-7.53	-7.06
72	30-05-24 17:45	3.58	4.41
73	30-05-24 18:00	42.69	43.17
74	30-05-24 18:15	50.07	50.04
75	30-05-24 18:30	55.19	55.66
76	30-05-24 18:45	61.04	61.02
77	30-05-24 19:00	50.14	50.36
78	30-05-24 19:15	26.4	26.02
79	30-05-24 19:30	14.38	13.1
80	30-05-24 19:45	13.43	12.33
81	30-05-24 20:00	27.35	26.46
82	30-05-24 20:15	58.74	59.18
83	30-05-24 20:30	59.33	59.32
84	30-05-24 20:45	50.47	50.49
85	30-05-24 21:00	50.42	50.19
86	30-05-24 21:15	52.86	53.67

S. No.	Time	KTPS	KTPS
		KOTA PG-1	KOTA PG-2
		220KV	220KV
	HRS	MW	MW
87	30-05-24 21:30	41.87	41.94
88	30-05-24 21:45	37.48	36.9
89	30-05-24 22:00	47.36	46.6
90	30-05-24 22:15	51.64	51.43
91	30-05-24 22:30	47.13	47.54
92	30-05-24 22:45	46.53	46.24
93	30-05-24 23:00	52.14	51.98
94	30-05-24 23:15	54.28	53.61
95	30-05-24 23:30	40.16	39.48
96	30-05-24 23:45	31.75	31
30.5.2024	**No. of Blocks export**	**67**	**67**
	No. of Blocks Import	**29**	**29**
	Maximum export	**61.04**	**61.02**
	Maximum Import	**-66.19**	**-65.23**
1	31-05-24 00:00	38.01	37.58
2	31-05-24 00:15	37.08	37.37
3	31-05-24 00:30	34.09	33.37
4	31-05-24 00:45	39.31	37.61
5	31-05-24 01:00	35.9	35.18
6	31-05-24 01:15	30.19	30.18
7	31-05-24 01:30	30	29.62
8	31-05-24 01:45	24.1	22.81
9	31-05-24 02:00	23.48	22.52
10	31-05-24 02:15	13.63	11.7
11	31-05-24 02:30	-13.84	-17.08
12	31-05-24 02:45	-14.19	-16.91
13	31-05-24 03:00	-12.25	-15.02
14	31-05-24 03:15	-8.8	-12.35
15	31-05-24 03:30	-7.78	-10.98
16	31-05-24 03:45	-6.76	-9.71
17	31-05-24 04:00	-6.33	-9.15
18	31-05-24 04:15	-9.02	-12.39
19	31-05-24 04:30	-8.89	-11.84
20	31-05-24 04:45	-8.55	-12.18
21	31-05-24 05:00	-22.14	-25.82
22	31-05-24 05:15	-58.6	-61.24
23	31-05-24 05:30	-58.03	-60.27
24	31-05-24 05:45	-58.39	-60.7
25	31-05-24 06:00	-55.92	-58.15
26	31-05-24 06:15	-61.89	-64.65
27	31-05-24 06:30	-64.08	-66.25
28	31-05-24 06:45	-65.44	-67.57
29	31-05-24 07:00	-69.01	-71.62
30	31-05-24 07:15	-72.36	-75.73
31	31-05-24 07:30	-70.16	-72.63
32	31-05-24 07:45	-69.59	-72.32
33	31-05-24 08:00	-68.82	-71.2
34	31-05-24 08:15	-62.58	-64.64
35	31-05-24 08:30	-60.27	-62.53
36	31-05-24 08:45	-56.69	-58.5
37	31-05-24 09:00	-56.92	-59.61
38	31-05-24 09:15	-62.65	-65.47
39	31-05-24 09:30	-76.97	-79.81
40	31-05-24 09:45	-87.02	-89.75
41	31-05-24 10:00	-84.72	-87.11

S. No.	Time	KTPS	KTPS
		KOTA PG-1	KOTA PG-2
		220KV	220KV
	HRS	MW	MW
42	31-05-24 10:15	-79.98	-82.75
43	31-05-24 10:30	-68.51	-71.81
44	31-05-24 10:45	-74.58	-77.68
45	31-05-24 11:00	-41.88	-45.25
46	31-05-24 11:15	-51.45	-55.29
47	31-05-24 11:30	-51.92	-54.41
48	31-05-24 11:45	-50.51	-53.1
49	31-05-24 12:00	-39.37	-42.37
50	31-05-24 12:15	-33.65	-37.93
51	31-05-24 12:30	-31.56	-34.7
52	31-05-24 12:45	-29.16	-33.36
53	31-05-24 13:00	-25.03	-28.29
54	31-05-24 13:15	-20.27	-23.76
55	31-05-24 13:30	-24.83	-27.95
56	31-05-24 13:45	-25.1	-30.03
57	31-05-24 14:00	-27.87	-32.14
58	31-05-24 14:15	-27.58	-31.44
59	31-05-24 14:30	-11.8	-14.91
60	31-05-24 14:45	-13.88	-16.45
61	31-05-24 15:00	-13.92	-17.4
62	31-05-24 15:15	-13.12	-16.34
63	31-05-24 15:30	-14.97	-17.9
64	31-05-24 15:45	-16.32	-19.12
65	31-05-24 16:00	-2.66	-5.94
66	31-05-24 16:15	-12.3	-15.34
67	31-05-24 16:30	-10.58	-12.93
68	31-05-24 16:45	-10.66	-14.18
69	31-05-24 17:00	-5.72	-8.54
70	31-05-24 17:15	-4.5	-7.41
71	31-05-24 17:30	-6.44	-10.22
72	31-05-24 17:45	-4.13	-7.51
73	31-05-24 18:00	2.37	-0.51
74	31-05-24 18:15	8.25	5.44
75	31-05-24 18:30	11.49	8.38
76	31-05-24 18:45	10.99	7.78
77	31-05-24 19:00	14.88	11.74
78	31-05-24 19:15	12.06	8.55
79	31-05-24 19:30	4.5	0.89
80	31-05-24 19:45	0.91	-1.29
81	31-05-24 20:00	3.81	1.1
82	31-05-24 20:15	-2.49	-4.89
83	31-05-24 20:30	-6.16	-9.13
84	31-05-24 20:45	-5.02	-8.45
85	31-05-24 21:00	3.24	0.53
86	31-05-24 21:15	4.93	1.69
87	31-05-24 21:30	1.48	-0.98
88	31-05-24 21:45	21.43	19.11
89	31-05-24 22:00	40.65	38.43
90	31-05-24 22:15	51.96	48.86
91	31-05-24 22:30	56.92	53.92
92	31-05-24 22:45	56.77	53.77
93	31-05-24 23:00	49.99	46.74
94	31-05-24 23:15	46.91	43.91
95	31-05-24 23:30	36.78	34.11
96	31-05-24 23:45	21.9	18.72

S. No.	Time	KTPS	KTPS
		KOTA PG-1	KOTA PG-2
		220KV	220KV
	HRS	MW	MW
31.5.2024	No. of Blocks export	31	28
	No. of Blocks Import	65	68
	Maximum export	56.92	53.92
	Maximum Import	-87.02	-89.75
1	01-06-24 00:00	7.36	4.71
2	01-06-24 00:15	6.04	2.69
3	01-06-24 00:30	-1.33	-4.07
4	01-06-24 00:45	-1.79	-5.73
5	01-06-24 01:00	-6.72	-9.85
6	01-06-24 01:15	-14.75	-18.21
7	01-06-24 01:30	-12.47	-15.15
8	01-06-24 01:45	-10.59	-13.56
9	01-06-24 02:00	-7.89	-10.63
10	01-06-24 02:15	-4.28	-6.67
11	01-06-24 02:30	4.92	3.11
12	01-06-24 02:45	12.86	11.1
13	01-06-24 03:00	9.98	7.86
14	01-06-24 03:15	20.3	18.83
15	01-06-24 03:30	27.31	26.45
16	01-06-24 03:45	31.2	30.03
17	01-06-24 04:00	36.49	35.89
18	01-06-24 04:15	37.12	36.71
19	01-06-24 04:30	35.14	34.91
20	01-06-24 04:45	33.29	34.54
21	01-06-24 05:00	26.03	26.12
22	01-06-24 05:15	11.14	11.01
23	01-06-24 05:30	-23.32	-22.48
24	01-06-24 05:45	-23.58	-23.44
25	01-06-24 06:00	-9.31	-8.99
26	01-06-24 06:15	-21.26	-20.68
27	01-06-24 06:30	-19.74	-18.73
28	01-06-24 06:45	-18.46	-18.14
29	01-06-24 07:00	-23.53	-22.64
30	01-06-24 07:15	-23.34	-22.98
31	01-06-24 07:30	-16.98	-16.91
32	01-06-24 07:45	-13.25	-13.14
33	01-06-24 08:00	-9.99	-9.48
34	01-06-24 08:15	-8.84	-8.65
35	01-06-24 08:30	-8.94	-8.77
36	01-06-24 08:45	-1.59	-1.48
37	01-06-24 09:00	1.37	2.86
38	01-06-24 09:15	-3.54	-3.18
39	01-06-24 09:30	-0.45	0.17
40	01-06-24 09:45	0.63	1.35
41	01-06-24 10:00	6.91	7.28
42	01-06-24 10:15	-6.94	-6.69
43	01-06-24 10:30	-5.93	-5.35
44	01-06-24 10:45	-6.95	-6.24
45	01-06-24 11:00	-1.5	-1.92
46	01-06-24 11:15	-2.78	-2.09
47	01-06-24 11:30	-5.78	-4.94
48	01-06-24 11:45	-5.98	-5.38
49	01-06-24 12:00	7	6.91
50	01-06-24 12:15	7.79	7.47
51	01-06-24 12:30	10.59	10.97

S. No.	Time	KTPS	KTPS
		KOTA PG-1	KOTA PG-2
		220KV	220KV
	HRS	MW	MW
52	01-06-24 12:45	10.37	10.8
53	01-06-24 13:00	13.85	14.06
54	01-06-24 13:15	15.58	17.12
55	01-06-24 13:30	11.94	14.13
56	01-06-24 13:45	3.66	4.19
57	01-06-24 14:00	0.35	0.81
58	01-06-24 14:15	-12.03	-11.46
59	01-06-24 14:30	-6.06	-5.1
60	01-06-24 14:45	-3.76	-2.93
61	01-06-24 15:00	4.01	4.9
62	01-06-24 15:15	33.49	33.4
63	01-06-24 15:30	18.39	18.52
64	01-06-24 15:45	-9.15	-9.27
65	01-06-24 16:00	-3.57	-4.34
66	01-06-24 16:15	-16.7	-16.92
67	01-06-24 16:30	-22.22	-21.94
68	01-06-24 16:45	-21.71	-22.02
69	01-06-24 17:00	11.3	11.48
70	01-06-24 17:15	26.61	26.79
71	01-06-24 17:30	33.16	33.38
72	01-06-24 17:45	42.62	42.28
73	01-06-24 18:00	55.39	55.44
74	01-06-24 18:15	67.56	67.64
75	01-06-24 18:30	84.26	84.38
76	01-06-24 18:45	87.19	86.41
77	01-06-24 19:00	89.7	89.57
78	01-06-24 19:15	83.15	83.47
79	01-06-24 19:30	79.86	79.73
80	01-06-24 19:45	71.48	71.27
81	01-06-24 20:00	35.11	33.97
82	01-06-24 20:15	22.54	22.25
83	01-06-24 20:30	15.13	15
84	01-06-24 20:45	21.55	20.82
85	01-06-24 21:00	37.74	35.66
86	01-06-24 21:15	47.17	47.49
87	01-06-24 21:30	46.73	48.3
88	01-06-24 21:45	37.08	37.65
89	01-06-24 22:00	34.84	34.6
90	01-06-24 22:15	34.89	34.88
91	01-06-24 22:30	32.18	32.06
92	01-06-24 22:45	28.6	29.19
93	01-06-24 23:00	25.87	25.78
94	01-06-24 23:15	18.96	17.6
95	01-06-24 23:30	6.95	7.67
96	01-06-24 23:45	4.07	4.23
1.6.2024	**No. of Blocks export**	**57**	**58**
	No. of Blocks Import	**39**	**38**
	Maximum export	**89.7**	**89.57**
	Maximum Import	**-23.58**	**-23.44**
1	02-06-24 00:00	4.15	4.44
2	02-06-24 00:15	5.38	5.77
3	02-06-24 00:30	6.18	6.77
4	02-06-24 00:45	10.19	10.61
5	02-06-24 01:00	12.74	12.08
6	02-06-24 01:15	-4.53	-4.62

S. No.	Time	KTPS	KTPS
		KOTA PG-1	KOTA PG-2
		220KV	220KV
	HRS	MW	MW
7	02-06-24 01:30	-38.85	-38.74
8	02-06-24 01:45	-39.43	-39.28
9	02-06-24 02:00	-41.36	-41.57
10	02-06-24 02:15	-41.35	-41.02
11	02-06-24 02:30	-41.95	-41.49
12	02-06-24 02:45	-43.06	-42.88
13	02-06-24 03:00	-37.52	-37.59
14	02-06-24 03:15	-34.57	-34
15	02-06-24 03:30	-30.91	-30.56
16	02-06-24 03:45	-32.49	-31.98
17	02-06-24 04:00	-28.99	-29.77
18	02-06-24 04:15	-28.37	-28.53
19	02-06-24 04:30	-28.67	-28.36
20	02-06-24 04:45	-30.61	-30.64
21	02-06-24 05:00	2.68	3.1
22	02-06-24 05:15	6.7	7.08
23	02-06-24 05:30	5.3	5.55
24	02-06-24 05:45	7.65	8.72
25	02-06-24 06:00	6.22	6.25
26	02-06-24 06:15	-3.67	-3.3
27	02-06-24 06:30	-1.22	-0.83
28	02-06-24 06:45	-16.48	-16.22
29	02-06-24 07:00	-57.47	-56.5
30	02-06-24 07:15	-66.08	-65.57
31	02-06-24 07:30	-71.16	-71.21
32	02-06-24 07:45	-67.18	-66.38
33	02-06-24 08:00	-63.74	-64.04
34	02-06-24 08:15	-62.55	-62.66
35	02-06-24 08:30	-57.44	-57.78
36	02-06-24 08:45	-57.32	-57.69
37	02-06-24 09:00	-52.28	-51.79
38	02-06-24 09:15	-50.31	-50.23
39	02-06-24 09:30	-47.23	-47.49
40	02-06-24 09:45	-48.61	-48.48
41	02-06-24 10:00	-42.56	-42.4
42	02-06-24 10:15	-39.27	-39.47
43	02-06-24 10:30	-38.73	-38.89
44	02-06-24 10:45	-33.93	-33.81
45	02-06-24 11:00	-30.45	-31.47
46	02-06-24 11:15	-29.21	-29.41
47	02-06-24 11:30	-27	-26.64
48	02-06-24 11:45	-26.49	-26.83
49	02-06-24 12:00	-19.55	-19.4
50	02-06-24 12:15	-18.27	-18.68
51	02-06-24 12:30	-18.55	-19.11
52	02-06-24 12:45	-18.63	-18.69
53	02-06-24 13:00	-19.99	-19.64
54	02-06-24 13:15	-22.55	-23.15
55	02-06-24 13:30	-23.41	-23.76
56	02-06-24 13:45	-24	-24.27
57	02-06-24 14:00	-2.4	-2.21
58	02-06-24 14:15	12.19	11.89
59	02-06-24 14:30	13.74	13.81
60	02-06-24 14:45	17.02	16.99
61	02-06-24 15:00	15.55	16.42

S. No.	Time	KTPS	KTPS
		KOTA PG-1	KOTA PG-2
		220KV	220KV
	HRS	MW	MW
62	02-06-24 15:15	19.45	19.41
63	02-06-24 15:30	0.43	0.64
64	02-06-24 15:45	-35.24	-34.93
65	02-06-24 16:00	-33.72	-34.12
66	02-06-24 16:15	-32.38	-31.86
67	02-06-24 16:30	-29.29	-29.68
68	02-06-24 16:45	-28.08	-27.68
69	02-06-24 17:00	-24.95	-24.36
70	02-06-24 17:15	-21.88	-21.44
71	02-06-24 17:30	-15.37	-15.52
72	02-06-24 17:45	-13.41	-13.38
73	02-06-24 18:00	-5.36	-4.49
74	02-06-24 18:15	13.54	13.14
75	02-06-24 18:30	19.88	20.25
76	02-06-24 18:45	24.04	24.33
77	02-06-24 19:00	29.07	29.47
78	02-06-24 19:15	34.79	35.35
79	02-06-24 19:30	45.58	45.44
80	02-06-24 19:45	44.93	44.9
81	02-06-24 20:00	35.03	35.17
82	02-06-24 20:15	28.34	28.4
83	02-06-24 20:30	19.18	19.12
84	02-06-24 20:45	15.03	15.07
85	02-06-24 21:00	44.3	44.02
86	02-06-24 21:15	57.72	57.94
87	02-06-24 21:30	54.86	55.25
88	02-06-24 21:45	53.01	53.05
89	02-06-24 22:00	50.89	50.85
90	02-06-24 22:15	46.82	46.31
91	02-06-24 22:30	44.07	44.2
92	02-06-24 22:45	41.95	41.98
93	02-06-24 23:00	39.38	39.56
94	02-06-24 23:15	34.29	33.5
95	02-06-24 23:30	36.41	36.47
96	02-06-24 23:45	47.15	47.74
2.6.2024	**No. of Blocks export**	**39**	**39**
	No. of Blocks Import	**57**	**57**
	Maximum export	**57.72**	**57.94**
	Maximum Import	**-71.16**	**-71.21**
1	03-06-24 00:00	51.55	51.9
2	03-06-24 00:15	52.93	53.58
3	03-06-24 00:30	61.04	61.12
4	03-06-24 00:45	51.76	52.06
5	03-06-24 01:00	53.78	53.43
6	03-06-24 01:15	47.4	47.02
7	03-06-24 01:30	41.55	42.08
8	03-06-24 01:45	26.23	26.53
9	03-06-24 02:00	23.92	24.49
10	03-06-24 02:15	22.92	22.82
11	03-06-24 02:30	23.61	23.81
12	03-06-24 02:45	25.59	26.42
13	03-06-24 03:00	28.65	28.81
14	03-06-24 03:15	30.97	30.79
15	03-06-24 03:30	36.07	36.11
16	03-06-24 03:45	36.47	36.27

S. No.	Time	KTPS	KTPS
		KOTA PG-1	KOTA PG-2
		220KV	220KV
	HRS	MW	MW
17	03-06-24 04:00	38.07	39.12
18	03-06-24 04:15	38.34	39.05
19	03-06-24 04:30	37.45	37.44
20	03-06-24 04:45	31.08	30.77
21	03-06-24 05:00	28.64	28.75
22	03-06-24 05:15	24.74	24.61
23	03-06-24 05:30	22.05	21.96
24	03-06-24 05:45	23.08	22.74
25	03-06-24 06:00	15.54	15.49
26	03-06-24 06:15	9.62	9.36
27	03-06-24 06:30	6.55	7.36
28	03-06-24 06:45	1.96	2.48
29	03-06-24 07:00	3.76	4.32
30	03-06-24 07:15	2.03	2.49
31	03-06-24 07:30	-0.64	-0.41
32	03-06-24 07:45	-3.14	-1.78
33	03-06-24 08:00	-3.28	-2.61
34	03-06-24 08:15	-2.31	-2.3
35	03-06-24 08:30	0.41	0.31
36	03-06-24 08:45	3.13	3.63
37	03-06-24 09:00	0.2	0.96
38	03-06-24 09:15	-1.6	-1.63
39	03-06-24 09:30	-0.63	-0.32
40	03-06-24 09:45	4.27	4.13
41	03-06-24 10:00	8.91	8.98
42	03-06-24 10:15	7.13	6.48
43	03-06-24 10:30	-8.82	-8.67
44	03-06-24 10:45	-40.14	-40.14
45	03-06-24 11:00	-31.24	-31.49
46	03-06-24 11:15	-27.12	-26.97
47	03-06-24 11:30	-11.74	-11.82
48	03-06-24 11:45	20.42	20.03
49	03-06-24 12:00	40.71	40.67
50	03-06-24 12:15	41.64	41.13
51	03-06-24 12:30	46.85	47
52	03-06-24 12:45	45.36	45.61
53	03-06-24 13:00	52.55	52.13
54	03-06-24 13:15	50.27	50.1
55	03-06-24 13:30	48.15	46.66
56	03-06-24 13:45	45.82	45
57	03-06-24 14:00	42.49	42.44
58	03-06-24 14:15	42.16	41.71
59	03-06-24 14:30	42.87	42.6
60	03-06-24 14:45	30.12	29.39
61	03-06-24 15:00	23.57	23.4
62	03-06-24 15:15	25.81	25.68
63	03-06-24 15:30	24.28	23.97
64	03-06-24 15:45	20.83	20.77
65	03-06-24 16:00	19.96	20.45
66	03-06-24 16:15	19.46	19.79
67	03-06-24 16:30	27.39	28.02
68	03-06-24 16:45	28.16	28.13
69	03-06-24 17:00	28.51	28.31
70	03-06-24 17:15	24.15	23.97
71	03-06-24 17:30	32.21	32.17

S. No.	Time	KTPS	KTPS
		KOTA PG-1	KOTA PG-2
		220KV	220KV
	HRS	MW	MW
72	03-06-24 17:45	39.17	37.83
73	03-06-24 18:00	52.2	51.78
74	03-06-24 18:15	62.74	62.53
75	03-06-24 18:30	75.13	75.07
76	03-06-24 18:45	75.44	75.5
77	03-06-24 19:00	79.56	79.03
78	03-06-24 19:15	75.54	75.01
79	03-06-24 19:30	69.61	69.59
80	03-06-24 19:45	69.35	69.04
81	03-06-24 20:00	67.05	66.44
82	03-06-24 20:15	72.1	71.91
83	03-06-24 20:30	73.89	73.38
84	03-06-24 20:45	75.74	76.38
85	03-06-24 21:00	81.57	81.65
86	03-06-24 21:15	78.96	79.03
87	03-06-24 21:30	69.49	70.01
88	03-06-24 21:45	62.52	62.5
89	03-06-24 22:00	77.69	78.62
90	03-06-24 22:15	75.37	75.48
91	03-06-24 22:30	73.67	74.01
92	03-06-24 22:45	72.44	72.74
93	03-06-24 23:00	75.06	75.51
94	03-06-24 23:15	68.25	68.74
95	03-06-24 23:30	55.71	55.92
96	03-06-24 23:45	47.52	47.99
3.6.2024	**No. of Blocks export**	**85**	**85**
	No. of Blocks Import	**11**	**11**
	Maximum export	**81.57**	**81.65**
	Maximum Import	**-40.14**	**-40.14**
1	04-06-24 00:00	54.07	54.64
2	04-06-24 00:15	52.7	53.04
3	04-06-24 00:30	38.04	38.57
4	04-06-24 00:45	24.1	24.68
5	04-06-24 01:00	31.51	31.48
6	04-06-24 01:15	33.2	33.54
7	04-06-24 01:30	34.55	34.62
8	04-06-24 01:45	34.4	35.32
9	04-06-24 02:00	40.63	41.11
10	04-06-24 02:15	37.49	37.74
11	04-06-24 02:30	37.97	38.52
12	04-06-24 02:45	44.47	44.84
13	04-06-24 03:00	43.73	44.14
14	04-06-24 03:15	43.54	44.03
15	04-06-24 03:30	44.86	45.05
16	04-06-24 03:45	45.14	45.3
17	04-06-24 04:00	43.36	43.43
18	04-06-24 04:15	43.99	44.28
19	04-06-24 04:30	22.41	22.4
20	04-06-24 04:45	-2.82	-2.6
21	04-06-24 05:00	-10.97	-10.69
22	04-06-24 05:15	-17.8	-17.87
23	04-06-24 05:30	-15.18	-13.77
24	04-06-24 05:45	-9.63	-9.55
25	04-06-24 06:00	-8.57	-8.82
26	04-06-24 06:15	-17.53	-17.34

S. No.	Time	KTPS	KTPS
		KOTA PG-1	KOTA PG-2
		220KV	220KV
	HRS	MW	MW
27	04-06-24 06:30	-21.34	-21.96
28	04-06-24 06:45	-19.46	-19.29
29	04-06-24 07:00	0.66	-0.37
30	04-06-24 07:15	17.5	17.93
31	04-06-24 07:30	12.74	13.11
32	04-06-24 07:45	12.82	13.04
33	04-06-24 08:00	18.13	18.29
34	04-06-24 08:15	21.18	21.09
35	04-06-24 08:30	24.14	24.53
36	04-06-24 08:45	22.18	22.13
37	04-06-24 09:00	26.56	26.95
38	04-06-24 09:15	26.98	26.68
39	04-06-24 09:30	26.36	26.44
40	04-06-24 09:45	23.5	23.58
41	04-06-24 10:00	27.91	27.69
42	04-06-24 10:15	25.9	25.98
43	04-06-24 10:30	-4.73	-5.34
44	04-06-24 10:45	-21.07	-20.83
45	04-06-24 11:00	-10.58	-11.09
46	04-06-24 11:15	-9.19	-9.97
47	04-06-24 11:30	-6.79	-6.52
48	04-06-24 11:45	-2.35	-2.61
49	04-06-24 12:00	3.09	2.84
50	04-06-24 12:15	3.1	2.53
51	04-06-24 12:30	6.89	7.22
52	04-06-24 12:45	36.63	36.57
53	04-06-24 13:00	50.2	50.15
54	04-06-24 13:15	55.8	56.08
55	04-06-24 13:30	56.18	55.52
56	04-06-24 13:45	51.89	51.05
57	04-06-24 14:00	50.67	49.17
58	04-06-24 14:15	43.09	42.46
59	04-06-24 14:30	68.81	67.89
60	04-06-24 14:45	47.45	47.35
61	04-06-24 15:00	39.18	38.85
62	04-06-24 15:15	36.34	36.18
63	04-06-24 15:30	33.28	33.78
64	04-06-24 15:45	29.49	29.39
65	04-06-24 16:00	9.59	8.67
66	04-06-24 16:15	0.35	-1.04
67	04-06-24 16:30	14.19	14.89
68	04-06-24 16:45	26.27	26.41
69	04-06-24 17:00	23.91	23.71
70	04-06-24 17:15	24.16	23.59
71	04-06-24 17:30	43.6	43.36
72	04-06-24 17:45	48.89	48.95
73	04-06-24 18:00	34.64	34.52
74	04-06-24 18:15	31.59	31.74
75	04-06-24 18:30	47.86	47.41
76	04-06-24 18:45	50.63	50.96
77	04-06-24 19:00	84.26	83.98
78	04-06-24 19:15	95.97	95.71
79	04-06-24 19:30	62.73	63.67
80	04-06-24 19:45	34.07	34.26
81	04-06-24 20:00	75.83	75.31

S. No.	Time	KTPS	KTPS
		KOTA PG-1	KOTA PG-2
		220KV	220KV
	HRS	MW	MW
82	04-06-24 20:15	86.1	86.34
83	04-06-24 20:30	87.19	86.91
84	04-06-24 20:45	85.48	85.2
85	04-06-24 21:00	78.52	78.87
86	04-06-24 21:15	66.73	66.4
87	04-06-24 21:30	71.76	71.58
88	04-06-24 21:45	80.65	80.2
89	04-06-24 22:00	79.39	79.67
90	04-06-24 22:15	79.61	78.97
91	04-06-24 22:30	77.94	78.81
92	04-06-24 22:45	70.3	71.64
93	04-06-24 23:00	75.82	75.84
94	04-06-24 23:15	76.15	76.14
95	04-06-24 23:30	81.11	80.61
96	04-06-24 23:45	80.38	79.82
4.6.2024	**No. of Blocks export**	**81**	**79**
	No. of Blocks Import	**15**	**17**
	Maximum export	**95.97**	**95.71**
	Maximum Import	**-21.34**	**-21.96**
1	05-06-24 00:00	75.99	75.55
2	05-06-24 00:15	54.77	54.35
3	05-06-24 00:30	51.15	51.02
4	05-06-24 00:45	53.13	53.43
5	05-06-24 01:00	53.84	54.48
6	05-06-24 01:15	48.5	47.46
7	05-06-24 01:30	42.99	42.9
8	05-06-24 01:45	44.46	43.7
9	05-06-24 02:00	47.54	47.79
10	05-06-24 02:15	45.98	46.14
11	05-06-24 02:30	51.55	52.05
12	05-06-24 02:45	52.08	52.29
13	05-06-24 03:00	54.66	54.62
14	05-06-24 03:15	55.32	54.95
15	05-06-24 03:30	56.61	56.78
16	05-06-24 03:45	55.34	55.19
17	05-06-24 04:00	58.41	58.54
18	05-06-24 04:15	62.08	63.19
19	05-06-24 04:30	59.43	59.63
20	05-06-24 04:45	59.69	59.84
21	05-06-24 05:00	52.45	52.39
22	05-06-24 05:15	22.28	22.23
23	05-06-24 05:30	-5.5	-5.05
24	05-06-24 05:45	-8.66	-8.67
25	05-06-24 06:00	-9.33	-9.45
26	05-06-24 06:15	-20.65	-20.9
27	05-06-24 06:30	-5.86	-5.51
28	05-06-24 06:45	20.1	19.95
29	05-06-24 07:00	21.64	21.32
30	05-06-24 07:15	21.96	22.01
31	05-06-24 07:30	22.17	22.21
32	05-06-24 07:45	21.22	21.4
33	05-06-24 08:00	29.1	28.9
34	05-06-24 08:15	34.41	34.15
35	05-06-24 08:30	33.34	33.21
36	05-06-24 08:45	21.17	20.54

S. No.	Time	KTPS	KTPS
		KOTA PG-1	KOTA PG-2
		220KV	220KV
	HRS	MW	MW
37	05-06-24 09:00	-10.5	-10.7
38	05-06-24 09:15	-5.46	-5.53
39	05-06-24 09:30	-10.7	-11.18
40	05-06-24 09:45	-5.6	-5.33
41	05-06-24 10:00	7.33	6.81
42	05-06-24 10:15	14.42	13.86
43	05-06-24 10:30	49.35	48.71
44	05-06-24 10:45	58.04	57.18
45	05-06-24 11:00	63.63	62.5
46	05-06-24 11:15	64.63	63.82
47	05-06-24 11:30	64.01	63.49
48	05-06-24 11:45	69.04	68.46
49	05-06-24 12:00	73.11	72.67
50	05-06-24 12:15	76.49	77.19
51	05-06-24 12:30	64.55	63.81
52	05-06-24 12:45	60.86	60.59
53	05-06-24 13:00	58.11	57.29
54	05-06-24 13:15	63.87	63.38
55	05-06-24 13:30	63.03	62.01
56	05-06-24 13:45	56.41	56.14
57	05-06-24 14:00	49.76	49.39
58	05-06-24 14:15	47.47	47.11
59	05-06-24 14:30	42.41	41.92
60	05-06-24 14:45	37.35	37.75
61	05-06-24 15:00	40.1	40.44
62	05-06-24 15:15	42.08	42.98
63	05-06-24 15:30	39.94	40.8
64	05-06-24 15:45	31.33	31.14
65	05-06-24 16:00	32.41	32.12
66	05-06-24 16:15	28.24	28.38
67	05-06-24 16:30	29.68	29.87
68	05-06-24 16:45	34.1	34.01
69	05-06-24 17:00	31.39	31.48
70	05-06-24 17:15	32.85	32.82
71	05-06-24 17:30	40.6	40.6
72	05-06-24 17:45	46.73	46.57
73	05-06-24 18:00	59.68	59.04
74	05-06-24 18:15	67.69	68.47
75	05-06-24 18:30	70.06	70.65
76	05-06-24 18:45	49.4	49.24
77	05-06-24 19:00	46.52	46.66
78	05-06-24 19:15	39.89	40.1
79	05-06-24 19:30	30.55	30.25
80	05-06-24 19:45	53.07	52.77
81	05-06-24 20:00	79.52	79.84
82	05-06-24 20:15	73.04	73.09
83	05-06-24 20:30	71.4	71.7
84	05-06-24 20:45	76.21	76.37
85	05-06-24 21:00	66.79	66.2
86	05-06-24 21:15	57.11	57.57
87	05-06-24 21:30	55.57	56.04
88	05-06-24 21:45	57.17	57.01
89	05-06-24 22:00	51.98	51.8
90	05-06-24 22:15	39.15	39.43
91	05-06-24 22:30	34.81	34.6

S. No.	Time	KTPS	KTPS
		KOTA PG-1	KOTA PG-2
		220KV	220KV
	HRS	MW	MW
92	05-06-24 22:45	36.75	37.29
93	05-06-24 23:00	35.33	35.22
94	05-06-24 23:15	36.75	36.78
95	05-06-24 23:30	33.49	33.87
96	05-06-24 23:45	38.43	38.54
5.6.2024	**No. of Blocks export**	**87**	**87**
	No. of Blocks Import	**9**	**9**
	Maximum export	**79.52**	**79.84**
	Maximum Import	**-20.65**	**-20.9**
1	06-06-24 00:00	32.39	32.57
2	06-06-24 00:15	17.01	17.61
3	06-06-24 00:30	-13.8	-13.12
4	06-06-24 00:45	-29.69	-29.71
5	06-06-24 01:00	-28.33	-28.23
6	06-06-24 01:15	6.8	7.37
7	06-06-24 01:30	8.9	8.45
8	06-06-24 01:45	9.43	9.79
9	06-06-24 02:00	13.79	14.68
10	06-06-24 02:15	-16.76	-16.58
11	06-06-24 02:30	-31.52	-32.23
12	06-06-24 02:45	-27.77	-27.91
13	06-06-24 03:00	-21.85	-21.46
14	06-06-24 03:15	-19.28	-19.06
15	06-06-24 03:30	-17.86	-17.64
16	06-06-24 03:45	-20.4	-19.95
17	06-06-24 04:00	-18.4	-18.73
18	06-06-24 04:15	-20.12	-19.89
19	06-06-24 04:30	-22.5	-22.62
20	06-06-24 04:45	-20.01	-20.19
21	06-06-24 05:00	-23.69	-23.89
22	06-06-24 05:15	-7.48	-7.33
23	06-06-24 05:30	11.37	11.34
24	06-06-24 05:45	16.76	16.9
25	06-06-24 06:00	19.42	19.37
26	06-06-24 06:15	9.54	9.75
27	06-06-24 06:30	5.32	4.98
28	06-06-24 06:45	3.36	2.73
29	06-06-24 07:00	-5.31	-4.9
30	06-06-24 07:15	-8.01	-7.58
31	06-06-24 07:30	-9.86	-9.44
32	06-06-24 07:45	-8.19	-8.15
33	06-06-24 08:00	-5.6	-5.17
34	06-06-24 08:15	-3.91	-4.4
35	06-06-24 08:30	-1.72	-2.45
36	06-06-24 08:45	-3.83	-3.75
37	06-06-24 09:00	-6.59	-7.32
38	06-06-24 09:15	-33.08	-32.79
39	06-06-24 09:30	-45.32	-44.85
40	06-06-24 09:45	-40.3	-40.59
41	06-06-24 10:00	-37.13	-36.73
42	06-06-24 10:15	-34.76	-34.86
43	06-06-24 10:30	-28.55	-28.65
44	06-06-24 10:45	-6.36	-5.93
45	06-06-24 11:00	2.28	2.05
46	06-06-24 11:15	-10.08	-10.33

S. No.	Time	KTPS	KTPS
		KOTA PG-1	KOTA PG-2
		220KV	220KV
	HRS	MW	MW
47	06-06-24 11:30	-17.53	-17.13
48	06-06-24 11:45	-21.49	-21.95
49	06-06-24 12:00	-9.24	-9.71
50	06-06-24 12:15	-5.71	-6.31
51	06-06-24 12:30	-12.77	-13.38
52	06-06-24 12:45	-12.06	-12.19
53	06-06-24 13:00	-10.02	-10.12
54	06-06-24 13:15	-9.19	-9.46
55	06-06-24 13:30	20.95	18.8
56	06-06-24 13:45	48.12	47.94
57	06-06-24 14:00	35.33	34.55
58	06-06-24 14:15	27.84	27.43
59	06-06-24 14:30	26.15	26.01
60	06-06-24 14:45	17.08	17.28
61	06-06-24 15:00	14.73	14.61
62	06-06-24 15:15	22.21	22.28
63	06-06-24 15:30	22.2	22.12
64	06-06-24 15:45	20.7	20.86
65	06-06-24 16:00	22.78	22.55
66	06-06-24 16:15	26.23	26.06
67	06-06-24 16:30	30.12	30.56
68	06-06-24 16:45	26.83	27.7
69	06-06-24 17:00	1.1	0.9
70	06-06-24 17:15	-10.09	-10.23
71	06-06-24 17:30	16.63	16.48
72	06-06-24 17:45	38.29	38.15
73	06-06-24 18:00	62.41	62.72
74	06-06-24 18:15	68.42	68.57
75	06-06-24 18:30	72.02	71.75
76	06-06-24 18:45	74.92	74.88
77	06-06-24 19:00	82.82	83.21
78	06-06-24 19:15	85.12	85.13
79	06-06-24 19:30	76.91	76.6
80	06-06-24 19:45	71.52	71.39
81	06-06-24 20:00	63.35	64.17
82	06-06-24 20:15	48.2	47.82
83	06-06-24 20:30	12.96	12.6
84	06-06-24 20:45	5.24	5.97
85	06-06-24 21:00	4.66	4.42
86	06-06-24 21:15	5.28	5.38
87	06-06-24 21:30	10.82	10.29
88	06-06-24 21:45	29.81	29.31
89	06-06-24 22:00	21.92	21.35
90	06-06-24 22:15	41.73	42.35
91	06-06-24 22:30	42.86	42.23
92	06-06-24 22:45	-1.62	-2.16
93	06-06-24 23:00	-1.06	-1.59
94	06-06-24 23:15	2.72	2.86
95	06-06-24 23:30	-0.55	-0.73
96	06-06-24 23:45	6.5	7.19
6.6.2024	**No. of Blocks export**	**51**	**51**
	No. of Blocks Import	**45**	**45**
	Maximum export	**85.12**	**85.13**
	Maximum Import	**-45.32**	**-44.85**
1	07-06-24 00:00	6.67	6.53

S. No.	Time	KTPS	KTPS
		KOTA PG-1	KOTA PG-2
		220KV	220KV
	HRS	MW	MW
2	07-06-24 00:15	0.59	0.68
3	07-06-24 00:30	9.1	9.13
4	07-06-24 00:45	35.66	35.6
5	07-06-24 01:00	38.12	38.37
6	07-06-24 01:15	40.5	40.84
7	07-06-24 01:30	43.54	43.38
8	07-06-24 01:45	43.53	43.32
9	07-06-24 02:00	44.47	44.26
10	07-06-24 02:15	44.3	44.28
11	07-06-24 02:30	37.49	37.78
12	07-06-24 02:45	8	7.8
13	07-06-24 03:00	4.33	4.52
14	07-06-24 03:15	5.54	2.86
15	07-06-24 03:30	19.09	19.3
16	07-06-24 03:45	47.99	47.82
17	07-06-24 04:00	58.97	57.61
18	07-06-24 04:15	56.84	56.73
19	07-06-24 04:30	58.59	59.07
20	07-06-24 04:45	31.8	31.5
21	07-06-24 05:00	5.3	6.9
22	07-06-24 05:15	-7.25	-7.23
23	07-06-24 05:30	-16.82	-17.32
24	07-06-24 05:45	-18.81	-19.25
25	07-06-24 06:00	-19.72	-19.32
26	07-06-24 06:15	2.69	3.39
27	07-06-24 06:30	14.28	14.96
28	07-06-24 06:45	12.57	12.86
29	07-06-24 07:00	11.71	12.02
30	07-06-24 07:15	12.62	12.75
31	07-06-24 07:30	16.56	16.33
32	07-06-24 07:45	24.42	24.67
33	07-06-24 08:00	24.51	24.47
34	07-06-24 08:15	17.43	17.74
35	07-06-24 08:30	25.22	25.84
36	07-06-24 08:45	34.52	34.74
37	07-06-24 09:00	41.14	42.06
38	07-06-24 09:15	31.57	31.62
39	07-06-24 09:30	31.71	32.08
40	07-06-24 09:45	33.33	33.73
41	07-06-24 10:00	38.48	38.84
42	07-06-24 10:15	46.03	45.08
43	07-06-24 10:30	46.86	46.86
44	07-06-24 10:45	49.8	49.53
45	07-06-24 11:00	50.19	50.36
46	07-06-24 11:15	60.85	61.12
47	07-06-24 11:30	57.57	57.45
48	07-06-24 11:45	53.25	52.75
49	07-06-24 12:00	53.75	53.7
50	07-06-24 12:15	50.3	49.75
51	07-06-24 12:30	46.42	45.98
52	07-06-24 12:45	40.43	39.89
53	07-06-24 13:00	40.78	40.32
54	07-06-24 13:15	45.08	45.06
55	07-06-24 13:30	47.27	46.68
56	07-06-24 13:45	49.36	49.28

S. No.	Time	KTPS	KTPS
		KOTA PG-1	KOTA PG-2
		220KV	220KV
	HRS	MW	MW
57	07-06-24 14:00	48.83	48.27
58	07-06-24 14:15	46.69	45.79
59	07-06-24 14:30	41.7	41.36
60	07-06-24 14:45	31.65	31.25
61	07-06-24 15:00	31.63	31.65
62	07-06-24 15:15	39.1	39
63	07-06-24 15:30	20.95	20.68
64	07-06-24 15:45	2.54	2.98
65	07-06-24 16:00	3.91	3.79
66	07-06-24 16:15	-12.3	-11.85
67	07-06-24 16:30	-14.82	-14.45
68	07-06-24 16:45	-5.21	-6.41
69	07-06-24 17:00	34.88	34.81
70	07-06-24 17:15	62.83	63.24
71	07-06-24 17:30	55.78	55.17
72	07-06-24 17:45	60.65	60.25
73	07-06-24 18:00	68.82	68.97
74	07-06-24 18:15	78.87	79.26
75	07-06-24 18:30	86.17	86.26
76	07-06-24 18:45	88.5	88.26
77	07-06-24 19:00	130.53	131.57
78	07-06-24 19:15	135.75	135.66
79	07-06-24 19:30	136.41	136.8
80	07-06-24 19:45	132.44	132.49
81	07-06-24 20:00	124.61	124.12
82	07-06-24 20:15	111.96	111.65
83	07-06-24 20:30	102.75	103.25
84	07-06-24 20:45	103.27	102.97
85	07-06-24 21:00	97.61	97.28
86	07-06-24 21:15	95.04	95.47
87	07-06-24 21:30	90.6	92.96
88	07-06-24 21:45	81.45	81.54
89	07-06-24 22:00	84.85	85.45
90	07-06-24 22:15	86.74	86.67
91	07-06-24 22:30	73.42	73.65
92	07-06-24 22:45	73.68	73.66
93	07-06-24 23:00	67.37	68
94	07-06-24 23:15	57.31	57.27
95	07-06-24 23:30	57.04	56.11
96	07-06-24 23:45	53.35	53.61
7.6.2024	**No. of Blocks export**	**89**	**89**
	No. of Blocks Import	**7**	**7**
	Maximum export	**136.41**	**136.8**
	Maximum Import	**-19.72**	**-19.32**
1	08-06-24 00:00	57.06	56.46
2	08-06-24 00:15	40.08	39.95
3	08-06-24 00:30	9.45	10.48
4	08-06-24 00:45	5.29	4.86
5	08-06-24 01:00	29.02	27.91
6	08-06-24 01:15	48.56	49
7	08-06-24 01:30	48.39	47.96
8	08-06-24 01:45	51.85	52.45
9	08-06-24 02:00	56.57	56.84
10	08-06-24 02:15	58.14	59.77
11	08-06-24 02:30	57.79	58.09

S. No.	Time	KTPS	KTPS
		KOTA PG-1	KOTA PG-2
		220KV	220KV
	HRS	MW	MW
12	08-06-24 02:45	57.4	57.12
13	08-06-24 03:00	26.68	26.66
14	08-06-24 03:15	12.85	12.59
15	08-06-24 03:30	16.71	16.67
16	08-06-24 03:45	20.54	20.53
17	08-06-24 04:00	19.41	19.61
18	08-06-24 04:15	19.87	19.82
19	08-06-24 04:30	18.9	19.42
20	08-06-24 04:45	20.97	22.13
21	08-06-24 05:00	25.79	26.17
22	08-06-24 05:15	27.3	27.61
23	08-06-24 05:30	26.35	26.36
24	08-06-24 05:45	30.49	30.16
25	08-06-24 06:00	29.83	29.68
26	08-06-24 06:15	23.48	23.57
27	08-06-24 06:30	17.95	18.25
28	08-06-24 06:45	17.66	18.45
29	08-06-24 07:00	15.32	15.14
30	08-06-24 07:15	13.77	14.71
31	08-06-24 07:30	16.9	17.51
32	08-06-24 07:45	39.42	39.88
33	08-06-24 08:00	64.52	69.28
34	08-06-24 08:15	71.57	71.7
35	08-06-24 08:30	73.78	74.38
36	08-06-24 08:45	69.27	69.39
37	08-06-24 09:00	71.81	71.95
38	08-06-24 09:15	30	29.96
39	08-06-24 09:30	34.14	34.01
40	08-06-24 09:45	30.69	30.74
41	08-06-24 10:00	32.38	31.96
42	08-06-24 10:15	33.44	33.48
43	08-06-24 10:30	27.81	27.75
44	08-06-24 10:45	23.1	22.91
45	08-06-24 11:00	24.64	24.75
46	08-06-24 11:15	21.99	21.75
47	08-06-24 11:30	15.3	17.12
48	08-06-24 11:45	20.26	20.46
49	08-06-24 12:00	26.28	26.87
50	08-06-24 12:15	26.03	25.55
51	08-06-24 12:30	23.92	23.36
52	08-06-24 12:45	21.42	21.33
53	08-06-24 13:00	27.64	27.55
54	08-06-24 13:15	19.52	18.91
55	08-06-24 13:30	17.46	17.96
56	08-06-24 13:45	11.41	11.16
57	08-06-24 14:00	9.4	8.79
58	08-06-24 14:15	12.85	12.33
59	08-06-24 14:30	2.08	1.84
60	08-06-24 14:45	29.85	29.98
61	08-06-24 15:00	47.91	47.28
62	08-06-24 15:15	48.95	48.8
63	08-06-24 15:30	48.29	48.76
64	08-06-24 15:45	50.22	49.71
65	08-06-24 16:00	55.69	55.84
66	08-06-24 16:15	56.11	55.6

S. No.	Time	KTPS	KTPS
		KOTA PG-1	KOTA PG-2
		220KV	220KV
	HRS	MW	MW
67	08-06-24 16:30	62.73	62.33
68	08-06-24 16:45	62.34	62.72
69	08-06-24 17:00	62	62.47
70	08-06-24 17:15	58.28	58.01
71	08-06-24 17:30	65.15	63.88
72	08-06-24 17:45	64.46	65.11
73	08-06-24 18:00	77.44	78.49
74	08-06-24 18:15	87.17	87.56
75	08-06-24 18:30	92.35	92.48
76	08-06-24 18:45	98.7	98.94
77	08-06-24 19:00	102.64	102.81
78	08-06-24 19:15	105.77	105.78
79	08-06-24 19:30	103.38	103.54
80	08-06-24 19:45	100.66	100.74
81	08-06-24 20:00	100.16	100.21
82	08-06-24 20:15	102.4	102.79
83	08-06-24 20:30	96.98	97.43
84	08-06-24 20:45	92.54	92.1
85	08-06-24 21:00	91.21	90.81
86	08-06-24 21:15	85.17	84.83
87	08-06-24 21:30	81.04	80.51
88	08-06-24 21:45	75.72	75.72
89	08-06-24 22:00	66.24	66.55
90	08-06-24 22:15	70.26	70.8
91	08-06-24 22:30	74.79	74.75
92	08-06-24 22:45	56.57	56.82
93	08-06-24 23:00	46.57	46.69
94	08-06-24 23:15	36.14	35.87
95	08-06-24 23:30	29.34	29.52
96	08-06-24 23:45	19.39	19.97
8.6.2024	**No. of Blocks export**	**96**	**96**
	No. of Blocks Import	**0**	**0**
	Maximum export	**105.77**	**105.78**
	Maximum Import	**0**	**0**
1	09-06-24 00:00	11.76	12.63
2	09-06-24 00:15	17.16	17.12
3	09-06-24 00:30	17.27	16.82
4	09-06-24 00:45	16.82	16.7
5	09-06-24 01:00	17.44	17.5
6	09-06-24 01:15	14.89	14.66
7	09-06-24 01:30	19.17	19.5
8	09-06-24 01:45	19.63	19.42
9	09-06-24 02:00	22.37	22.21
10	09-06-24 02:15	23.79	23.91
11	09-06-24 02:30	24.93	24.83
12	09-06-24 02:45	28.53	29.39
13	09-06-24 03:00	34.33	34.76
14	09-06-24 03:15	34.86	35.37
15	09-06-24 03:30	33.67	34.5
16	09-06-24 03:45	36.63	36.78
17	09-06-24 04:00	37.15	36.42
18	09-06-24 04:15	34.17	34.67
19	09-06-24 04:30	36.25	36.22
20	09-06-24 04:45	33.01	34.1
21	09-06-24 05:00	28.93	28.98

S. No.	Time	KTPS	KTPS
		KOTA PG-1	KOTA PG-2
		220KV	220KV
	HRS	MW	MW
22	09-06-24 05:15	25.67	25.49
23	09-06-24 05:30	22.74	23.36
24	09-06-24 05:45	18.47	18.48
25	09-06-24 06:00	19.36	19.1
26	09-06-24 06:15	15.47	15.98
27	09-06-24 06:30	14	14.59
28	09-06-24 06:45	14.66	15.72
29	09-06-24 07:00	5.93	6.57
30	09-06-24 07:15	-29.6	-28.94
31	09-06-24 07:30	-31.89	-31.07
32	09-06-24 07:45	-32.68	-31.52
33	09-06-24 08:00	-32.14	-31.19
34	09-06-24 08:15	-28.62	-28.38
35	09-06-24 08:30	-27.83	-27.9
36	09-06-24 08:45	-26.76	-26.56
37	09-06-24 09:00	-25.17	-24.67
38	09-06-24 09:15	-23.4	-23.35
39	09-06-24 09:30	-22.98	-22.14
40	09-06-24 09:45	-22.15	-21.87
41	09-06-24 10:00	-14.76	-14.04
42	09-06-24 10:15	-17.13	-16.7
43	09-06-24 10:30	-17.12	-17
44	09-06-24 10:45	-11.01	-11.04
45	09-06-24 11:00	-2.04	-2.11
46	09-06-24 11:15	3.97	4.05
47	09-06-24 11:30	6.23	5.89
48	09-06-24 11:45	12.53	11.2
49	09-06-24 12:00	11.37	11.4
50	09-06-24 12:15	11.71	11.75
51	09-06-24 12:30	12.64	12.37
52	09-06-24 12:45	10.77	10.63
53	09-06-24 13:00	11.93	11.98
54	09-06-24 13:15	15.54	15.68
55	09-06-24 13:30	5.75	5.3
56	09-06-24 13:45	9.51	8.9
57	09-06-24 14:00	5.59	5.38
58	09-06-24 14:15	2.32	1.96
59	09-06-24 14:30	-3.2	-3.52
60	09-06-24 14:45	-7.06	-6.69
61	09-06-24 15:00	-6.46	-6.75
62	09-06-24 15:15	-13.22	-13.54
63	09-06-24 15:30	-11.84	-11.95
64	09-06-24 15:45	-11.05	-11.38
65	09-06-24 16:00	-10.82	-10.83
66	09-06-24 16:15	13.68	13.47
67	09-06-24 16:30	26.23	26.34
68	09-06-24 16:45	31.67	32.28
69	09-06-24 17:00	24.82	24.92
70	09-06-24 17:15	-5.65	-5.64
71	09-06-24 17:30	-22.84	-22.18
72	09-06-24 17:45	-11.65	-11.81
73	09-06-24 18:00	-1.43	-1.38
74	09-06-24 18:15	7.71	7.41
75	09-06-24 18:30	15.47	15.24
76	09-06-24 18:45	7.52	8.02

S. No.	Time	KTPS	KTPS
		KOTA PG-1	KOTA PG-2
		220KV	220KV
	HRS	MW	MW
77	09-06-24 19:00	8.55	8.69
78	09-06-24 19:15	48.12	48.05
79	09-06-24 19:30	67.84	68.36
80	09-06-24 19:45	69.92	68.81
81	09-06-24 20:00	61.15	61.21
82	09-06-24 20:15	58.87	58.78
83	09-06-24 20:30	52.56	52.45
84	09-06-24 20:45	49.26	49.81
85	09-06-24 21:00	47.4	47.63
86	09-06-24 21:15	36.13	35.93
87	09-06-24 21:30	39.83	39.97
88	09-06-24 21:45	46.02	45.45
89	09-06-24 22:00	41.9	41.87
90	09-06-24 22:15	40.28	40.48
91	09-06-24 22:30	44.8	44.28
92	09-06-24 22:45	45.9	46.6
93	09-06-24 23:00	55.73	55.26
94	09-06-24 23:15	54.56	55.04
95	09-06-24 23:30	47.92	47.62
96	09-06-24 23:45	34.8	34.94
9.6.2024	**No. of Blocks export**	**69**	**69**
	No. of Blocks Import	**27**	**27**
	Maximum export	**69.92**	**68.81**
	Maximum Import	**-32.68**	**-31.52**
1	10-06-24 00:00	6.89	6.94
2	10-06-24 00:15	5.41	5.91
3	10-06-24 00:30	10.2	10.03
4	10-06-24 00:45	5.51	6.24
5	10-06-24 01:00	-15.87	-15.66
6	10-06-24 01:15	-31.99	-31.95
7	10-06-24 01:30	-31.46	-31.43
8	10-06-24 01:45	-32.14	-32.04
9	10-06-24 02:00	-29.11	-28.76
10	10-06-24 02:15	-26.22	-26
11	10-06-24 02:30	-22.38	-22.31
12	10-06-24 02:45	-26.79	-26.66
13	10-06-24 03:00	-24.1	-24.03
14	10-06-24 03:15	-22.74	-22.69
15	10-06-24 03:30	-22.37	-22.87
16	10-06-24 03:45	-22.08	-22.14
17	10-06-24 04:00	-19.31	-19.38
18	10-06-24 04:15	8.39	8.42
19	10-06-24 04:30	22.05	21.54
20	10-06-24 04:45	27.41	27.17
21	10-06-24 05:00	26.92	26.7
22	10-06-24 05:15	20.54	20.68
23	10-06-24 05:30	16.5	16.25
24	10-06-24 05:45	13.54	13.41
25	10-06-24 06:00	13.21	12.89
26	10-06-24 06:15	5.91	5.87
27	10-06-24 06:30	2.92	2.91
28	10-06-24 06:45	-0.62	-0.57
29	10-06-24 07:00	-0.07	0.26
30	10-06-24 07:15	-5.95	-5.54
31	10-06-24 07:30	2.05	2.32

S. No.	Time	KTPS	KTPS
		KOTA PG-1	KOTA PG-2
		220KV	220KV
	HRS	MW	MW
32	10-06-24 07:45	5.94	5.67
33	10-06-24 08:00	8.8	8.7
34	10-06-24 08:15	5.24	4.95
35	10-06-24 08:30	4.7	4.75
36	10-06-24 08:45	6.38	6.96
37	10-06-24 09:00	8.47	7.82
38	10-06-24 09:15	5.52	5.6
39	10-06-24 09:30	4.53	5.49
40	10-06-24 09:45	5.24	5.71
41	10-06-24 10:00	12.15	12.08
42	10-06-24 10:15	10.76	10.74
43	10-06-24 10:30	-15.34	-15.56
44	10-06-24 10:45	-28.56	-28.6
45	10-06-24 11:00	1.26	1.92
46	10-06-24 11:15	19.33	19.98
47	10-06-24 11:30	25.41	26.07
48	10-06-24 11:45	44.18	44.19
49	10-06-24 12:00	57.45	57.57
50	10-06-24 12:15	53.63	53.83
51	10-06-24 12:30	51.33	51.5
52	10-06-24 12:45	47.02	47.15
53	10-06-24 13:00	19.59	19.2
54	10-06-24 13:15	9.37	8.54
55	10-06-24 13:30	3.18	3.4
56	10-06-24 13:45	1.06	1.22
57	10-06-24 14:00	21.24	20.67
58	10-06-24 14:15	30.9	30.81
59	10-06-24 14:30	40.51	40.44
60	10-06-24 14:45	39.67	39.52
61	10-06-24 15:00	38.75	39.09
62	10-06-24 15:15	33.35	32.85
63	10-06-24 15:30	37.78	37.74
64	10-06-24 15:45	47.33	47.03
65	10-06-24 16:00	46.34	46.63
66	10-06-24 16:15	39.59	39.49
67	10-06-24 16:30	42.68	42.72
68	10-06-24 16:45	43.23	43.57
69	10-06-24 17:00	39.88	39.77
70	10-06-24 17:15	45.56	44.9
71	10-06-24 17:30	54.66	54.59
72	10-06-24 17:45	66.55	66.77
73	10-06-24 18:00	80.29	80.63
74	10-06-24 18:15	84.54	84.73
75	10-06-24 18:30	94.88	94.96
76	10-06-24 18:45	93.56	93.33
77	10-06-24 19:00	91.08	90.88
78	10-06-24 19:15	97.32	97.08
79	10-06-24 19:30	93.7	92.21
80	10-06-24 19:45	87.89	88.95
81	10-06-24 20:00	85.32	86.35
82	10-06-24 20:15	84.34	83.9
83	10-06-24 20:30	86.78	86.67
84	10-06-24 20:45	88.72	88.11
85	10-06-24 21:00	82.61	81.65
86	10-06-24 21:15	80.52	81.08

S. No.	Time	KTPS	KTPS
		KOTA PG-1	KOTA PG-2
		220KV	220KV
	HRS	MW	MW
87	10-06-24 21:30	78.27	78.46
88	10-06-24 21:45	78.37	78.37
89	10-06-24 22:00	78.12	77.78
90	10-06-24 22:15	71.19	70.84
91	10-06-24 22:30	68.28	68.08
92	10-06-24 22:45	66.5	66.37
93	10-06-24 23:00	59.73	59.31
94	10-06-24 23:15	61.29	61.17
95	10-06-24 23:30	64.1	64.34
96	10-06-24 23:45	61.72	61.25
10.6.2024	**No. of Blocks export**	**78**	**79**
	No. of Blocks Import	**18**	**17**
	Maximum export	**97.32**	**97.08**
	Maximum Import	**-32.14**	**-32.04**
1	11-06-24 00:00	58.34	58.22
2	11-06-24 00:15	65.69	66.33
3	11-06-24 00:30	66.79	66.42
4	11-06-24 00:45	68.31	67.65
5	11-06-24 01:00	61.8	61.45
6	11-06-24 01:15	56.01	55.91
7	11-06-24 01:30	55.94	55.23
8	11-06-24 01:45	50.62	49.82
9	11-06-24 02:00	54.27	53.97
10	11-06-24 02:15	55.56	55.14
11	11-06-24 02:30	54.5	54.45
12	11-06-24 02:45	59.19	59.31
13	11-06-24 03:00	61.66	62.15
14	11-06-24 03:15	63.28	62.72
15	11-06-24 03:30	49.43	49.28
16	11-06-24 03:45	46.94	45.77
17	11-06-24 04:00	58.12	58.03
18	11-06-24 04:15	61.4	61.61
19	11-06-24 04:30	60.33	61.66
20	11-06-24 04:45	61.46	61.74
21	11-06-24 05:00	58.47	58.98
22	11-06-24 05:15	51.45	51.75
23	11-06-24 05:30	45.52	44.93
24	11-06-24 05:45	43.99	43.67
25	11-06-24 06:00	44.9	44.59
26	11-06-24 06:15	39.21	40.47
27	11-06-24 06:30	30.27	30.85
28	11-06-24 06:45	29.62	30.23
29	11-06-24 07:00	29.93	30.91
30	11-06-24 07:15	29.59	29.74
31	11-06-24 07:30	28.32	29.14
32	11-06-24 07:45	29.55	30.34
33	11-06-24 08:00	25.22	25.83
34	11-06-24 08:15	-7.15	-7
35	11-06-24 08:30	-6.64	-7.24
36	11-06-24 08:45	-1.33	-1.61
37	11-06-24 09:00	-4.34	-4.1
38	11-06-24 09:15	-5.23	-5.44
39	11-06-24 09:30	3.32	2.79
40	11-06-24 09:45	5.97	5.7
41	11-06-24 10:00	41.3	40.73

S. No.	Time	KTPS	KTPS
		KOTA PG-1	KOTA PG-2
		220KV	220KV
	HRS	MW	MW
42	11-06-24 10:15	54.49	54.46
43	11-06-24 10:30	60.28	60.02
44	11-06-24 10:45	53.61	53.39
45	11-06-24 11:00	51.32	50.89
46	11-06-24 11:15	47.11	48.81
47	11-06-24 11:30	47.73	47.91
48	11-06-24 11:45	56.97	56.56
49	11-06-24 12:00	62.7	62.28
50	11-06-24 12:15	68.13	67.64
51	11-06-24 12:30	64.95	64.68
52	11-06-24 12:45	62.71	62.92
53	11-06-24 13:00	68.82	68.38
54	11-06-24 13:15	71.57	71
55	11-06-24 13:30	62	62.31
56	11-06-24 13:45	53.74	53.59
57	11-06-24 14:00	54.88	54.81
58	11-06-24 14:15	54.28	54.15
59	11-06-24 14:30	55.51	55.72
60	11-06-24 14:45	56.5	56.35
61	11-06-24 15:00	62.24	62
62	11-06-24 15:15	31.37	31.38
63	11-06-24 15:30	26.79	26.74
64	11-06-24 15:45	44.83	45.21
65	11-06-24 16:00	51.33	50.02
66	11-06-24 16:15	53.16	53.19
67	11-06-24 16:30	60.45	60.53
68	11-06-24 16:45	64.27	63.97
69	11-06-24 17:00	65.49	65.32
70	11-06-24 17:15	72.47	72
71	11-06-24 17:30	73.71	73.58
72	11-06-24 17:45	82.12	82.58
73	11-06-24 18:00	93.93	93.63
74	11-06-24 18:15	101.94	101.53
75	11-06-24 18:30	95.38	95.47
76	11-06-24 18:45	93.48	94.13
77	11-06-24 19:00	105.54	105.8
78	11-06-24 19:15	111.49	111.14
79	11-06-24 19:30	101.53	101.6
80	11-06-24 19:45	93.14	93.17
81	11-06-24 20:00	89.23	88.66
82	11-06-24 20:15	83.84	84.13
83	11-06-24 20:30	90.93	90.88
84	11-06-24 20:45	96.14	96.04
85	11-06-24 21:00	89.8	89.62
86	11-06-24 21:15	87.63	86.78
87	11-06-24 21:30	87.43	86.86
88	11-06-24 21:45	86.27	85.93
89	11-06-24 22:00	92.48	92.38
90	11-06-24 22:15	91.05	91.01
91	11-06-24 22:30	86.6	86.51
92	11-06-24 22:45	86.94	87.12
93	11-06-24 23:00	90.94	90.99
94	11-06-24 23:15	89.27	89.89
95	11-06-24 23:30	86.98	86.15
96	11-06-24 23:45	84.51	83.81

S. No.	Time	KTPS	KTPS
		KOTA PG-1	KOTA PG-2
		220KV	220KV
	HRS	MW	MW
11.6.2024	No. of Blocks export	91	91
	No. of Blocks Import	5	5
	Maximum export	111.49	111.14
	Maximum Import	-7.15	-7.24
1	12-06-24 00:00	89.48	89.79
2	12-06-24 00:15	89.08	88.42
3	12-06-24 00:30	91.37	90.85
4	12-06-24 00:45	92.83	92.14
5	12-06-24 01:00	90.55	89.64
6	12-06-24 01:15	90.8	91.44
7	12-06-24 01:30	75.86	75.62
8	12-06-24 01:45	30.36	29.9
9	12-06-24 02:00	10.08	9.47
10	12-06-24 02:15	13.95	13.44
11	12-06-24 02:30	26.53	26.26
12	12-06-24 02:45	28.03	28.11
13	12-06-24 03:00	67.58	67.2
14	12-06-24 03:15	81.38	81.18
15	12-06-24 03:30	86.77	86.39
16	12-06-24 03:45	85.67	85.46
17	12-06-24 04:00	86.93	86.96
18	12-06-24 04:15	82.84	82.84
19	12-06-24 04:30	61.38	60.67
20	12-06-24 04:45	34.05	33.59
21	12-06-24 05:00	30.22	30.33
22	12-06-24 05:15	24.38	24.46
23	12-06-24 05:30	58.07	58.09
24	12-06-24 05:45	68.79	68.34
25	12-06-24 06:00	71.46	71.73
26	12-06-24 06:15	62.85	64.43
27	12-06-24 06:30	57.92	58.65
28	12-06-24 06:45	52.78	53.02
29	12-06-24 07:00	39.88	40.17
30	12-06-24 07:15	0.85	1.37
31	12-06-24 07:30	-3.77	-4.2
32	12-06-24 07:45	5.24	4.89
33	12-06-24 08:00	10.71	10.53
34	12-06-24 08:15	9.82	9.8
35	12-06-24 08:30	29.27	29.22
36	12-06-24 08:45	51.27	50.85
37	12-06-24 09:00	58.57	58.84
38	12-06-24 09:15	63.53	63.34
39	12-06-24 09:30	63.14	62.82
40	12-06-24 09:45	62.69	63.24
41	12-06-24 10:00	63.05	63.1
42	12-06-24 10:15	63.17	62.55
43	12-06-24 10:30	68.32	68.47
44	12-06-24 10:45	78.62	78.79
45	12-06-24 11:00	83.48	83.02
46	12-06-24 11:15	81.72	81.78
47	12-06-24 11:30	85.35	85.47
48	12-06-24 11:45	82.23	81.69
49	12-06-24 12:00	79.13	79.19
50	12-06-24 12:15	76.52	76.67
51	12-06-24 12:30	73.42	73.81

S. No.	Time	KTPS	KTPS
		KOTA PG-1	KOTA PG-2
		220KV	220KV
	HRS	MW	MW
52	12-06-24 12:45	74.94	75.34
53	12-06-24 13:00	72.85	73.19
54	12-06-24 13:15	75.46	75.34
55	12-06-24 13:30	70.95	70.49
56	12-06-24 13:45	62.31	62.14
57	12-06-24 14:00	59.38	58.38
58	12-06-24 14:15	56.3	55.64
59	12-06-24 14:30	58.96	58.33
60	12-06-24 14:45	55.68	55.37
61	12-06-24 15:00	56.12	56.03
62	12-06-24 15:15	50.27	50.15
63	12-06-24 15:30	45.5	45.41
64	12-06-24 15:45	43.77	43.72
65	12-06-24 16:00	44.27	43.9
66	12-06-24 16:15	44.01	43.59
67	12-06-24 16:30	43.02	42.76
68	12-06-24 16:45	41.61	41.37
69	12-06-24 17:00	44.12	43.28
70	12-06-24 17:15	39.36	38.88
71	12-06-24 17:30	41.6	41.6
72	12-06-24 17:45	49.05	48.93
73	12-06-24 18:00	56.02	56.33
74	12-06-24 18:15	56.48	55.84
75	12-06-24 18:30	53.52	54.31
76	12-06-24 18:45	63.66	63.89
77	12-06-24 19:00	70.43	70.48
78	12-06-24 19:15	76.43	76.58
79	12-06-24 19:30	73.02	73.49
80	12-06-24 19:45	69.77	69.91
81	12-06-24 20:00	65.93	64.24
82	12-06-24 20:15	75.61	75.12
83	12-06-24 20:30	79.8	79.5
84	12-06-24 20:45	72.28	71.76
85	12-06-24 21:00	73.63	73.38
86	12-06-24 21:15	78.89	78.76
87	12-06-24 21:30	75.97	75.51
88	12-06-24 21:45	73.84	72.43
89	12-06-24 22:00	70.44	69.87
90	12-06-24 22:15	67.13	67.78
91	12-06-24 22:30	58.89	59.07
92	12-06-24 22:45	58.47	58.43
93	12-06-24 23:00	59.75	60.71
94	12-06-24 23:15	62.93	62.47
95	12-06-24 23:30	61.44	61.03
96	12-06-24 23:45	59.15	58.9
12.6.2024	**No. of Blocks export**	**95**	**95**
	No. of Blocks Import	**1**	**1**
	Maximum export	**92.83**	**92.14**
	Maximum Import	**-3.77**	**-4.2**
1	13-06-24 00:00	60.2	60.56
2	13-06-24 00:15	70.23	69.89
3	13-06-24 00:30	62.8	62.69
4	13-06-24 00:45	40.57	40.72
5	13-06-24 01:00	41.07	40.46
6	13-06-24 01:15	42.48	42.18

S. No.	Time	KTPS	KTPS
		KOTA PG-1	KOTA PG-2
		220KV	220KV
	HRS	MW	MW
7	13-06-24 01:30	43.85	43.41
8	13-06-24 01:45	43.65	43.7
9	13-06-24 02:00	45.21	44.71
10	13-06-24 02:15	48.35	48.41
11	13-06-24 02:30	50.99	51.07
12	13-06-24 02:45	49.18	49.33
13	13-06-24 03:00	54.46	54.13
14	13-06-24 03:15	57.18	57.45
15	13-06-24 03:30	57.6	57.35
16	13-06-24 03:45	59.01	59.3
17	13-06-24 04:00	58.92	59.33
18	13-06-24 04:15	54.76	54.38
19	13-06-24 04:30	55.51	55.23
20	13-06-24 04:45	56.48	56.15
21	13-06-24 05:00	52.48	52.62
22	13-06-24 05:15	42.69	42.14
23	13-06-24 05:30	35.36	35.4
24	13-06-24 05:45	36.24	34.94
25	13-06-24 06:00	38.99	38.71
26	13-06-24 06:15	31.28	31.61
27	13-06-24 06:30	19.5	19.27
28	13-06-24 06:45	18.48	18.73
29	13-06-24 07:00	20.39	19.73
30	13-06-24 07:15	14.27	14.34
31	13-06-24 07:30	18.52	18.72
32	13-06-24 07:45	24.04	24.89
33	13-06-24 08:00	18.9	20.66
34	13-06-24 08:15	0.56	1.37
35	13-06-24 08:30	-2.77	-2.88
36	13-06-24 08:45	-7.42	-7.23
37	13-06-24 09:00	-4.25	-4.69
38	13-06-24 09:15	14.8	14.73
39	13-06-24 09:30	26.48	26.09
40	13-06-24 09:45	24.92	24.19
41	13-06-24 10:00	30.94	30.01
42	13-06-24 10:15	35.26	34.79
43	13-06-24 10:30	35.51	34.11
44	13-06-24 10:45	35.02	34.46
45	13-06-24 11:00	37.19	36.31
46	13-06-24 11:15	34.61	33.5
47	13-06-24 11:30	37.96	36.46
48	13-06-24 11:45	33.58	33.18
49	13-06-24 12:00	18.03	16.95
50	13-06-24 12:15	14.07	12.92
51	13-06-24 12:30	32.52	31.6
52	13-06-24 12:45	57.33	56.32
53	13-06-24 13:00	64.92	64.5
54	13-06-24 13:15	64.12	63.61
55	13-06-24 13:30	64.6	64.53
56	13-06-24 13:45	72.37	66.96
57	13-06-24 14:00	55.84	55.85
58	13-06-24 14:15	59.16	58.82
59	13-06-24 14:30	60.97	60.9
60	13-06-24 14:45	61.09	60.57
61	13-06-24 15:00	82.52	82.03

S. No.	Time	KTPS	KTPS
		KOTA PG-1	KOTA PG-2
		220KV	220KV
	HRS	MW	MW
62	13-06-24 15:15	87.93	87.02
63	13-06-24 15:30	90.46	89.79
64	13-06-24 15:45	86.25	85.59
65	13-06-24 16:00	74.46	73.67
66	13-06-24 16:15	64.55	64.34
67	13-06-24 16:30	35.51	35.6
68	13-06-24 16:45	35.02	34.72
69	13-06-24 17:00	30.19	30.93
70	13-06-24 17:15	24.27	24.33
71	13-06-24 17:30	25.72	25.73
72	13-06-24 17:45	26.46	37.65
73	13-06-24 18:00	57.82	57.6
74	13-06-24 18:15	69.38	69.08
75	13-06-24 18:30	80.59	81.7
76	13-06-24 18:45	85.27	85.28
77	13-06-24 19:00	96.04	96.02
78	13-06-24 19:15	91.27	91.47
79	13-06-24 19:30	79.84	80.31
80	13-06-24 19:45	70.82	70.33
81	13-06-24 20:00	70.49	70.82
82	13-06-24 20:15	66.57	66.62
83	13-06-24 20:30	68.91	69.35
84	13-06-24 20:45	64.86	64.65
85	13-06-24 21:00	65.33	64.87
86	13-06-24 21:15	58.06	57.71
87	13-06-24 21:30	54.79	54.27
88	13-06-24 21:45	55.47	55.57
89	13-06-24 22:00	51.64	51.53
90	13-06-24 22:15	50.03	50.28
91	13-06-24 22:30	46.94	46.29
92	13-06-24 22:45	46.62	45.98
93	13-06-24 23:00	54.63	53.99
94	13-06-24 23:15	53.23	53.12
95	13-06-24 23:30	43.47	43.34
96	13-06-24 23:45	33.2	33.23
13.6.2024	**No. of Blocks export**	**93**	**93**
	No. of Blocks Import	**3**	**3**
	Maximum export	**96.04**	**96.02**
	Maximum Import	**-7.42**	**-7.23**
1	14-06-24 00:00	30.67	30.34
2	14-06-24 00:15	31.45	32.3
3	14-06-24 00:30	36.01	36.22
4	14-06-24 00:45	40.45	41.14
5	14-06-24 01:00	45.53	45.89
6	14-06-24 01:15	47.12	46.69
7	14-06-24 01:30	46.57	45.97
8	14-06-24 01:45	49.6	49.18
9	14-06-24 02:00	49.39	49.78
10	14-06-24 02:15	48.9	48.83
11	14-06-24 02:30	51.61	51.87
12	14-06-24 02:45	52.97	53.13
13	14-06-24 03:00	49.18	49.19
14	14-06-24 03:15	51.03	51.97
15	14-06-24 03:30	49.57	49.91
16	14-06-24 03:45	51.59	51.17

S. No.	Time	KTPS	KTPS
		KOTA PG-1	KOTA PG-2
		220KV	220KV
	HRS	MW	MW
17	14-06-24 04:00	53.66	52.98
18	14-06-24 04:15	52.84	53.03
19	14-06-24 04:30	50.33	50.22
20	14-06-24 04:45	51.78	51.77
21	14-06-24 05:00	46.78	46.78
22	14-06-24 05:15	40.61	39.75
23	14-06-24 05:30	38.86	38.66
24	14-06-24 05:45	40.63	40.94
25	14-06-24 06:00	39.84	40.27
26	14-06-24 06:15	33.94	33.78
27	14-06-24 06:30	24.19	23.9
28	14-06-24 06:45	25.76	25.74
29	14-06-24 07:00	22.24	22.14
30	14-06-24 07:15	23.62	23.74
31	14-06-24 07:30	25.64	25.83
32	14-06-24 07:45	1.34	1.32
33	14-06-24 08:00	-7.86	-8.01
34	14-06-24 08:15	-5.2	-5.36
35	14-06-24 08:30	-4.91	-5.07
36	14-06-24 08:45	3.96	3.92
37	14-06-24 09:00	8.17	7.86
38	14-06-24 09:15	17.04	16.8
39	14-06-24 09:30	-11.16	-11.8
40	14-06-24 09:45	-14.22	-15.03
41	14-06-24 10:00	-0.69	-1.28
42	14-06-24 10:15	-0.05	-0.82
43	14-06-24 10:30	8.75	7.85
44	14-06-24 10:45	12.03	11.15
45	14-06-24 11:00	18.06	17.72
46	14-06-24 11:15	15.9	14.67
47	14-06-24 11:30	21.26	20.36
48	14-06-24 11:45	24.34	23.57
49	14-06-24 12:00	27.66	26.93
50	14-06-24 12:15	27.14	26.22
51	14-06-24 12:30	19.39	19.02
52	14-06-24 12:45	17.24	16.43
53	14-06-24 13:00	15.05	14.38
54	14-06-24 13:15	10.39	9.33
55	14-06-24 13:30	32.47	32.56
56	14-06-24 13:45	57.33	56.49
57	14-06-24 14:00	55.72	55
58	14-06-24 14:15	50.44	50.19
59	14-06-24 14:30	43.72	42.57
60	14-06-24 14:45	42.27	41.55
61	14-06-24 15:00	36.66	36.55
62	14-06-24 15:15	32.91	32.44
63	14-06-24 15:30	36.89	36.76
64	14-06-24 15:45	37.33	36.86
65	14-06-24 16:00	38.73	38.72
66	14-06-24 16:15	37.6	36.93
67	14-06-24 16:30	33.35	33.8
68	14-06-24 16:45	31.52	31.33
69	14-06-24 17:00	30.57	29.38
70	14-06-24 17:15	22.61	21.75
71	14-06-24 17:30	22.61	22.92

S. No.	Time	KTPS	KTPS
		KOTA PG-1	KOTA PG-2
		220KV	220KV
	HRS	MW	MW
72	14-06-24 17:45	30.7	30.65
73	14-06-24 18:00	33.17	33.08
74	14-06-24 18:15	44.14	43.93
75	14-06-24 18:30	43.9	43.93
76	14-06-24 18:45	55.58	55.88
77	14-06-24 19:00	60.07	60.22
78	14-06-24 19:15	61.28	60.98
79	14-06-24 19:30	62.15	61.87
80	14-06-24 19:45	54.52	53.94
81	14-06-24 20:00	53.98	53.79
82	14-06-24 20:15	53.59	53.71
83	14-06-24 20:30	55.9	55.82
84	14-06-24 20:45	50.51	50.49
85	14-06-24 21:00	52.13	52.25
86	14-06-24 21:15	49.22	48.29
87	14-06-24 21:30	39.11	39.45
88	14-06-24 21:45	29.58	29.1
89	14-06-24 22:00	35.63	35.65
90	14-06-24 22:15	40	40.21
91	14-06-24 22:30	33.48	33.12
92	14-06-24 22:45	31.71	31.68
93	14-06-24 23:00	54.43	53.98
94	14-06-24 23:15	58.15	58.18
95	14-06-24 23:30	51.69	51.42
96	14-06-24 23:45	55.29	55.04
14.6.2024	**No. of Blocks export**	**89**	**89**
	No. of Blocks Import	**7**	**7**
	Maximum export	**62.15**	**61.87**
	Maximum Import	**-14.22**	**-15.03**
1	15-06-24 00:00	51.92	52.12
2	15-06-24 00:15	46.13	46.46
3	15-06-24 00:30	54.25	54.21
4	15-06-24 00:45	65.34	64.69
5	15-06-24 01:00	66.97	67.2
6	15-06-24 01:15	68.17	68.27
7	15-06-24 01:30	65.86	65.38
8	15-06-24 01:45	55.75	54.4
9	15-06-24 02:00	51.92	51.4
10	15-06-24 02:15	56.01	55.62
11	15-06-24 02:30	52.41	52.67
12	15-06-24 02:45	51.34	51.59
13	15-06-24 03:00	52.41	52.38
14	15-06-24 03:15	52.69	51.43
15	15-06-24 03:30	55.98	55.32
16	15-06-24 03:45	59.71	59.61
17	15-06-24 04:00	60.32	60.85
18	15-06-24 04:15	61.05	60.44
19	15-06-24 04:30	57.17	58.05
20	15-06-24 04:45	69.25	69.66
21	15-06-24 05:00	65.15	65.19
22	15-06-24 05:15	60.42	60.76
23	15-06-24 05:30	59.68	60.41
24	15-06-24 05:45	57.5	57.58
25	15-06-24 06:00	58.33	59.09
26	15-06-24 06:15	48.4	48.66

S. No.	Time	KTPS	KTPS
		KOTA PG-1	KOTA PG-2
		220KV	220KV
	HRS	MW	MW
27	15-06-24 06:30	35.67	36.38
28	15-06-24 06:45	31.95	32.93
29	15-06-24 07:00	30.65	31.24
30	15-06-24 07:15	30.61	30.07
31	15-06-24 07:30	34.17	34.86
32	15-06-24 07:45	7.96	8.64
33	15-06-24 08:00	-2.28	-3.26
34	15-06-24 08:15	-9.76	-7.98
35	15-06-24 08:30	-2.83	-2.33
36	15-06-24 08:45	2.91	3.25
37	15-06-24 09:00	34.72	33.88
38	15-06-24 09:15	53.82	53.87
39	15-06-24 09:30	58.38	58.77
40	15-06-24 09:45	62.65	63.25
41	15-06-24 10:00	71.25	70.66
42	15-06-24 10:15	40.33	41.01
43	15-06-24 10:30	4.74	4.2
44	15-06-24 10:45	-9.9	-10.66
45	15-06-24 11:00	24.39	24.02
46	15-06-24 11:15	41	40.99
47	15-06-24 11:30	41.03	40.25
48	15-06-24 11:45	51.09	51.02
49	15-06-24 12:00	63.08	63.72
50	15-06-24 12:15	72.18	71.98
51	15-06-24 12:30	73.29	72.75
52	15-06-24 12:45	67.97	68.39
53	15-06-24 13:00	70.45	70.51
54	15-06-24 13:15	71	71.15
55	15-06-24 13:30	66.67	67.01
56	15-06-24 13:45	61.79	62.13
57	15-06-24 14:00	58.43	59.21
58	15-06-24 14:15	53.36	53.69
59	15-06-24 14:30	58.83	58.89
60	15-06-24 14:45	57.32	58.27
61	15-06-24 15:00	54.39	54.85
62	15-06-24 15:15	54.04	54.42
63	15-06-24 15:30	49.79	50.73
64	15-06-24 15:45	48.76	49.18
65	15-06-24 16:00	50.73	50.53
66	15-06-24 16:15	42.36	42.47
67	15-06-24 16:30	33.51	34.3
68	15-06-24 16:45	34.54	35.28
69	15-06-24 17:00	25.1	25.71
70	15-06-24 17:15	2.92	2.41
71	15-06-24 17:30	11.04	10.8
72	15-06-24 17:45	13.86	13.96
73	15-06-24 18:00	28.29	28.16
74	15-06-24 18:15	29.93	29.72
75	15-06-24 18:30	34.81	34.47
76	15-06-24 18:45	35.95	36.01
77	15-06-24 19:00	45.37	45.33
78	15-06-24 19:15	38.28	39.45
79	15-06-24 19:30	29.09	28.58
80	15-06-24 19:45	42.53	42.84
81	15-06-24 20:00	42.22	42.13

S. No.	Time	KTPS	KTPS
		KOTA PG-1	KOTA PG-2
		220KV	220KV
	HRS	MW	MW
82	15-06-24 20:15	48.41	47.79
83	15-06-24 20:30	49.13	49.24
84	15-06-24 20:45	44.58	44.78
85	15-06-24 21:00	42.6	42.96
86	15-06-24 21:15	40.6	40.59
87	15-06-24 21:30	39.64	39.26
88	15-06-24 21:45	34.35	34.2
89	15-06-24 22:00	38.52	38.86
90	15-06-24 22:15	42.08	42
91	15-06-24 22:30	54.27	54.21
92	15-06-24 22:45	66.39	66.32
93	15-06-24 23:00	65.65	64.51
94	15-06-24 23:15	55.13	55.08
95	15-06-24 23:30	52.47	52.3
96	15-06-24 23:45	49.66	49.34
15.6.2024	**No. of Blocks export**	**92**	**92**
	No. of Blocks Import	**4**	**4**
	Maximum export	**73.29**	**72.75**
	Maximum Import	**-9.9**	**-10.66**
1	16-06-24 00:00	53.37	53.46
2	16-06-24 00:15	52.13	52.06
3	16-06-24 00:30	60.91	60.85
4	16-06-24 00:45	64.32	64.29
5	16-06-24 01:00	63.53	63.87
6	16-06-24 01:15	65.53	63.94
7	16-06-24 01:30	71.28	71.08
8	16-06-24 01:45	64.76	64.91
9	16-06-24 02:00	48.63	47.84
10	16-06-24 02:15	48.04	48.21
11	16-06-24 02:30	46.89	46.04
12	16-06-24 02:45	50.26	50.25
13	16-06-24 03:00	53.45	53.51
14	16-06-24 03:15	55.95	55.84
15	16-06-24 03:30	56.94	57.1
16	16-06-24 03:45	39.23	38.64
17	16-06-24 04:00	41.08	41.11
18	16-06-24 04:15	39.54	39.36
19	16-06-24 04:30	45.53	46
20	16-06-24 04:45	48.73	48.55
21	16-06-24 05:00	40.29	40.37
22	16-06-24 05:15	31.31	30.8
23	16-06-24 05:30	28.48	28.38
24	16-06-24 05:45	29.97	29.76
25	16-06-24 06:00	32.83	32.88
26	16-06-24 06:15	25.64	25.6
27	16-06-24 06:30	15.98	16.44
28	16-06-24 06:45	10.41	10.52
29	16-06-24 07:00	5.68	5.84
30	16-06-24 07:15	4.21	4.53
31	16-06-24 07:30	4.51	4.29
32	16-06-24 07:45	6.79	7.43
33	16-06-24 08:00	11.73	11.88
34	16-06-24 08:15	14.25	13.96
35	16-06-24 08:30	15.77	14.78
36	16-06-24 08:45	20.04	20.19

S. No.	Time	KTPS	KTPS
		KOTA PG-1	KOTA PG-2
		220KV	220KV
	HRS	MW	MW
37	16-06-24 09:00	18.75	18.57
38	16-06-24 09:15	19.58	19.94
39	16-06-24 09:30	23.3	23.26
40	16-06-24 09:45	22.37	23.06
41	16-06-24 10:00	24.83	25.04
42	16-06-24 10:15	25.55	25.53
43	16-06-24 10:30	24.6	23.72
44	16-06-24 10:45	33.83	33.61
45	16-06-24 11:00	40.28	38.82
46	16-06-24 11:15	40.86	40.95
47	16-06-24 11:30	40.48	40.47
48	16-06-24 11:45	43.6	43.13
49	16-06-24 12:00	54.44	54.44
50	16-06-24 12:15	54.39	53.9
51	16-06-24 12:30	54.5	54.11
52	16-06-24 12:45	47.36	46.16
53	16-06-24 13:00	50.59	50.61
54	16-06-24 13:15	50.33	50.12
55	16-06-24 13:30	45.37	45.18
56	16-06-24 13:45	37.74	36.95
57	16-06-24 14:00	43.02	42.75
58	16-06-24 14:15	37.46	37.11
59	16-06-24 14:30	42.96	41.53
60	16-06-24 14:45	47.85	47.6
61	16-06-24 15:00	50.92	50.9
62	16-06-24 15:15	56.2	55.71
63	16-06-24 15:30	47.51	46.39
64	16-06-24 15:45	41.32	41.19
65	16-06-24 16:00	42.83	43.53
66	16-06-24 16:15	41.76	41.34
67	16-06-24 16:30	29.87	30.39
68	16-06-24 16:45	31.73	32.87
69	16-06-24 17:00	47.21	47.65
70	16-06-24 17:15	28.93	29.89
71	16-06-24 17:30	30.85	31.37
72	16-06-24 17:45	44.04	44.09
73	16-06-24 18:00	47.01	47.78
74	16-06-24 18:15	50.53	50.59
75	16-06-24 18:30	57.25	56.85
76	16-06-24 18:45	68.66	68.27
77	16-06-24 19:00	67.49	67.46
78	16-06-24 19:15	62.55	62.42
79	16-06-24 19:30	54.6	54.71
80	16-06-24 19:45	44.99	45.49
81	16-06-24 20:00	47.76	47.69
82	16-06-24 20:15	38.59	38.4
83	16-06-24 20:30	40.52	39.95
84	16-06-24 20:45	43.25	43.12
85	16-06-24 21:00	51.68	51.47
86	16-06-24 21:15	55.4	54.86
87	16-06-24 21:30	62	61.78
88	16-06-24 21:45	81.29	81.53
89	16-06-24 22:00	83.26	82.92
90	16-06-24 22:15	90.4	89.73
91	16-06-24 22:30	87.73	87.85

S. No.	Time	KTPS	KTPS
		KOTA PG-1	KOTA PG-2
		220KV	220KV
	HRS	MW	MW
92	16-06-24 22:45	85.12	85.26
93	16-06-24 23:00	71.87	71.94
94	16-06-24 23:15	78.63	78.91
95	16-06-24 23:30	77.44	77.37
96	16-06-24 23:45	74.35	73.96
16.6.2024	**No. of Blocks export**	**96**	**96**
	No. of Blocks Import	**0**	**0**
	Maximum export	**90.4**	**89.73**
	Maximum Import	**0**	**0**
1	17-06-24 00:00	77.56	78.05
2	17-06-24 00:15	76.72	76.65
3	17-06-24 00:30	80.6	80.65
4	17-06-24 00:45	80.54	81.4
5	17-06-24 01:00	81.43	81.35
6	17-06-24 01:15	84.22	83.86
7	17-06-24 01:30	80.65	80.82
8	17-06-24 01:45	74.68	74.52
9	17-06-24 02:00	56.95	57.16
10	17-06-24 02:15	49.42	49.68
11	17-06-24 02:30	46.21	45.42
12	17-06-24 02:45	41.62	41.76
13	17-06-24 03:00	43.86	43.82
14	17-06-24 03:15	41.32	41.11
15	17-06-24 03:30	46.61	46.32
16	17-06-24 03:45	60.24	60.39
17	17-06-24 04:00	70.83	71.92
18	17-06-24 04:15	84.5	84.33
19	17-06-24 04:30	84.35	84.82
20	17-06-24 04:45	85.84	86.01
21	17-06-24 05:00	83.06	82.7
22	17-06-24 05:15	68.03	67.77
23	17-06-24 05:30	72.15	72.29
24	17-06-24 05:45	73.82	73.71
25	17-06-24 06:00	69.42	69.11
26	17-06-24 06:15	51.17	51.07
27	17-06-24 06:30	31.55	31.64
28	17-06-24 06:45	16.09	16.18
29	17-06-24 07:00	10.4	9.92
30	17-06-24 07:15	6.93	7.3
31	17-06-24 07:30	4.36	4.02
32	17-06-24 07:45	12.5	12.2
33	17-06-24 08:00	13.18	13.17
34	17-06-24 08:15	11.13	10.9
35	17-06-24 08:30	13.39	13.36
36	17-06-24 08:45	14.53	15.26
37	17-06-24 09:00	15.87	16.13
38	17-06-24 09:15	14.11	14.02
39	17-06-24 09:30	5.62	5.57
40	17-06-24 09:45	2.62	2.53
41	17-06-24 10:00	5.95	5.2
42	17-06-24 10:15	9.09	8.5
43	17-06-24 10:30	15.78	15.22
44	17-06-24 10:45	19.49	19.06
45	17-06-24 11:00	22.33	22.56
46	17-06-24 11:15	14.11	13.88

S. No.	Time	KTPS	KTPS
		KOTA PG-1	KOTA PG-2
		220KV	220KV
	HRS	MW	MW
47	17-06-24 11:30	13.24	12.82
48	17-06-24 11:45	10.95	11.06
49	17-06-24 12:00	21.38	21.59
50	17-06-24 12:15	24.54	24.31
51	17-06-24 12:30	40.18	40.09
52	17-06-24 12:45	30.54	31.06
53	17-06-24 13:00	28.69	28.11
54	17-06-24 13:15	23.19	23.36
55	17-06-24 13:30	17.79	17.29
56	17-06-24 13:45	24.81	24.58
57	17-06-24 14:00	25.73	25.39
58	17-06-24 14:15	22.46	22
59	17-06-24 14:30	20.67	20.91
60	17-06-24 14:45	19.6	19.81
61	17-06-24 15:00	22.77	21.95
62	17-06-24 15:15	25.14	24.9
63	17-06-24 15:30	34.56	34.38
64	17-06-24 15:45	28.61	28.34
65	17-06-24 16:00	32.37	32.02
66	17-06-24 16:15	34.6	34.93
67	17-06-24 16:30	35.82	35.69
68	17-06-24 16:45	33.96	34.28
69	17-06-24 17:00	12.4	12.75
70	17-06-24 17:15	9.62	10.1
71	17-06-24 17:30	-0.63	-0.42
72	17-06-24 17:45	-1.05	-0.76
73	17-06-24 18:00	8.52	8.23
74	17-06-24 18:15	19.03	19.67
75	17-06-24 18:30	24.81	24.92
76	17-06-24 18:45	23.46	23.63
77	17-06-24 19:00	37.29	37.13
78	17-06-24 19:15	42.26	42.19
79	17-06-24 19:30	40.67	40.8
80	17-06-24 19:45	32.73	32.65
81	17-06-24 20:00	53.8	54.42
82	17-06-24 20:15	62.18	62.41
83	17-06-24 20:30	66.95	67.29
84	17-06-24 20:45	80.23	79.51
85	17-06-24 21:00	82	81.39
86	17-06-24 21:15	73.59	73.44
87	17-06-24 21:30	64.35	64.39
88	17-06-24 21:45	62.48	62.09
89	17-06-24 22:00	60.72	60.81
90	17-06-24 22:15	61.18	60.84
91	17-06-24 22:30	57.53	57.55
92	17-06-24 22:45	58.42	59
93	17-06-24 23:00	67.05	67.24
94	17-06-24 23:15	69.58	69.5
95	17-06-24 23:30	69.27	69.47
96	17-06-24 23:45	69.37	69.19
17.6.2024	**No. of Blocks export**	**94**	**94**
	No. of Blocks Import	**2**	**2**
	Maximum export	**85.84**	**86.01**
	Maximum Import	**-1.05**	**-0.76**
1	18-06-24 00:00	72.46	72.46

S. No.	Time	KTPS	KTPS
		KOTA PG-1	KOTA PG-2
		220KV	220KV
	HRS	MW	MW
2	18-06-24 00:15	73.84	74.06
3	18-06-24 00:30	80.38	80.02
4	18-06-24 00:45	79.55	78.46
5	18-06-24 01:00	75.89	76.51
6	18-06-24 01:15	73.11	73
7	18-06-24 01:30	76.75	76.88
8	18-06-24 01:45	77.06	76.97
9	18-06-24 02:00	74.8	74.21
10	18-06-24 02:15	75.74	75.28
11	18-06-24 02:30	60.12	59.89
12	18-06-24 02:45	50.85	50.79
13	18-06-24 03:00	54.44	54.71
14	18-06-24 03:15	53.19	52.93
15	18-06-24 03:30	55	55.27
16	18-06-24 03:45	55.43	55.8
17	18-06-24 04:00	50.19	50.47
18	18-06-24 04:15	46.91	46.77
19	18-06-24 04:30	46.57	46.76
20	18-06-24 04:45	52.91	53.07
21	18-06-24 05:00	63.05	62.91
22	18-06-24 05:15	60.09	60.42
23	18-06-24 05:30	52.13	53.06
24	18-06-24 05:45	52.54	52.64
25	18-06-24 06:00	54.45	54.42
26	18-06-24 06:15	32.26	32.48
27	18-06-24 06:30	9.76	9.74
28	18-06-24 06:45	-3.38	-3.25
29	18-06-24 07:00	-6.81	-6.38
30	18-06-24 07:15	-7.35	-6.65
31	18-06-24 07:30	1.99	2.64
32	18-06-24 07:45	4.06	4.93
33	18-06-24 08:00	3.06	3.62
34	18-06-24 08:15	-24.28	-24.21
35	18-06-24 08:30	-31.7	-31.97
36	18-06-24 08:45	-26.72	-26.33
37	18-06-24 09:00	-22.56	-22.58
38	18-06-24 09:15	-13.47	-13.06
39	18-06-24 09:30	-13.9	-14.49
40	18-06-24 09:45	14.68	14.01
41	18-06-24 10:00	20.66	20.16
42	18-06-24 10:15	25.88	25.73
43	18-06-24 10:30	25.83	25.84
44	18-06-24 10:45	34.99	34.76
45	18-06-24 11:00	31.35	30.58
46	18-06-24 11:15	26.51	25.14
47	18-06-24 11:30	25.4	25.23
48	18-06-24 11:45	25.87	25.18
49	18-06-24 12:00	31.43	31.98
50	18-06-24 12:15	33.48	32.89
51	18-06-24 12:30	30.82	30.69
52	18-06-24 12:45	20.41	20.3
53	18-06-24 13:00	0.11	-0.2
54	18-06-24 13:15	1.1	1.15
55	18-06-24 13:30	3.13	3.38
56	18-06-24 13:45	1.68	0.89

S. No.	Time	KTPS	KTPS
		KOTA PG-1	KOTA PG-2
		220KV	220KV
	HRS	MW	MW
57	18-06-24 14:00	22.19	21.65
58	18-06-24 14:15	27.63	27.39
59	18-06-24 14:30	30.4	30.46
60	18-06-24 14:45	38.84	38.08
61	18-06-24 15:00	33.58	33.22
62	18-06-24 15:15	36.53	36.39
63	18-06-24 15:30	29.75	29.81
64	18-06-24 15:45	36.36	36.14
65	18-06-24 16:00	17.3	16.87
66	18-06-24 16:15	17.79	17.61
67	18-06-24 16:30	17.77	17.46
68	18-06-24 16:45	18.39	18.21
69	18-06-24 17:00	17.95	17.77
70	18-06-24 17:15	20.57	21.44
71	18-06-24 17:30	24.29	25.24
72	18-06-24 17:45	25.1	25.43
73	18-06-24 18:00	24.57	24.53
74	18-06-24 18:15	34.7	34.8
75	18-06-24 18:30	45.15	45.34
76	18-06-24 18:45	41.56	41.47
77	18-06-24 19:00	61.8	61.82
78	18-06-24 19:15	87.08	87.29
79	18-06-24 19:30	82.36	81.87
80	18-06-24 19:45	75.93	75.44
81	18-06-24 20:00	69.09	69.03
82	18-06-24 20:15	64.84	64.79
83	18-06-24 20:30	67.03	67.13
84	18-06-24 20:45	68.06	68.18
85	18-06-24 21:00	69.53	70.21
86	18-06-24 21:15	73.86	73.51
87	18-06-24 21:30	77.32	77.96
88	18-06-24 21:45	76.27	76.48
89	18-06-24 22:00	68.24	67.73
90	18-06-24 22:15	60.24	59.73
91	18-06-24 22:30	56.72	56.78
92	18-06-24 22:45	59.58	59.61
93	18-06-24 23:00	65.19	64.66
94	18-06-24 23:15	75.29	75.74
95	18-06-24 23:30	80.83	80.81
96	18-06-24 23:45	79.96	79.6
18.6.2024	**No. of Blocks export**	**87**	**86**
	No. of Blocks Import	**9**	**10**
	Maximum export	**87.08**	**87.29**
	Maximum Import	**-31.7**	**-31.97**
1	19-06-24 00:00	81.03	80.94
2	19-06-24 00:15	76.61	76.23
3	19-06-24 00:30	60.2	60.18
4	19-06-24 00:45	59.65	59.58
5	19-06-24 01:00	51.07	50.61
6	19-06-24 01:15	45.98	45.85
7	19-06-24 01:30	40.04	39.54
8	19-06-24 01:45	41.23	41.96
9	19-06-24 02:00	51.33	52.2
10	19-06-24 02:15	50.87	51.92
11	19-06-24 02:30	41.99	42.73

S. No.	Time	KTPS	KTPS
		KOTA PG-1	KOTA PG-2
		220KV	220KV
	HRS	MW	MW
12	19-06-24 02:45	40.83	41.48
13	19-06-24 03:00	42.2	41.26
14	19-06-24 03:15	45.31	45.74
15	19-06-24 03:30	49.16	49.29
16	19-06-24 03:45	52.23	52.25
17	19-06-24 04:00	56.87	56.89
18	19-06-24 04:15	61.26	60.55
19	19-06-24 04:30	55.7	54.85
20	19-06-24 04:45	46.23	46.09
21	19-06-24 05:00	44.49	44.65
22	19-06-24 05:15	40.92	41.06
23	19-06-24 05:30	37.57	37.73
24	19-06-24 05:45	38.81	38.77
25	19-06-24 06:00	37.8	38.21
26	19-06-24 06:15	27.23	26.78
27	19-06-24 06:30	21	20.87
28	19-06-24 06:45	20.69	20.64
29	19-06-24 07:00	15.34	15.26
30	19-06-24 07:15	14.49	14.92
31	19-06-24 07:30	10.63	10.91
32	19-06-24 07:45	16.2	16.44
33	19-06-24 08:00	18.26	18.02
34	19-06-24 08:15	16.73	17.21
35	19-06-24 08:30	22.16	22.57
36	19-06-24 08:45	24.08	23.85
37	19-06-24 09:00	24.55	24.25
38	19-06-24 09:15	28.66	28.79
39	19-06-24 09:30	30.66	30.54
40	19-06-24 09:45	31.38	31.41
41	19-06-24 10:00	39.76	38.58
42	19-06-24 10:15	37.37	36.87
43	19-06-24 10:30	33.29	33.16
44	19-06-24 10:45	31.75	31.37
45	19-06-24 11:00	36.5	36.13
46	19-06-24 11:15	39.93	39.45
47	19-06-24 11:30	40.45	40.21
48	19-06-24 11:45	36.31	36.4
49	19-06-24 12:00	44.98	44.99
50	19-06-24 12:15	48.48	48.1
51	19-06-24 12:30	53.61	53.06
52	19-06-24 12:45	50.33	49.75
53	19-06-24 13:00	55.1	54.64
54	19-06-24 13:15	46.97	46.25
55	19-06-24 13:30	45.54	44.14
56	19-06-24 13:45	49.35	48.65
57	19-06-24 14:00	49.87	49.97
58	19-06-24 14:15	41.79	41.31
59	19-06-24 14:30	38.06	37.75
60	19-06-24 14:45	36.2	35.99
61	19-06-24 15:00	39.29	38.86
62	19-06-24 15:15	30.62	29.15
63	19-06-24 15:30	27	27.53
64	19-06-24 15:45	25.6	26.15
65	19-06-24 16:00	25.38	26.54
66	19-06-24 16:15	16.29	15.97

S. No.	Time	KTPS	KTPS
		KOTA PG-1	KOTA PG-2
		220KV	220KV
	HRS	MW	MW
67	19-06-24 16:30	14.75	14.14
68	19-06-24 16:45	25.38	25.13
69	19-06-24 17:00	24.58	23.32
70	19-06-24 17:15	33.77	33.55
71	19-06-24 17:30	27.27	27.04
72	19-06-24 17:45	26.95	25.34
73	19-06-24 18:00	41.6	41.86
74	19-06-24 18:15	53.38	52.93
75	19-06-24 18:30	60.62	60.82
76	19-06-24 18:45	58.04	57.74
77	19-06-24 19:00	65.77	64.45
78	19-06-24 19:15	56.84	56.71
79	19-06-24 19:30	58.61	59.14
80	19-06-24 19:45	52.57	51.82
81	19-06-24 20:00	51	50.35
82	19-06-24 20:15	50.28	50.55
83	19-06-24 20:30	50.35	51.49
84	19-06-24 20:45	46.82	46.44
85	19-06-24 21:00	42.24	42.62
86	19-06-24 21:15	33.36	33.73
87	19-06-24 21:30	32.09	32.01
88	19-06-24 21:45	26.13	25.48
89	19-06-24 22:00	23.82	24.01
90	19-06-24 22:15	23.89	24.32
91	19-06-24 22:30	34.76	33.88
92	19-06-24 22:45	33.58	33.49
93	19-06-24 23:00	37.09	36.9
94	19-06-24 23:15	39.14	38.9
95	19-06-24 23:30	25.42	25.62
96	19-06-24 23:45	22.75	22.63
19.6.2024	**No. of Blocks export**	**96**	**96**
	No. of Blocks Import	**0**	**0**
	Maximum export	**81.03**	**80.94**
	Maximum Import	**0**	**0**
1	20-06-24 00:00	26.81	26.92
2	20-06-24 00:15	33.74	33.43
3	20-06-24 00:30	28.49	27.99
4	20-06-24 00:45	28.49	28.14
5	20-06-24 01:00	30.05	30.14
6	20-06-24 01:15	30.55	30.61
7	20-06-24 01:30	33.94	34.03
8	20-06-24 01:45	34.09	34.43
9	20-06-24 02:00	35.5	34.69
10	20-06-24 02:15	33.6	33.43
11	20-06-24 02:30	35.39	35.19
12	20-06-24 02:45	35.03	34.82
13	20-06-24 03:00	37.05	36.87
14	20-06-24 03:15	36.99	36.77
15	20-06-24 03:30	38.05	37.8
16	20-06-24 03:45	37.74	37.58
17	20-06-24 04:00	37.26	36.89
18	20-06-24 04:15	36.47	36.28
19	20-06-24 04:30	34.21	34.54
20	20-06-24 04:45	35.74	35.84
21	20-06-24 05:00	30.37	29.98

S. No.	Time	KTPS	KTPS
		KOTA PG-1	KOTA PG-2
		220KV	220KV
	HRS	MW	MW
22	20-06-24 05:15	21.89	21.84
23	20-06-24 05:30	21.35	21.81
24	20-06-24 05:45	21.1	20.72
25	20-06-24 06:00	21.93	21.43
26	20-06-24 06:15	11.13	12.7
27	20-06-24 06:30	6.93	6.14
28	20-06-24 06:45	4.56	4.35
29	20-06-24 07:00	3.01	1.11
30	20-06-24 07:15	-25.24	-25.25
31	20-06-24 07:30	-35.4	-35.2
32	20-06-24 07:45	-39.07	-38.51
33	20-06-24 08:00	-38.88	-38.78
34	20-06-24 08:15	-30.26	-30.19
35	20-06-24 08:30	-23.88	-22.96
36	20-06-24 08:45	-17.57	-17.71
37	20-06-24 09:00	-13.73	-14.41
38	20-06-24 09:15	-13.02	-13.12
39	20-06-24 09:30	-11.32	-11.31
40	20-06-24 09:45	-7.36	-7.42
41	20-06-24 10:00	-4.54	-4.46
42	20-06-24 10:15	-5.99	-6.4
43	20-06-24 10:30	-6.49	-7.47
44	20-06-24 10:45	-6.91	-6.92
45	20-06-24 11:00	5.99	5.51
46	20-06-24 11:15	2.95	2.52
47	20-06-24 11:30	0.54	0.11
48	20-06-24 11:45	7.04	6.5
49	20-06-24 12:00	12.58	11.84
50	20-06-24 12:15	8.6	7.37
51	20-06-24 12:30	13.15	12.38
52	20-06-24 12:45	15.53	14.99
53	20-06-24 13:00	18.7	18.17
54	20-06-24 13:15	25.07	24.9
55	20-06-24 13:30	26.04	25.18
56	20-06-24 13:45	34.19	33.38
57	20-06-24 14:00	25.25	24.86
58	20-06-24 14:15	23.69	23.51
59	20-06-24 14:30	18.53	18.19
60	20-06-24 14:45	19.23	19.11
61	20-06-24 15:00	16.95	16.28
62	20-06-24 15:15	52.21	52.1
63	20-06-24 15:30	51.15	51.01
64	20-06-24 15:45	50.79	50.42
65	20-06-24 16:00	54.53	54.81
66	20-06-24 16:15	20.39	20.81
67	20-06-24 16:30	10.55	11.22
68	20-06-24 16:45	13.15	12.79
69	20-06-24 17:00	10.34	10.8
70	20-06-24 17:15	8.88	9.58
71	20-06-24 17:30	8.9	8.08
72	20-06-24 17:45	15.22	15.16
73	20-06-24 18:00	18.68	18.77
74	20-06-24 18:15	32.15	31.93
75	20-06-24 18:30	37.49	37.3
76	20-06-24 18:45	35.07	35.16

S. No.	Time	KTPS	KTPS
		KOTA PG-1	KOTA PG-2
		220KV	220KV
	HRS	MW	MW
77	20-06-24 19:00	71.85	72.28
78	20-06-24 19:15	80.92	80.81
79	20-06-24 19:30	71.82	71.93
80	20-06-24 19:45	62.73	62.91
81	20-06-24 20:00	50.51	50.28
82	20-06-24 20:15	54.4	54.31
83	20-06-24 20:30	57.82	58.29
84	20-06-24 20:45	61.81	61.36
85	20-06-24 21:00	67.01	66.86
86	20-06-24 21:15	61.15	60.68
87	20-06-24 21:30	45.37	45.04
88	20-06-24 21:45	41.04	41.24
89	20-06-24 22:00	40.1	39.64
90	20-06-24 22:15	47.67	47.35
91	20-06-24 22:30	57.72	56.83
92	20-06-24 22:45	57.61	57.53
93	20-06-24 23:00	58.44	58.05
94	20-06-24 23:15	56.03	55.86
95	20-06-24 23:30	53.39	53.48
96	20-06-24 23:45	55.58	55.86
20..6.2024	**No. of Blocks export**	**81**	**81**
	No. of Blocks Import	**15**	**15**
	Maximum export	**80.92**	**80.81**
	Maximum Import	**-39.07**	**-38.78**
1	21-06-24 00:00	57.06	57.46
2	21-06-24 00:15	54.7	54.57
3	21-06-24 00:30	51.75	51.98
4	21-06-24 00:45	52.84	52.5
5	21-06-24 01:00	57.14	57.34
6	21-06-24 01:15	61.43	61.83
7	21-06-24 01:30	61.97	62.14
8	21-06-24 01:45	65.44	65.67
9	21-06-24 02:00	71.44	71.74
10	21-06-24 02:15	75.54	75.96
11	21-06-24 02:30	77.39	77.09
12	21-06-24 02:45	77.12	77.38
13	21-06-24 03:00	75.5	75.57
14	21-06-24 03:15	73.62	73.27
15	21-06-24 03:30	64.97	65.19
16	21-06-24 03:45	27.42	28.83
17	21-06-24 04:00	36.49	35.46
18	21-06-24 04:15	31.55	32.42
19	21-06-24 04:30	17.86	18.08
20	21-06-24 04:45	46.33	45.18
21	21-06-24 05:00	59.82	59.57
22	21-06-24 05:15	57.74	57.93
23	21-06-24 05:30	57.97	58.65
24	21-06-24 05:45	54.27	54.22
25	21-06-24 06:00	58.55	56.76
26	21-06-24 06:15	53.86	54.02
27	21-06-24 06:30	51.25	51.32
28	21-06-24 06:45	51.66	52.37
29	21-06-24 07:00	37	37.17
30	21-06-24 07:15	28.24	28.42
31	21-06-24 07:30	27.04	26.62

S. No.	Time	KTPS	KTPS
		KOTA PG-1	KOTA PG-2
		220KV	220KV
	HRS	MW	MW
32	21-06-24 07:45	33.58	34.05
33	21-06-24 08:00	35.43	36.64
34	21-06-24 08:15	36.39	36.65
35	21-06-24 08:30	36.61	36.45
36	21-06-24 08:45	32.52	32.7
37	21-06-24 09:00	36.95	36.98
38	21-06-24 09:15	55.25	55.26
39	21-06-24 09:30	38.22	38.45
40	21-06-24 09:45	41.55	41.75
41	21-06-24 10:00	52.85	53.67
42	21-06-24 10:15	55.34	55.55
43	21-06-24 10:30	53.4	53.71
44	21-06-24 10:45	52.68	52.53
45	21-06-24 11:00	59.05	58.69
46	21-06-24 11:15	60.14	59.62
47	21-06-24 11:30	34.95	-21.73
48	21-06-24 11:45	0	-241.4
49	21-06-24 12:00	0	-196.15
50	21-06-24 12:15	0	-170.07
51	21-06-24 12:30	0	-162.27
52	21-06-24 12:45	0	-167.76
53	21-06-24 13:00	0	-175.41
54	21-06-24 13:15	0	-169.75
55	21-06-24 13:30	0	-200.01
56	21-06-24 13:45	0	-193.44
57	21-06-24 14:00	0	-202.07
58	21-06-24 14:15	0	-218.61
59	21-06-24 14:30	0	-217.95
60	21-06-24 14:45	0	-200.8
61	21-06-24 15:00	0	-193.04
62	21-06-24 15:15	0	-216.05
63	21-06-24 15:30	0	-212.92
64	21-06-24 15:45	0	-196.51
65	21-06-24 16:00	0	-185.08
66	21-06-24 16:15	0	-164.06
67	21-06-24 16:30	0	-157.7
68	21-06-24 16:45	0	-141.5
69	21-06-24 17:00	0	-130.04
70	21-06-24 17:15	0	-129.69
71	21-06-24 17:30	0	-128.67
72	21-06-24 17:45	0	-130.67
73	21-06-24 18:00	0	-118.07
74	21-06-24 18:15	0	-116.61
75	21-06-24 18:30	0	-113.88
76	21-06-24 18:45	0	-111.12
77	21-06-24 19:00	0	-102.24
78	21-06-24 19:15	0	-91.69
79	21-06-24 19:30	0	-59.31
80	21-06-24 19:45	0	-47.75
81	21-06-24 20:00	0	-43.08
82	21-06-24 20:15	0	-95.91
83	21-06-24 20:30	0	-105.32
84	21-06-24 20:45	0	-105.27
85	21-06-24 21:00	0	-107.11
86	21-06-24 21:15	0	-106.69

S. No.	Time	KTPS	KTPS
		KOTA PG-1	KOTA PG-2
		220KV	220KV
	HRS	MW	MW
87	21-06-24 21:30	0	-104.13
88	21-06-24 21:45	0	-105.1
89	21-06-24 22:00	0	-104.05
90	21-06-24 22:15	0	-91.45
91	21-06-24 22:30	0	-93.63
92	21-06-24 22:45	0	-110.82
93	21-06-24 23:00	0	-112.66
94	21-06-24 23:15	0	-87.9
95	21-06-24 23:30	0	-33.09
96	21-06-24 23:45	0	11.47
21..6.2024	**No. of Blocks export**	**47**	**47**
	No. of Blocks Import	**0**	**49**
	Maximum export	**77.39**	**77.38**
	Maximum Import	**0**	**-241.4**

Annexure-B

Max. / Minimum Power Exports/Imports on 220 kV D/C KTPS-Kota(PG) line from 21.5.2024 to 21.6.2024

S. No.	Date	No. of Blocks Export	No. of Blocks Import	Maximum Export (MW)	Maximum Import(MW)
1	21.5.2024	80	16	204.22	-87.76
2	22.5.2024	96	0	169.3	0
3	23.5.2024	95	1	85.15	-1.71
4	24.5.2024	91	5	75.54	-23.7
5	25.5.2024	13	83	33.92	-164.72
6	26.5.2024	24	72	94.02	-243.56
7	27.5.2024	32	64	108.22	-156.48
8	28.5.2024	44	52	166.64	-164.48
9	29.5.2024	64	32	133.86	-70.88
10	30.5.2024	67	29	122.08	-132.38
11	31.5.2024	31	65	113.84	-174.04
12	1.6.2024	57	39	179.4	-47.16
13	2.6.2024	39	57	115.44	-142.32
14	3.6.2024	85	11	163.14	-80.28
15	4.6.2024	81	15	191.94	-42.68
16	5.6.2024	87	9	159.04	-41.3
17	6.6.2024	51	45	170.24	-90.64
18	7.6.2024	89	7	272.82	-39.44
19	8.6.2024	96	0	211.54	0
20	9.6.2024	69	27	139.84	-65.36
21	10.6.2024	78	18	194.64	-64.28
22	11.6.2024	91	5	222.98	-14.3
23	12.6.2024	95	1	185.66	-7.54
24	13.6.2024	93	3	192.08	-14.84
25	14.6.2024	89	7	124.3	-28.44
26	15.6.2024	92	4	146.58	-19.8
27	16.6.2024	96	0	180.8	0
28	17.6.2024	94	2	171.68	-2.1
29	18.6.2024	87	9	174.16	-63.4
30	19.6.2024	96	0	162.06	0
31	20.6.2024	81	15	161.84	-78.14
32	21.6.2024	47	49	154.76	-241.4
	Total	2330	742		
	Maximum			272.82	-243.56

Annexure-C

5 nos. Conditions of maximum Power EXPORT & IMPORT On 220 kV D/C KTPS-Kota(PG) line from 21.5.2024 to 21.6.2024

S. No.	Date	Time (Hrs)	Maximum Export / Import (-) (MW)	KTPS GEN (IC : 1240 MW, Net Available : 1116 MW)			Raj Demand (MW)	Solar (MW)	Generation at KTPS
				MW	%	Generation less than from Net available			
A	Maximum Export								
1	7.6.2024	19:30-19:45	272.82	1064.71	86	51	12200	0	All units are in operation
2	11.6.2024	19:15-19:30	222.98	1039.33	84	77	12842	15	
3	8.6.2024	19:15-19:30	211.54	1076.5	87	40	12471	17	
4	21.5.2024	22:00-22:15	204.22	1096	88	20	13512	0	
5	10.6.2024	19:15-19:30	194.64	1049.58	85	66	12644	22	
B	Maximum Import								
1	26.5.2024	10:45-11:00	-243.56	712.49	57	404	16289	3376	All units are in operation and running on backdown.
2	21.6.2024	11:45-12:00	-241.4	211.26	17	905	15344	3376	KTPS unit#1(110 MW) , unit #3 (210MW), unit #4 (210MW), unit #5, (210MW),unit #7 (210MW) tripped at 11:39 Hrs dt. 21.06.24 due to electrical fault. In the event Following lines tripped at KTPS :- 1. one circuit of 220 kV D/C KTPS-Kota(PG) line (ckt-1) 2. KTPS-Bundi line 3. KTPS-Ranpur line 4. KTPS-Sakatpura Interconnector-3
3	31.5.2024	9:45-10:00	-174.04	849.15	68	267	16994	3059	KTPS unit #6 (195 MW) tripped at 2.23 hrs dt 31.05.24 due to suspected BTL.
4	25.5.2024	10:30-10:45	-164.72	727.56	59	388	17242	3136	KTPS unit #3 (210MW) tripped at 22.10 hrs dt 24.05.24 due to suspected BTL.
5	28.5.2024	6:30-6:45	-164.48	877.43	71	239	14731	179	All units are in operation and running on backdown.

Annexure-1

Power flow (MW) in various contingencies at KTPS switchyard

S. No.	Name of line	Base Case	Contingency at KTPS							
			Cont-1	Cont-2	Cont-3	Cont-4	Cont-5	Cont-6	Cont-7	Cont-7
		Case-1	Case-1A	Case-1B	Case-1C	Case-1D	Case-1E	Case-1F	Case-1G	Case-1G
			Outage of unit-3 (210 MW) at KTPS	Outage of unit-3&4 (2X210 MW) at KTPS	Outage of Interconnector-1 between KTPS and Sakatpura(Bus-A)					
A	**KTPS switchyard**									
1	220 kV S/C KTPS-Heerapura line	84	71	57	84					
2	220 kV S/C KTPS-Beawar line	85	76	67	86					
3	220 kV S/C KTPS-Bundi line	161	154	146	161					
4	220 kV S/C KTPS-Ranpur line	142	141	140	142					
5	220 kV S/C KTPS-Vatika line	Under S/D	Under S/D	Under S/D	Under S/D	Under S/D	Under S/D	Under S/D	Under S/D	Under S/D
6	220 kV S/C KTPS-Sakatpura(bus-A) interconnector-1	124	112	101	OUT					
7	220 kV S/C KTPS-Sakatpura(bus-A) interconnector-3	141	128	114	196					
8	220 kV S/C KTPS-Sakatpura (bus-C) interconnector-2	147	133	120	179					
9	220 kV S/C KTPS-Sakatpura (bus-C) interconnector-4	170	154	139	207					
10	220 kV D/C KTPS-Kota(PG) line (400 kV line charged at 220 kV) (Ckt-1)	30	-21	-73	31					
11	220 kV D/C KTPS-Kota(PG) line (400 kV line charged at 220 kV) (Ckt-2)	30	-21	-73	31					
B	**RAPP(A) switchyard**									
1	220 kV S/C RAPP(A)-Debari line	84	83	83	84					
2	220 kV S/C RAPP(A)-RAPP(B) line	122	105	88	121					
3	220 kV D/C RAPP(A)-Sakatpura line (ckt-I)	-13	-4	5	-12					
4	220 kV D/C RAPP(A)-Sakatpura line (ckt-II)	-13	-4	4	-13					
C	**RAPP(B) switchyard**									
1	220 kV S/C RAPP(B)-Debari line	78	78	79	78					
2	220 kV S/C RAPP(B)-RAPP(A) line	-122	-105	-88	-121					
3	220 kV D/C RAPP(B)-RAPP(C) line (ckt-I)	51	49	46	51					
4	220 kV D/C RAPP(B)-RAPP(C) line (ckt-II)	51	49	46	51					
5	220 kV S/C RAPP(B)-Sakatpura line	-29	-17	-6	-29					
6	220 kV D/C RAPP(B)-Chittorgarh line (ckt-I)	84	72	60	84					
7	220 kV D/C RAPP(B)-Chittorgarh line (ckt-II)	84	72	60	84					
D	**220 kV GSS Sakatpura**									
	220 kV Bus-A									
1	220 kV D/C Sakatpura-RAPP(A) line(Ckt-I)	13	4	-4	13					
2	220 kV S/C Sakatpura-KTPS interconnector-1	-124	-112	-101	OUT					
3	220 kV S/C Sakatpura-KTPS interconnector-3	-141	-128	-114	-196					
4	220/132 kV Trf-1 (160 MVA) to 132 kV Bus-C	84	83	82	83					
5	B/S between A& B-Closed	169	153	137	99					
6	B/C between A& D-Opened	open	open	open	open	open	open	open	open	open
	220 kV Bus-B									
1	220 kV D/C Sakatpura-RAPP(A) line(Ckt-II)	13	4	-5	12					
2	220 kV S/C Sakatpura-Mandalgarh line	125	116	107	125					
3	B/S between B& A-Closed	-169	-153	-137	-99					
4	B/C between B& C-Closed	31	33	35	-38					
	220 kV Bus-C									
1	220 kV S/C Sakatpura-KTPS interconnector-2	-147	-133	-120	-179					
2	220 kV S/C Sakatpura-KTPS interconnector-4	-170	-154	-139	-207					
3	220 kV S/C Sakatpura-RAPP(B) line	29	17	6	29					
4	220 kV S/C Sakatpura-Anta GTPS line	163	149	136	163					
5	B/C between C& B-Closed	-31	-33	-35	38					
6	220/132 kV Trf-2 (100 MVA) to 132 kV Bus-A	90	89	88	90					
7	220/132 kV Trf-3 (100 MVA) to 132 kV Bus-C	66	65	64	66					
	220 kV Bus-D									
1	220 kV S/C Sakatpura-Ranpur line	-141	-140	-139	-141					
2	220 kV S/C Sakatpura-Dahra line	108	108	108	108					
3	220/132 kV Trf-4 (100 MVA) to 132 kV Bus-A	33	32	31	33					
4	B/C between A& D-Opened	open	open	open	open	open	open	open	open	open

Annexure-2

Power flow (MW) in various contingencies at RAPP(A) switchyard

S. No.	Name of line	Base Case	Contingency at KTPS		
			Cont-1	Cont-2	Cont-3
		Case-1	Case-1I	Case-1J	Case-1K
			Outage of 220 kV S/C RAPP(A)-Debari line	Outage of 220 kV S/C RAPP(A)-RAPP(B) line	Outage of 220 kV D/C RAPP(A)-Sakatpura line
A	**KTPS switchyard**				
1	220 kV S/C KTPS-Heerapura line	84	Minimal change in power flow	Minimal change in power flow	Minimal change in power flow
2	220 kV S/C KTPS-Beawar line	85			
3	220 kV S/C KTPS-Bundi line	161			
4	220 kV S/C KTPS-Ranpur line	142			
5	220 kV S/C KTPS-Vatika line	Under S/D			
6	220 kV S/C KTPS-Sakatpura(bus-A) interconnector-1	124			
7	220 kV S/C KTPS-Sakatpura(bus-A) interconnector-3	141			
8	220 kV S/C KTPS-Sakatpura (bus-C) interconnector-2	147			
9	220 kV S/C KTPS-Sakatpura (bus-C) interconnector-4	170			
10	220 kV D/C KTPS-Kota(PG) line (400 kV line charged at 220 kV) (Ckt-1)	30	30	40	33
11	220 kV D/C KTPS-Kota(PG) line (400 kV line charged at 220 kV) (Ckt-2)	30	30	40	33
B	**RAPP(A) switchyard**				
1	220 kV S/C RAPP(A)-Debari line	84	OUT	96	83
2	220 kV S/C RAPP(A)-RAPP(B) line	122	199	OUT	97
3	220 kV D/C RAPP(A)-Sakatpura line (ckt-I)	-13	-9	42	OUT
4	220 kV D/C RAPP(A)-Sakatpura line (ckt-II)	-13	-10	42	OUT
C	**RAPP(B) switchyard**				
1	220 kV S/C RAPP(B)-Debari line	78	167	66	78
2	220 kV S/C RAPP(B)-RAPP(A) line	-122	-199	-	-97
3	220 kV D/C RAPP(B)-RAPP(C) line (ckt-I)	51	50	41	49
4	220 kV D/C RAPP(B)-RAPP(C) line (ckt-II)	51	50	41	49
5	220 kV S/C RAPP(B)-Sakatpura line	-29	-35	-95	-44
6	220 kV D/C RAPP(B)-Chittorgarh line (ckt-I)	84	82	72	49
7	220 kV D/C RAPP(B)-Chittorgarh line (ckt-II)	84	82	72	49
D	**220 kV GSS Sakatpura**				
	220 kV Bus-A				
1	220 kV D/C Sakatpura-RAPP(A) line(Ckt-I)	13	Minimal change in power flow	Minimal change in power flow	Minimal change in power flow
2	220 kV S/C Sakatpura-KTPS interconnector-1	-124			
3	220 kV S/C Sakatpura-KTPS interconnector-3	-141			
4	220/132 kV Trf-1 (160 MVA) to 132 kV Bus-C	84			
5	B/S between A& B-Closed	169			
6	B/C between A& D-Opened	open			
	220 kV Bus-B				
1	220 kV D/C Sakatpura-RAPP(A) line(Ckt-II)	13			
2	220 kV S/C Sakatpura-Mandalgarh line	125			
3	B/S between B& A-Closed	-169			
4	B/C between B& C-Closed	31			
	220 kV Bus-C				
1	220 kV S/C Sakatpura-KTPS interconnector-2	-147			
2	220 kV S/C Sakatpura-KTPS interconnector-4	-170			
3	220 kV S/C Sakatpura-RAPP(B) line	29			
4	220 kV S/C Sakatpura-Anta GTPS line	163			
5	B/C between C& B-Closed	-31			
6	220/132 kV Trf-2 (100 MVA) to 132 kV Bus-A	90			
7	220/132 kV Trf-3 (100 MVA) to 132 kV Bus-C	66			
	220 kV Bus-D				
1	220 kV S/C Sakatpura-Ranpur line	-141			
2	220 kV S/C Sakatpura-Dahra line	108			
3	220/132 kV Trf-4 (100 MVA) to 132 kV Bus-A	33			
4	B/C between A& D-Opened	open			

Annexure3

Power flow (MW) in various contingencies at RAPP(B) switchyard

S. No.	Name of line	Base Case	Contingency at RAPP(B)			
			Cont-12	Cont-13	Cont-14	Cont-15
		Case-1	Case-1L	Case-1M	Case-1N	Case-10
			Outage of 220 kV S/C RAPP(B)-Debari line	Outage of 220 kV S/C RAPP(B)-Sakatpura line	Outage of 220 kV D/C RAPP(B)-Chhitorgarh line	Outage of 220 kV D/C RAPP(B)-RAPP(C) line
A	**KTPS switchyard**					
1	220 kV S/C KTPS-Heerapura line	84	Minimal change in power flow	Minimal change in power flow	Minimal change in power flow	Minimal change in power flow
2	220 kV S/C KTPS-Beawar line	85				
3	220 kV S/C KTPS-Bundi line	161				
4	220 kV S/C KTPS-Ranpur line	142				
5	220 kV S/C KTPS-Vatika line	Under S/D				
6	220 kV S/C KTPS-Sakatpura(bus-A) interconnector-1	124				
7	220 kV S/C KTPS-Sakatpura(bus-A) interconnector-3	141				
8	220 kV S/C KTPS-Sakatpura (bus-C) interconnector-2	147				
9	220 kV S/C KTPS-Sakatpura (bus-C) interconnector-4	170				
10	220 kV D/C KTPS-Kota(PG) line (400 kV line charged at 220 kV) (Ckt-1)	30	29	32	72	39
11	220 kV D/C KTPS-Kota(PG) line (400 kV line charged at 220 kV) (Ckt-2)	30	29	32	72	39
B	**RAPP(A) switchyard**					
1	220 kV S/C RAPP(A)-Debari line	84	166	84	83	83
2	220 kV S/C RAPP(A)-RAPP(B) line	122	49	142	38	72
3	220 kV D/C RAPP(A)-Sakatpura line (ckt-I)	-13	-18	-23	30	13
4	220 kV D/C RAPP(A)-Sakatpura line (ckt-II)	-13	-18	-23	30	12
C	**RAPP(B) switchyard**					
1	220 kV S/C RAPP(B)-Debari line	78	OUT	78	78	79
2	220 kV S/C RAPP(B)-RAPP(A) line	-122	-49	-141	-38	-72
3	220 kV D/C RAPP(B)-RAPP(C) line (ckt-I)	51	52	49	65	OUT
4	220 kV D/C RAPP(B)-RAPP(C) line (ckt-II)	51	52	49	65	OUT
5	220 kV S/C RAPP(B)-Sakatpura line	-29	-25	OUT	27	5
6	220 kV D/C RAPP(B)-Chittorgarh line (ckt-I)	84	84	82	OUT	93
7	220 kV D/C RAPP(B)-Chittorgarh line (ckt-II)	84	84	82	OUT	93
D	**220 kV GSS Sakatpura**					
	220 kV Bus-A					
1	220 kV D/C Sakatpura-RAPP(A) line(Ckt-I)	13	Minimal change in power flow	Minimal change in power flow	Minimal change in power flow	Minimal change in power flow
2	220 kV S/C Sakatpura-KTPS interconnector-1	-124				
3	220 kV S/C Sakatpura-KTPS interconnector-3	-141				
4	220/132 kV Trf-1 (160 MVA) to 132 kV Bus-C	84				
5	B/S between A& B-Closed	169				
6	B/C between A& D-Opened	open				
	220 kV Bus-B					
1	220 kV D/C Sakatpura-RAPP(A) line(Ckt-II)	13				
2	220 kV S/C Sakatpura-Mandalgarh line	125				
3	B/S between B& A-Closed	-169				
4	B/C between B& C-Closed	31				
	220 kV Bus-C					
1	220 kV S/C Sakatpura-KTPS interconnector-2	-147				
2	220 kV S/C Sakatpura-KTPS interconnector-4	-170				
3	220 kV S/C Sakatpura-RAPP(B) line	29				
4	220 kV S/C Sakatpura-Anta GTPS line	163				221
5	B/C between C& B-Closed	-31				Minimal change in power flow
6	220/132 kV Trf-2 (100 MVA) to 132 kV Bus-A	90				
7	220/132 kV Trf-3 (100 MVA) to 132 kV Bus-C	66				
	220 kV Bus-D					
1	220 kV S/C Sakatpura-Ranpur line	-141				
2	220 kV S/C Sakatpura-Dahra line	108				
3	220/132 kV Trf-4 (100 MVA) to 132 kV Bus-A	33				
4	B/C between A& D-Opened	open				

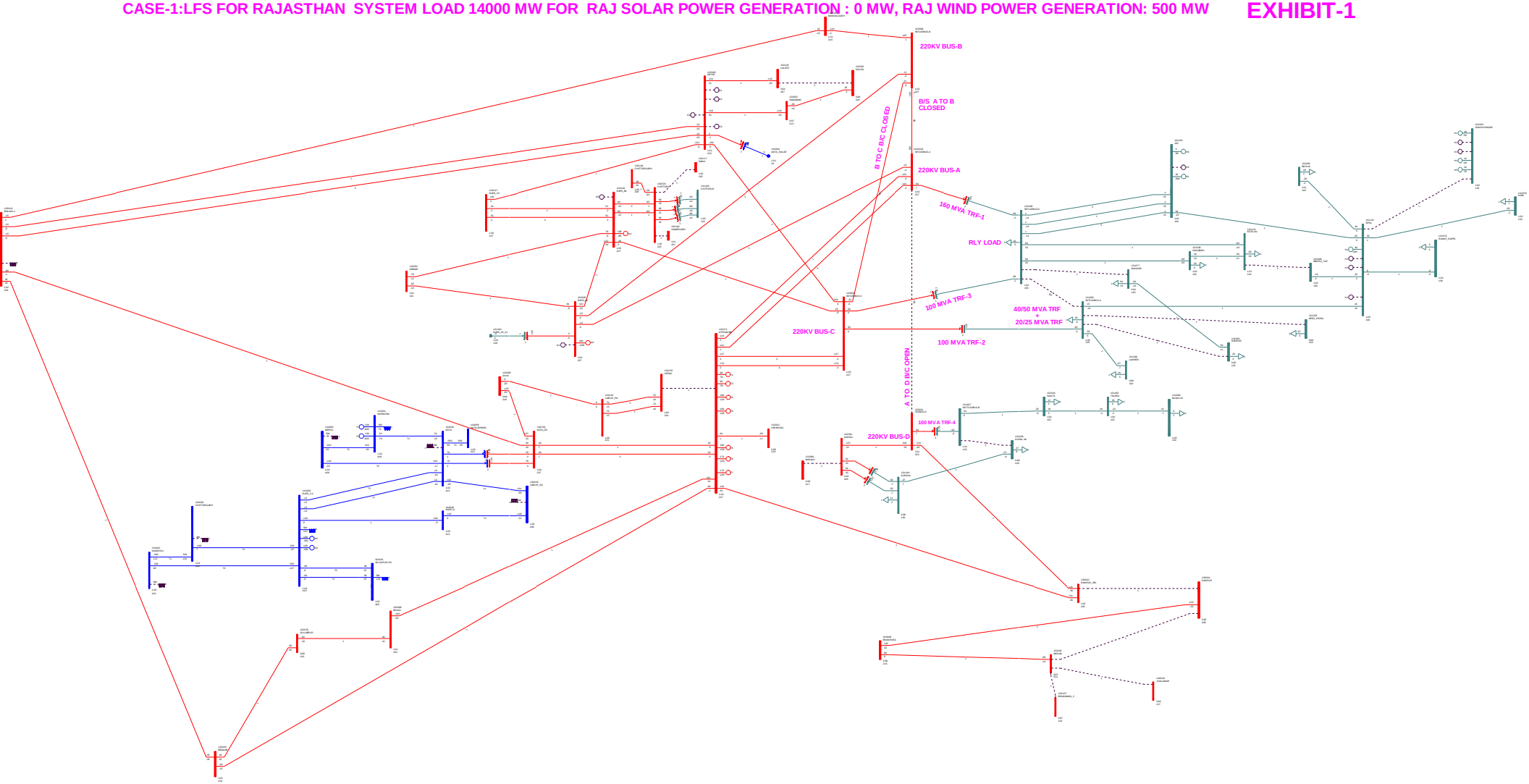
Annexure-4

Power flow (MW) in various contingencies at Kota(PG)) switchyard

S. No.	Name of line	Base Case	Contingency at Kota(PG)					
			Cont-16	Cont-17	Cont-18	Cont-19	Cont-20	Cont-21
		Case-1	Case-16	Case-17	Case-18	Case-19	Case-20	Case-21
			Outage of one 315 MVA, 400/220 kV transformer at Kota(PG)	Outage of 220 kV S/C Kota(PG)-Bhilwara line	Outage of 220 kV S/C Kota(PG)-Duni line	Outage of 400 kV S/C Kota(PG)-Anta –Chhabra TPS line	Outage of 400 kV S/C Kota(PG)-Jaipur(PG) line	Outage of 400 kV S/C Kota(PG)-Merta line
A	**KTPS switchyard**							
1	220 kV S/C KTPS-Heerapura line	84	Minimal change in power flow	Minimal change in power flow	Minimal change in power flow	Minimal change in power flow	Minimal change in power flow	Minimal change in power flow
2	220 kV S/C KTPS-Beawar line	85						
3	220 kV S/C KTPS-Bundi line	161						
4	220 kV S/C KTPS-Ranpur line	142						
5	220 kV S/C KTPS-Vatika line	Under S/D						
6	220 kV S/C KTPS-Sakatpura(bus-A) interconnector-1	124						
7	220 kV S/C KTPS-Sakatpura(bus-A) interconnector-3	141						
8	220 kV S/C KTPS-Sakatpura (bus-C) interconnector-2	147						
9	220 kV S/C KTPS-Sakatpura (bus-C) interconnector-4	170						
10	220 kV D/C KTPS-Kota(PG) line (400 kV line charged at 220 kV) (Ckt-1)	30	48	4	2	66	26	23
11	220 kV D/C KTPS-Kota(PG) line (400 kV line charged at 220 kV) (Ckt-2)	30	48	4	2	66	26	23
B	**RAPP(A) switchyard**							
1	220 kV S/C RAPP(A)-Debari line	84	Minimal change in power flow	Minimal change in power flow	Minimal change in power flow	Minimal change in power flow	Minimal change in power flow	Minimal change in power flow
2	220 kV S/C RAPP(A)-RAPP(B) line	122						
3	220 kV D/C RAPP(A)-Sakatpura line (ckt-I)	-13						
4	220 kV D/C RAPP(A)-Sakatpura line (ckt-II)	-13						
C	**RAPP(B) switchyard**							
1	220 kV S/C RAPP(B)-Debari line	78	Minimal change in power flow	Minimal change in power flow	Minimal change in power flow	Minimal change in power flow	Minimal change in power flow	Minimal change in power flow
2	220 kV S/C RAPP(B)-RAPP(A) line	-122						
3	220 kV D/C RAPP(B)-RAPP(C) line (ckt-I)	51						
4	220 kV D/C RAPP(B)-RAPP(C) line (ckt-II)	51						
5	220 kV S/C RAPP(B)-Sakatpura line	-29						
6	220 kV D/C RAPP(B)-Chittorgarh line (ckt-I)	84						
7	220 kV D/C RAPP(B)-Chittorgarh line (ckt-II)	84						
D	**220 kV GSS Sakatpura**							
	220 kV Bus-A		Minimal change in power flow	Minimal change in power flow	Minimal change in power flow	Minimal change in power flow	Minimal change in power flow	Minimal change in power flow
1	220 kV D/C Sakatpura-RAPP(A) line(Ckt-I)	13						
2	220 kV S/C Sakatpura-KTPS interconnector-1	-124						
3	220 kV S/C Sakatpura-KTPS interconnector-3	-141						
4	220/132 kV Trf-1 (160 MVA) to 132 kV Bus-C	84						
5	B/S between A& B-Closed	169						
6	B/C between A& D-Opened	open						
	220 kV Bus-B							
1	220 kV D/C Sakatpura-RAPP(A) line(Ckt-II)	13						
2	220 kV S/C Sakatpura-Mandalgarh line	125						
3	B/S between B& A-Closed	-169						
4	B/C between B& C-Closed	31						
	220 kV Bus-C							
1	220 kV S/C Sakatpura-KTPS interconnector-2	-147						
2	220 kV S/C Sakatpura-KTPS interconnector-4	-170						
3	220 kV S/C Sakatpura-RAPP(B) line	29						
4	220 kV S/C Sakatpura-Anta GTPS line	163						
5	B/C between C& B-Closed	-31						
6	220/132 kV Trf-2 (100 MVA) to 132 kV Bus-A	90						
7	220/132 kV Trf-3 (100 MVA) to 132 kV Bus-C	66						
	220 kV Bus-D							
1	220 kV S/C Sakatpura-Ranpur line	-141						
2	220 kV S/C Sakatpura-Dahra line	108						
3	220/132 kV Trf-4 (100 MVA) to 132 kV Bus-A	33						
4	B/C between A& D-Opened	open						

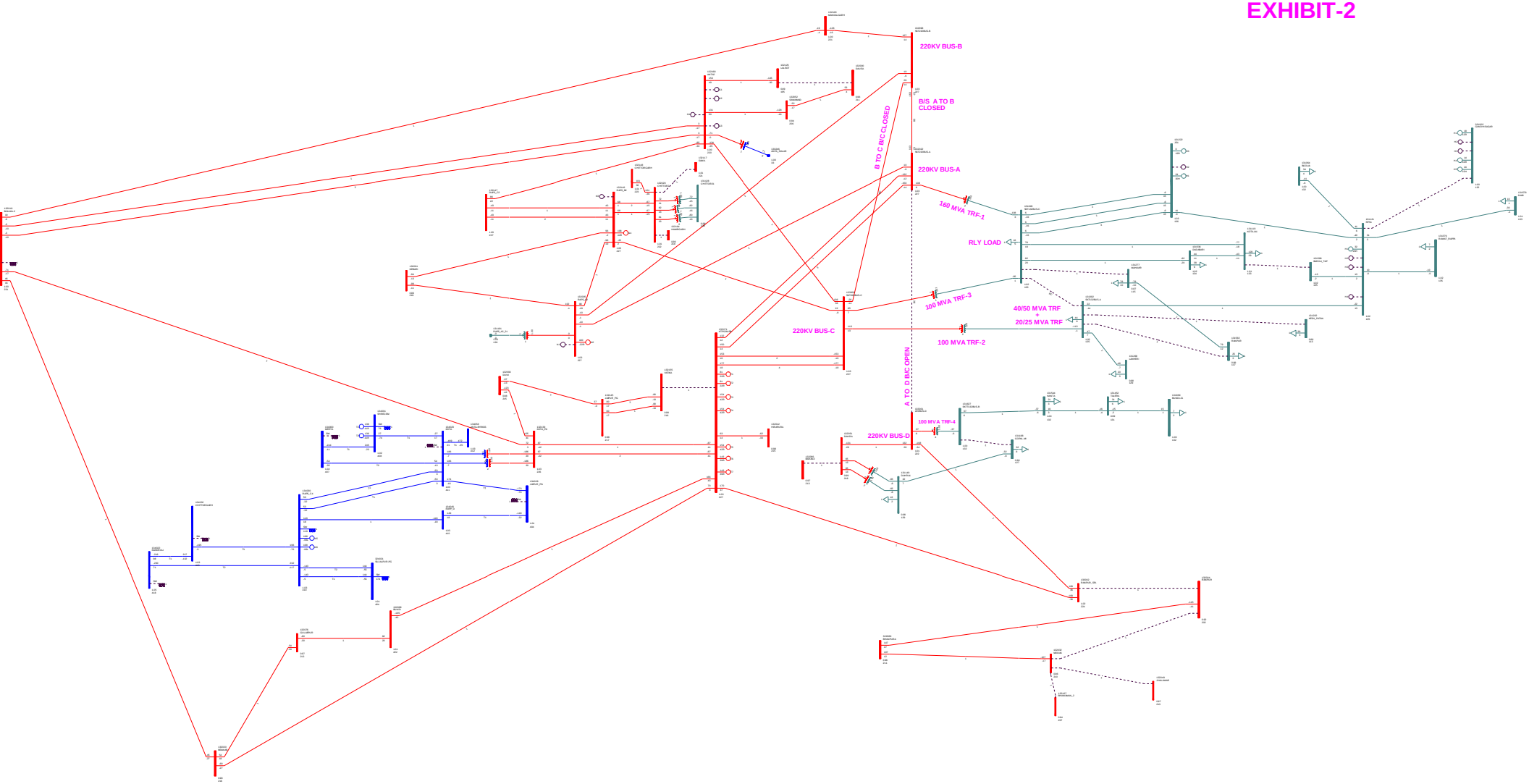
CASE-1:LFS FOR RAJASTHAN SYSTEM LOAD 14000 MW FOR RAJ SOLAR POWER GENERATION : 0 MW, RAJ WIND POWER GENERATION: 500 MW

EXHIBIT-1



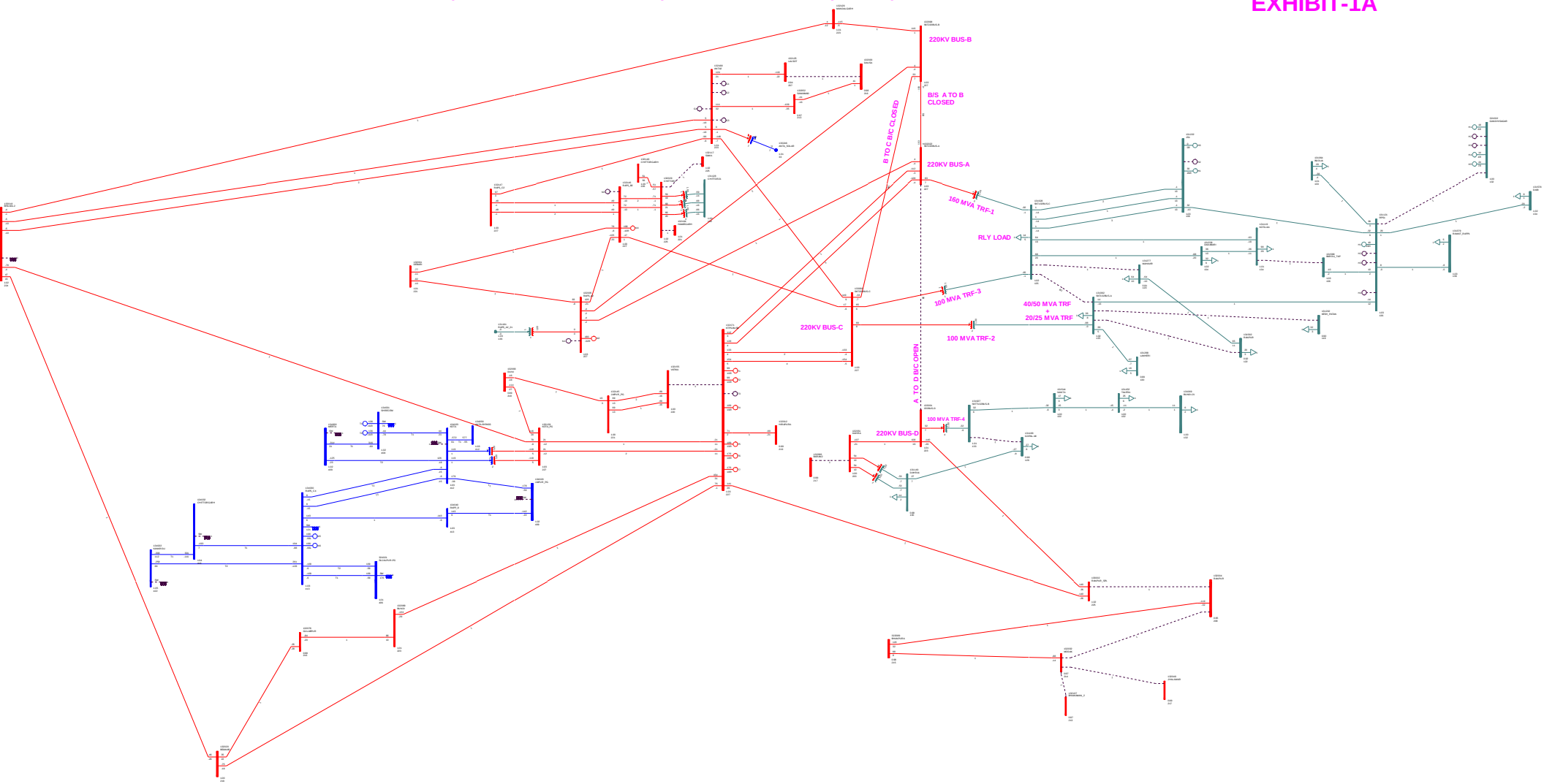
CASE-2:LFS FOR RAJASTHAN SYSTEM LOAD 17000 MW FOR RAJ SOLAR POWER GENERATION : 3864 MW, RAJ WIND POWER GENERATION: 500 MW

EXHIBIT-2



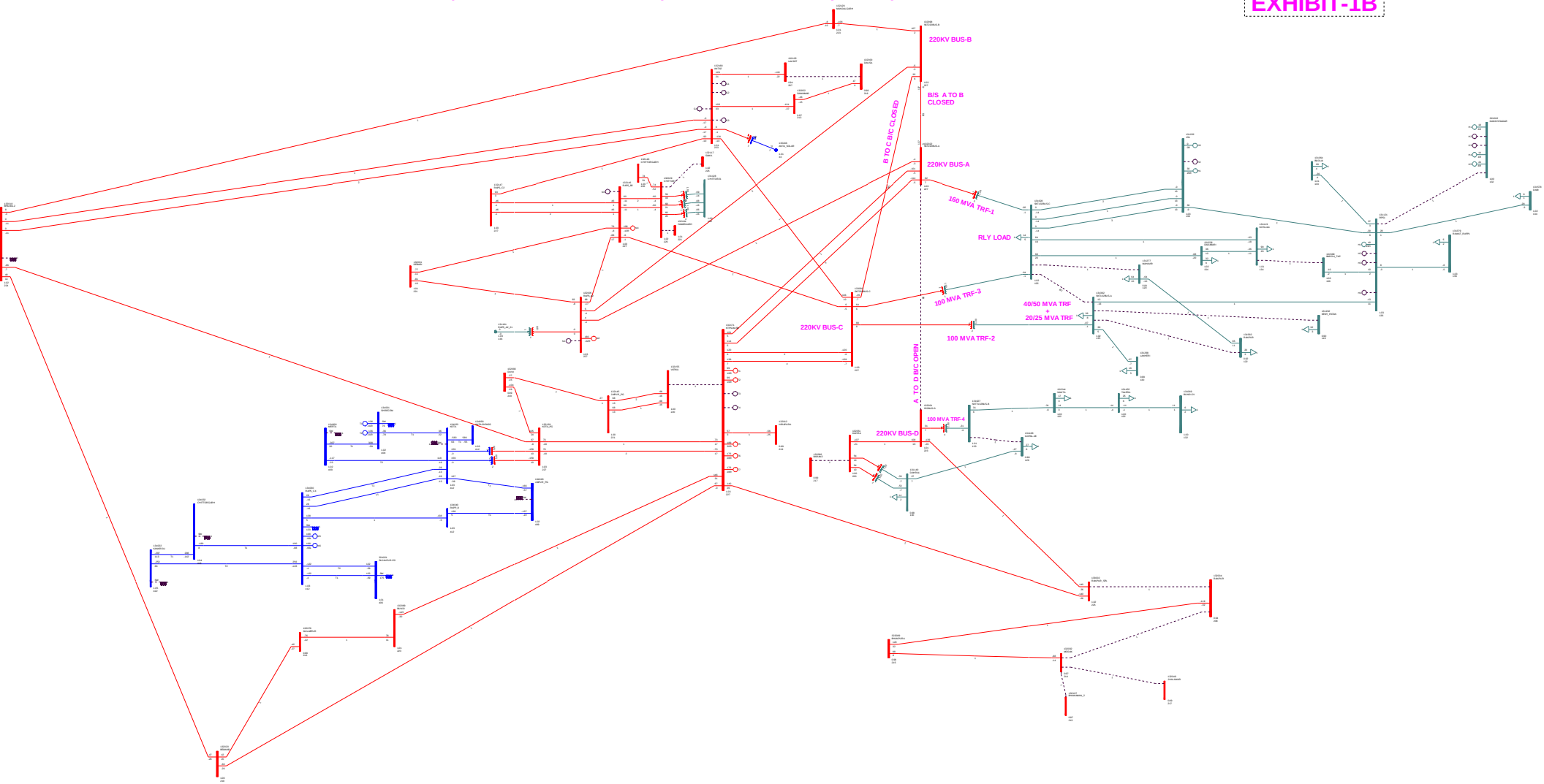
CASE-1A (CONTINGENCY-1 IN CASE-1) : OUTAGE OF UNIT-3 (210 MW) AT KTPS

EXHIBIT-1A



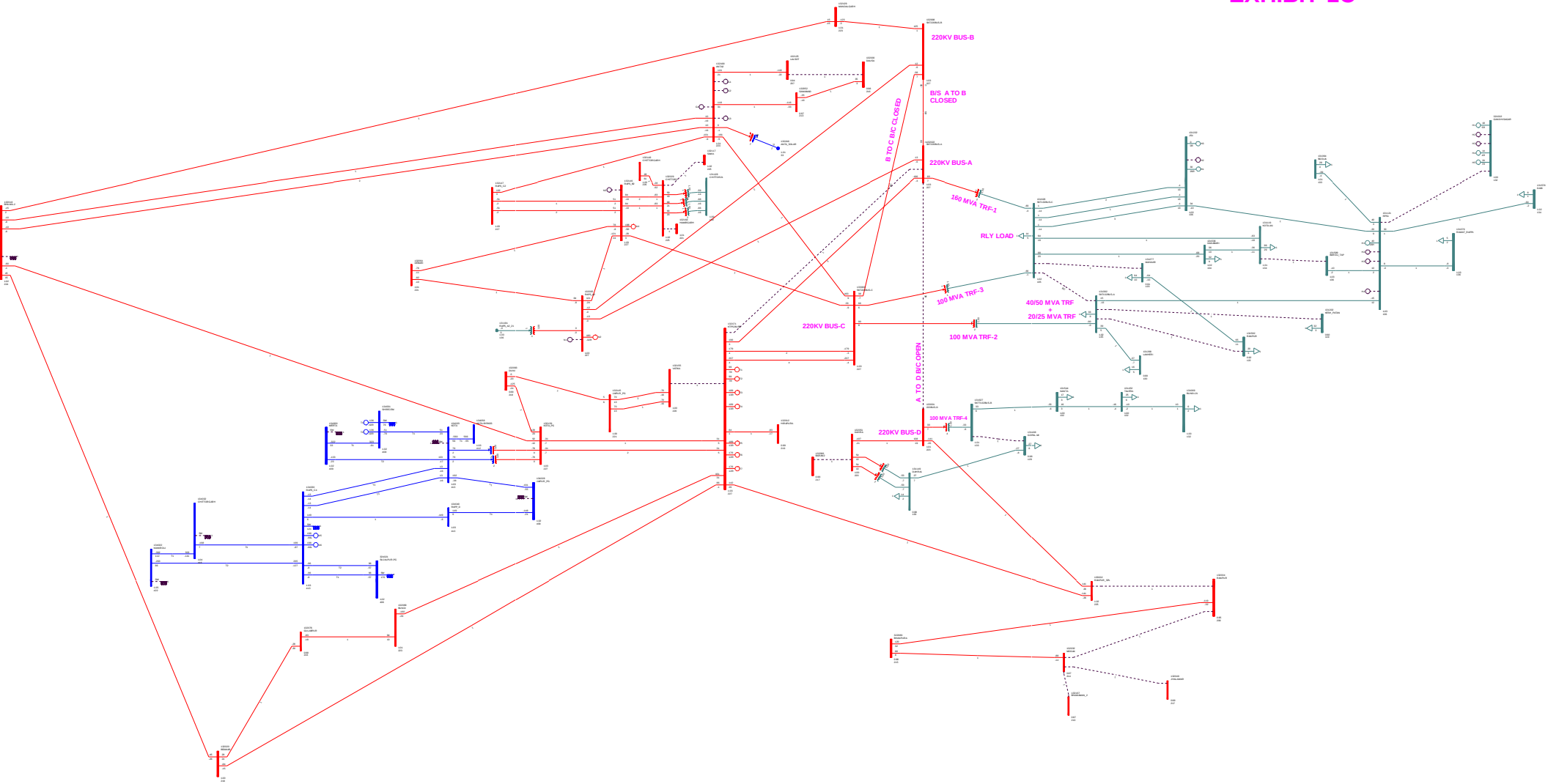
CASE-1B (CONTINGENCY-2 IN CASE-1) : OUTAGE OF UNIT-3 (210 MW) AT KTPS

EXHIBIT-1B



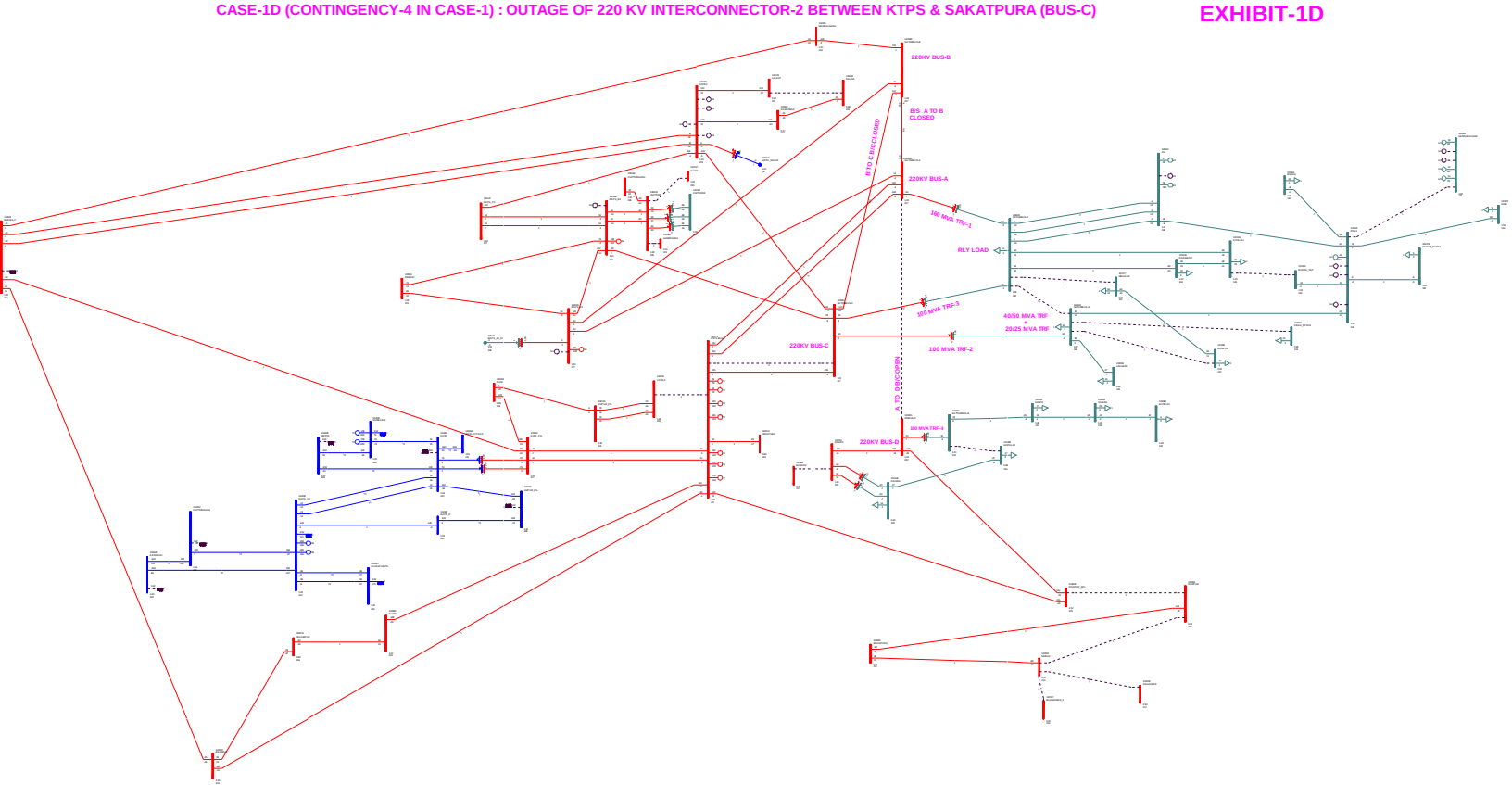
CASE-1C (CONTINGENCY-3 IN CASE-1) : OUTAGE OF 220 KV INTERCONNECTOR-1 BETWEEN KTPS & SAKATPURA (BUS-A)

EXHIBIT-1C



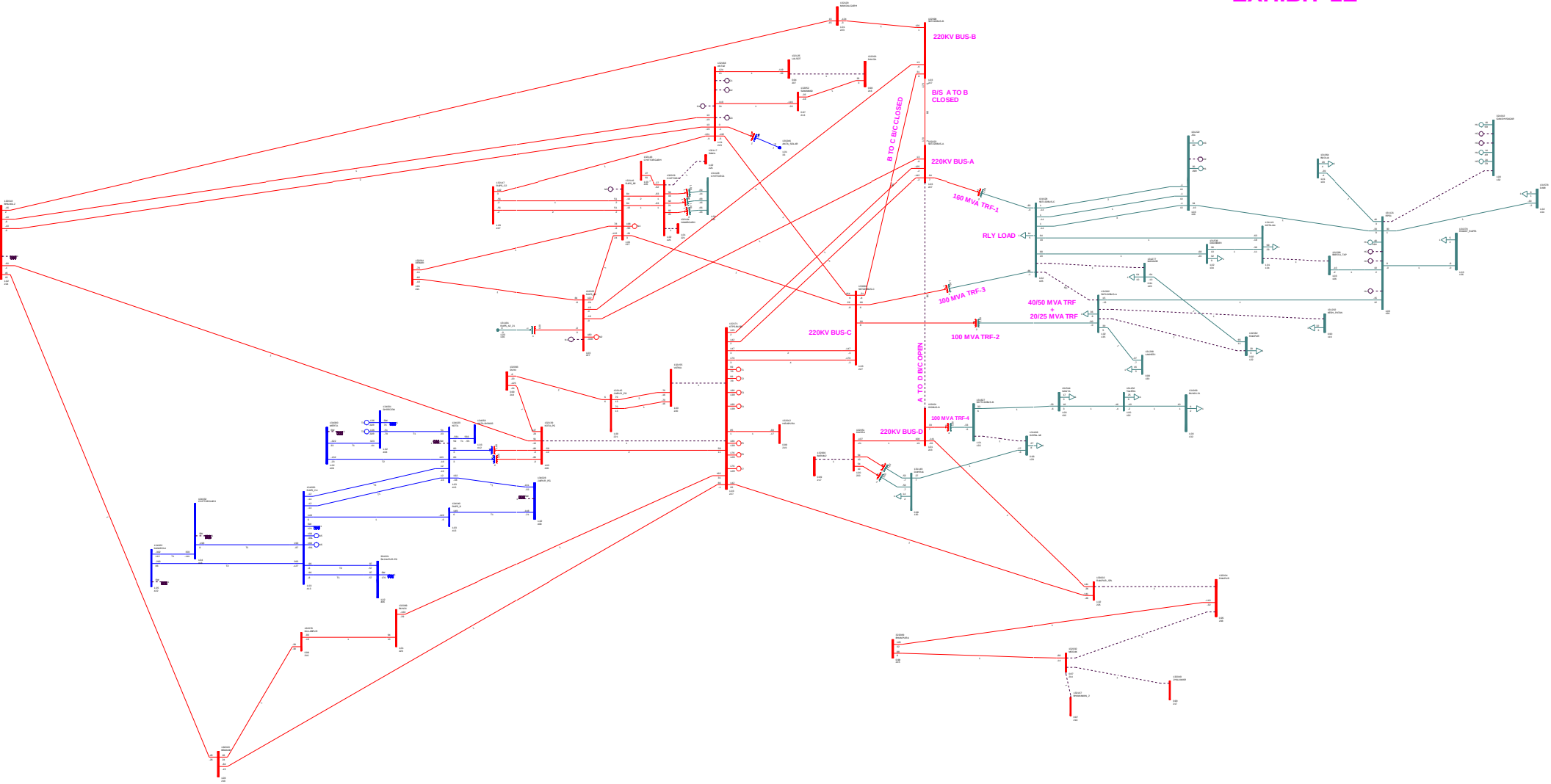
CASE-1D (CONTINGENCY-4 IN CASE-1) : OUTAGE OF 220 KV INTERCONNECTOR-2 BETWEEN KTPS & SAKATPURA (BUS-C)

EXHIBIT-1D



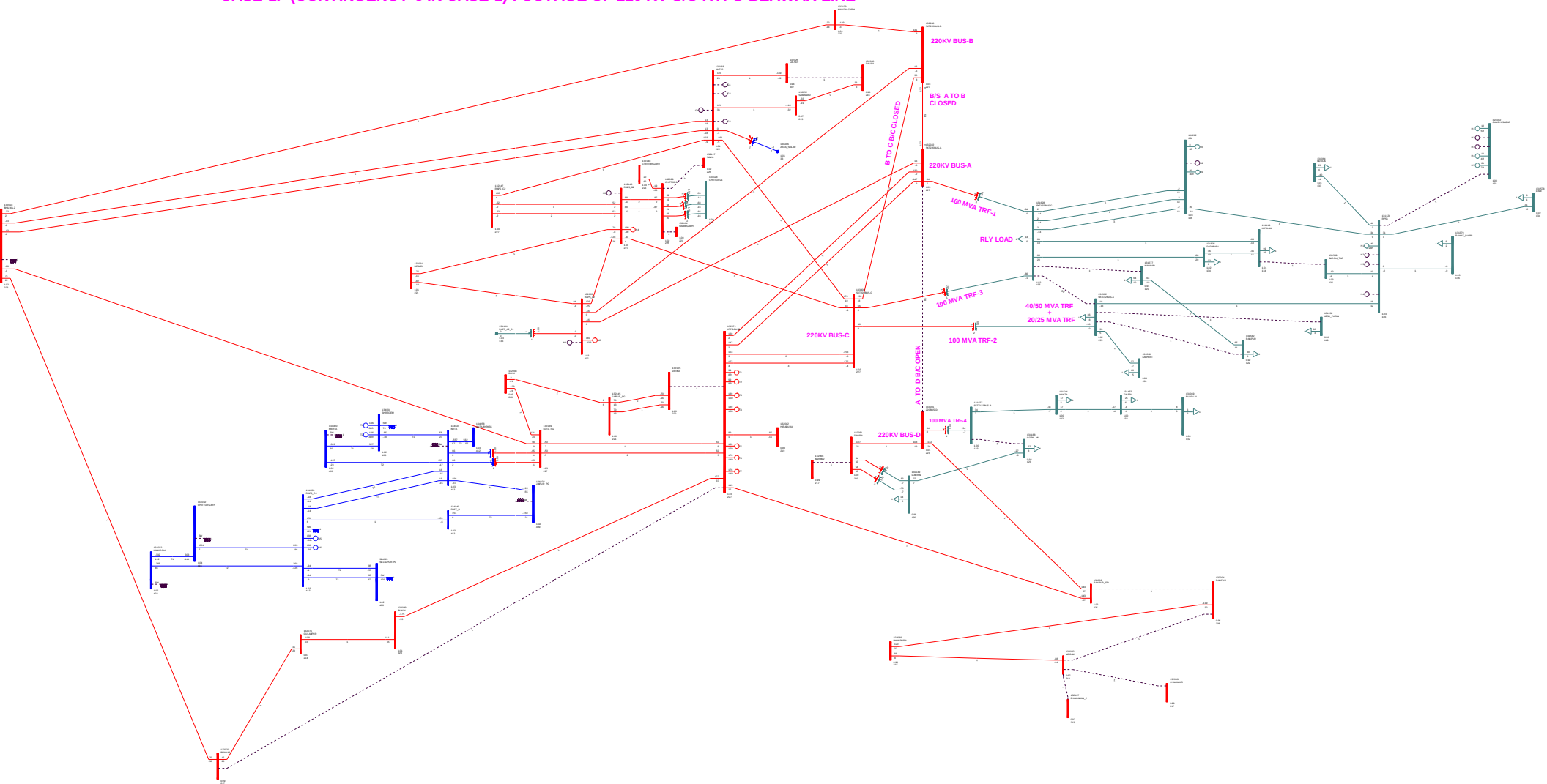
CASE-1E (CONTINGENCY-5 IN CASE-1) : OUTAGE OF ONE CIRCUIT OF 220 KV D/C KTPS-KOTA(PG) LINE

EXHIBIT-1E



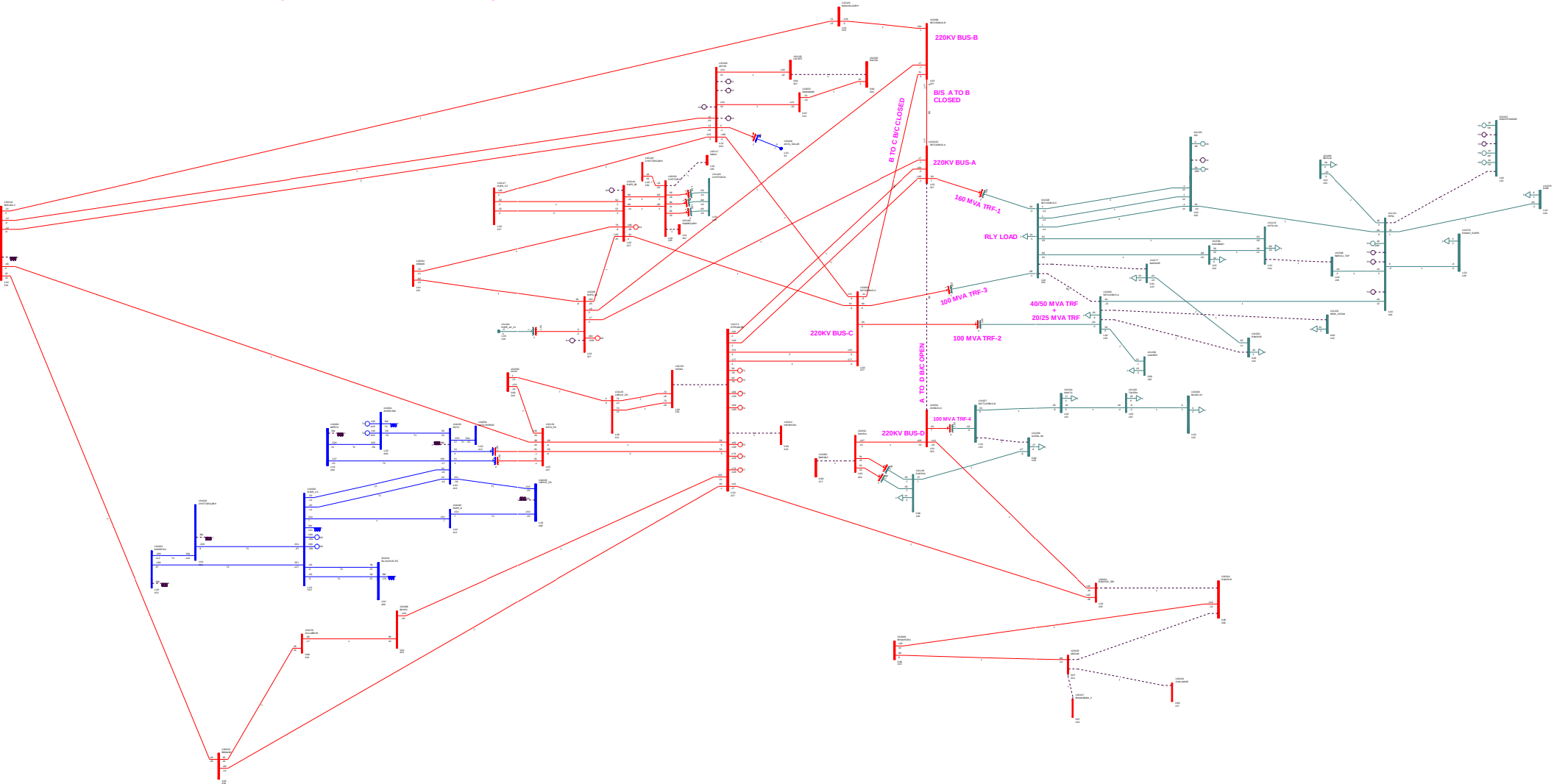
CASE-1F (CONTINGENCY-6 IN CASE-1) : OUTAGE OF 220 KV S/C KTPS-BEAWAR LINE

EXHIBIT-1F



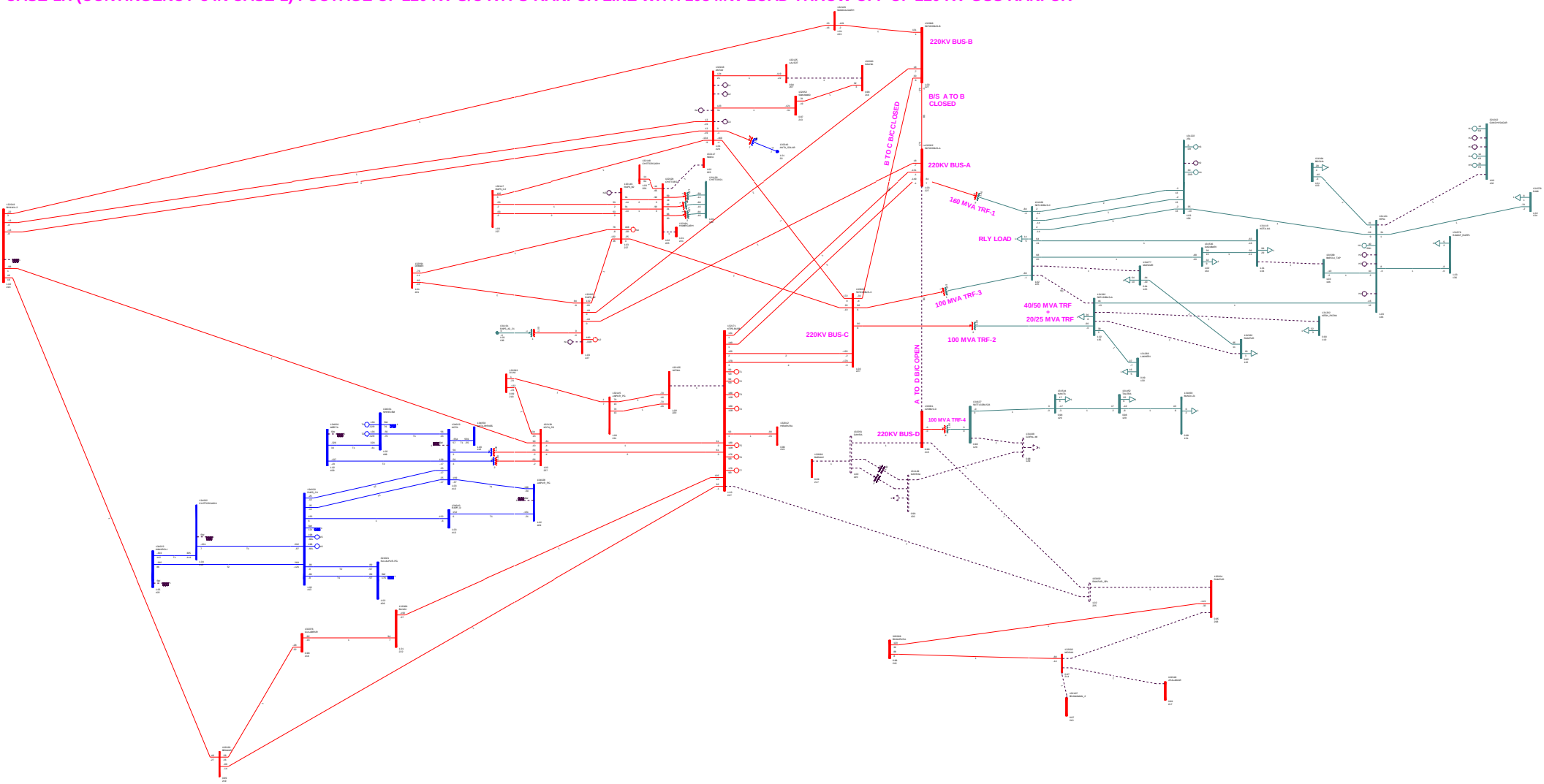
CASE-1G (CONTINGENCY-7 IN CASE-1) : OUTAGE OF 220 KV S/C KTPS-HEERAPURA LINE

EXHIBIT-1G



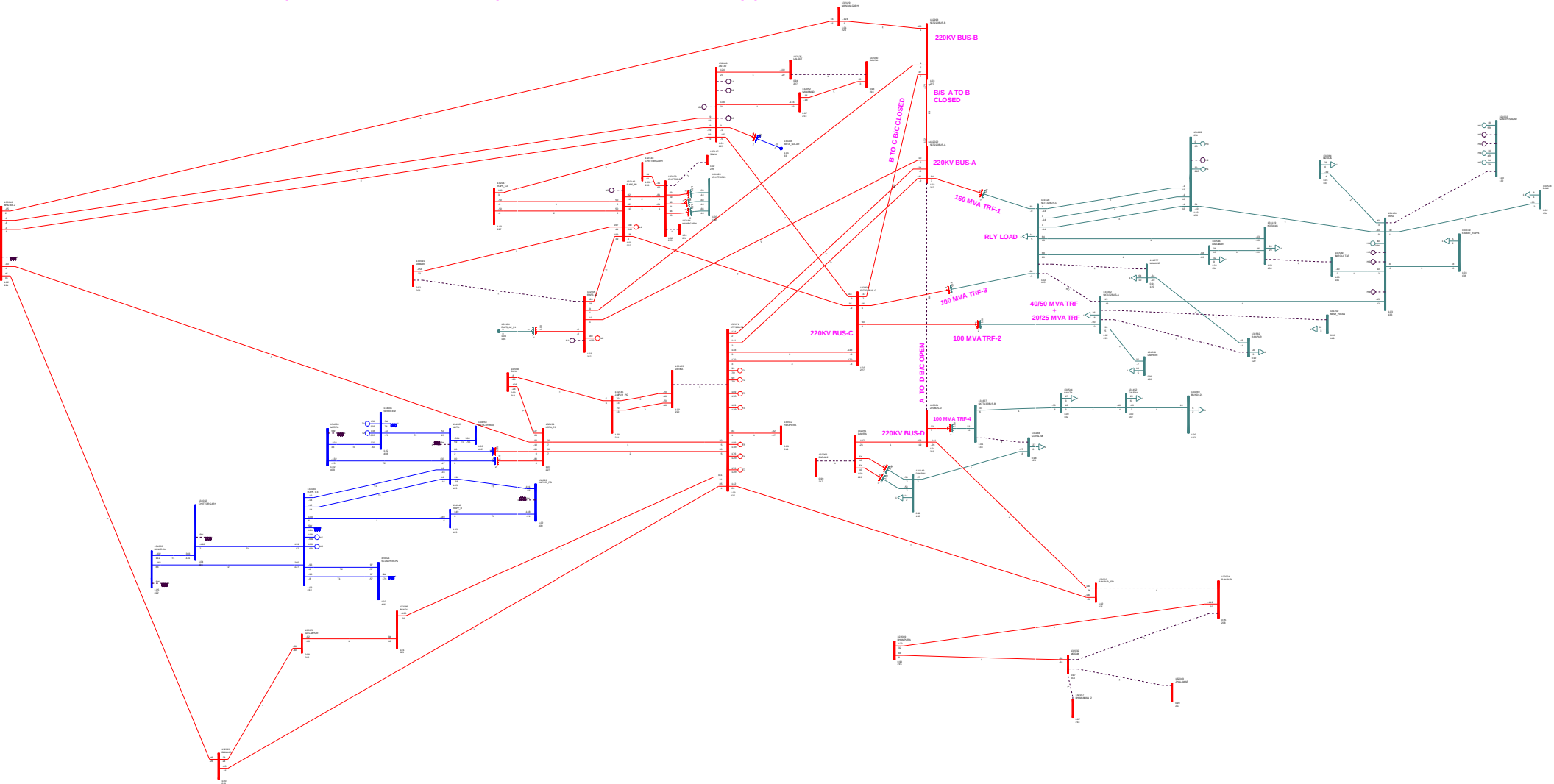
CASE-1H (CONTINGENCY-8 IN CASE-1) : OUTAGE OF 220 KV S/C KTPS-RANPUR LINE WITH 108 MW LOAD THROW OFF OF 220 KV GSS RANPUR

EXHIBIT-1H



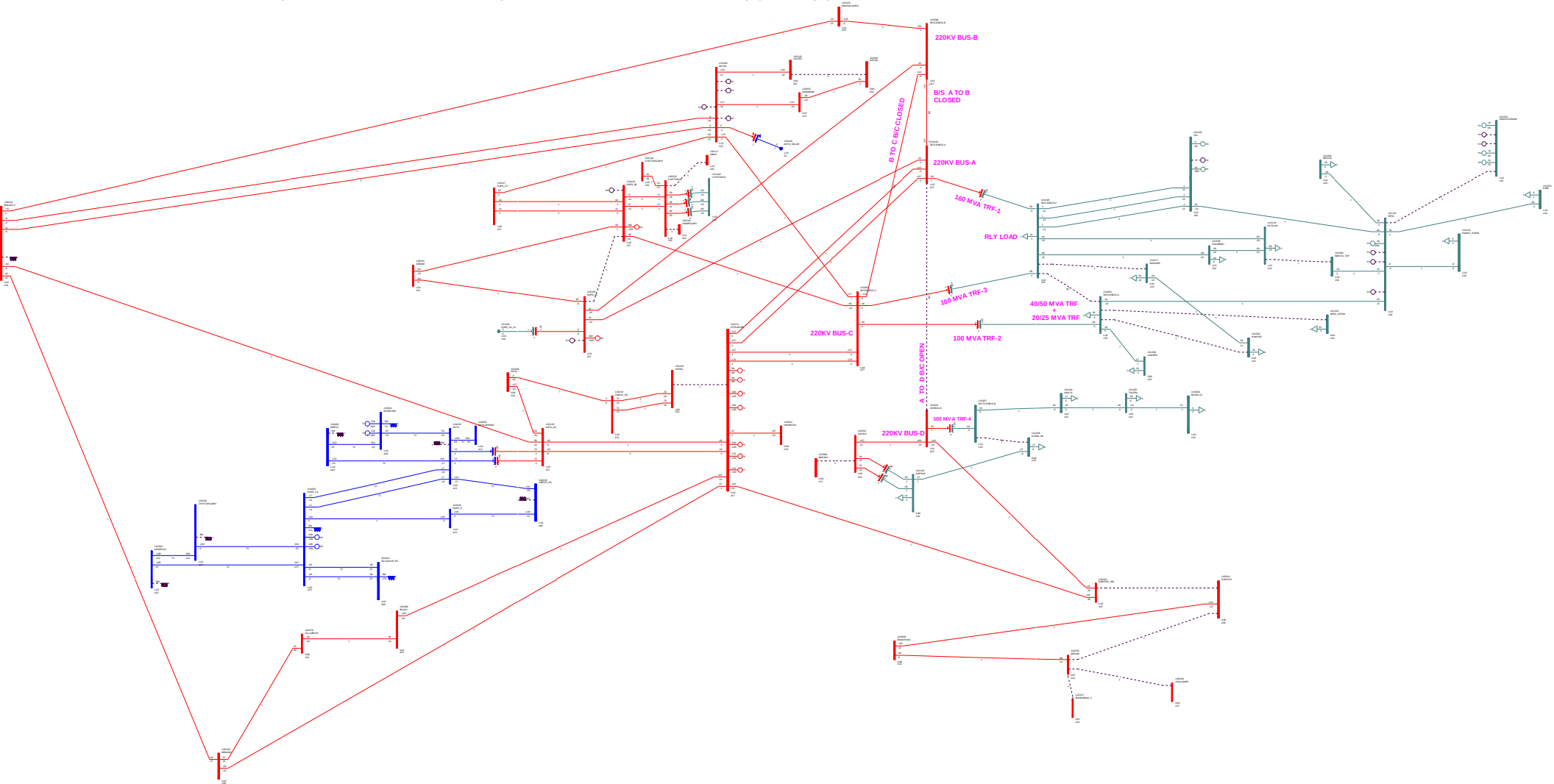
CASE-1I (CONTINGENCY-9 IN CASE-1) : OUTAGE OF 220 KV S/C RAPP(A)-DEBARI LINE

EXHIBIT-1I



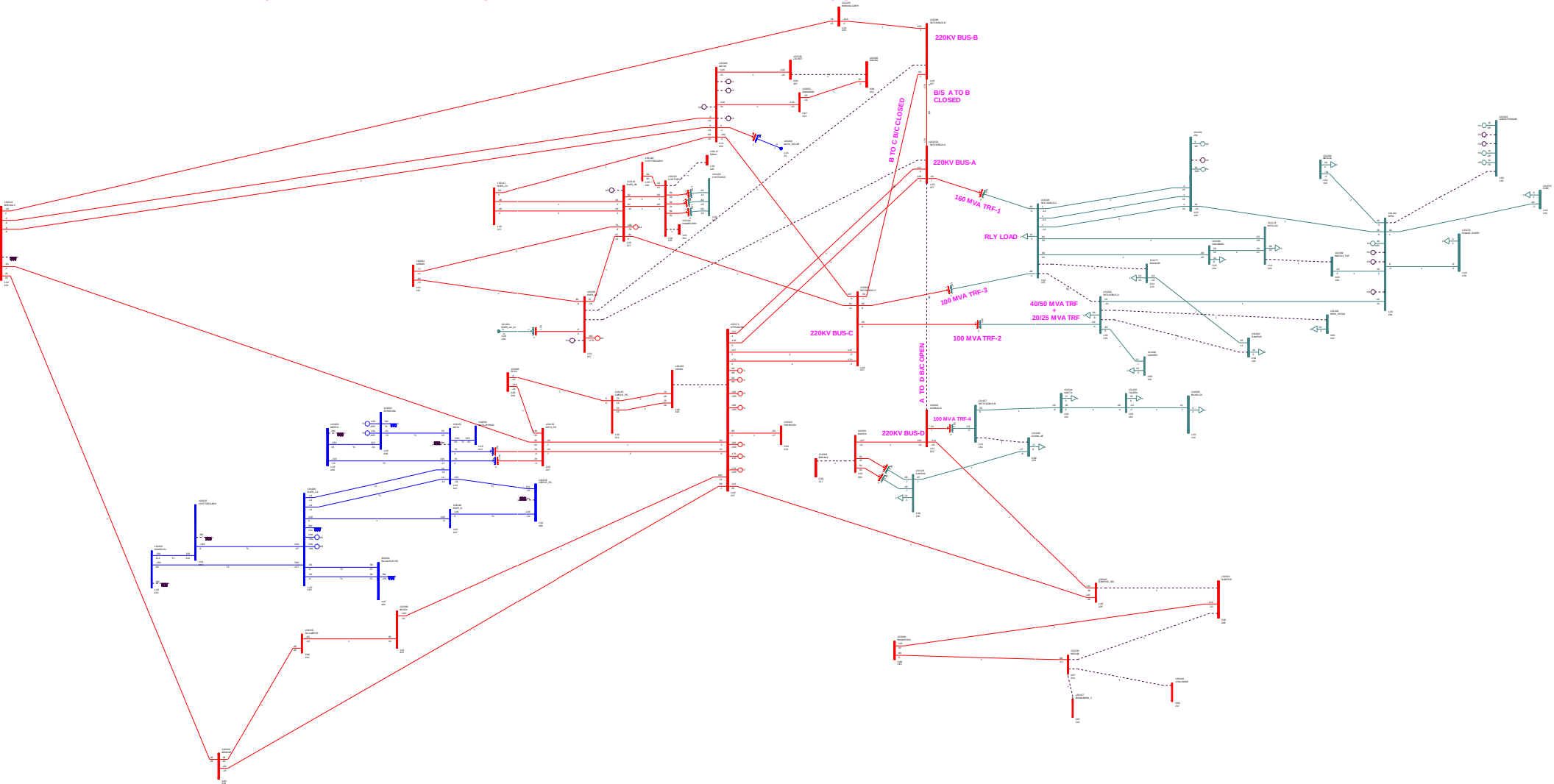
CASE-1J (CONTINGENCY-10 IN CASE-1) : OUTAGE OF 220 KV S/C RAPP(A)-RAPP(B) LINE

EXHIBIT-1J



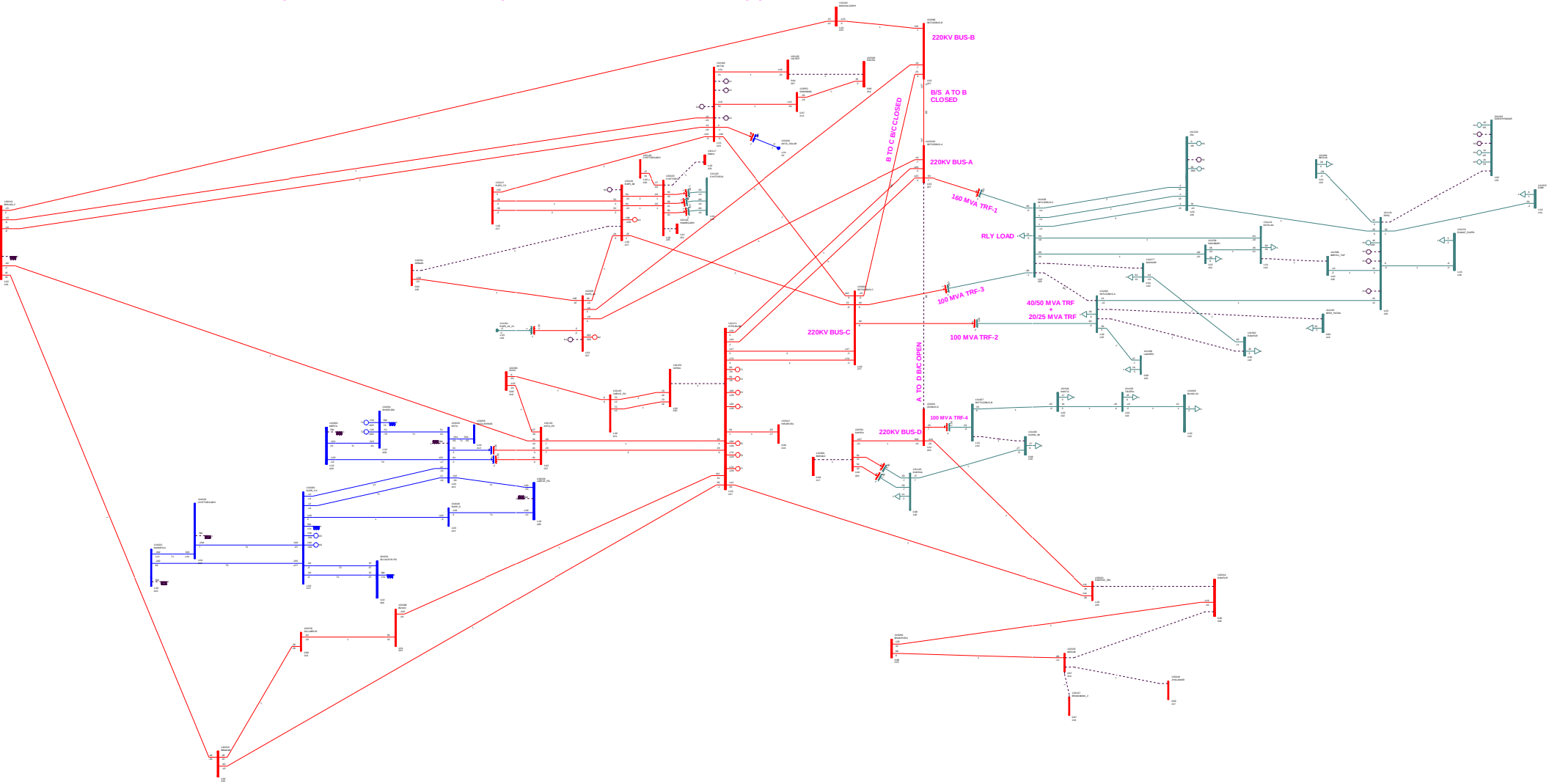
CASE-1K (CONTINGENCY-11 IN CASE-1) : OUTAGE OF 220 KV D/C SAKATPURA-RAPP(A) LINE

EXHIBIT-1K



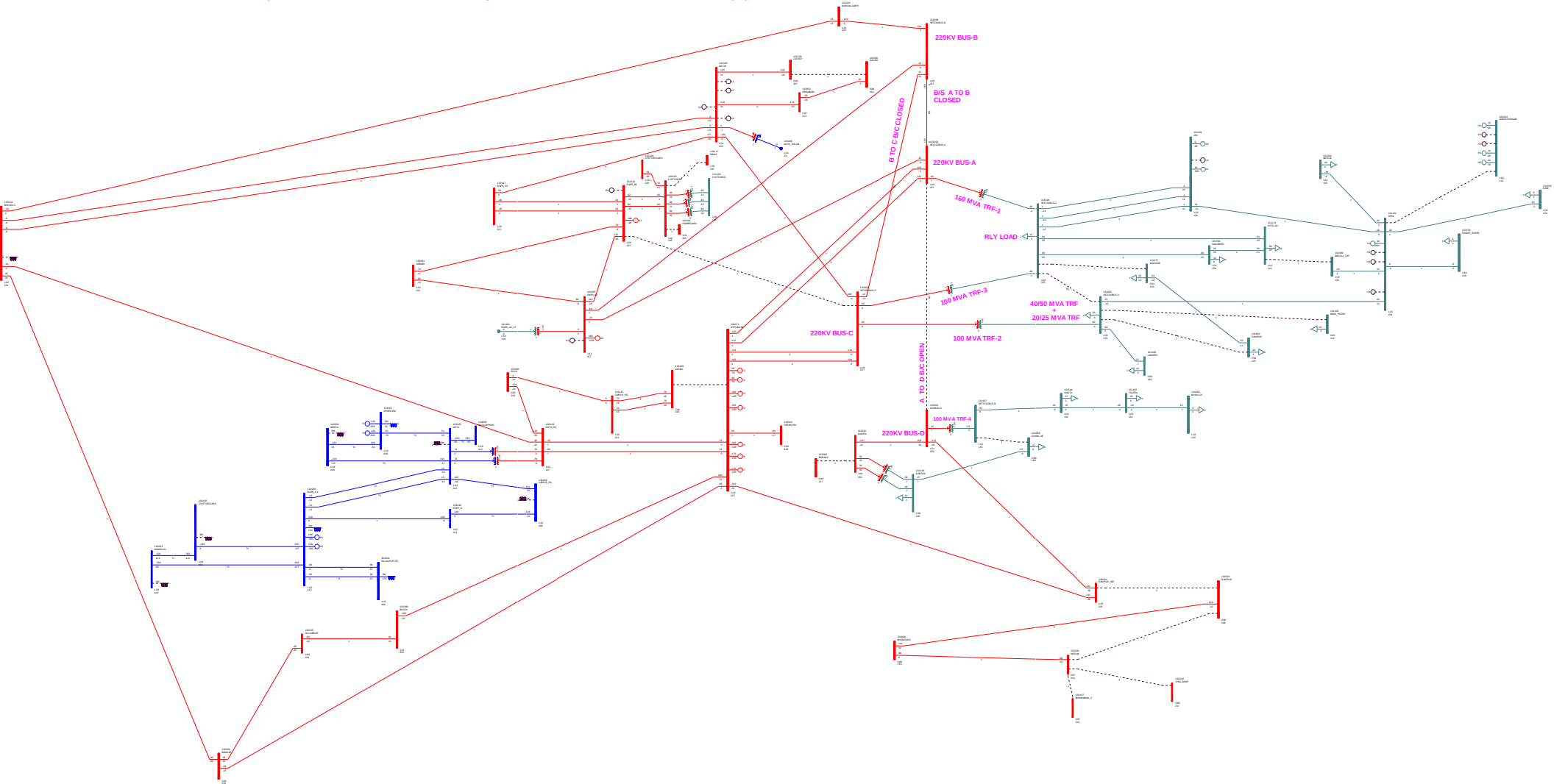
CASE-1L (CONTINGENCY-12 IN CASE-1) : OUTAGE OF 220 KV S/C RAPP(B)-DEBARI LINE

EXHIBIT-1L



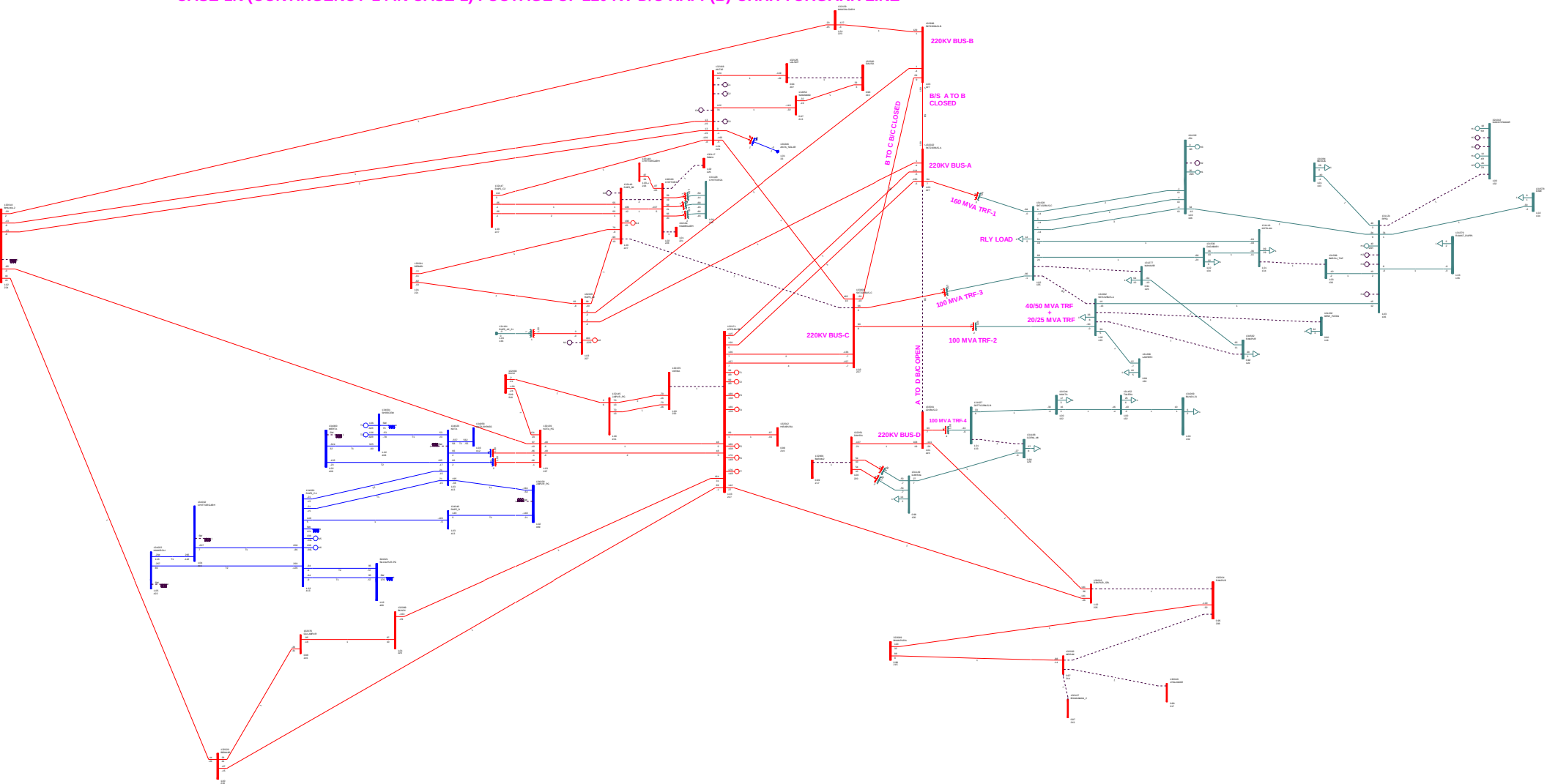
CASE-1M (CONTINGENCY-13 IN CASE-1) : OUTAGE OF 220 KV S/C RAPP(B)-SAKATPURA LINE

EXHIBIT-1M



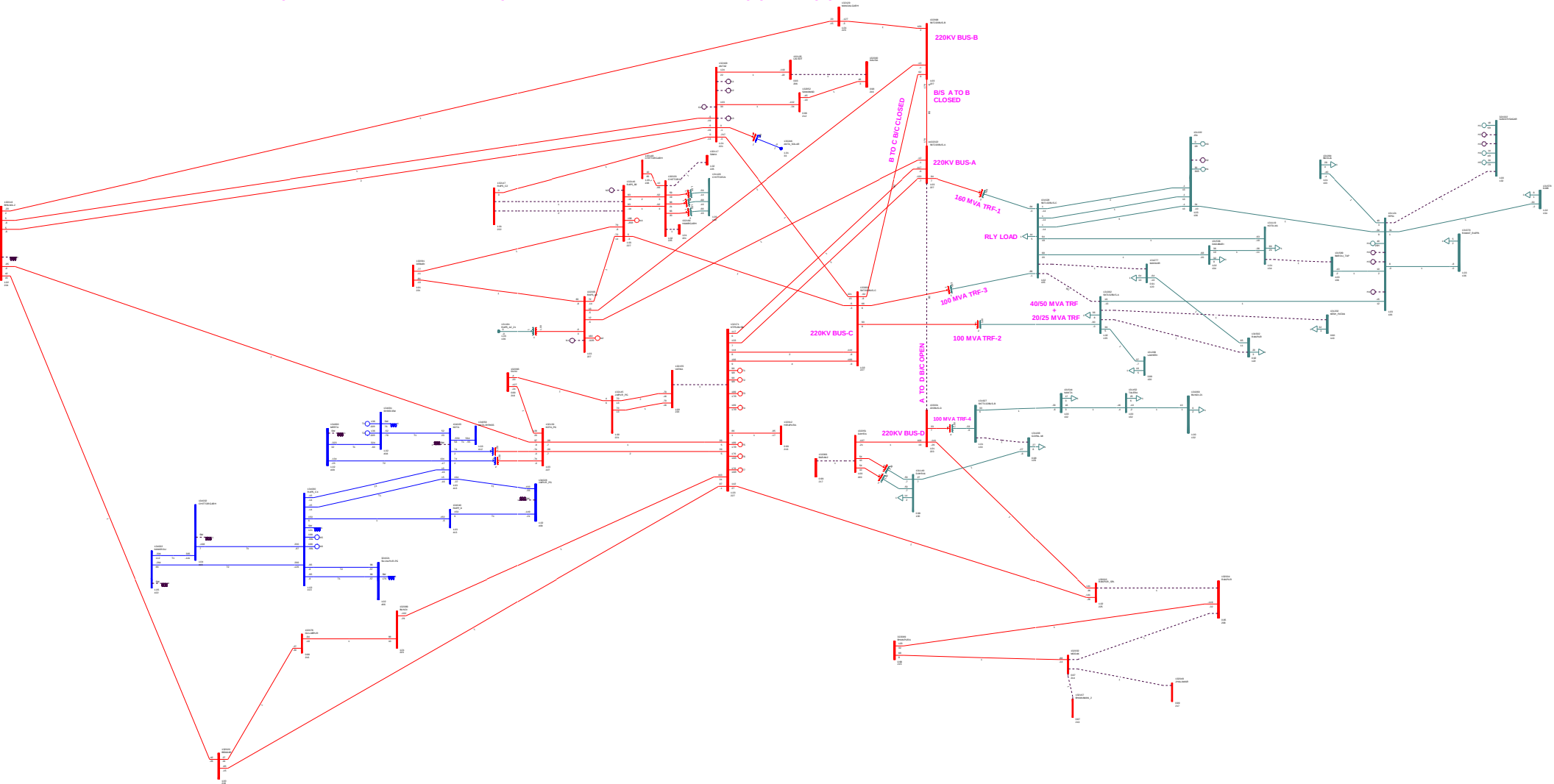
CASE-1N (CONTINGENCY-14 IN CASE-1) : OUTAGE OF 220 KV D/C RAPP(B)-CHHITTORGARH LINE

EXHIBIT-1N

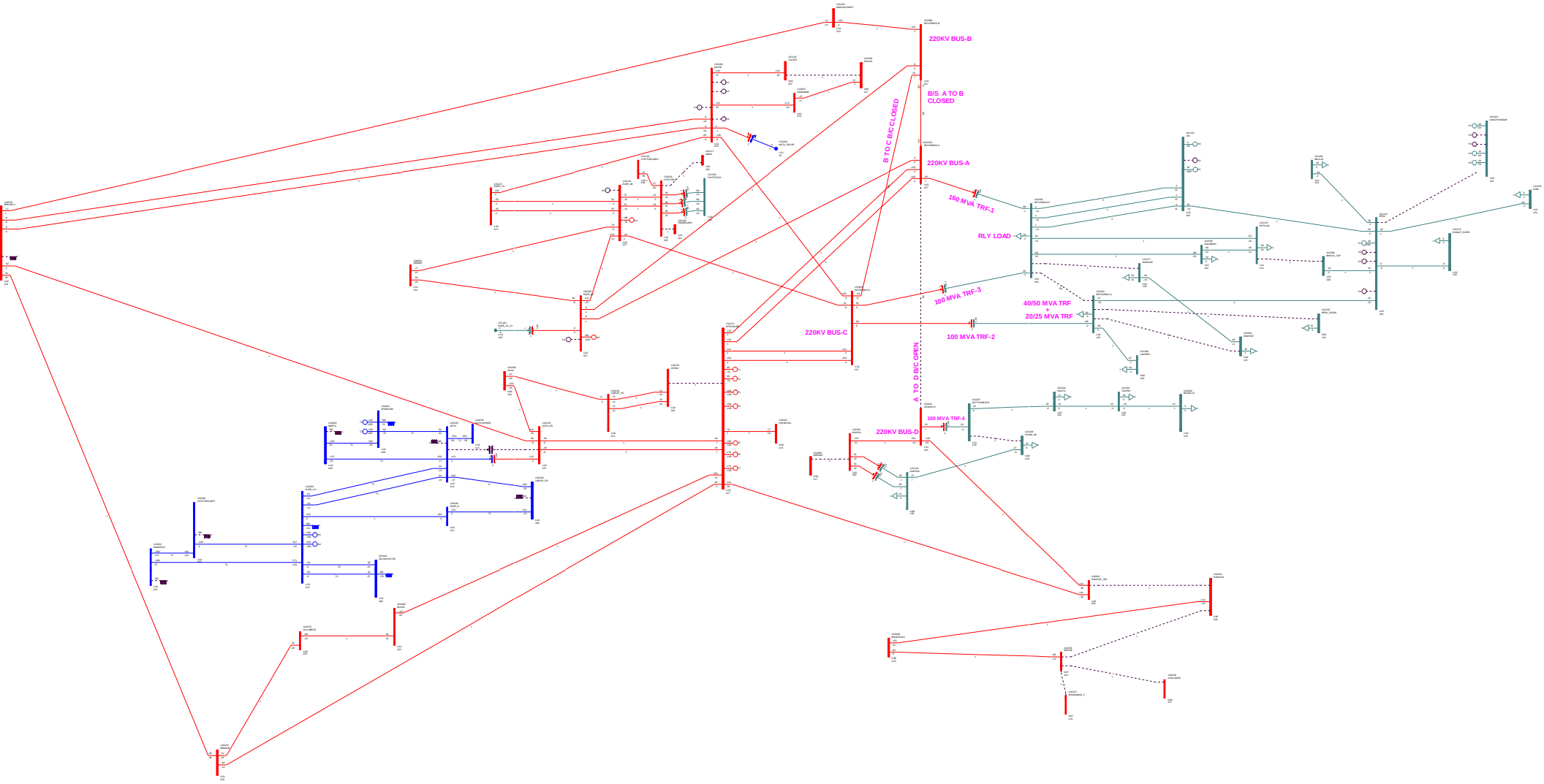


CASE-1O (CONTINGENCY-15 IN CASE-1) : OUTAGE OF 220 KV D/C RAPP(B)-RAPP(C) LINE

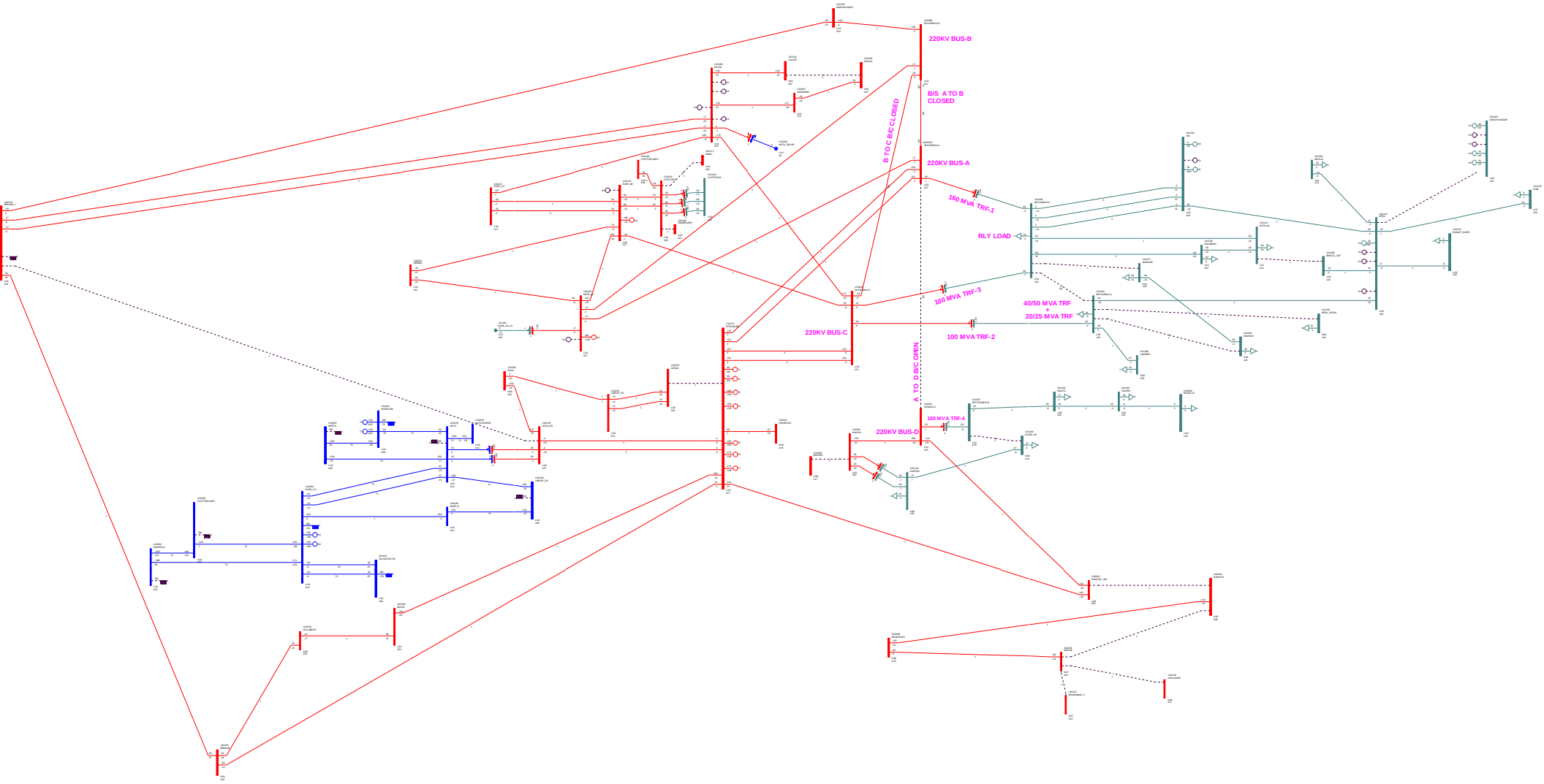
EXHIBIT-1O



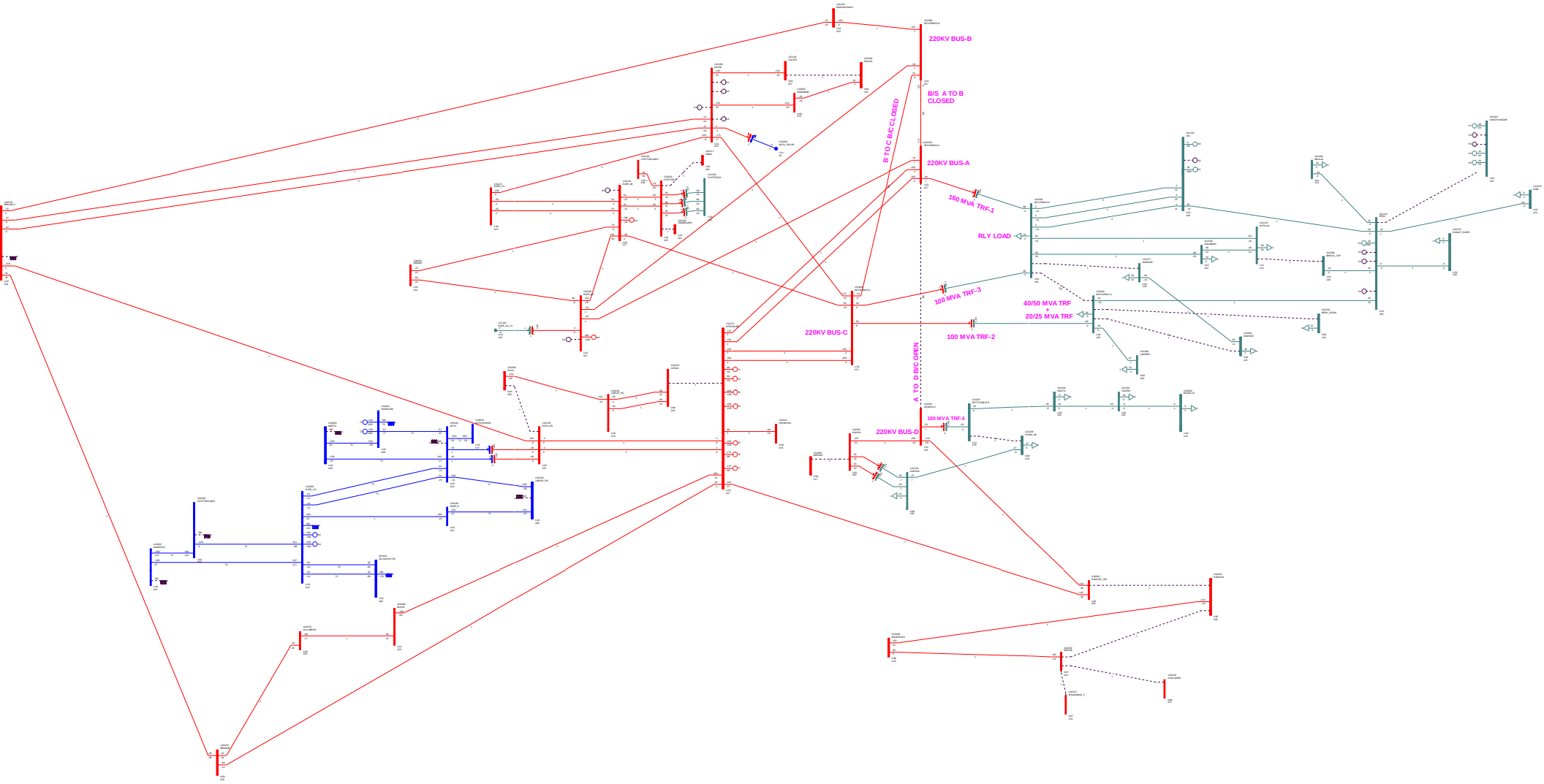
Contingency-16 (Case-1P, Exhibit-1P): Outage of one 315 MVA, 400/220 kV transformer at Kota(PG)



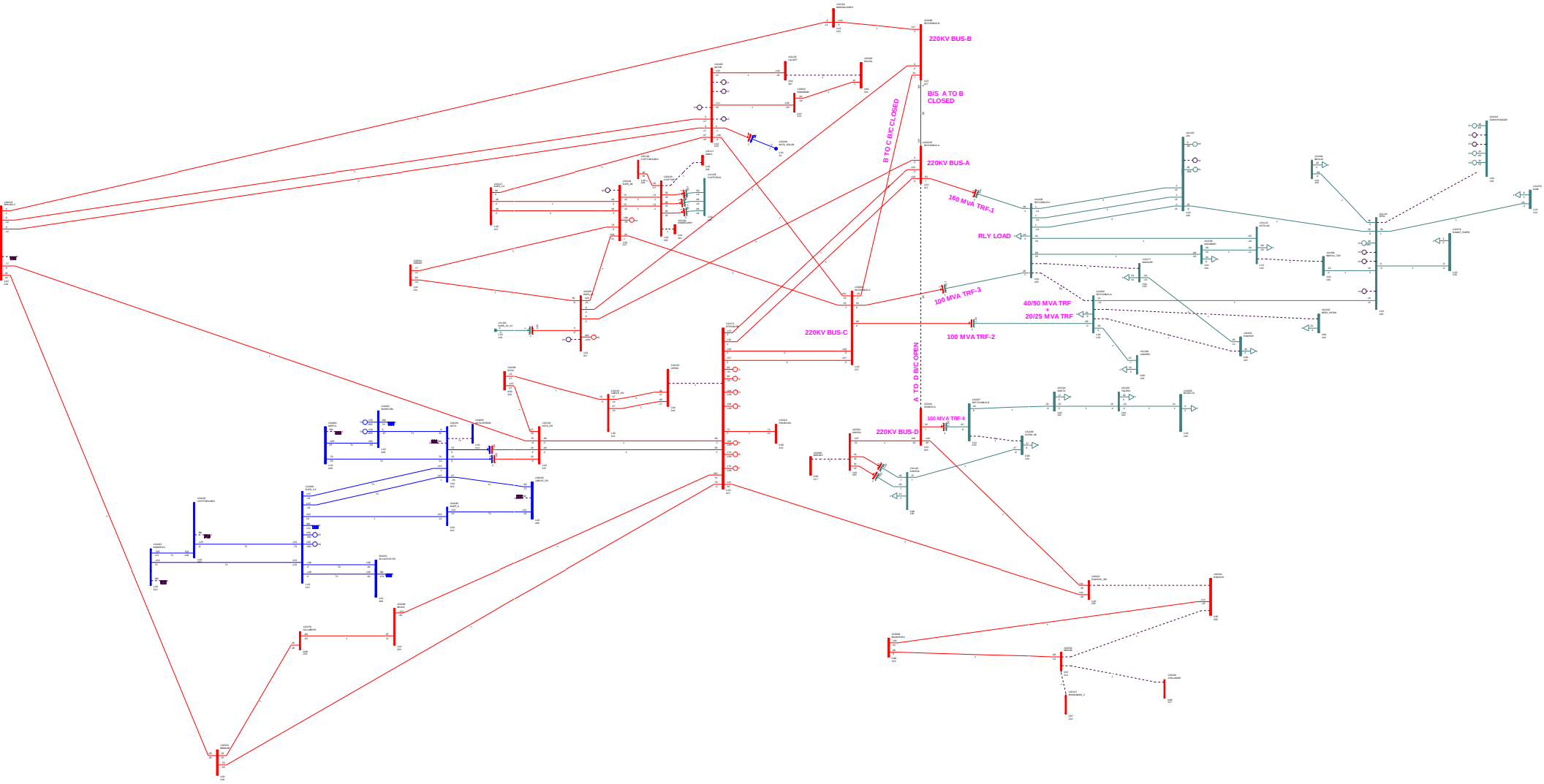
Contingency-17 (Case-1Q, Exhibit-1Q) : Outage of 220 kV S/C Kota(PG)-Bhilwara line



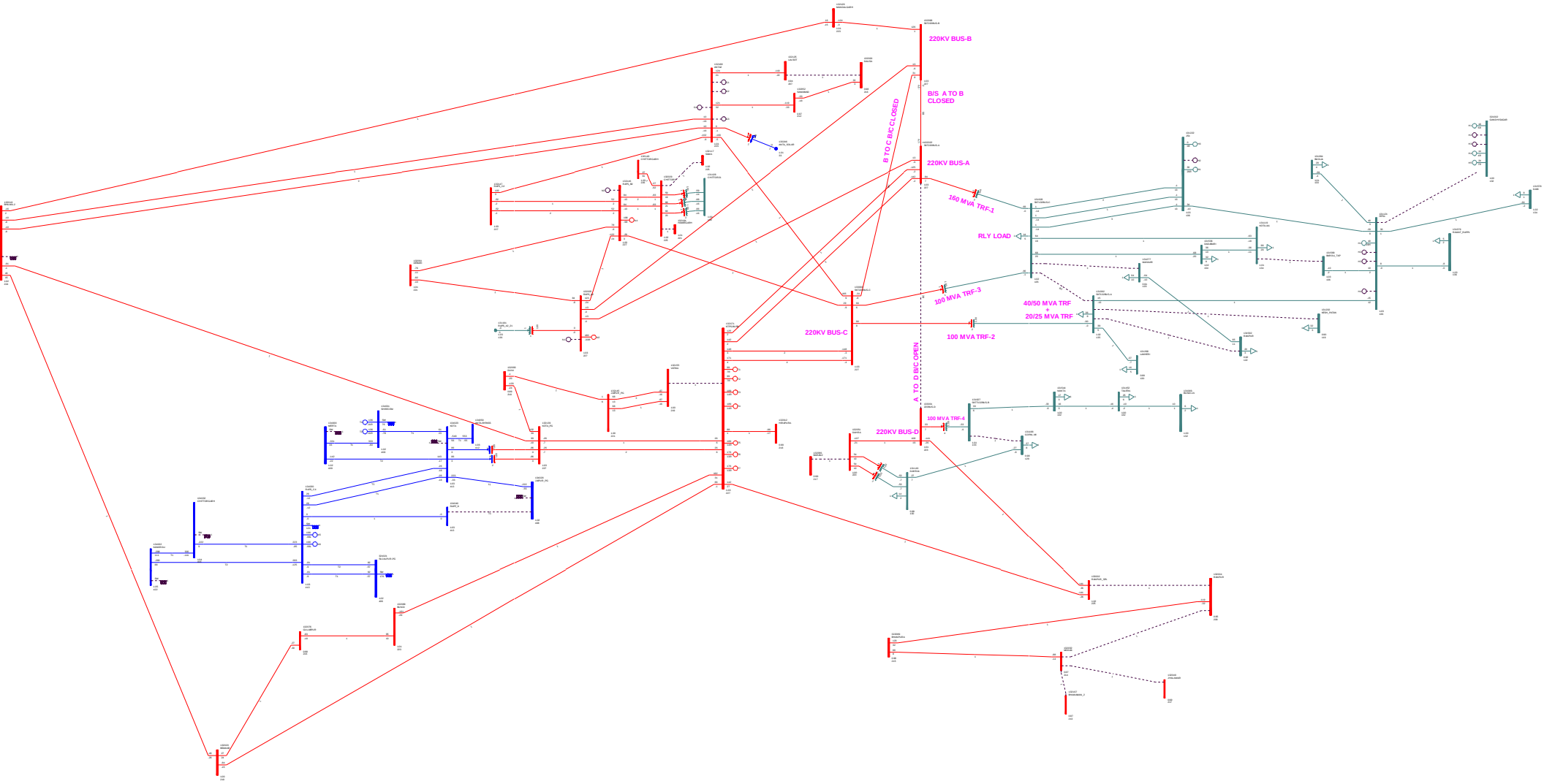
Contingency-18 (Case-1R, Exhibit-1R): Outage of 220 kV S/C Kota(PG)-Duni line



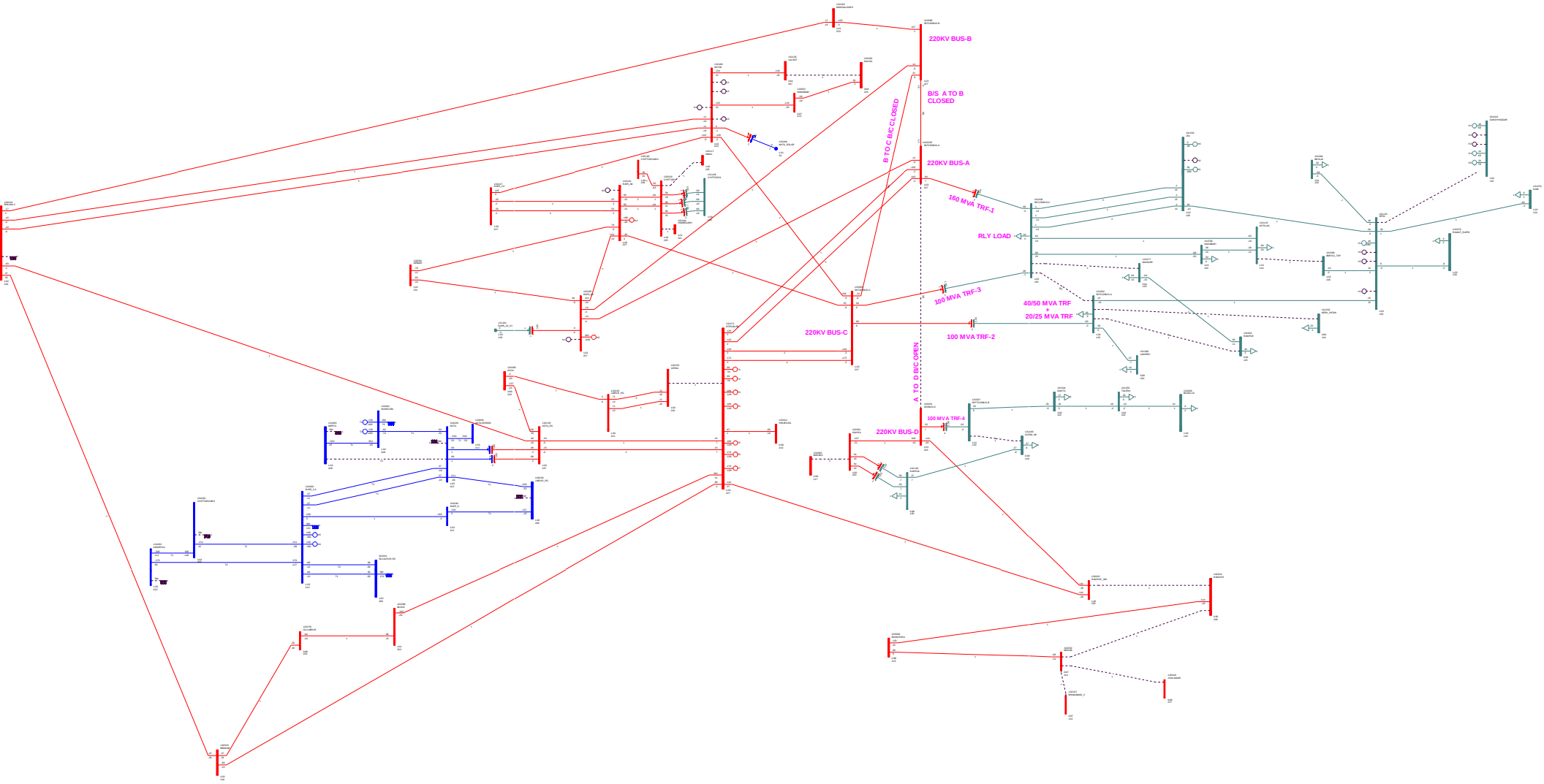
Contingency-19 (Case-1S, Exhibit-1S): Outage of 400 kV S/C Kota(PG)-Anta –Chhabra TPS line



Contingency-20 (Case-1T, Exhibit-1T): Outage of 400 kV S/C Kota(PG)-Jaipur(PG) line



Contingency-21 (Case-1U, Exhibit-1U): Outage of 400 kV S/C Kota(PG)-Merta line



PROPOSED REVISED ISLANDING SCHEME FOR RAPS-A&B

A. **Objective:** The Existing Islanding Scheme for RAPS-A&B was planned in 2013 and again reviewed in 2022. Major Grid disturbance occurred in KTPS & RAPP Generation complex leading tripping of all running generating units of KTPS and RAPP generation complex. In this regard NRPC vide letter dated 6.6.2024 has constituted a committee of members from NRPC Secretariat, NRLDC, NLDC, POWERGRID, NPCIL, RVUNL (KTPS) and RVPN to review the protection system and load management in the KTPS, RAPS generation complex. In the various committee meetings existing Islanding scheme was also discussed and deliberated as per following: -

I. M/s NPCIL member vide email dated 01/07/2024 and also in the committee meetings intimated that the reason for exclusion of RAPP-C and RAPP-D auxiliary loads from islanding scheme is the introduction of new ATS initiation scheme that will changeover auxiliary loads to UT side in case of grid disturbances (including islanding condition). In normal operation, these loads are still being fed from SUT only.

II. M/s NPCIL member vide email dated 19.11.2024 intimated that in event of Grid disturbance occurred on 29.3.2024, RAPP-A unit-2 was survived on Islanding but could not survived more than 20 minutes due to four long transmission lines (2 for Debari GSS and 2 for Chhittorgarh GSS) remained connected to it and this could have been the possible reason for higher 220 kV bus voltage at RAPP-

A. In view of above M/s NPCIL requested to separate Islanding Scheme of RAPP(A) and RAPP(B). In view of NPCIL concern in the committee meetings two Stage island for RAPS complex was discussed and deliberated and it was concluded that two stage Islanding Scheme is not feasible.

III. In the meeting Rajasthan SLDC Member also apprized that :-

a. Due to transmission system constraints load of 132 kV GSS Mavli & Sanwad is not being fed from 220 kV GSS Debari and also load of 132 kV GSS Dakan Kotra is being fed from 220 kV GSS Debari via Auxiliary bus of 220 kV GSS Madri

b. After construction of 132 kV GSS Soniyana alongwith LILO of 132 kV S/C Hamirgarh-Rashmi line at Soniyana load of 132 kV GSS Rashmi is being fed from 220 kV GSS Hamirgarh instead of 220 kV GSS Chhittorgarh.

c. Due to transmission system constraints load of 132 kV GSS Badisadri is being fed from 220 kV GSS Nimbahera via Auxiliary bus of 132 kV GSS Choitisadri.

d. In integrated operation 132 kV S/C Chhitorgarh-Sawa line got over loaded, therefore, for load management 132 kV S/C Chhitorgarh-Sawa line kept charged at no load to balance the load between 220 kV transformers at Chhitorgarh and Sawa. Under this condition during Island formation 220 kV S/C Chhitorgarh-Sawa line would be critically over loaded to feed the load of 220 kV GSS Sawa & Nimbahera.

IV. In view of above in the committee meetings it is also discussed and deliberated that after

Island formation load of 220 kV GSS Sawa & Nimbahera would be fed from 220 kV S/C Chhitorgarh-Sawa- Nimbahera line, therefore, to increase the reliability it would be appropriate to consider load of 220 kV GSS Hamirgarh part of the Island and some load of 220 kV GSS Sawa and Nimbahera may be disconnected.

V. Further M/s NPCIL member vide email dated 4.2.2025 intimated that the frequency setting for islanding for RAPP-A and RAPPB is as follows:

   a. For under frequency: One of the unit shall be brought to house load operation at 47.5 Hz with a delay time of 2 sec and another unit with time delay of 4 secs. and instantaneous house load operation of all units at 47.3 Hz.
   b. For over frequency: One unit shall be brought to house load at 51.5 Hz with time delay of 1 SEC and another unit with time delay of 2 sec. and instantaneous house load operation of all units at 51.7Hz.

Accordingly, as per detailed discussions and deliberations in the various 7 meetings of the committee Islanding scheme has been reviewed and redesigned considering updated load scenario and transmission system configuration and discussed in the subsequent paragraphs.

B. Generation Details

I. RAPS-A

- The total generation of Unit-II is around 200 MW.
- Auxiliary load plus load of Heavy Water Plant is 30 MW.
- Net generation of unit-II is 170 MW.

II. RAPS-B

- The generation of Unit-III and Unit-IV is each around 220 MW. The total generation is around 440 MW if both units are running.
- Auxiliary load is 20 MW per unit, i.e. total 40 MW for both units of RAPS-B.
- Net generation of RAPS-B is 400 MW.

C. Transmission System at RAPP-A&B

- 220 kV S/C RAPS-A - RAPS-B Line (3.00 km)
- 220 kV S/C RAPS-A - 220 kV GSS Debari line (192.70 km)
- 220 kV S/C RAPS-A - 220 kV GSS Kota (Sakatpura) Ckt-I (39.70 km)
- 220 kV S/C RAPS-A - 220 kV GSS Kota (Sakatpura) Ckt-II (42.50 km)
- 220 kV S/C RAPS-B - 220 kV GSS Debari line (198.00 km)
- 220 kV S/C RAPS-B - 220 kV GSS Chittorgargh line Ckt-I (95.00 km)
- 220 kV S/C RAPS-B - 220 kV GSS Chittorgargh line Ckt-II (95.00 km)

- 220 kV S/C RAPS-B - 220 kV GSS Kota (Sakatpura) Line (41.00 km)
- 220 kV S/C RAPS-B – RAPP-C Tie Line-I (2.00 km)
- 220 kV S/C RAPS-B – RAPP-C Tie Line-II (1.80 km)
- 220 kV S/C RAPS-C – Anta (80 km)
- 220 kV Switchyard for RAPS-C and RAPS-D is common.

D. Load Details

The identified load for island of RAPS-A&B is 507.0 MW which is placed at **Annexure-A.** Additional **30 MW load** on 220 kV bus of RAPS-A bus also considered to represent the auxiliary load of RAPP-A & heavy water load. Also, Additional **40 MW load** on 220 kV bus of RAPS-B also considered to represent the auxiliary load of RAPP-B units. Additional load of 115 MW is also identified which can be considered for lean load period. There are heavy seasonal variations of load in the region. Similarly, day and night load variations are also high in the region. Hence, islanding scheme is planned considering some of the transmission lines with both operative/blocked modes so that SLDC, Rajasthan can monitor and decide upon mode of the lines so as to match the load with generation in the island. Further, additional lines with blocked/operative status are also identified which helps to manage the load-generation during the lean load period.

E. Proposed Islanding Scheme

1. Islanding shall take place at 48 Hz without time delay.
2. Islanding is designed for the current scenario for load of 507.0MW. Additional **30 MW load** on 220 kV bus of RAPS-A bus also considered to represent the auxiliary load of RAPP-A & heavy water load. Also, Additional **40 MW load** on 220 kV bus of RAPS-B is also considered to represent the auxiliary load of RAPP-B units.
3. Further, if generation is low then load generation balance may be maintained by changing the blocked/operative status of the identified transmission lines depending on the available generation.
4. All the transmission lines with operative status may be operated at 48 Hz instantaneous to form Island.
5. Tie lines between RAPS-A & RAPS-B and RAPS-B & RAPS-C will be kept blocked during island formation.
6. If load in the network of island is very high and frequency is going further down then at RAPS-B unit-3 & unit-4 will come to house load at 47.5Hz with a delay time of 2 seconds and 47.5Hz with a delay time of 4 seconds respectively and instantaneously house load of both the units at 47.3 Hz. Similarly, at RAPS-A, unit-2 will come to house load at 47.5Hz with a delay time of 4 seconds and instantaneously house load at 47.3 Hz.

7. If load in the network of island is very low and frequency is increasing after island formation then at RAPS-B unit-3 & unit-4 will come to house load at 51.5 Hz with a delay time of 1 second and 51.5 Hz with a delay time of 2 seconds respectively and instantaneously house load of both the units at 51.7 Hz. Similarly, at RAPS-A, unit-2 will come to house load at 51.5 Hz with a delay time of 2 seconds and instantaneously house load at 51.7 Hz.
8. Blocked and operative status of all transmission lines of 220 kV and 132 kV voltage levels considered for the islanding are placed at **Annexure-B**. During the condition of light loads, the load-generation balance is to be maintained by changing the blocked/operative status of the additional lines which have also been identified to include additional GSS in the island.
9. A single line diagram of 400 kV network, 220 kV & 132 kV network is at **Annexure-C.**
10. House load frequency settings of RAPS-A & RAPS-B units in condition of under and over frequency are based on the information provided by M/s NPCIL vide email dated 4.2.2025.

F. Results of Load Flow Study

I. A load flow study is carried out considering the blocked and operative status of line included in **Annexure-B** as per SLD diagram indicated in **Annexure-C** for a total identified load of 577.0 MW (including **70 MW** auxiliary load of RAPP-A & RAPP-B units and also heavy water load) which is placed at **Annexure-A.**

II. In the load flow study Unit-2 of RAPP-A is considered swing bus and voltage of all units is set to 1.03 pu. Power flow plot of the network included in the island is placed at **Exhibit-1**. The results of load flow study indicate the following load-generation balance:-

   i. Generation=640 MW (Unit-1 : 200 MW, Unit-3:220 MW, Unit-4 : 220 MW)

   ii. Load=577 MW (Network load : 507.0 MW , Auxiliary + heavy water load : 70 MW)

   iii. Network Losses: 34 MW

   iv. Generation vs Load Ratio (G/L) : 1.11 (i.e. 640/577)

III. Power flow on 220 kV lines and transformers are tabulated at **Annexure-D**. It is observed that loading on all the lines and transformers included in the island of RAPS-A&B is normal and overloading is not observed.

IV. Single Line Diagram of proposed island is attached at **Annexure-E.**

G. Conclusion

Proposed islanding scheme is designed after detailed discussion and deliberations in 7

meetings of NRPC Sub-Committee. Based on the results of load flow studies, it is concluded that:

i. Results of load flow study indicate that load generation balance can be maintained in the network considered for the island of RAPS-A & B.

ii. All the transmission lines included in the island will be equipped with under frequency relays (UFRs) and additional transmission lines are considered for the island to manage the load generation balance for different load scenario considering the large seasonal variations of load in the region.

iii. The proposed islanding scheme can be practically implemented on the transmission network of RVPN for the current scenario for load of 507.0 MW (excluding system losses) when all three units of RAPS- A&B are running. However, continuous monitoring of load-generation balance is required and action to change status of UFRs from blocked to operative and vice-versa will be needed for load-generation balance during the event of change in generation and load.

iv. Islanding scheme is designed considering total auxiliary load of 70 MW which consists of 20 MW (Unit-II of RAPS-A) + 10 MW (Heavy water plant) + 40 MW (RAPS-B both units).

*****

Annexure-A

Load in Islanding Scheme for RAPP-A&B (Unit-2 : 200 MW, Unit-3 &4 : 2x220 MW)

S. No.	Name of GSS		Load before Island formation		Load which is part of the Island		Load which is tripped at 48 Hz at time of Island formation		Load which is available for lean load period by blocking the operation of UFR		Remarks
			Maximum Load	Average Load	Maximum Load	Average Load	Maximum Load	Average Load	Maximum Load	Average Load	
A-1	**Load at 220 kV GSS Debari**										
1	220 kV GSS Debari (load of 132/33 kV transformers)	MW	27	20	27	20	-	-	-	-	
		MVAR	9	7	9	7	-	-	-	-	
2	132 kV GSS Mavii	MW	34	22	34	22	-	-	-	-	
		MVAR	11	7	11	7	-	-	-	-	
3	132 kV GSS Bhatewar	MW	36	19	36	19	-	-	-	-	
		MVAR	17	4	17	4	-	-	-	-	
4	132 kV GSS Bhinder	MW	19	10	19	10	-	-	-	-	
		MVAR	1	1	1	1	-	-	-	-	
5	132 kV GSS Jhojhopura	MW	19	11	19	11	-	-	-	-	
		MVAR	12	6	12	6	-	-	-	-	
6	132 kV GSS Dakankotda	MW	27	20	27	20	-	-	-	-	
		MVAR	4	1	4	1	-	-	-	-	
7	132 KV Hindustan Zinc Limited Line (Industry)	MW	51	36	51	36	-	-	-	-	
		MVAR	17	12	17	12	-	-	-	-	
8	132 KV GSS UCW Line (Industry)	MW	20	9	20	9	-	-	-	-	
		MVAR	7	3	7	3	-	-	-	-	
9	Railway load from 132 kV GSS Mavli	MW	2	1	2	1	-	-	-	-	
		MVAR	1	1	1	1	-	-	-	-	
	Total (A.1)	**MW**	**235**	**147**	**235**	**147**	**0**	**0**	**0**	**0**	
		MVAR	**79**	**41**	**79**	**41**	**0**	**0**	**0**	**0**	

S. No.	Name of GSS		Load before Island formation		Load which is part of the Island		Load which is tripped at 48 Hz at time of Island formation		Load which is available for lean load period by blocking the operation of UFR		Remarks
			Maximum Load	Average Load	Maximum Load	Average Load	Maximum Load	Average Load	Maximum Load	Average Load	
A-2	**Load at 220 kV GSS Chittorgarh**										
1	Load of 132/33 kv transformers at 220 KV GSS Chittorgarh	MW	58	32	58	32	0	0	0	0	
		MVAR	30	16	30	16	0	0	0	0	
2	132 KV BCW feeder from 220 kV GSS Chittorgarh	MW	3	2	3	2	0	0	0	0	
		MVAR	1	0	1	0	0	0	0	0	
3	132 KV CCW feeder from 220 kV GSS Chittorgarh	MW	19	9	0	0	19	9	19	9	
		MVAR	9	2	0	0	9	2	9	2	
4	132 KV HZL-1 feeder from 220 kV GSS Chittorgarh	MW	23	4	0	0	23	4	23	4	
		MVAR	8	1	0	0	8	1	8	1	
5	132 KV HZL-2 feeder from 220 kV GSS Chittorgarh	MW	23	4	0	0	23	4	23	4	
		MVAR	8	1	0	0	8	1	8	1	
6	132 KV GSS Ajolia Khera	MW	36	21	36	21	0	0	0	0	
		MVAR	10	7	10	7	0	0	0	0	
7	132 KV GSS Bassi	MW	28	12	28	12	0	0	0	0	
		MVAR	12	3	12	3	0	0	0	0	
8	132 KV GSS Senthi	MW	29	15	29	15	0	0	0	0	
		MVAR	3	1	3	1	0	0	0	0	
9	Railway load from 132 kV GSS Senthi	MW	10	1	10	1	0	0	0	0	
		MVAR	3	1	3	1	0	0	0	0	
10	132 kV GSS Rasoolpura		16	8	16	8	0	0	0	0	
			5	2	5	2	0	0	0	0	
11	132 KV JK MANGROL feeder from 132 kV GSS Rasoolpur		4	1	0	0	4	1	4	1	
			1	0	0	0	1	0	1	0	
	Total (A.2)	**MW**	**249**	**110**	**179**	**92**	**70**	**18**	**70**	**18**	
		MVAR	**89**	**35**	**64**	**30**	**25**	**4**	**25**	**4**	

S. No.	Name of GSS		Load before Island formation		Load which is part of the Island		Load which is tripped at 48 Hz at time of Island formation		Load which is available for lean load period by blocking the operation of UFR		Remarks
			Maximum Load	Average Load	Maximum Load	Average Load	Maximum Load	Average Load	Maximum Load	Average Load	
A-3	**Load at 220 kV GSS Sawa**										
1	Load of 132/33 kv transformers at 220 KV GSS Sawa	MW	26	13	26	13	0	0	0	0	
		MVAR	7	2	7	2	0	0	0	0	
2	132 kV ACW at Sawa	MW	30	19	0	0	30	19	30	19	
		MVAR	4	1	0	0	4	1	4	1	
3	132 kV NUVOCO at Sawa	MW	11	3	0	0	11	3	11	3	
		MVAR	1	0	0	0	1	0	1	0	
4	132 KV GSS Kapasan	MW	38	18	38	18	0	0	0	0	
		MVAR	9	2	9	2	0	0	0	0	
5	132 KV GSS Bhopalsagar	MW	13	8	13	8	0	0	0	0	
		MVAR	9	2	9	2	0	0	0	0	
6	132 kV GSS Bhadesar	MW	36	17	36	17	0	0	0	0	
		MVAR	7	3	7	3	0	0	0	0	
	Total (A.3)	**MW**	**154**	**79**	**113**	**57**	**41**	**22**	**41**	**22**	
		MVAR	**37**	**11**	**32**	**9**	**5**	**2**	**5**	**2**	
B	**Group -B**										
B-1	**Load at 220 kV GSS Nimbahera**										
1	220 kV GSS Nimbahera	MW	50	37	50	37	0	0	0	0	
		MVAR	11	6	11	6	0	0	0	0	
2	132 kV GSS Kanera	MW	12	8	12	8	0	0	0	0	
		MVAR	9	6	9	6	0	0	0	0	
3	132 kV GSS Bijapur	MW	14	7	14	7	0	0	0	0	
		MVAR	7	3	7	3	0	0	0	0	
4	132 WGSS Mangalwad	MW	38	24	38	24	0	0	0	0	
		MVAR	8	4	8	4	0	0	0	0	
5	132 KV GSS Dhoriya Choraha	MW	21	12	21	12	0	0	0	0	
		MVAR	15	7	15	7	0	0	0	0	
6	132 KV GSS Badisadri	MW	54	38	54	38	0	0	0	0	
		MVAR	18	8	18	8	0	0	0	0	
7	132 kVJKCW at Nimbahera	MW	19	10	0	0	19	10	19	10	
		MVAR	3	2	0	0	3	2	3	2	

S. No.	Name of GSS		Load before Island formation		Load which is part of the Island		Load which is tripped at 48 Hz at time of Island formation		Load which is available for lean load period by blocking the operation of UFR		Remarks
			Maximum Load	Average Load	Maximum Load	Average Load	Maximum Load	Average Load	Maximum Load	Average Load	
8	132 kV WCL at Rasoorpura	MW	48	35	0	0	48	35	48	35	
		MVAR	10	6	0	0	10	6	10	6	
	Total (B)	**MW**	**257**	**171**	**189**	**126**	**67**	**45**	**67**	**45**	
		MVAR	**80**	**42**	**67**	**34**	**13**	**8**	**13**	**8**	
C	**Group -C**										
C-1	**Load at 220 kV GSS Hamirgarh**										
1	220 kV GSS Hamirgarh	MW	66	50	66	50	0	0	0	0	
		MVAR	3	2	3	2	0	0	0	0	
2	132 kV GSS RICCO Growth	MW	46	35	46	35	0	0	0	0	
		MVAR	6	5	6	5	0	0	0	0	
3	132 kV GSS SONIYANA	MW	5	2	0	0	5	2	5	2	
		MVAR	3	1	0	0	3	1	3	1	
4	132 kV GSS Rashmi	MW	31	19	0	0	31	19	31	19	
		MVAR	13	7	0	0	13	7	13	7	
5	132 kV GSS RSWML line connected from 220 kV GSS Hamirgarh	MW	6	6	0	0	6	6	6	6	
		MVAR	0	0	0	0	0	0	0	0	TRIPPED at 48.0 HZ .
6	132 kV RSWML line connected from 132 kV GSS RIICO Grwoth Center Hamirgarh	MW	3	2	0	0	3	2	3	2	Available for Lean load period
		MVAR	0	0	0	0	0	0	0	0	
7	132 kV NITIN SPINNER line connected from 132 kV GSS RIICO Grwoth Center Hamirgarh	MW	30	27	0	0	30	27	30	27	
		MVAR	4	4	0	0	4	4	4	4	
8	132 kV GSS ASAHI GLASS line connected from 132 kV GSS SONIYANA	MW	2	2	0	0	2	2	2	2	
		MVAR	0	0	0	0	0	0	0	0	
	Total (C)	**MW**	**158**	**116**	**112**	**86**	**46**	**31**	**46**	**31**	
		MVAR	**25**	**15**	**9**	**7**	**17**	**8**	**17**	**8**	
	Total (A+B+C)	**MW**	**1054**	**623**	**829**	**507**	**225**	**115**	**225**	**115**	
		MVAR	**311**	**144**	**251**	**122**	**60**	**22**	**60**	**22**	

S. No.	Name of GSS		Load before Island formation		Load which is part of the Island		Load which is tripped at 48 Hz at time of Island formation		Load which is available for lean load period by blocking the operation of UFR		Remarks
			Maximum Load	Average Load	Maximum Load	Average Load	Maximum Load	Average Load	Maximum Load	Average Load	
D	**Group -D**	**Auxiliary load of RAPS-A & B**									
	Auxiliary load of RAPS-A + Heavy Water Plant load	MW	30	30	30	30	0	0	0	0	
		MVAR	10	10	10	10	0	0	0	0	
	Auxiliary load of RAPS-B	MW	40	40	40	40	0	0	0	0	
		MVAR	13	13	13	13	0	0	0	0	
	Total (D)	MW	70	70	70	70	0	0	0	0	
		MVAR	23	23	23	23	0	0	0	0	
	Total (A+B+C+D)	**MW**	**1124**	**693**	**899**	**577**	**225**	**115**	**225**	**115**	
		MVAR	**334**	**167**	**274**	**145**	**60**	**22**	**60**	**22**	
E	Total Generation Available										
	Unit-2 of RAPP(A)	**MW**				200					
	Unit-3 of RAPP(B)	**MW**				220					
	Unit-4 of RAPP(B)	**MW**				220					
	Total-E	MW				640					
	Generation/Load ratio in Island					1.11	"640/577= 1.11"				

Note: Maximum Load is maximum value out of all the maximums among hourly data(7hrs to 18hrs) of each day during 1st to 7th day of Jan'24. Average load is average of all the averages of hourly data (7hrs to 18hrs) of each day during 1st to 7th day of Jan'24.

Annexure-B

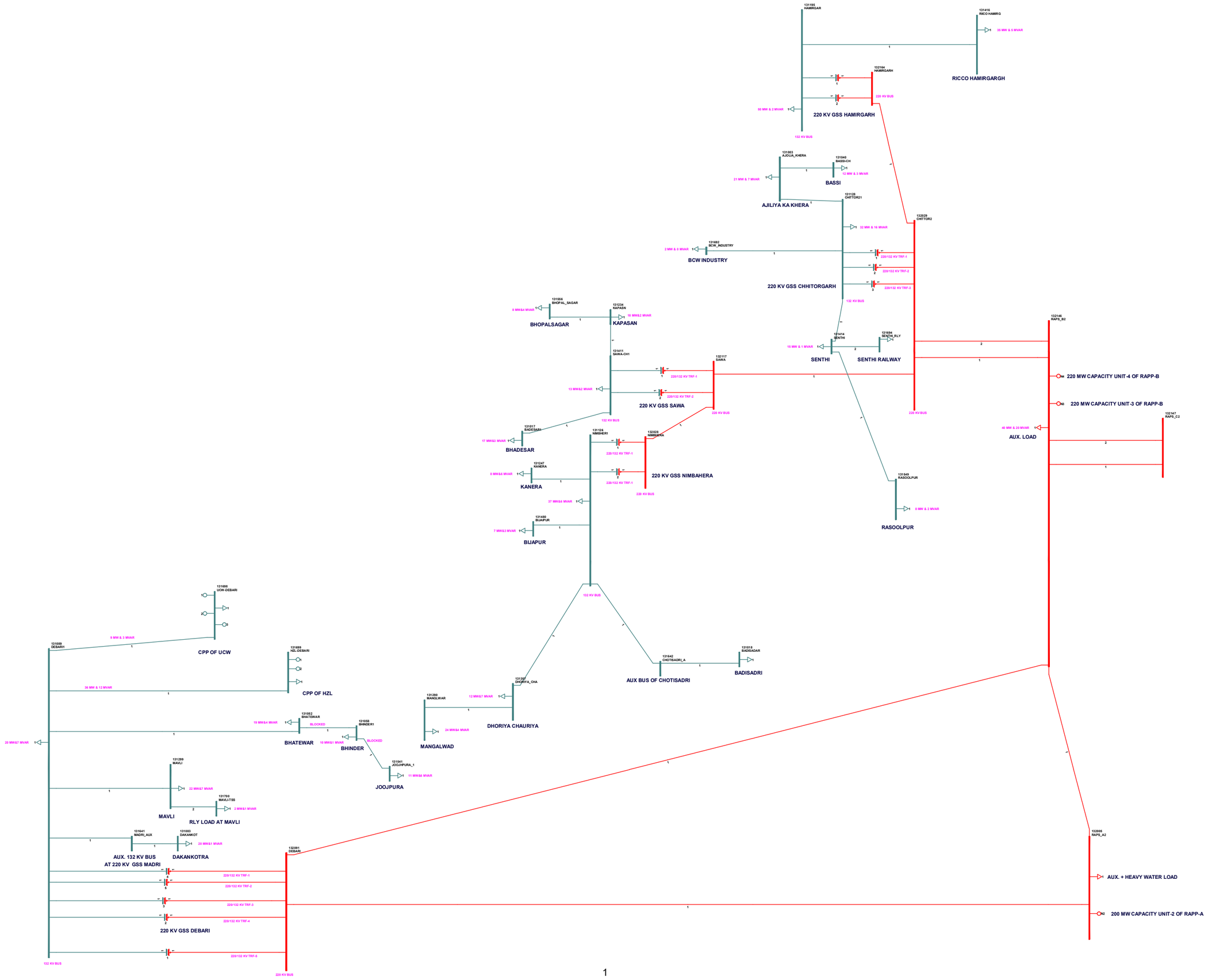
Transmission Lines and Status of Under Frequency Relays for RAPP-A&B Island

S. No.	Name of Line	Status	Remark
A.	**Transmision Lines at RAPP-A**		
1	220 kV S/C RAPS-A-Kota (Sakatpura)Line Ckt-I	Operative	
2	220 kV S/C RAPS-A-Kota (Sakatpura)Line Ckt-II	Operative	
3	132 kV S/C RAPS-A to RAPS-B Line	Blocked	
4	220 kV S/C Debari-RAPS-A Line	Blocked	
B.	**Transmision Lines at RAPP-B**		
1	220 kV S/C RAPS-B-Kota (Sakatpura)Line Ckt-III	Operative	
2	220 kV S/C RAPS-C-Anta line	Operative	
3	220 kV S/C RAPS-B-RAPS-C Tie line Ckt-I	Blocked	
4	220 kV S/C RAPS-B-RAPS-C Tie line Ckt-II	Blocked	
5	220 kV S/C Chittorgarh (220 kV GSS)-RAPS-B line Ckt-I	Blocked	
6	220 kV S/C Chittorgarh (220 kV GSS)-RAPS-B line Ckt-II	Blocked	
7	220 kV S/C Debari-RAPS-B Line	Blocked	
C.	**Transmision Lines at 220 kV GSS Debari**		
1	220 kV S/C Debari-RAPS-A Line	Blocked	In present arrangement only 220 kV S/C Debari-RAPS-A line and 220 kV S/C Debari-RAPS-B lines with all 220/132 kV transformers are connected to 220 kV Main bus-1 and bus coupler is opened.
2	220 kV S/C Debari-RAPS-B Line	Blocked	
3	220 kV S/C Debari-Amberi Line	Blocked	220 kV S/C Debari-Amberi line and 220 kV S/C Debari-Aspur lines are conncted to 220 kV main bus-2. In this arrangement UFR relays should be kept blocked. If in real time grid operation these lines are connected to 220 kV main bus-1 then UFR relays should be made operative
4	220 kV S/C Debari-Aspur Line	Blocked	
5	220 kV S/C Debari-Chhittorgarh(400 kV GSS) Line	Blocked	220 kV S/C Debari-Chhittorgarh(400 kV GSS) line and 220 kV S/C Debari-Madri lines are conncted to 220 kV Auxiliary bus. In this arrangement UFR relays should be kept blocked. If in real time grid operation these lines are connected to 220 kV main bus-1 then UFR relays should be made operative
6	220 kV S/C Debari- Madri Line	Blocked/Operative	
7	132 kV S/C Debari-Nathdwara line with T-off at Mavli	Operative	Line generally remains charged at no load
8	132 kV S/C Debari-Amberi Line	Operative	Line generally remains charged at no load
9	132 kV S/C Debari-Madri Line	Blocked	Load of 132 kV GSS Dakan Kotra is fed being from 220 kV GSS Debari via 132 kV Auxiliary bus of 220 kV GSS Debari, therefore, UFR realy should be kept blocked. If in future any other arrangement is made then it should be reviewd by SLDC, Rajasthan with intimation to NRPC.
10	132 kV S/C Debari-Mavli Ckt-I Line	Blocked	
11	132 kV S/C Debari-Bhatewar Line	Blocked	
12	132 kV S/C Bhatewar-Bhinder Line	Blocked	
13	132 kV S/C Bhinder-Jhoojhpura Line	Blocked	
14	132 kV S/C Bhinder-Mangalwad Line	Operative	Line generally remains charged at no load.
15	132 kV S/C Debari-UCW Line	Blocked	
16	132 kV S/C Debari-HZL Line	Blocked	
17	132 kV S/C Mavli-TSS Line	Blocked	

S. No.	Name of Line	Status	Remark
D.	**Transmision Lines at 220 kV GSS Chittorgrah**		
1	220 kV S/C Chittorgarh (400 kV GSS)-Chittorgarh (220 kV GSS) line	Operative	-
2	220 kV D/C Chittorgarh (220 kV GSS)-RAPP(B) line (Circuit-1)	Blocked	
3	220 kV D/C Chittorgarh (220 kV GSS)-RAPP(B) line (Circuit-2)	Blocked	
4	220 kV S/C Chittorgarh (220 kV GSS)-Sawa line	Blocked	
5	220 kV S/C Chittorgarh (220 kV GSS)-Hamirgarh line	Blocked	-
6	132 kV S/C Ajoliya Khera-Rashmi Line	Operative	Line generally remains charged at no load
7	132 kV S/C Chittorgarh-Ajoliya Khera Line	Blocked	
8	132 kV S/C Ajoliya Khera-Bassi Line	Blocked	-
9	132 kV S/C Chittorgarh-Senthi Line	Blocked	
10	132 kV S/C Senthi-Rasoolpura Line	Blocked	
11	132 kV S/C Chittorgarh-BCW Line	Blocked	
12	132 kV S/C Chittorgarh-Sawa Line	Operative	Line generally remains charged at no load
13	132 kV S/C Chittorgarh-CCW Line	Operative/blocked	Normal condition operative but available for lean load period
14	132 kV D/C Chittorgarh-HZL Line (Circuit-1)	Operative/blocked	
15	132 kV D/C Chittorgarh-HZL Line (Circuit-2)	Operative/blocked	
16	132 kV S/C Rasoolpura-WCL Line	Operative/blocked	
17	132 kV S/C Senthi-Gosunda TSS Line	Blocked	
E.	**Transmision Lines at 220 kV GSS Sawa**		
1	220 kV D/C Sawa-Chittorgarh (400 kV GSS) Line (Circuit-1)	Operative	
2	220 kV D/C Sawa-Chittorgarh (400 kV GSS) Line (Circuit-2)	Operative	
3	132 kV S/C Sawa-Chittorgarh (220 kV GSS) Line	Operative	Line generally remains charged at no load
4	220 kV S/C Sawa-Chittorgarh (220 kV GSS) Line	Blocked	
5	220 kV S/C Sawa-Nimbahera Line	Blocked	
6	132 kV S/C Sawa-BhadesarLine	Blocked	
7	132 kV S/C Sawa-Kapasan Line	Blocked	
8	132 kV S/C Kapasan-Bhopal Sagar Line	Blocked	
9	132 kV S/C Sawa-ACW Line	Operative/blocked	Normal condition operative but available for lean load period
10	132 kV S/C Sawa-NUVOCO Line	Operative/blocked	
F.	**Transmision Lines at 220 kV GSS Nimbahera**		
1	220 kV S/C Nimbahera-Pratapgarh Line	Operative	
2	220 kV S/C Nimbahera-Chittorgarh (400 kV GSS) Line	Operative	
3	132 kV S/C Rasoolpura-JKCW Line	Operative	
4	132 kV S/C Nimbahera-JKCW Line	Operative	
5	220 kV S/C Nimbahera-Sawa Line	Blocked	
6	132 kV S/C Nimbahera-Bhadesar Line	Operative	Line generally remains charged at no load
7	132 kV S/C Nimbahera-Rasoolpura Line	Operative/blocked	Normal condition operative but available for lean load period
8	132 kV S/C Nimbahera-Kaneri Line	Blocked	
9	132 kV S/C Nimbahera-Bijapur Line	Blocked	
10	132 kV S/C Nimbahera-Chhotisadari Line	Blocked	Load of 132 kV GSS Badisadri is fed via 132 kV Auxiliary bus of Chotisadri
11	132 kV S/C Nimbahera-Dhoriya Chouraha Line	Blocked	
12	132 kV S/C Dhoriya Chouraha-Mangalwad Line	Blocked	
13	132 kV S/C Mangalwad-Bhinder Line	Blocked	
G	**Transmision Lines at 220 kV GSS Hamirgarh**		
1	220 kV S/C Bhilwara (400 kV GSS)-Hamirgarh line	Operative	-
2	220 kV S/C Chittorgarh (220 kV GSS)-Hamirgarh line	Blocked	-
3	132 kV S/C Hamirgarh-RICCO Growth Center Hamirgarh line	Blocked	
4	132 kV S/C Hamirgarh-RSWML line	Operative/Blocked	Normal condition operative but available for lean load period
5	132 kV S/C Hamirgarh-Soniya line	Operative/Blocked	
6	132 kV S/C Soniya-Rasmi line	Operative/Blocked	
7	132 kV S/C Soniya-Asahi Glass line	Operative/Blocked	
8	132 kV S/C RICCO Growth Center Hamirgarh-Nitin Spinner line	Operative/Blocked	
9	132 kV S/C RICCO Growth Center Hamirgarh-RSWML line	Operative/Blocked	
10	132 kV S/C Hamirgarh-RICCO Bhilwara Line	Operative	

TRANSMISSION NETWORK INCLUDED IN ISLANDING SCHEME OF RAPP-A & B

Annexure-C



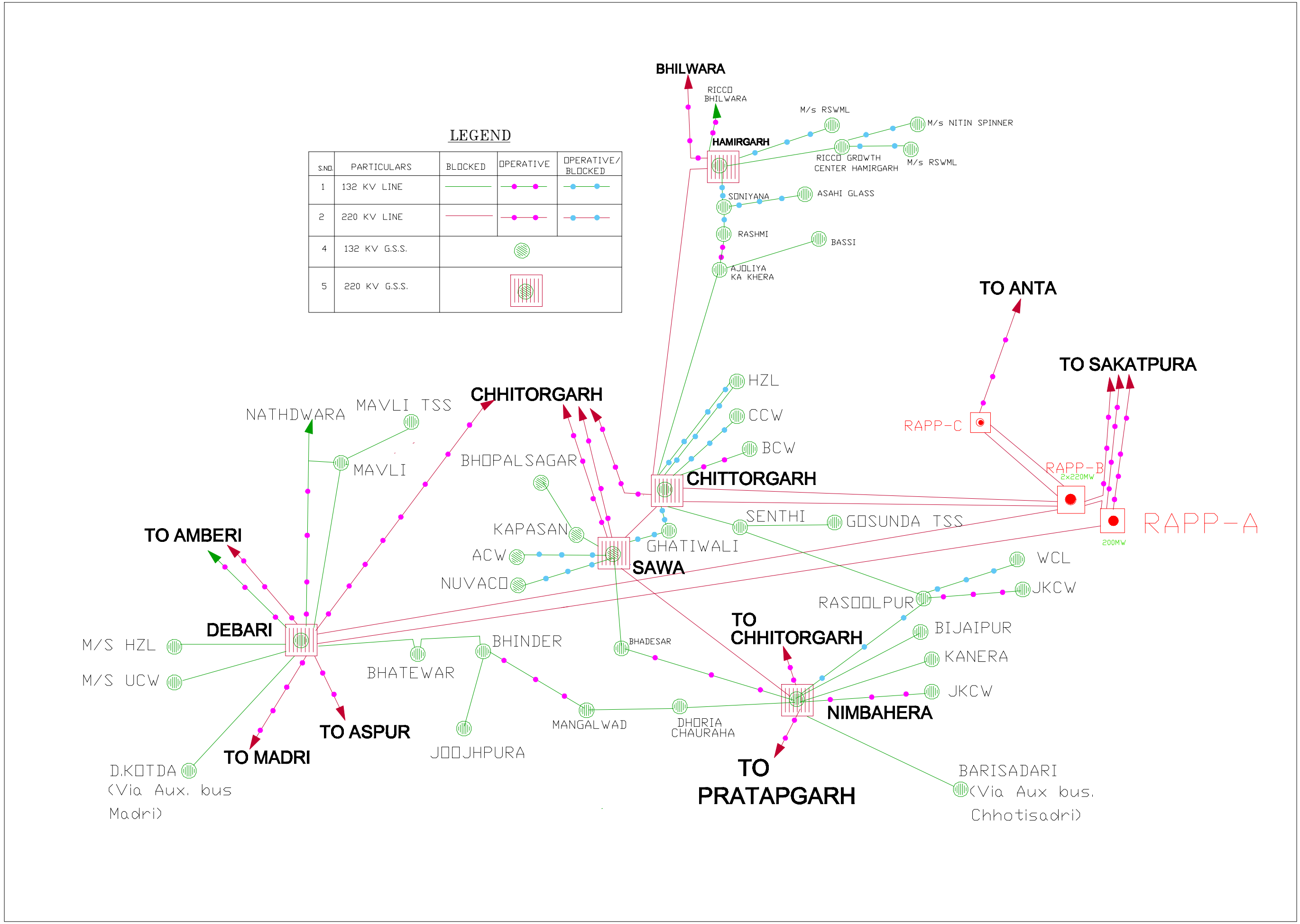
Annexure-D

Power flow on Lines and transformers in Island

S. No.	Name of Line/transformers	Power flow		Remark
		MW	**MVAR**	
A	**Generation**			
1	Unit-2 of RAPP-A	200	5	Swing bus
2	Unit-3 of RAPP-B	220	93	-
3	Unit-4 of RAPP-B	220	93	-
	Total (A)	640	191	-
B	**Power flow on network**			
B-1	**220/132 kV Transformers**			
1	220/132 kV transformers at Debari (570 MVA 220 kV transformers capacity) (Group-A1)	150	40	Connected load : 147 MW & 41 MVAR
2	220/132 kV transformers at Chhitorgarh (260 MVA 220 kV transformers capacity) (Group-A2)	98	31	Connected load : 92 MW & 30 MVAR
3	220/132 kV transformers at Sawa (260 MVA 220 kV transformers capacity) (Group-A3)	57	11	Connected load : 57 MW & 9 MVAR
4	220/132 kV transformers at Nimbahera (320 MVA 220 kV transformers capacity) (Group-B1)	128	38	Connected load : 126 MW & 34 MVAR
5	220/132 kV transformers at Hamirgarh (200 MVA 220 kV transformers capacity) (Group-C1)	86	12	Connected load : 86 MW & 7 MVAR
	Total (B1)	**519**	**132**	
B-2	**220 kV Lines**			
1	220 kV S/C RAPP(A)-Debari line	78	2	-
2	220 kV S/C RAPP(A)- RAPP(B)line	61	12	-
3	220 kV S/C RAPP(B)-Debari line	74	2	-
4	220 kV D/C RAPP(B)-Chhitorgarh line (Ckt-1)	193	2	-
5	220 kV D/C RAPP(B)-Chhitorgarh line (Ckt-1)	193	2	-
6	220 kV S/C Chhitorgarh-Hamirgarh line	86	2	-
7	220 kV S/C Chhitorgarh-Sawa line	187	57	-
8	220 kV S/C Sawa-Nimbahera line	129	40	-

Annexure-E

SINLE LINE DIAGRAM OF ISLANDING SCHEME OF RAPP GENERATION COMPLEX



CEA-GO-17-11/1/2023-NRPC

I/52747/2025

सत्यमेव जयते

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

विषय: प्रचालन समन्वय उप-समिति की 234 वीं बैठक की कार्यसूची ।

Subject: Agenda of the 234th OCC meeting.

प्रचालन समन्वय उप-समिति की **234 वीं** बैठक का आयोजन वीडियो कॉन्फ्रेंसिंग के माध्यम से दिनांक **14.08.2025** को **10:30** बजे से किया जायेगा । उक्त बैठक की कार्यसूची उत्तर क्षेत्रीय विद्युत् समिति की वेबसाइट http://164.100.60.165 पर उपलब्ध है ।

बैठक में सम्मिलित होने के लिए लिंक व पासवर्ड सभी सदस्यों को ई-मेल द्वारा प्रदान किया जाएगा।

कृपया बैठक में उपस्थित होने की सुविधा प्रदान करें।

The **234th** meeting of the Operation Co-ordination sub-committee will be conducted through Video Conferencing on **14.08.2025** from **10:30 Hrs**. The agenda of this meeting has been uploaded on the NRPC web-site http://164.100.60.165.

The link and password for joining the meeting will be e-mailed to respective e-mail IDs in due course.

Kindly make it convenient to attend the meeting.

(डी. के. मीना) 12/8/25
अधीक्षण अभियंता (प्रचालन)

सेवा में : प्रचालन समन्वय उप समिति के सभी सदस्य।
To : All Members of OCC

18-ए, शहीदजीतसिंहमार्ग, कटवारियासराय, नईदिल्ली- 110016 फोन:011-26513265 ई-मेल: seo-nrpc@nic.in वेबसाईट: www.nrpc.gov.in
18-A, Shaheed Jeet Singh Marg, Katwaria Sarai, New Delhi-110016 Phone: 011-26513265 e- mail: seo-nrpc@nic.in Website: www.nrpc.gov.in

A.10.2. The status of MTDL achieved in intra-state thermal generating stations of Punjab, Rajasthan and Haryana noted in 223rd OCC meeting of NRPC is attached at **Annexure-A.V**.

A.10.3. NRPC Secretariat vide letter dated 31.07.2025 **(Annexure-A.VI)** had requested thermal generating stations mentioned at **Annexure-A.V** are requested to submit the reasons for not achieving 55% Technical Minimum Level.

Members may kindly deliberate.

A.11. Unit-wise Planned Maintenance schedule of Generating Units for the year 2026-27

(Agenda by NRPC Secretariat)

A.11.1. Central Electricity Authority vide mail dated 10.07.2025 has sought information regarding the Unit Wise Planned Maintenance schedule for the year 2026-27.

A.11.2. NRPC Secretariat vide letter dated 22.07.2025 (**Annexure-A.VII**) had requested respective SLDC's of Northern Region to co-ordinate with IPPs and State Generating Companies within their control area and submit the data as per **Annexure-A.VIII**. Further, Central Generating utilities are also requested to submit the abovementioned data as per **Annexure-A.VIII**.

A.11.3. All generating stations of NR are requested to submit Unit Wise Planned Maintenance schedule for the year 2026-27 in the format **Annexure-A.VIII** attached by email to seo-nrpc@nic.in by the 31st August 2025.

Members may kindly deliberate.

A.12. Approval of SPS at 400kV substation Bareilly (Agenda by UPSLDC)

A.12.1. UP SLDC has submitted that during peak load condition, ICTs at 400 kV substation Bareilly are observed to be N-1 noncompliant.

A.12.2. Meeting regarding identification of feeders for load shedding, logic of SPS and over current setting was held on 25.07.2025.

A.12.3. Based on discussion, UPSLDC has finalized SPS logic, which are enclosed as **Annexure-A.IX.**

A.12.4. UPSLDC has requested approval for its implementation of SPS.

Members may kindly deliberate.

A.13. Approval of SPS at 400 kV substation Panki (Agenda by UPSLDC)

A.13.1. UP SLDC has submitted that during peak load condition, ICTs at 400 kV S/S Panki are observed to be N-1 non-compliant. SPS for ICTs at 400 kV S/S Panki has been finalized by UPSLDC.

A.13.2. Agenda for approval of the same was put up in 232nd OCC Meeting wherein OCC forum found the SPS logic technically in order as per requirement. However, forum advised that Over Current settings may be reviewed in Protection Sub-Committee Meeting of NRPC.

A.13.3. UP SLDC has informed that over current settings at 400kV substation Panki has been implemented on 15.07.2025 as per NRPC Protection philosophy. The same

was communicated to NRLDC and NRPC vide e-mail on dated 16.07.2025 & 30.07.2025 respectively.

A.13.4. SPS logic and over current settings are attached as **Annexure-A.X.**

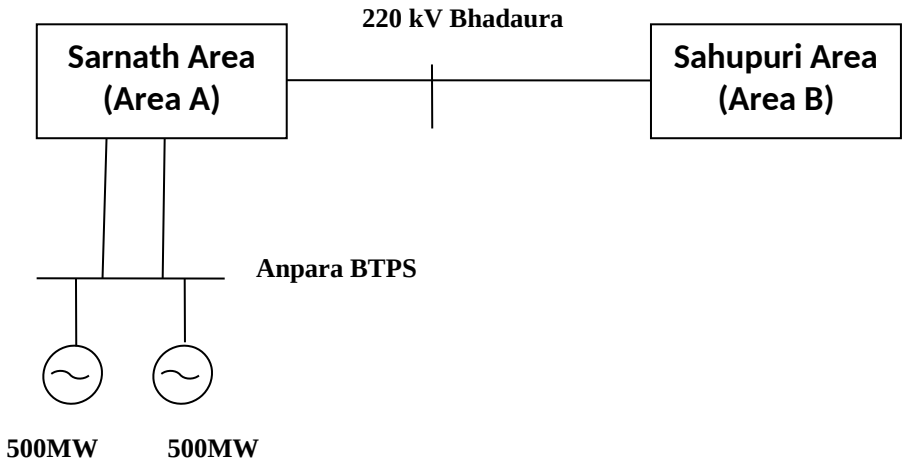
A.13.5. Therefore, UPSLDC has requested approval for its implementation of SPS.

Members may kindly deliberate.

A.14. Agenda on Varanasi Islanding Scheme (Agenda by UPSLDC)

A.14.1. UPSLDC has submitted that it has conducted steady state load flow study of Varanasi Islanding Scheme using generation of Anpara BTPS (2X500MW).

A.14.2. 400 kV Anpara BTPS is connected to 400 kV S/S Sarnath through 400 kV double circuit lines.



A.14.3. Study was conducted in various scenarios which are given as follows:-

Sl. No.	Case	Area	Number of Machine	Generation	Load	Remarks
1	Case-1	A and B	2	874 MW	806 MW (Summer Peak)	Not Feasible
2	Case-2	A and B	2	442 MW	435 MW (Winter Peak)	Not Feasible
3	Case-3	A	1	452 MW	440 MW (Summer Peak)	Feasible
4	Case-4	A	1	310 MW	305 MW (Summer Off Peak)	Feasible
5	Case-5	A and B	1	409 MW	402 MW (Winter Peak)	Feasible
6	Case-6	A and B	1	326 MW	322 MW (Winter Off Peak)	Feasible

A.14.4. As per the study, Islanding Scheme does not seem feasible in cases 1, due to under voltage observed at various node when 2 machine are taken considering area A & B

Electricity Test & Commissioning Circle,Lucknow

Priority wise opening of feeders connected on SPS at 400KV Sub - stations Bareilly

Name of S/S	T/F Rating	Tripping Logic Stage		Tripping Logic Stage			
		% Setting	Time	%Setting	Time	Priority of Feeders for load cut off	Average Load in MW Load in MW
400KV S/S Bareilly	315MVA - I	100-110 (454-500 A)	5 Sec	Above 110% (>500 A)	1500 ms	1-220KV Amariya DC	32
						2-20KV Faridpur	20
						3-20KV Pilibhit DC	130
	315MVA - II	100-110 (454-500 A)	5 Sec	Above 110% (>500 A)	1500 ms	4- 220 KV Pantnagar	118
						5- 220 KV CB Ganj DC	84
	315MVA - III	100-110 (454-500 A)	5 Sec	Above 110% (>500 A)	1500 ms	6- 220 KV Dohna DC	70

Note: Delay as mentioned in the above Tripping logics I& II is for initiation of tripping command. After initiation of tripping command, feeders will continue to trip as per priority without any time delay untill loading on ICT recahes below 100%.

Overcurrent setting of ICTs at 400KV Sub - stations Bareilly		
Fault current with respect to full load (FL) current	Current in A	OC trip time (in Sec)
100% of FL	-	-
105% of FL	-	-
110% of FL pikup (500A)	501	1051
120% of FL	545	24
130% of FL	590	7.983
140% of FL	635	6.22

Logic for proposed SPS (System Protection Scheme) for ICTs at 400kV Substation Panki							
Name of Substation	ICT Rating	Tripping Logic-I			Tripping Logic-II		
		% Setting	Time Delay	Priority of feeder for load cut off	% Setting	Time Delay	Priority of feeder for load cut off
400kV Substation Panki	315MVA ICT- I	100-110% of rated current	5 sec	1. 220kV Chibramau 2. 220kV RPH 3. 220kV Bithoor 4. 220kV Raniya 5. 132kV Dibiyapur 6. 132kV Dadanagar 7. 132kV Azad Nagar Ckt I & II	Above 110% of rated current	1500 msec	1. 220kV Chibramau 2. 220kV RPH 3. 220kV Bithoor 4. 220kV Raniya 5. 132kV Dibiyapur 6. 132kV Dadanagar 7. 132kV Azad Nagar Ckt I & II
	500MVA ICT- II	100-110% of rated current	5 sec	1. 220kV Chibramau 2. 220kV RPH 3. 220kV Bithoor 4. 220kV Raniya 5. 132kV Dibiyapur 6. 132kV Dadanagar 7. 132kV Azad Nagar Ckt I & II	Above 110% of rated current	1500 msec	1. 220kV Chibramau 2. 220kV RPH 3. 220kV Bithoor 4. 220kV Raniya 5. 132kV Dibiyapur 6. 132kV Dadanagar 7. 132kV Azad Nagar Ckt I & II

Note: Delay as mentioned in the above Tripping logics I& II is for initiation of tripping command. After initiation of tripping command, feeders will continue to trip as per priority without any time delay untill loading on ICT recahes below 100%.

Overcurrent setting of ICTs at Panki	
Fault current with respect to full load (FL) current	OC trip time (in Sec)
100% of FL	-
105% of FL	-
110% of FL	Pickup
120% of FL	11.498
130% of FL	7.983
140% of FL	6.22

RAJASTHAN RAJYA VIDYUT PRASARAN NIGAM LIMITED
[Corporate Identity Number (CIN): U40109RJ2000SGC016485]
Regd. Office: Vidyut Bhawan, Janpath, Jyoti Nagar, Jaipur-302005

RVPN
An ISO 9001:2015 Certified Company

OFFICE OF THE CHIEF ENGINEER (LD)
New Prasaran Bhawan, TCC Building, Heerapura, Jaipur Tel. No. 0141-2948293
E-mail: ce.ld@rvpn.co.in website: www.http://energy.rajasthan.gov.in/rvpnl

Annexure-A.IX

No. RVPN/ CE (LD)/ SE(SOLD)/XEN(SA)/A-1/F. / D. Jaipur dt.

The Member Secretary
NRPC, New Delhi

Sub: -Agenda for inclusion in 62nd PSC Meeting SCHEDULED on 14.8.2025 - permission for opening of 6 nos. 50 MVAR capacity non-switchable line reactors installed on various 400 kV lines to improve voltage and reduce MVAR drawal from NR Grid in Rajasthan Control area

Ref:-1. Discussions held in 234th OCC meeting held on 14.8.2025

On the above captioned subject and under references, an Agenda item is enclosed herewith for inclusion in 62nd PSC meeting scheduled on 26.8.2025 for discussion and deliberation. It is also informed that aforesaid agenda item was also discussed in the 234th OCC meeting held on 14.8.2025 wherein it was advised to putup agenda in the forthcoming PSC meeting.

Encl: As above

(Sudhir Jain)
Chief Engineer (LD)
RVPN, Jaipur

Copy to the following for information and necessary action :-
1. The Director (Operations/Technical), RVPN, Jaipur
2. The Chief Engineer (PP&D), RVPN, Jaipur.
3. The General Manager, NRLDC, New Delhi
4. The Chief Engineer(PP&D), RVPN, Jaipur
5. The Zonal Chief Engineer(T&C), RVPN, Jodhpur/Ajmer
6. The Superintending Engineer (P&P), RVPN, Jaipur
7. TA to the MD, RVPN, for kind perusal of MD, RVPN, Jaipur

Encl: As above

Chief Engineer (LD)
RVPN, Jaipur

Document certified by SUDHIR JAIN <jain.sudhir@rvpn.co.in>
Digitally Signed by SUDHIR JAIN
Designation: Chief Engineer
Date :18-08-2025 05:54:55

RajKaj Ref No.: 17221333
eSign DSC

Agenda Item- Opening of 6 nos. 50 MVAR capacity non-switchable line reactors installed on various 400 kV lines to improve voltage and reduce MVAR drawal from NR Grid in Rajasthan Control area

In the various NRPC/OCC meetings regarding critically low voltage issues in Rajasthan control area has been discussed and Rajasthan SLDC has been advised to improve voltage and reduce MVAR drawal from NR grid.

In this regard it is intimated that various measures viz. regular pursuance with intrastate generators for injection MVAR as per their capability curve, MVAR injection by RE Generators as per CEA Regulations, proper maintenance & operation of the shunt capacitor banks etc. are being taken by SLDC, Rajasthan. In this regard SLDC Rajasthan has also explored to open non-switchable line reactors installed on 400 kV lines sothat in day time voltage can be improved. 50 MVAR capacity non-switchable line reactors are installed on following 400 kV lines which line lengths are less than 200 kM :-

i. 400 kV S/C Bikaner-Merta line (Twin moose) with 50 MVAR non switchable line reactors at both ends of line (172 kM)
ii. 400 kV D/C Bhadla-Bikaner line (quad moose) with 50 MVAR non switchable line reactors on each circuit at Bhadla end (189.1 kM)
iii. 400 kV S/C Ramgarh-Bhadla line (Twin moose) with 50 MVAR non switchable line reactor at Ramgarh end of line (160 kM)
iv. 400 kV S/C Jaisalmer 2-Kankani line (Quad moose) with 50 MVAR non switchable line reactor at Kankani end of line (176.84 kM)

Rajasthan SLDC has carried out load flow studies in latest PSSE file shared by NRLDC to assess the impact of opening of above 6 nos. 50 MVAR capacity non-switchable line reactors installed on aforesaid 400 kV lines to improve day time low Grid voltage in Rajasthan Control area. Following two scenarios have been simulated:-

i. Case-1: Load flow study with 17000 MW system demand and aforesaid 6 nos. 50 MVAR line are in circuit
ii. Case-2: Load flow study with 17000 MW system demand and aforesaid 6 nos. 50 MVAR line reactors are out of circuit

Load flow study results are tabulated hereunder :

Table-1: Impact on Voltage and system losses

S. No.	Particulars	Voltage (kV)		Change in voltage in Case-2 with respect to Case-1
		Case-1	Case-2	
1	400 kV GSS Merta	388	391	-3
2	400 kV GSS Bikaner	393	395	-2
3	400 kV GSS Kankani	384	387	-3
4	400 kV GSS Bhadla	390	393	-3
5	400 kV GSS Jodhpur	386	388	-2
6	400 kV GSS Ramgarh	393	397	-4
7	Transmission losses(MW)	840.2	834.6	5.6

Impact of switching off 06 nos 50 MVAR reactors (Total 300 MVAR Capacity) on MVAR loss of transmission lines on which installed line reactors are proposed to take out of circuit are placed at Annexure-1 and tabulated hereunder :-

Table-2: Impact on Line MVAR loss

S. No.	Particulars	Line reactor capacity(MVAR)		Line Conductor	Line length (km)	Line MVAR loss reduction in Case-2 as compare to Case-1
		End1	End2			
1	400 kV S/C Bikaner-Merta line	50	50	Twin Moose	172	51
2	400 kV D/C Bhadla-Bikaner line (Ckt-1)	50	-	Quad Moose	189.1	51
3	400 kV D/C Bhadla-Bikaner line (Ckt-2)	50	-	Quad Moose	189.1	51
4	400 kV S/C Ramgarh-Bhadla line (Ckt-1)	50	-	Twin Moose	160	65
5	400 kV S/C Jaisalmer2-Kanknai line	-	50	Quad Moose	176.84	44
	Total	**200**	**100**			**262**

In view of above load flow study results case is submitted for grant permission to open of 6 nos. 50 MVAR capacity non-switchable line reactors installed on aforesaid 400 kV to improve day time low Grid voltage in Rajasthan Control area. If required night time voltage would be controlled by opening of lines and MVAR absorption by Generators. Aforesaid agenda was also discussed in the 234th OCC meeting held on 14.8.2025 wherein it was advised to putup agenda in the forthcoming PSC meeting. Issue is submitted for discussion and deliberation.

Annexure-1

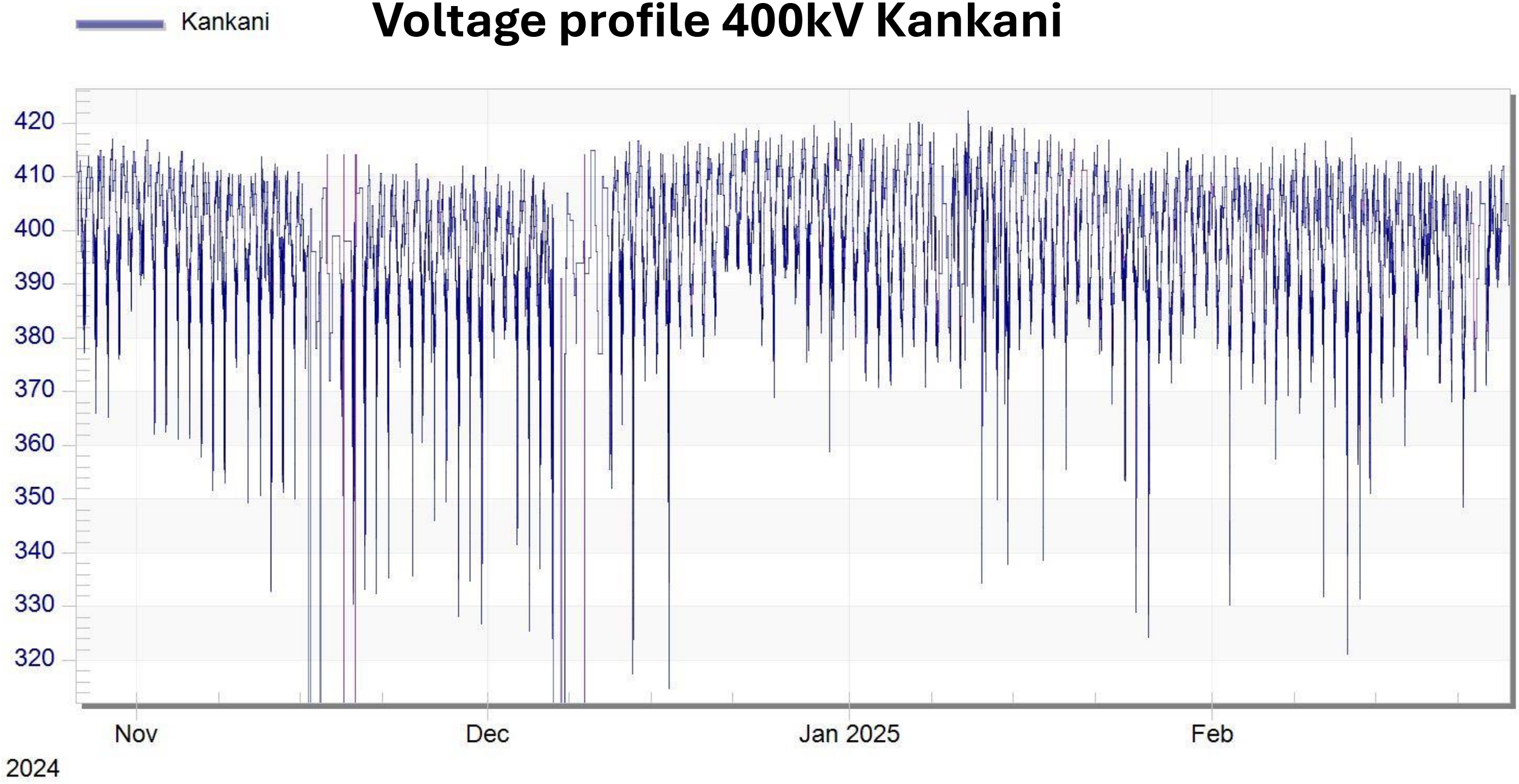
Impact of switching off 06 nos 50 MVAR reactors (Total 300 MVAR Capacity) on line MVAR loss

S. No.	Particulars	Line reactor capacity(MVAR)		Line Conductor	Line length (km)	Power flow on lines in case-1				Power flow on lines in case-2				Line MVAR loss		Line MVAR loss reduction in Case-2 as compare to Case-1
						End1		End2		End1		End2				
		End1	End2			MW	MVAR	MW	MVAR	MW	MVAR	MW	MVAR	Case-1	Case-2	
1	400 kV S/C Bikaner-Merta line	50	50	Twin Moose	172	227	10	-225	2	-225	2	229	-41	12	-39	51
2	400 kV D/C Bhadla-Bikaner line (Ckt-1)	50	-	Quad Moose	189.1	744	7	-734	82	746	-38	-736	76	89	38	51
3	400 kV D/C Bhadla-Bikaner line (Ckt-2)	50	-	Quad Moose	189.1	744	7	-734	82	746	-38	-736	76	89	38	51
4	400 kV S/C Ramgarh-Bhadla line (Ckt-1)	50	-	Twin Moose	160	204	14	-203	-36	205	-29	-204	-43	-22	-72	65
5	400 kV S/C Jaisalmer2-Kanknai line	-	50	Quad Moose	176.84	942	109	-927	73	946	97	-931	41	182	138	44
	Total	200	100												Total	262

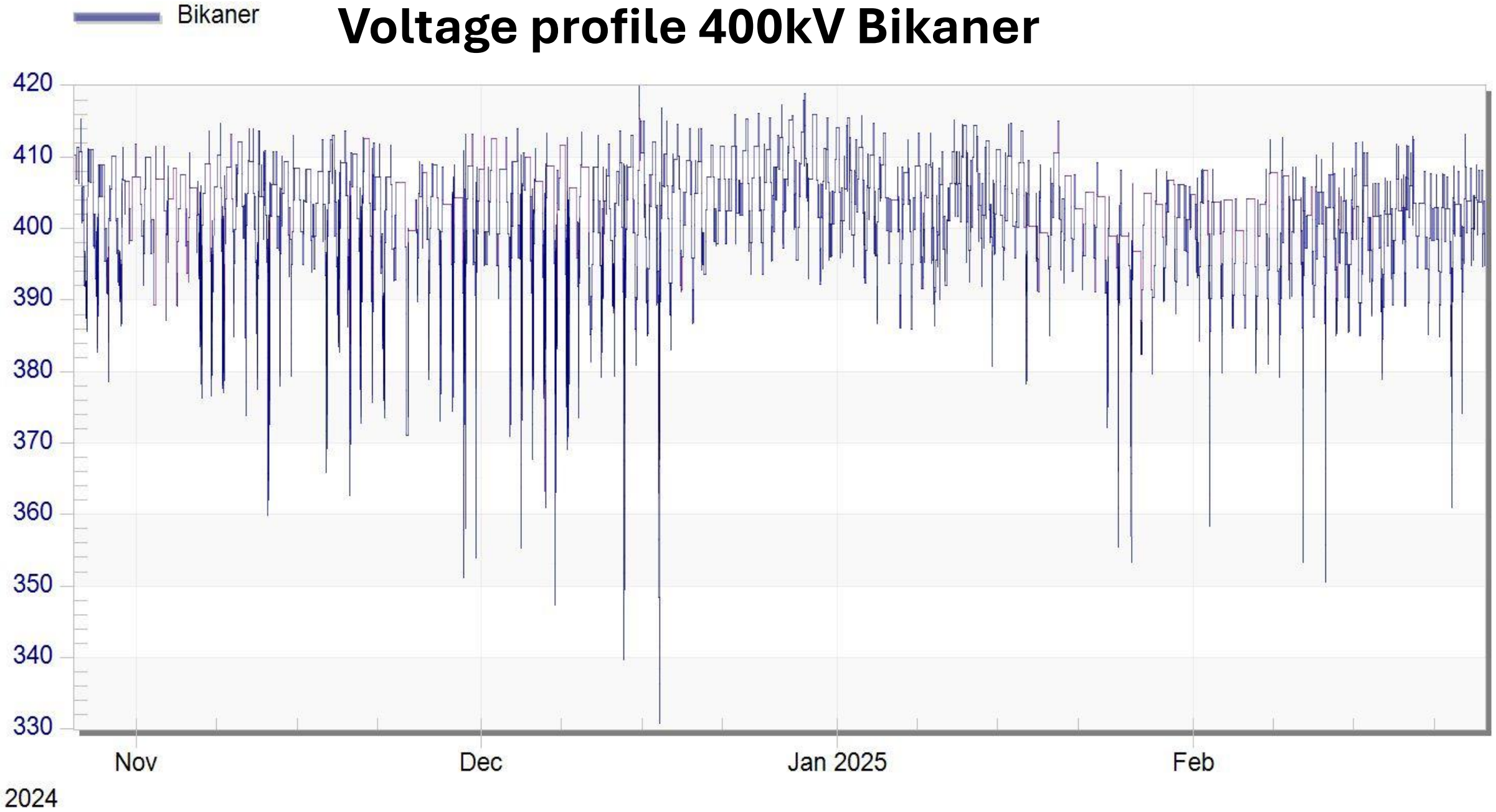
Voltage profile during winter months

Nov’2024 – Feb’2025

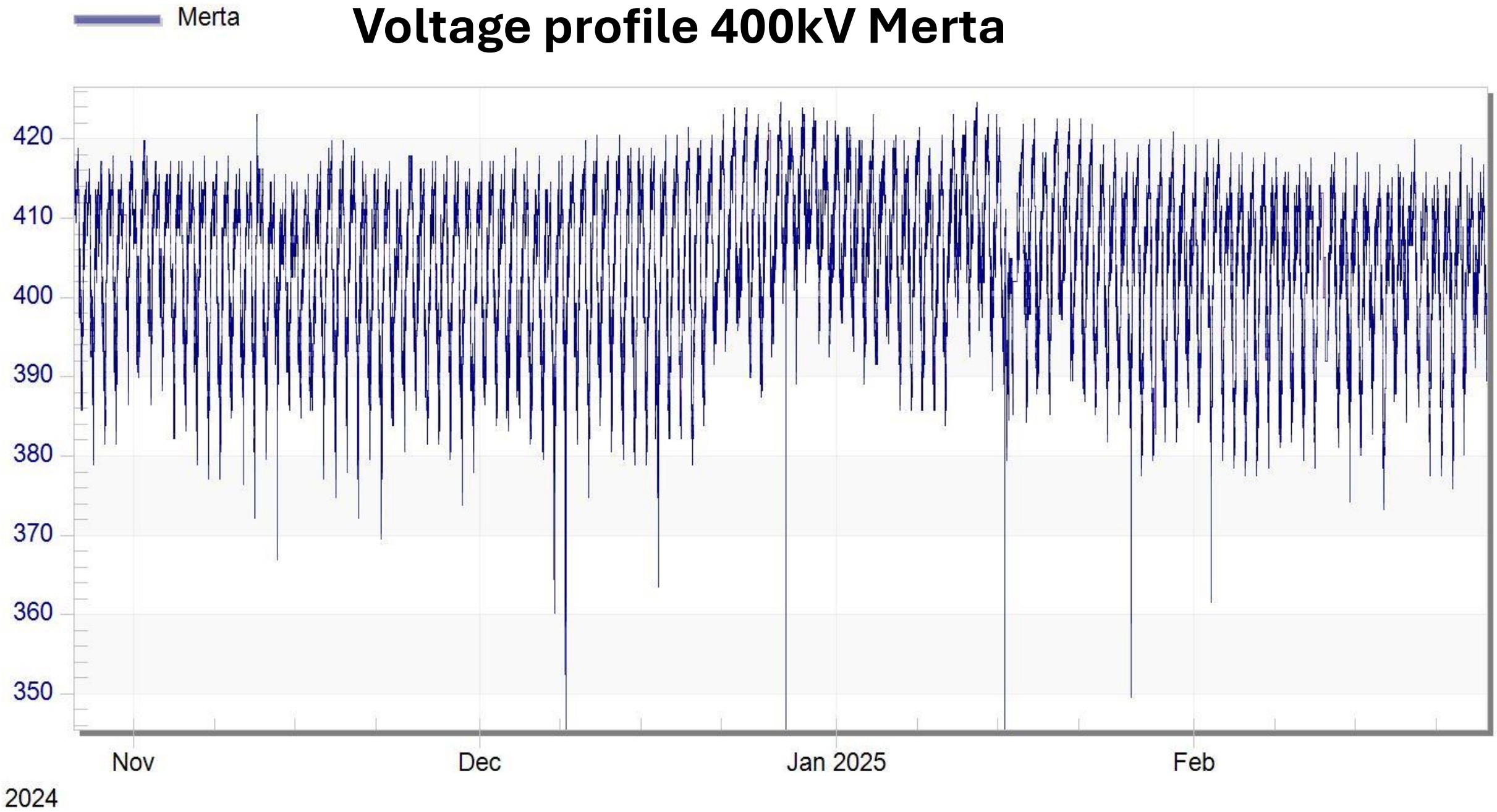
Voltage profile 400kV Kankani



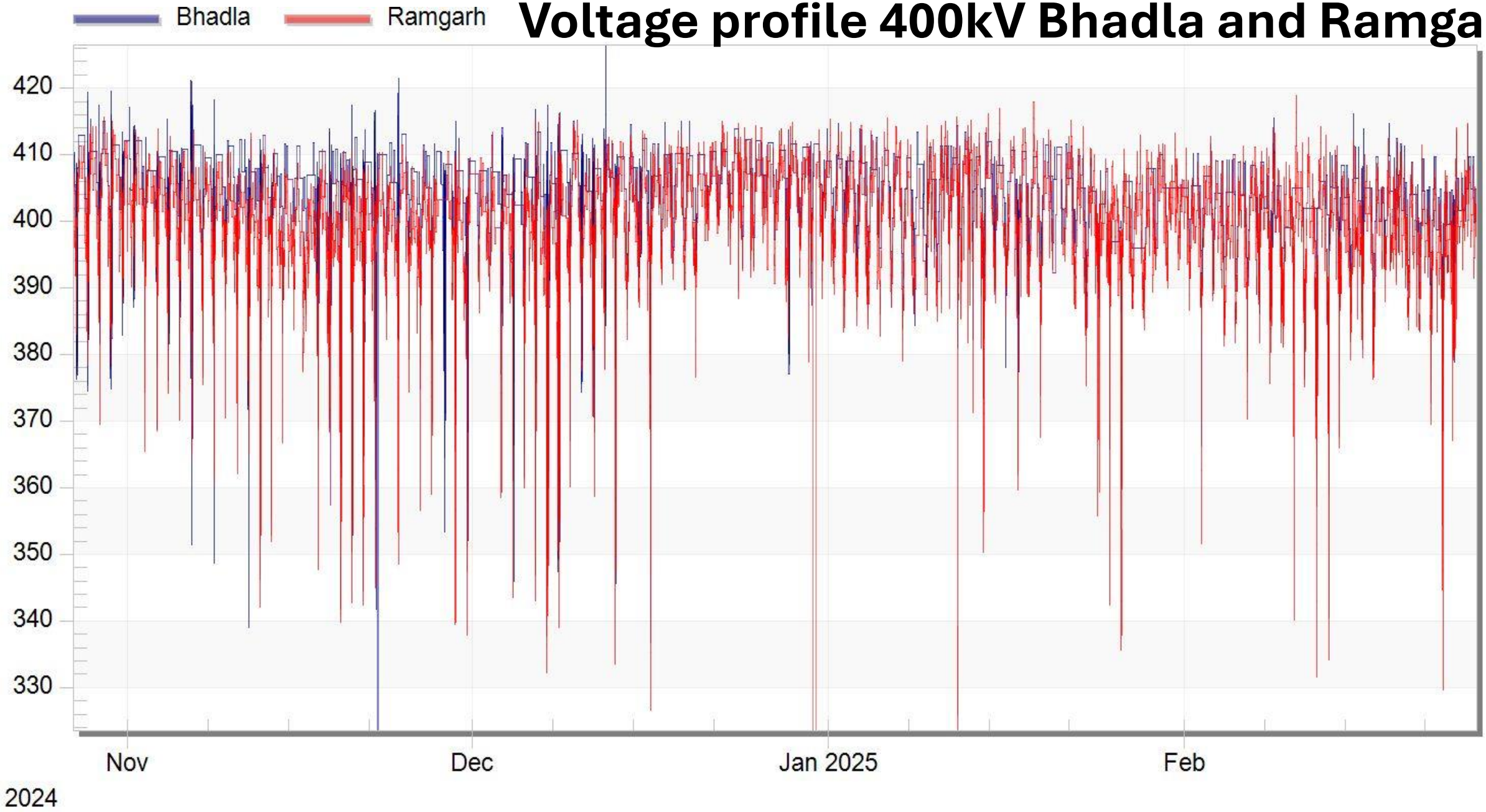
Voltage profile 400kV Bikaner



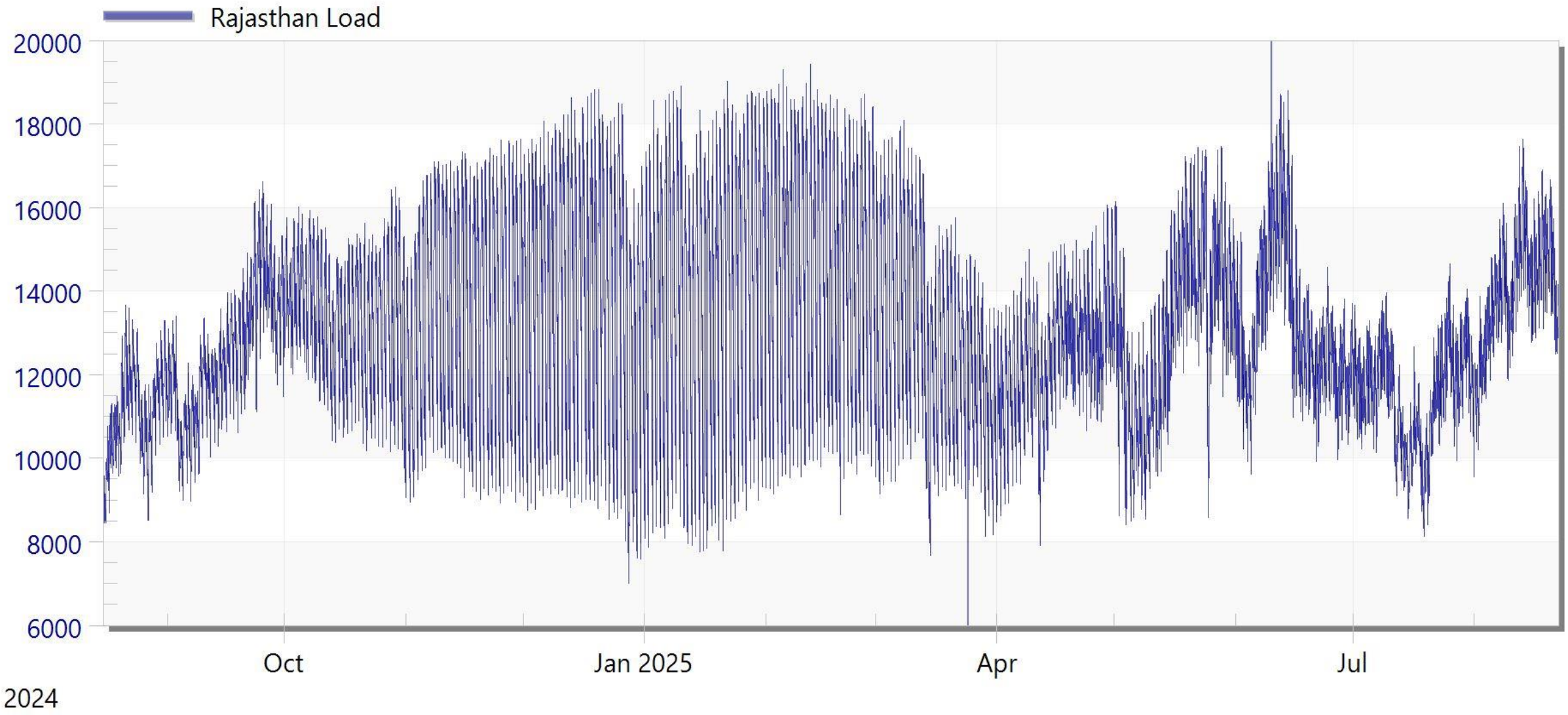
Voltage profile 400kV Merta



Voltage profile 400kV Bhadla and Ramgarh



Load variations of Rajasthan across the year



ICTs MW drawl, MVAr drawl, Power factor and S/s voltage for Solar hours (10:00-14:00hrs) for Rajasthan Control area (01-08 Dec 2024)					
400/220 Sub-Station_ICTs	ICTs Capacity (MVA)	MW Drawl	MVAr Drawl	Power factor	Voltage(kV)
Bikaner(RVPN)	2*315	100-300	150-300	0.40-0.65	375-390
Jodhpur	315	400-500	200-300	0.85-0.90	375-385
Kankani	(315+500)	500-700	200-300	0.87-0.90	370-385
Merta	2*315	400-500	200-250	0.85-0.89	380-395
Bhinmal(Powergrid)	2*315	500-600	200-300	0.87-0.90	360-370

Clauses as per CEA manual on TPC, 2023

5.4.3 **Shunt reactors**

5.4.3.1 Bus reactors shall be provided at EHV substations for controlling voltages within the limits (defined in the Paragraph: 4.3(a)) without resorting to switching-off the lines. The bus reactors may also be provided at generation switchyards to supplement reactive capability of generators. The size of reactors should be such that under steady state condition, switching on and off of the reactors shall not cause a voltage change exceeding 5%. The standard sizes (MVAr) of reactors are:

Voltage Level	Standard sizes of reactors (in MVAr)
132 kV (3-ph unit)	12.5 and 25 (rated at 145 kV)
220 kV (3-ph unit)	50, 25 (rated at 245 kV)
400 kV (3-ph unit)	50, 63, 80,125 and 250 (rated at 420 kV)
765 kV (1-ph unit)	80 and 110 (rated at 765/√3 kV)

5.4.3.2 Fixed line reactors may be provided to control power frequency temporary over-voltage (TOV) after all voltage regulation action has taken place within the limits as defined in Paragraph: 4.3(b) under all probable operating conditions.

5.4.3.3 Line reactors (switchable/ controlled/ fixed) may be provided if it is not possible to charge EHV line without exceeding the maximum voltage limits given in Paragraph: 4.3(a). The possibility of reducing pre-charging voltage of the charging end shall also be considered in the context of establishing the need for reactors.

5.4.3.4 The line reactors may be planned as switchable wherever the voltage limits, without the reactor(s), remain within limits specified for TOV conditions given at Paragraph: 4.3(b).

Impact of opening of L/R based on studies

S. No.	Particulars	Line reactor capacity(MVAR)		Line Conductor	Line length (km)	Impact after opening of LR			
						Charged from End1		Charged from End2	
		End1	End2			Open End Voltage	Charging MVAR	Open End Voltage	Charging MVAR
1	400 kV S/C Bikaner- Merta line	50	50	Twin Moose	172	414	115	415	116
2	400 kV D/C Bhadla- Bikaner line (Ckt-1)	50	-	Quad Moose	189.1	414	145	410	142
3	400 kV D/C Bhadla- Bikaner line (Ckt-2)	50	-	Quad Moose	189.1	414	145	410	142
4	400 kV S/C Ramgarh- Bhadla line (Ckt-1)	50	-	Twin Moose	160	412	92	407	90
5	400 kV S/C Jaisalmer2-Kanknai line	-	50	Quad Moose	176.84	409	132	410	132
	Total	200	100						

NRLDC comments/observations

- Voltages generally below 420kV during Nov-Feb months. 400kV Merta slightly higher upto 425kV
- As per studies, voltage rise were at open end were in range of 5-10kV only
- Requirement of L/R must have been planned in line with CEA manual on TPC 2023
- LRs provide essential open-end voltage support during the energization of long EHV T/L as well as during A/R. Unavailability may adversely impact voltage control and terminal equipment life.
- Advisable to charge these T/L along with their respective LRs during non-solar hours to minimize voltage stress on terminal equipment

NRLDC comments/observations

- During low demand periods and non-solar hours, these LRs are critical for maintaining system voltage stability. Hence, **their outage should be done seasonally, and reviewed monthly by Raj SLDC to determine whether forced outage is required**.
- Incase of outage beyond 6 months, FTC compliances through safety inspector may be ensured
- **As requirement hs come up due to lack of reactive compensation by RRVPNL, any equipment damage arising due to the unavailability of LRs, will rest solely with RRVPNL.**
- Protection engineers may provide additional comments from their side.

Backup O/C protection in lines at NTPC

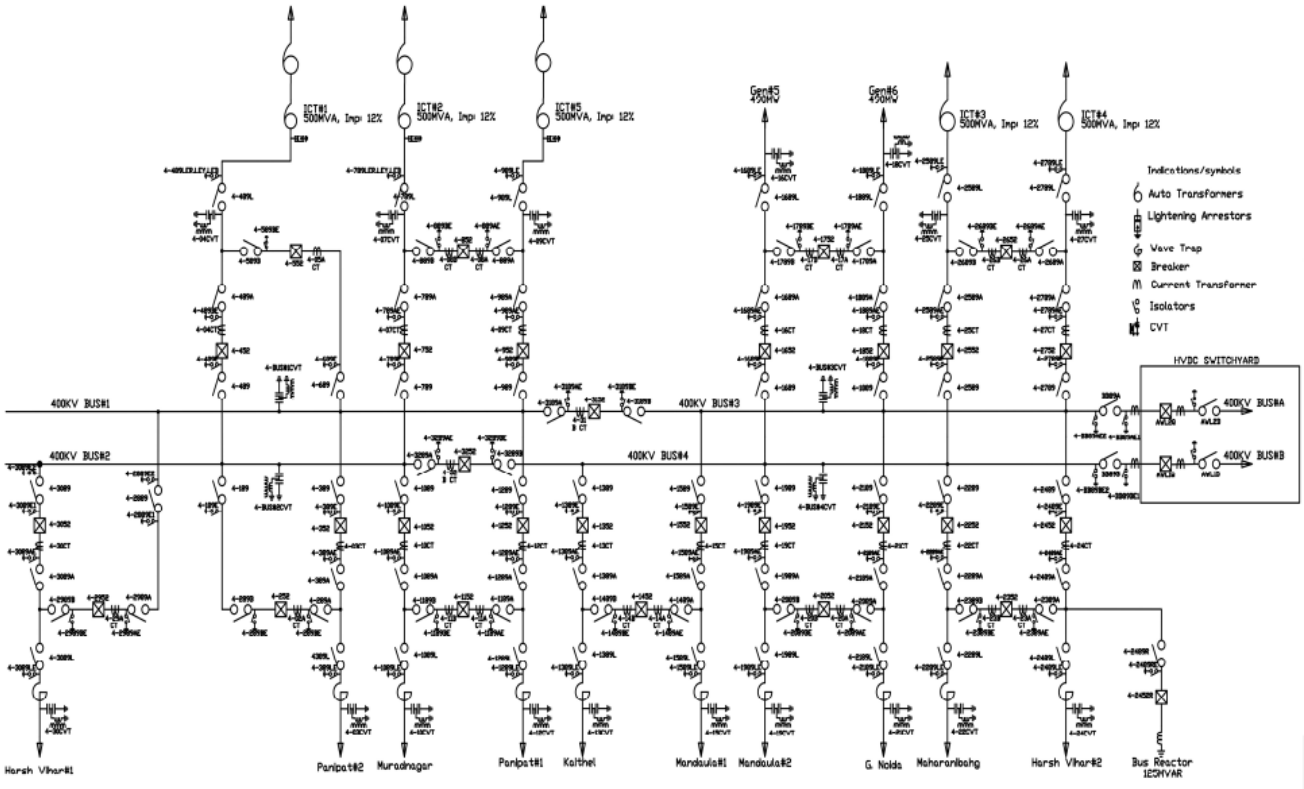
NTPC Dadri is having Thermal generation (**1820 MW**), Gas power generation (**829.78 MW**) & Solar(**5MWp**) generation capacity amounting to a total of **2654.78MW** of power generation capacity.

In addition to generation capacity, ±500kV, **1500MW**, HVDC Rihand – Dadri Link operating with power flow from Rihand to Dadri Switchyard.

NTPC Dadri is having 400kV and 220kV Switchyard. 400kV Switchyard from NTPC Dadri is evacuating a total **maximum power capacity** of **4154.78MW**.

This is w.r.t. Backup O/C protection in lines at NTPC overcurrent protection settings in 400kV Lines from NTPC Dadri.

We are having 10 Nos. of lines from NTPC Dadri. 400kV Switchyard Single Line diagram is given below: -



CEA philosophy for Line Backup Overcurrent Protection:

As per CEA construction standards 2022, there should be no Backup Over current protection enabled in 220KV & above rating transmission lines. (Recommendation attached in **Annexure:1**)

However, as per recommendation of CEA regulations 2022, it is mentioned that if main 1 and main 2 distance protections are being installed then overcurrent feature is not required. It is not mentioned that it cannot be enabled as backup protection.

NTPC philosophy for Line Overcurrent protection:

Definite Time, VT Fuse Failure-Enabled, Non-Directional Phase Overcurrent Protection in Main-1

and Main-2 Distance protection Relays:

- **Activation Condition:**

Non-Directional Overcurrent (OC) protection shall only be enabled with VT Fuse Failure. If there is no VT Fuse Failure, Overcurrent Protection shall not issue any trip. Additionally, Directional

Overcurrent protection shall not be used.

During VT fuse fail condition, Distance Protection will not be active. During such condition only, Definite time (DT) Backup O/C will be enabled with VT fuse fail & will act for breaker tripping (3ph trip relay) as per setting parameters.

Purpose to enable Backup O/C protection in lines at NTPC generating stations:

NTPC Engineering has provided a guiding philosophy for lines at NTPC stations, in which 'fuse failure enabled phase over current protection' shall get enabled in case of VT fuse failure only and pickup value around 1.7 times of thermal rating of line conductors with time delay.

we have adopted '**fuse failure enabled phase over current protection'** in all transmission lines connected to our generating stations because of **following reason**:

"Distance protection relays protect the transmissions during electrical faults. However, during a PT/CVT fuse failure condition, distance relays cannot detect the faults. If any transmission line of a generating does not trip during electrical faults, Generators will continue to feed the faults, there is a risk of operation of backup protections of all Generators connected to that substation, leading to blackout of that substation.

Therefore, to avoid the tripping of multiple Generators, station outages and to reduce fault feeding time of generators and GTs during such special cases, we have adopted fuse failure enabled phase over current protection. This Over Current protection is programmed to operate only in case of PT/CVT fuse failure and remains inactive during PT/CVT fuse healthy conditions."

Moreover, the over current setting for this protection is kept far beyond the thermal overloading capacity of the transmission lines.

Consent to enable BUOC as per NTPC philosophy by ERPC:

A meeting was held between ERPC, ERLDC, PGCIL & NTPC team dtd 08.01.2025 regarding enabling of BU O/C feature in NTPC transmission lines. NTPC team explained the requirement of enabling VT fuse fail enabled O/C protection in generating stations.

The matter was also discussed in the ERPC meetings and recorded in the ERPC OCC meeting-223 and 224 MOM.

All NTPC ROS/Station representatives are requested to take up the matter in their respective RLDC/RPC meetings.

Annexure:1

SCHEDULE-V

[See sub-regulation (3) of regulation 48]

Protection Details of Transmission Lines, Transformers, Reactors and Bus Bars

1. Transmission Line Protection

No.	Protection	765 kV	400 kV	220 kV/230 kV	132 kV/110 kV/ 66 kV
(a)	Main I- Distance protection*	Y	Y	Y	Y (for 132 kV/110 kV) Y/N (for 66 kV)
(b)	Main II- Distance protection* or directional comparison protection or phase segregated line	Y	Y	Y/N 'N' if Directional IDMT over	N

	differential protection			current and earth fault back up protection is provided otherwise 'Y'	
(c)	Directional inverse definite minimum time (IDMT) type earth fault relay	Y	Y	'Y' if both Main-I & Main-II are distance protections otherwise 'N'	N
(d)	Directional IDMT over current and earth fault back up protection	N	N	'Y' if Main-II is not provided otherwise 'N'	Y
(e)	Two stage over voltage protection	Y	Y	Y/N	Y/N
(f)	Auto reclosing#	Y (Single phase and three phase)	Y (Single phase and three phase)	Y (Single phase and three phase)	Y/N (three phase)

***For short line (less than 10 km) or cable or combination of overhead line and cable, line differential protection shall be used with built-in backup distance protection.**

 # For cable or combination of overhead line and cable, autoreclosing shall not be provided.

Note: (1) Y- Required; N- Not required; Y/N- Optional.

(2) Transmission lines with distance protection shall, in general, have carrier aided or fibre optic based inter-tripping or blocking feature.

ग्रिड-इंडिया
GRID-INDIA

ग्रिड कंट्रोलर ऑफ इंडिया लिमिटेड
(भारत सरकार का उद्यम)
GRID CONTROLLER OF INDIA LIMITED
(A Government of India Enterprise)
[formerly Power System Operation Corporation Limited (POSOCO)]
राष्ट्रीय भार प्रेषण केन्द्र / National Load Despatch Centre

आज़ादी का अमृत महोत्सव

कार्यालय : बी-9, प्रथम एवं द्वितीय तल, कुतुब इंस्टीट्यूशनल एरिया, कटवारिया सराय, नई दिल्ली - 110016
Office : 1st and 2nd Floor, B-9, Qutab Institutional Area, Katwaria Sarai, New Delhi -110016
CIN : U40105DL2009GOI188682, Website : www.grid-india.in, E-mail : gridindiacc@grid-india.in, Tel.: 011- 42785855

संदर्भ/Reference: Grid-India/NLDC/2025/Aug/ **दिनाँक/Date:** 21.08.2025

सेवा मे,

[1] Member Secretary, Northern Regional Power Committee,18-A, Qutab Institutional Area, Shaheed Jeet Singh Marg, Katwaria Sarai, New Delhi-110 016
[2] Member Secretary, Western Regional Power Committee, F-3, MIDC Area, Marol, Opp. SEEPZ, Central Road, Andheri East, Mumbai-400093

महोदय/महोदया,

विषय/Subject: / एक से अधिक क्षेत्रों से संबंधित ग्रिड दुर्घटनाओं/घटनाओं की ड्राफ्ट ट्रिपिंग रिपोर्ट

Draft Tripping Reports of Grid Disturbances/Incidents Involving Multiple Regions

With reference to IEGC Section 37.2 (f), the draft grid event reports for the following incidents involving more than one region are attached:

1. GD -1: Outage of HVDC Vindhyachal Bipole on 30th July 2025

सधन्यवाद,

भवदीय,

(सुहास धमभरे)
मुख्य महा प्रबंधक, रा.भा.प्रे.कें.

Copy to:

1. MS, NPC
2. Member (GO&D), CEA

ग्रिड-इंडिया
GRID-INDIA

ग्रिड कंट्रोलर ऑफ इंडिया लिमिटेड
(भारत सरकार का उद्यम)
GRID CONTROLLER OF INDIA LIMITED
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आज़ादी का अमृत महोत्सव

कार्यालय : बी-9, प्रथम एवं द्वितीय तल, कुतुब इंस्टीट्यूशनल एरिया, कटवारिया सराय, नई दिल्ली - 110016
Office : 1st and 2nd Floor, B-9, Qutab Institutional Area, Katwaria Sarai, New Delhi -110016
CIN : U40105DL2009GOI188682, Website : www.grid-india.in, E-mail : gridindiacc@grid-india.in, Tel.: 011- 42785855

Report on Event of tripping at 400KV Vindhyachal (PG)

1. **Date & Time of event:** 20:25 hrs on 30.07.2025

2. **Location/Control Area:** VSTPS, Madhya Pradesh (WR), Uttar Pradesh (NR)

3. **Plant/Substation Name:** 400KV Vindhyachal(PG)

4. **GD/GI Category:** GD-1

5. **Antecedent Condition:**
   - NR Demand : 75651 MW
   - WR Demand : 58458 MW
   - Frequency : 50.02 Hz
   - weather condition : Normal
   - NR IR exchange : 20222 MW
   - 400 kV VSTPS Stage III – Stage V ckts 1&2 opened since 29-07-2024 to control tie line loading between Stage IV to V

6. **Generation loss/Load loss:**
   - Generation loss of 206 MW in VSTPS Unit 3 (210 MW).
   - As informed by MP SLDC, 70 MW load loss occurred due to the event

7. **Duration of interruption:** ~ 03:43 (hh:mm) (Restoration time: 00:08 hrs on 31st Jul'25)

8. **Tripped elements:**

क्र.सं. S.No	नाम Name	ट्रिपिंग का समय Tripping time (hh:mm:ss)	वापसी का समय Restoration time	रिले संकेत Relay Indication
1	400/132 kV VSTPS ICT 1	20:25	20:51	B/U E/F protection operation DRs provided are not of required duration
2	400/132 kV VSTPS ICT 2	20:25	-	
3	400/132 kV VSTPS ICT 3	20:25	21:45	
4	400 kV Vindhyachal - Vindhyachal HVDC 1	20:25	00:08 /31-07-2025	6.6 kV auxiliary supply failed
5	400 kV Vindhyachal - Vindhyachal HVDC 2	20:25	00:08 /31-07-2025	
6	70 kV HVDC Vindhyachal Pole 1	20:25	00:31 /31-07-2025	
7	70 kV HVDC Vindhyachal Pole 2	20:25	00:31 /31-07-2025	
8	132 kV VSTPS- Waidan 1	20:25	23:09	Waidan end: R-E fault, Zone 2 DPR operation
9	132 kV VSTPS- Waidan 2	20:25	23:42	
10	VSTPS Unit 3 (210 MW)	20:28	14:36 /31-07-2025	Drum level low

9. घटना का सारांश / Event Summary:

(i) At 20:25 Hrs /30-07-2025, Bus fault occurred in 132 kV VSTPS Main Bus but the fault was not cleared by Bus bar protection operation and resulted in tripping of all the elements connected to 132 kV VSTPS Main bus on respective Backup protection operation.

(ii) 400/132 kV VSTPS ICTs 1, 2 & 3, 132 kV VSTPS- Waidan 1&2 & 132/6.6 kV VSTPS STs 1, 2&3 tripped during the event.

(iii) Due to the tripping of 132 kV/6.6 kV Station Transformers, 70 kV HVDC Vindhyachal Poles 1&2 blocked due to Auxiliary supply failure.

(iv) Due to the tripping of 132 kV/6.6 kV Station Transformers, Auxillary supply of VSTPS Unit 3 (210 MW) failed and resulted in tripping of Boiler Feed Pump and tripping of the unit on Drum level low at 20:29 Hrs.

(v) Generation loss of 206 MW occurred due to VSTPS Unit 3 (210 MW) tripping.

(vi) As informed by MP SLDC, 70 MW load loss occurred due to the event.

10. Network across the affected area:

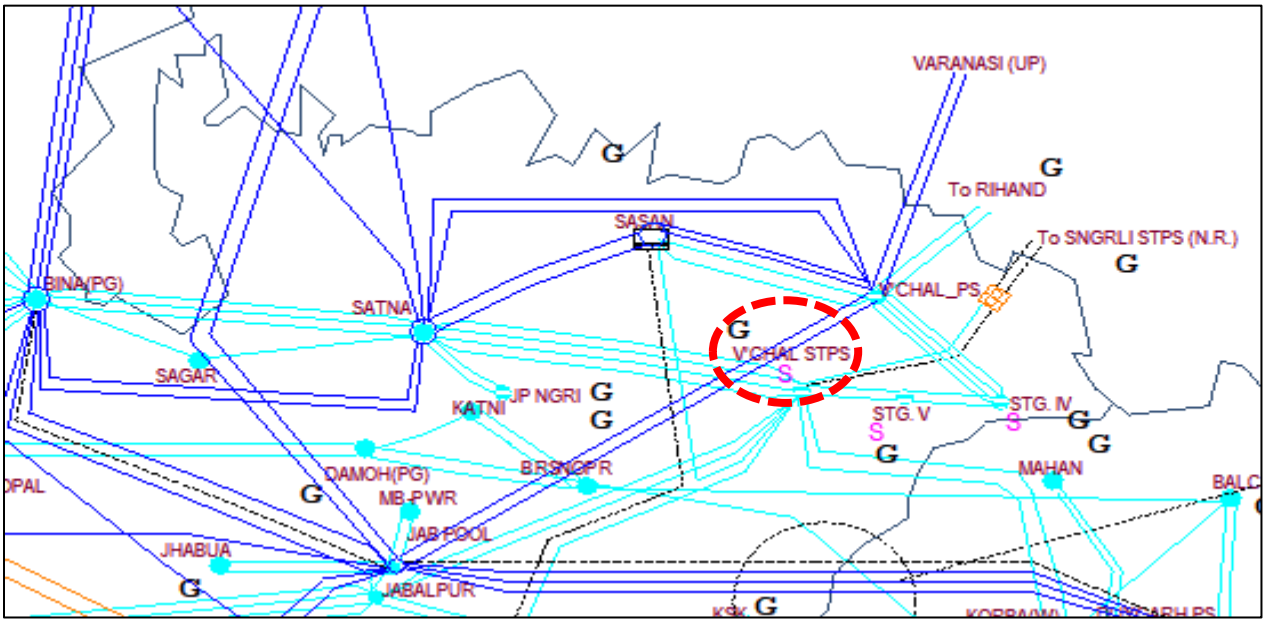


Figure 1. Network across the affected area

11. घटना का विश्लेषण / Event Analysis (Based on PMU, SCADA & DR):

- As shown in figure 2 & 3 , it is observed that initially fault was in R phase and converted into R-Y phase fault. The total duration of fault is 1.08 seconds.
- Both 132kV VSTPS-Waidhan circuit trip in zone-2 from remote end on R-phase to Earth fault.
- As per information received by **NTPC VSTPS:-**

  On 30.07.2025 (20:21)132KV Bus-1 got tripped and its feeders Waidhan-1 ,2, ST-2, ST-4, Bus section-1, IBT-2 Got tripped after a delay of 1098 ms. along with BS-2. This delayed

tripping led to fault feeding from ICT-1, 2 & 3 and all three ICTs got tripped on back up protection leading to complete outage of 132KV System.

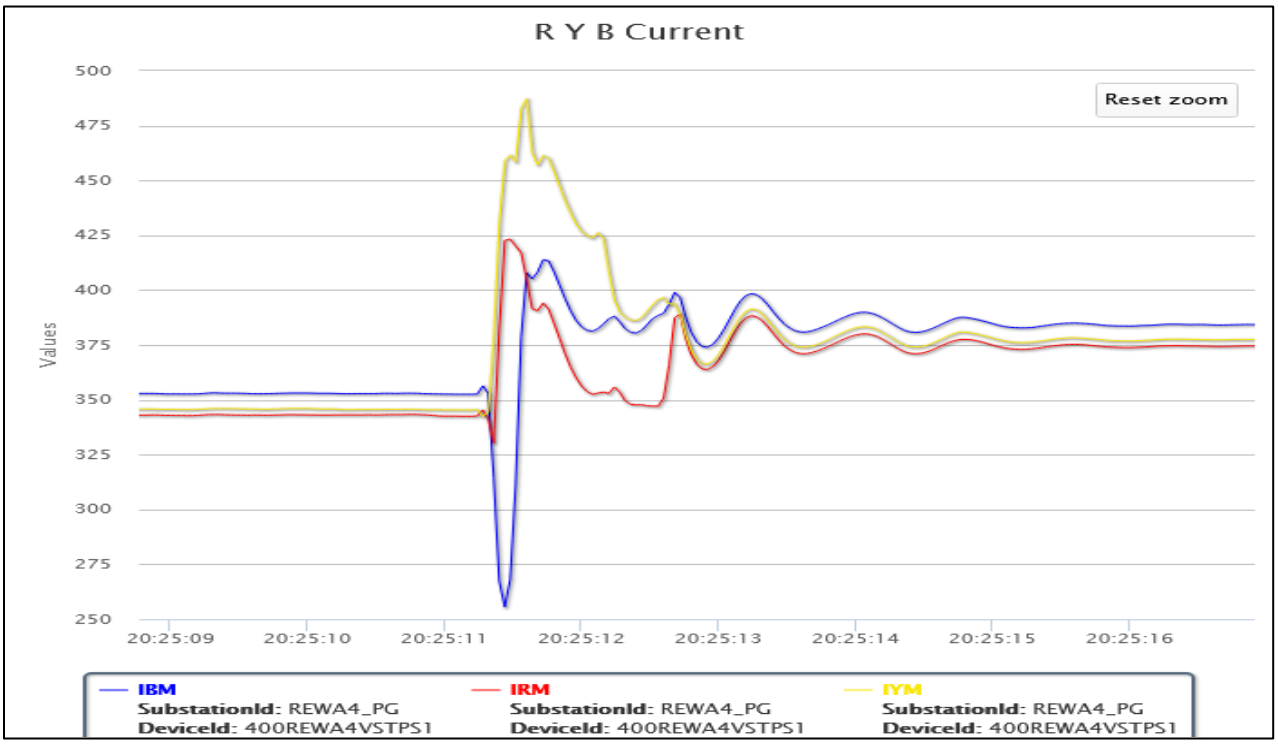


Figure 2. PMU Current Plot of 400 kV Rewa-VSTPS-1

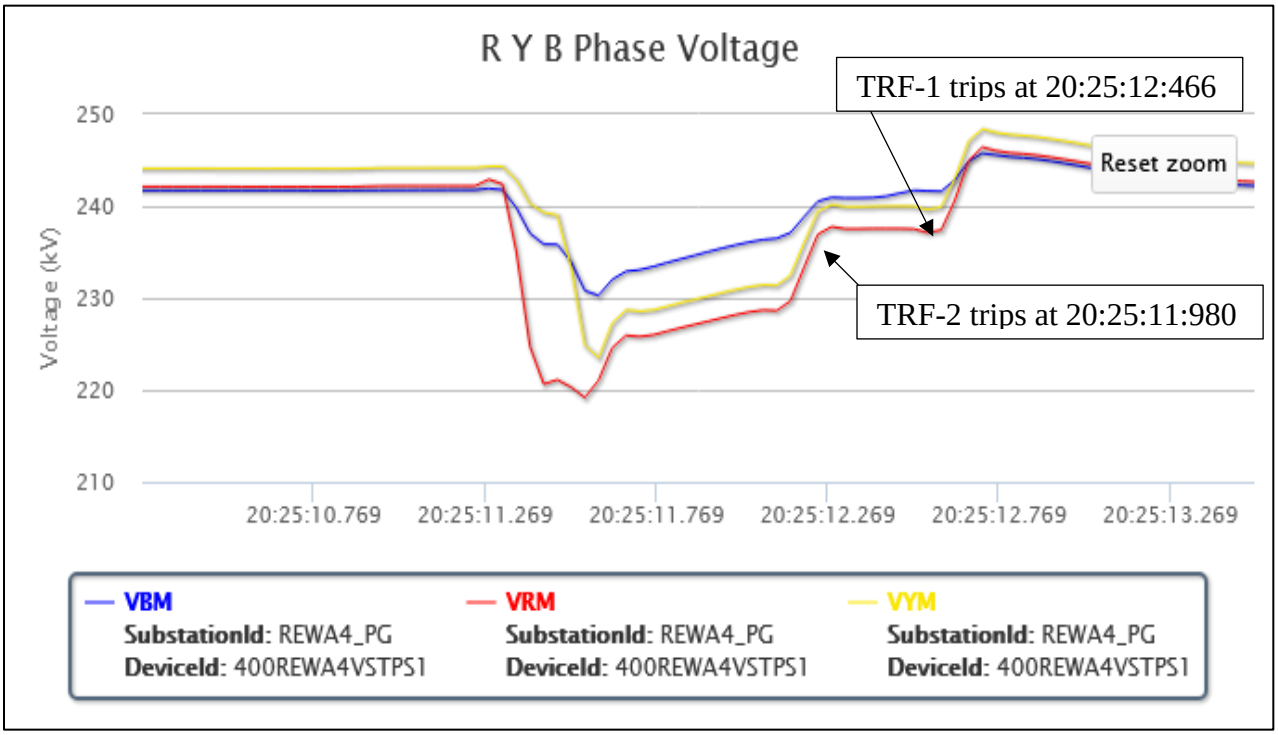


Figure 3. PMU Voltage Plot of 400 kV Rewa-VSTPS-1

12. प्रमुख अधिगम बिंदु / Protection/Operational issues observed:

- Bus bar protection not operated.

13. सुधारात्मक उपाय / Action Taken/Remedial Measures :

- After analysis by VSTPS, Visible tracking marks were observed in Y ph. of BPI of ICT-2 Bus isolator. After isolation of ICT-2 Bay, all three Buses of 132KV were normalized its feeders were taken in service.
- On 31.07.2025 Bus-1 S/D was taken to replace the Y-Phase BPI of ICT-2 Bus isolator, on analysis slight tracking marks were also observed on R-PH BPI and in consultation with COS, R-ph BPI also replaced along with Y-Ph BPI.

अनुलग्नक-1 / Annexure-1: Sequence of Events as per SCADA -

SOE by WRLDC-

AREA	CATEGORY	LOCATION	TEXT	HH:MM:SS:MS
WRLDC	400KV-CB	VSTPS_GS	VSTPS 1 2 CB 41152 (T2_P) FAULTY	20:25:11:974
WRLDC	400KV-CB	VSTPS_GS	VSTPS 1 2 CB 41152 (T2_P) OPEN	20:25:11:980
WRLDC	400KV-CB	VSTPS_GS	VSTPS 1 2 CB 41752 (T1_P) FAULTY	20:25:12:461
WRLDC	400KV-CB	VSTPS_GS	VSTPS 1 2 CB 41752 (T1_P) OPEN	20:25:12:466
WRLDC	400KV-CB	VSTPS_GS	VSTPS 1 2 CB CB 40952 (G3) FAULTY	20:28:52:864
WRLDC	400KV-CB	VSTPS_GS	VSTPS 1 2 CB CB 40952 (G3) OPEN	20:28:52:869
WRLDC	400KV-CB	VSTPS_GS	VSTPS 1 2 CB 41752 (T1_P) FAULTY	20:51:36:491
WRLDC	400KV-CB	VSTPS_GS	VSTPS 1 2 CB 41752 (T1_P) CLOSED	20:51:36:505
WRLDC	400KV-CB	VSTPS_GS	VSTPS 1 2 CB 41152 (T2_P) FAULTY	20:57:32:23
WRLDC	400KV-CB	VSTPS_GS	VSTPS 1 2 CB 41152 (T2_P) CLOSED	20:57:32:37
WRLDC	400KV-CB	VSTPS_GS	VSTPS 1 2 CB 41152 (T2_P) FAULTY	20:57:32:68

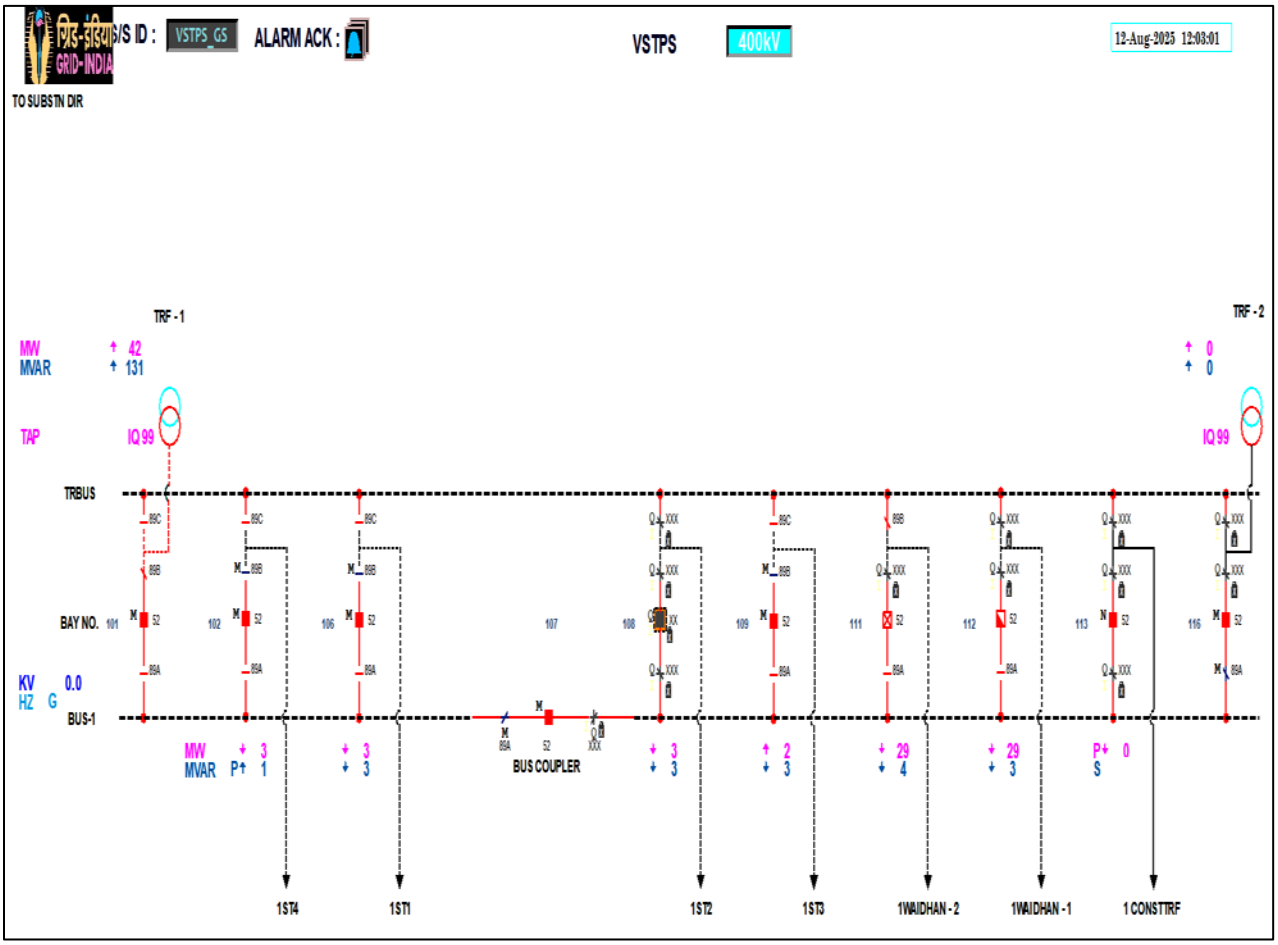
SOE submitted by NTPC Vindhyachal S/S:-

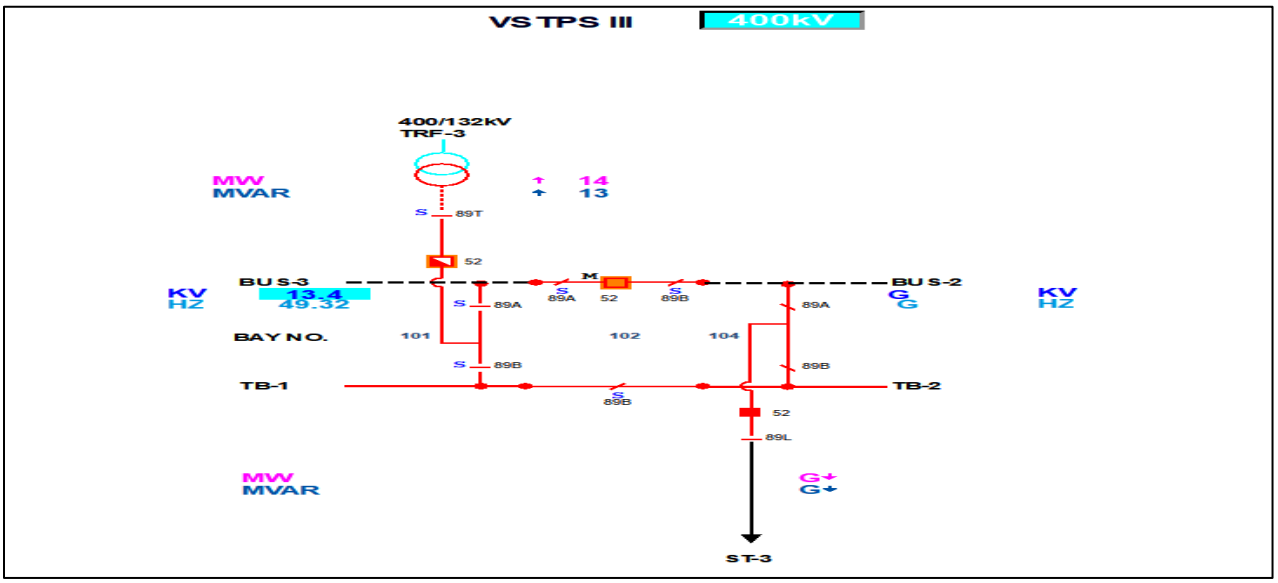
NTPC LIMITED-VINDHYACHAL
Plant Name : 400/220KV SWITCHYARD

Sr. No.	SER Name	SER	Status	Date and Time	Point No.	Legend
41	NTPC Vindhyanchal STG-II	SER01	Alarm	7/30/2025 20:21:41:920	276	132KV BUS-1 TRIP
42	NTPC Vindhyanchal STG-II	SER01	Normal	7/30/2025 20:21:42:1	276	132KV BUS-1 TRIP
43	NTPC Vindhyanchal STG-II	SER01	Alarm	7/30/2025 20:21:42:40	276	132KV BUS-1 TRIP
44	NTPC Vindhyanchal STG-II	SER01	Alarm	7/30/2025 20:21:43:138	302	BS#1 132KV BB LBB TRIP
45	NTPC Vindhyanchal STG-II	SER01	Alarm	7/30/2025 20:21:43:138	303	ST#4 132KV BB LBB TRIP
46	NTPC Vindhyanchal STG-II	SER01	Alarm	7/30/2025 20:21:43:138	304	ST#2 132KV BB LBB TRIP
47	NTPC Vindhyanchal STG-II	SER01	Alarm	7/30/2025 20:21:43:138	309	IBT#2 132KV BB LBB TRIP
48	NTPC Vindhyanchal STG-II	SER01	Normal	7/30/2025 20:21:43:175	229	Normal Legend 229
49	NTPC Vindhyanchal STG-II	SER01	Alarm	7/30/2025 20:21:43:180	307	W#2 132KV BB LBB TRIP
50	NTPC Vindhyanchal STG-II	SER01	Alarm	7/30/2025 20:21:43:183	306	BT#2 132KV BB LBB TRIP
51	NTPC Vindhyanchal STG-II	SER01	Alarm	7/30/2025 20:21:43:185	305	CPT 132KV BB LBB TRIP
52	NTPC Vindhyanchal STG-II	SER01	Alarm	7/30/2025 20:21:43:193	308	W#1 132KV BB LBB TRIP
53	NTPC Vindhyanchal STG-II	SER01	Normal	7/30/2025 20:21:43:210	276	132KV BUS-1 TRIP
54	NTPC Vindhyanchal STG-II	SER01	Normal	7/30/2025 20:21:43:473	302	BS#1 132KV BB LBB TRIP
55	NTPC Vindhyanchal STG-II	SER01	Normal	7/30/2025 20:21:43:473	303	ST#4 132KV BB LBB TRIP
56	NTPC Vindhyanchal STG-II	SER01	Normal	7/30/2025 20:21:43:473	304	ST#2 132KV BB LBB TRIP
57	NTPC Vindhyanchal STG-II	SER01	Normal	7/30/2025 20:21:43:473	309	IBT#2 132KV BB LBB TRIP
58	NTPC Vindhyanchal STG-II	SER01	Normal	7/30/2025 20:21:43:515	306	BT#2 132KV BB LBB TRIP
59	NTPC Vindhyanchal STG-II	SER01	Normal	7/30/2025 20:21:43:523	305	CPT 132KV BB LBB TRIP
60	NTPC Vindhyanchal STG-II	SER01	Normal	7/30/2025 20:21:43:527	307	W#2 132KV BB LBB TRIP
61	NTPC Vindhyanchal STG-II	SER01	Normal	7/30/2025 20:21:43:528	308	W#1 132KV BB LBB TRIP

अनुलग्नक-2 / Annexure-2: SLD of the affected Sub-station/Connectivity Diagram

A. 400kV VSTPS SLD :-





अनुलग्नक-3 / Annexure-3: Disturbance recorder highlighting the observations as per below:

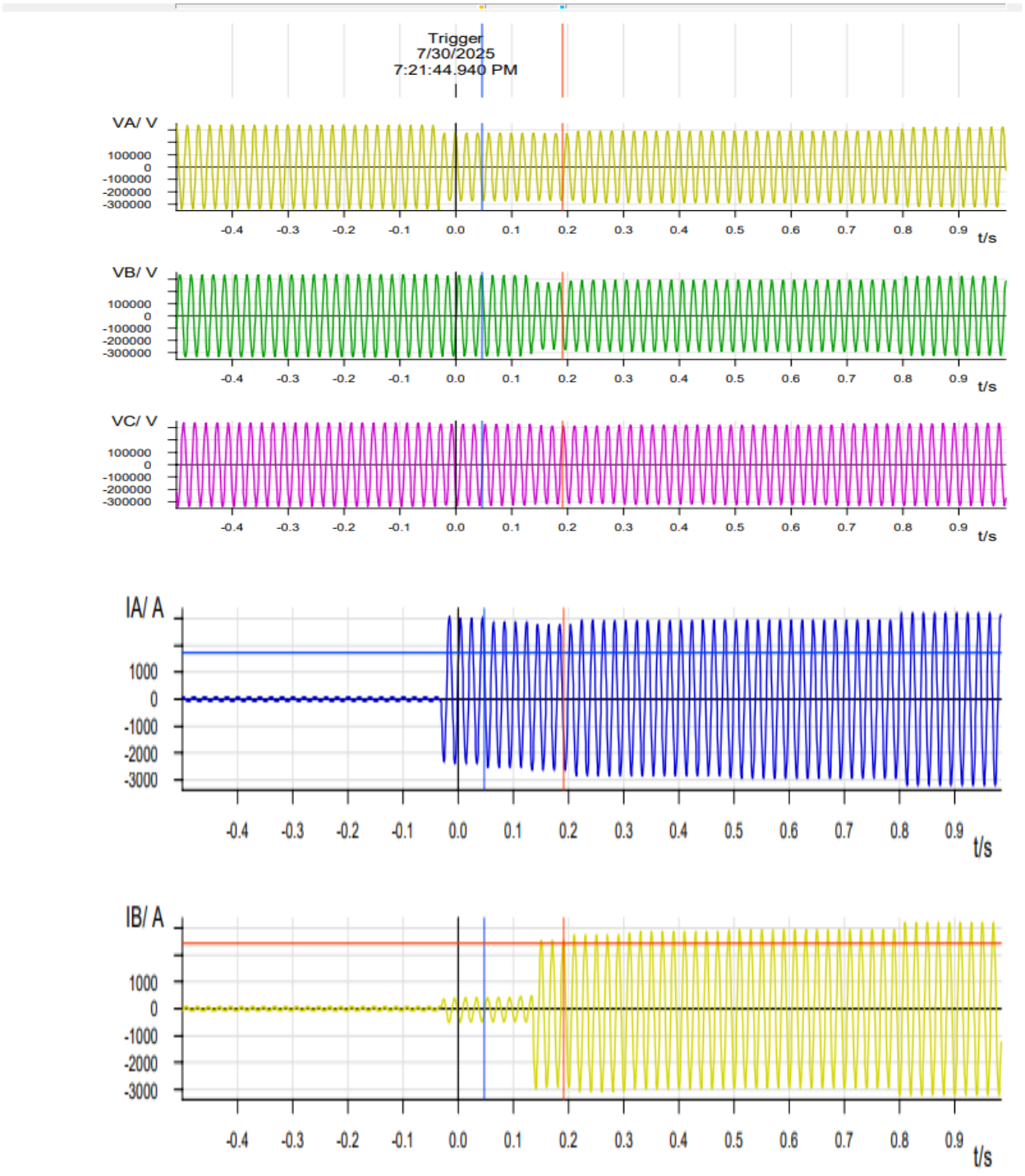
DR of VINDHYACHAL 200MVA ICT-2

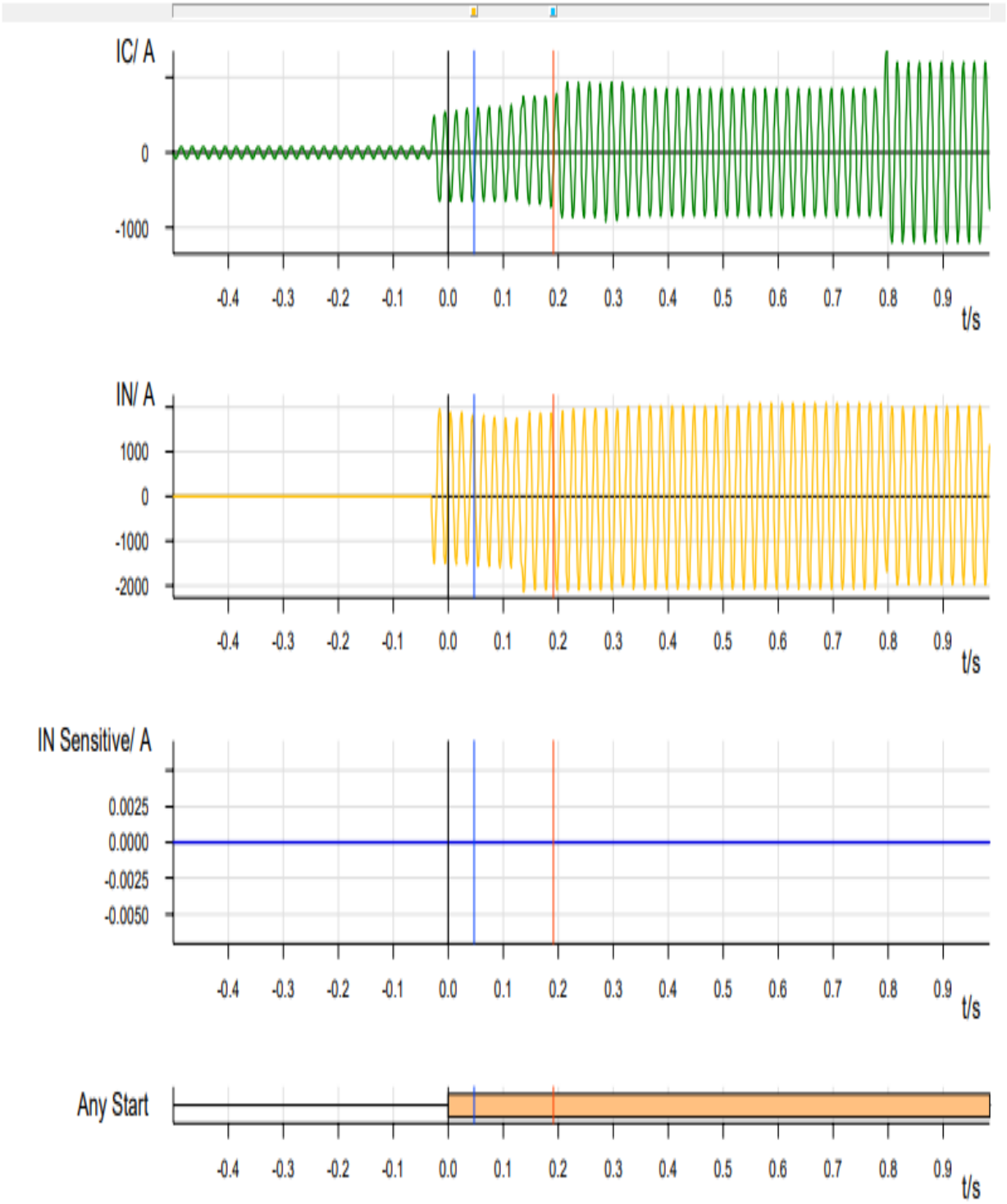


DR provided doesn't contains the tripping instance, Fault present in R phase for more than 900 msec indicating ICT must have tripped on B/U E/F operation

DR of VINDHYACHAL 200MVA ICT-3 (Provided in pdf format)

	Time in ms	Measuring Signal	Instantaneous	R.M.S.
Cursor 1:	46.9	IA	1.7300 kA	1.9419 kA
Cursor 2:	191.3	IB	2.4252 kA	1.9379 kA
C2 - C1	144.4	IB - IA	0.6953 kA	-0.0039 kA




IC/ A
0
-1000
IN/ A
1000
0
-1000
-2000
IN Sensitive/ A
0.0025
0.0000
-0.0025
-0.0050
Any Start
-0.4 -0.3 -0.2 -0.1 0.0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9
t/s

अनुलग्नक-D / Annexure-D: Any other photographs from site (Equipment damage, switchyard, tower collapse or the case may be)



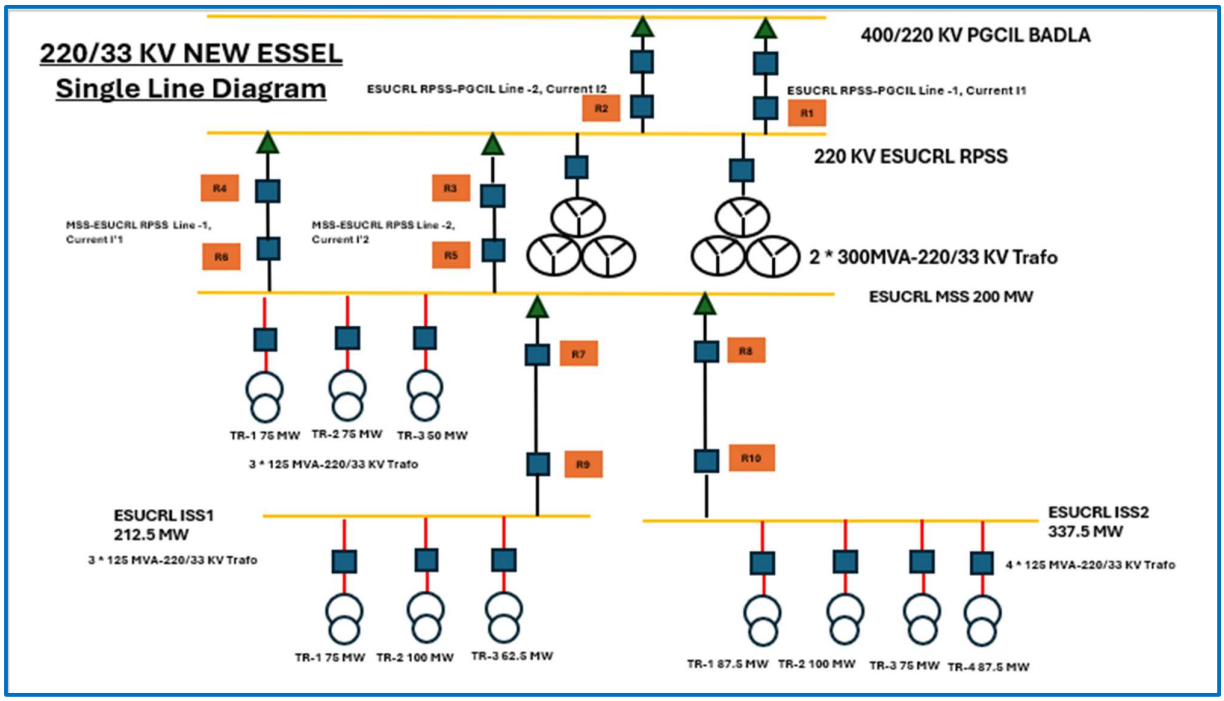


Proposal - Special Protection Scheme for 220 KV ESUCRL 750 MW SOLAR PARK, PHALODI, RAJASTHAN

- **Plant Details:**

  - Plant Name : ESUCRL Solar Park, 750 MW, Phalodi, Rajasthan
  - Plant Capacity : 750 MW (Aggregated)
  - Switchyard Voltage : 220 kV
  - Switchgear Voltage : 33 kV
  - PPC Set Limit : 750 MW
  - No of Lines : 2 no's (MSS to RPSS and RPSS to PGCIL)
  - No Transformers : 2*300 MVA at RPSS
    3*125 MVA at MSS,
    3*125 MVA at ISS1,
    4*125 MVA at ISS2

- **Plant SLD:**

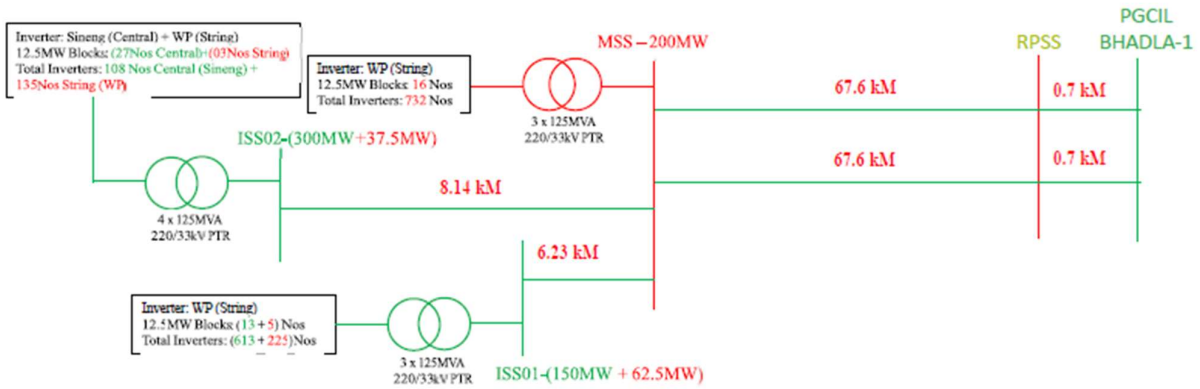


Relay Details for SPS Scheme at various substation	
R1	ESUCRL RPSS to PGCIL LINE-1: RELAY M1:RED670 at ESUCRL RPSS END
R2	ESUCRL RPSS to PGCIL LINE-2: RELAY M1:RED670 at ESUCRL RPSS END
R3	ESUCRL RPSS to ESUCRL MSS LINE-1: RELAY M1: RED670 at ESUCRL RPSS END
R4	ESUCRL RPSS to ESUCRL MSS LINE-2: RELAY M1: RED670 at ESUCRL RPSS END
R5	ESUCRL MSS to ESUCRL RPSS LINE-1: RELAY M1:RED670 at ESUCRL MSS END
R6	ESUCRL MSS to ESUCRL RPSS LINE-2: RELAY M1:RED670 at ESUCRL MSS END
R7	ESUCRL MSS to ESUCRL ISS1 LINE: RELAY M1:RED670 at ESUCRL MSS END
R8	ESUCRL MSS to ESUCRL ISS2 LINE: RELAY M1:RED670 at ESUCRL MSS END
R9	ESUCRL MSS to ESUCRL ISS1 LINE: RELAY M1:RED670 at ESUCRL ISS1 END
R10	ESUCRL MSS to ESUCRL ISS2 LINE: RELAY M1:RED670 at ESUCRL ISS2 END

- **<u>Need for Special Protection Scheme (SPS) at ESUCRL 750 MW Park:</u>**

As per the transmission system connectivity, Total 750 MW Power evacuation (Aggregated Power from MSS, ISS-1 and ISS-2) is envisaged to be flow from MSS to PGCIL Bhadla substation via RPSS through Double circuit transmission line.

Following 220 kV Transmission System / Network exists at ISS-1, ISS-2, MSS, RPSS, PGCIL Bhadla-1 S/S for Power Evacuation.



- Single circuit 220 kV Line from ISS-1 to MSS
- Single circuit 220 kV Line from ISS-2 to MSS
- Double circuit 220 kV Line from MSS to RPSS **<u>(SPS required during N-1)</u>**
- Double circuit 220 kV Line from RPSS to PGCIL Bhadla-1 **<u>(SPS required during N-1)</u>**

During N-1 Line Contingency – Between MSS to RPSS or RPSS to PGCIL Bhadla-1 S/S, total power being evacuated will be shifted to single line, which may be more than its current carrying capacity as per real time power evacuation scenario.

To avoid such scenario for longer duration and prevent overloading of single transmission line, appropriate SPS need to be designed to limit the power evacuation during N-1 contingency.

220 kV Line has HTLS ACSS TEAL conductor with continuous current carrying capacity of 1127 A and Maximum current carrying capacity of 1231 A.

- **<u>The Philosophy of SPS is based on limiting the generation to single Line current capacity between MSS to RPSS / RPSS to PGCIL</u>**

  - If one of the 220 kV lines tripped (between MSS to RPSS / RPSS to PGCIL), the remaining line may experience an overload situation based on Power evacuation at that point of time.
  - With a plant max. capacity of 750 MW and current is 1968 A at 220 kV Voltage.
  - One-line continuous current carrying capacity is considered 1184 Amp based on conductor GTP.
  - During N-1 contingency, generation backdown of a total of 325 MW will be initiated in Staggered manner (Step by Step) by tripping of

- ✓ 33kV LV OG2 (PTR-2) and OG3 (PTR-3) feeders as Stage-1 at MSS End
- ✓ 33 KV LV OG2 (PTR-2) feeder as Stage-2 at ISS1 End
- ✓ 33 KV LV OG2 (PTR-2) feeder as stage-3 at ISS2 End.

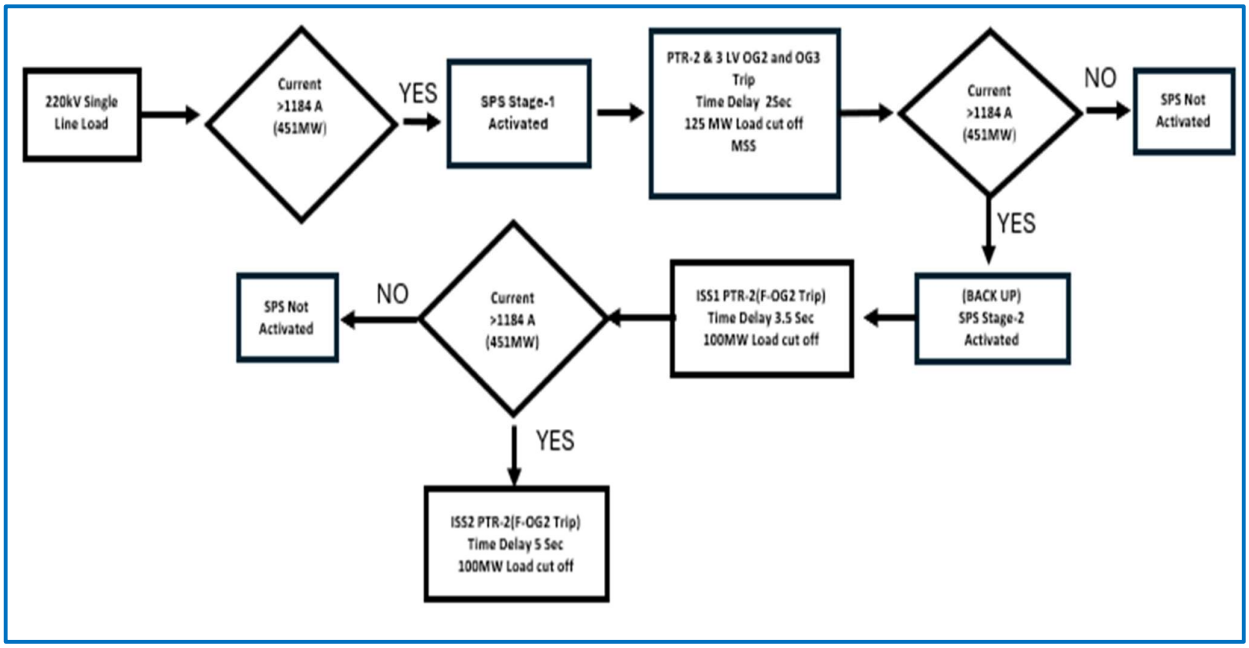
Above Condition is tabulated below:

SPS	Current	Time	Current Criteria	Action
Stage-1	1184 Amp	2 sec	In all three phases	Load Shedding of 125 MW at MSS
Stage-2	1184 Amp	3.5 sec	In all three phases	Load Shedding of 100 MW at ISS-1
Stage-3	1184 Amp	5 sec	In all three phases	Load Shedding of 100 MW at ISS-2
				Total: 325 MW

▪ SPS configuration concept:

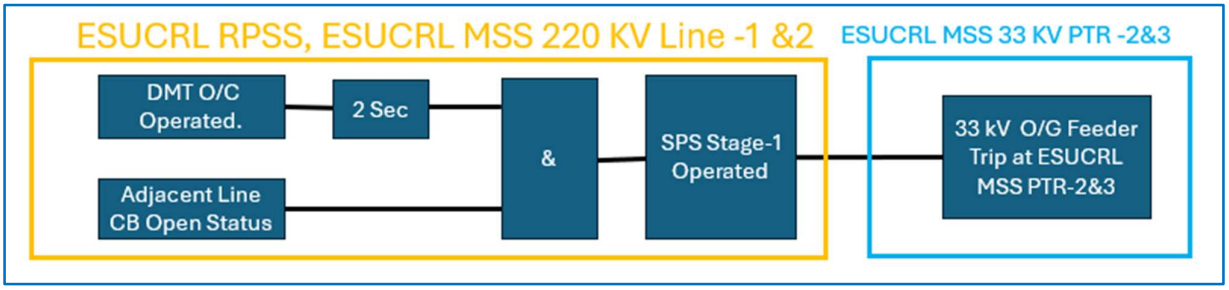
- SPS proposed to have three stages of operation to ensure required relief against line overloading conditions.
- The Over current stages with DT characteristics, available in the Numerical Line Protection Relays, are used to detect and initiate SPS action. Overcurrent function will be configured as 3 phase elements, to avoid undue initiation during line fault.
- The pickup of Overcurrent stage is considered as 1184A with time delay of 2 sec for Stage-1, 3.5 sec for Stage-2 and 5 sec for Stage-3.
- Staggered and step by step action is proposed to ensure required relief from each station i.e ISS-1, ISS-2 and MSS.
- In SPS action, SPS Stage-1 will activate and initiate tripping action of connected generation at MSS end.
- If Line Overloading still prevails, Stage-2 will be initiated for generation reduction at ISS-1.
- If Line continues to be overloaded even after Stage-2, SPS Stage-3 will be initiated for generation reduction at ISS-2.
- The functional flow chart of SPS and tripping sequence are mentioned below with different SPS stages operation.

▪ SPS Flow Chart:

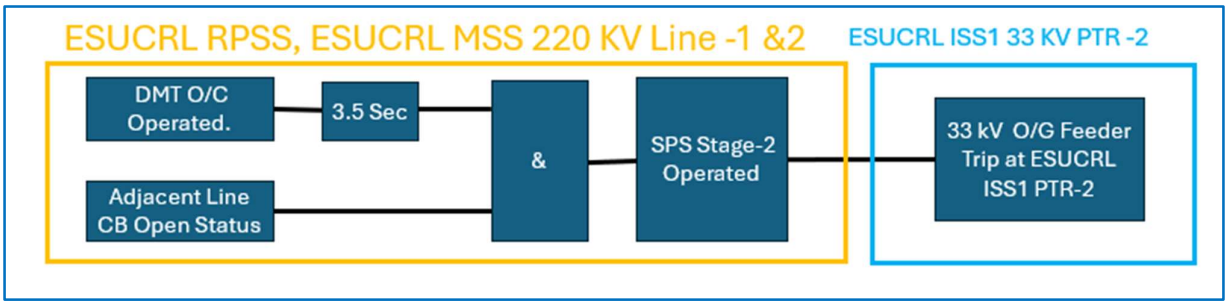


Relay SPS Logic:

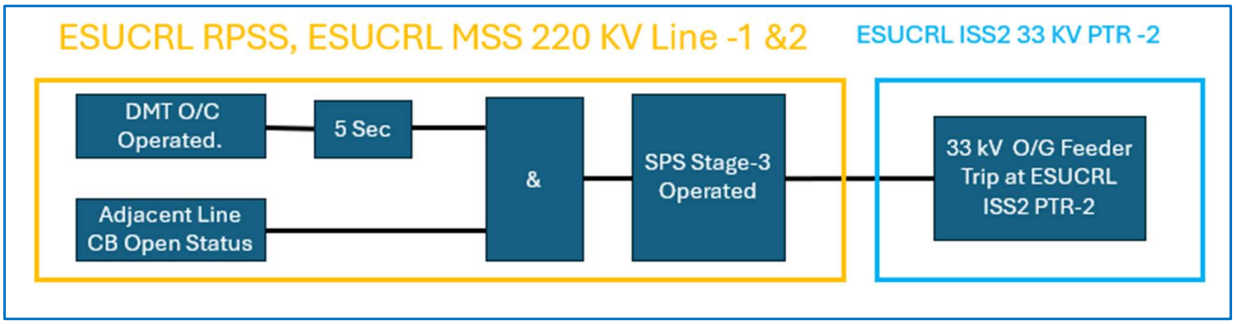
Stage-1



Stage-2



Stage-3



Status of actions points recommended during previous PSC meetings (discussed in 62nd PSC meeting)

S. No	Agenda	Remdial actions recommended during PSC meeting	Status of remdial action taken	
			61st PSC (26.06.2025)	62nd PSC (26.08.2025)
1	Frequent multiple elements tripping at 220kV Kunihar, Baddi, Upperla Nangal complex and load loss event in HP control area	**51 PSC:** PSC Forum requested HP to complete the protection audit as per mentioned timelines (protection audit of 220kV Kunihar has been awarded and it would be completed within next 15-20 days. In next phase, by 15th September, protection audit of substations in downstream and upstream of 220kV Kunihar S/s would be completed.) and resolve the protection related issues. HP was also requested to share the reports of protection audit to NRPC & NRLDC after completion of audits.	HPSEBL representative stated that option of PSDF fund haven't been successful. Therefore, followup is being done to complete the work through own fund sources. Further update will be shared. *PSC forum requested HPSEBL to take expeditious actions at their end and ensure the healthiness of protection system in this complex.*	HPSEBL stated that status is same and approval of own funding to complete the work is in process. *PSC forum requested HPSEBL to take expeditious actions at their end and ensure the healthiness of protection system in this complex.*
2	Multiple elements tripping at 220kV Hissar(BBMB) 07th May 2024, 11:16 hrs	**51 PSC:** a) Expedite the implementation of differential protection in short lines to avoid undesired operation of distance protection.	HVPNL representative informed that status mentioned in 60th PSC minutes need to be corrected. As informed during earlier PSC meetings, all the differential protection requirement in state is being compiled and shall be processed. *PSC forum recommended HVPNL to expedite the implementation of differential protection in short lines and also share the expected timeline.*	HVPNL representative informed that all the differential protection requirement in state is compiled and tendering process is in progress. *PSC forum recommended HVPNL to expedite the implementation of differential protection in short lines and also share the expected timeline.*
3	Multiple elements tripping at 400kV Sainj (HP), 400kV Parbati2 & Parbti3 (NHPC) Stations on 07th May 2024, 16:17 hrs	**51 PSC:** a) NHPC shall follow up with the relay engineer and taken necessary remedial actions to ensure proper operation of A/R scheme at Parbati2 end. b) NHPC and HPPTCL shall review the healthiness of PLCC at Parbati3 and Sainj end and take necessary actions to ensure their proper operation. c) Expedite the implementation of differential protection in 400kV Parbati2-Sainj line. d) Standardisation of recording instruments (DR/EL) need to be ensured.	NHPC representaitve stated that status is same. Estimated time for completion of OPGW work and differential protection implementation is by Oct-Nov 2025. HPPCL representative stated that they will confirm the status and share. No further updates received during the meeting. *PSC forum recommended NHPC & HPPCL to take expeditious action at their end and ensure healthiness of protection system.*	NHPC representaitve stated that status is same. Estimated time for completion of OPGW work and differential protection implementation is by Oct-Nov 2025. HPPCL representative stated that 3 PLCC card were found faulty and they would complete the work within next one-two months. *PSC forum recommended NHPC & HPPCL to take expeditious action at their end and ensure healthiness of protection system.*
4	Multiple elements tripping at 400kV Koteshwar(PG) on 17th May 2024, 17:21 hrs	**51 PSC:** a) In view of short line length of 400KV Koteshwar(PG)-Tehri D/C, POWERGRID shall plan for the differential protection in the line on priority in near future to avoid overreach of distance protection.	POWERGID(NR-1) representative informed that status is same as previous meeting, estimated time for completion of work is ~6 months. *PSC forum requested POWERGID to expedite the work related to implementation of differential protection scheme on 400kV Koteshwar(PG)-Tehri(TH) D/C.*	POWERGID(NR-1) representative informed that status is same as previous meeting, estimated time for completion of work is ~6 months i.e., by Feb'26. *PSC forum requested POWERGID to expedite the work related to implementation of differential protection scheme on 400kV Koteshwar(PG)-Tehri(TH) D/C.*
5	Multiple elements tripping at 220kV Sarna (PS) on 04th May 2024, 07:10 hrs	**51 PSC:** a) Punjab shall expedite the commissioning of new bus scheme. B) POWERGRID shall revise the Z-4 time delay setting of Kishenpur lines at Sarna (PS) end as 160msec till bus bar get operational.	PSTCL representative informed that status is same as previous meeting, estimated time for completion of work is by October 2025. *PSC forum requested PSTCL to expedite the work related to implementation of bus bar protection at Sarna S/s.*	PSTCL representative informed that new panel for busbar scheme is already delivered and commissioning activity will be started soon. It would be completed by October'25. *PSC forum requested PSTCL to expedite the work related to implementation of bus bar protection at Sarna S/s.*
6	Multiple elements tripping at 220kV KTPS (RVUN) on 21st June 2024, 11:37 hrs	**51 PSC:** a) Commissioning of bus coupler between 220kV Bus-3 & 5 need to be expedited.	RVUNL representatives were not present. *PSC forum requested RVUNL for expeditious actions at their end.*	RVUNL representatives were not present. *PSC forum requested RVUNL for expeditious actions at their end.*
7	Frequent tripping of 220 KV Anta(NT)-Sakatpura(RS) (RS) Ckt-1	**52 & 53 PSC:** RVPN was requested to expedite the process of relay replacement and rectification of issues related to A/R operation.	RVPNL representative informed that work is getting delayed due to trench issue in yard. Control room is ready but due to space constraint work is getting delayed. *PSC forum requested RVPNL to expedite the actions at their end.*	RVPNL representative informed that work is getting delayed due to trench issue in yard. However, work would be completed by Novemeber'25. *PSC forum requested RVPNL to expedite the actions at their end.*
8	Frequent tripping of 220 KV Khara(UP)-Saharanpur(PG) (UP) Ckt-1	**52 & 53 PSC:** UP was requested to expedite the process of relay replacement at Khara end. POWERGRID shall review and ensure the A/R operation at their end.	SLDC UP representative informed that status is same as previous meeting, relay replacement will be done as per shutdown availability. *PSC forum requested UPPTCL to expedite the replacement of relay at Khara(UP) end.*	SLDC UP informed that Unit-1 related work has been done, AR Relay replacement for 220kV Saharanpur- Behat line is also done, Unit-2 and Unit-3 relay replacement work will start after October 2025. *PSC forum requested UPPTCL to expedite the replacement of relay at Khara(UP) end.*
9	Multiple elements tripping at 220kV Khodri HEP & Chibro HEP on 5th, 11th & 19th September 2024	**53 PSC:** a)Timely submission of disturbance recorder (DR) and event logger (EL) files need to be ensured. As per IEGC clause 37.2 (c), Disturbance Recorder (DR), station Event Logger (EL), Data Acquisition System (DAS) shall be submitted within 24 hrs of the event. b)HPPTCL shall taken necessary actions to rectify the protection related issue in 220kV Khdori-Majri ckt-2. c)OV protection needs to be disabled in 220kV lines at the earliest. d)Over frequency and over current protection operation in units at Khodri HEP need to be reviewed. e)A/R should be made operational in Sarsawan line at the earliest. f)UJVNL shall share the CPRI audit report and details of remedial action taken within one week. g)Replacement of Units breakers need to be expedited.	UJVUNL representative informed that status is same as previous meeting, tender is at approval stage. *PSC forum requested UJVUNL & HPSEBL to expedtie the necessary remedial action at their end and ensure proper operation of protection system. UJVUNL shall expedite the action plan at khodri end and HPSEBL shall review the protection setting of 220kV Khodri-Majri line-II.*	UJVUNL representative informed that current status is same as tender for A/R is at approval stage. At present maintenance of protection system of 220kV Khodri-Majri line-II at Khodri end is under jurisdiction of HPSEB. Necessary actions to rectify the protection related issues in 220kV Khdori-Majri ckt-2 is to be taken by HPSEB. *PSC forum requested UJVNL to share the audit report of CPRI and also requested to mutually resolve the protection related pending issues at the earliest.*
10	Multiple elements tripping at 400/220kV Obra_A(UP) on 9th October 2024	**54 PSC Recommendations:** a)UPPTCL & Obra_A(UP) shall ensure the implementation of LBB protection at the earliest at 220kV side. b)GPS scheme shall be implemented at Obra_B(UP) by the **end of January 2025** and time sync of recording devices will be ensured.	UPPTCL representative informed that status is same as previous meeting, work will be completed within 4 months and LBB relay will be replaced by FY 2026-27. *PSC forum requested UPPTCL for expedited corrective actions.*	UPPTCL representative informed that status is same as previous meeting, work will be completed within 4 months and LBB relay will be replaced by FY 2026-27. *PSC forum requested UPPTCL for expedited corrective actions.*
11	Multiple elements tripping at 220/132kV Obra_A(UP) on 9th October 2024	**54 PSC Recommendations:** Commissioning and Implementation of numerical relays in 132kV ICT-1&2 at Obra_A(UP) need to be expedited. Timely commissioning of the same need to be ensured.	UPPTCL representative informed that status is same as previous meeting, work will be completed within 4 months and LBB relay will be replaced by FY 2026-27. *PSC forum requested UPPTCL for expedited corrective actions.*	UPPTCL representative informed that status is same as previous meeting, work will be completed within 4 months and LBB relay will be replaced by FY 2026-27. *PSC forum requested UPPTCL for expedited corrective actions.*
12	Frequent tripping of 220 KV RAPS_A(NP)-Sakatpura (RS) (RS) Ckt-1 &2	**55 PSC Recommendations: E**xpeditious corrective actions to minimise frequent faults in line.	RAPS represenative stated that A/R scheme is not available at RAPS-A end. Issue has been raised to the NPCIL design team. Necessary actions will be taken after review by design team. Estimate time required is ~2 months. *PSC forum requested RAPS to expedite the necessary remedial actions .*	RAPS represenative stated that A/R scheme is not available at RAPS-A end. Issue has been raised to the NPCIL design team and estimated to complete by September 2025. *PSC forum requested RAPS to expedite the necessary remedial actions.*
13	Frequent tripping of 400 KV Amritsar(PG)-Makhu(PS) (PSTCL) Ckt-1 & 400 KV Talwandi Saboo(PSG)-Nakodar (PSG) (PS) Ckt-1	**55 PSC Recommendations:** PSTCL was requested to plan replacement of porcelain insulators with polymer type.	PSTCL representative informed that work will be coompleted by October 2025. *PSC forum requested PSTCL for expeditious actions and esnure insulators replacement before November 2025 to avoid frequent trippings during fog.*	PSTCL representative informed that insulator replacement work of 400 KV Talwandi Saboo(PSG)-Nakodar (PSG) (PS) Ckt-1 has been completed and replacement work of 400 KV Amritsar(PG)-Makhu(PS) (PSTCL) Ckt-1 will be completed by October 2025. *PSC forum requested PSTCL for expeditious actions to avoid frequent trippings during fog.*
14	Multiple element tripping event at 400kV Aligarh(UP) on 02nd November, 2024	**55 PSC Recommendations:** UPPTCL shall ensure the healthiness of carrier communication and A/R operation at Muradnagar_1(UP) end.	UPPTCL representative informed that status is same as previous meeting, carrier cabinets are yet to be alloted. *PSC forum requested UPPTCL for expedited corrective actions.*	UPPTCL representative informed that one pair of Digital PLCC (50W) has been allotted for Muradnagar and Aligarh ends through diversion from Bareilly, yet to be installed and commissioned. *PSC forum requested UPPTCL for expedited corrective actions.*
15	Frequent tripping of 400 KV Anpara_B(UPUN)-Sarnath(UP) (UP) Ckt-2	**57 PSC Recommendations:** Healthiness of carrier communication need to be reviewed.	UPPTCL representative informed that status is same as previous meeting, carrier cabinets are yet to be alloted. *PSC forum requested UPPTCL for expedited corrective actions.*	UPPTCL representative informed that status is same as previous meeting, carrier cabinets are yet to be alloted. *PSC forum requested UPPTCL for expedited corrective actions.*

16	Multiple elements tripping at 220/132kV Ropar(PS) on 06th January, 2025	**57 PSC Recommendations:** PSTCL need to share the DR/EL & tripping details within one week	Event details was not shared by PSPCL representaitve. PSPCL agreed to share the event analysis report within 01 week. *PSC forum requested PSPCL to share detailed report along with observations and remedial action taken.*	PSPCL representative did not respond regarding this point. *PSC forum requested PSPCL to share detailed report along with observations and remedial action taken at the earliest.*
17	Multiple elements tripping at 400/220KV Heerapura(RS) on 10th January, 2025	**57 PSC Recommendations:** a) Instantaneous OC relay (High set) settings of ICTs at Heerapura(RS) may be reviewed. b) Replacement of remaining electromechanical/ static relays & schemes with numerical relay need to be expedited at Heerapura(RS).	RVPNL representative informed that case has been moved for both 220kV & 400kV bus. Estimated timeline for bus bar relay replacement is approx. 6 months (by Nov 2025). *PSC forum requested RVPNL to share the timeline of replacement of relays and take expedited corrective actions at their end.*	RVPNL representative informed that busbar replacement scheme has been sanctioned from corporate and expected time of completion is by Nov'25. *PSC forum requested RVPNL to expedite corrective actions at their end.*
18	Frequent tripping of 220 KV Debari(RS)-RAPS_A(NP) (RS) Ckt-1	**58 PSC Recommendations: E**xpeditious corrective actions to minimise frequent faults in line.	RVPNL representative informed that 2-3 towers need to be replaced estimate time required for completion of work is 6-7 months (by end of Dec25). *PSC forum requested RVPNL to take expeditious corrective action to minimise frequent faults in line.*	RVPNL representative informed that tender has been floated for 2-3 towers replacement. The estimate time required for completion of work is 6 months (by end of Dec'25). *PSC forum requested RVPNL to take expeditious corrective action to minimise frequent faults in line.*
19	Frequent tripping of 400 KV Merta-Kankani (RS) Ckt-1	**59 PSC Recommendations:** A/R operation need to be reviewed at both the ends.	RVPNL representative stated that A/R is enabled at Kankani end also. Review is to be done on the next available shutdown. *PSC forum requested RVPNL to review A/R operation at Kankani end at the earliest.*	RVPNL representative informed that shutdown of this line is yet to be availed and A/R operation would be reviewed accordingly. *PSC forum requested RVPNL to review A/R operation at Kankani end at the earliest.*
20	Multiple elements tripping at 400kV AGE25L & 220kV Nokhra(IP) at 10:00 hrs on 18th March, 2025	**59 PSC Recommendations:** NTPC need to ensure over-voltage is disabled at Nokhra end of 220kV Nokhra-Bhadla2 Ckt.	*NTPC representative informed that they are yet to confirm the status of over-voltage protection operation (disabled or not) at Nokhra end .* *PSC forum requested NTPC to ensure over-voltage is disabled at Nokhra end of 220kV Nokhra-Bhadla2 Ckt. Further, it was sugegsted to take up the issue in RE subcommitte meeting scheduled in July 2025.*	NTPC representative informed that this issue has been resolved by OEM. Presently, tripping at the line breaker will occur only if: Line voltage remains above 112% for more than 5 seconds, or Line voltage exceeds 140% for more than 100 ms. These settings, already in use for other NTPC solar plants, ensure adequate protection of the equipment installed at the solar plant while providing sufficient time for inverters installed at project to meet LVRT/HVRT requirements. *PSC recommended to maintain the relay setting as per philosophy. Same can only be changed after taking approval in PSC for case to case basis. NTPC is requested to take this as separate agenda in next PSC for approval of such settings.*
21	Multiple elements tripping at 765/220 kV Lalitpur TPS(UP) at 15:32 hrs on 03rd May, 2025	**61 PSC Recommendation:** a) In line with the NRPC protection philosophy, UPPTCL shall implement the DT scheme at 220kV level also. b) A/R need to be reviewed in 220kV Lalitpur-Jhansi line and 220kV Lalitpur-Dunara line.	Lalitpur TPS representative stated that at their 220kV remote end, DT signals are not considered for Overvoltage & LBB. Implementation of DT scheme shall be done in coordination with UPPTCL.	Lalitpur TPS representative was not present in the meeting.
22	Multiple elements tripping at 400/220KV Jaisalmer(RS) at 01:53 hrs on 05th May, 2025	**61 PSC Recommendation:** a) Reach setting of distance protection in 400kV lines at Jaisalmer(RS) (zone-2 of 400kV Akal-Jaisalmer Ckt) need to be reviewed and corrected. b) Reason of non-operation of bus bar protection on R_N fault need to be identified and necessary corrective actions need to be taken to ensure its proper operation.	NRLDC representative stated that Z-2 reach of 400kV Akal-Jaislamer line distance protection need to be reviewed as it shouldn't have tripped on fault at 220kV level and delayed fault clearance was due to non operation of bus bar protection on R-N fault. RVPNL representative agreed the same and stated that Z-2 reach setting and non operation of bus bar protection shall be reviewed. Necessary corrective actions shall be taken to rectify the protection related issue at 400/220kV Jaisalmer S/s.	RVPNL representative informed that settings have been reviewed, all the necessary corrective actions has been taken and protection related issues have been rectified.
23	Multiple elements tripping at 400 kV Uri-II HEP (NHPC) at 21:35 hrs on 18th May, 202	**61 PSC Recommendation:** NHPC in coordination with the POWERGRID(NR-2) shall review the healthiness of carrier protection in 400kV Uri_2-Wagoora line	NRLDC representative stated that as per PMU, fault cleared with the delay of 400msec. As per DR of Wagoora end, fault was sensed in Z-2 and tripped with the delay of Z-2. It seems that carrier aided tripping didn't occur. Hence, carrier aided protection needs to be reviewed. NHPC agreed for the same.	NHPC representaitve stated that shutdown of the said element is required and in view of high hydro season, work would be completed by Oct'25. *PSC forum requested to complete the work within the stipulated time.*
24	Multiple elements tripping at 765/400 kV Meerut(PG) and 400kV Dadri TPS(NTPC) at 19:55 hrs & 20:00 hrs respectively on 21st May, 2025	**61 PSC Recommendation:** a) DTL shall review whether any UFR relay is still in service at 400kV Dadri, Mandola complex or any other stations which is not part of present Delhi islanding scheme. b) POWERGRID shall study the philosophy for implementing O/C E/F relay as back up in case of VT fuse fail in both Main-I & II relay to avoid such major grid event.	POWERGRID representative stated that it is being planned to implement non directional O/C E/F protection in case of VT fail alarm in both Main-&II. This proposal is being reviewed internally at POWERGRID.	POWERGRID representative stated that study is being done for finalizing setting of non directional O/C E/F protection in case of VT fail alarm in both Main-&II. Once it is finalised same shall be shared and implemented accordingly. *PSC forum agreed with this proposal and requested to expedite the process.*

Annexure-B.II

Multiple Element Tripping Event at 220/132kV Kaithal(HV)

At 00:20 hrs on 10.06.2025

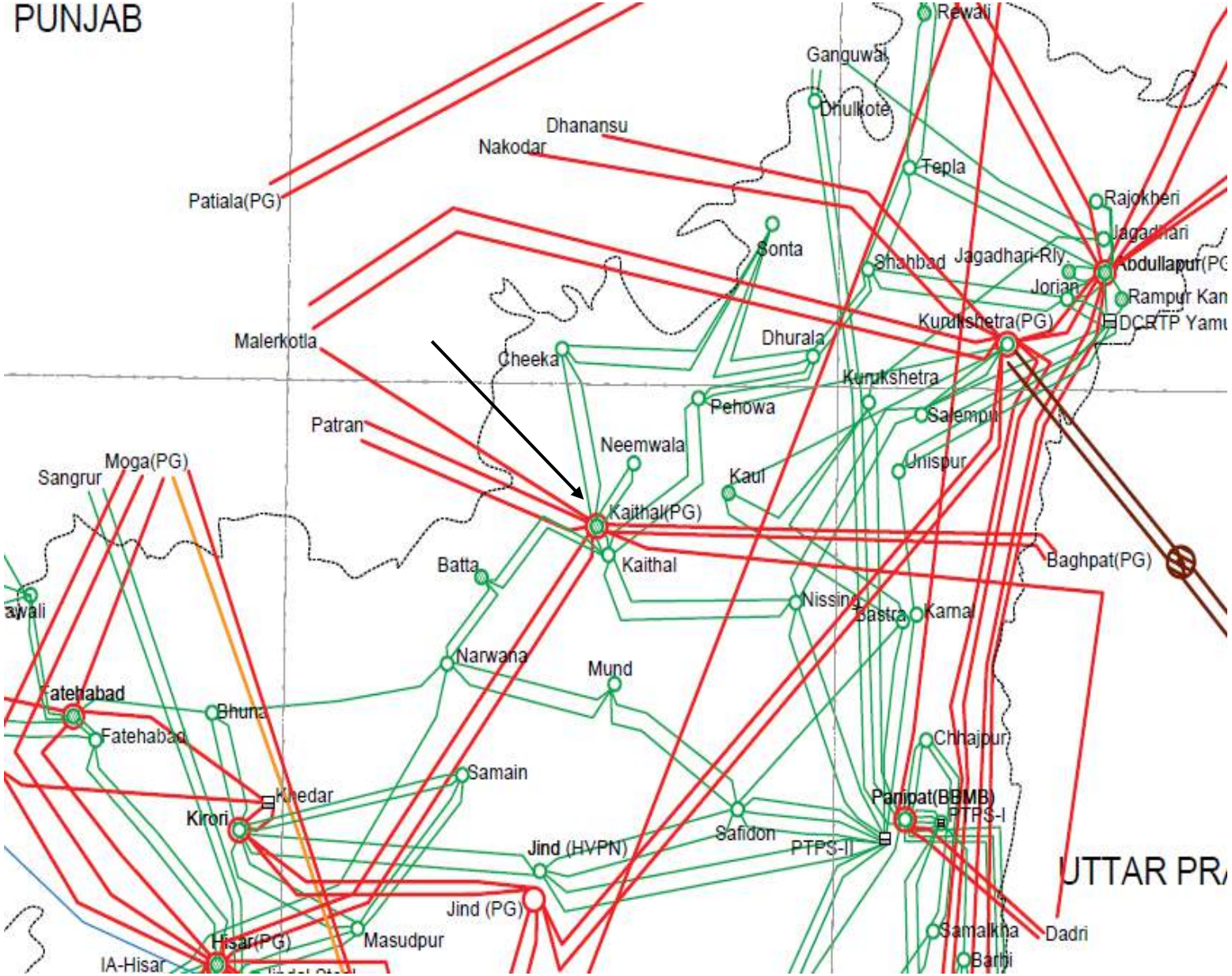
Tripped Elements

S. No	Name of Elements	Outage Time	Revival Time	Reason of tripping
1.	220kV Kaithal(PG)-Kaithal(HR) (HR) Line-1	00:20 hrs	03:50 hrs	B-N fault followed by Y-B Fault (exact location yet to be shared). Line tripped from remote end
2.	220kV Kaithal(PG)-Kaithal(HR) (HR) Line-2		03:44 hrs	
3.	220kV Kaithal-Nising Line-1			
4.	220kV Kaithal-Nising Line-2			
5.	220kV Kaithal-Phowa Line-1			
6.	220kV Kaithal-Phowa Line-2			

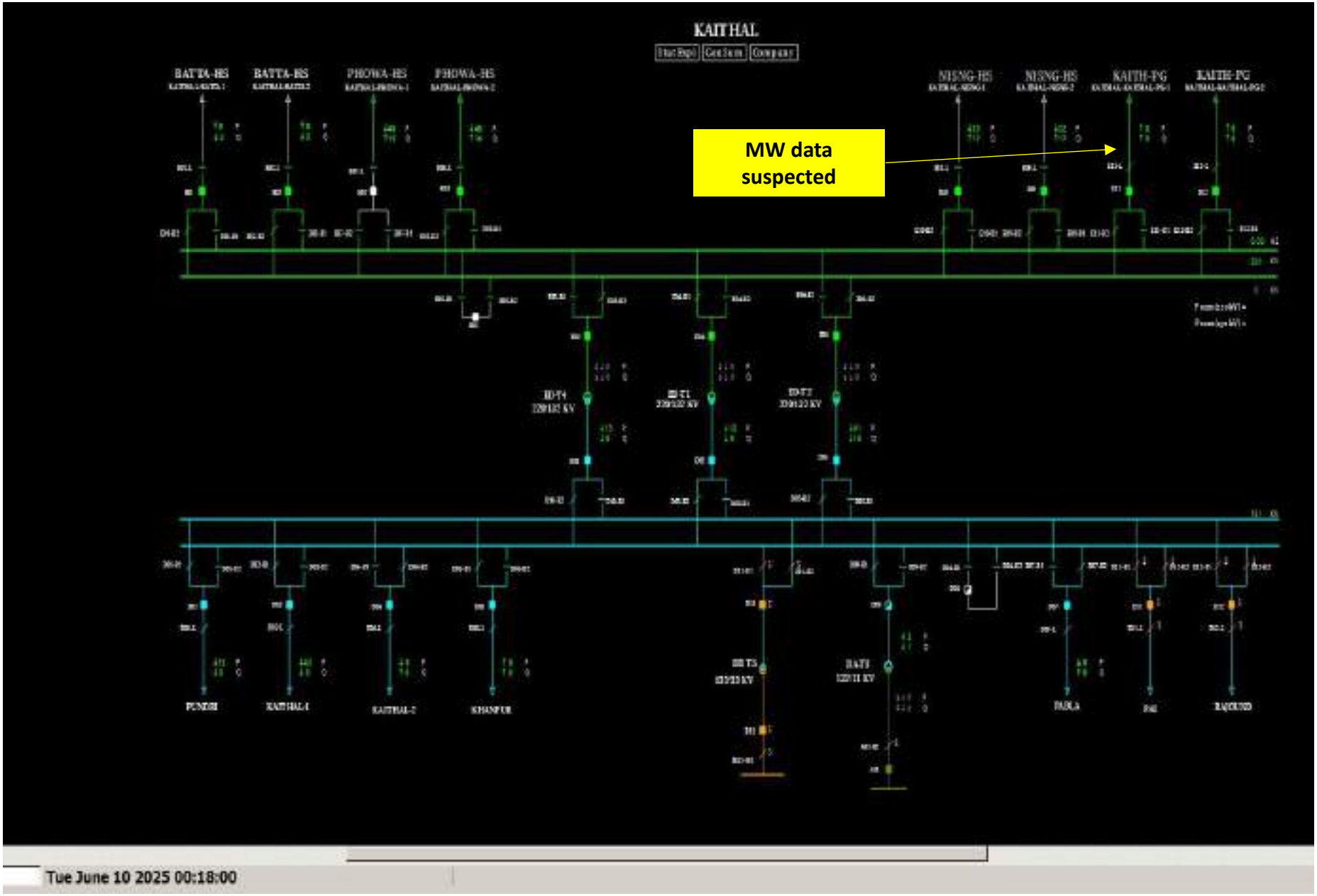
Brief details of the event

i. 220/132kV Kaithal(HR) has double main bus scheme.
ii. As reported, at 00:20 hrs, all the elements connected at 220/132kV Kaithal(HR) tripped. 220kV lines tripped from remote end.
iii. As per PMU at Kaithal(PG), B-N phase to earth fault followed by Y-B fault with delayed clearance of 560msec is observed.
iv. It is suspected that due to non clearance of fault from Kaithal(HR), all the 220kV lines tripped from remote end in Z-2.
v. As per SCADA, drop in Haryana demand of ~970 MW is observed out of which ~670 MW recovered within 05 minutes and complete load recovered within ~15 minutes. Reason for the load drop yet to be received from SLDC-Haryana.

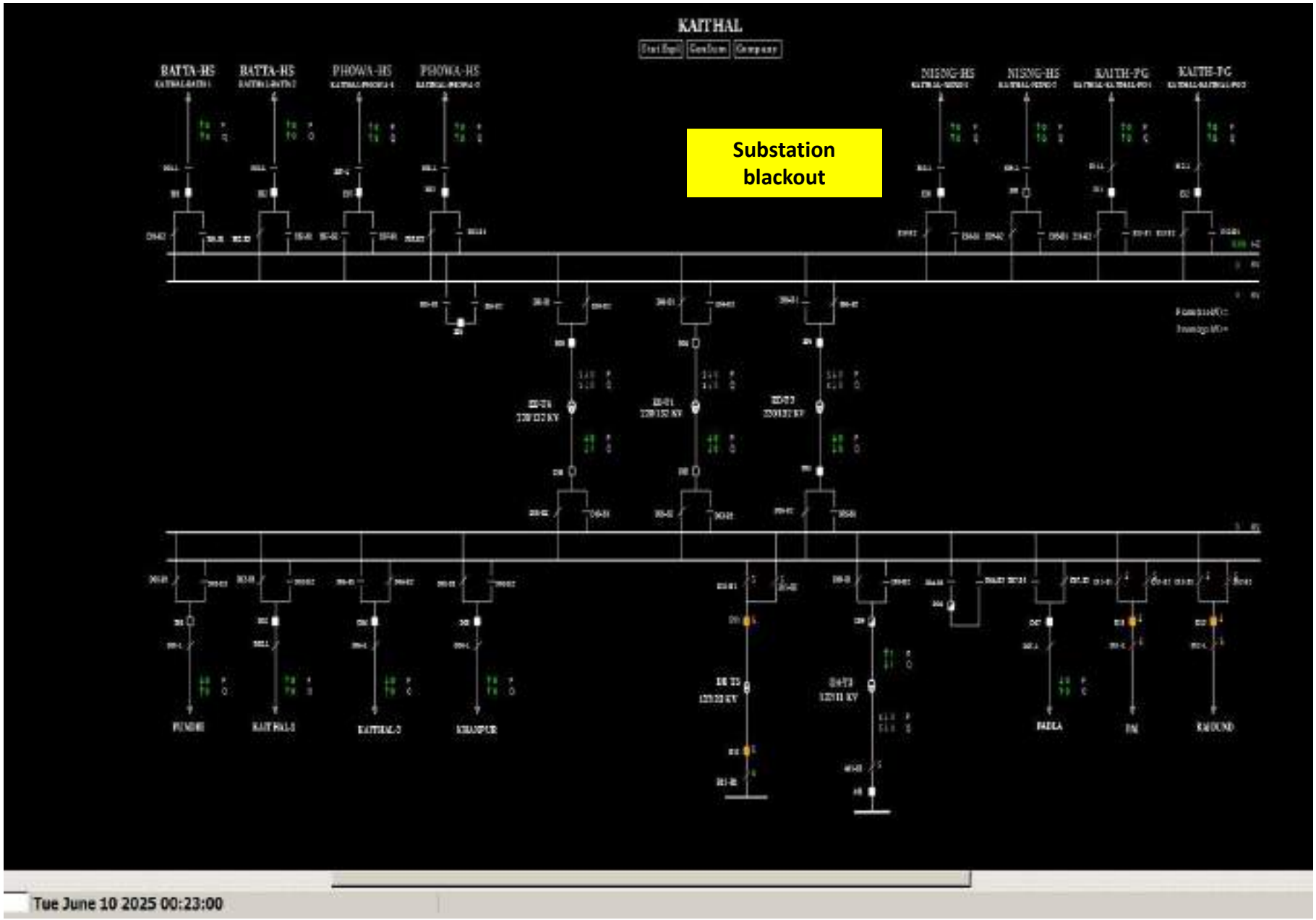
Network Diagram



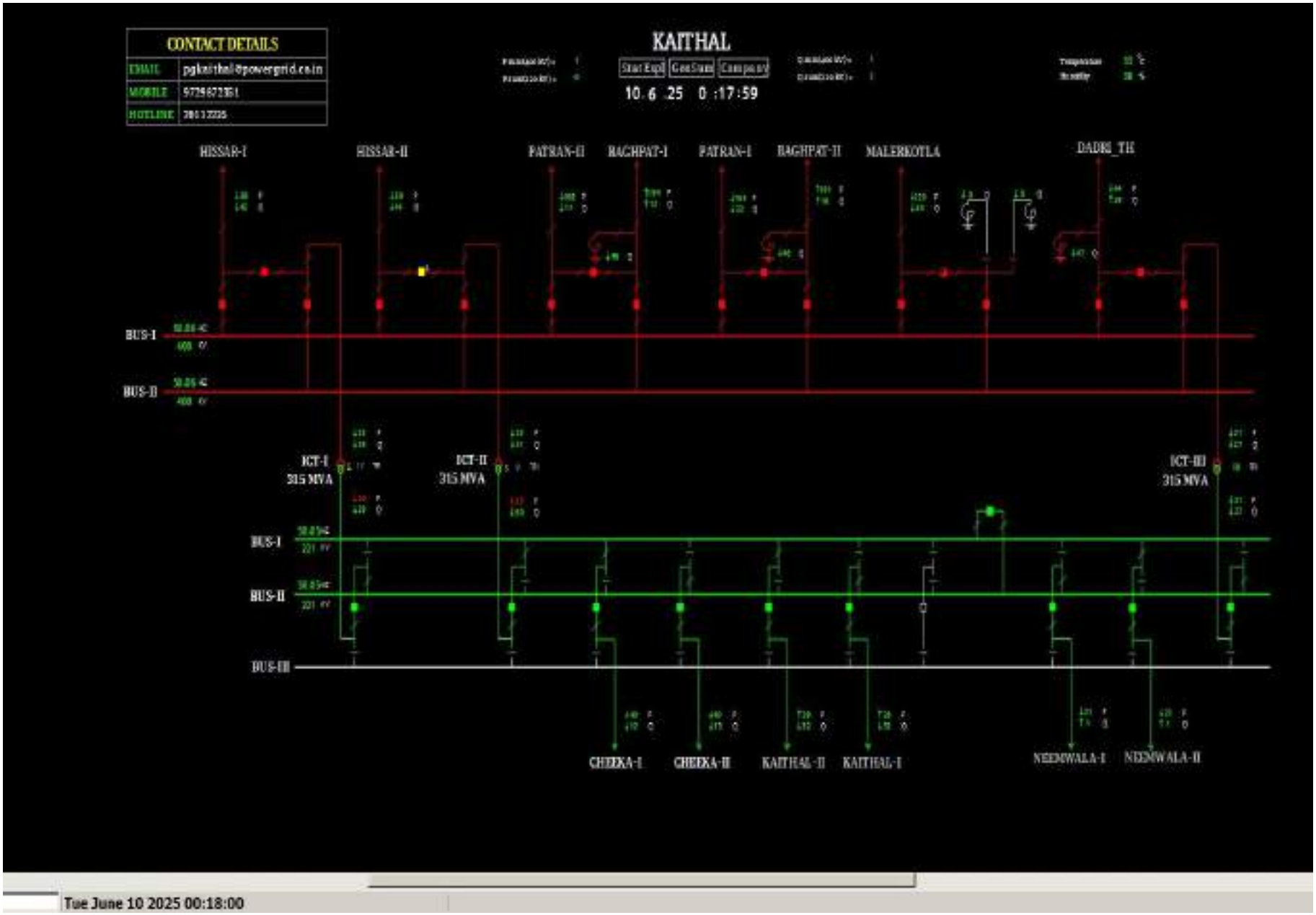
SLD of 220/132kV Kaithal(HR) before the event



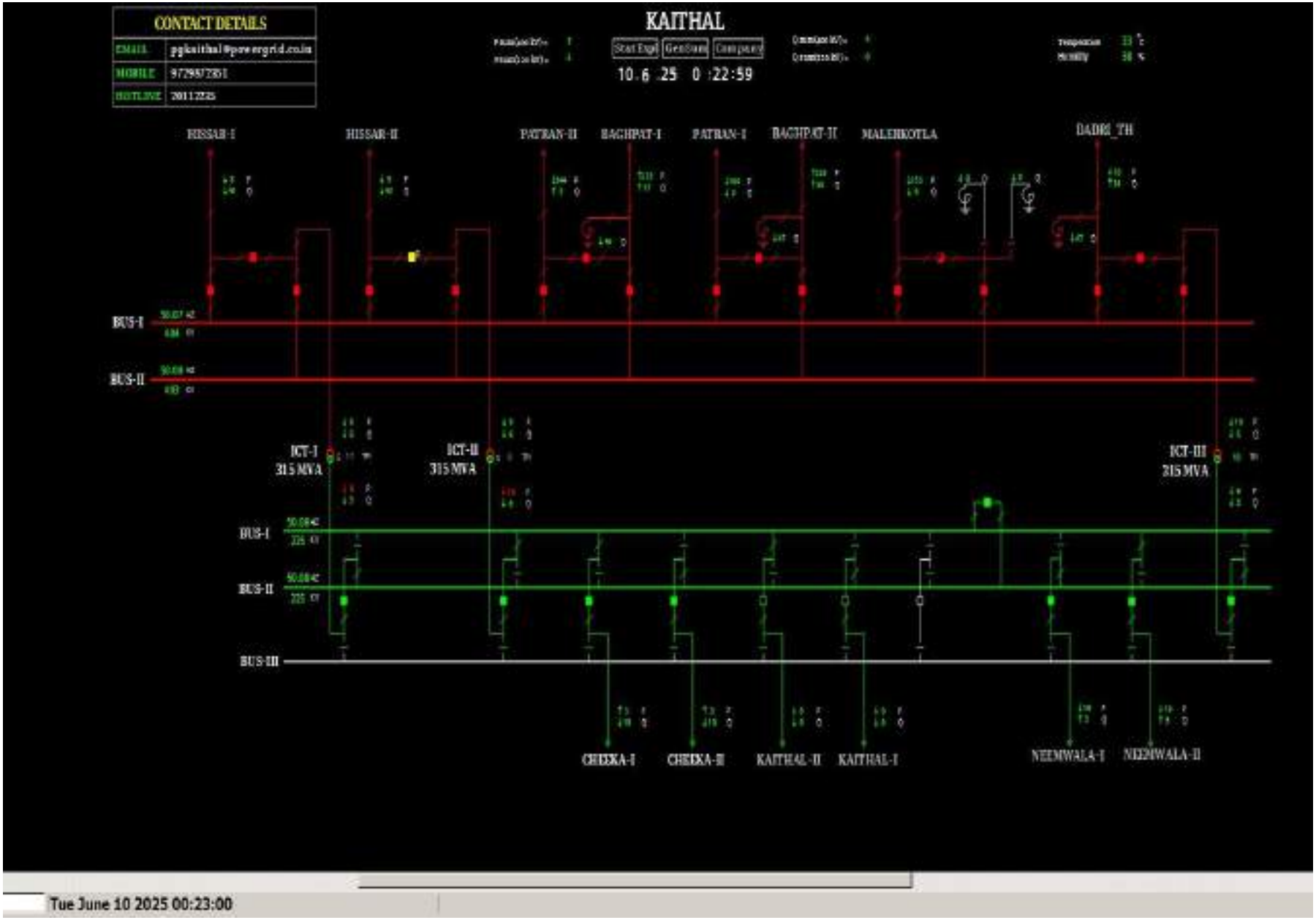
SLD of 220/132kV Kaithal(HR) after the event



SLD of 400/220kV Kaithal(PG) before the event

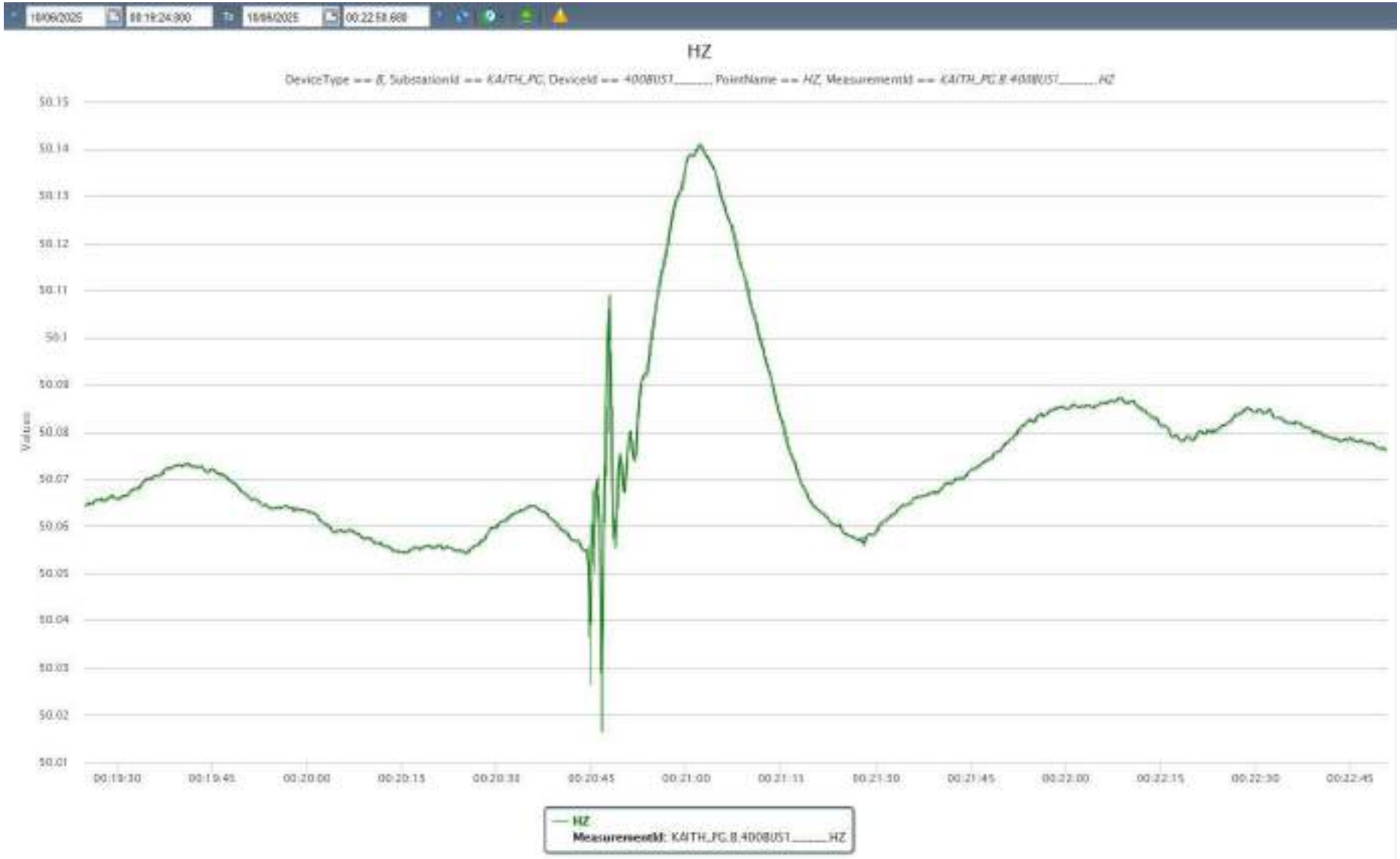


SLD of 400/220kV Kaithal(PG) after the event



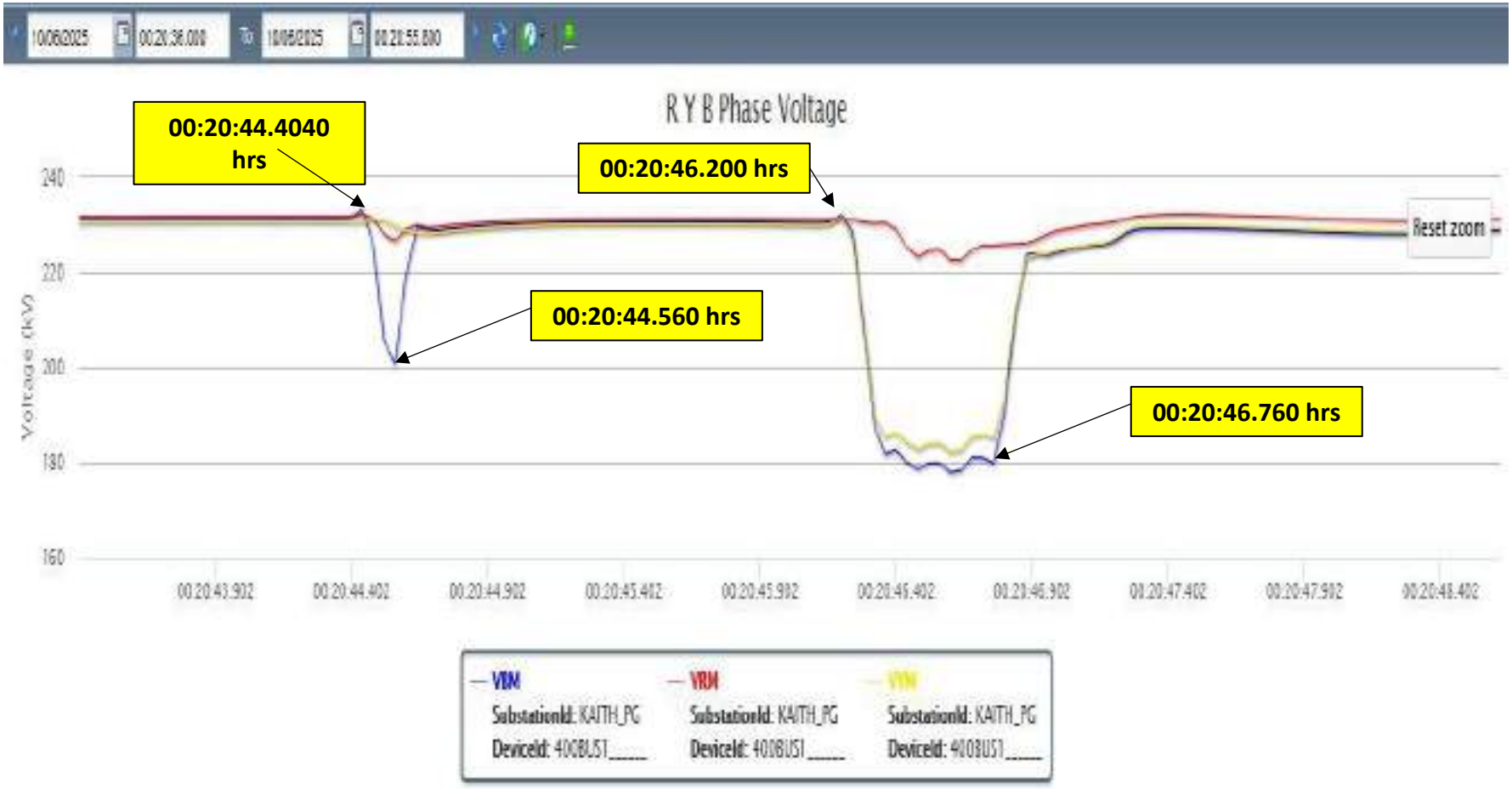
PMU Plot of frequency at Kaithal(PG)

00:20hrs/10-Jun-25

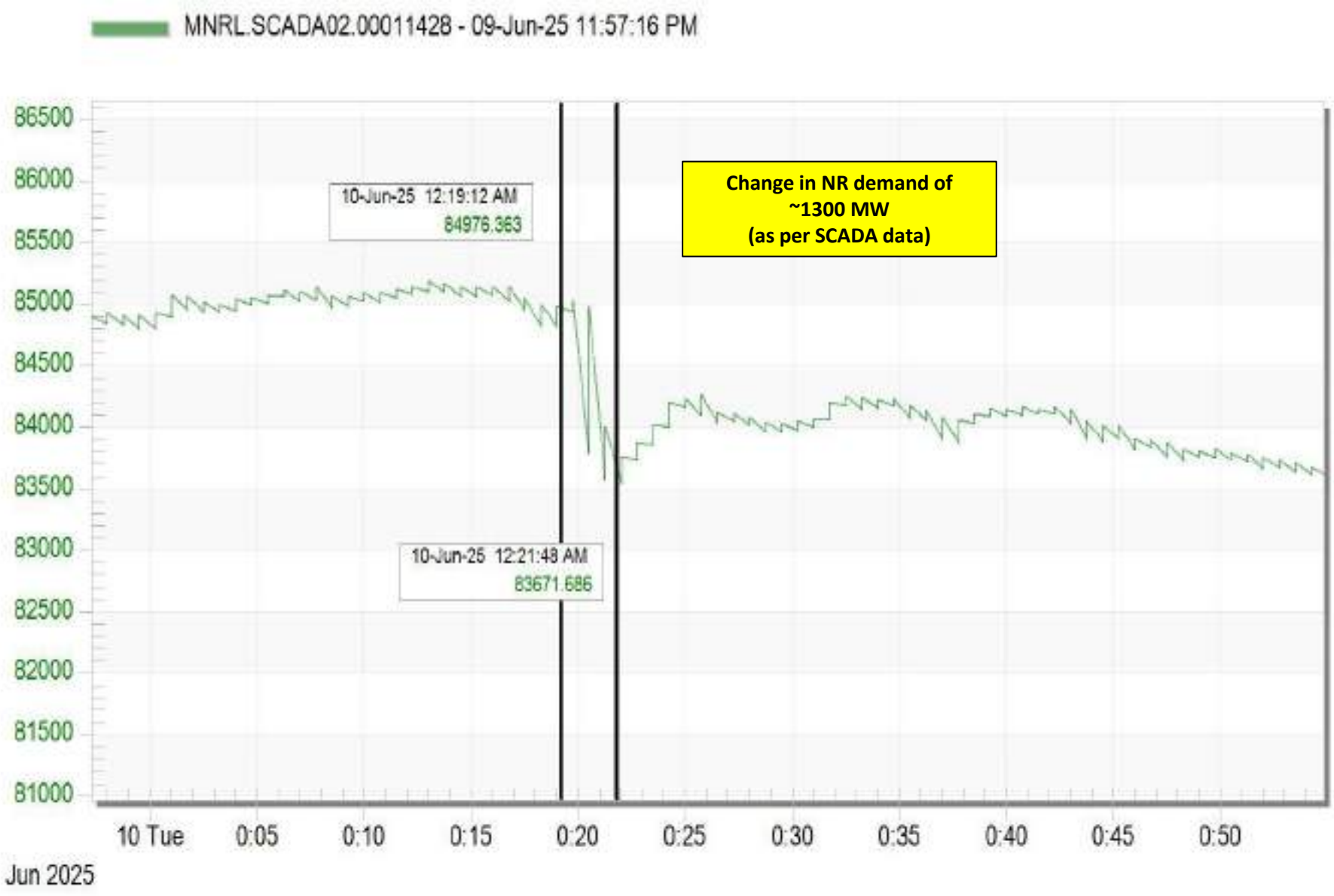


PMU Plot of phase voltage magnitude at Maharanibagh(PG)

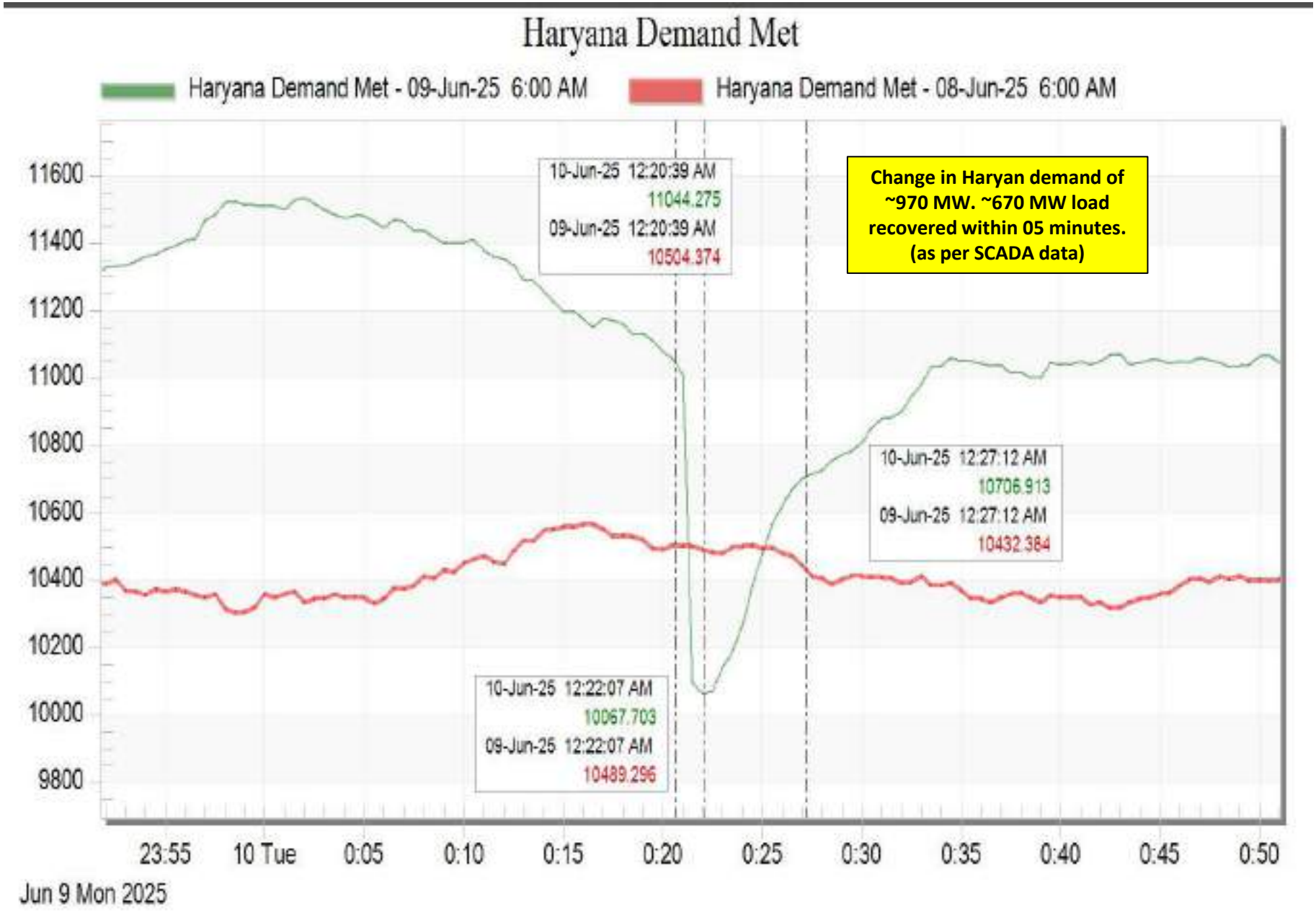
00:20hrs/10-Jun-25



NR demand at 00:20 hrs on 10.06.2025



Haryana demand at 00:20 hrs on 10.06.2025



Points for Discussion

i. Exact location and nature of fault needs to be shared.
ii. Reason of delayed clearance of fault also need to be shared.
iii. The exact reason and sequence of protection operated during tripping need to be shared.
iv. DR/EL along with tripping report not received yet from Haryana and POWERGRID end. Details need to be shared at the earliest.
v. Tripping of elements is not recorded in SCADA SOE. Availability of SCADA SOE data need to be ensured.
vi. Reason of significant quantum of load drop in Haryana control area during the event need to be shared.
vii. Remedial action taken report to be shared.

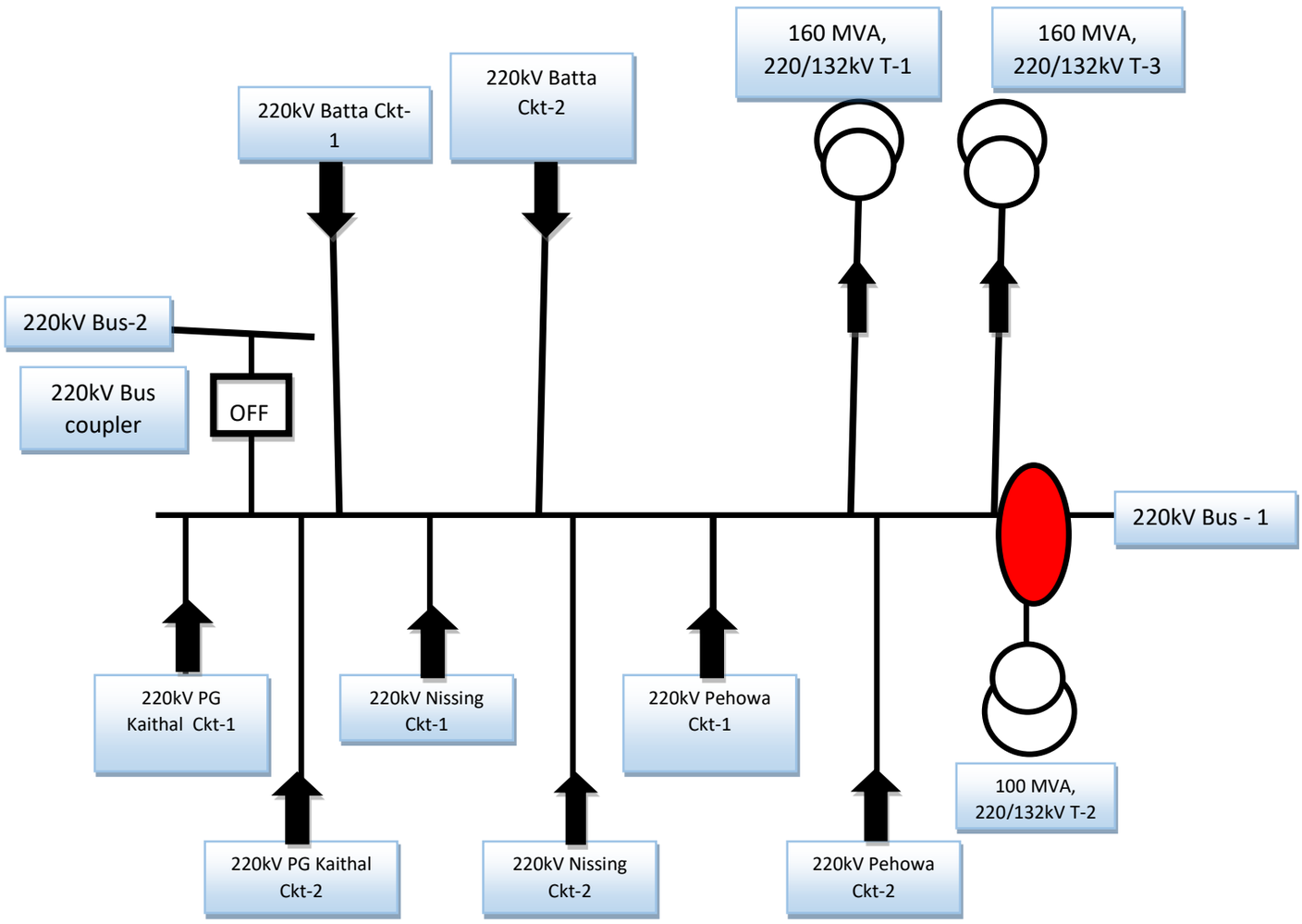
Subject: - **Analysis report of supply failure i.e. Tripping & Breakdown at 220 KV S / Stn. Kaithal on dated 10.06.2025 at 00:20 Hrs.**

On dated 10.06.2025, following transmission elements were tripped at 220 kV S/Stn. Kaithal:

Sr. No.	Name of Element	Time of Tripping (Hrs)		Relay Operated	
		From	To	This end (Pali end)	Other End
1	220kV Kaithal PG Ckt-1	00:20	03:50	-	Zone-2
3	220kV Kaithal PG Ckt-2	00:20	03:44	-	Zone-2
4	220 kV Nissing Ckt-1	00:20		-	Zone-2
5	220kV Nissing Ckt-2	00:20		-	Zone-2
6	220kV Pehowa Ckt-1	00:20		-	Zone-2
8	220kV Pehowa Ckt-2	00:20		-	Zone-2
9	220kV Batta Ckt-1	00:20		-	Zone-2
10	220kV Batta Ckt-2	00:20		-	Zone-2
9	160 MVA, 220/132kV T/F T-1	00:20		Diff & O/C B-ph (Hiset)	

2. Further, Y & B-Phase Bus conductor of 220/132 kV, 160 MVA TF T-1 found broken and B-phase 220 kV CT also found damaged.

3. The SLD showing supply arrangement at 220kV S/Stn. Kaithal on dated 10.06.2025 is as under:



4. B-phase 220 kV CT of 220/132 kV, 160 MVA TF T-1 found damaged and also Y & B-Phase Bus conductor found broken hence created bus-bar fault. During checking of 220kV Bus Bar protection relay at 220kV S/Stn. Kaithal, it was observed that DC supply MCB found tripped and hence Bus Bar protection didn't operated and all the 220kV Circuits tripped from remote end in Zone-2. Further, as per the event logs in the relays and on checking of yard of 220kV Kaithal S/Stn and as conveyed by the substation staff that at 00:20 hrs on 10.06.2025, a heavy sound and spark was observed in 220kV yard and snapping of 220kV jack bus conductor which fell on 220kV Bus-1 resulting into complete blackout at 220kV S/Stn. Kaithal.

5. Conclusion:

From the above, it is concluded that 220 kV Bus Bar protection didn't operated on bus fault caused due to damage of 220 kV CT of TF T-1 & snapping of jack-bus conductors. This resulted in tripping of all 220kV Circuits from remote end in Zone-2.

6. Remedial Measures taken:

i) DC fault of 220 kV Bus-bar protection circuit rectified and put back in circuit. Now Bus-bar protection relay is healthy.

Multiple Element Tripping Event at 220kV Maharanibagh(DTL) and 220kV Pragati(DTL)

At 03:45-03:55 hrs on 15.06.2025

Tripped Elements

S. No	Name of Elements	Outage Time	Revival Time	Reason of tripping
1.	220kV Maharanibagh-Gazipur (DTL) line-1	03:48 hrs	05:23 hrs	Y-N phase to earth fault (6.6kA)
2.	220kV Maharanibagh-Gazipur (DTL) line-2		05:23 hrs	
3.	220kV Maharanibagh-Pragati (DTL) Line-1	03:52 hrs	05:11 hrs	Y-N phase to earth fault, 18.1kA (bus fault), Bus bar Z-1 & Z-2 protection operated. All the elements connected at Pragati(DTL) tripped.
4.	220kV Maharanibagh-Pragati (DTL) Line-2		05:22 hrs	
5.	220kV Pragati-IPPOS (DTL) line-1		04:48 hrs	
6.	220kV Pragati-IPPOS (DTL) line-2		04:48 hrs	
7.	220kV Pragati-Park Street (DTL)line-1		04:48 hrs	
8.	220kV Pragati-Park Street (DTL) line-2		04:48 hrs	
9.	220/66kV 160 MVA ICT-1 at Pragati(DTL)		06:29 hrs	
10.	220/66kV 160 MVA ICT-2 at Pragati(DTL)		05:04 hrs	
11.	104 MW GT-1 at Pragati GPS			
12.	104 MW GT-2 at Pragati GPS			
13.	122 MW STG-1 at Pragati GPS			
14.	220kV Maharanibagh-Lodhi Road (DTL) line-2	03:55 hrs	06:04 hrs	B-N phase to earth fault (17.4kA)

Brief details of the event

- 220kV Maharanibagh(DTL) is basically 220kV side of 400/220kV Maharanibagh(PG) station and has double main bus scheme. 220/66kV Pragati(DTL) also has double main bus scheme.
- During antecedent condition, 220kV Maharanibagh-Gazipur (DTL) D/C was feeding load of 220/66kV Gazipur and 220/66kV Patparganj. Further 220/66kV Pragati(DTL) was having generation from Pragati GPS (generating ~277 MW) and feeding load of 220/66kV Pragati and 220/66kV Parkstreet.
- As reported at 03:48 hrs, 220kV Maharanibagh-Gazipur (DTL) line-1 & 2 tripped on Y-N phase to earth fault. As per PMU at Maharanibagh(PG) and DR of the line (Maharanibagh end), Y-N phase to earth fault with fault current of ~6.6kA and cleared with the delay of ~200msec is observed with no A/R operation. Exact location of fault, reason of delayed clearance and reason of tripping of both the lines yet to be received from DTL.
- With the tripping of 220kV Maharanibagh-Gazipur (DTL) line-1 & 2, load of 220/66kV Gazipur(DTL) and 220/66kV Patparganj(DTL) affected.
- Further at 03:52 hrs, Y-ph bus bar differential protection, 18.1kA, Z-1 & Z-2 at 220kV Pragati(DTL operated leading to tripping of all the elements connected at 220kV Bus-1 & 2 at 220/66kV Pragati(DTL). As per PMU, Y-N phase to earth fault cleared within 120msec is observed. As per DR of Y-ph bus bar differential at 220kV Pragati(DTL), Z-1 bus bar protection followed by Z-2 bus bar protection operated.

Brief details of the event

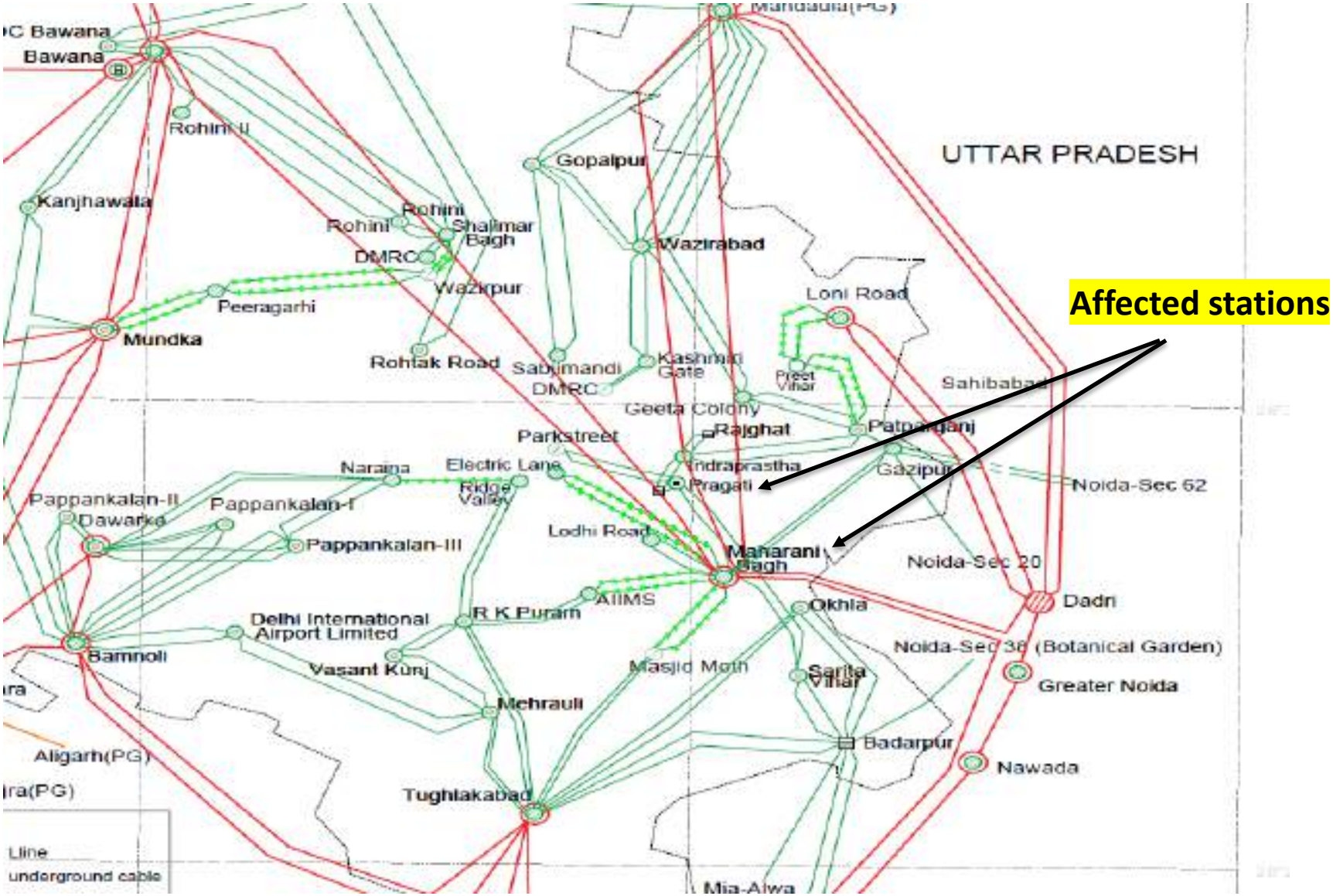
- Due to tripping of all the elements at 220/66kV Pragati(DTL), load of 220/66kV Park Street(DTL) and 220/66kV Pragati(DTL) affected. Approx. 277 MW generation of Pragati GPS also lost due to loss of evacuation path.
- Further at 03:55 hrs, 220kV Maharanibagh-Lodhi Road (DTL) line-2 tripped on B-N fault. As per DR and PMU, B-N fault in Z-1, Ib=17.4kA with no A/R operation and cleared within 100msec is observed.
- As reported by SLDC-Delhi, due to tripping of aforementioned elements, load loss of approx. 640 MW occurred in Delhi control area. Complete details of the load affected during the event are attached in Annexure.
- As per SCADA, change in demand of approx. 700MW in Delhi control area and loss in generation of ~277 MW at Pragati GPS is observed.
- As reported, restoration started from 04:48 hrs and completed by 06:04 hrs.

Brief description of event

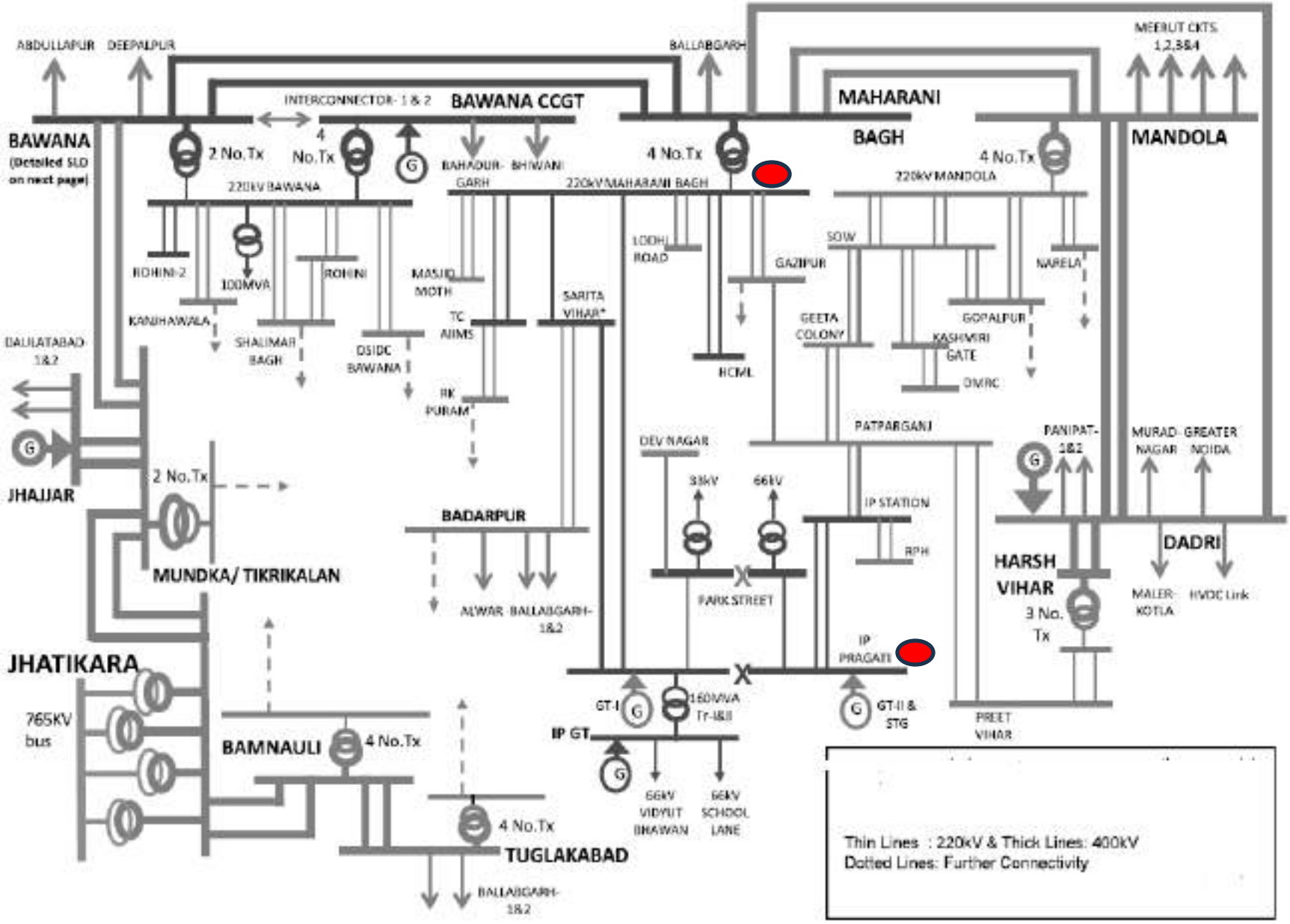
S. No	Time	Event	Fault signature in PMU & DR	Load / Generation affected
1	03:48 hrs	220kV Maharanibagh-Gazipur Line-1&2 tripped on Y-N fault	**Y-N fault** observed in PMU at 03:48 hrs; Load of 220/66kV Gazipur(DTL) and 220kV Patparganj affected (DR of only Gajipur line-2 received)	Load of **220/66kV Gazipur and 220kV Patparganj** affected
2	03:52 hrs	220kV Maharanibagh-Sarita Vihar Line and 220kV Maharanibagh-Pragati line tripped	**Y-N fault** observed in PMU at 03:52 hrs	
3	03:52 hrs	Blackout at 220/66kV Pragati(DTL)	**Bus bar protection (Y-ph differential)** operated at 220kV Pragati	Load of **220/66kV Pragati (DTL), Parkstreet(DTL) affected**. Generation of **Pragati GPS** also affected
4	03:55 hrs	220kV Maharanibagh-Lodhi Road line-2 tripped on B-N fault	**B-N fault** observed in PMU at 03:55 hrs	

As reported by DTL, faults occurred during heavy windstorm/thunderstorm and rain. No physical fault found during patrolling

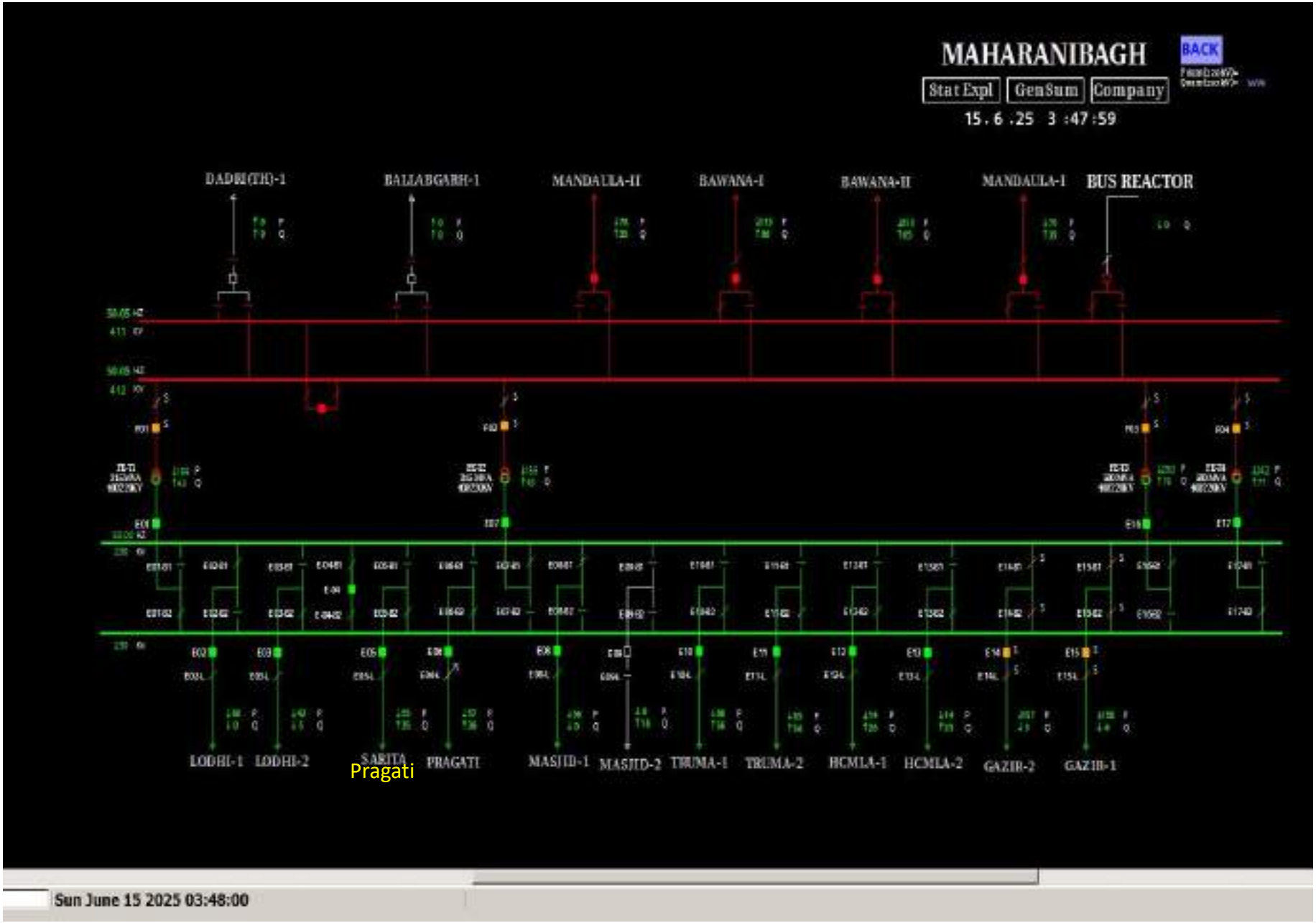
Network Diagram



Connectivity Diagram

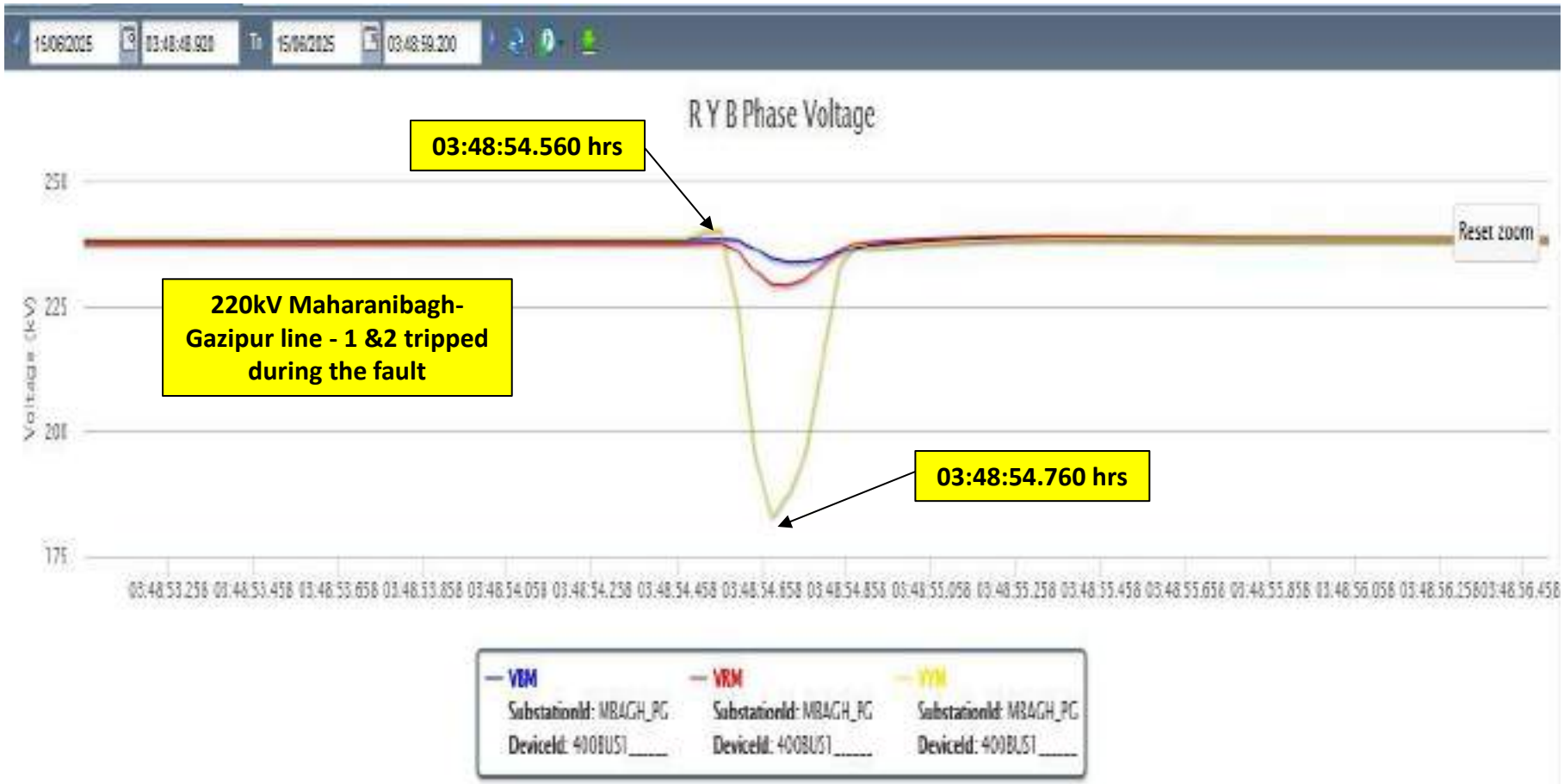


SLD of 400/220kV Maharanibagh(03:48hrs)

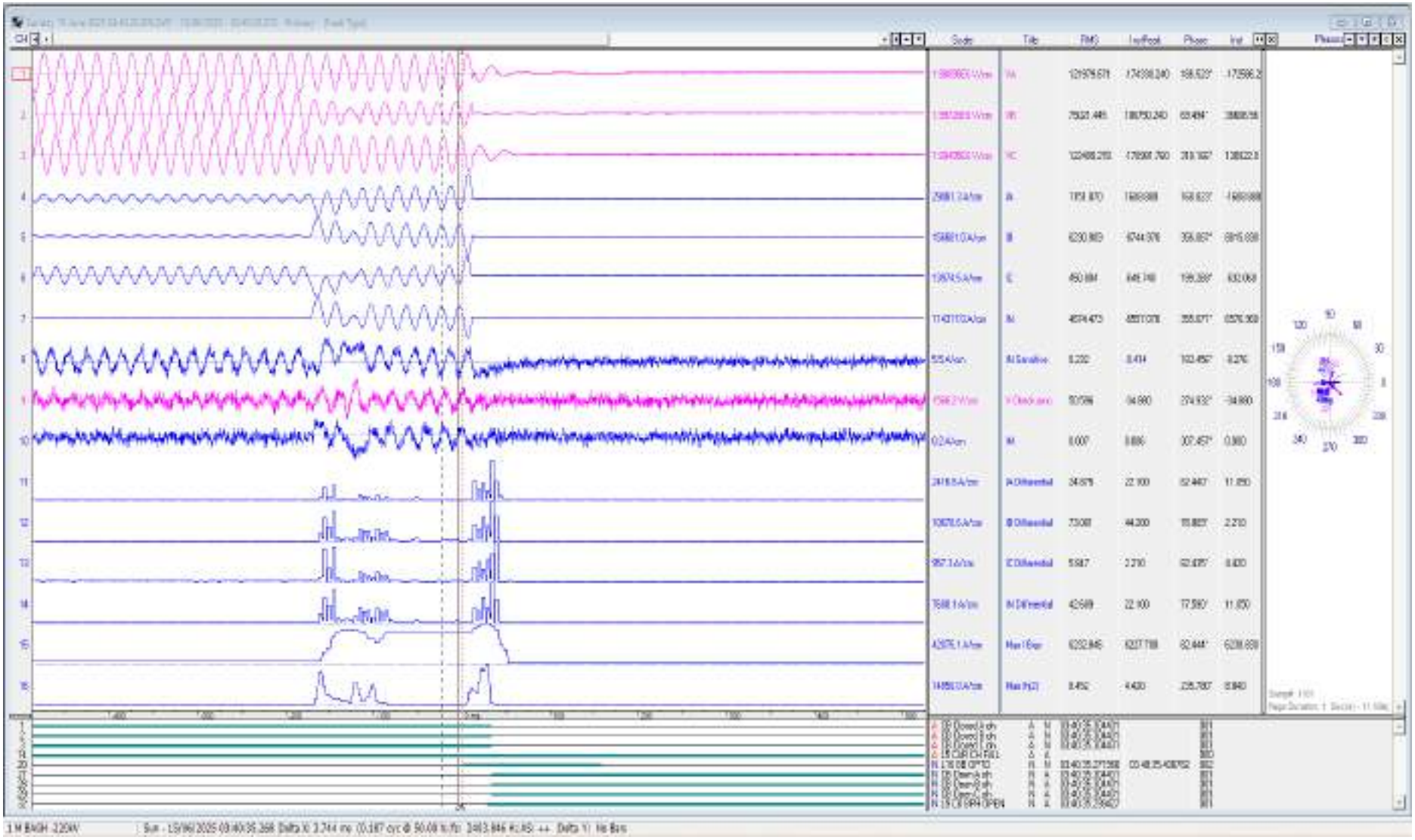


PMU Plot of phase voltage magnitude at Maharanibagh(PG)

03:48hrs/15-Jun-25



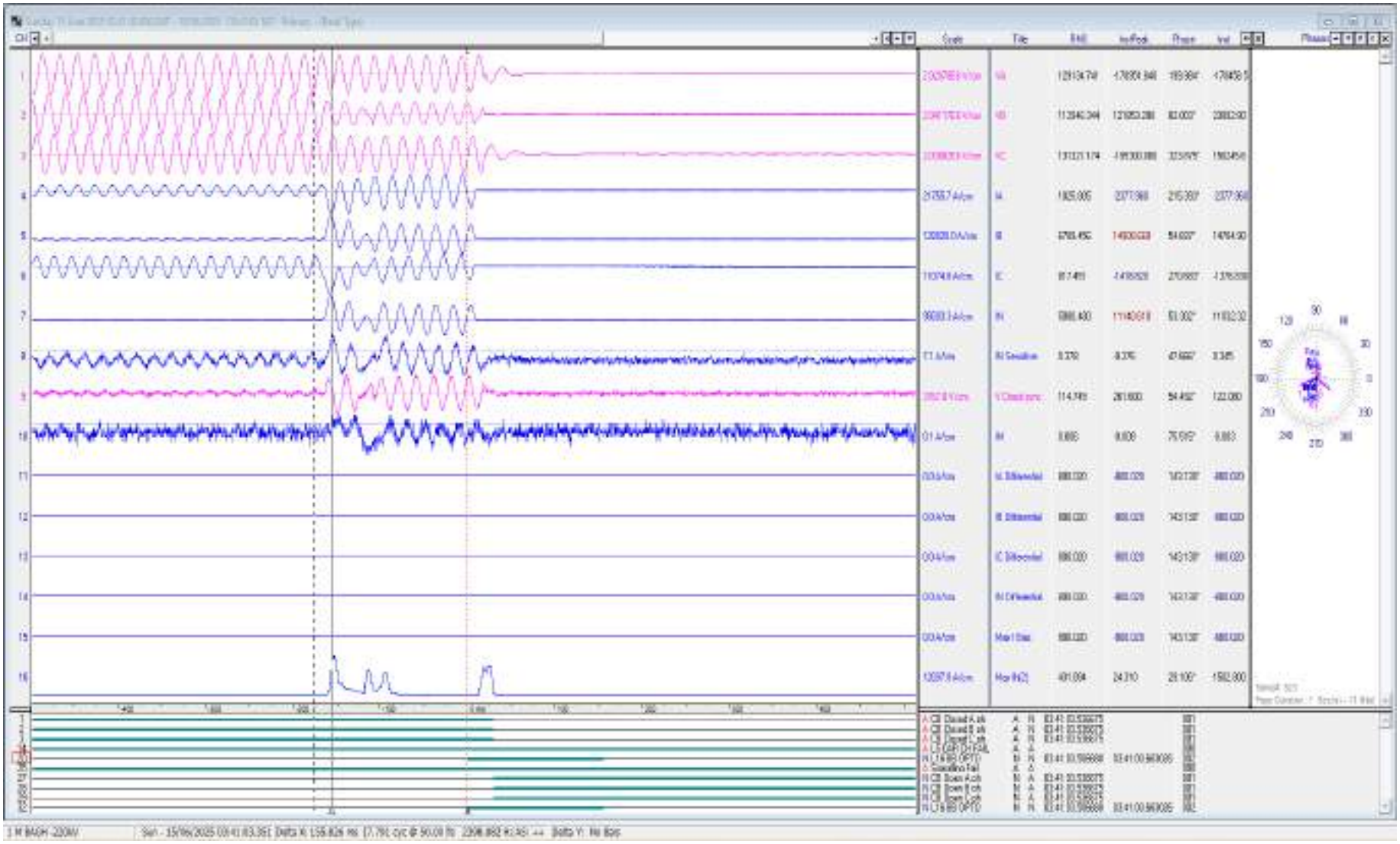
DR of 220kV Maharanibagh(end)-Gazipur line-2



Y-N fault, Iy-6.2kA; Fault clearance time: 160msec;

Observation: No A/R operation, time not GPS synced, reason of BB OPTD channel high, nomenclature is also not as per standard

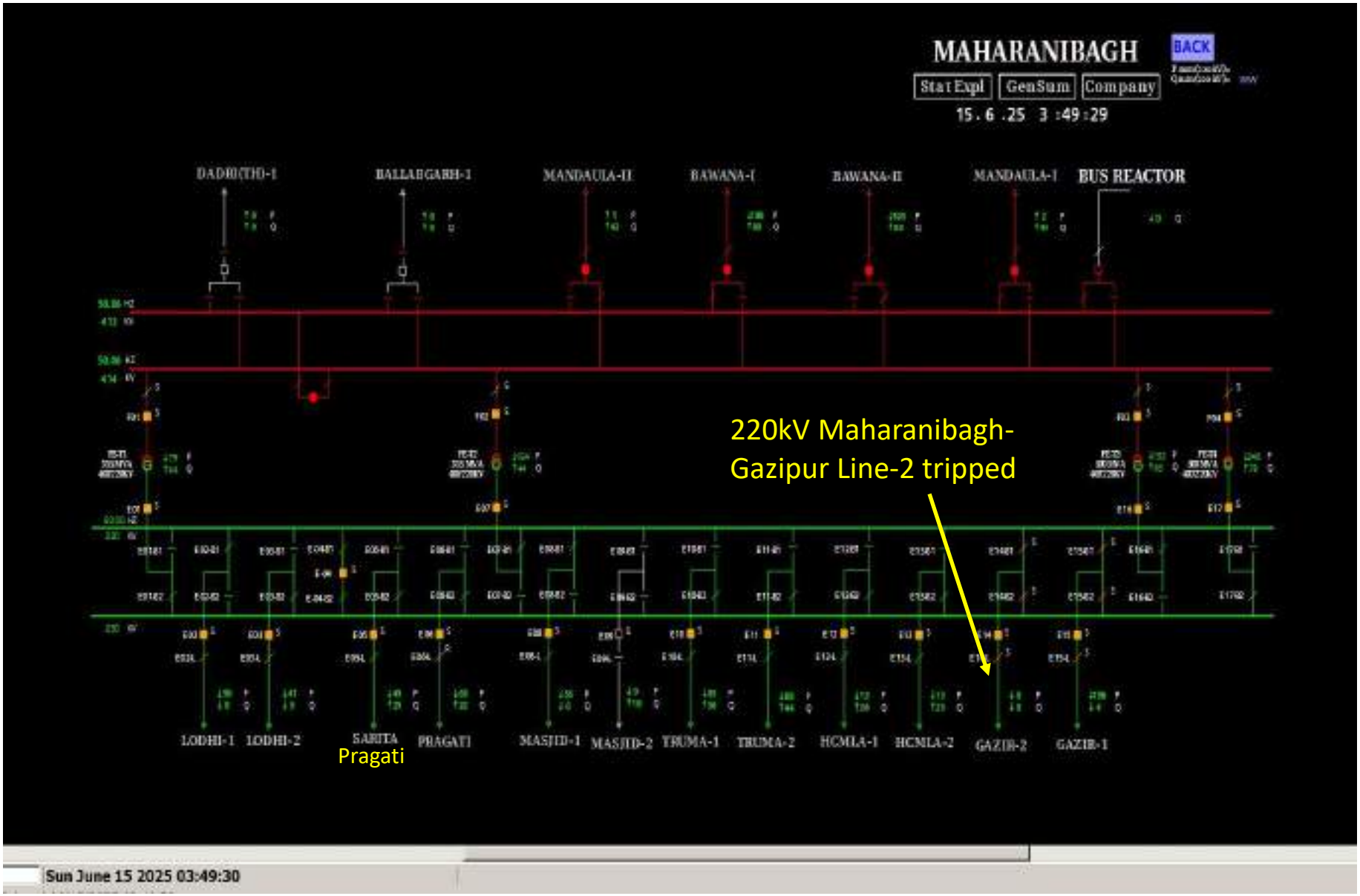
DR of 220kV Maharanibagh(end)-Gazipur line-1



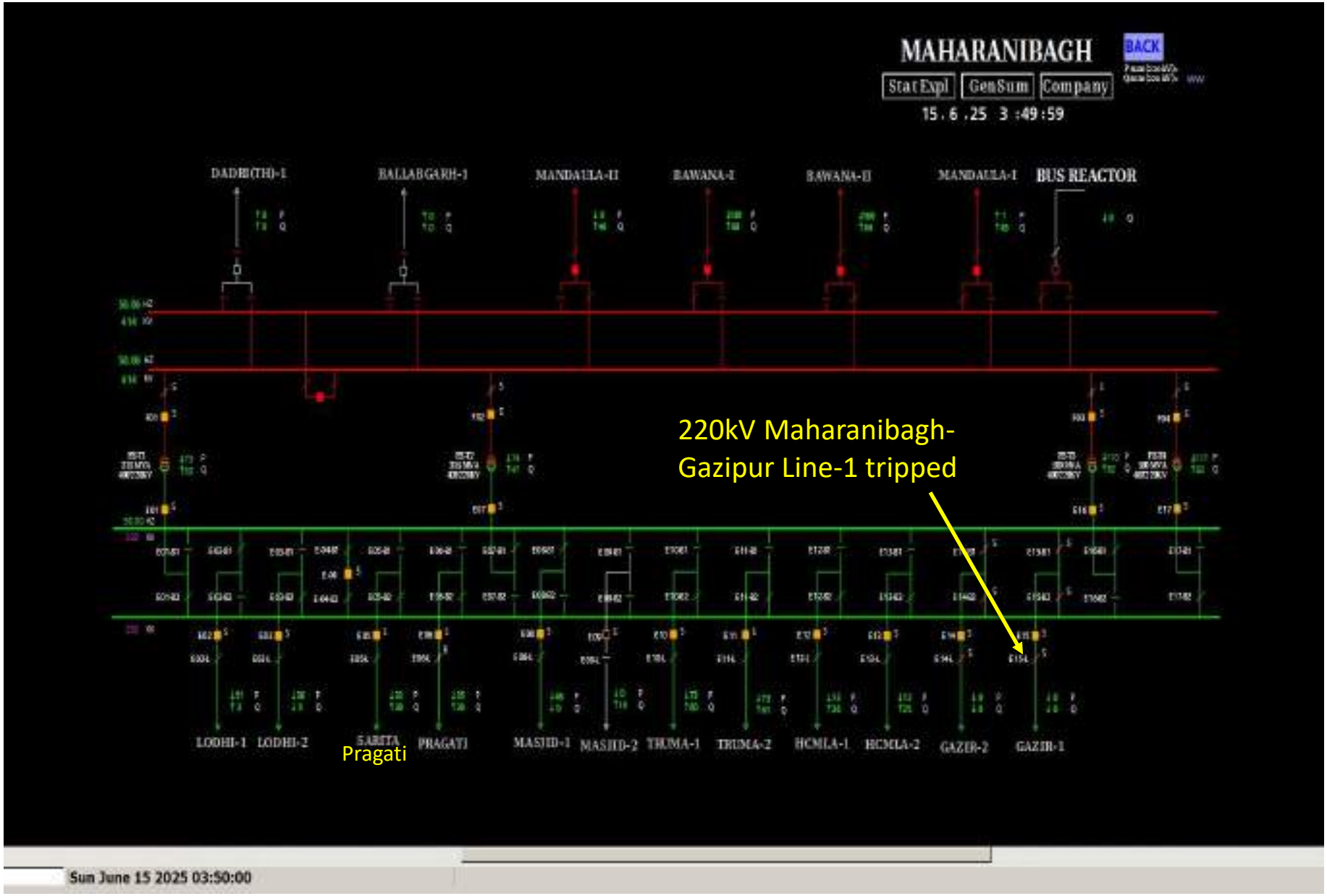
Y-N fault, Iy-6.7kA; Fault clearance time: 160msec;

Observation: No A/R operation, time not GPS synced, reason of BB OPTD channel high, nomenclature is also not as per standard

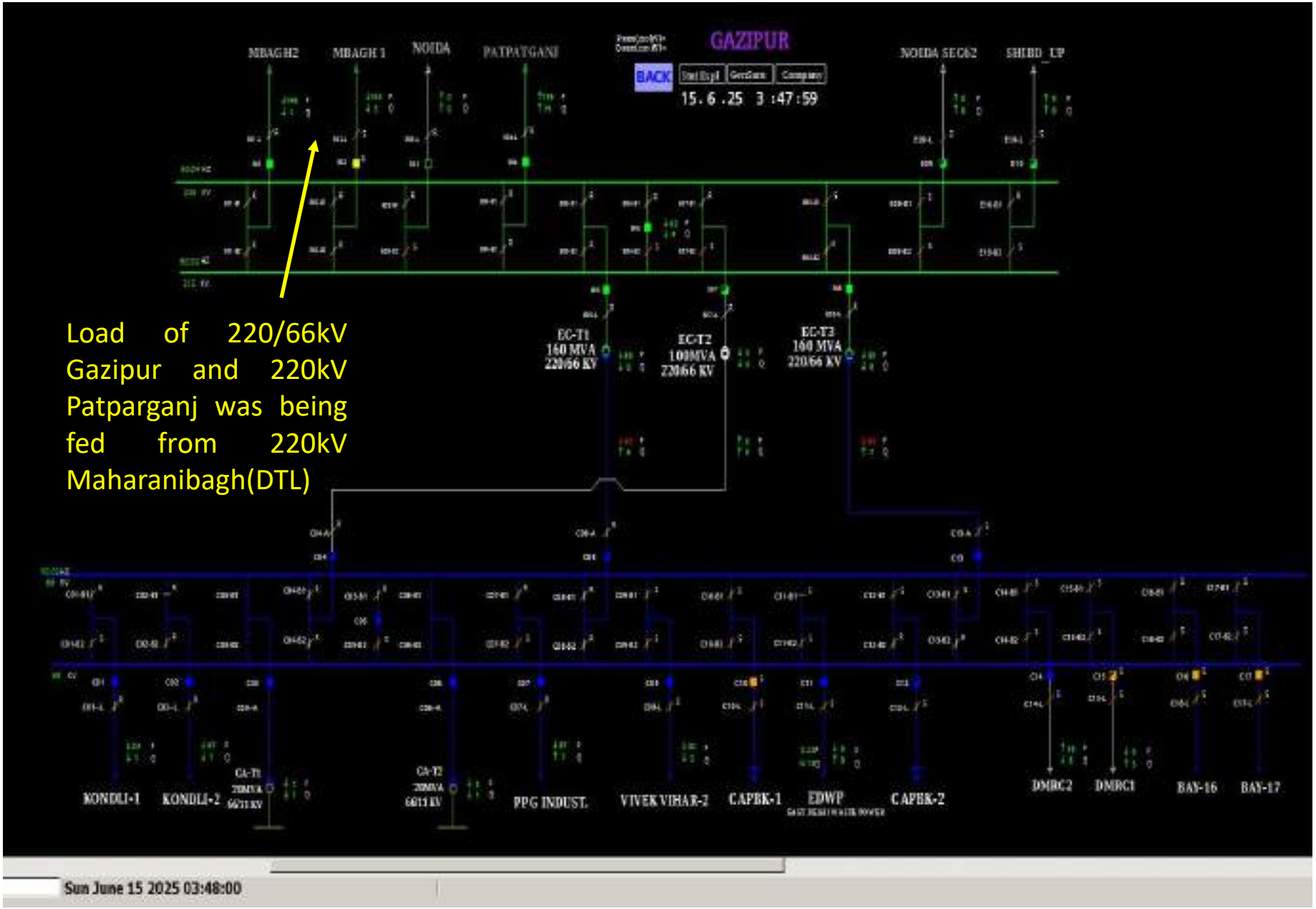
SLD of 400/220kV Maharanibagh(03:49:30hrs)



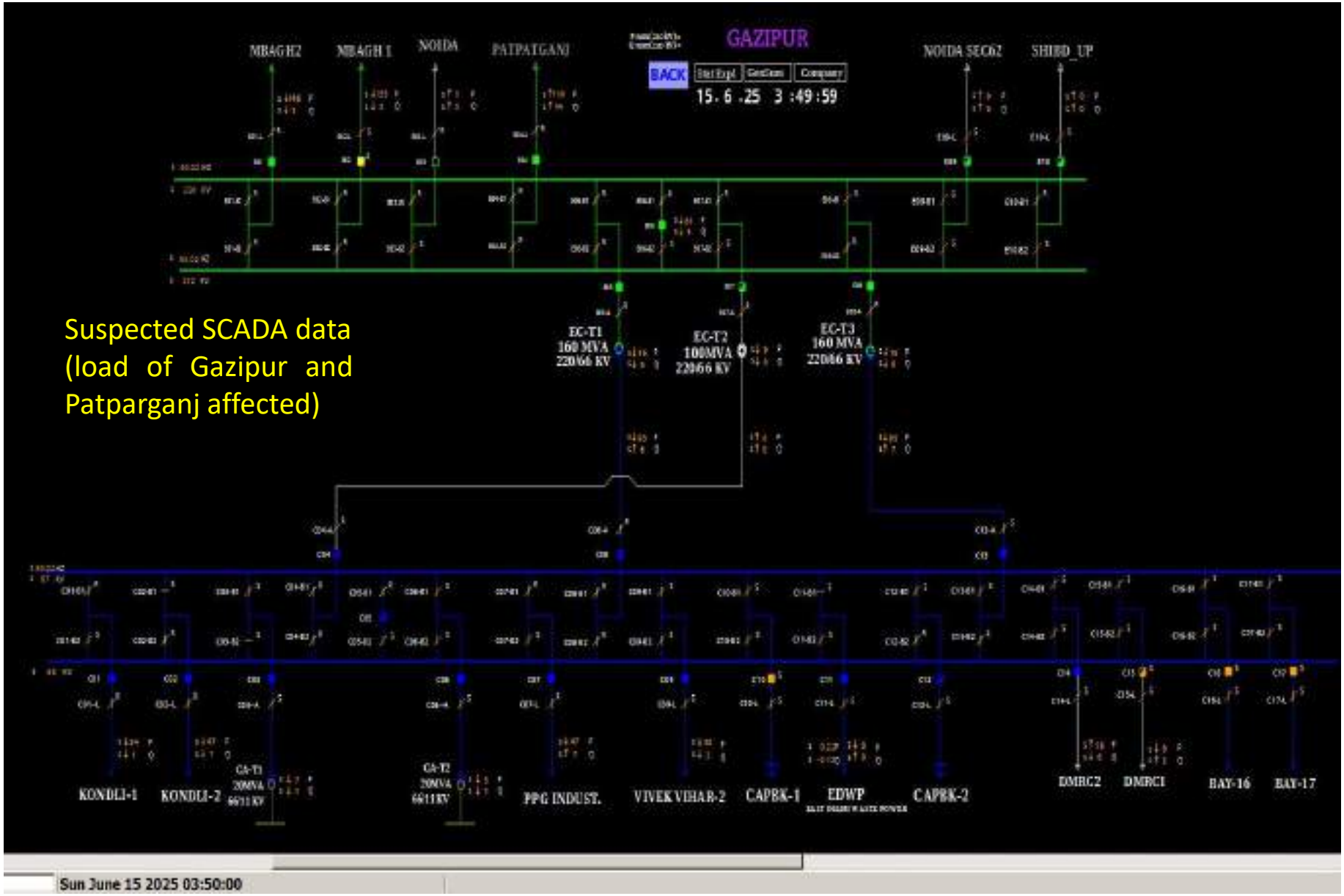
SLD of 400/220kV Maharanibagh(03:50hrs)



SLD of 220/66kV Gazipur(DTL) (03:48hrs)



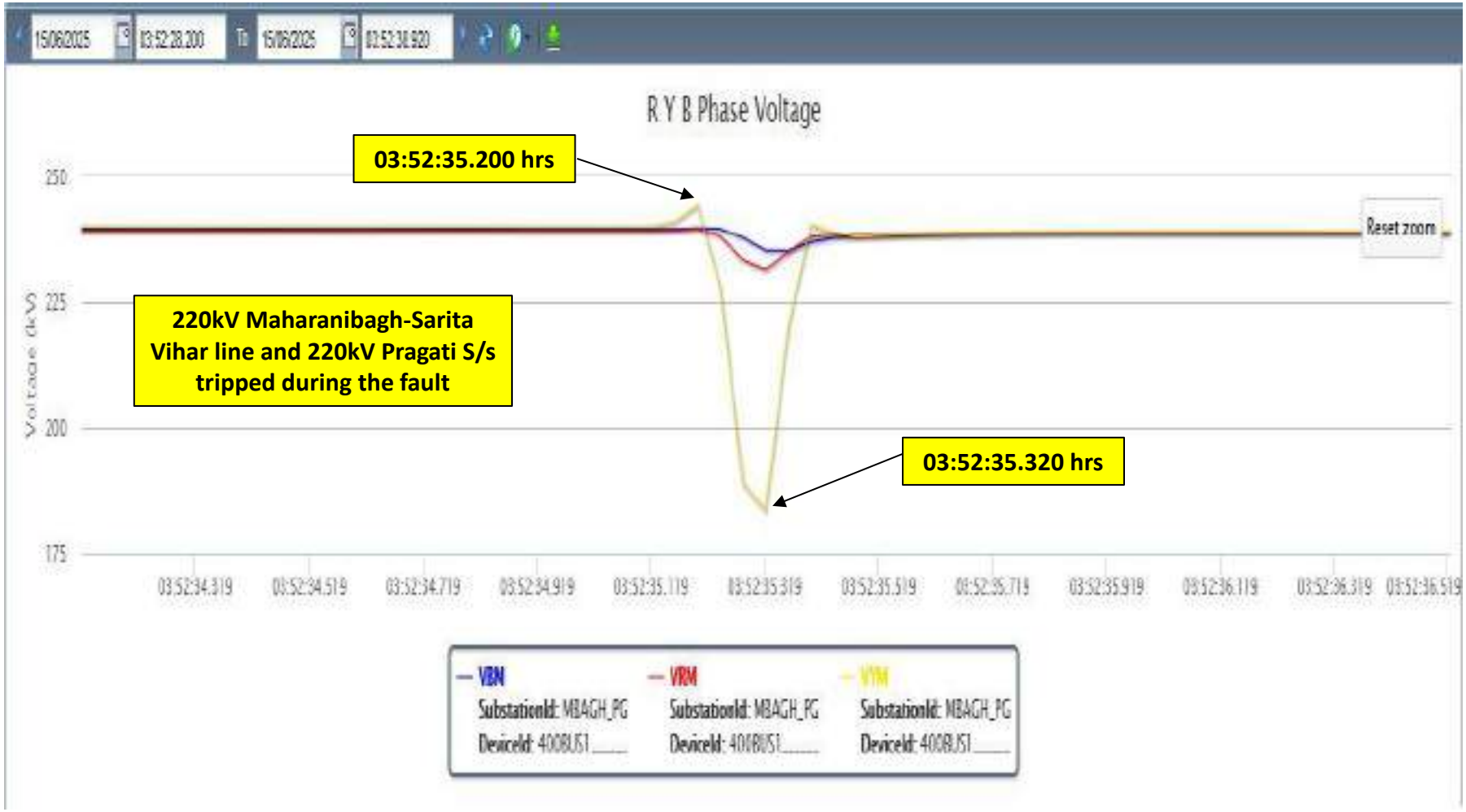
SLD of 220/66kV Gazipur(DTL) (03:50hrs)



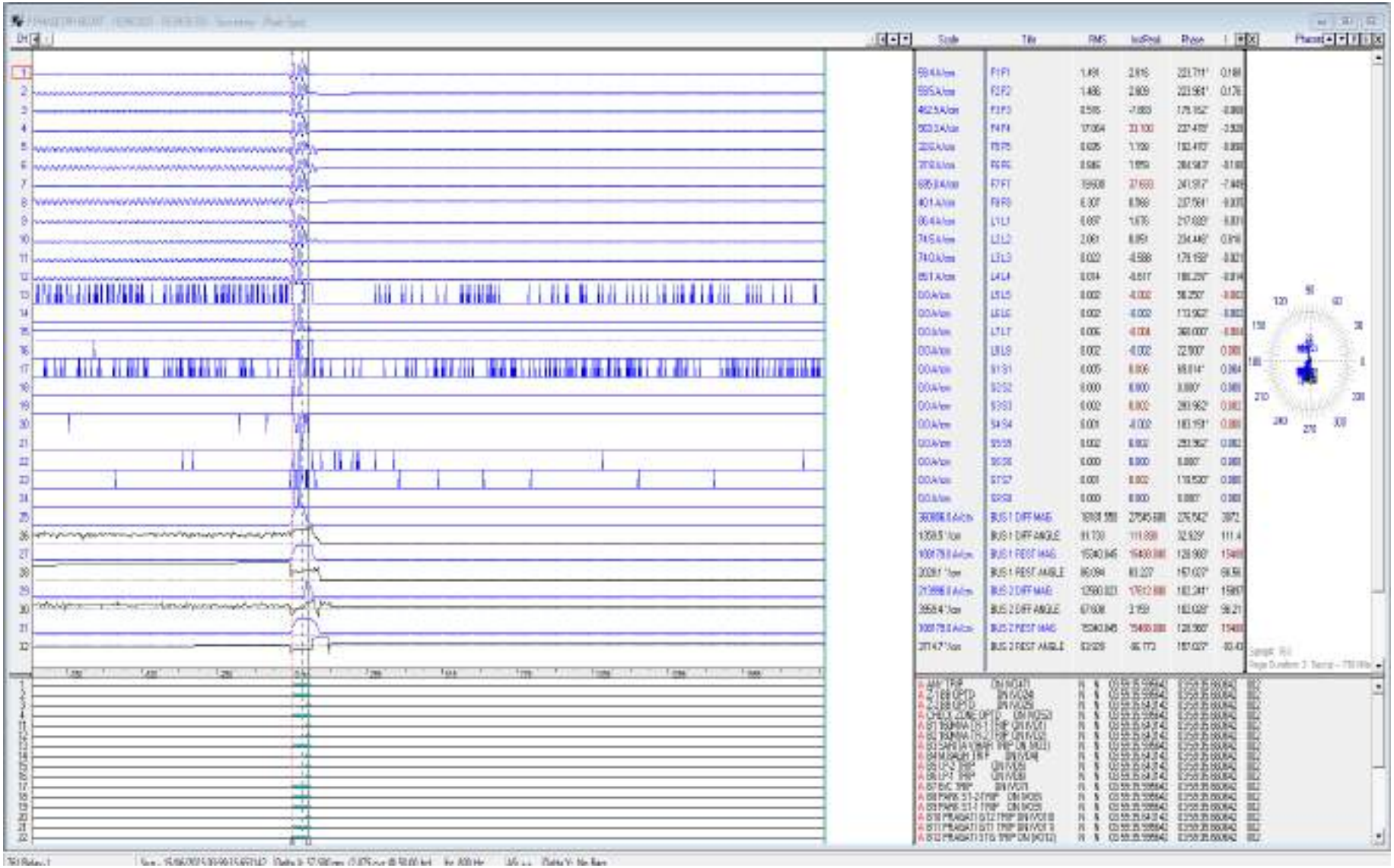
Suspected SCADA data (load of Gazipur and Patparganj affected)

PMU Plot of phase voltage magnitude at Maharanibagh(PG)

03:52hrs/15-Jun-25



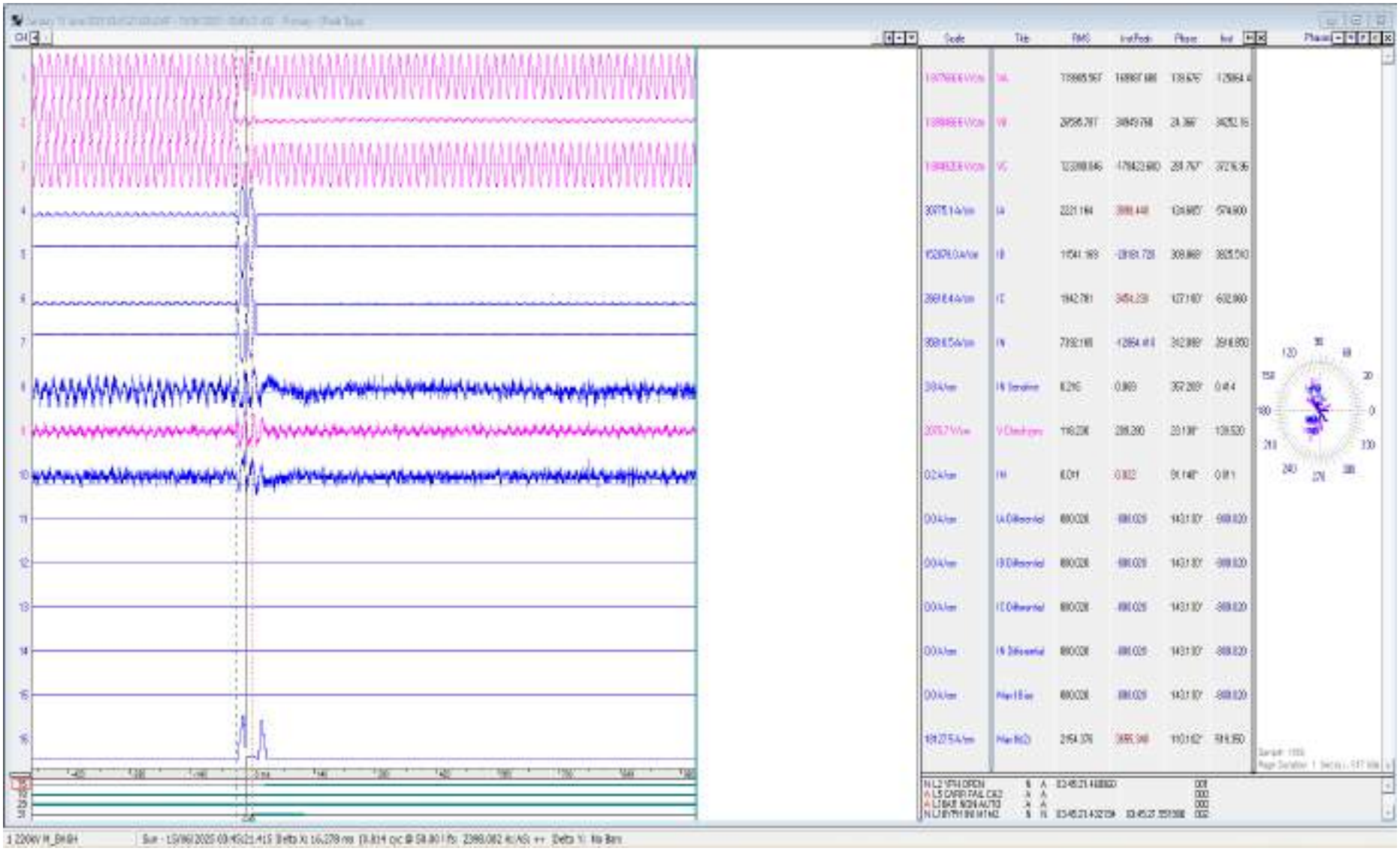
DR of 220kV Bus bar at 220kV Pragati(DTL)



Y-ph bus bar differential protection operated, Bus bar Z-1 & Z-2 operated.

Observation: Time not GPS synced, nomenclature is also not as per standard

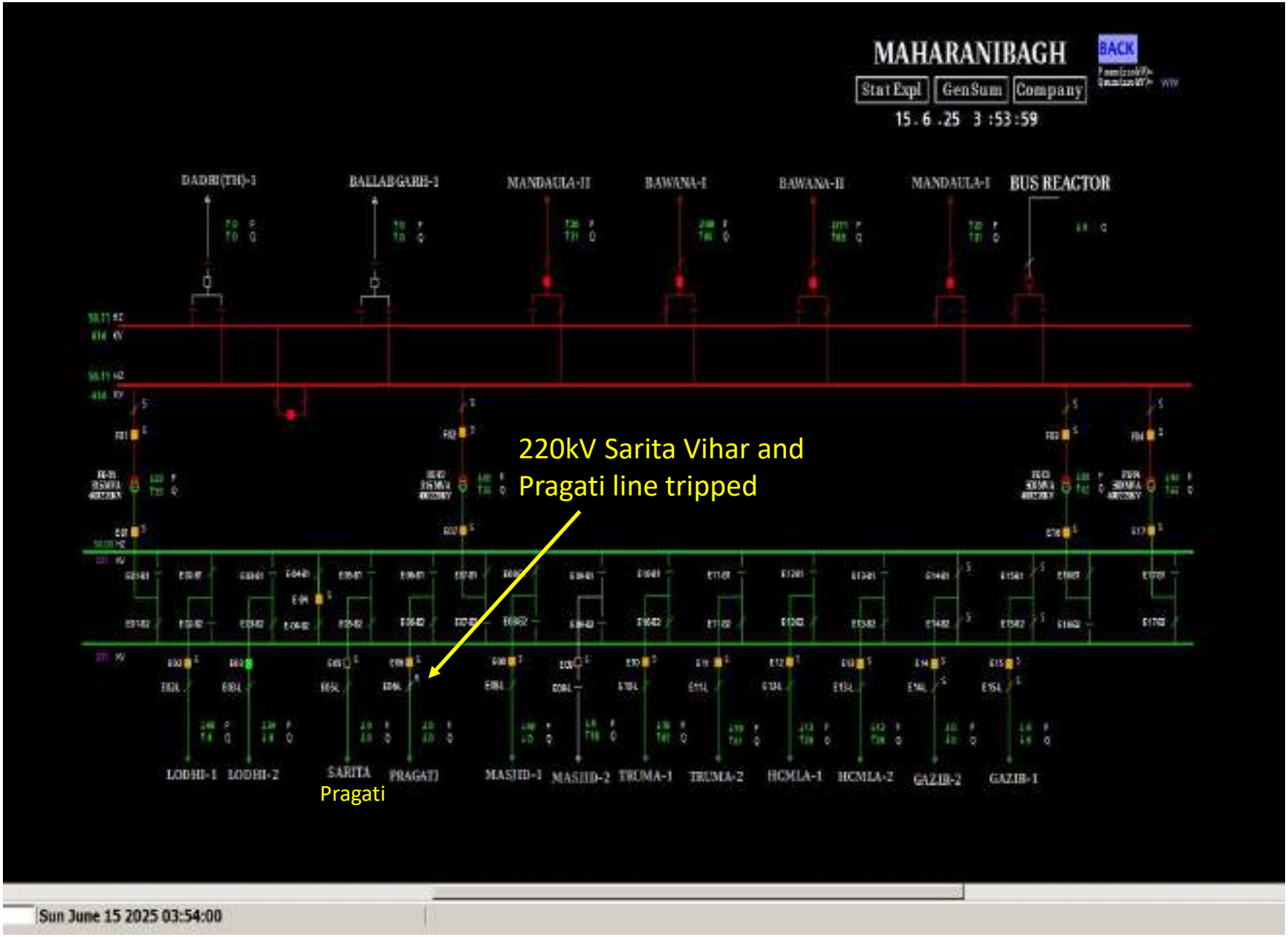
DR of 220kV Maharanibagh(end)-Pragati line



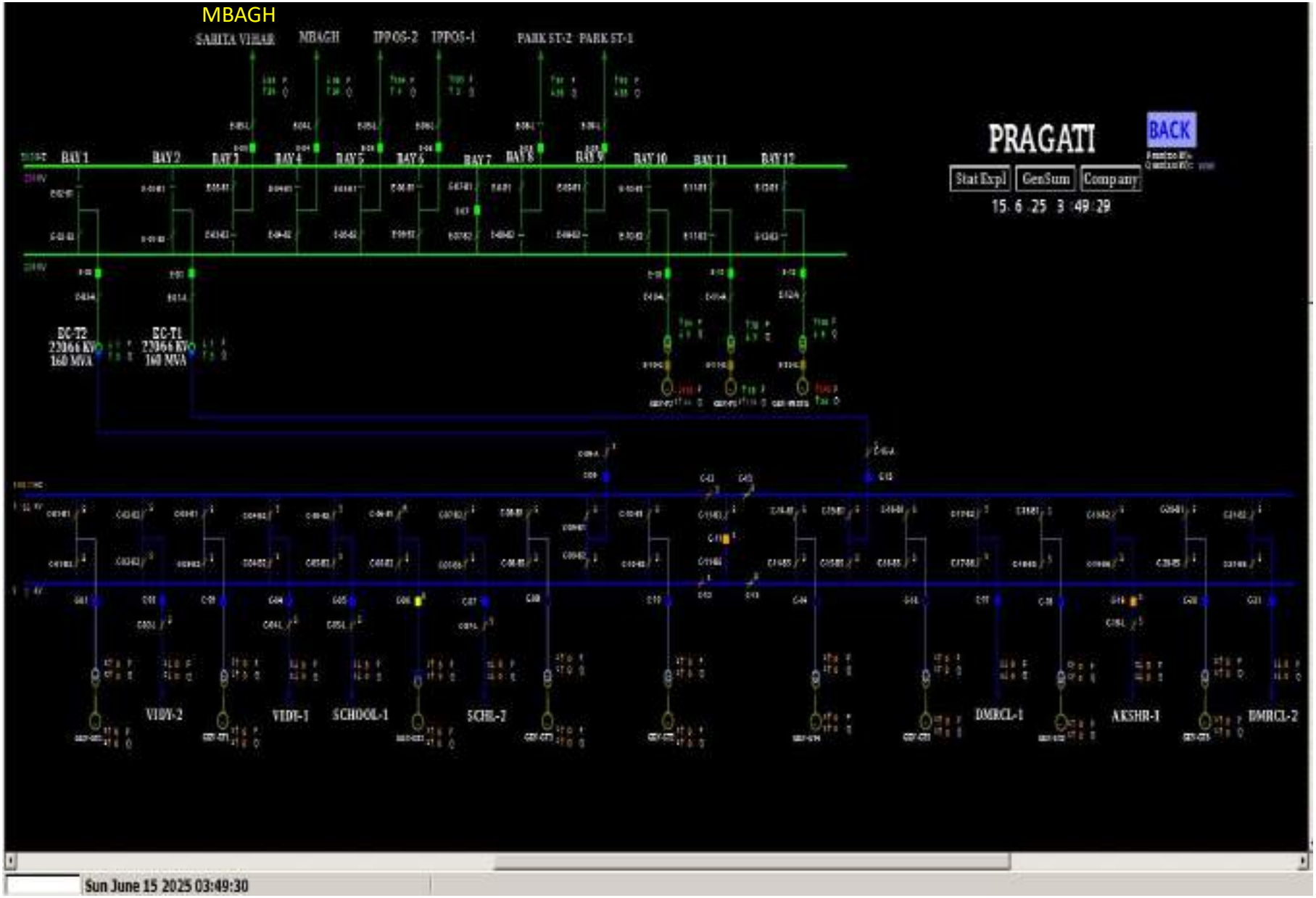
Y-N fault, A/R operation observed. Iy=~11.5kA. Fault distance reported: 4.7km

Observation: Time not GPS synced, Complete DR not recorded (time window issue), nomenclature is also not as per standard

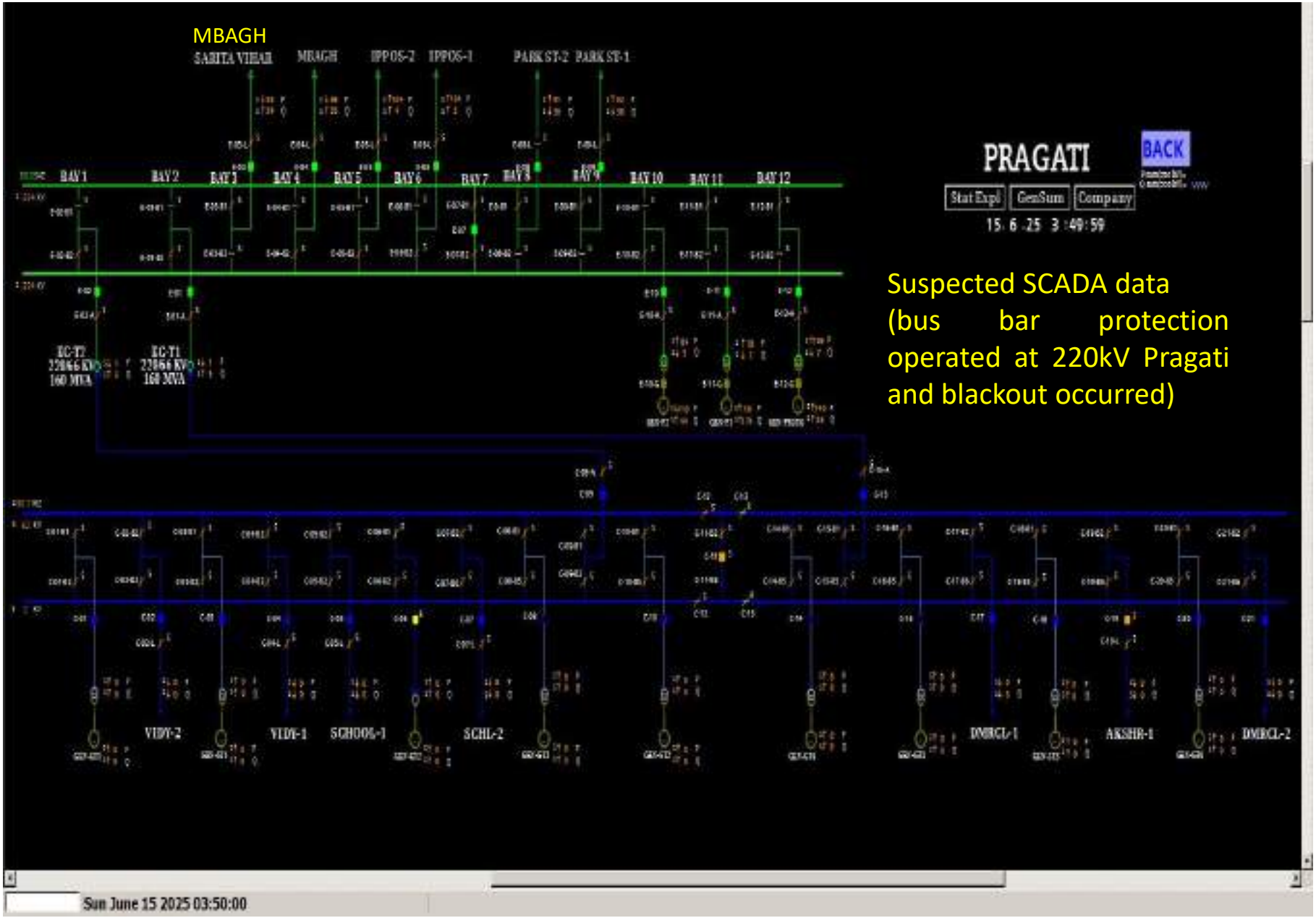
SLD of 400/220kV Maharanibagh(03:54hrs)



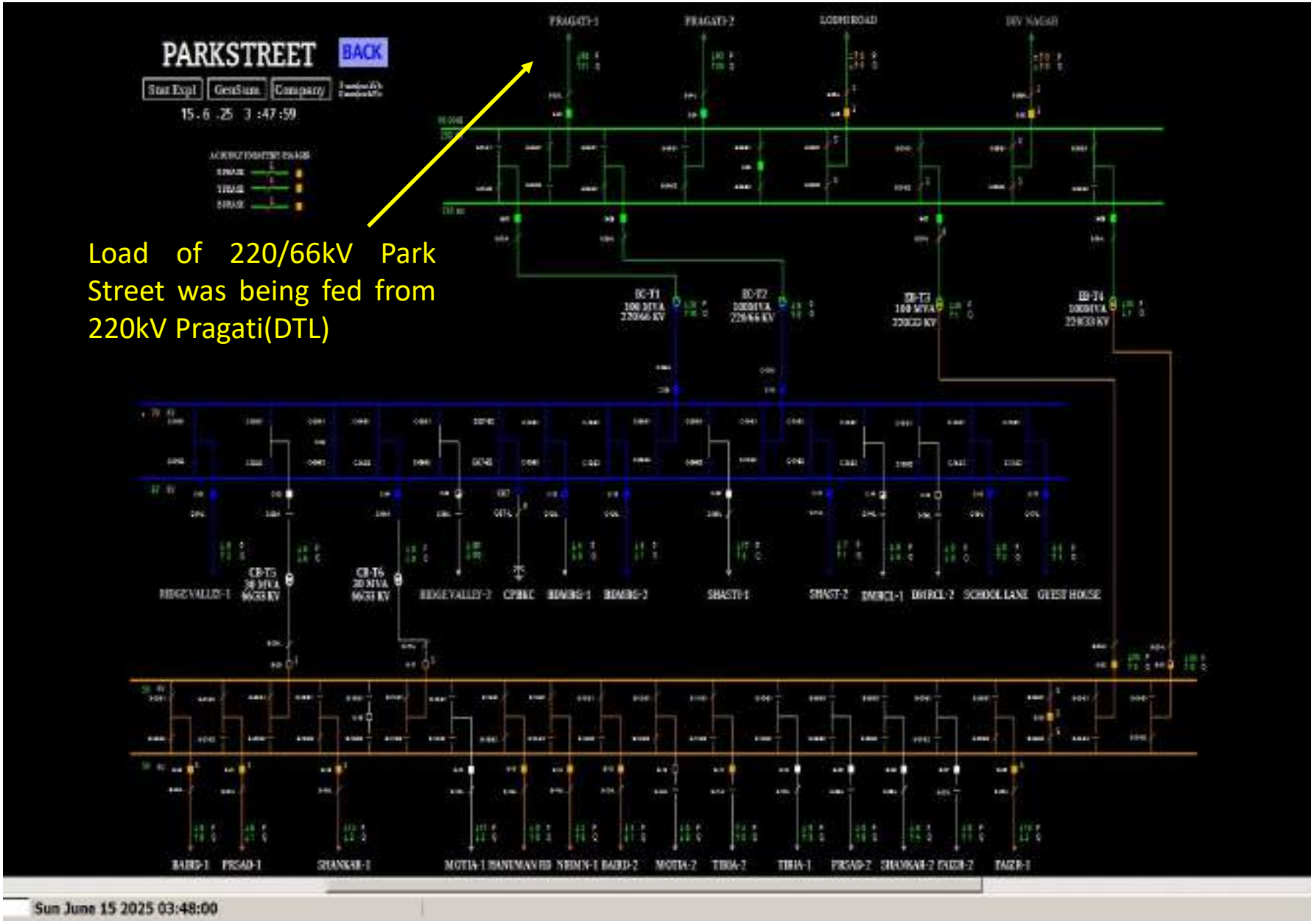
SLD of 220/66kV Pragati(DTL) (03:49:30hrs)



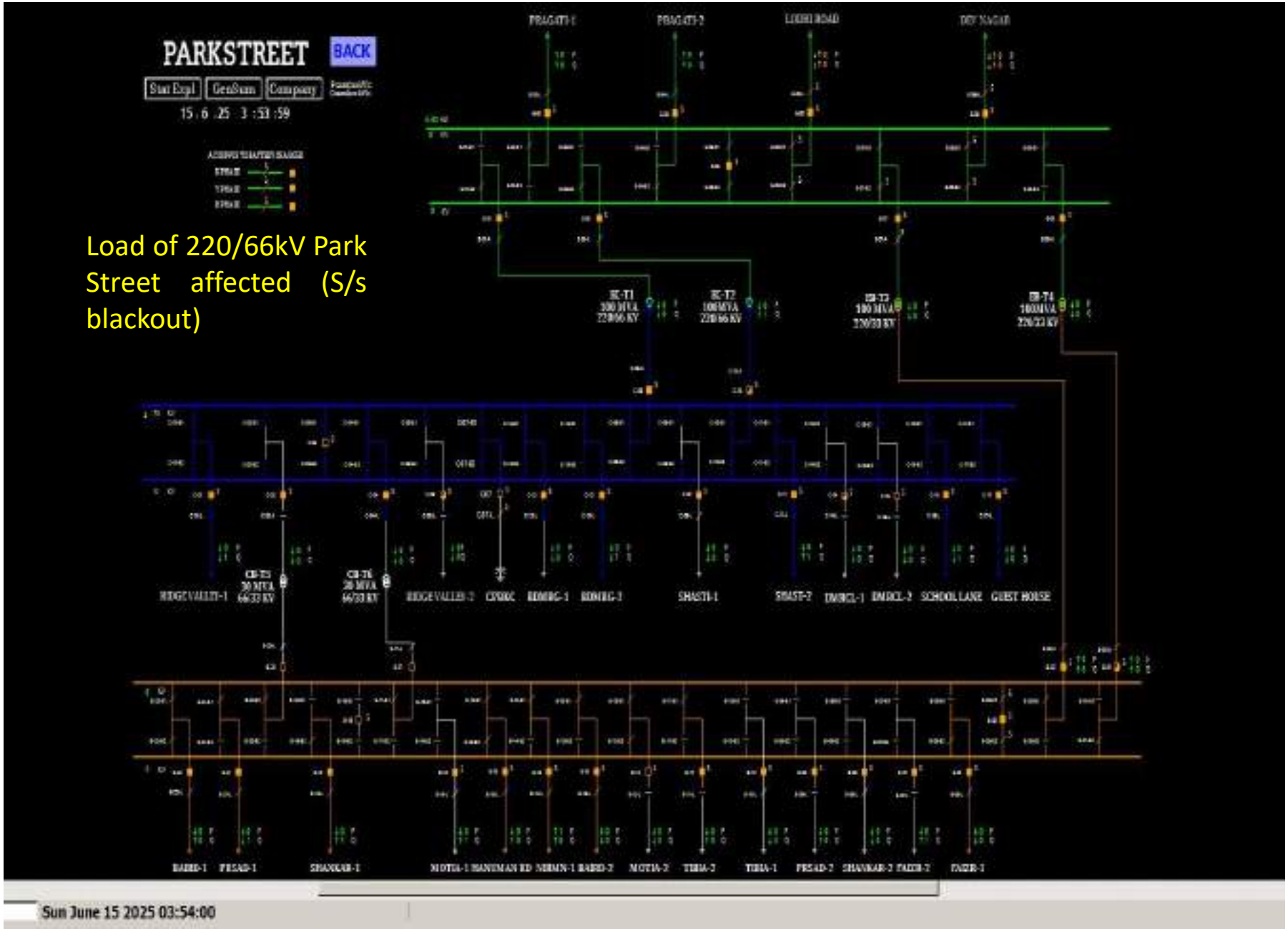
SLD of 220/66kV Pragati(DTL) (03:50hrs)



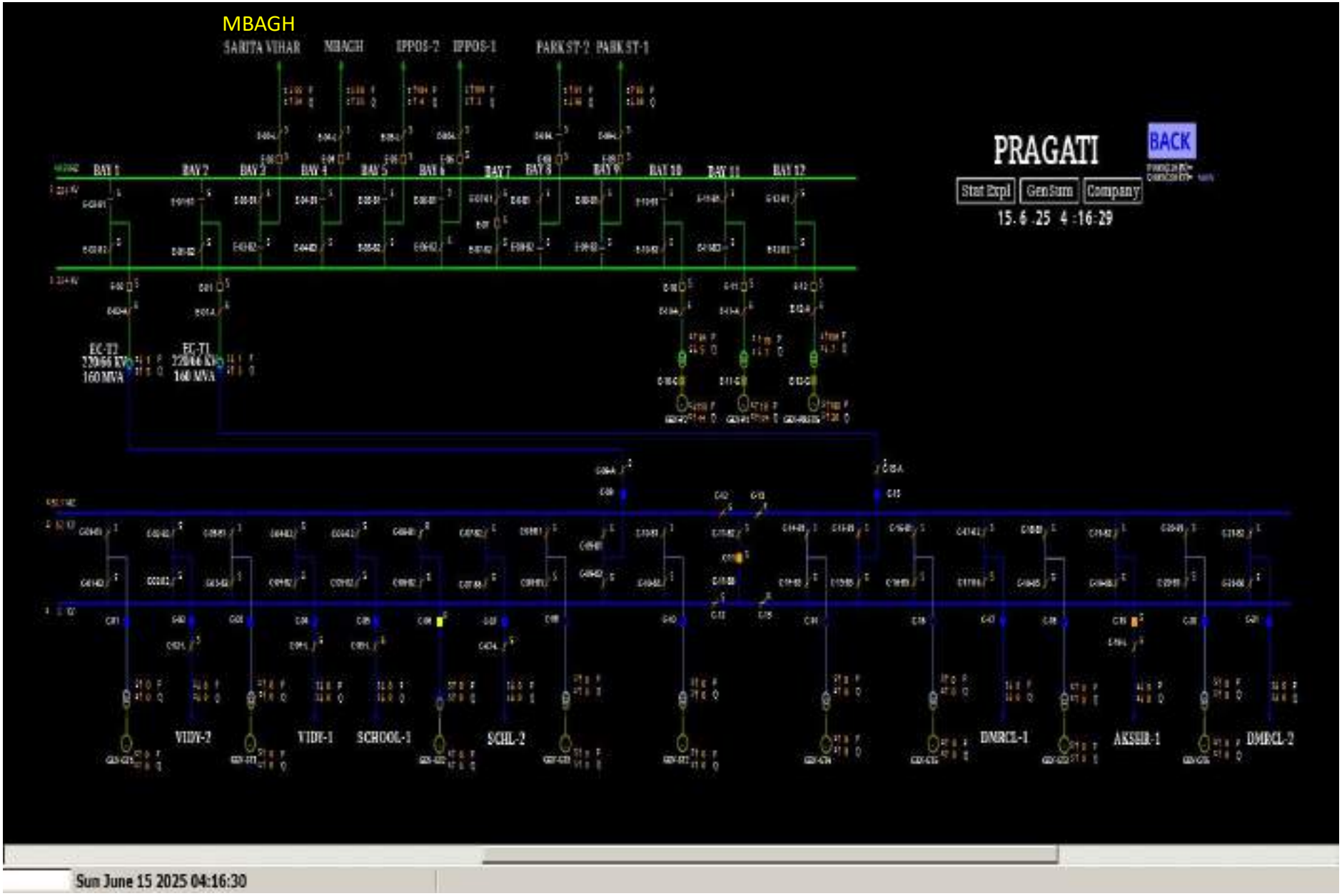
SLD of 220/66kV Park Street(DTL) (03:48hrs)



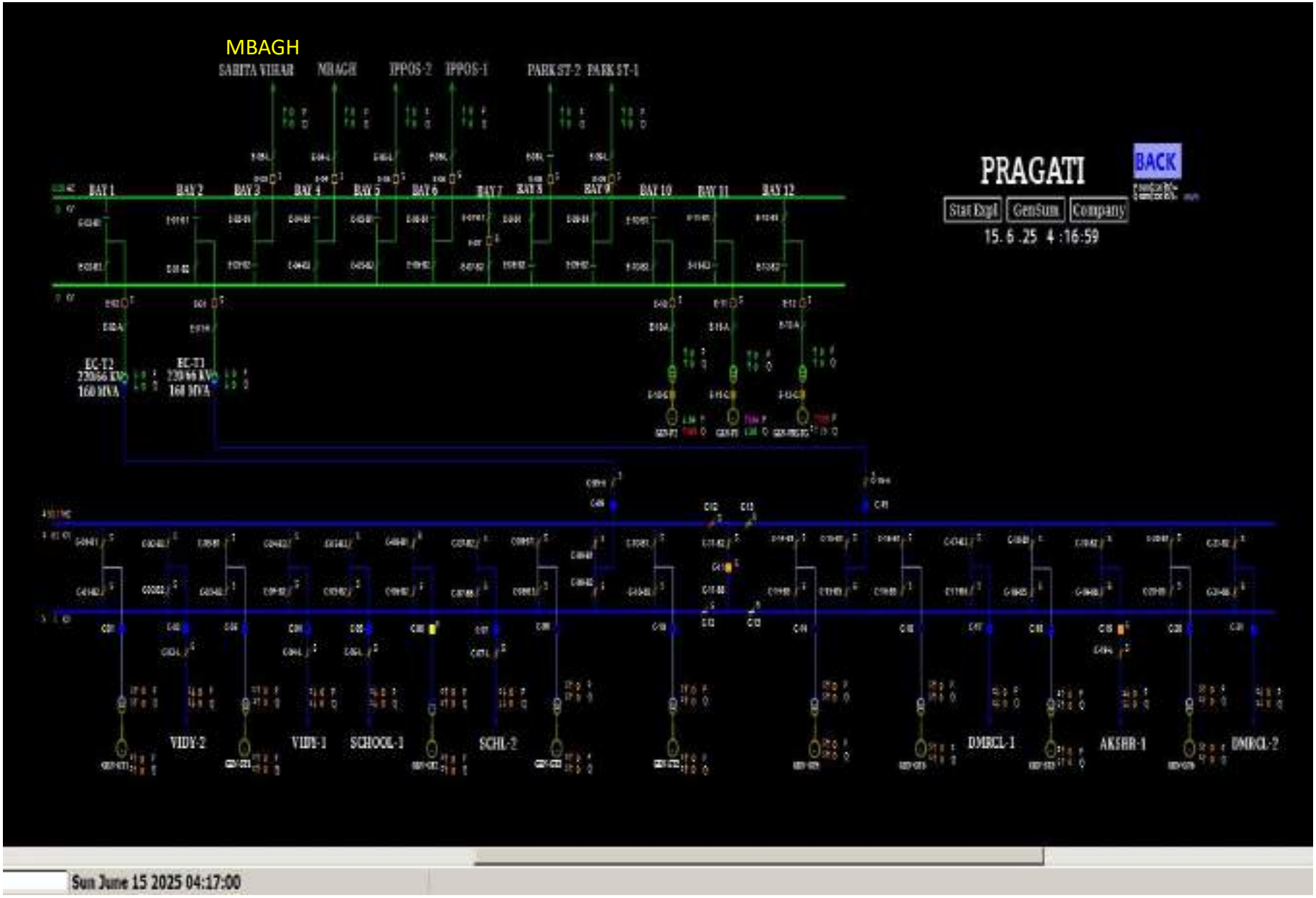
SLD of 220/66kV Park Street(DTL) (03:54hrs)



SLD of 220/66kV Pragati(DTL) (04:16hrs)



SLD of 220/66kV Pragati(DTL) (04:17hrs)

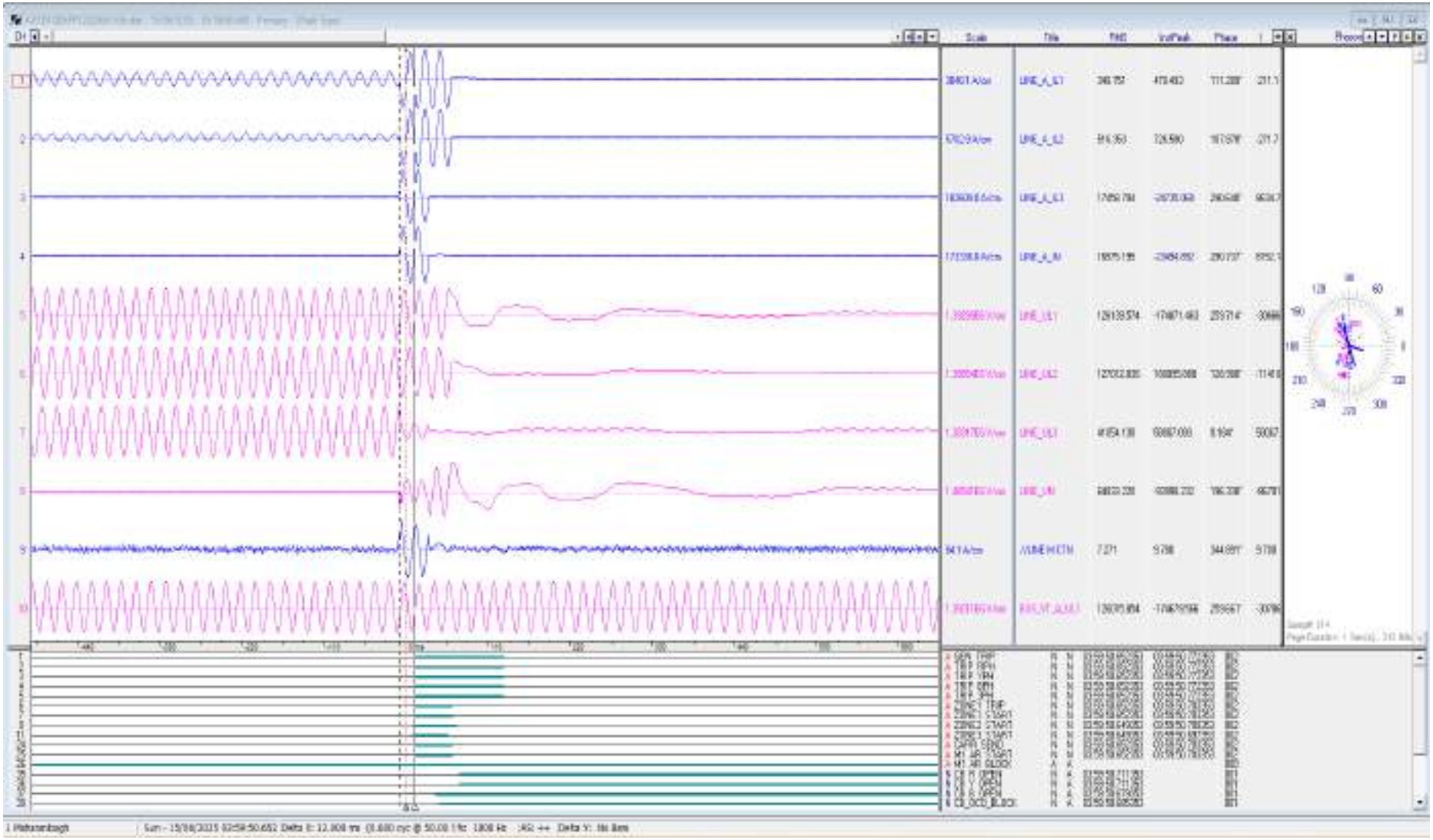


PMU Plot of phase voltage magnitude at Maharanibagh(PG)

03:55hrs/15-Jun-25



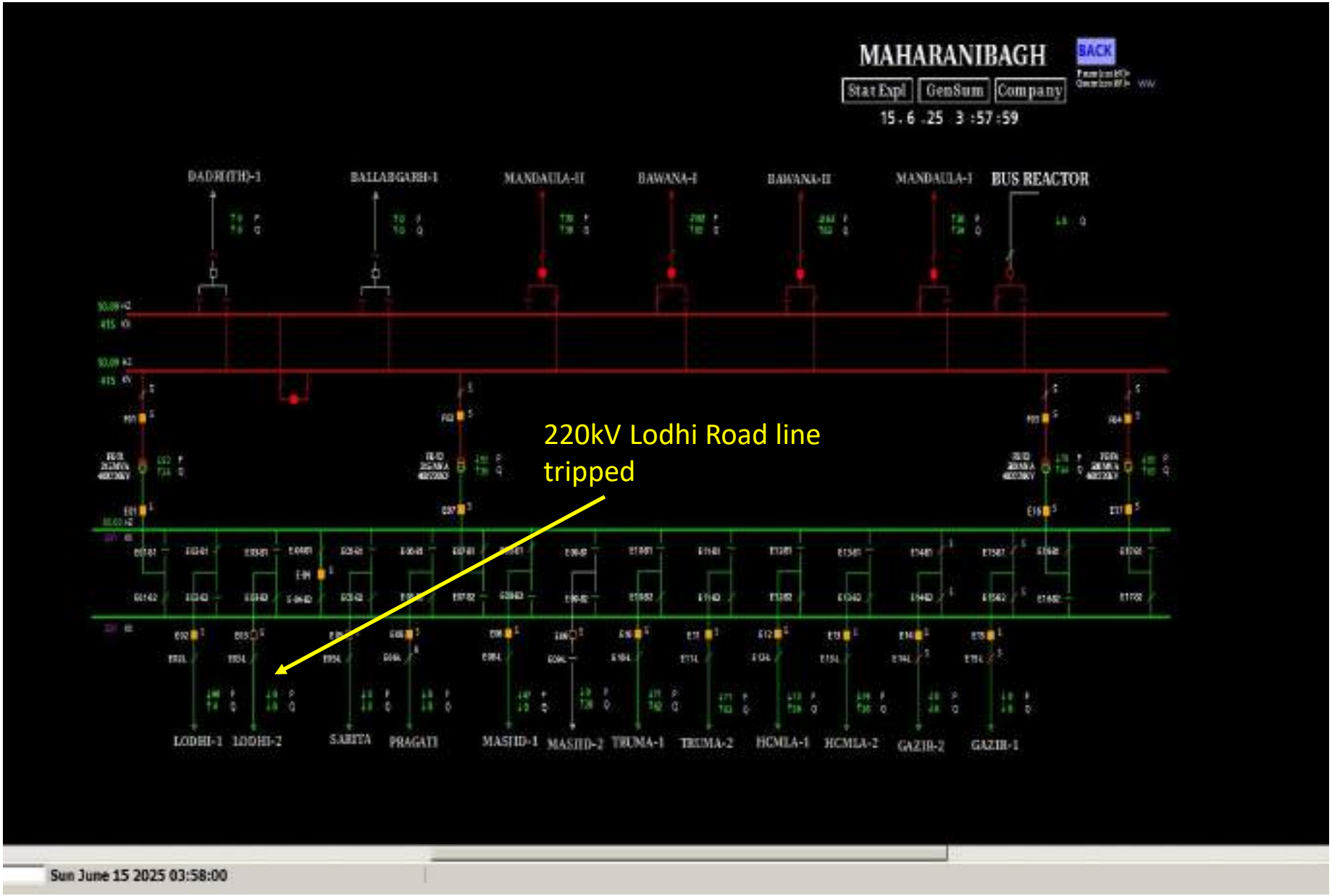
DR of 220kV Maharanibagh(end)-Lodhi Road line-2



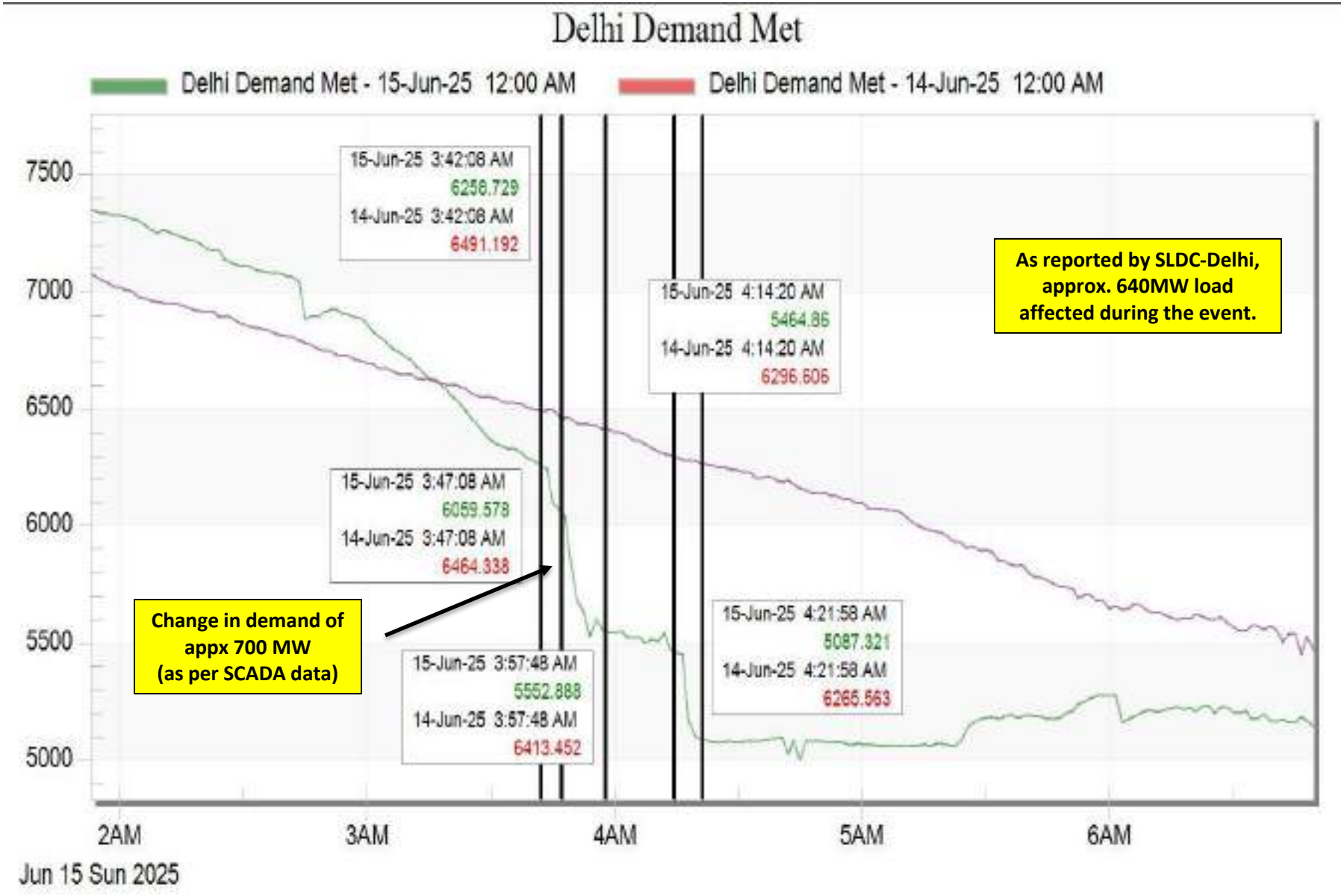
B-N fault, Ib=~17.4kA, Z-1

Observation: No A/R operation, time not GPS synced, Complete DR not recorded (time window issue), nomenclature is also not as per standard

SLD of 400/220kV Maharanibagh(03:58hrs)



Delhi Demand during the event



Delhi Demand during the event

Details of Delhi load affected during the event							
	Timings		Duration	Quantum		Affected Area/Circuits/	Remarks
	From hrs	To hrs	Hrs. Mins.	MW	MUs	Grid	
BRPL	03:53	04:35	00:42	20	0.014	Kilokari	Due to Bus Bar protection operated at 220 kV Pragati
	03:53	04:22	00:29	11	0.0053167	Sarai Julenna	
	03:53	04:12	00:19	8.6	0.0027233	Lajpat Nagar	
	03:53	04:27	00:34	3.5	0.0019833	Exbn Gd-2	
	03:53	04:33	00:40	6.8	0.0045333	Nzm	
BYPL	03:48	03:51	00:03	14	0.0007	Preet Vihar	Due to tripping of 220 kV Gazipur Ckt-1 & 2, Sarita Vihar Ckt-1, Lodhi Road Ckt-2 and Pragati Ckt at 220 kV Maharani Bagh
	03:48	03:53	00:05	30	0.0025	Khichiripur	
	03:48	03:53	00:05	4	0.0003333	Ppg Industrial Area	
	03:48	03:56	00:08	6	0.0008	Karkardooma	
	03:48	04:04	00:16	28	0.0074667	Vivek Vihar	
	03:48	04:05	00:17	25.5	0.007225	Mayur Vihar Ph-I	
	03:48	04:07	00:19	19	0.0060167	Mayur Vihar Ph-Ii	
	03:48	04:08	00:20	15.5	0.0051667	Shakarpur	
	03:48	04:10	00:22	10	0.0036667	Shakarpur	
	03:48	04:10	00:22	16.5	0.00605	I P Extension Grid (33/11Kv)	
	03:48	05:05	01:17	15	0.01925	Gh-I Grid	
	03:48	05:25	01:37	22.5	0.036375	Kondli Gharauli (	
	03:48	05:25	01:37	15	0.02425	New Kondli Grid	
	03:48	05:25	01:37	10	0.0161667	220 Kv Gazipur Grid	
	03:48	05:25	01:37	30	0.0485	Dallupura	
	03:48	05:48	02:00	23	0.046	Gh-Ii Grid (66/11Kv) Sstn	
	03:48	05:50	02:02	33	0.0671	Guru Angad Nagar (33/11Kv) Grid Sstn	
	03:48	05:52	02:04	4	0.0082667	Akshardham Temple 66/11Kv Grid Sstn	
	03:48	06:11	02:23	9.5	0.0226417	220 Kv Patparganjgrid Sstn (220/66/11Kv, Transco)	
	03:48	06:39	02:51	6.28	0.017898	220 Kv Patparganjgrid Sstn (220/66/11Kv, Transco)	
	03:48	04:10	00:22	0.5	0.0001833	Scope Minar	
	03:48	04:10	00:22	1	0.0003667	Mother Dairy	
	03:52	03:56	00:04	6.5	0.0004333	Lahori Gate 33/11Kv Grid S/Stn	

Delhi Demand during the event

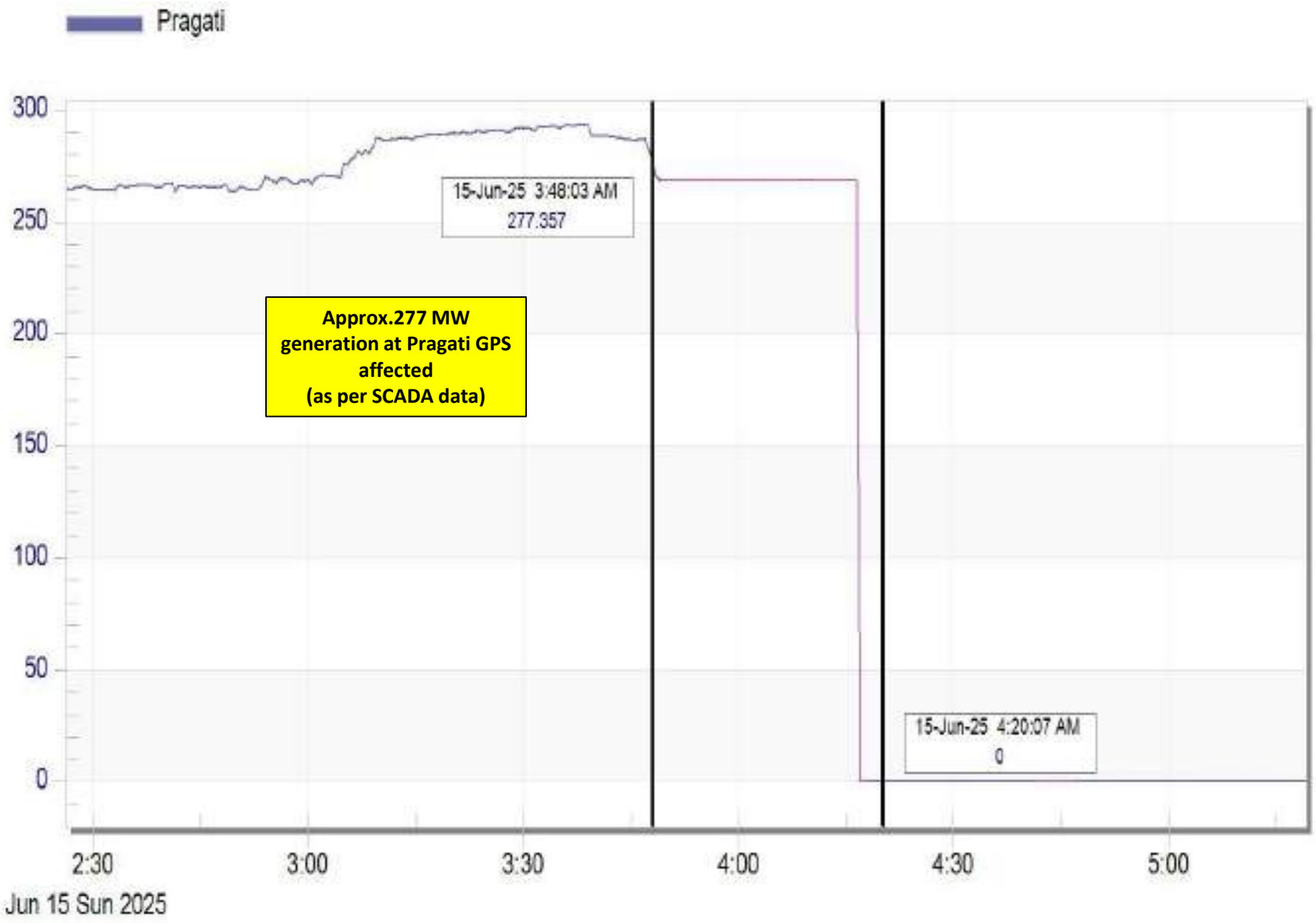
Details of Delhi load affected during the event							
	Timings		Duration	Quantum		Affected Area/Circuits/	Remarks
	From hrs	To hrs	Hrs. Mins.	MW	MUs	Grid	
BYPL	03:52	03:57	00:05	3	0.00025	Jama Masjid 33/11Kv Grid S/Stn	Due to tripping of 220 kV Gazipur Ckt-1 & 2, Sarita Vihar Ckt-1, Lodhi Road Ckt-2 and Pragati Ckt at 220 kV Maharani Bagh
	03:52	04:16	00:24	1.5	0.0006	Fountain 33/11Kv Grid S/Stn	
	03:52	04:23	00:31	6.5	0.0033583	B.G.Road Grid 33/11Kv S/Stn	
	03:52	04:30	00:38	11.7	0.00741	Faiz Road 33/11Kv Grid S/Stn	
	03:52	05:14	01:22	3	0.0041	Minto Road 33/11Kv Grid S/Stn	
	03:52	05:14	01:22	8	0.0109333	G.B. Pant 33/11Kv Grid S/Stn	
	03:52	05:14	01:22	20	0.0273333	Kamla Market 33/11Kv Grid S/Stn	
	03:52	05:14	01:22	2	0.0027333	I.G. Stadium 33/11Kv Grid S/Stn	
	03:52	05:14	01:22	4.5	0.00615	Deen Dyal Upadhaya Marg 33/11Kv Grid Sstn	
	03:52	05:24	01:32	10.5	0.0161	Shastri Park 66/33/11Kv Grid S/Stn	
	03:52	05:24	01:32	8	0.0122667	Tibia Collage Grid Sstn	
	03:52	05:24	01:32	9.5	0.0145667	Shankar Road 33/11Kv Grid S/Stn	
	03:52	05:24	01:32	19.75	0.0302833	Anand Parbat 33/11Kv Grid S/Stn	
	03:52	05:24	01:32	13	0.0199333	Dms 33/11Kv Grid S/Stn	
	03:52	05:24	01:32	11	0.0168667	Prasad Nagar 33/11Kv Grid S/Stn	
	03:52	05:47	01:55	15	0.02875	Prasad Nagar 33/11Kv Grid S/Stn	
	03:52	05:47	01:55	27	0.05175	Motia Khan 33/11Kv Grid S/Stn	
	03:52	05:57	02:05	6.5	0.0135417	Minto Road 33/11Kv Grid S/Stn	
	03:52	06:03	02:11	10.5	0.022925	Delhi Gate 33Kv/11Kv Grid Sstn	

Delhi Demand during the event

Details of Delhi load affected during the event							
	Timings		Duration	Quantum		Affected Area/Circuits/	Remarks
	From hrs	To hrs	Hrs. Mins.	MW	MUs	Grid	
BYPL	03:52	05:14	01:22	1	0.0013667	Mcd Civic Center	Due to tripping of 220 kV Gazipur Ckt-1 & 2, Sarita Vihar Ckt-1, Lodhi Road Ckt-2 and Pragati Ckt at 220 kV Maharani Bagh
	03:52	04:25	00:33	2.5	0.001375	Sir Ganga Ram Hospital	
	03:52	05:47	01:55	0.5	0.0009583	Omaxe	
	04:12	05:47	01:35	28	0.0443333	Vivek Vihar (66/33/11Kv) Grid Sstn	
TPDDL	03:52	03:53	00:01	3.25	0.0000542	Pusa	Due to Bus Bar protection operated at 220 kV Pragati
	03:52	03:54	00:02	4.5	0.00015	Rama Road	
	03:52	03:55	00:03	18.25	0.0009125	Gulabi Bagh	
Total				**640**	**0.0033417**		

As per details received from SLDC-Delhi, approx. 640 MW load affected during the event.

Pragati GPS generation during the event



PMU Plot of frequency at Bassi(PG)

03:48hrs/15-Jun-25



PMU Plot of frequency at Bassi(PG)

03:48hrs/15-Jun-25



SCADA SOE

Time	Station Name	Voltage(kV)	Element Name	Element Type	Element Status	Remarks
03:52:42,220	MAHARANIBAGH	220kV	E_05(PRGTI)	Circuit Breaker	Open	Line CB at Maharanibagh end of 220kV Maharanibagh-Pragati line opened
03:54:35,491	MAHARANIBAGH	220kV	E_03(LODHI-2)	Circuit Breaker	Open	Line CB at Maharanibagh end of 220kV Maharanibagh-Lodhi Road line-2 opened
04:16:04,487	PRAGATI	220kV	07MBC	Circuit Breaker	Open	Bus coupler at 220kV Pragati opened
04:16:04,522	PRAGATI	220kV	E_08(T2)	Circuit Breaker	Open	CB at 220kV side of 220/66kV ICT-2 at Pragati opened
04:16:04,523	PRAGATI	220kV	E_09(T1)	Circuit Breaker	Open	CB at 220kV side of 220/66kV ICT-1 at Pragati opened
04:16:04,542	PRAGATI	220kV	E_06(SARIV)	Circuit Breaker	Open	CB at Pragati end of 220kV Pragati-Sarita Vihar line opened
04:16:04,543	PRAGATI	220kV	E_07(MBAGH)	Circuit Breaker	Open	CB at Pragati end of 220kV Pragati-Maharanibagh line opened
04:16:04,544	PRAGATI	220kV	E_05(IPPOS-2)	Circuit Breaker	Open	CB at Pragati end of 220kV Pragati-IPPOS line-2 opened
04:16:04,546	PRAGATI	220kV	E_04(IPPOS-1)	Circuit Breaker	Open	CB at Pragati end of 220kV Pragati-IPPOS line-1 opened
04:16:04,574	PRAGATI	220kV	E_02(PARKS-2)	Circuit Breaker	Open	CB at Pragati end of 220kV Pragati-Park Street line-2 opened
04:16:04,575	PRAGATI	220kV	E_01(PARKS-1)	Circuit Breaker	Open	CB at Pragati end of 220kV Pragati-Park Street line-1 opened
04:16:04,578	PRAGATI	220kV	E_11(PRG_2)	Circuit Breaker	Open	CB of GT-2 at Pragati opened
04:16:04,596	PRAGATI	220kV	E_10(PRG_1)	Circuit Breaker	Open	CB of GT-1 at Pragati opened
04:16:04,598	PRAGATI	220kV	E_12(PRSTG)	Circuit Breaker	Open	CB of STG at Pragati opened
04:23:11,563	GTPS_DV	66	02VIDY2	Circuit Breaker	Open	Elements at 66kV side of 220/66kV Pragati opened
04:23:15,696	GTPS_DV	66	03ST1	Circuit Breaker	Open	
04:23:19,395	GTPS_DV	66	05SCHL1	Circuit Breaker	Open	
04:23:24,412	GTPS_DV	66	07SCHL2	Circuit Breaker	Open	

Points for Discussion

- At 03:48 hrs, 220kV Maharanibagh-Gajipur Line-1&2 tripped on Y-N fault. Observation w.r.t. tripping are as follows:
  - Relay flags related to fault location and distance protection initiation not available.
  - Reason of tripping of both the lines on single Y-N fault yet to be ascertained.
  - In DR files, “BB OPTD” flag is there, reason of its initiation also needs to be identified. Fault cleared with the delay of ~200msec, reason of delayed clearance of fault also needs to be identified.
- Further at 03:55 hrs, 220kV Maharanibagh-Lodhi Road line-2 tripped on B-N fault. As per PMU B-N fault is observed however DR file submitted for this line tripping is showing R-N fault. Exact details need to be shared.
- It is also observed that all the DR files i.e., bus bar relay DR of Pragati end, line protection relay DR w.r.t. Maharanibagh lines tripping are not in standard format. DRs nomenclature are not as per standard, time is not GPS synced. Therefore, standardization of recording instruments (DR/EL) needs to be ensured.
- Station Event logger file of 220kV Maharanibagh and 220kV Pragati(DTL) has not been shared yet. It also needs to be extracted for further analysis of the event.
- Details of remedial action taken to avoid such events in future along with detailed analysis of the event need to be shared.

Tripping Report – Multiple Elements Tripping in DTL

At 220kV Maharani Bagh & Pragati Substations on 15.06.2025 during period 03:48 hrs – 03:55 hrs

Introduction / Background

- 220kV Maharani Bagh is basically 220kV side of 400/220kV Maharanibagh (PG) station with double main bus scheme is connected to 220kV Gazipur, Lodhi Road, Pragati, Sarita Vihar, Masjid Moth, Trauma Centre and Electric lane.

- 220/66kV S/Stn Pragati (DTL) also has double main bus scheme is connected to 220kV Park Street, IP, Maharani Bagh and Sarita Vihar.

Trippings Summary

- Multiple substations affected: 220kV Maharani Bagh & 220kV Pragati
- Tripping Window: 03:48 hrs – 03:55 hrs on 15.06.2025
- Cause of trippings: Heavy windstorm / thunderstorm / rain in Delhi

Tripping Details

S. No	Name of Substation	Name of Bay	Time of Incidence	Time of Restoration	Relay Indication	DTL Observations
1.	220kV Maharani Bagh	220kV Gazipur Ckt-I	03:48 hrs	05:23 hrs	Distance pickup L2E & Distance Loop L2E. Y phase Fault Current 6.268 kA	Distance Relays sensed Zone-2 start during heavy storm condition but both Gazipur Ckt-I and Ckt-II tripped through BB as per the DR available. Peripheral unit (PU) of ABB make Bus-Bar Protection Scheme which is an old scheme wrongly issued tripping commands to the circuits in 200ms. The old REB 500 scheme is set to be up-graded & replaced by PGCIL in coordination with DTL.
2.	220kV Maharani Bagh	220kV Gazipur Ckt-II	03:48 hrs	05:23 hrs	Distance pickup L2E & Distance Loop L2E. Y phase Fault Current 8.6 kA	
3	220kV Maharani Bagh	220kV Pragati Circuit - II	3:52 hrs	05:22 hrs	General Trip, Y- Phase, Zone-1, Distance pickup L2E & Distance Loop L2E, 4.7 km. Y- phase, Fault current 11.9 kA	Main-2 Siemens make relay over-reached and got tripped due to Bus Fault at Pragati.
4	220kV Maharani Bagh	220kV Lodhi Road-II	03:55 hrs	06:04 hrs	General Trip, B phase Trip, Zone1, Distance Pickup L3E, Distance LoopL3E, 2.4km, E/F & F/L. B-phase fault current 17.4 kA.	

Tripping Details

S. No	Name of Substation	Name of Bay	Time of Incidence	Time of Restoration	Relay Indication	DTL Observations
5	220kV Pragati	220kV IP Ckt-I	3.52hrs	04:48 hrs	Bus-bar protection operated, Z-1 & Z-2, Y-N Phase-earth fault.	Y-N Phase-earth fault, 18.1kA (bus fault), Bus-bar Z-1 & Z-2 protection operated. All the elements connected at Pragati tripped.
		220kV IP Ckt-II		04:48 hrs		
		220kV ParkStreet Ckt-I		04:48 hrs		
		220kV ParkStreet Ckt-II		04:48 hrs		
		220/66kV 160 MVA ICT-1		06:29 hrs		
		220/66kV 160 MVA ICT-2		05:04 hrs		
		GT-1				
		GT-2				
		STG-1				

Observations

1. Multiple tripping occurred during period 03:48 hrs – 03:55 hrs on 15.06.2025 due to heavy windstorm/ thunderstorm and rain in Eastern Delhi region.

2. At 03:48 hrs 220kV Gazipur Ckt-I and II distance relay picked up on Y-E fault, Fault current of 6.26kA but got tripped after 200ms on BB as per the available DR at 220kV S/Stn Maharani Bagh.

3. At 03:52 hrs., Y-N Ground fault of 29 kA magnitude occurred in 220 kV Bus-1 at 220kV S/Stn Pragati, thereby tripping all the connected elements of Bus-1 as well as 220 kV Bus coupler on Bus differential Zone-1 operation. After 41 ms of operation of Bus-1 differential, another fault of 16.8 kA magnitude occurred in the dead zone of Bus coupler Y-Ph (between CT and breaker), and since the check zone (Zone-6) was already high, it resulted tripping of all the connected elements of Bus-2 on Bus differential Zone-2 operation. Both the above faults were cleared in 100 ms (along with CB opening time).

Observations

4. At 03:52 hrs. 220kV Pragati Ckt-2 at 220kV S/Stn Maharani bagh got tripped on Zone-1 as Main-2 Siemens make relay over-reached and got tripped due to Bus Fault at 220kV S/Stn Pragati. Settings have been revised.

5. At 03:55 hrs. 220kV Lodhi Road Ckt-2 at 220kV Maharanibagh tripped on distance protection Zone-1 , B-N fault, Fault current of 17.4kA.

6. All the trippings cleared the faults within the prescribed time.

Compliance

S. No	Observations by NRPC	DTL Compliance
1.	At 03:48 hrs, 220kV Maharani Bagh- Gazipur Lines-1 & 2 tripped on Y-N fault. Observations w.r.t tripping are as follows:	
a)	Relay flags related to fault location and distance protection initiation not available.	Distance Relays sensed Zone-2 start during heavy storm condition but both Gazipur Ckt-I and Ckt-II tripped through BB as per the DR available. Peripheral unit (PU) of ABB make Bus-Bar Protection Scheme which is an old scheme wrongly issued tripping commands to the circuits in 200ms. After checking the connections, some of the connections which were found to be loose were tightened and the problem has been rectified. The old REB 500 scheme is set to be up-graded & replaced by PGCIL in coordination with DTL.
b)	Reason of tripping of both the lines on single Y-N fault yet to be ascertained. In DR files, “BB OPTD” flag is there, reason of its initiation also needs to be identified.	
c)	Fault cleared with the delay of about 200ms, reason of delayed clearance of fault also needs to be identified.	

Compliance

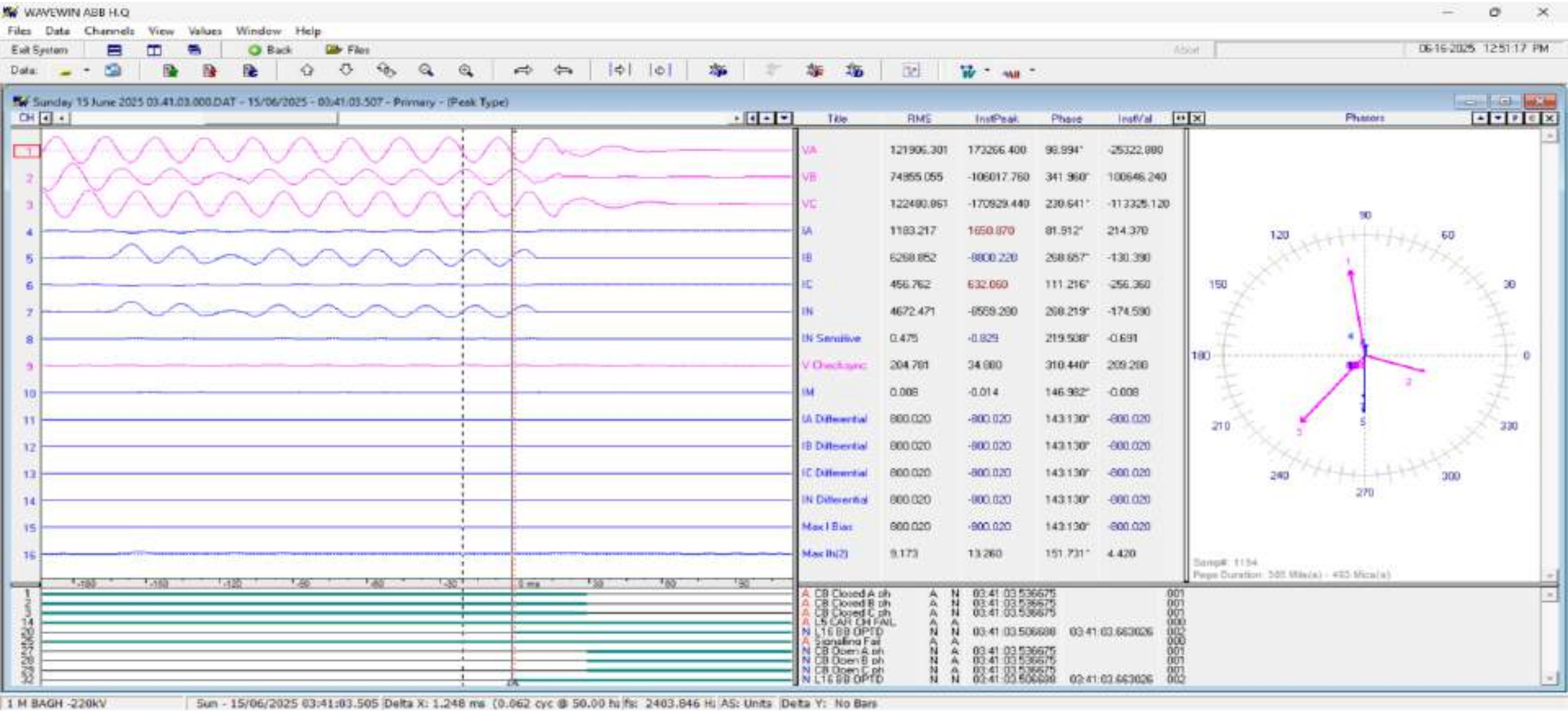
S. No	Observations by NRPC	DTL Compliance
2.	It is observed that all the DR files i.e bus bar relay DR of Pragati end, line protection relay DR w.r.t Maharani Bagh lines tripping are not in standard format. DRs nomenclature are not as per standard, time is not GPS synced. Therefore, standardization of recording instruments (DR/EL) needs to be ensured.	DR nomenclatures shall be revised for better clarity at the earliest. Time synchronization issue at 220kV S/Stn Maharani Bagh shall be resolved at the earliest.
3.	Station Event logger file of 220kV Maharani Bagh and 220kV Pragati (DTL) has not been shared yet. It also needs to be extracted for further analysis of the event.	Detailed sequence of events and tripping report already submitted.

Compliance

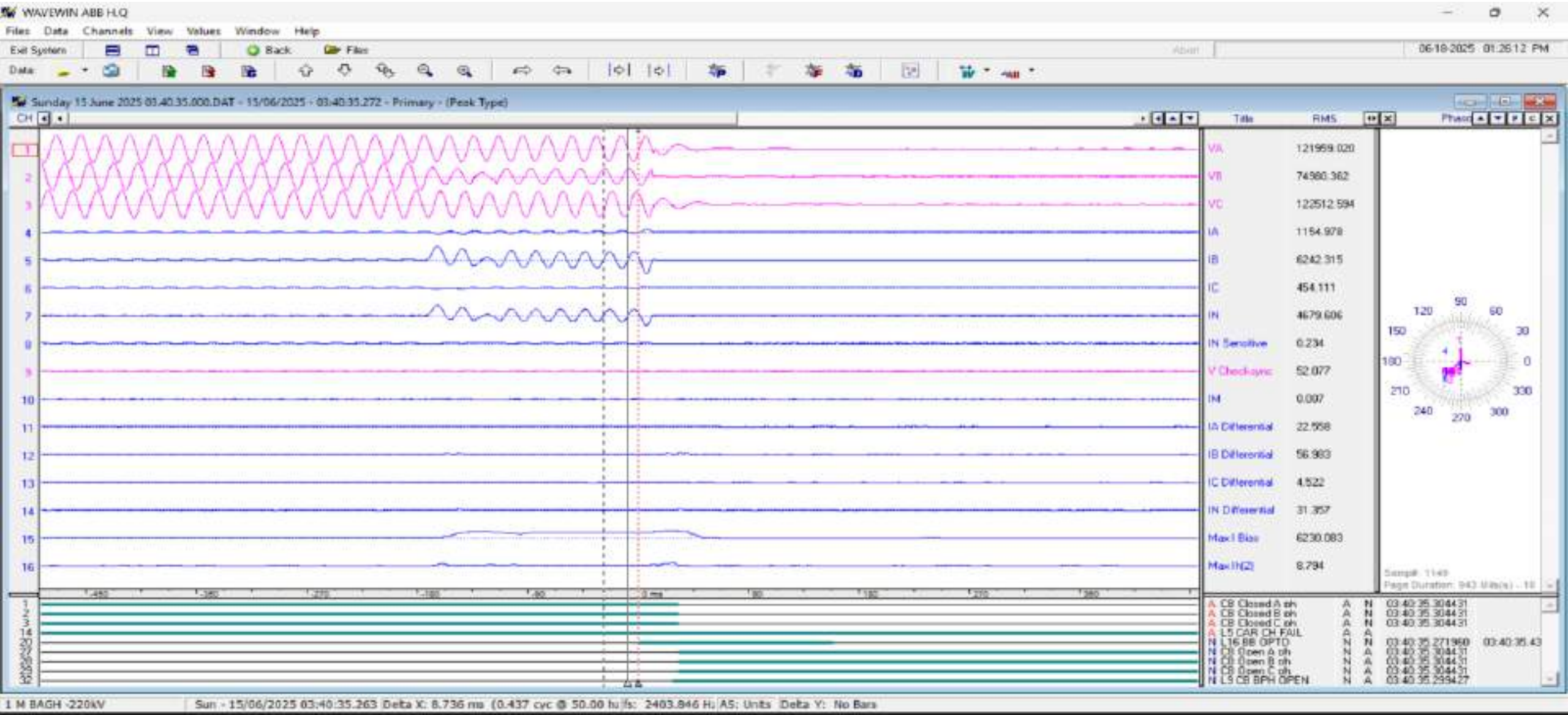
S. No	Observations by NRPC	DTL Compliance
4.	Details of remedial action taken to avoid such events in future along with detailed analysis of the event need to be shared.	1) At Pragati substation, all the protection operated correctly within the prescribed time limits as there was an actual bus-bar fault due to heavy windstorm/ thunderstorm/ rain conditions. 2) At Maharani Bagh substation: a) Bus-bar protection scheme shall be upgraded and replaced by PGCIL in co-ordination with DTL. b) Time synchronization issue shall be resolved at the earliest. 3) Various relay connections shall be checked for tightness on regular basis to avoid any maloperation. 4) DR nomenclatures shall be revised for better clarity at the earliest.

Disturbance Records

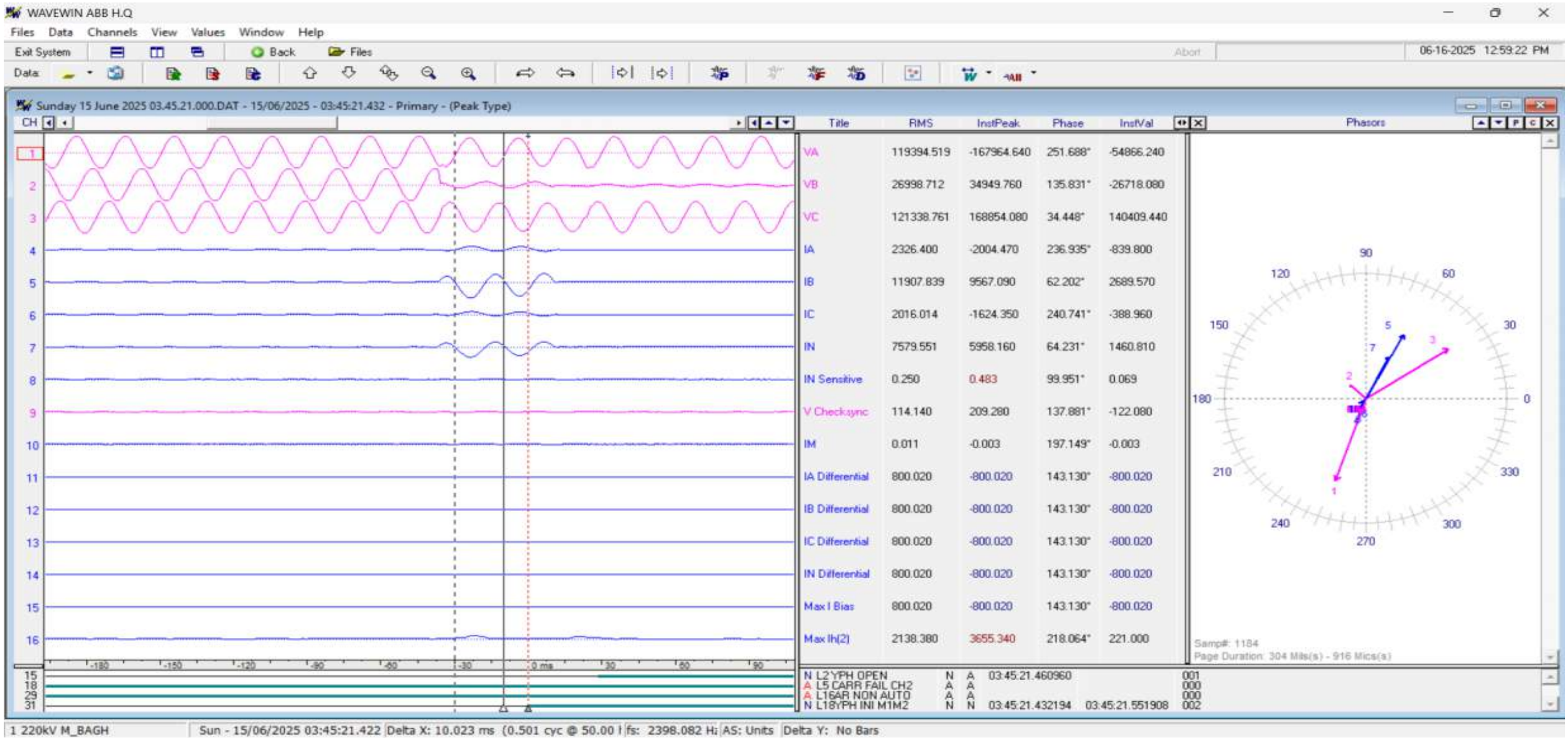
1) DR of 220kV Gazipur Ckt-1 from 220kV S/Stn Maharanibagh end at 03:48 Hrs (Pre-fault 133 kV, 388Amp) (Fault Y-phase, 74 kV, 6.2 kA)



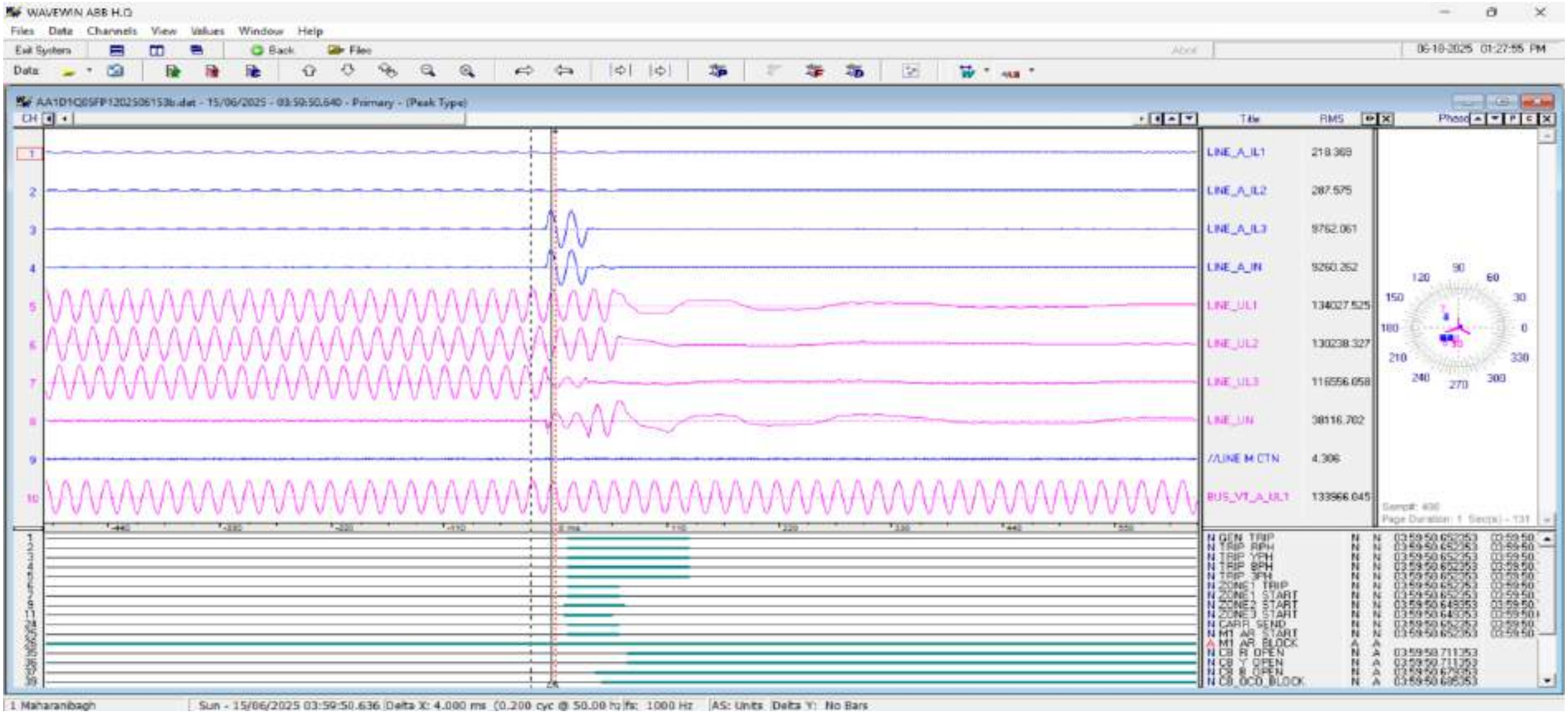
2) DR of 220kV Gazipur Ckt-2 at 220kV S/Stn Maharanibagh end 03:48 Hrs (Pre-fault 133 kV, 392Amp) (Fault Y-phase, 74 kV, 8.6 kA)



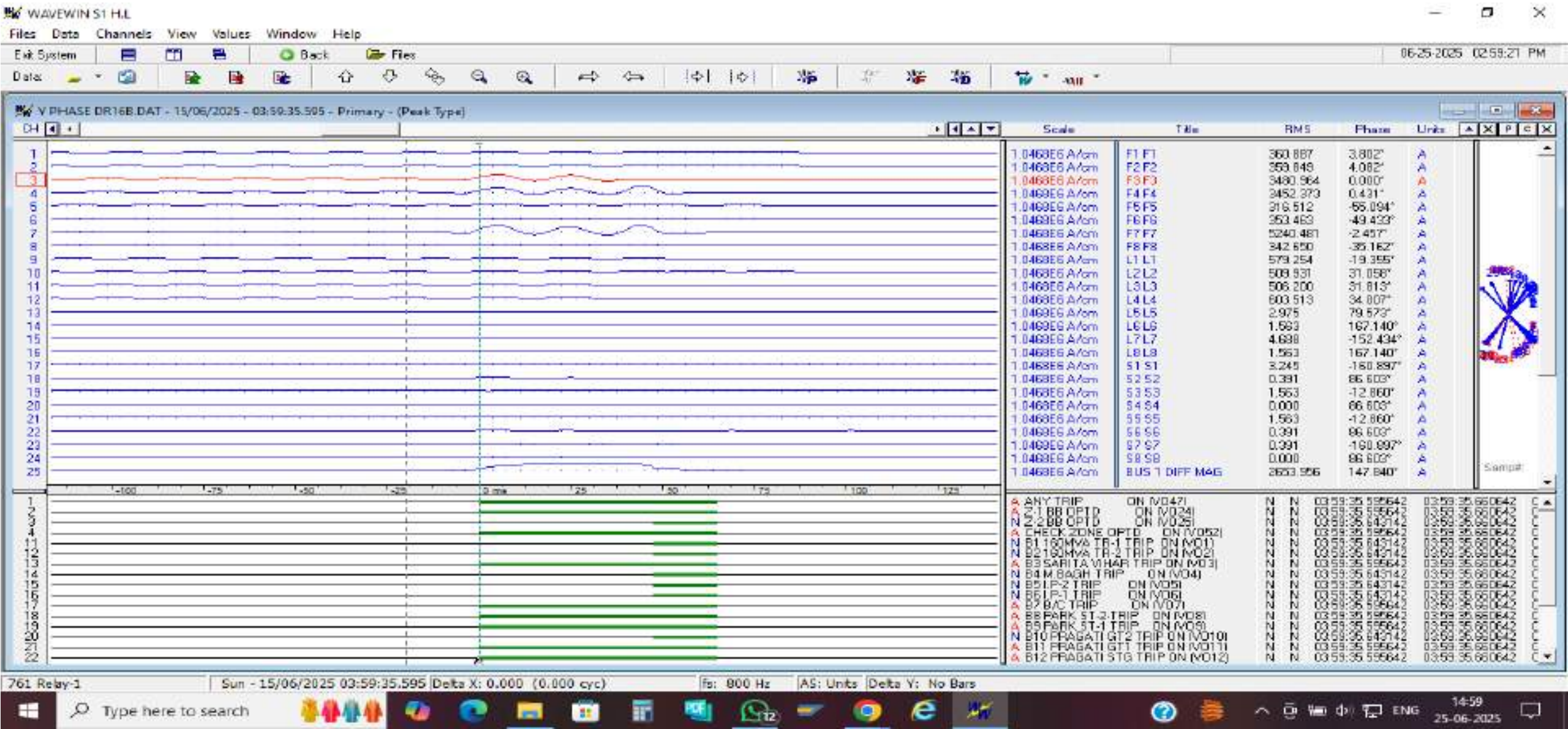
3) DR of 220kV Pragati Ckt -II from 220kV S/Stn Maharanibagh end at 03:52 Hrs (Pre-fault 134 kV, 128 Amp) (Fault Y-phase, 27 kV, 11.9 kA)



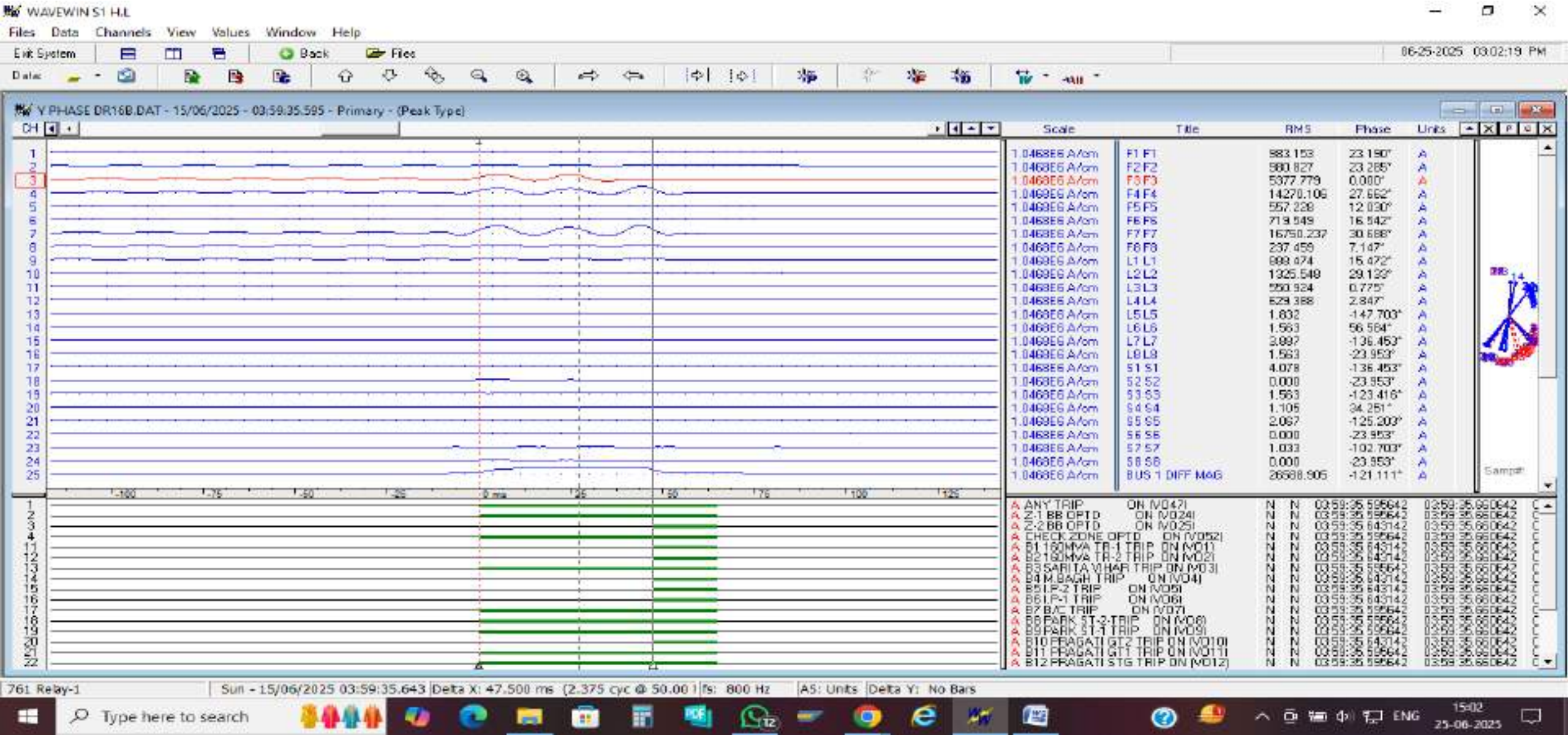
4) DR of 220kV Lodhi Road Ckt- II from 220 kV S/Stn Maharanibagh end at 03:53 Hrs (Pre-fault 133 kV, 88 Amp) (Fault B-phase, 41 kV, 17.4 kA)



5) DR for operation of Bus Differential Zone-1 at 220 kV Pragati Sub-station on 15.06.2025 at 03:52 hrs.



6) DR for operation of Bus Differential Zone-2 at 220 kV Pragati Sub-station on 15.06.2025 at 03:52 hrs.



Multiple Element Tripping Event at 220/132kV Pampore(J&K)

At 23:25 hrs on 20.06.2025

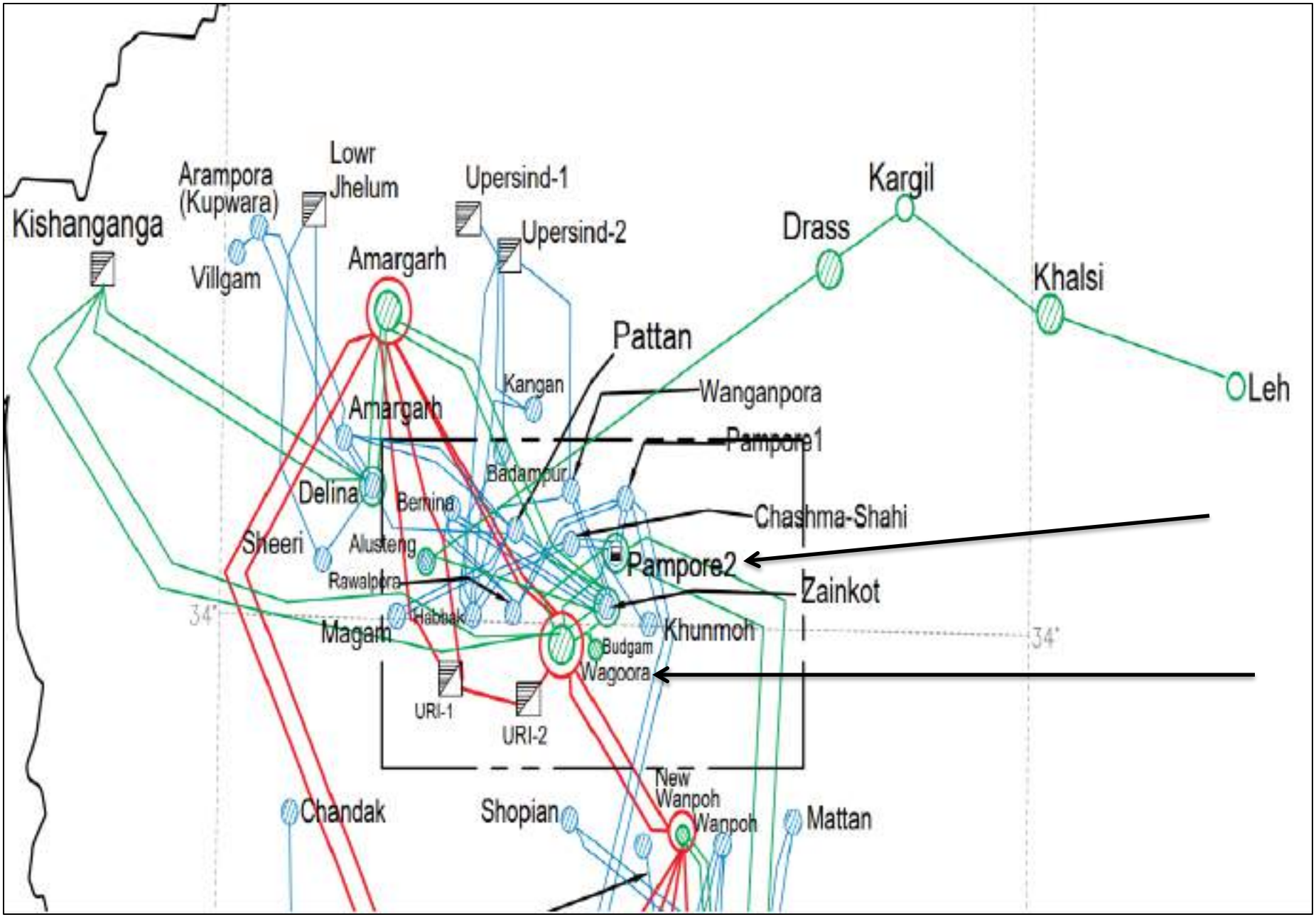
Tripped Elements

S. No	Name of Elements	Outage Time	Revival Time	Reason of tripping
1.	220 KV Wagoora(PG)-Pampore(PDD) (PG) Ckt-1	23:25 hrs	03:27 hrs (21.06.25)	Y-N phase to earth fault
2.	220 KV Wagoora(PG)-Pampore(PDD) (PG) Ckt-2		03:26 hrs (21.06.25)	

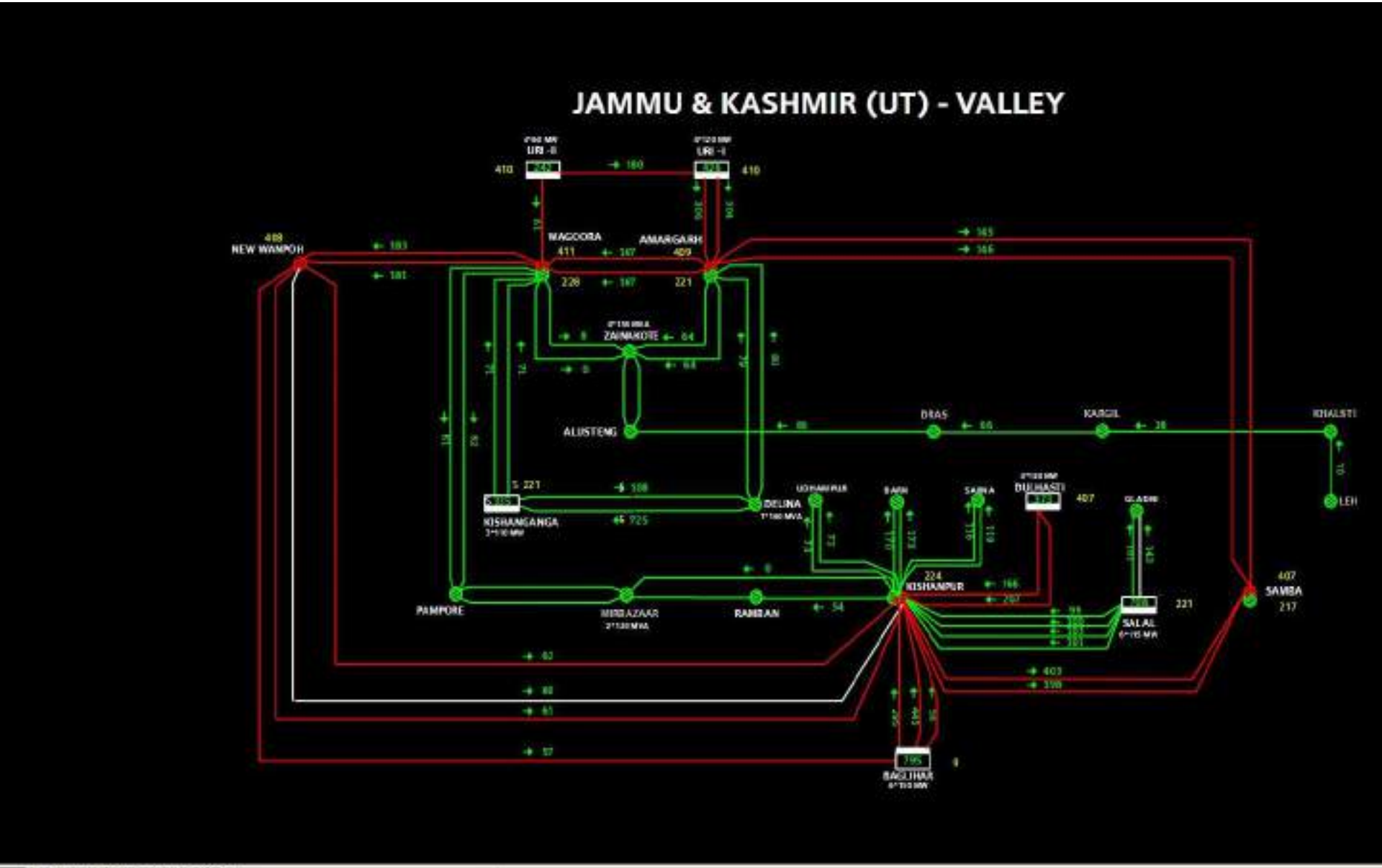
Brief details of the event

i. 400/220kV Wagoora(PG) has double main and transfer Bus arrangement at both 400KV and 220KV side. 220/132kV Pampore(J&K) has double bus scheme at 220kV level however SCADA data is not healthy there.
ii. During antecedent condition, power flow from Wagoora(PG) S/s to Pampore(PDD) S/s was approx. 162 MW (81 MW each) through 220 KV Wagoora(PG)-Pampore(PDD) (PG) D/C. Load of 220/132kV Pampore(J&K) was being fed from Wagoora only.
iii. As reported at 23:25 hrs, Y-phase Transformer Bushing at Pampore failed. On this fault, 220kV Wagoora(PG)-Pampore(PDD) (PG) Ckt-1 & 2 tripped from Wagoora end.
iv. As per PMU at Amargarh(INDIGRID), Y-N phase to earth fault clearing time of 160ms is observed.
v. As per DR of Wagoora end, distance protection relay of both the lines sensed the fault in Z-2, fault current was ~11kA in line-2 and ~8.5kA in line-1.
vi. Due to tripping of both the lines, load of 220/132kV Pampore(J&K) affected. As per SCADA, change in demand of approx. 190 MW is observed in J&K control area.

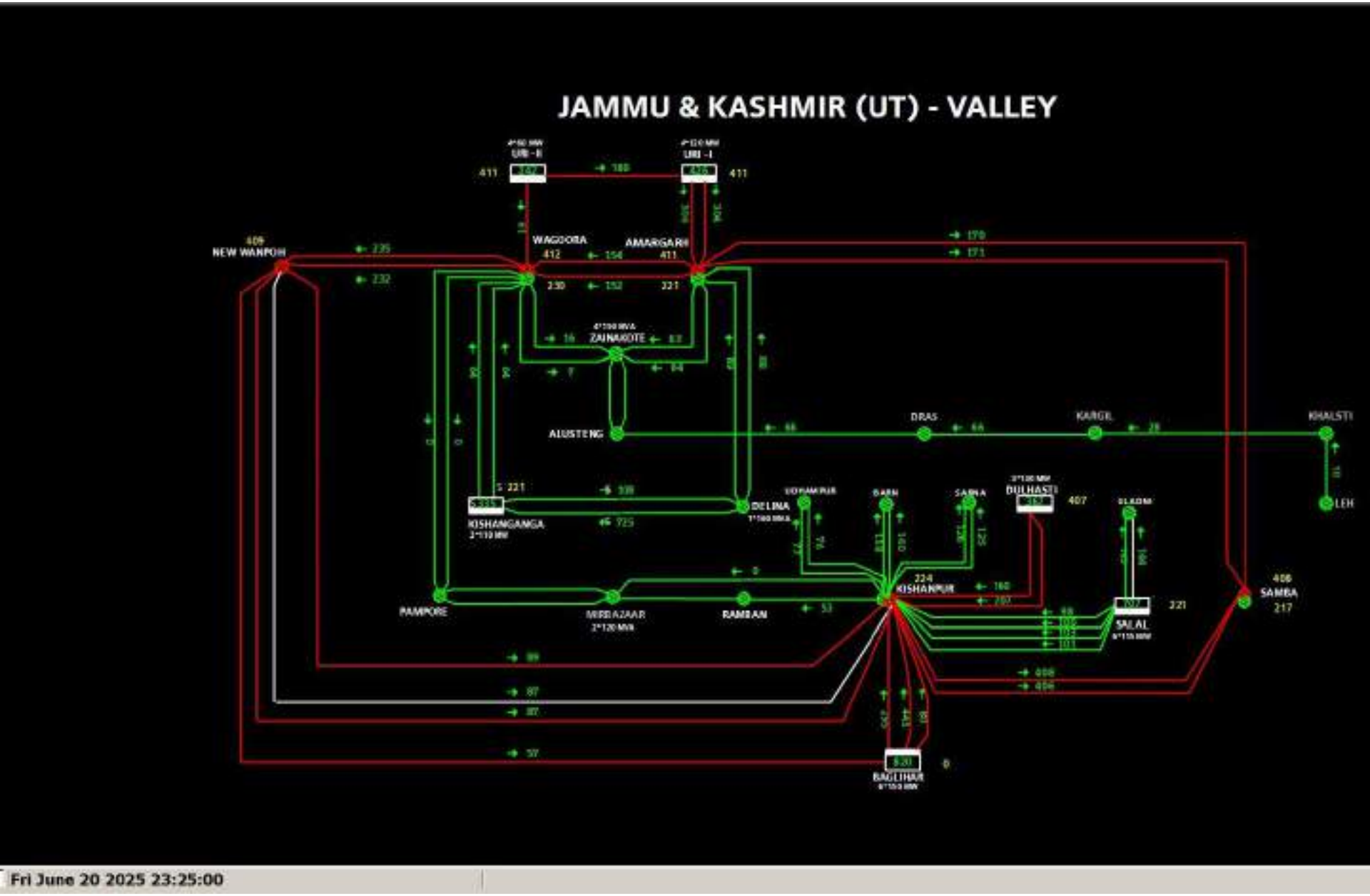
Network Diagram



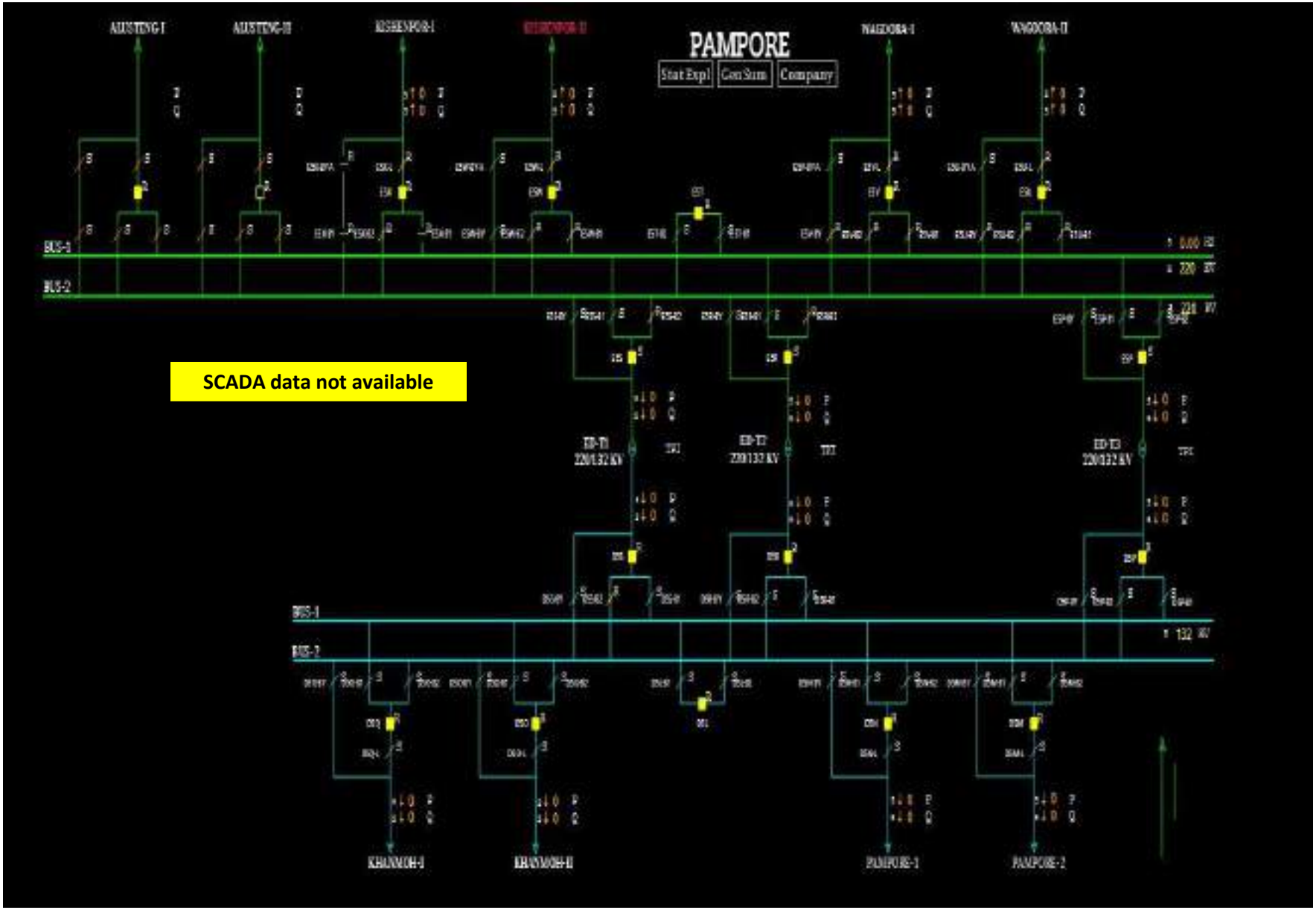
J&K Valley Network Diagram before the event



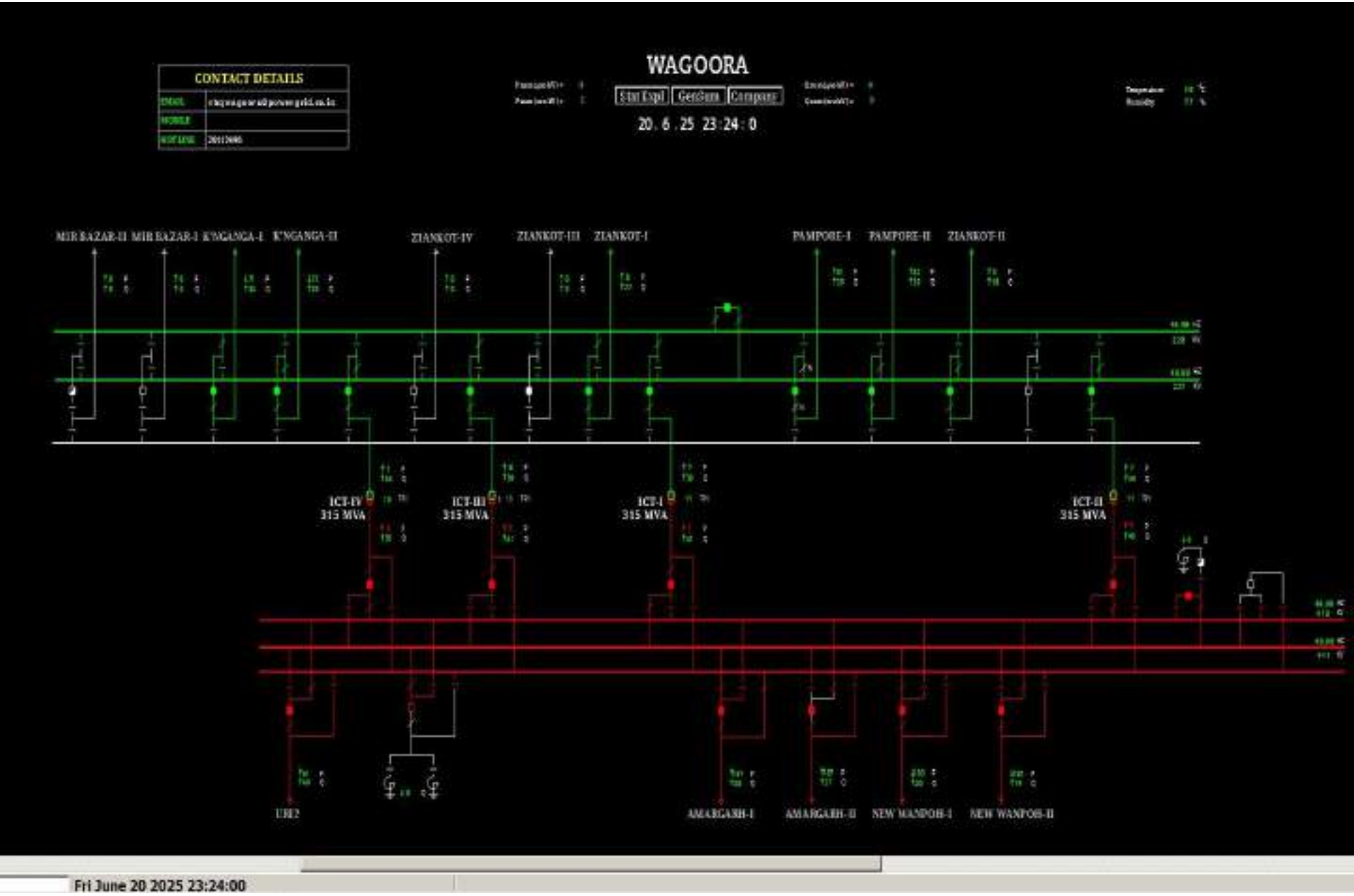
J&K Valley Network Diagram after the event



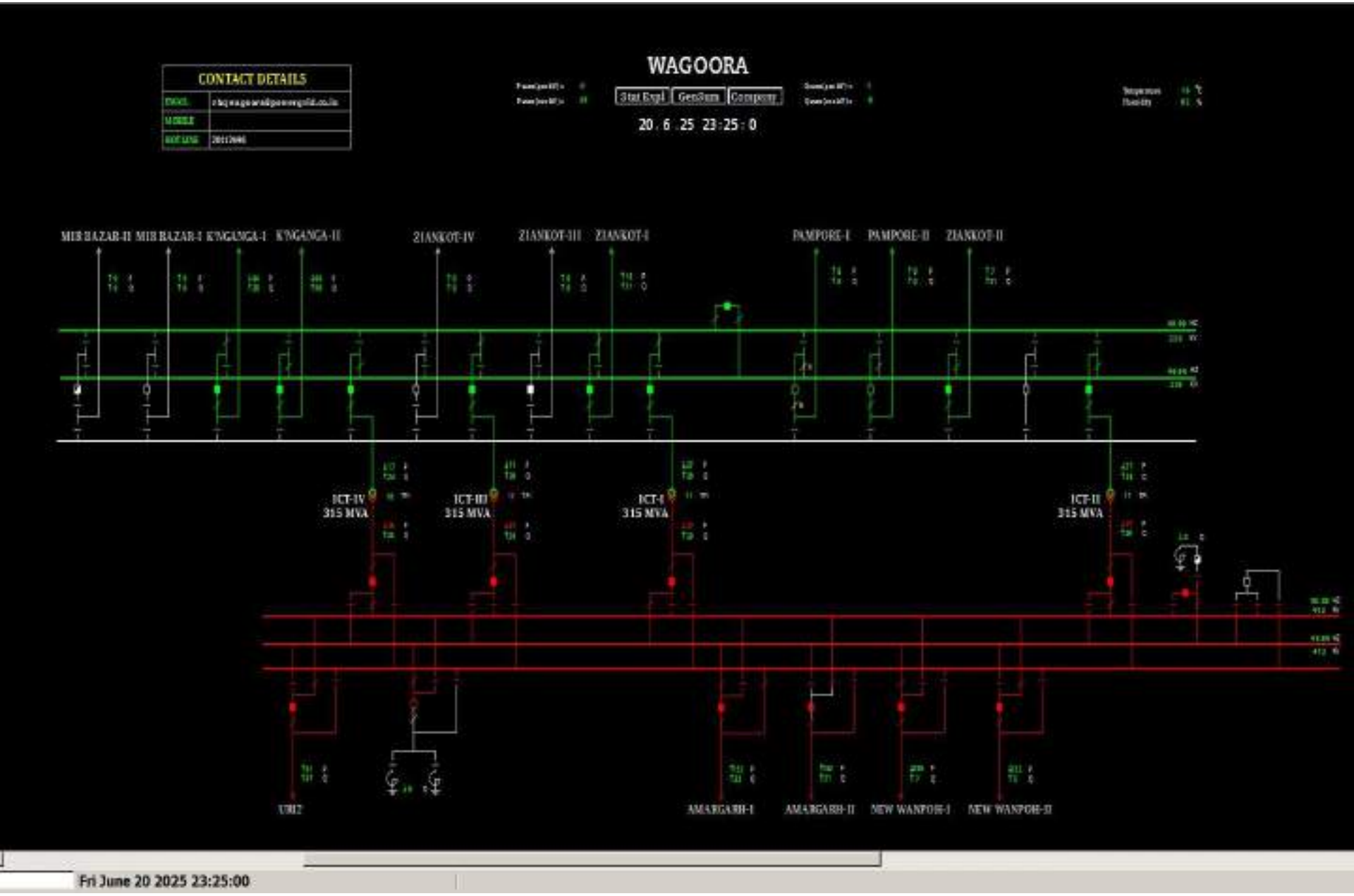
SLD of 220/132kV Pampore



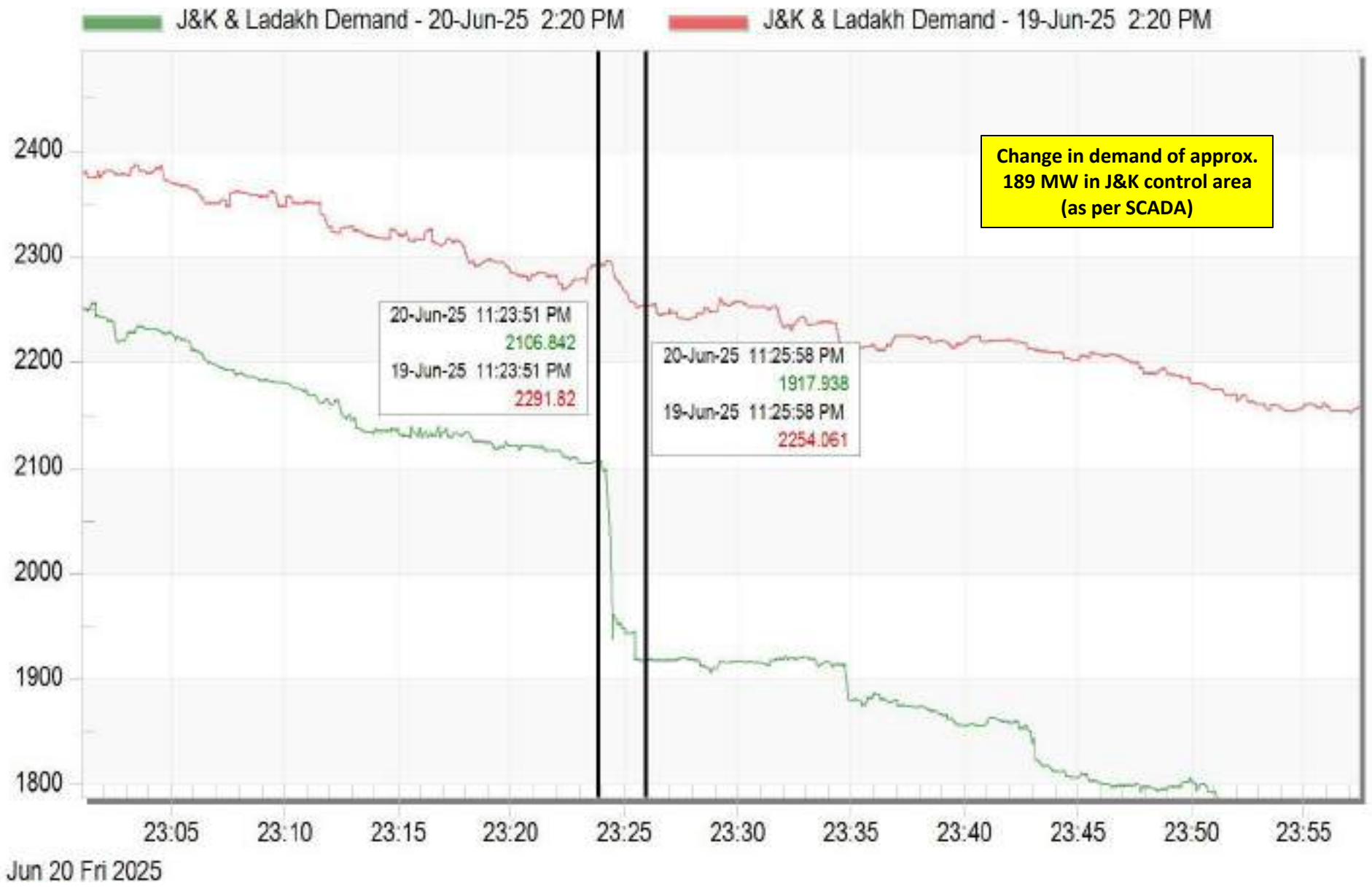
SLD of 400/220kV Wagoora(PG) before the event



SLD of 400/220kV Wagoora(PG) after the event



J&K Demand during the event



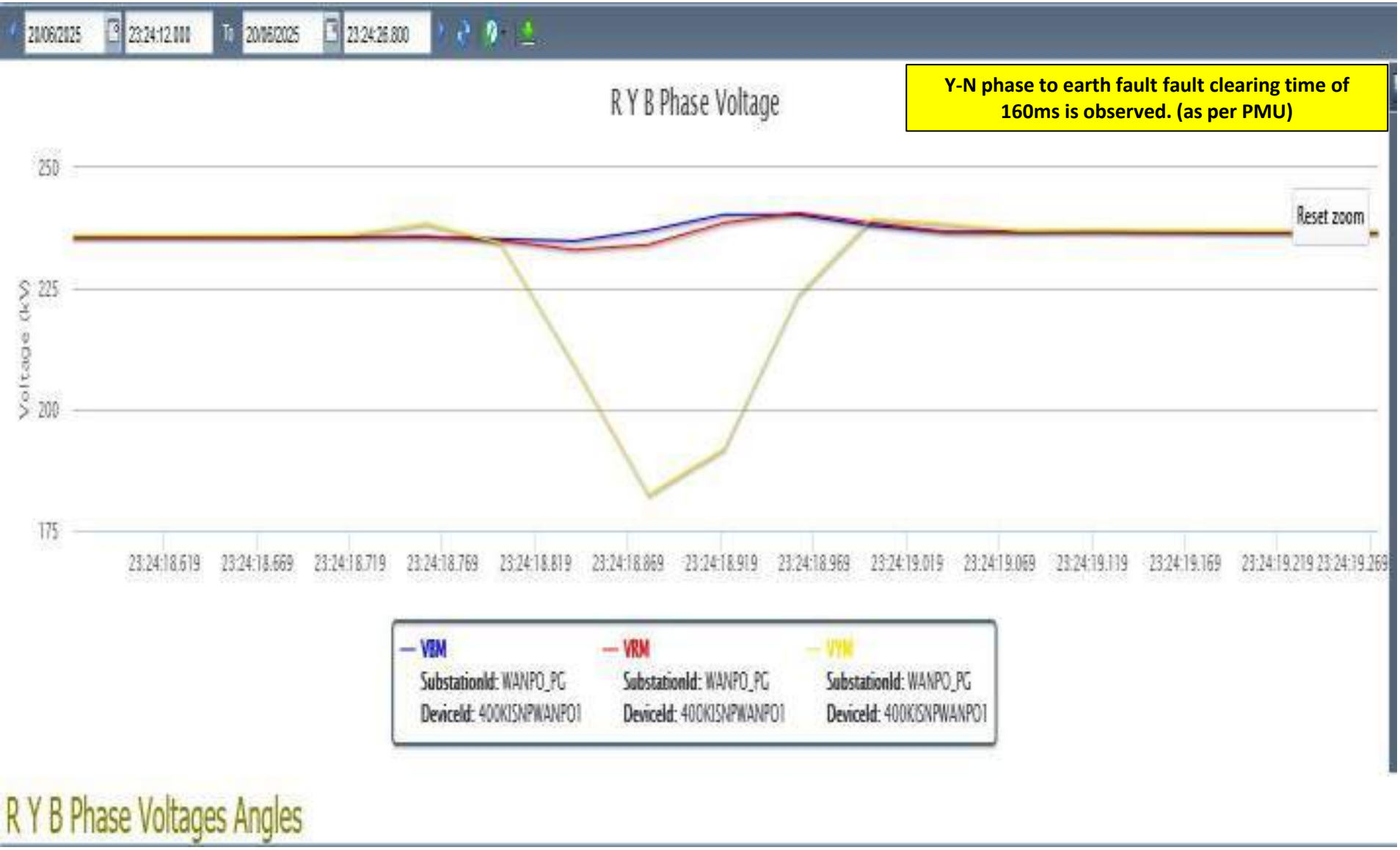
PMU Plot of frequency at New Wanpoh(PG)

23:25 hrs/20-Jun-25

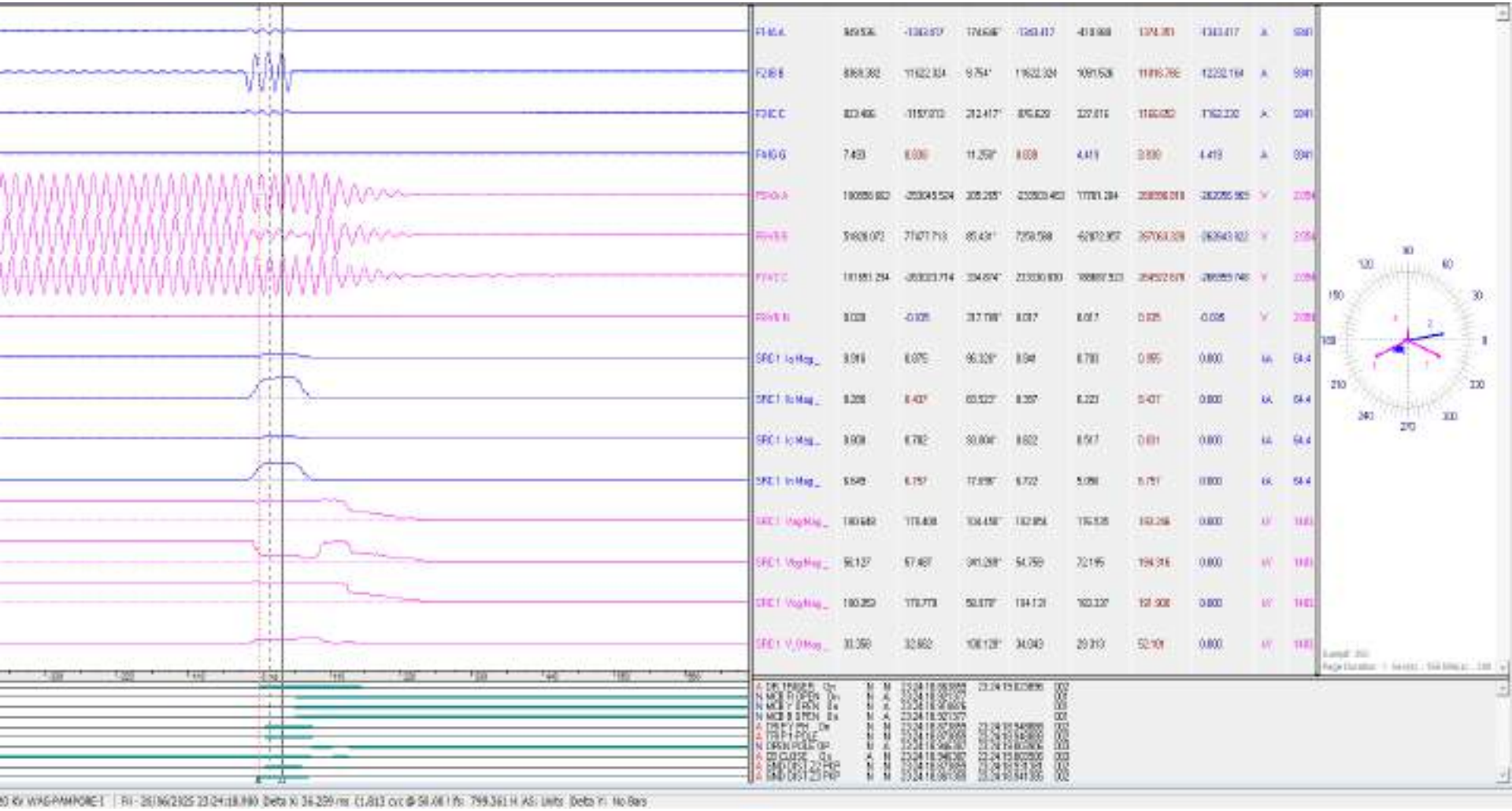


PMU Plot of phase voltage magnitude at New Wanpoh(PG)

23:25 hrs/20-Jun-25

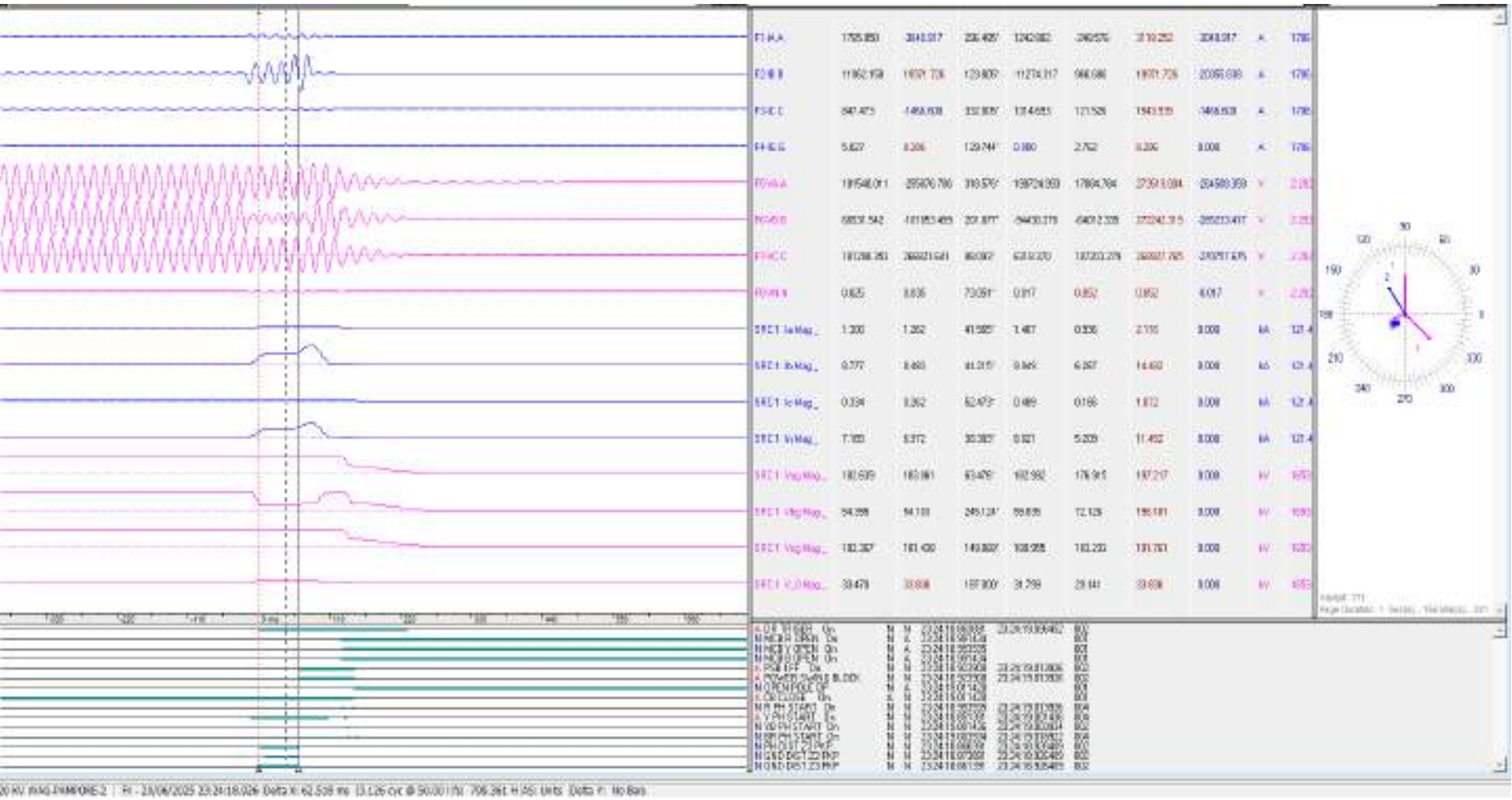


DR Of 220 KV WAGOORA(PG)(end)-PAMPORE(PDD) (PG) CKT-1



- ✓ Y-N phase to Earth fault.
- ✓ Z-2 distance protection operated. Iy = 8.4KA, tripped with no delay

DR Of 220 KV WAGOORA(PG)(end)-PAMPORE(PDD) (PG) CKT-2



- ✓ Y-N phase to Earth fault.
- ✓ Z-2 distance protection operated. Iy = 12KA, tripped with ~100msec delay.

Points for Discussion

i. Exact location of fault and nature of protection operated need to be shared.
ii. Why did both 220kV line trip from Wagoora end? Time delay setting of Z-2 at Wagoora end also need to be shared as line tripped within ~160msec.
iii. SCADA data was not available for 220/132kV Pampore(PDD JK) S/s during the event. Tripping is also not recorded in SCADA SOE. Availability and healthiness of SCADA data need to be ensured.
iv. DR/EL (.dat/.cfg file) along with tripping report of the tripped elements at Pampore(J&K) end need to be shared.
v. Remedial action taken report need to be shared.

Multiple Element Tripping Event at 220/132kV Moga(PS), 220 kV /66 kV Badhni kalan(PS) & 220/66 kV Himmatpura(PS)

At 11:06 hrs on 01.07.2025

Tripped Elements

S. No	Name of Elements	Outage Time	Revival Time	Reason of tripping
1.	220 KV Moga(PG)-Moga(PS) (PSTCL) Ckt-2	11:06 hrs	13:54 hrs	R-ph jumper of 220 KV Moga(PG)-Moga(PS) (PSTCL) Ckt-3 snapped and came in contact with Y-ph conductor.
2.	220 KV Moga(PG)-Moga(PS) (PSTCL) Ckt-3		21:50 hrs	
3.	220 KV Moga(PG)-Moga(PS) (PSTCL) Ckt-4		15:26 hrs	
4.	220 KV Moga(PS)-Kotkaror (PSTCL) Ckt-1		11:52 hrs	
5.	220 KV Moga(PS)-Kotkaror (PSTCL) Ckt-2		11:52 hrs	
6.	220kV Moga(PS)-Sadiq Ckt		17:17 hrs	
7.	220kV GHTP-Himmatpura (PS) Ckt-1			Details yet to be shared
8.	220kV GHTP-Himmatpura (PS) Ckt-2			
9.	220 KV Moga(PG)-Badhni kalan(PS) (PSTCL) Ckt-1		11:54 hrs	
10.	220 KV Moga(PG)-Ajitwal(PS) (PSTCL) Ckt-1		12:50 hrs	Busbar protection operated aT Ajitwal(PS)
11.	220kV Ajitwal-Himmatpura (PS) Ckt			
12.	220kV Badhni kalan-Himmatpura (PS) Ckt			Details yet to be shared

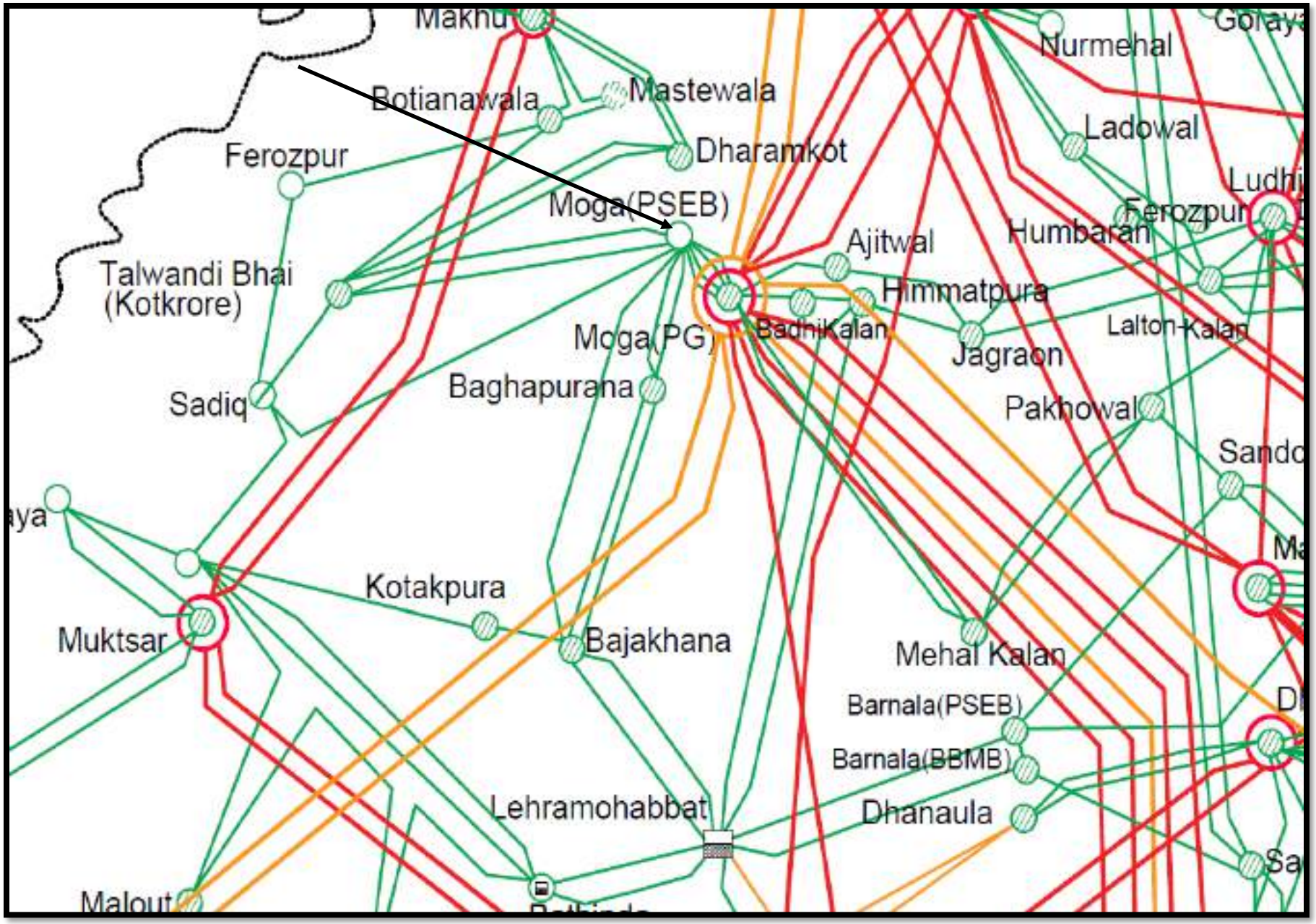
Brief details of the event

- 220/132 KV Moga (PS) has double main bus system at 220KV level.
- During antecedent condition, 220 KV Moga(PS)-Bajakhana (PSTCL) Ckt was under outage and also 220kV Moga(PS)-Baghapurana Ckt-1 & 2 was already under tripped condition. As reported, at 10:50 hrs, R-phase conductor of 220kV Moga(PS)-Baghapurana Ckt-2 snapped and both the lines tripped in zone-1 protection operation at Moga end (exact reason of tripping of 220kV Moga(PS)-Baghapurana Ckt-1 need to be analysed).
- As reported at 11:06 hrs, R-phase jumper of 220 KV Moga(PG)-Moga(PS) (PSTCL) Ckt-3 snapped and came in contact with Y-phase conductor. On this fault O/C E/F relay at Moga(PS) end did not pick up (which was only in operation during the event) and line tripped from Moga(PG) end only.
- This fault was also fed by 220 KV Moga(PG)-Moga(PS) (PSTCL) Ckt-2 & 4 and these Ckt-2 also tripped from Moga(PG) end only while Ckt-4 tripped from both the ends (exact nature of protection operated yet to be shared).
- 220 KV Moga(PS)-Kotkaror (PSTCL) Ckt-1 & 2 tripped from Moga(PS) end sensing the fault in zone-4. Further, 220kV Moga(PS)-Sadiq Ckt also tripped from Moga(PS) end, but reason of tripping could not be identified due to connectivity issue in Main-2 relay.
- Due to tripping of all 220kV lines connected to Moga(PS), complete blackout occurred at 220/132kV Moga(PS) S/s.

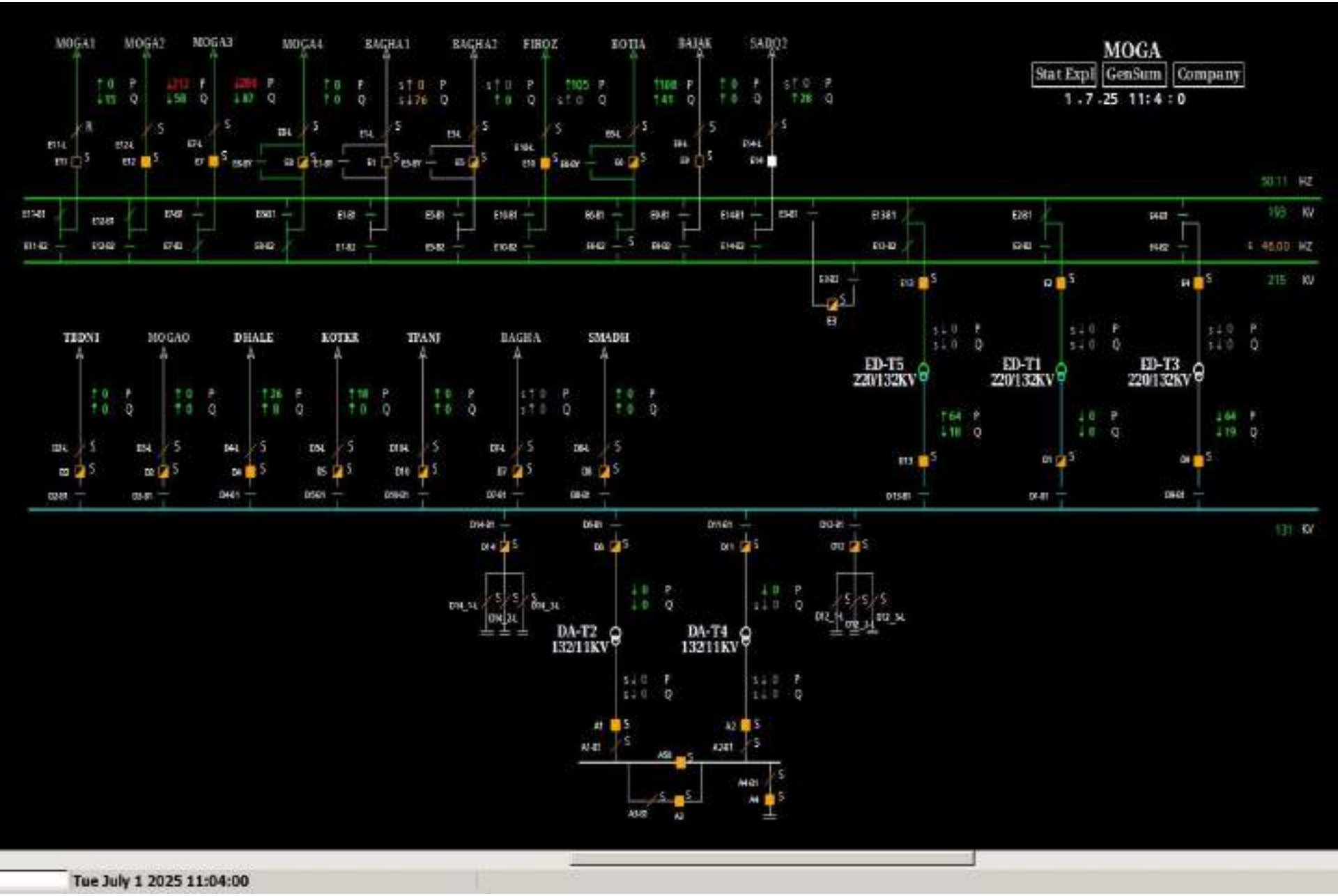
Brief details of the event

- During the same time, busbar protection operated at Ajitwal(PS) and 220kV Ajitwal-Himmatpura (PS) Ckt and 220 KV Moga(PG)-Ajitwal(PS) (PSTCL) Ckt-1 tripped. (exact reason of busbar protection operation at Ajitwal(PS) need to be shared).
- As per SCADA SOE and as reported, 220kV Badhni kalan-Himmatpura (PS) Ckt, 220kV GHTP-Himmatpura(PS) Ckt-1 & 2 and 220 KV Moga(PG)-Badhni kalan(PS) (PSTCL) Ckt-1 also tripped during the same time (exact reason and nature of protection operated need to be shared).
- Due to this tripping, complete blackout occurred at 220/66kV Badhni kalan(PS) & 220/66 kV Himmatpura(PS) S/s also.
- As per PMU at Ludhiana(PG), R-Y phase to phase fault followed by B-N phase to earth fault was observed with fault clearance time of 240 ms & 120 ms respectively.
- As per SCADA, change in demand of approx. 1005 MW was observed in Punjab control area. However, as reported by SLDC Punjab, load loss of approx. 582 MW occurred in Punjab control area.
- As reported by Punjab, line differential along with distance protection installation will be completed within one week for 220 KV Moga(PG)-Moga(PS) (PSTCL) Ckt-1, 2, 3 & 4.

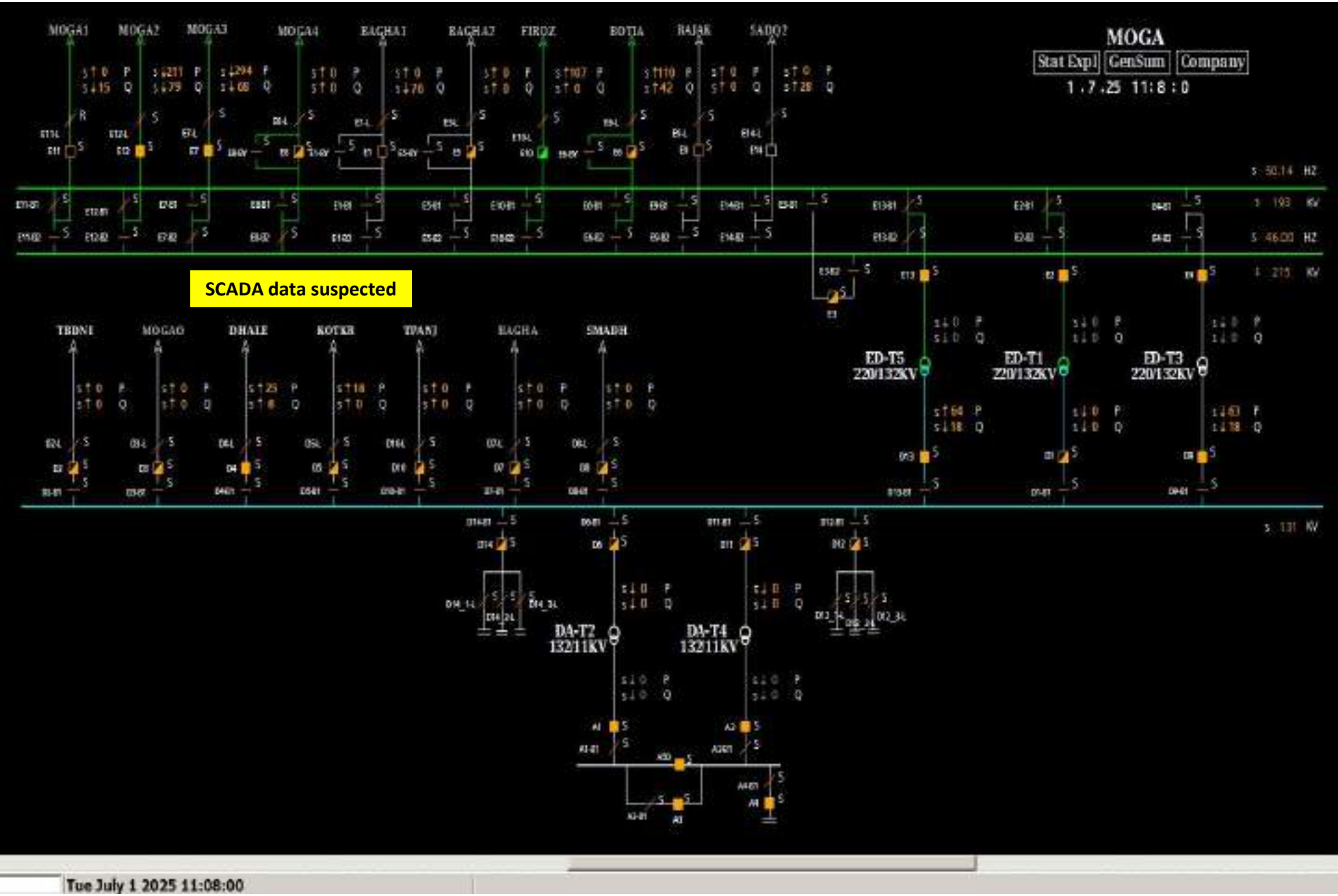
Network Diagram



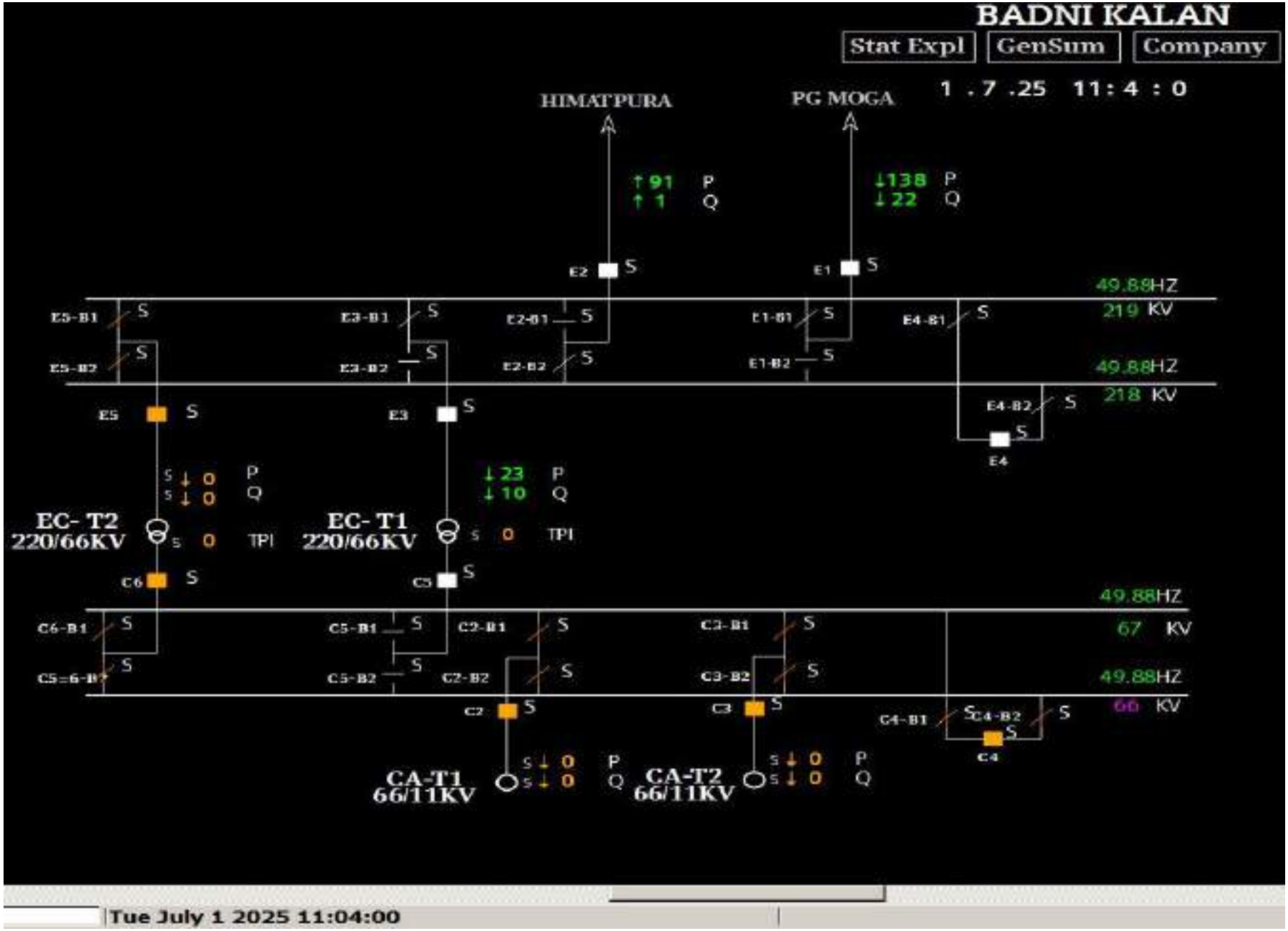
SLD of 220/132kV Moga(PS) before the event



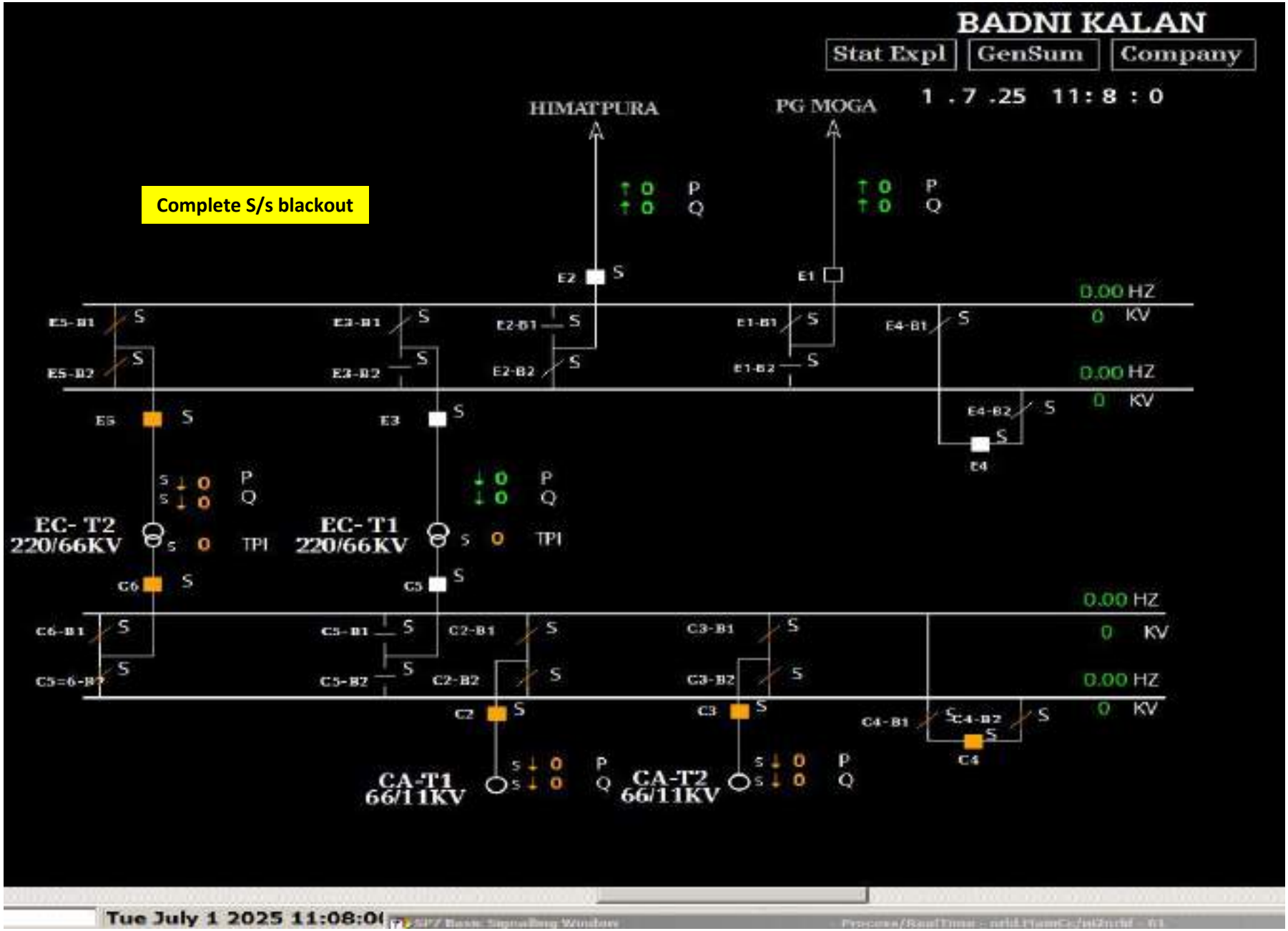
SLD of 220/132kV Moga(PS) after the event



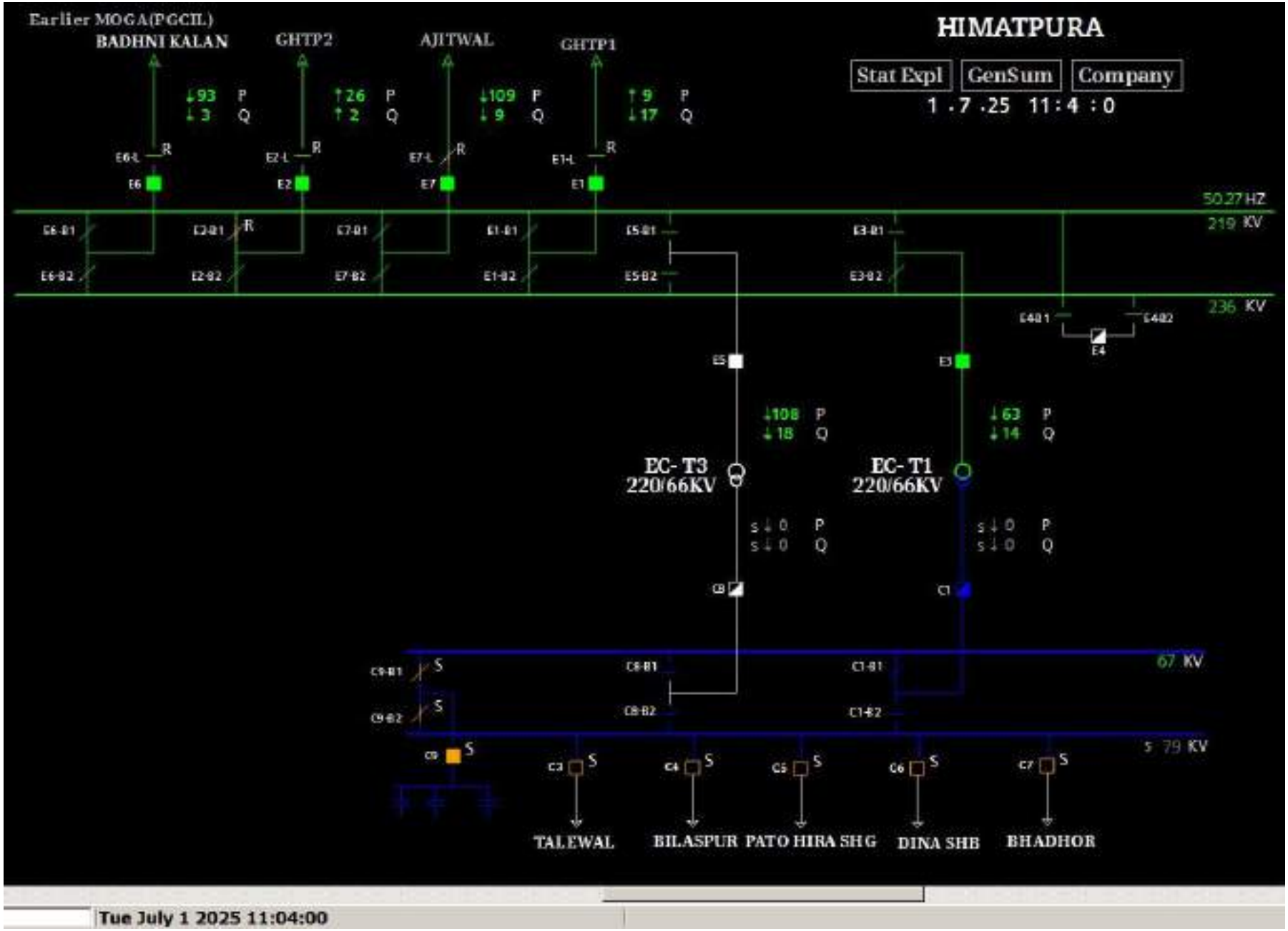
SLD of 220/66kV Badhnikalan(PS) before the event



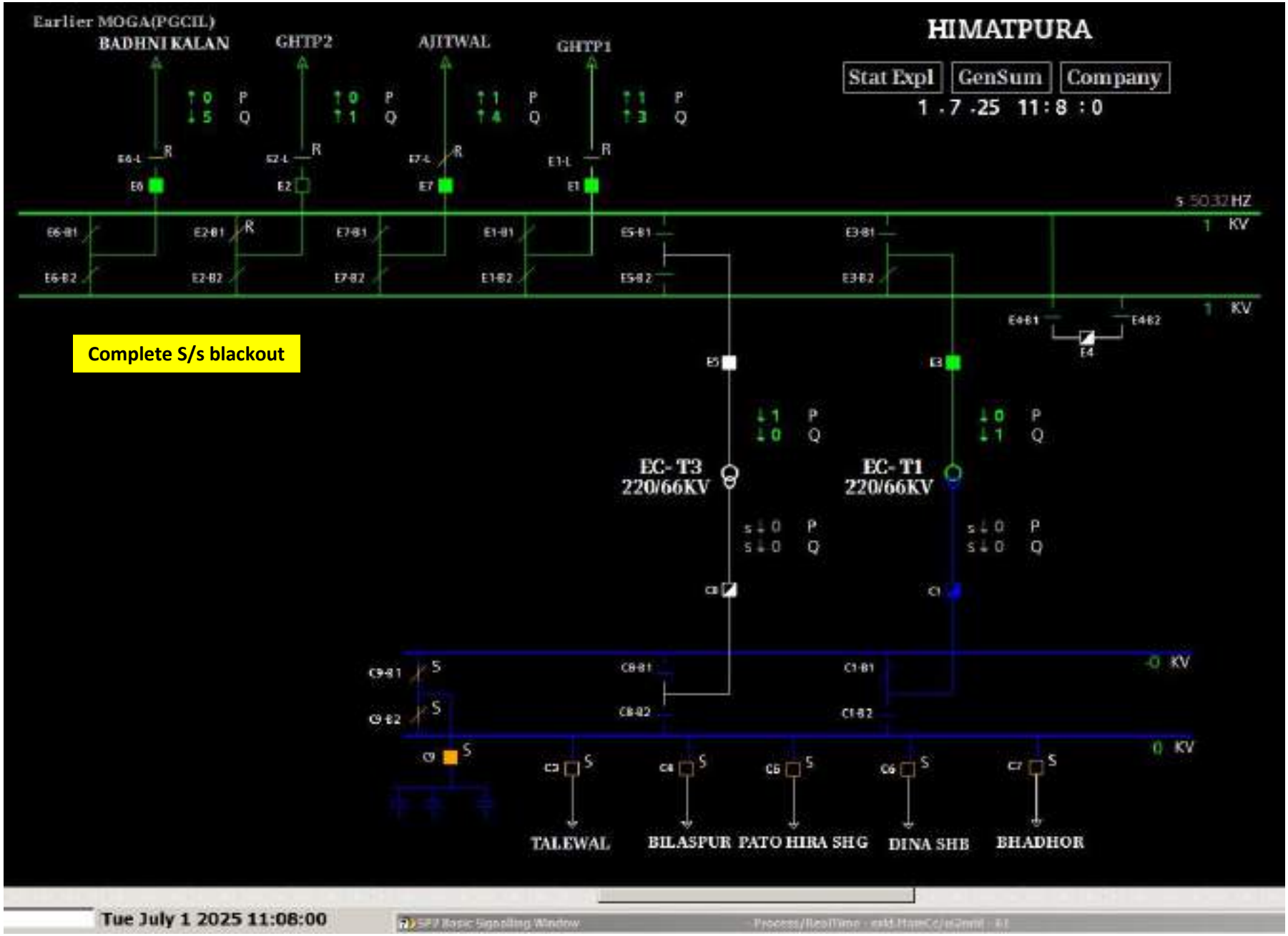
SLD of 220/66kV Badhnikalan(PS) after the event



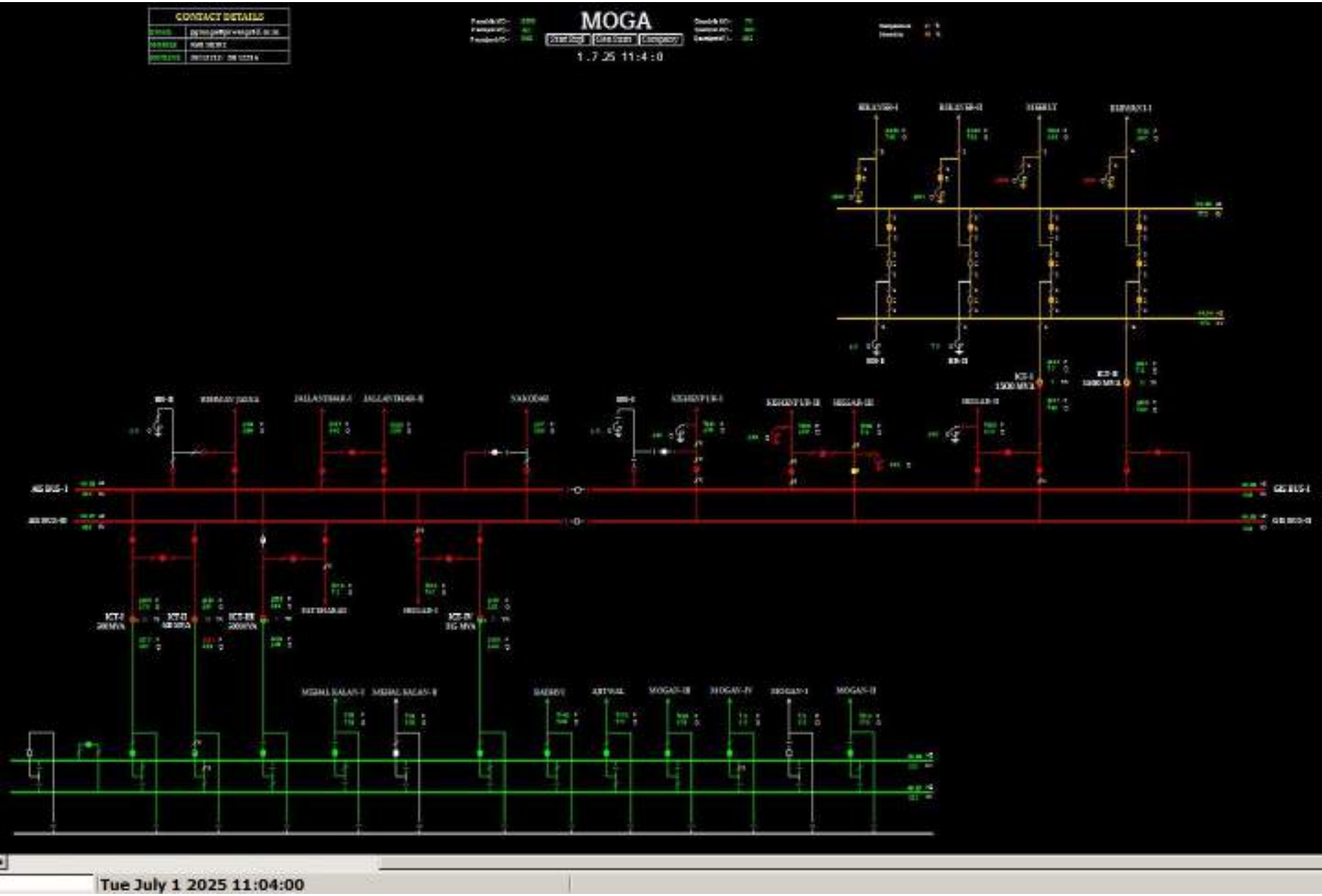
SLD of 220/66kV Himmatpura(PS) before the event



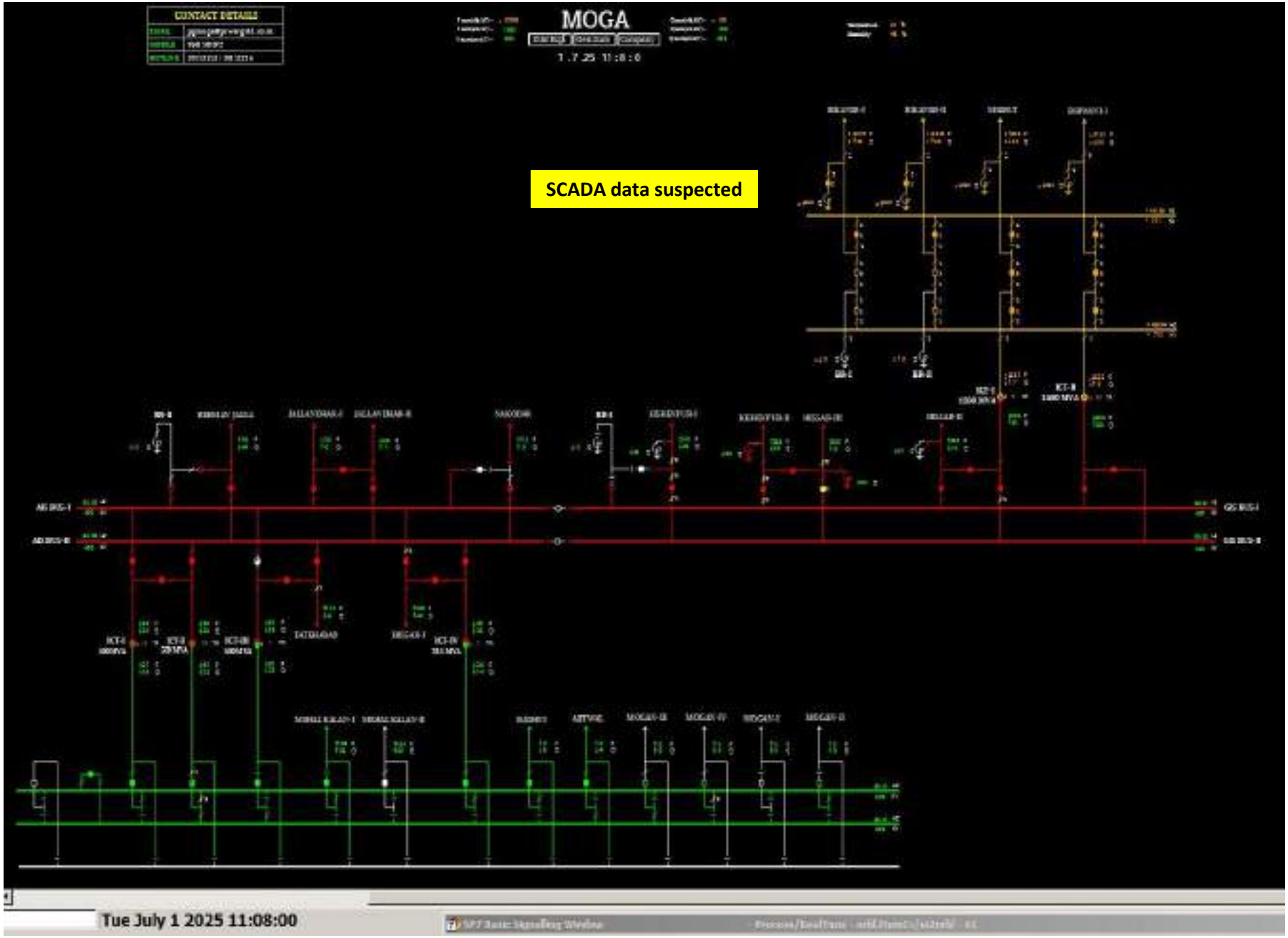
SLD of 220/66kV Himmatpura(PS) after the event



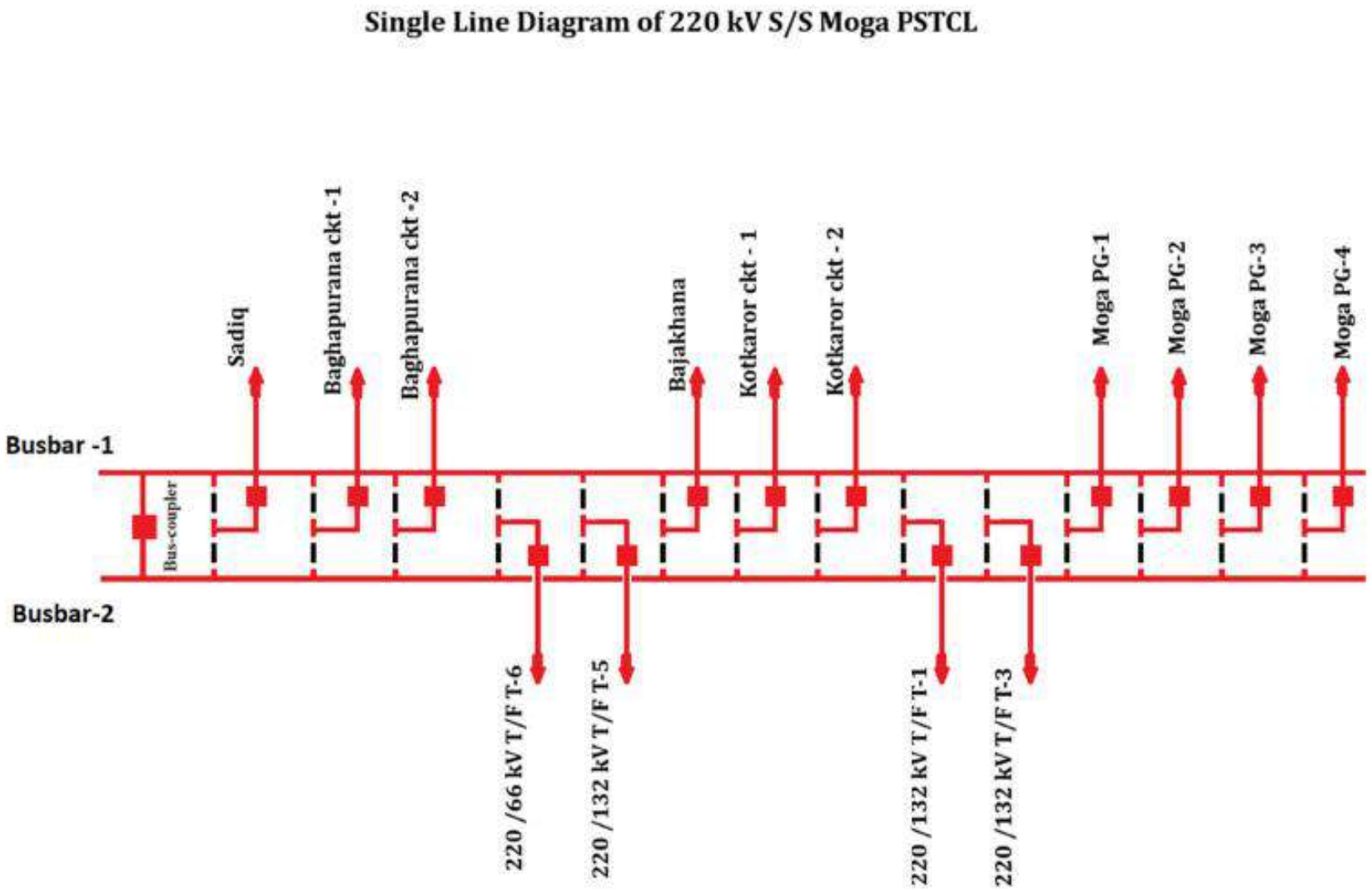
SLD of 765/400/220kV Moga(PG) before the event



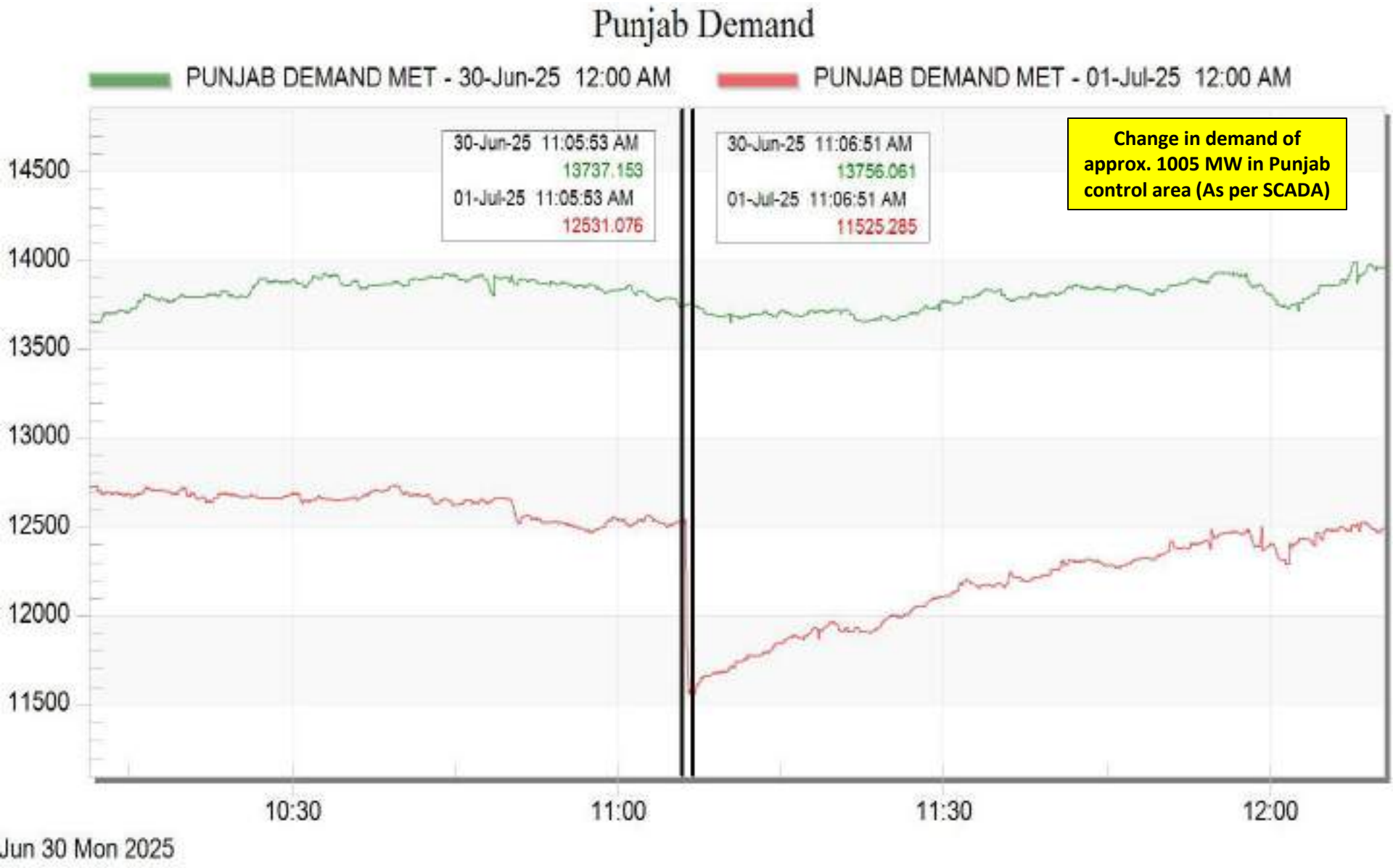
SLD of 765/400/220kV Moga(PG) after the event



SLD of 220kV Moga(PS) as shared by PSTCL



Punjab Demand during the event



Load loss details as shared by Punjab

Details of Load Loss during the event at 11:06hr dated 01.07.2025		
Sr. No	**Name of Sub-Station**	**Load Loss (MW)**
1	220kV Moga	21.78
2	220kV Baghapurana	120
3	132kV Kotkapura 1	34.72
4	220kV Himmatpura	164.46
5	220kV Badhni kalan	45.77
6	132kV Moga 1	74.23
7	132kV dhalleke	16.74
8	132kV Gholia Kalan	46.8
9	132kv Panjgrain	18.26
10	132kV Smadh Bhai	31.05
11	132kV Sosan	8.39
Total Load Loss		**582.2**

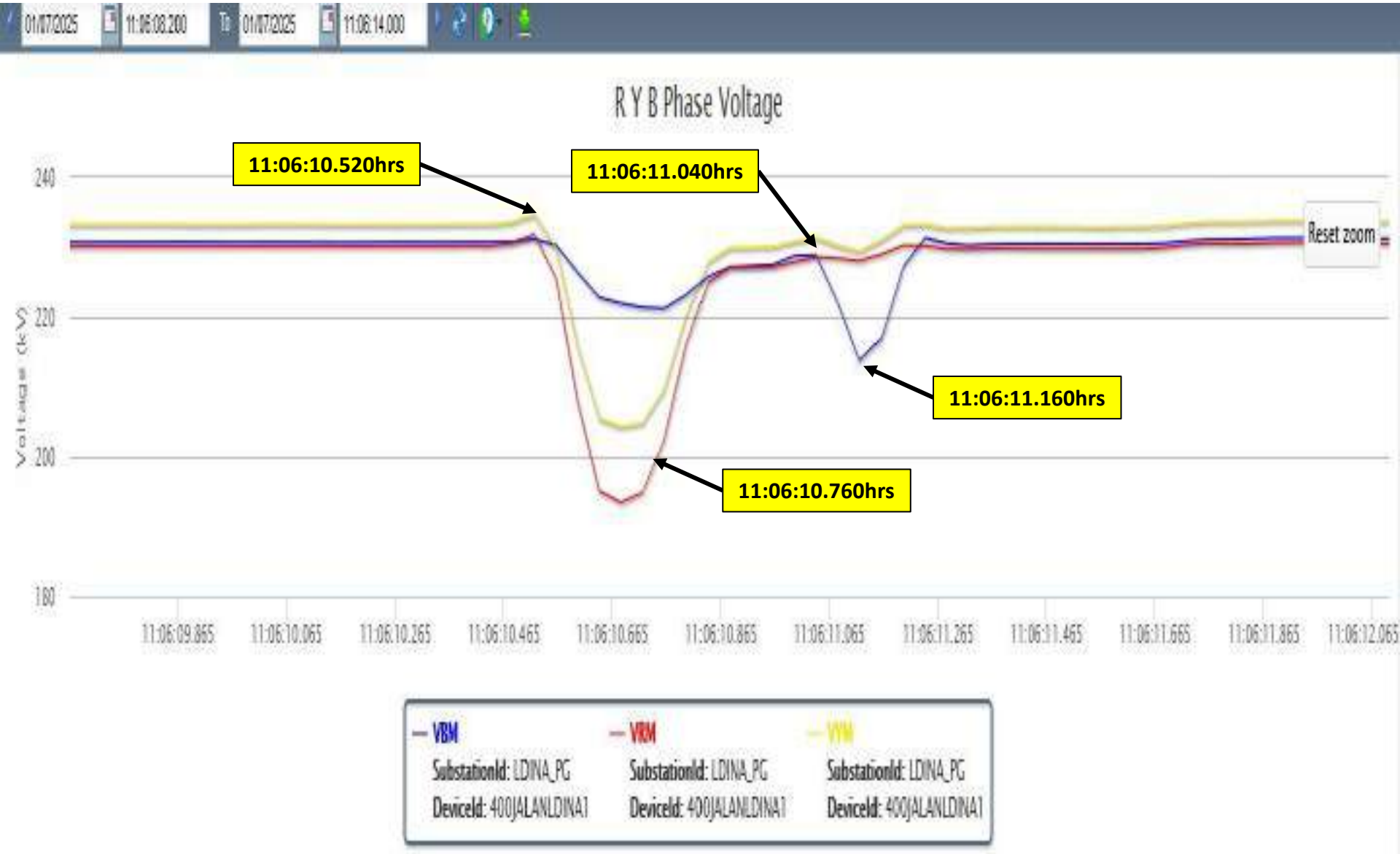
PMU Plot of frequency at Bassi(PG)

11:06 hrs/01-Jul-25



PMU Plot of phase voltage magnitude at Ludhiana(PG)

11:06 hrs/01-Jul-25



SCADA SOE

Time	Station Name	Voltage Level	Element Name	Element Type	Element Status	Remarks
11:04:07,062	GHTP__PS	220kV	12ST1	Circuit Breaker	Open	CB at 220kV side of 220/11kV ST-1 at GHTP opened
11:04:15,350	GHTP__PS	220kV	12ST1	Circuit Breaker	disturbe	
11:06:10,077	MOGAN_PS	220kV	10FIROZ	Circuit Breaker	disturbe	
11:06:10,081	MOGAN_PS	220kV	14SADQ2	Circuit Breaker	Open	Line CB at Moga(PS) end of 220kV Moga(PS)-Sadiq Ckt opened
11:06:10,752	MOGA__PG	220kV	03MOGAN3	Circuit Breaker	Open	Line CB at Moga(PG) end of 220kV Moga(PG)-Moga(PS) Ckt-3 opened
11:06:10,828	GHTP__PS	220kV	1Himmat1	Circuit Breaker	Open	Line CB at GHTP end of 220kV GHTP-Himmatpura(PS) Ckt-1 opened
11:06:10,851	MOGA__PG	220kV	07MOGAN2	Circuit Breaker	Open	Line CB at Moga(PG) end of 220kV Moga(PG)-Moga (PS) Ckt-2 opened
11:06:11,178	MOGA__PG	220kV	05MOGAN4	Circuit Breaker	Open	Line CB at Moga(PG) end of 220kV Moga(PG)-Moga (PS) Ckt-4 opened
11:06:11,860	BADNI_PS	220kV	1PGMOGA	Circuit Breaker	Open	Line CB at Badhnikalan(PS) end of 220kV Moga(PG)-Badhnikalan(PS) Ckt opened
11:06:16,815	Himmat_PS	220kV	02GHTP2	Circuit Breaker	Open	Line CB at Himmatpura end of 220kV GHTP-Himmatpura(PS) Ckt-2 opened

Points for Discussion

i. Exact reason of tripping of 220kV Moga(PS)-Baghapurana Ckt-1 at 10:50 hrs need to be shared.
ii. Issue in O/C E/F relay at Moga(PS) of 220 KV Moga(PG)-Moga(PS) (PSTCL) Ckt-3 need to be addressed at the earliest.
iii. Connectivity issue in Main-2 relay at Moga(PS) end of 220kV Moga(PS)-Sadiq Ckt need to be resolved.
iv. Exact nature of protection operated need to be shared for 220 KV Moga(PG)-Moga(PS) (PSTCL) Ckt-2, 3 & 4 from PG end.
v. Exact reason of busbar protection operation at Ajitwal(PS) need to be shared.
vi. Exact reason and nature of protection operated need to be shared 220kV Badhni kalan-Himmatpura (PS) Ckt, 220kV GHTP-Himmatpura(PS) Ckt-1 & 2 and 220 KV Moga(PG)-Badhni kalan(PS) (PSTCL) Ckt-1
vii. SCADA data was freezed at 220/132kV Moga(PS) during the event. Avaialbility and healthiness of SCADA data need to be ensured.
viii. DR/EL (.dat/.cfg file) of all tripped elements along with detailed tripping report need to be shared.
ix. Remedial action taken report need to be shared.

Tripping Report for fault on Dated 01.07.2025 at 220 kV Moga (Singhawala) PSTCL, Baghapurana, Ajitwal, Badhni kalan and Himmatpura.

	Detailed Report	
a.	Time and date of event (GPS Sync time)	**01.07.2025 10:50 Hrs** **01.07.2025 11:06 Hrs.**
b.	Location.	Moga (Punjab),
c.	Plant and/or Equipment directly involved.	• 765/400/220 kV PGCIL Moga • 220 kV Baghapurana PSTCL • 220 kV Ajitwal • 220 kV Badhni kalan • 220 kV Himmatpura • 220 kV Sadiq PSTCL • 220 kV Kotkaror PSTCL
D	Plant and/or Equipment under maintenance/Discharged	• 220 kV Bajakhana • 220 kV Moga PGCIL ckt -1
e.	Single line diagram showing the connection (isolators) of various 400 KV lines, bus coupler, ICT's etc	Attached
f.	Description and cause of event.	1) Fault -1 (10:50 Hrs) – R-phase jumper of Baghapurana ckt-2 snapped 2) Fault-2 (11:06 Hrs) – R-phase jumper of 220 kV Moga PGCIL ckt-3 snapped and came in contact with Y-phase conductor
g.	Bus Voltage/Frequency, Time duration of tripping including Weather Condition prior to the event.	220kV Bus Voltage – 215 kV 220kV Bus Frequency – 50.01 Hz Weather Condition - Cloudy
h.	Duration of interruption and Demand and/or Generation (in MW and MWh) interrupted.	Nil
i.	All Relevant system data including copies of records of all recording instruments including Disturbance Recorder, Event Logger, DAS etc of DPR's of affected lines.	Attached
j.	Sequence of tripping with time.	#
k.	Details of Relay Flags.	
l.	Remedial measures.	--

Before and After Fault Load Condition at 220 kV Moga PSTCL

Fault dt – 01.07.2025 Fault Time : - 10:50 Hrs.

Sr No	T/Line or ICT Description	Load in Amp (at 10:00 Hrs.)	Load in Amp (at 11:00 Hrs.)	Tripped on Dt 10.07.2025 at (Hrs.)	Restore on dt 10.07.2025 at (Hrs.)
1	220 kV Moga PSTCL – Moga PG ckt-1	555	PTW (at 10:36 Hrs)	PTW	-
2	220 kV Moga PSTCL – Moga PG ckt-2	408	ON	11:06	13:54
3	220 kV Moga PSTCL – Moga PG ckt-3	543	ON	11:06	21:50
4	220 kV Moga PSTCL – Moga PG ckt-4	471	548	11:06	15:26
5	220 kV Moga PSTCL – Baghapurana ckt-1	410	Trip	10:50	18:45
6	220 kV Moga PSTCL – Baghapurana ckt-2	410	Trip	10:50	18:45
7	220 kV Moga PSTCL – Sadiq	237	277	11:06	17:17
8	220 kV Moga PSTCL – Kotkaror ckt-1	216	292	11:06	11:52
9	220 kV Moga PSTCL – Kotkaror ckt-2	216	292	11:06	11:52
10	220 kV Moga PSTCL – Bajakhana	PTW	PTW	-	-
11	220/132 kV 160 MVA T/F T -1	173	174	-	-
12	220/132 kV 100 MVA T/F T -3	173	174	-	-
13	220/132 kV 100 MVA T/F T- 5	173	174	-	-
14	220/66 kV 100 MVA T/F T- 6	ON	ON	-	-
15	220 kV Bus - coupler	ON	ON	-	

Before and After Fault Load Condition at 220 kV Ajitwal PSTCL

Fault dt – 01.07.2025 Fault Time : - 11:06 Hrs.

Sr No	T/Line or ICT Description	Load in Amp (at 11:00 Hrs.)	Load in Amp (at 12:00 Hrs.)	Restore at (Hrs.)
1	220 kV Ajitwal – Moga PG	258	Trip	12:50
2	220 kV Ajitwal – Jagraon ckt - 1	112	210	-
3	220 kV Ajitwal – Jagraon ckt - 2	112	Trip	13:22
4	220 kV Ajitwal – Himmatpura	211	Trip	13:35
5	220/66 kV 100 MVA T/F T -3	103	187	-
6	220/66 kV 100 MVA T/F T- 4	107	Trip	12:54
7	220 kV Bus - coupler	ON	Trip	12:40

Before and After Fault Load Condition at 220 kV Badhni Kalan PSTCL

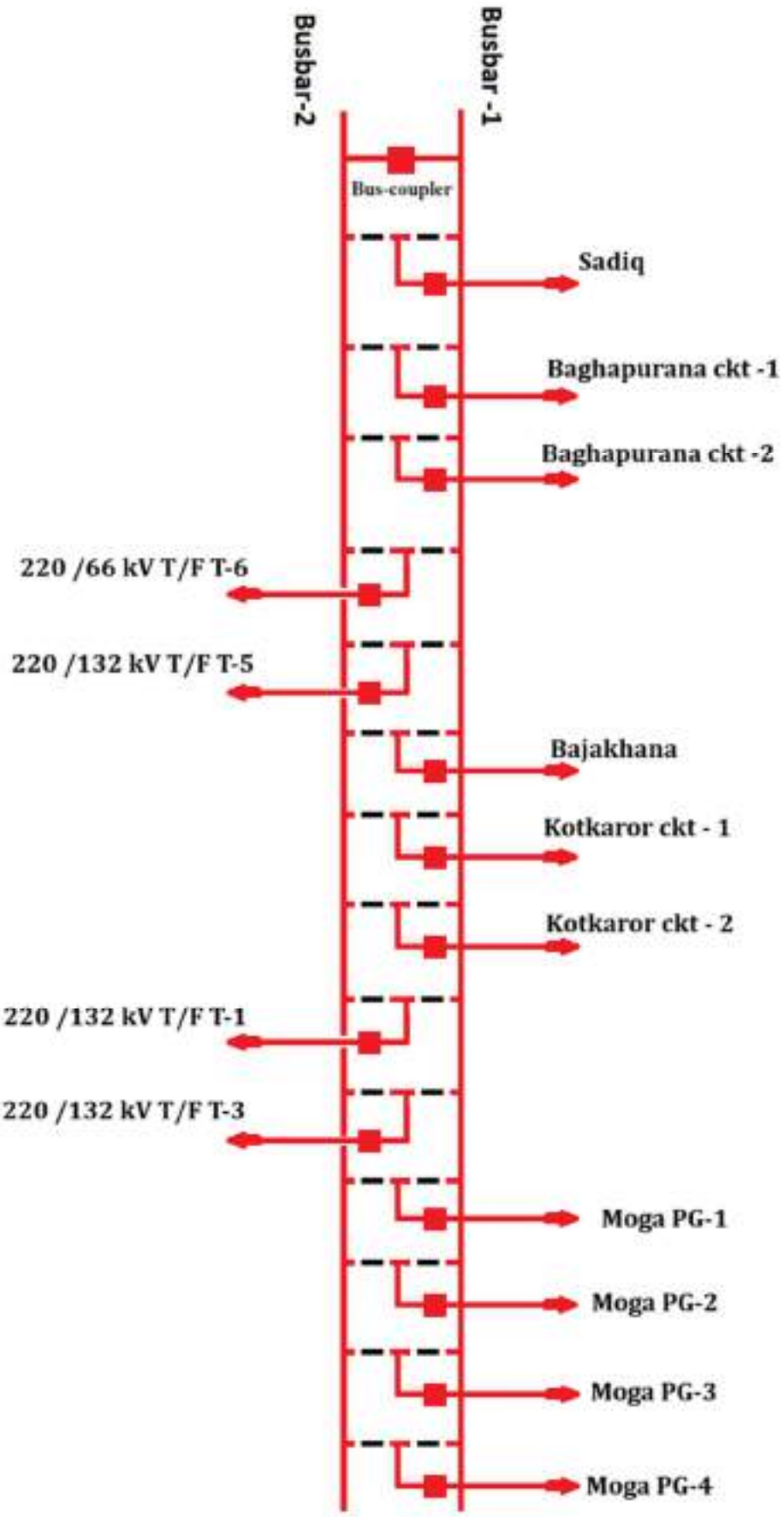
Fault dt – 01.07.2025 Fault Time : - 11:06 Hrs.

Sr No	T/Line or ICT Description	Load in Amp (at 11:00 Hrs.)	Load in Amp (at 12:00 Hrs.)	Remarks
1	220 kV Badhni – Moga PG	373	32	Line tripped at 11:06 Hrs. and charged at 11:54 Hrs.
2	220 kV Badhni – Himmatpura	246	OFF	Line tripped from other end at 11:06 Hrs. & charged at 11:28 Hrs. and Line manually discharged at 11:59 Hrs. due to overload
3	220/66 kV 100 MVA T/F T -1	66	16	-
4	220/66 kV 100 MVA T/F T- 4	66	16	-
5	220 kV Bus - coupler	ON	ON	-

Before and After Fault Load Condition at 220 kV Himmatpura PSTCL

Fault dt – 01.07.2025 Fault Time : - 11:06 Hrs.

Sr No	T/Line or ICT Description	Load in Amp (at 11:00 Hrs.)	Load in Amp (at 12:00 Hrs.)	Remarks
1	220 kV Lehra Mohabbat ckt - 1	ON	87	Line tripped from other end at 10:50 Hrs. and charged at 11:28 Hrs.
2	220 kV Lehra Mohabbat ckt - 2	90	87	Tripped from Himmatpura end at 11:06 Hrs and charged at 11:28 Hrs.
3	220 kV Badhni Kalan	128	120	-
4	220 kV Ajitwal	102	Trip at 11:06 Hrs. from other end	
5	220/66 kV 100 MVA T/F T -1	147	141	-
6	220/66 kV 160 MVA T/F T- 3	252	240	-
7	220 kV Bus - coupler	ON	ON	-

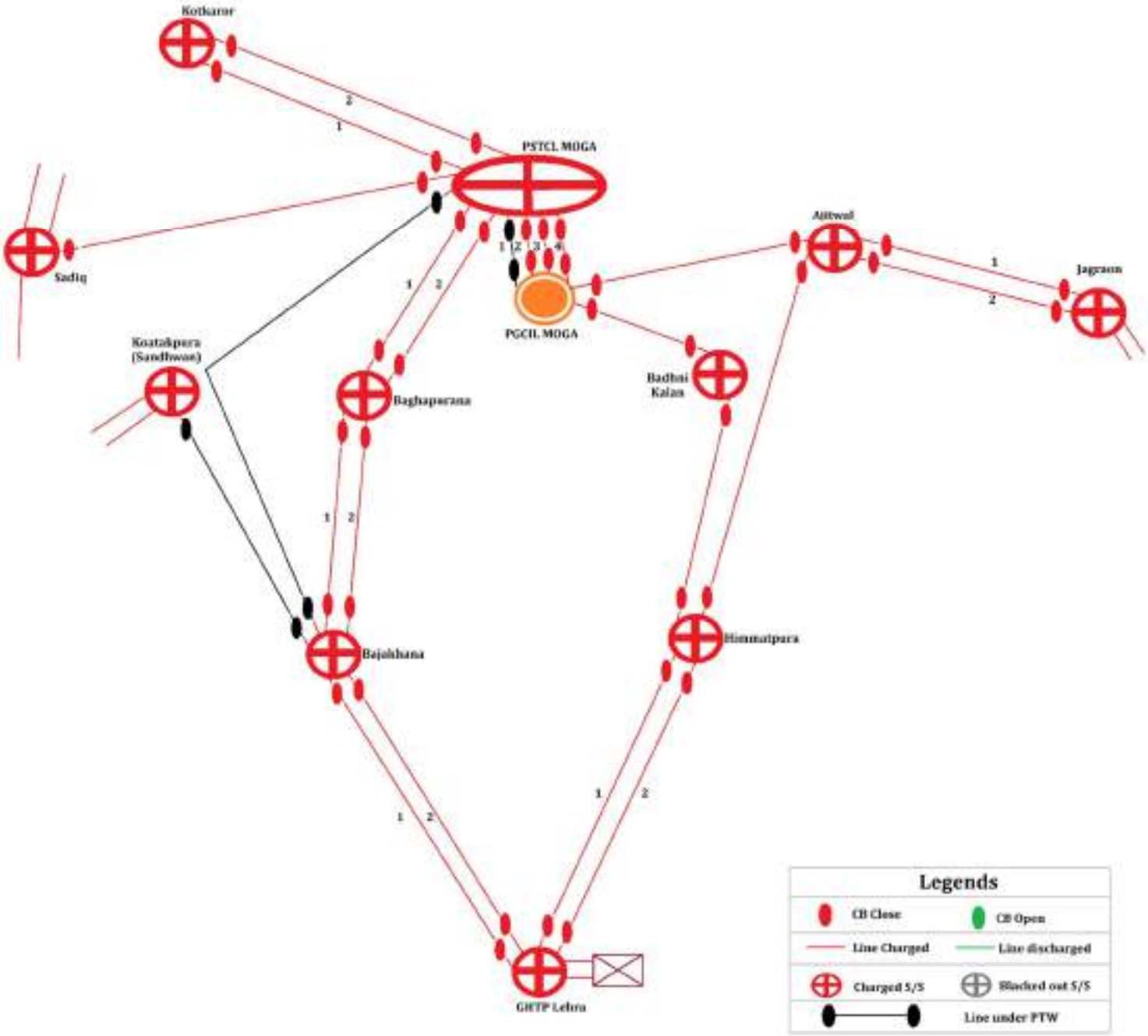


Single Line Diagram of 220 kV S/S Moga PSTCL

Single line connectivity of 220 kv Transmission Network of PSTCL

Fault Dt 01.07.2025

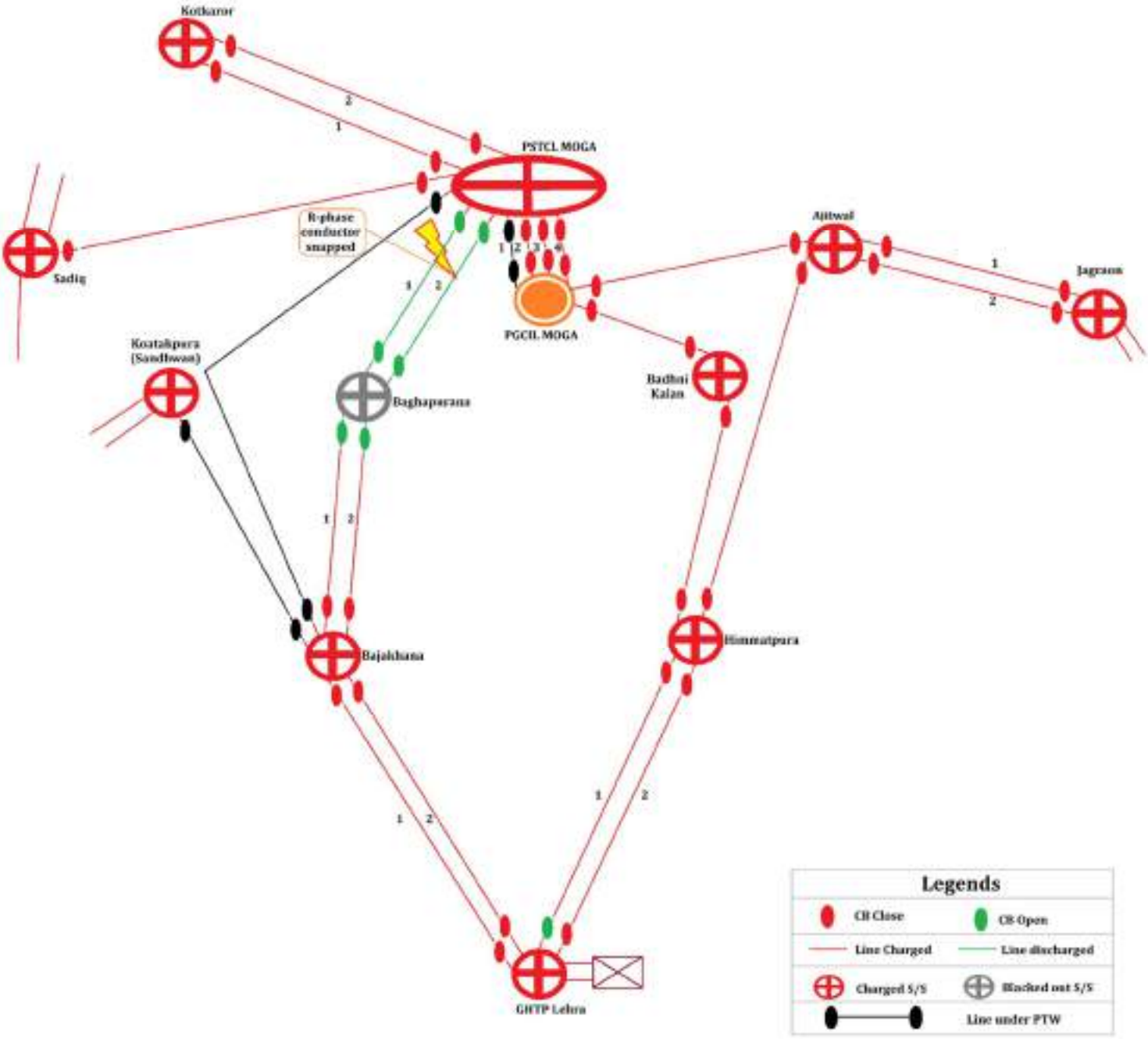
CB Position before Fault of 10:50



Single line connectivity of 220 kv Transmission Network of PSTCL

Fault Dt 01.07.2025

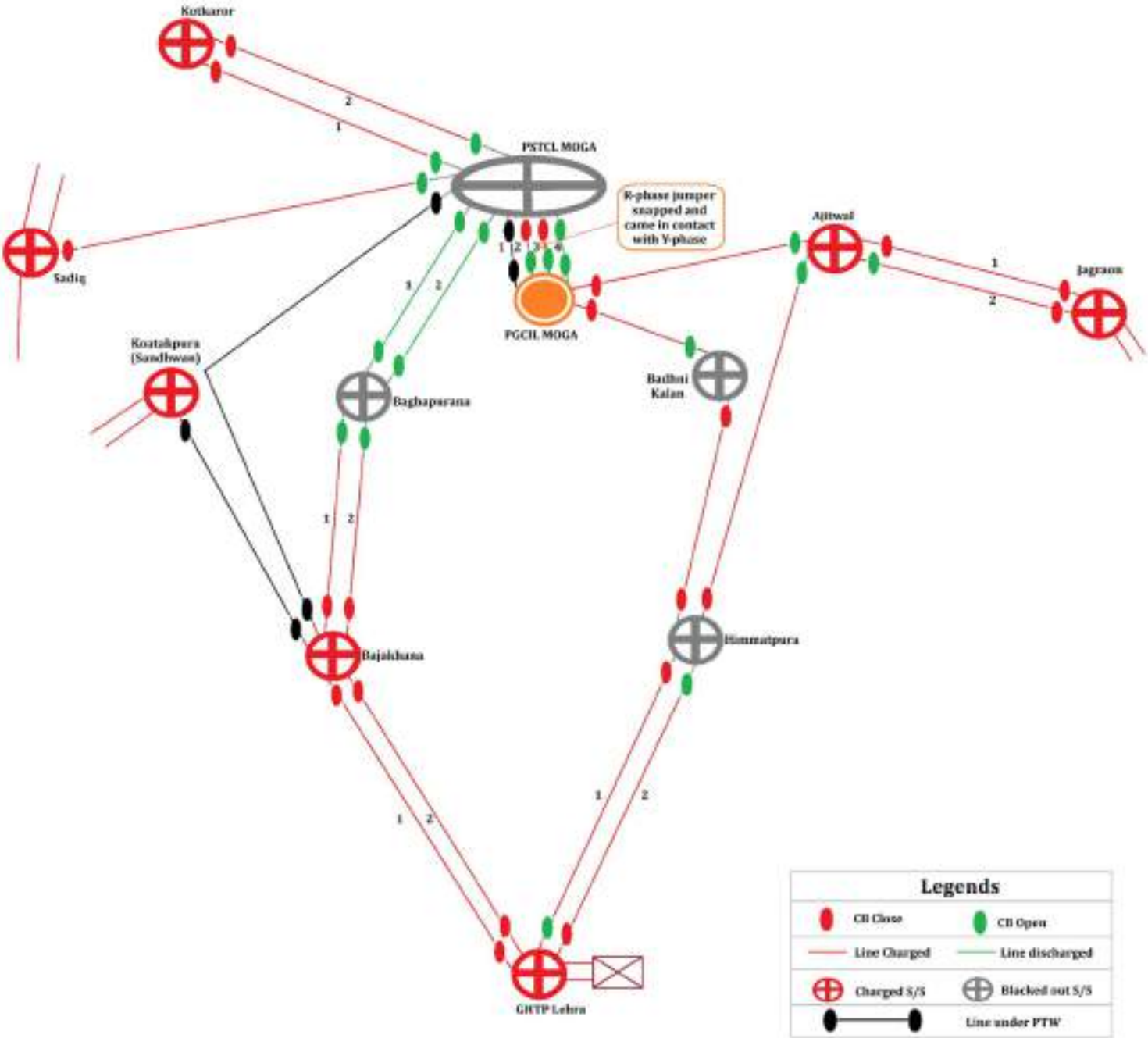
CB Position after Fault at 10:50 Hrs.



Single line connectivity of 220 kv Transmission Network of PSTCL

Fault Dt 01.07.2025

CB Position after Fault at 11:06 Hrs.



#Tripping Sequence

Power System Fault Dated 01.07.2025 Time 10:50 Hrs

FAULT : 1 (AT 10:50 HRS)

220KV Moga PSTCL – Baghapurana ckt-2

Moga PSTCL end (Actual trip time – **10:50 Hrs.** but relay not time synch).:-

- Distance protection picked R phase to ground fault in Zone-1 at 10:48:47.751 Hrs. with Fault current – 25.115 kAmp, Fault location – 1.9 km (18.7%) (Ref to Annexure-1)
- Relay issued instant trip command to R-phase CB.
- Auto-reclose successfully operated at 10:48:48.788 Hrs. and within reclaiming time relay again picked R-phase to ground fault at 10:48:48.931 Hrs. (Ref to Annexure -2)
- Relay issue instant 3-pole trip command.
- Fault current isolated at appr. 10:48:49.005 Hrs. **(Fault clearing time – 68 msec)**

Baghapurana end:-

- Line tripped from this end with following indications:-
  E/F protection operated. Fault current in Rph – 0 Amp, Yph- 461 Amp, Bph – 735 Amp, IN – 1270 Amp.

220KV Moga PSTCL – Baghapurana ckt-1

Moga PSTCL end (Actual trip time – **10:50 Hrs.** but relay not time synch).:-

- Distance protection relay Main-1 got picked with E/F at 11:48:53.105 Hrs. but got unpicked after 600 msec. (Ref to Annexure – 3)
- Relay did not issued trip command.
- Main-2 Relay (ZIV make) operated with the following indications –
  Trip Zone-1, Fault current in Rph – 2.537 A, Yph – 749 mA, Bph -7 mA IN – 1.827 Amp (Values in Secondary)

Baghapurana end:-

- Line tripped from this end with following indications:-
  Zone-1 RN phase, Fault distance – 2.819 km

220kV Busbar Protection at 220kV baghapurana (Tripped at 10:50 Hrs.)

- 220 kV Busbar protection relay operated at 10:50 Hrs. with following indications-
  Zone-1 Rphase, Zone-2 R-phase
- due to operation of BBPS all 220 kV elements tripped from 220 kV Baghapurana and station blacked out.

220KV Himmatpura – GHTP Lehra ckt - 1

Himmatpura end

- Line did not trip from this end.

GHTP Lehra end

- Line tripped from Lehra end at 10:50 Hrs. with following indications-
  AG fault, Zone-1, Fault current in Rph – 1.223 Amp, Yph – 0.0 mAmp, Bph - 1 mAmp, IN – 1.223 Amp (Values in Secondary). Fault location – 2.252 km (Length of line – 38 km)

Power System Fault Date 01.07.2025 Time 11:06 Hrs

FAULT : 2 (AT 11:06 HRS)

220KV Moga PSTCL – Moga PGCIL ckt-3

Moga PSTCL end (Actual trip time – **11:06 Hrs.** but relay not time synch).:-

- At 11:04:57.566 Hrs. when Disturbance record started the value of Fault current in Rph – 2336 Amp, Yph – 1286 Amp. (Ref to Annexure – 4)
- Starting of the fault feeding could not confirm as DR recorded while fault feeding but fault feeding continued till 11:04:58.281 Hrs. (Fault feeding time as recorded in DR is 715 msec.)
  Relay did not issued trip command. **(Total Fault feeding time – appr. 715 msec.)**

Note: - Line did not trip from this end.

Moga PGCIL end

- Line tripped from this end with following indications:-
  O/C HSU R-Y phase Fault current in Rph – 14.6 kAmp, Yph – 13.92 kAmp, Bph – 1.03 kAmp.

220KV Moga PSTCL – Moga PGCIL ckt-4

Moga PSTCL end (No Trip data available)

- Line tripped from this end with following indications:-
  Pilot wire Trip, Master Trip

Moga PGCIL end

- Line tripped from this end with following indications:-
  E/F HSU & Pilot wire protection operated.

220KV Moga PSTCL – Moga PGCIL ckt-2

Moga PSTCL end

- Fault current developed in R & Y phase in O/C E/F relay at 11:05:06.997 Hrs. Fault current in Rph - 8.3 kAmp, Yph – 7.4 kAmp.
- At 11:05:07.177 Hrs. fault current risen to 13 kAmp in both phases and after that fault current gradually drops. (Ref to Annexure – 5)
- Fault current isolated around 11:05:07.243 Hrs. when other end tripped but Line did not trip from this end.

(Total Fault feeding time – 246 msec.)

Moga PGCIL end

- Line tripped from this end with following indications:-
- O/C HSU R-Y phase Fault current in Rph – 8.16 kAmp, Yph – 7.34 kAmp, Bph – 0.79 kAmp.

220KV Moga PSTCL – Kotkaror ckt-1

Moga PSTCL end (Actual trip time – **11:06 Hrs.** but relay not time synch).:-

- Distance protection picked R-Y phase to ground fault in Zone-4 at 11:05:18.197 Hrs. with Fault current Rph – 3.359 kAmp, Yph – 3.638 kAmp, Fault location – -193.9 mtr (18.7%) (Ref to Annexure - 6)
- Relay issued trip command at 11:05:18.352 Hrs. to 3-pole of CB. (Zone-4 time – 160 msec.)
- Fault current isolated at appr. 11:05:18.432 Hrs. **(Fault clearing time – 235 msec)**

Kotkaror end:-

- Line did not trip from this end.

220KV Moga PSTCL – Kotkaror ckt-2

Moga PSTCL end (Actual trip time – **11:06 Hrs.** but relay not time synch).:-

- Distance protection picked R-Y phase to ground fault in Zone-4 at 11:04:42.081 Hrs. with Fault current Rph – 3.600 kAmp, Yph – 3.8482 kAmp, (Ref to Annexure - 7)
- Relay issued trip command at 11:04:42.237 Hrs. to 3-pole of CB. (Zone-4 time – 160 msec.)
- Fault current isolated at appr. 11:04:42.307 Hrs. **(Fault clearing time – 226 msec)**

Kotkaror end:-

- Line did not trip from this end.

220KV Moga PSTCL – Sadiq

Moga PSTCL end (Actual trip time – **11:06 Hrs.** but relay not time synch).:-

- Distance protection picked R-Y phase to ground fault in Zone-4 at 11:06:15.920 Hrs. with Fault current Rph – 1.48 kAmp, Yph – 1.78 kAmp, Fault location - -0.6 km (Ref to Annexure-8)
- Relay got unpicked after 35 msec. but fault current got isolated at 11:06:15.964 Hrs.

Note :- Line was tripped due to operation of Master Trip relay which may be due to operation of Main-2 relay (trip data not available due to relay connectivity issue and screen issue.)

Sadiq end:-

- Line did not trip from this end.

Power System Fault Date 01.07.2025 Time 11:06 Hrs at 220 kV Ajitwal

220KV Busbar Protection
(Actual time – 11:06 Hrs.; Relay Time – 10:47 Hrs.)

- Busbar protection picked in alarm for Zone A and Zone B at 10:31:20.166 Hrs. but got unpicked after 56 msec. (Ref to Annexure – B)
- At 10:31:20.318 Hrs. relay issued retrip command and got unpicked at 10:31:20.518 Hrs.
- Busbar protection issued ZA & ZB common trip command at 10:47:13.763 Hrs. for L1 and L2 phase.

Reason of Busbar Protection operation and Action taken:-

- Line isolator status in Busbar protection relay was found to be in-correct due to which differential current raised. When Fault occurred at Baghapurana – Moga ckt-2 at 10:50 Hrs, BBPS picked for this fault also (at 10:31 Hrs. in BBPS) but did not operated.
- When Moga – PG Moga ckt-3 got faulty at 11:06 Hrs, BBPS operated (at 10:47 Hrs) , exact value of differential current is not available as no Disturbance Record available in BBPS relay.
- Issue was found in the status wiring, which are now correct and no differential current in BBPS.

220KV Ajitwal PSTCL – Jagraon ckt-2

Ajitwal PSTCL end (Actual Date – 01.07.2025 but in Relay – 30.06.2024)

- Distance protection picked reverse fault at 11:06:10.838 Hrs. with current Rph – 146.9 Amp, Yph – 147.3 Amp, Bph – 146 Amp. (Ref to Annexure-9) but unpicked after 2 msec.
- Relay again picked reverse fault in zone-4 at 11:06:11.905 Hrs. (Ref Annexure – 9) but unpicked after 33 msec.
- Relay again picked reverse fault in zone-4 at 11:10:57.687 Hrs. and relay picked fault in Zone-2 at 11:10:57.729 Hrs. (Ref to Annexure – 10) Current in Rph – 102.668 Amp, Yph - 103.278 Amp, Bph – 101.991 Amp.
- Relay issued RYB phase trip command at 11:10:57.981 Hrs. (Zone 2 time – 300 msec.)
- 3-phase current isolated at 11:10:58.027 Hrs. (CB opened)

NOTE:- Value of current in 3-phase was normal but voltage value drops , due to which Impedance relay (DPR) mal-operated for Zone-2. Drop in voltage may be due to VT Fusefail.

Jagraon end:-

- Line did not trip from this end.

❖ **220KV PG Moga , 220kV Himmatpura lines tripped from Himmatpura end due to operation of BBPS along with Transformer T-4 and Bus-coupler. 220 kV Jagraon ckt-1 and Trasnformer T-3 did not trip, issue was found in trip wires which is now resolved.**

Power System Fault Date 01.07.2025 Time 11:06 Hrs at 220 kV Badhni Kalan

220KV Badhni kalan – PG Moga

Badhni kalan PSTCL end

Mian-1 P444

- Distance protection picked R-Y phase fault at 11:06:10.606 Hrs. with current Rph – 2050 Amp, Yph – 2185 Amp,(Ref to Annexure-11)
- Relay received R-phase initiation from Main-2 relay and initiated Any Trip at 11:06:10.726 Hrs.
- Single pole open detected at 11:06:10.770 Hrs. and relay got unpicked after 13 msec.

Mian-2 D60 (Time in Relay – 04:56 Hrs., Actual Time – 11:06 Hrs)

- Relay picked R & Y phase at 04:56:03.720 Hrs. with fault current in Rph – 1769 Amp, Yph – 2312 Amp, Fault location – 30.3 km (Ref to Annexure – 12)
- Relay picked R-phase fault in Zone-1 and issued Zone-1trip at 04:56:03.817 Hrs.
- R-phase current again raised at 04:56:04.913 Hrs. (AR operated) and relay issued Master Trip (Ref to Annexure 13).
- 3-phase current isolated at 04:56:04.002 Hrs. (CB Open)

PG Moga end

- Line remain charged from PG end.

Power System Fault Date 01.07.2025 Time 11:06 Hrs at 220 kV Himmatpura

220KV Himmatpura – GHTP Lehra ckt - 2

Himmatpura end

- Relay issued Power Swing trip at 11:06:10.761 Hrs. (Ref to Annexure – 14)
- Relay issued 3-pole trip command instantly.

GHTP Lehra end

- Line did not trip from this end.

Conclusion:-

Fault 1 (10:50 Hrs.) :-

- At 220 kV S/s Moga PSTCL, R-phase conductor of Baghapurana ckt-2 line conductor snapped and Line DPR cleared the fault in Zone-1 at 10:50 Hrs. AR operated successfully but due to presence of fault under re-claiming time 220 kV Moga – Baghapurana ckt-2 tripped from Moga end.
- 220 kV Moga PSTCL – Baghapurana ckt-1 also tripped from Moga end due to operation of Main-2 relay for Zone- 1 trip. 220 kV Moga – Baghapurana ckt-1 & 2 tripped from Baghapurana end.
- Busbar protection relay mal-operated at 220 kV Baghapurana end at 10:50 Hrs., reason of Busbar protection operation could not confirm as no trip data available in BBPS. Busbar checked for any false initiation and differential current and now in Healthy condition.
- 220 kV Himmatpura – GHTP Lehra ckt-1 tripped from lehra end at 10:50 Hrs. in zone-1.

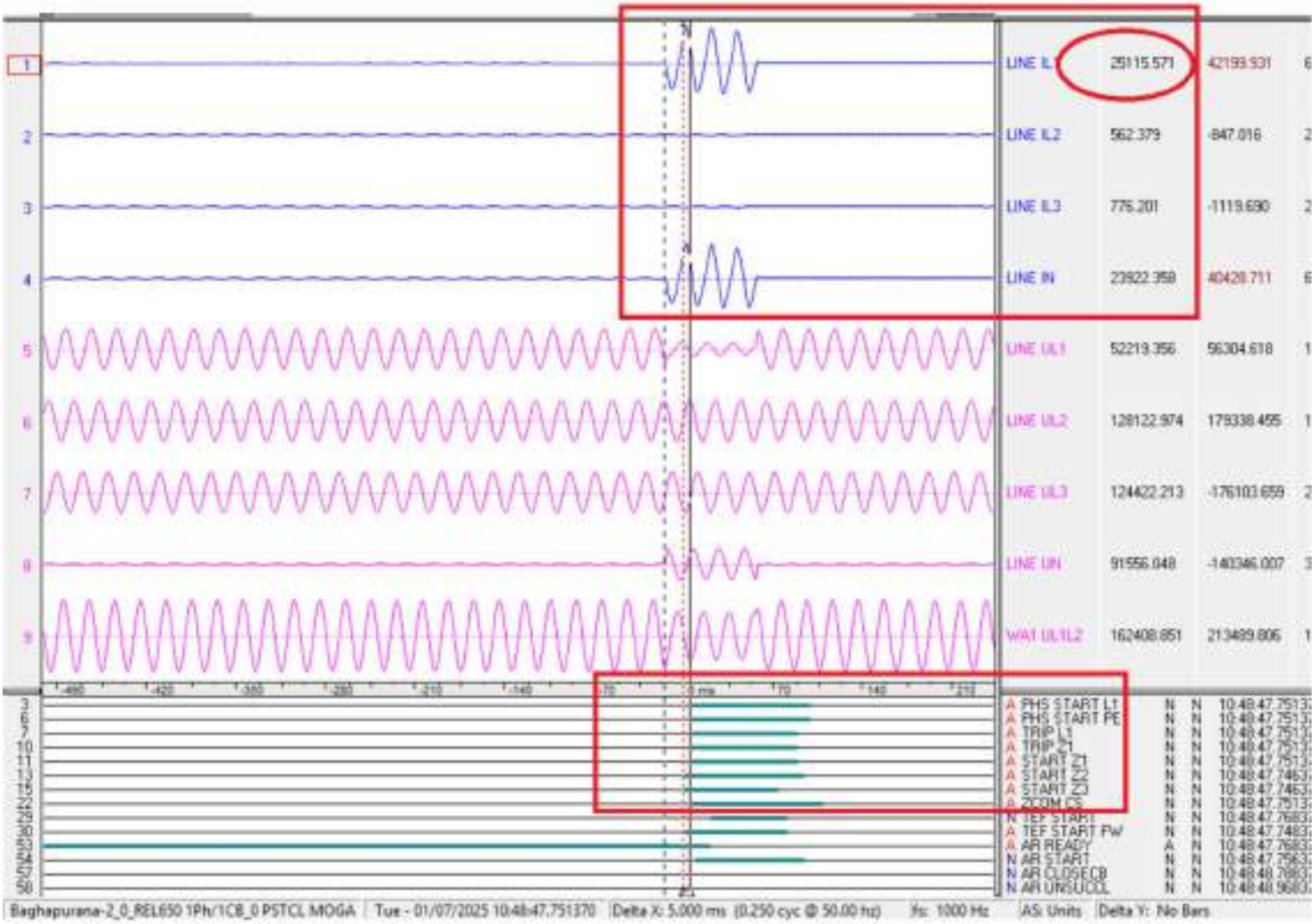
Fault 2 (11:06 Hrs.) :-

- At 11:06 Hrs. R-phase jumper of 220 kV Moga PSTCL – Moga PGCIL ckt-3 snapped and came in contact with Y-phase conductor. At Moga PSTCL end, only O/C E/F relay was operation at the time of fault , which did not picked and line remain charged from Moga end and tripped from Moga PGCIL end only. Due to which fault clearance took more than 715 msec.)
- 220 kV Moga PSTCL – Moga PGCIL ckt-2 also not tripped from Moga PSTCL end but total fault feeding time recorded was 246 msec. Line tripped from Moga PGCIL end only.
- 220 kV Moga PSTCL – Kotkaror ckt – 1 & 2 tripped from Moga end with Zone-4 timing thus cleared the fault under 240 msec.
- 220 kV Moga PSTCL – Sadiq tripped from Moga end and total fault feeding recorded was 44 msec, reason of tripping could not be identified due to connectivity issue in Main-2 relay.
- 220 kV Moga PSTCL – Moga PGCIL ckt- 4 tripped from both ends due to pilot wire protection operated at PG Moga end, no fault data available from Moga PSTCL end .
- 220 kV Busbar protection at 220 kV Ajitwal S/s operated at 11:06 Hrs, due to which 220 kV PG Moga , Jagraon ckt-2 and Himmatpura line tripped from Ajitwal end.
- 220 kV Badhni kalan – PG Moga line tripped from Badhni end due to false operation of Main-2 relay in Zone-1.
- 220 kV Himmatpura – Lehra Mohabbat ckt-2 tripped at 11:06 Hrs. due to false tripping of Power swing, which is now set to Power Swing Block only.

Remedial Measure :-

- 220 kV Moga PSTCL – Moga ckt-3 OC/EF relay did not clear the fault, issue was found in relay settings, now settings has been revised. Ckt-1, 2, 3 & 4 relay at PG Moga end are more sensitive to fault due to which Moga PSTCL – Moga PG ckt – 2, 3 & 4 tripped from PG Moga end only.
- Commissioning of Line Differential for 220 kV Moga PSTCL – Moga PGCIL ckt-1 , ckt-3 & ckt-4 has been completed and will also work as Distance protection. Due to mismatch in CT ratios of both ends of ckt-2, settings have been suggested by OEM, the approval of which is pending from PGCIL end.
- 220 kV Busbar protection at 220 kV Baghapurana has been checked for any false initiation and differential current and now in Healthy condition.
- New Busbar Protection Panel has arrived at 220 kV Moga PSTCL and work of commissioning will start after paddy season.
- 220 kV Badhni kalan end , PG Moga ckt Main-2 relay settings and Himmatpura end lehra ckt relay settings has been revised to avoid false tripping in future.

Annexure - 1



ABB

Disturbance Short Report

Disturbance Recordings Information

Device Information

Recorder ID	1
IED type	REL650
IED version	1.3.0.7
Station name	PSTCL MOGA
Object name	Baghapurana-2
IED name	REL650 1PN/1CB

Fault Information

Trig date and time	01-07-2025 10:48:47.746
Trigger signal name	START Z2
Recording number	159
Total recording time	3595 ms
Pre-trig recording time	500 ms
Post trig recording time	3000 ms
Max. recording time	4000 ms

General Recordings Information

Disturbance recorder	Installed
Event recorder	Installed
System frequency	50 Hz
Sampling frequency	1 kHz
Active setting group during recording	1

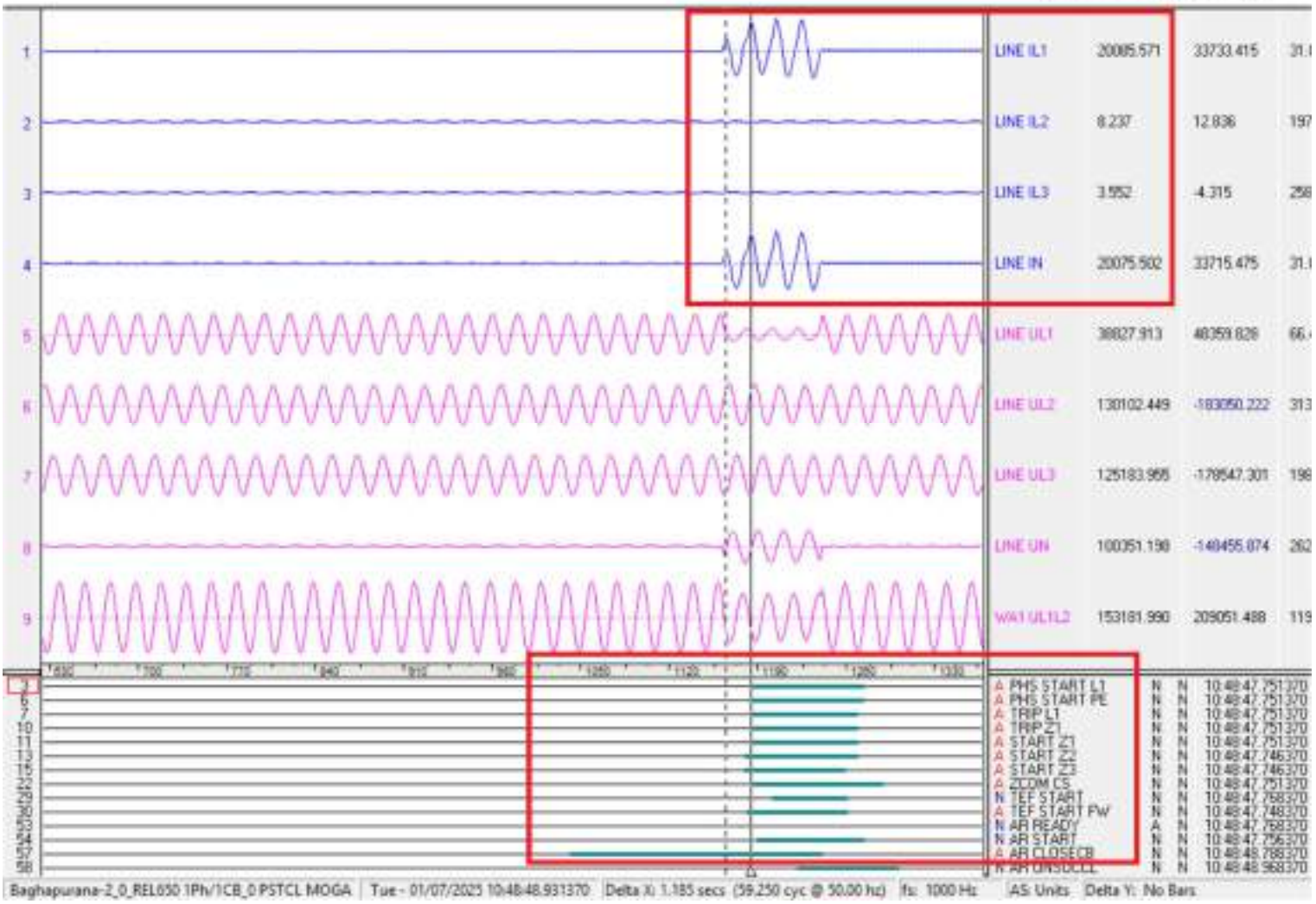
Fault Location Information

Fault loop type	L1-N
Fault location	1.9 km (18.7 %)
[illegible]	[illegible]
Fault direction	Forward

Analog Time Diagram

Trig Date Time: 01-07-2025 10:48:47.746

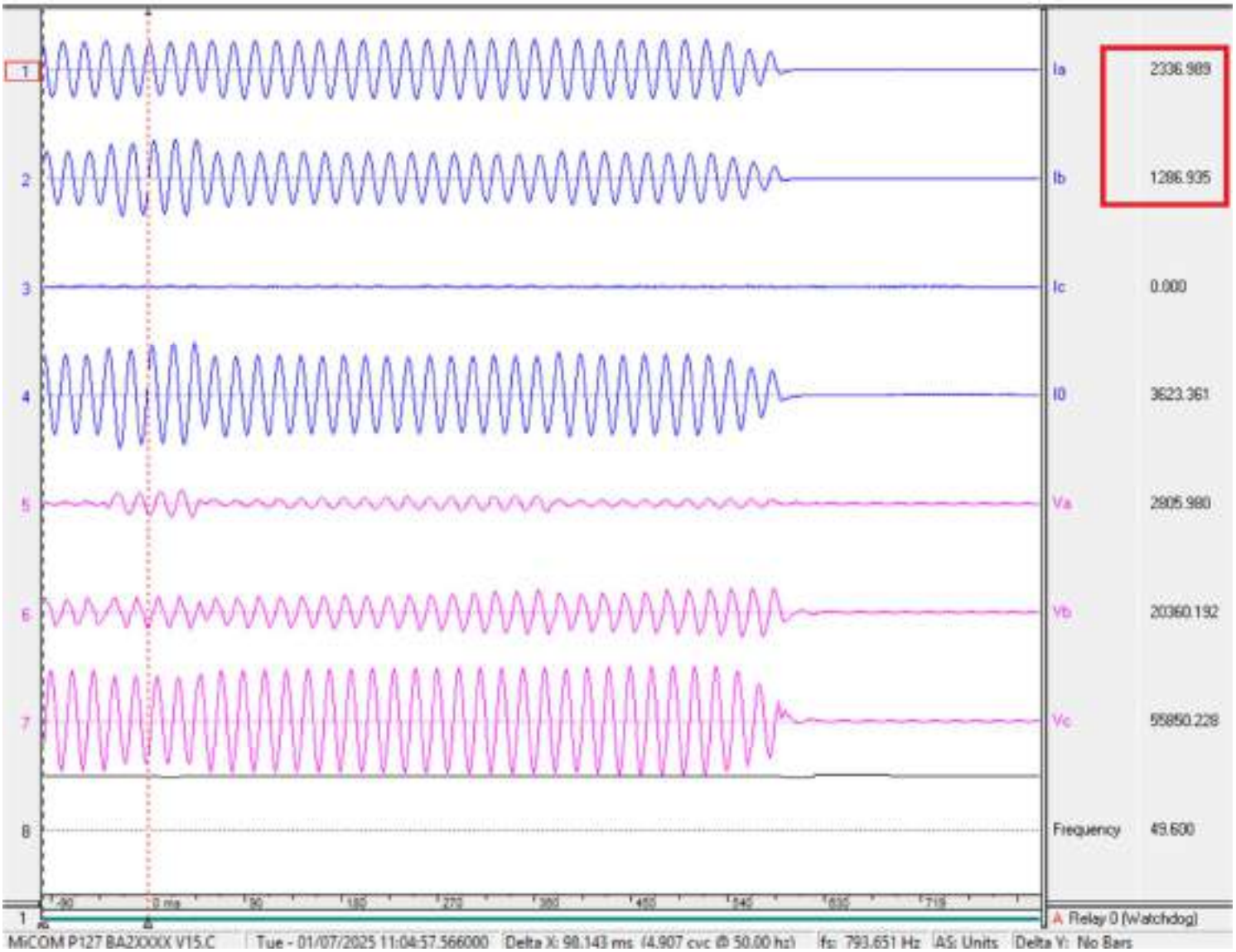
Annexure - 2


LINE IL1 20085.571 33733.415
LINE IL2 8.237 12.836
LINE IL3 3.552 -4.315
LINE IN 20075.502 33715.475
LINE UL1 38827.913 48359.826
LINE UL2 130102.449 -183050.222
LINE UL3 125183.965 -178547.301
LINE UN 100351.199 -149455.074
WA1 UL1L2 153181.990 209051.488
A PHS START L1
A PHS START PE
A TRIP L1
A TRIP Z1
A START Z1
A START Z2
A START Z3
A ZCOM CS
N TEF START
A TEF START FW
N AR READY
N AR START
A AR CLOSECB
Baghapurana-2_0_REL650 1Ph/1CB_0 PSTCL MOGA
Tue - 01/07/2025 10:48:48.931370
Delta X: 1.185 secs (59.250 cyc @ 50.00 hz)
fs: 1000 Hz
AS: Units
Delta Y: No Bars

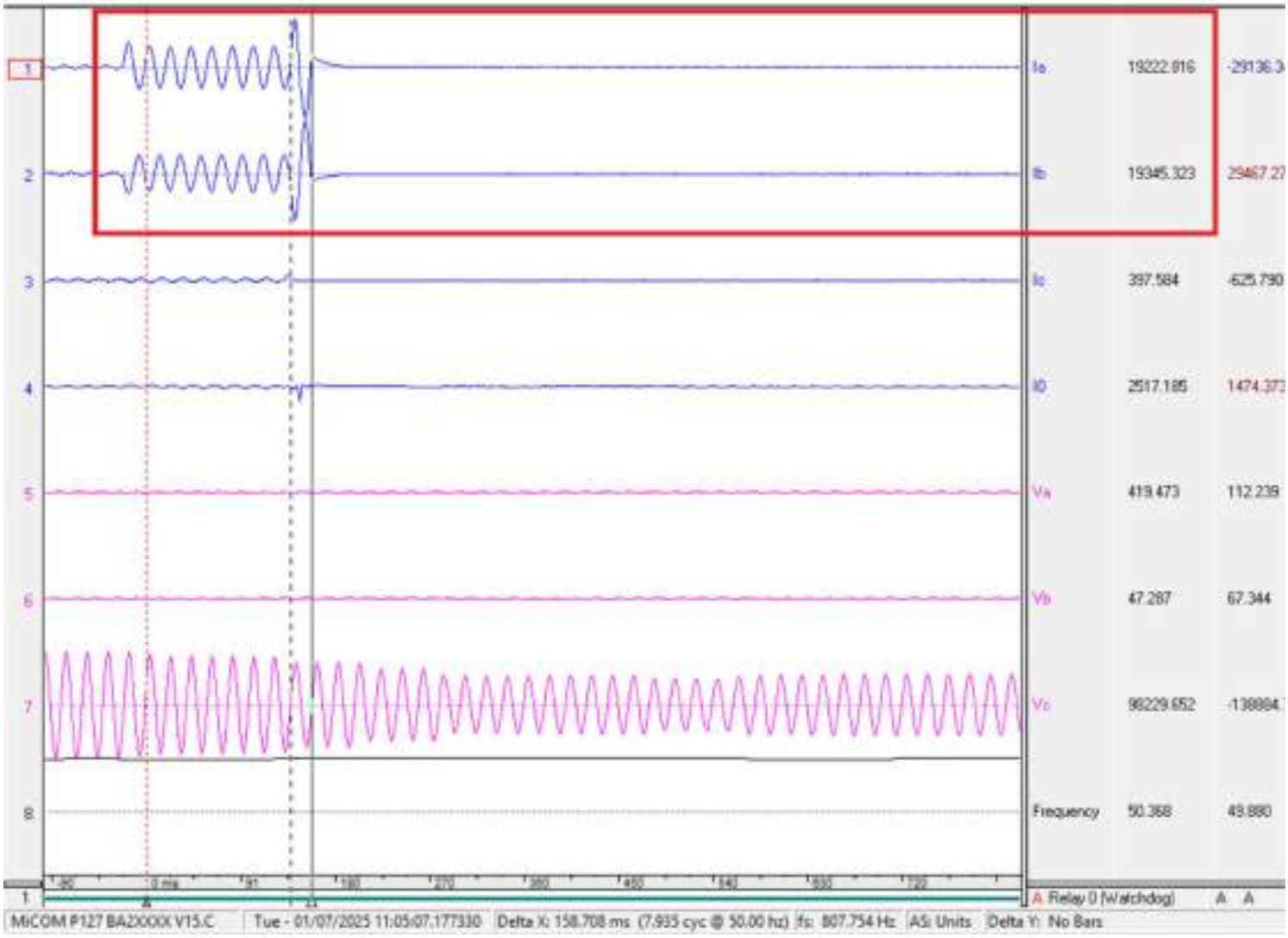
Annexure - 3

Type	Date & Time	Signal name	Status
P	29-06-2025 17:06:31.768	TEF START RV	On
P	29-06-2025 17:06:31.828	TEF START RV	Off
P	29-06-2025 17:34:21.047	TEF START RV	On
P	29-06-2025 17:34:21.127	TEF START RV	Off
P	29-06-2025 19:23:32.501	TEF START RV	On
P	29-06-2025 19:23:32.561	TEF START RV	Off
P	30-06-2025 06:10:57.285	TEF START RV	On
P	30-06-2025 06:10:57.305	TEF START RV	Off
P	01-07-2025 03:38:39.132	TEF START RV	On
P	01-07-2025 03:38:39.172	TEF START RV	Off
P	01-07-2025 11:48:53.105	TEF START RV	On
P	01-07-2025 11:48:53.705	TEF START FW	On
P	01-07-2025 11:48:53.705	TEF START RV	Off
P	01-07-2025 11:48:53.725	TEF START	On
P	01-07-2025 11:48:53.765	TEF START	Off
P	01-07-2025 11:48:53.785	TEF START FW	Off
P	01-07-2025 11:48:54.891	FF BLKU	On
P	01-07-2025 11:48:54.891	FF BLKZ	On
P	01-07-2025 11:48:54.896	FF BLKZ	Off
P	01-07-2025 11:48:54.966	FF BLKU	Off
P	01-07-2025 11:48:55.021	REC START	On
P	01-07-2025 11:48:55.291	REC START	Off
P	01-07-2025 11:48:57.065	AR READY	Off
P	01-07-2025 12:04:47.610	FF BLKU	On
P	01-07-2025 12:04:48.425	FF BLKU	Off
P	01-07-2025 19:44:14.878	AR READY	On

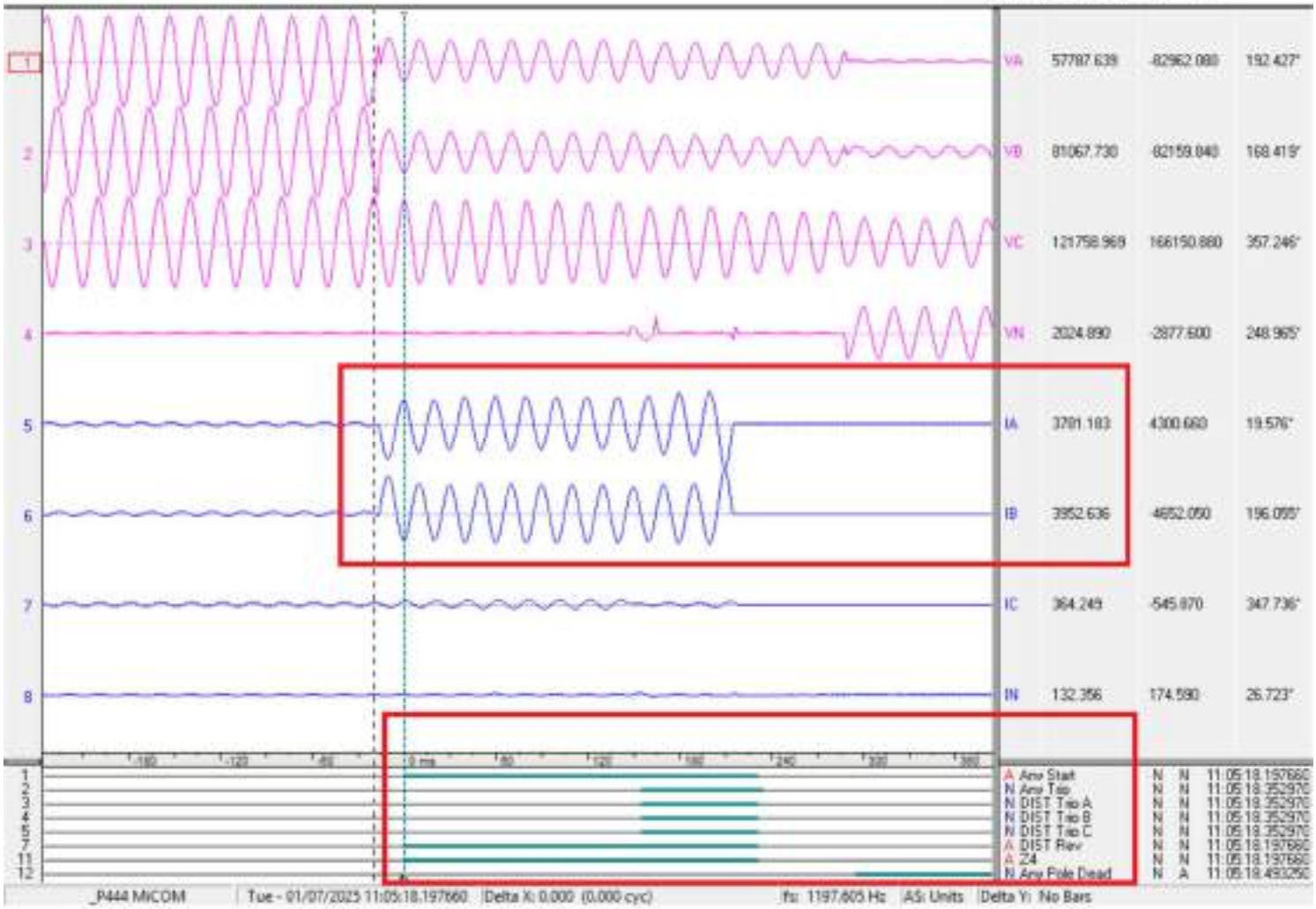
Annexure - 4

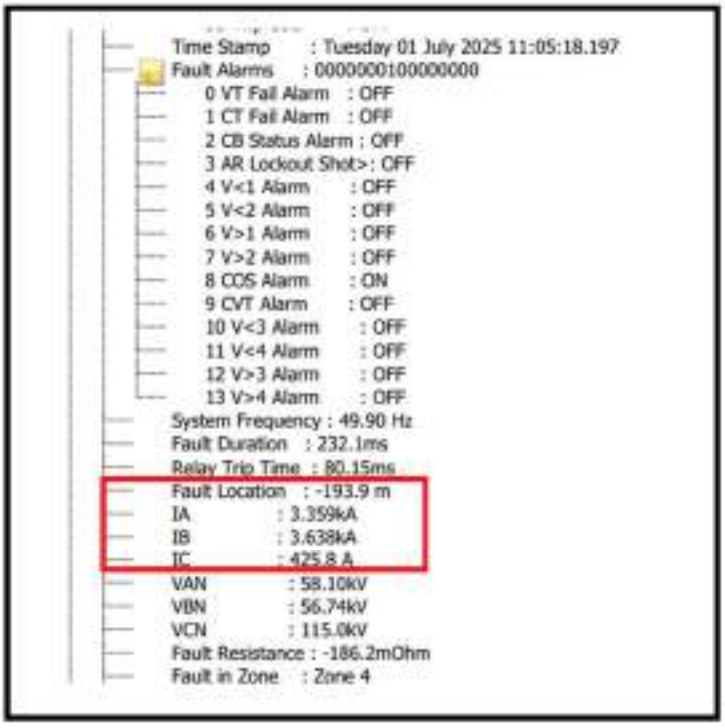

1
2
3
4
5
6
7
8
Ia
2336.989
Ib
1286.935
Ic
0.000
I0
3623.361
Va
2905.980
Vb
20360.192
Vc
55850.228
Frequency
49.600
A Relay 0 (Watchdog)
MiCOM P127 BA2XXXX V15.C
Tue - 01/07/2025 11:04:57.566000
Delta X: 98.143 ms (4.907 cyc @ 50.00 hz)
fs: 793.651 Hz
AS: Units
Delta Y: No Bars

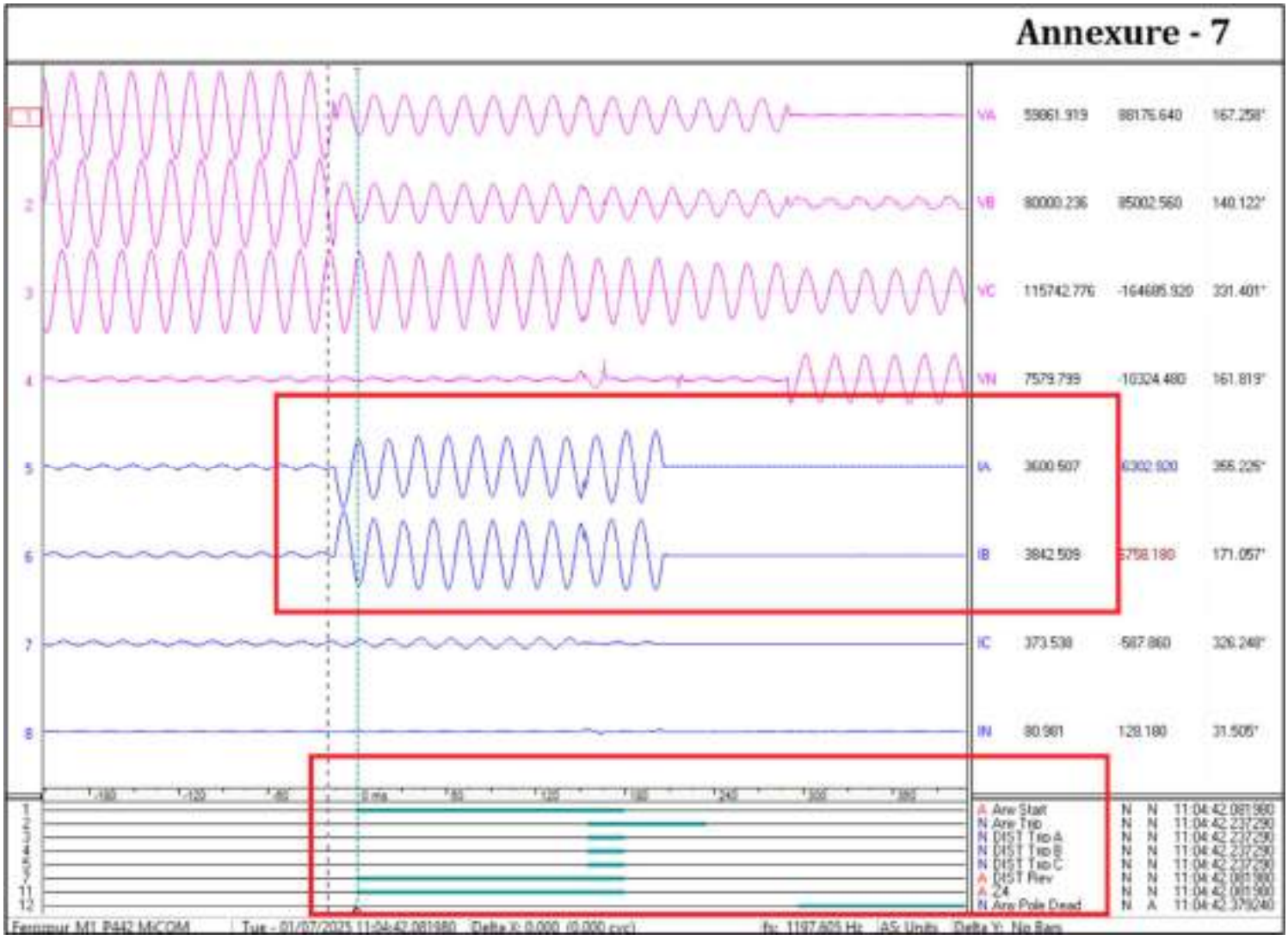
Annexure - 5


Ia 19222.916 -29136.3
Ib 19345.323 29467.27
Ic 397.584 -625.790
I0 2517.185 1474.373
Va 419.473 112.239
Vb 47.287 67.344
Vc 98229.652 -139884
Frequency 50.368 49.880
A Relay 0 (Watchdog)
MiCOM P127 BAZ0000X V15.C
Tue - 01/07/2025 11:05:07.177330
Delta X: 158.708 ms (7.935 cyc @ 50.00 hz) fs: 807.754 Hz
Delta Y: No Bars

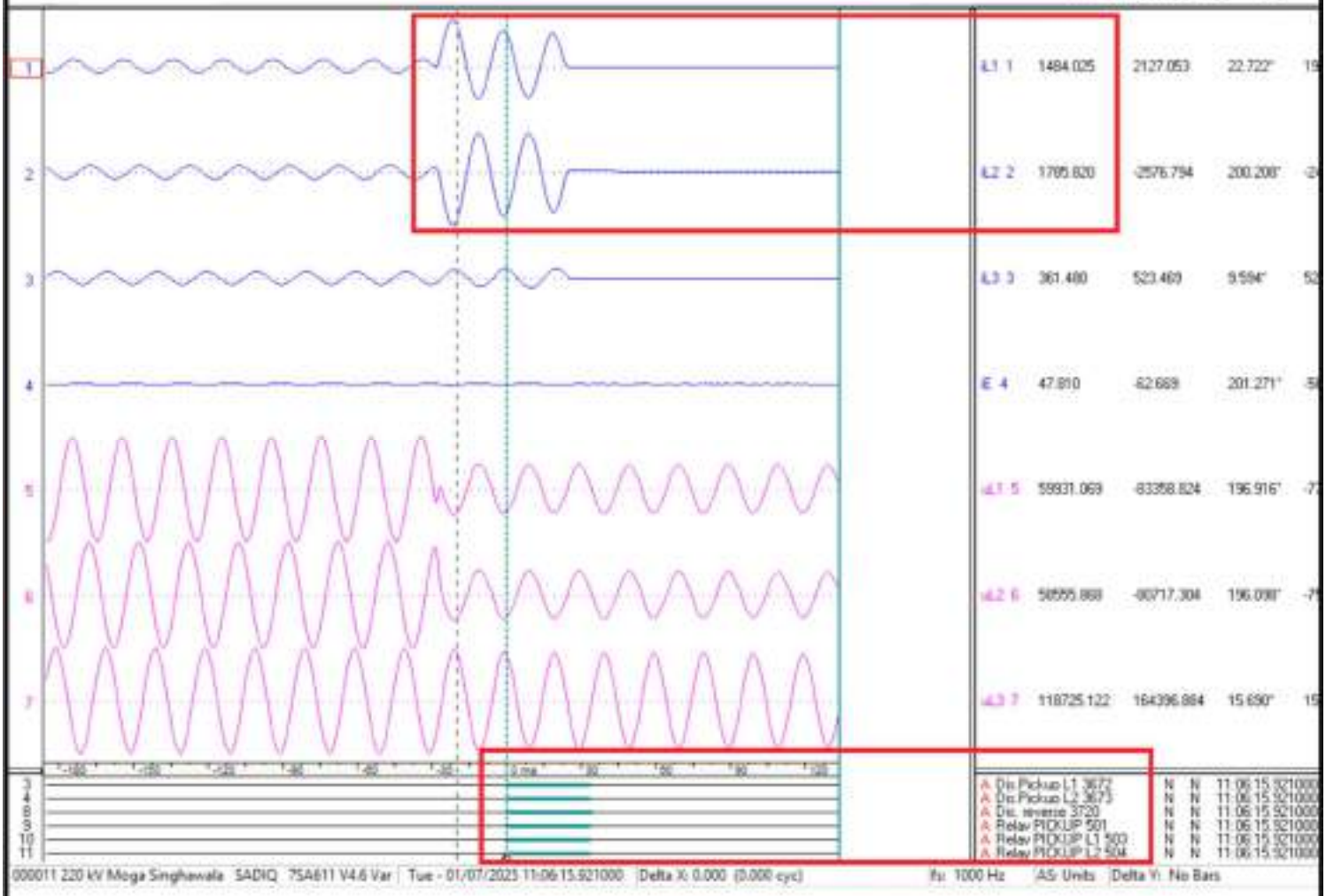
Annexure - 6


VA 57787.639 -82962.080 192.427°
VB 81067.730 -82159.840 168.419°
VC 121758.969 166150.880 357.246°
VN 2024.890 -2877.600 248.965°
IA 3701.183 4300.660 19.576°
IB 3952.636 4652.050 196.055°
IC 364.249 -545.870 347.736°
IN 132.356 174.590 26.723°
A Any Start
N Any Trip
N DIST Trip A
N DIST Trip B
N DIST Trip C
A DIST Rev
A Z4
N Any Pole Dead
_P444 MiCOM
Tue - 01/07/2025 11:05:18.197660
Delta X: 0.000 (0.000 cyc)
fs: 1197.605 Hz
ASi Units
Delta Y: No Bars


Time Stamp : Tuesday 01 July 2025 11:05:18.197
Fault Alarms : 0000000100000000
0 VT Fail Alarm : OFF
1 CT Fail Alarm : OFF
2 CB Status Alarm : OFF
3 AR Lockout Shot>: OFF
4 V<1 Alarm : OFF
5 V<2 Alarm : OFF
6 V>1 Alarm : OFF
7 V>2 Alarm : OFF
8 COS Alarm : ON
9 CVT Alarm : OFF
10 V<3 Alarm : OFF
11 V<4 Alarm : OFF
12 V>3 Alarm : OFF
13 V>4 Alarm : OFF
System Frequency : 49.90 Hz
Fault Duration : 232.1ms
Relay Trip Time : 80.15ms
Fault Location : -193.9 m
IA : 3.359kA
IB : 3.638kA
IC : 425.8 A
VAN : 58.10kV
VBN : 56.74kV
VCN : 115.0kV
Fault Resistance : -186.2mOhm
Fault in Zone : Zone 4


Annexure - 7
VA 59861.919 88176.640 167.258°
VB 80000.236 85002.560 140.122°
VC 115742.776 -164685.920 331.401°
VN 7579.799 -10324.480 161.819°
IA 3600.507 6302.920 355.225°
IB 3842.509 5758.180 171.057°
IC 373.539 587.860 326.248°
IN 80.981 129.180 31.505°
A Anv Start
N Anv Trip
N 51ST Trip A
N 51ST Trip B
N 51ST Trip C
A 51ST Rev
A 24
N Anv Pole Dead
Ferromur M1 P442 MiCOM
Tue - 01/07/2025 11:04:42.081980 Delta X: 0.000 (0.000 cyc)
fs: 1197.605 Hz AS: Units Delta Y: No Bars

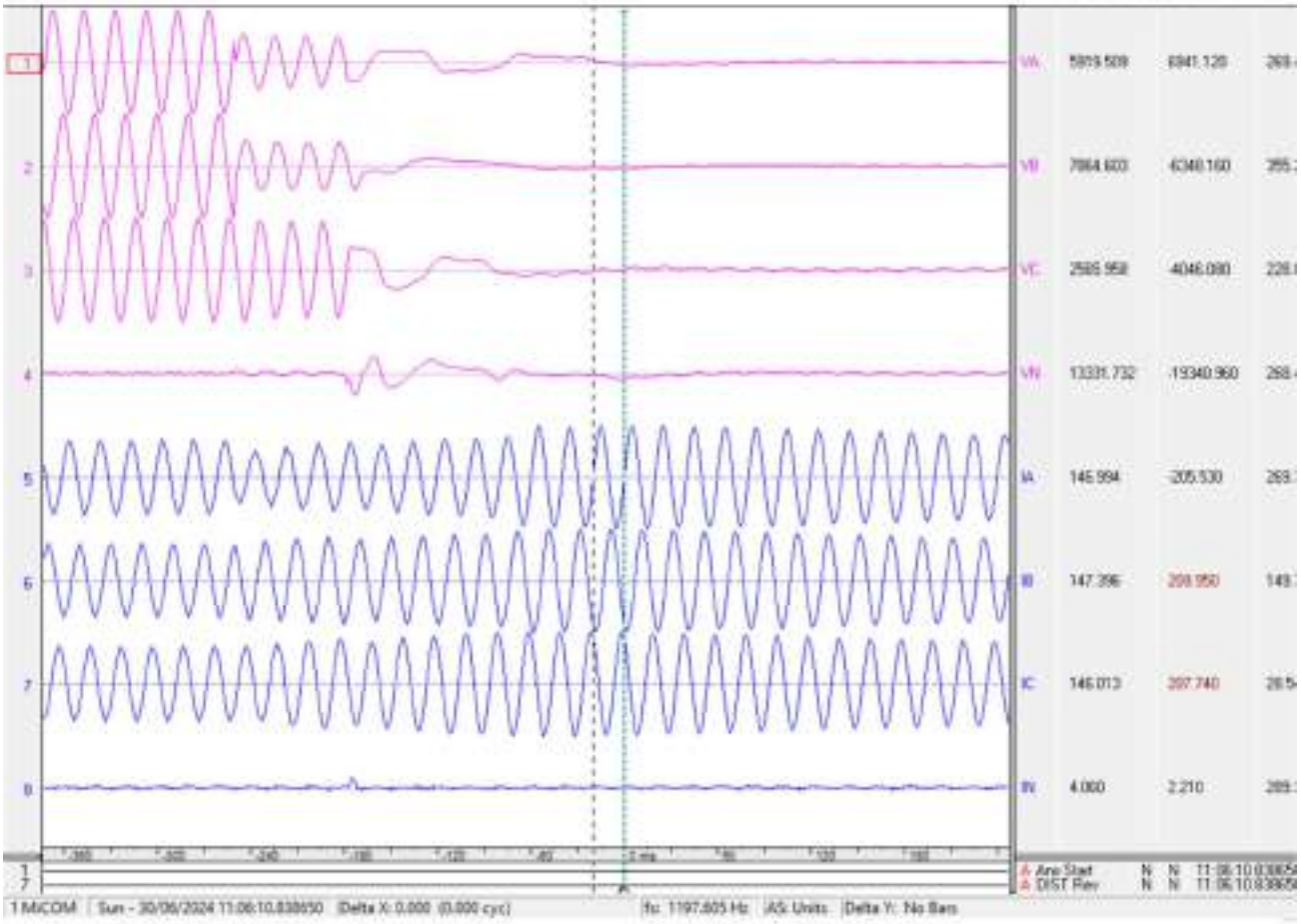
Annexure - 8

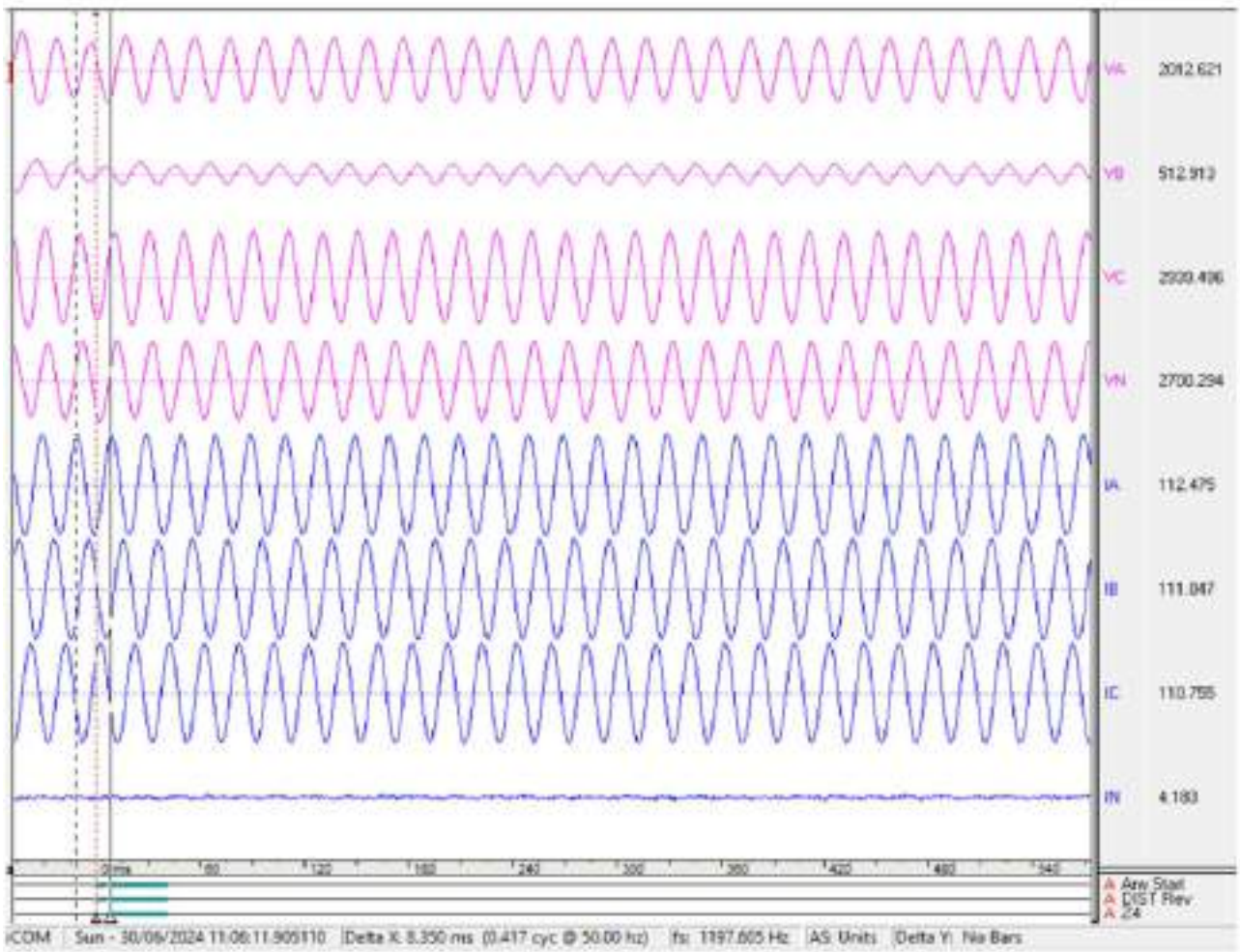


Number	Indication	Value	Date and time	Cause	State
00301	Power System fault	10 - ON	01.07.2025 11:06:15.920		
00302	Fault Event	11 - ON	01.07.2025 11:06:15.920		
03685	Distance Pickup L12	ON	1 ms		
03710	Distance Loop L12 selected reverse	ON	1 ms		
03671	Distance PICKED UP	OFF	35 ms		
03710	Distance Loop L12 selected reverse	OFF	36 ms		
01126	Fault Locator Loop L1L2	ON	23 ms		
01117	Flt Locator: secondary RESISTANCE	-0.17 Ohm	23 ms		
01118	Flt Locator: secondary REACTANCE	-0.10 Ohm	23 ms		
01114	Flt Locator: primary RESISTANCE	-0.44 Ohm	23 ms		
01115	Flt Locator: primary REACTANCE	-0.25 Ohm	23 ms		
01119	Flt Locator: Distance to fault	-0.6 km	23 ms		
01120	Flt Locator: Distance [%] to fault	-0.9 %	23 ms		

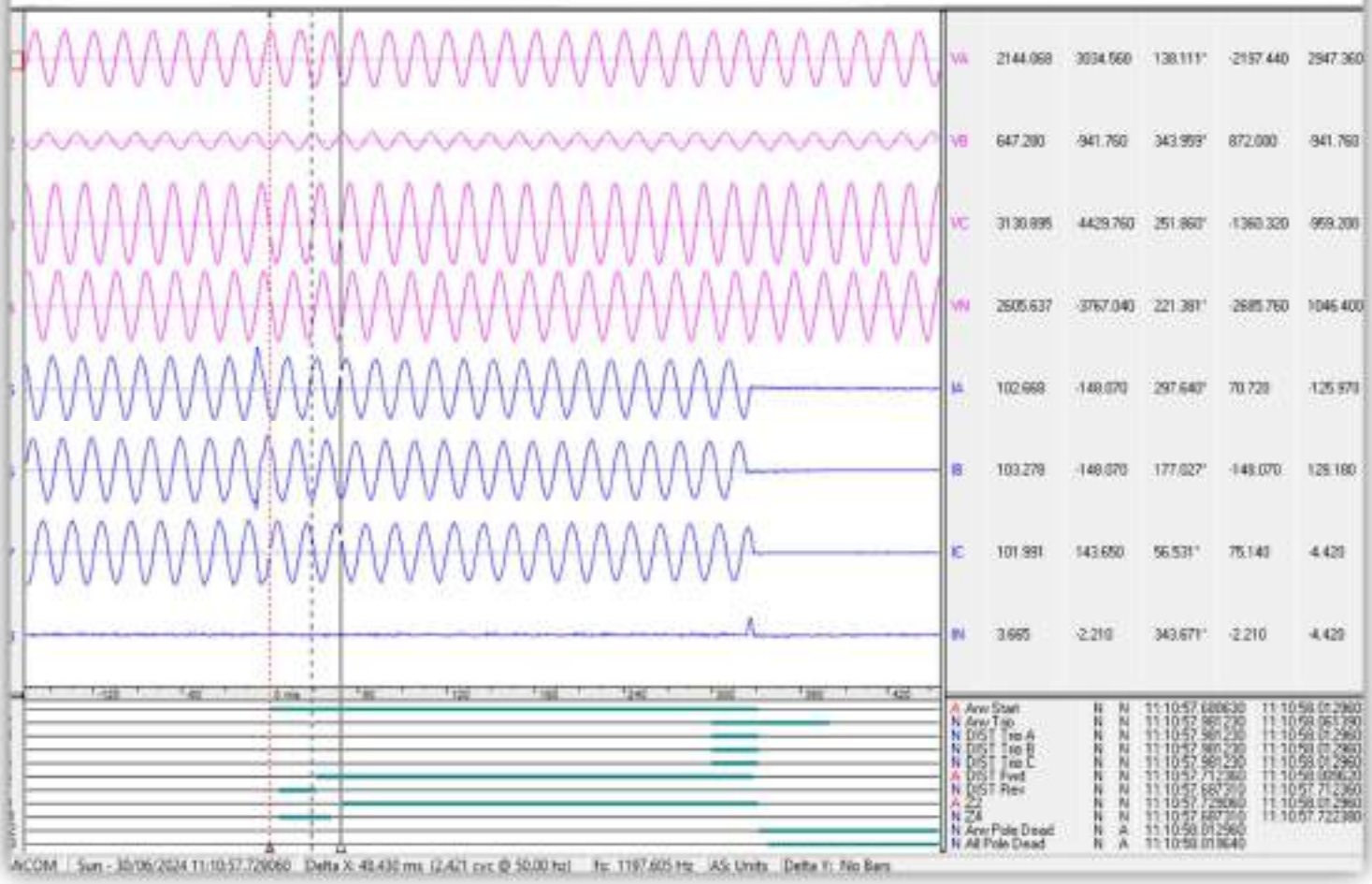
P	01-07-2025	10:31:20:166	ZB In ALARM	On
P	01-07-2025	10:31:20:172	ZA In ALARM	On
P	01-07-2025	10:31:20:232	ZA In ALARM	Off
P	01-07-2025	10:31:20:235	ZB In ALARM	Off
P	01-07-2025	10:31:20:318	Bay06 BF ReTR	On
P	01-07-2025	10:31:20:319	Bay06 CB TRIP	On
P	01-07-2025	10:31:20:518	Bay06 BF ReTR	Off
P	01-07-2025	10:31:20:520	Bay06 CB TRIP	Off
P	01-07-2025	10:47:13:763	Bay06 CB TRIP	On
P	01-07-2025	10:47:13:763	Bay07 CB TRIP	On
P	01-07-2025	10:47:13:763	ZA COMON TRIP	On
P	01-07-2025	10:47:13:763	ZA L2 TRIP	On
P	01-07-2025	10:47:13:763	ZB COMON TRIP	On
P	01-07-2025	10:47:13:763	ZB L2 TRIP	On
P	01-07-2025	10:47:13:766	ZA L1 TRIP	On
P	01-07-2025	10:47:13:766	ZB L1 TRIP	On
P	01-07-2025	10:47:13:769	ZA In ALARM	On
P	01-07-2025	10:47:13:769	ZB In ALARM	On
P	01-07-2025	10:47:13:775	ZA In ALARM	Off
P	01-07-2025	10:47:13:775	ZB In ALARM	Off
P	01-07-2025	10:47:13:850	ZA Id ALARM	Off
P	01-07-2025	10:47:13:850	ZB Id ALARM	Off
P	01-07-2025	10:47:13:878	Bay07 BF ReTR	On
P	01-07-2025	10:47:13:994	ZA L1 TRIP	Off
P	01-07-2025	10:47:13:994	ZB L1 TRIP	Off
P	01-07-2025	10:47:14:018	Bay06 CB TRIP	Off
P	01-07-2025	10:47:14:018	ZA COMON TRIP	Off
P	01-07-2025	10:47:14:018	ZA L2 TRIP	Off
P	01-07-2025	10:47:14:018	ZB COMON TRIP	Off
P	01-07-2025	10:47:14:018	ZB L2 TRIP	Off
P	01-07-2025	10:47:14:085	Bay07 BF ReTR	Off
P	01-07-2025	10:47:14:087	Bay07 CB TRIP	Off
P	01-07-2025	10:52:01:253	Bay01 BF ReTR	On
P	01-07-2025	10:52:01:461	Bay01 BF ReTR	Off
P	01-07-2025	11:31:18:135	Bay01 to ZA	On
P	01-07-2025	11:31:18:135	Bay02 to ZB	On
P	01-07-2025	11:31:18:135	Bay03 to ZB	On
P	01-07-2025	11:31:18:135	Bay04 to ZA	On
P	01-07-2025	11:31:18:135	Bay05 to ZB	On
P	01-07-2025	11:31:18:135	Bay07 to ZA	On

Annexure - 9


VA 5815.509 6941.120
VB 7864.603 4048.160
VC 2585.958 4046.080
VN 13331.732 19340.960
IA 146.994 205.530
IB 147.356 208.950
IC 146.013 207.740
IN 4.000 2.210
A Ane Start
A DIST Rev
1 MICOM Sun - 30/06/2024 11:06:10.838650 Delta X: 0.000 (0.000 cyc) fs: 1197.605 Hz AS: Units Delta Y: No Bars


VA 2012.621
VB 512.913
VC 2939.496
VN 2700.294
IA 112.475
IB 111.047
IC 110.755
IN 4.183
A Ane Start
A DIST Rev
A 24
iCOM Sun - 30/06/2024 11:06:11.905110 Delta X: 8.350 ms (0.417 cyc @ 50.00 hz) fs: 1197.605 Hz AS: Units Delta Y: No Bars

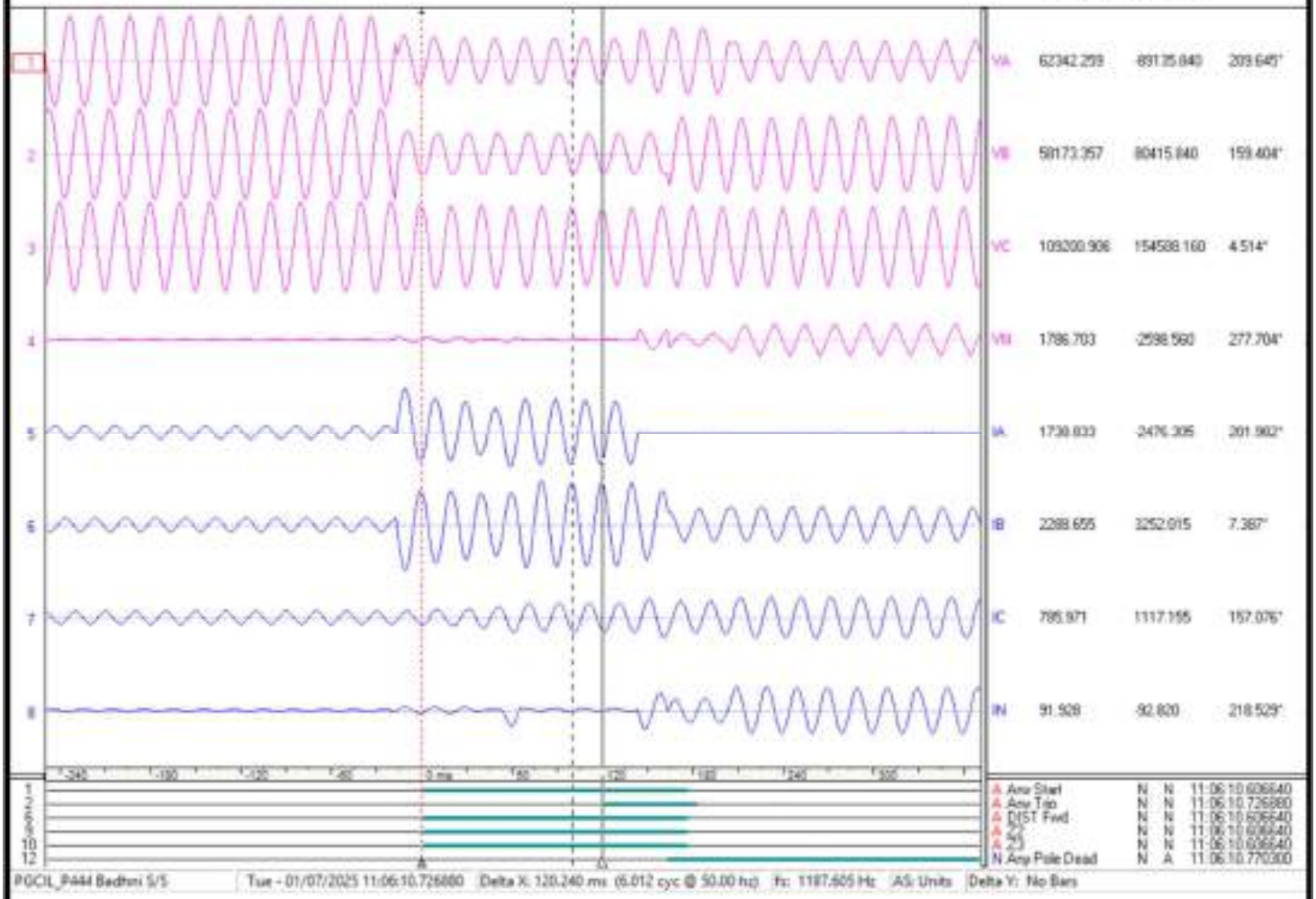
Annexure - 10



Annexure - 12

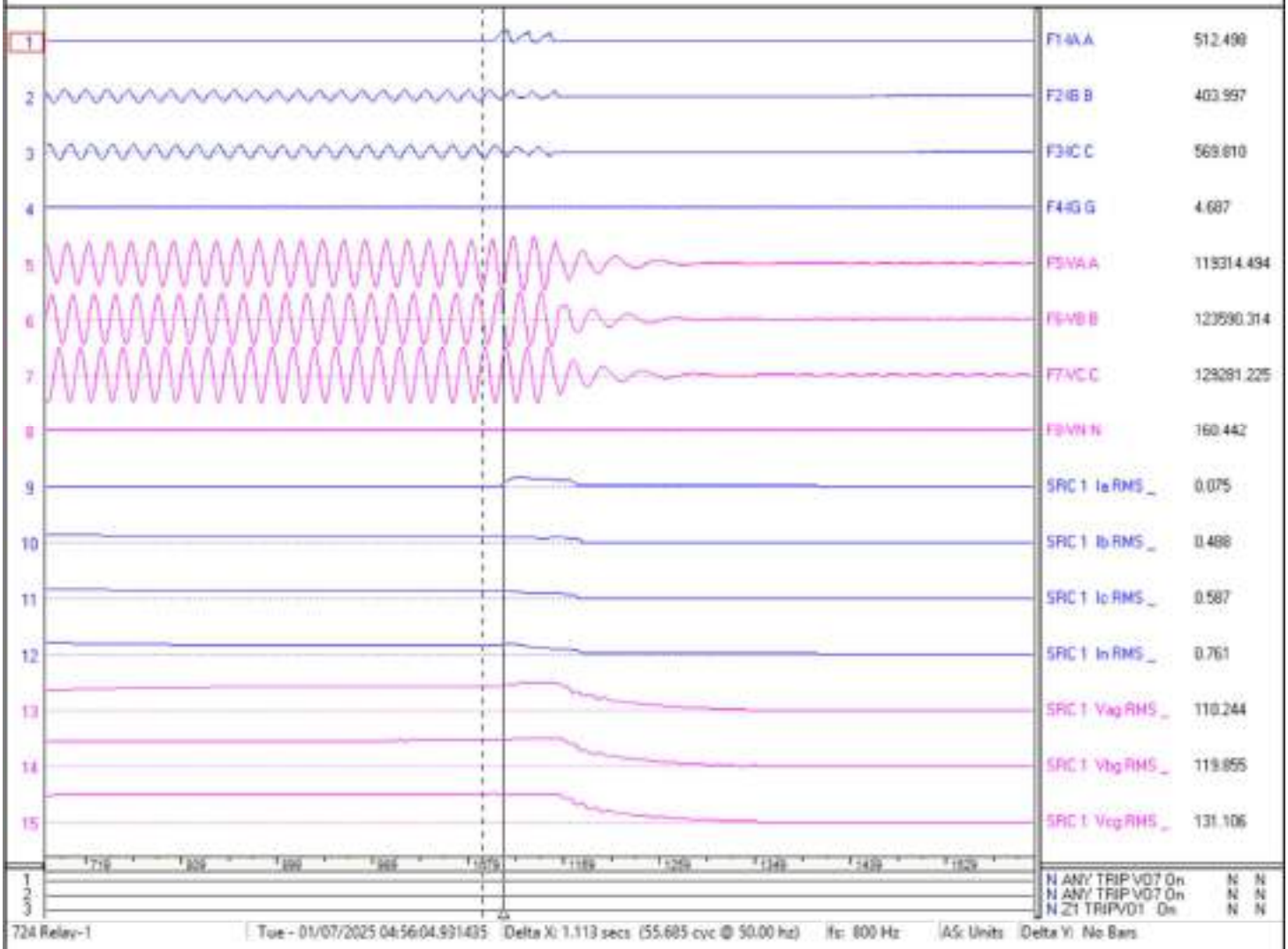
Event Nu	Date/Time	Cause	Data
6250	Jul 01 2025 04:56:03.817733	PUTT TX1	
6249	Jul 01 2025 04:56:03.817733	GND DIST Z1 OP A	
6248	Jul 01 2025 04:56:03.817733	GND DIST Z1 PKP A	
6247	Jul 01 2025 04:56:03.815233	PH DIST Z2 PKP BC	
6246	Jul 01 2025 04:56:03.807743	GND DIST Z2 PKP A	
6245	Jul 01 2025 04:56:03.805231	GND DIST Z3 PKP A	
6244	Jul 01 2025 04:56:03.797731	PH DIST Z3 PKP BC	
6243	Jul 01 2025 04:56:03.772732	PH DIST Z3 DPO BC	
6242	Jul 01 2025 04:56:03.755231	PH DIST Z3 PKP BC	
6241	Jul 01 2025 04:56:03.750231	PH DIST Z3 DPO BC	
6240	Jul 01 2025 04:56:03.747733	PH DIST Z3 PKP BC	
6239	Jul 01 2025 04:56:03.745230	PH DIST Z2 PKP AB	
6238	Jul 01 2025 04:56:03.735232	PH DIST Z3 PKP AB	

Annexure - 11



Tuesday 01 July 2025 11:06:10.717: Logic Inputs 1
- Description: PGCIL Moga
- Plant reference: Badhni S/S
- Model number: P44491PB6M0710M
- Address: 001 Column: 00 Row: 20
- Event type: Logic Input Changed State
- Category: 0
- Event Value : 00000100000000001000100O
  - 0 L1 CB R PH OPEN : OFF
  - 1 L2 CB Y PH OPEN : OFF
  - 2 L3 CB B PH OPEN : OFF
  - 3 L4 CB HLTY A/R : ON
  - 4 L5 SPARE : OFF
  - 5 L6 SPARE : OFF
  - 6 L7 SPARE : OFF
  - 7 L8 CARR IN SERV : ON
  - 8 L9 CARR HLTY : OFF
  - 9 L10 CARR REC : OFF
  - 10 L11 DIR TRIP REC: OFF
  - 11 L12 LBB OPTD : OFF
  - 12 L13 POLE DISC : OFF
  - 13 L14 SPARE : OFF
  - 14 L15 SOTF INI : OFF
  - 15 L16 TRIP RLY 86 : OFF
  - 16 L17SF6 GAS ALM : OFF
  - 17 L18 SF6 GAS TRIP: OFF
  - 18 L19 M-2 R PH INI: ON
  - 19 L20 M-2 Y PH INI: OFF
  - 20 L21 M-2 B PH INI: OFF
  - 21 L22 SPARE : OFF
  - 22 L23 SPARE : OFF

Annexure - 13



6280	Jul 01 2025 04:56:05.060234	SRC1 VT FF VOL LOSS	
6279	Jul 01 2025 04:56:04.931422	TRIP RLY OPD On (CI1)	
6278	Jul 01 2025 04:56:03.910231	PH DIST Z3 DPO BC	
6277	Jul 01 2025 04:56:03.907731	PH DIST Z3 PKP BC	
6276	Jul 01 2025 04:56:03.905232	R23 R-INIT Off (CO23)	
6275	Jul 01 2025 04:56:03.905232	R10 AR R PH Off (CO10)	
6274	Jul 01 2025 04:56:03.905232	R7 LBB R PH Off (CO7)	
6273	Jul 01 2025 04:56:03.905232	R4 TC2 R PH Off (CO4)	
6272	Jul 01 2025 04:56:03.905232	R1 TC1 R PH Off (CO1)	
6271	Jul 01 2025 04:56:03.902731	GND DIST Z3 DPO B	
6270	Jul 01 2025 04:56:03.899231	GND DIST Z3 PKP B	
6269	Jul 01 2025 04:56:03.899231	PH DIST Z3 DPO AB	
6268	Jul 01 2025 04:56:03.882731	ANY TRIP VO7 Off (VO7)	
6267	Jul 01 2025 04:56:03.882731	GND DIST Z1 DPO A	
6266	Jul 01 2025 04:56:03.882731	PH DIST Z3 DPO BC	
6265	Jul 01 2025 04:56:03.882731	PH DIST Z2 DPO BC	
6264	Jul 01 2025 04:56:03.882731	PH DIST Z2 DPO AB	
6263	Jul 01 2025 04:56:03.837731	R23 R-INIT On (CO23)	
6262	Jul 01 2025 04:56:03.837731	R10 AR R PH On (CO10)	
6261	Jul 01 2025 04:56:03.837731	R7 LBB R PH On (CO7)	
6260	Jul 01 2025 04:56:03.837731	R4 TC2 R PH On (CO4)	
6259	Jul 01 2025 04:56:03.837731	R1 TC1 R PH On (CO1)	
6258	Jul 01 2025 04:56:03.820243	R14 CR SEND On (CO14)	
6257	Jul 01 2025 04:56:03.820243	FAULT RPT TRIG	
6256	Jul 01 2025 04:56:03.820243	GND DIST Z3 DPO A	
6255	Jul 01 2025 04:56:03.820243	GND DIST Z2 DPO A	

Annexure - 14

32763	Jul 01 2025 11:06:12.773786	R5 TC2 Y PH Off (CO5)	
32762	Jul 01 2025 11:06:12.773786	R4 TC2 R PH Off (CO4)	
32761	Jul 01 2025 11:06:12.773786	R3 TC1 B PH Off (CO3)	
32760	Jul 01 2025 11:06:12.773786	R2 TC1 Y PH Off (CO2)	
32759	Jul 01 2025 11:06:12.773786	R1 TC1 R PH Off (CO1)	
32758	Jul 01 2025 11:06:10.773790	R12 AR B PH On (CO12)	
32757	Jul 01 2025 11:06:10.773790	R11 AR Y PH On (CO11)	
32756	Jul 01 2025 11:06:10.773790	R10 AR R PH On (CO10)	
32755	Jul 01 2025 11:06:10.773790	R9 LBB B PH On (CO9)	
32754	Jul 01 2025 11:06:10.773790	R8 LBB Y PH On (CO8)	
32753	Jul 01 2025 11:06:10.773790	R7 LBB R PH On (CO7)	
32752	Jul 01 2025 11:06:10.773790	R6 TC2 B PH On (CO6)	
32751	Jul 01 2025 11:06:10.773790	R5 TC2 Y PH On (CO5)	
32750	Jul 01 2025 11:06:10.773790	R4 TC2 R PH On (CO4)	
32749	Jul 01 2025 11:06:10.773790	R3 TC1 B PH On (CO3)	
32748	Jul 01 2025 11:06:10.773790	R2 TC1 Y PH On (CO2)	
32747	Jul 01 2025 11:06:10.773790	R1 TC1 R PH On (CO1)	
32746	Jul 01 2025 11:06:10.761286	POWER SWING OUTGOING	
32745	Jul 01 2025 11:06:10.761286	POWER SWING TRIP	
32744	Jul 01 2025 11:06:10.681286	POWER SWING UN/BLOCK	
32743	Jul 01 2025 11:06:10.671286	POWER SWING INCOMING	
32742	Jul 01 2025 11:06:10.661289	POWER SWING INNER	
32741	Jul 01 2025 11:06:10.646289	POWER SWING BLOCK	
32740	Jul 01 2025 11:06:10.636289	POWER SWING MIDDLE	
32739	Jul 01 2025 11:06:10.616286	POWER SWING OUTER	
32738	Jun 16 2025 19:01:52.998784	DATE/TIME CHANGED	

Multiple Element Tripping Event at 220kV Patparganj(DTL)

At 17:31 hrs on 09.07.2025

Tripped Elements

S. No	Name of Elements	Outage Time	Revival Time	Reason of tripping
1.	220 kV Patparganj-IPPOS (DTL) Ckt-1	17:31 hrs	18:25 hrs	Bus bar protection operated at 220kV Bus-2 at Patparganj(DTL)
2.	220 kV Patparganj-IPPOS (DTL) Ckt-2		17:44 hrs	
3.	220 kV Patparganj-Geeta Colony (DTL) Ckt-1		17:41 hrs	
4.	220 kV Patparganj-Geeta Colony (DTL) Ckt-2		17:41 hrs	
5.	220 kV Patparganj-Ghazipur (DTL) Ckt		18:25 hrs	
6.	220/66kV 100MVA ICT-1 at Patparganj(DTL)		17:42 hrs	
7.	220/66kV 100MVA ICT-2 at Patparganj(DTL)		17:42 hrs	
8.	220 kV Rajghat-IPPOS (DTL) Ckt-1		18:30 hrs	Details yet to be shared
9.	220 kV Rajghat-IPPOS (DTL) Ckt-2		18:30 hrs	
10.	104 MW GT-1 at Pragati (PPCL)			
11.	122 MW STG at Pragati (PPCL)		19:19 hrs	

Brief details of the event

i. 220/66kV Patparganj(DTL) has double main Bus arrangement at 220kV side.

ii. During antecedent condition, 220 kV Patparganj-IPPOS (DTL) Ckt-1 & 2, 220 kV Patparganj-Geeta Colony (DTL) Ckt-1 & 2, 220 kV Patparganj-Ghazipur (DTL) Ckt and 220/66kV 100MVA ICT-1 & 2 at Patparganj(DTL) were connected to 220kV Bus-2 at Patparganj(DTL) and 220kV Patparganj-Preet Vihar Ckt-1 & 2 and 220/33kV 100MVA ICT-1 & 3 were connected to 220kV Bus-1 at Patparganj(DTL). 220kV Bus coupler was in OFF position. 104 MW GT-1 and 122 MW STG at Pragati (PPCL) were generating approx. 80 MW and 104 MW respectively.

iii. As reported, at 17:31 hrs, bus bar protection operated at 220kV Bus-2 at Patparganj(DTL) and all the elements connected to Bus-2 tripped and Bus-2 became dead (exact nature, location and reason of fault yet to be shared).

iv. During the same time, 220 kV Rajghat-IPPOS (DTL) Ckt-1 & 2 also tripped (exact reason and nature of protection operated yet to be shared).

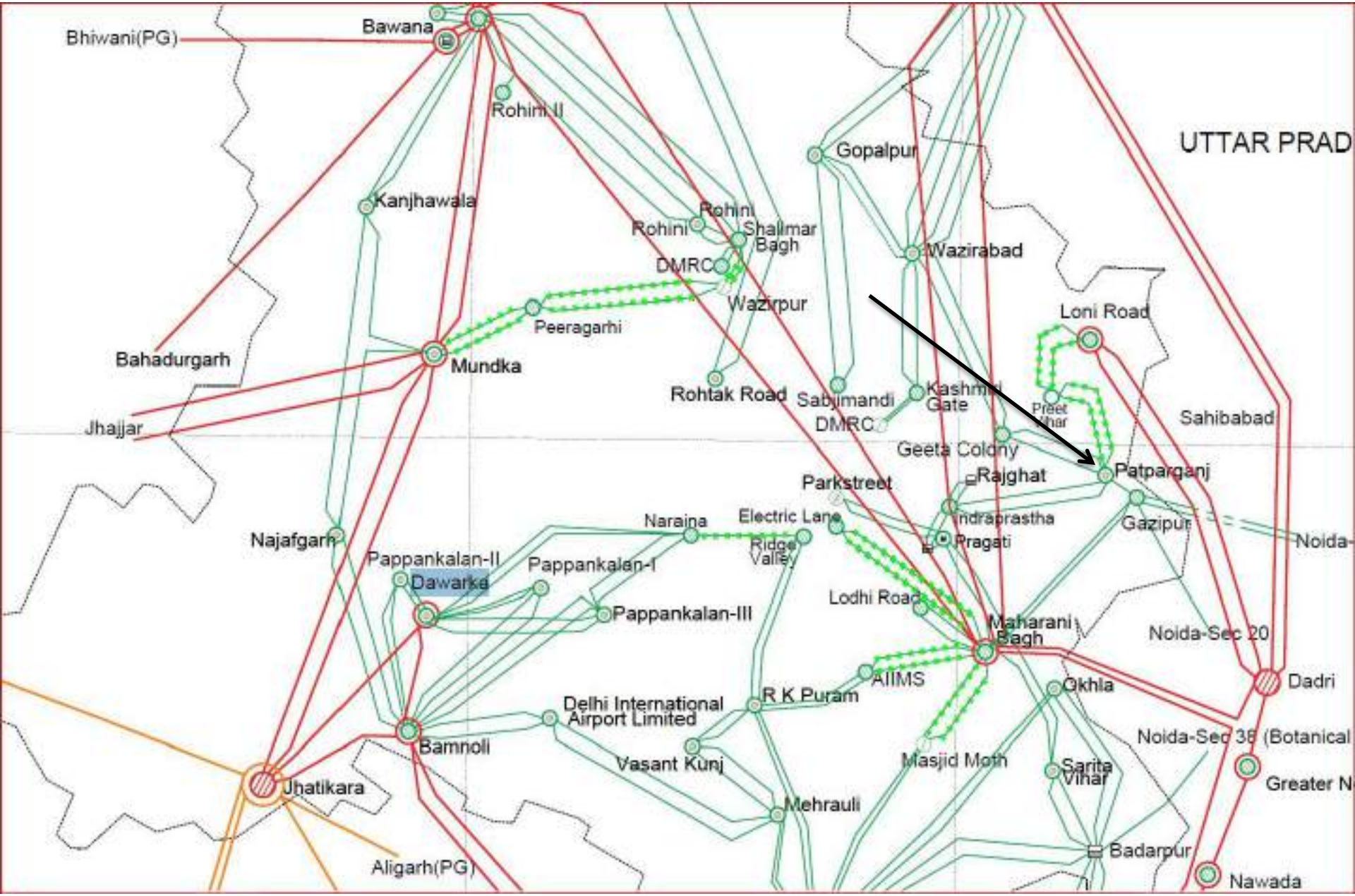
v. As reported by SLDC Delhi, 104 MW GT-1 and 122 MW STG at Pragati (PPCL) tripped during the same time (exact reason and nature of protection operated yet to be shared).

vi. As per PMU at Dwarka(PG), R-Y phase to phase fault with fault clearance time of 120msec was observed.

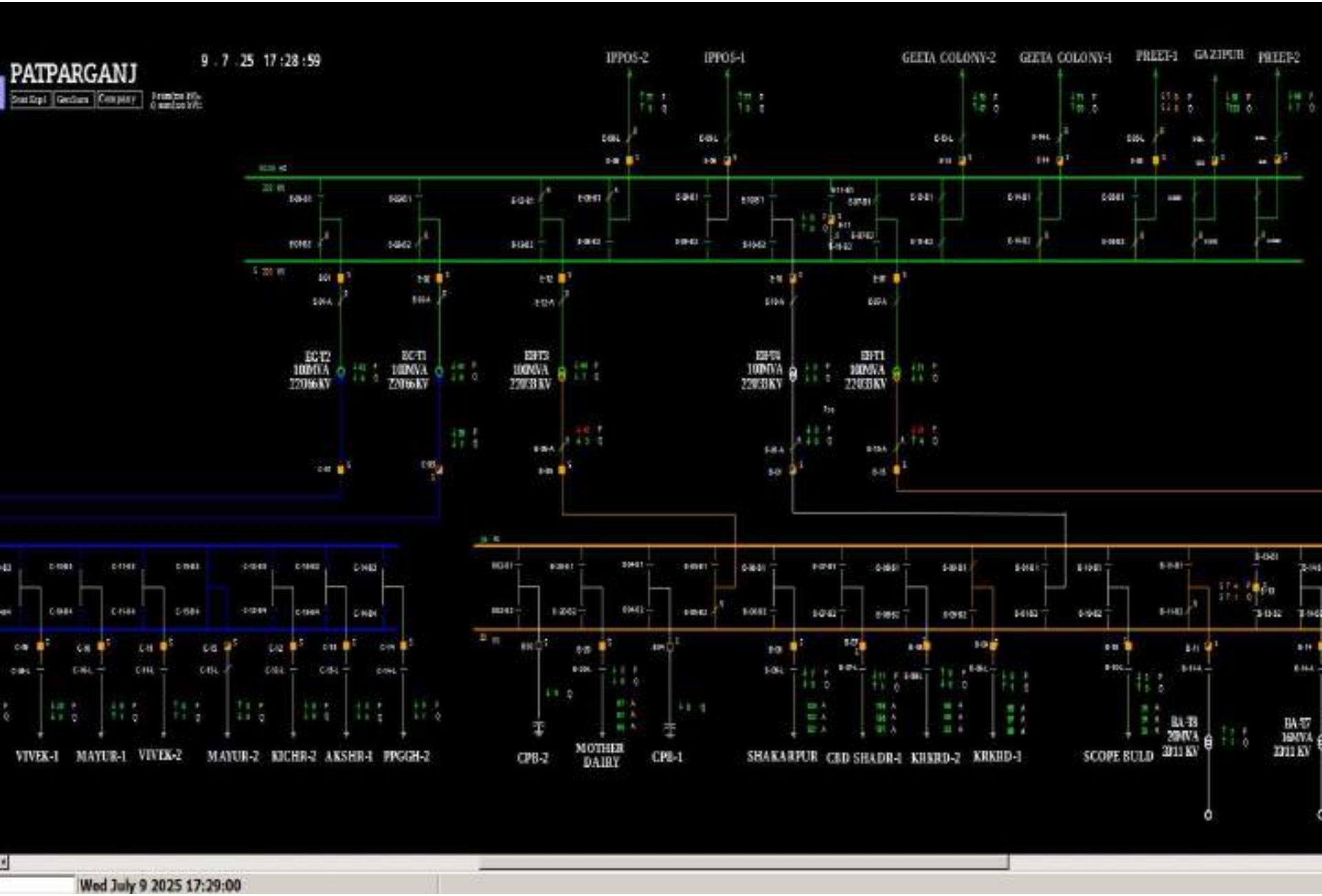
vii. As per SCADA, change in demand of approx. 405 MW in Delhi control area was observed. However, as reported by SLDC Delhi, load loss of approx. 270 MW in Delhi control area and generation loss of approx. 184 MW at Pragati(PPCL) occurred.

viii. As reported by SLDC Delhi, at 17:38 hrs, 220kV Bus coupler was closed at Pragati and IPPOS normalised.

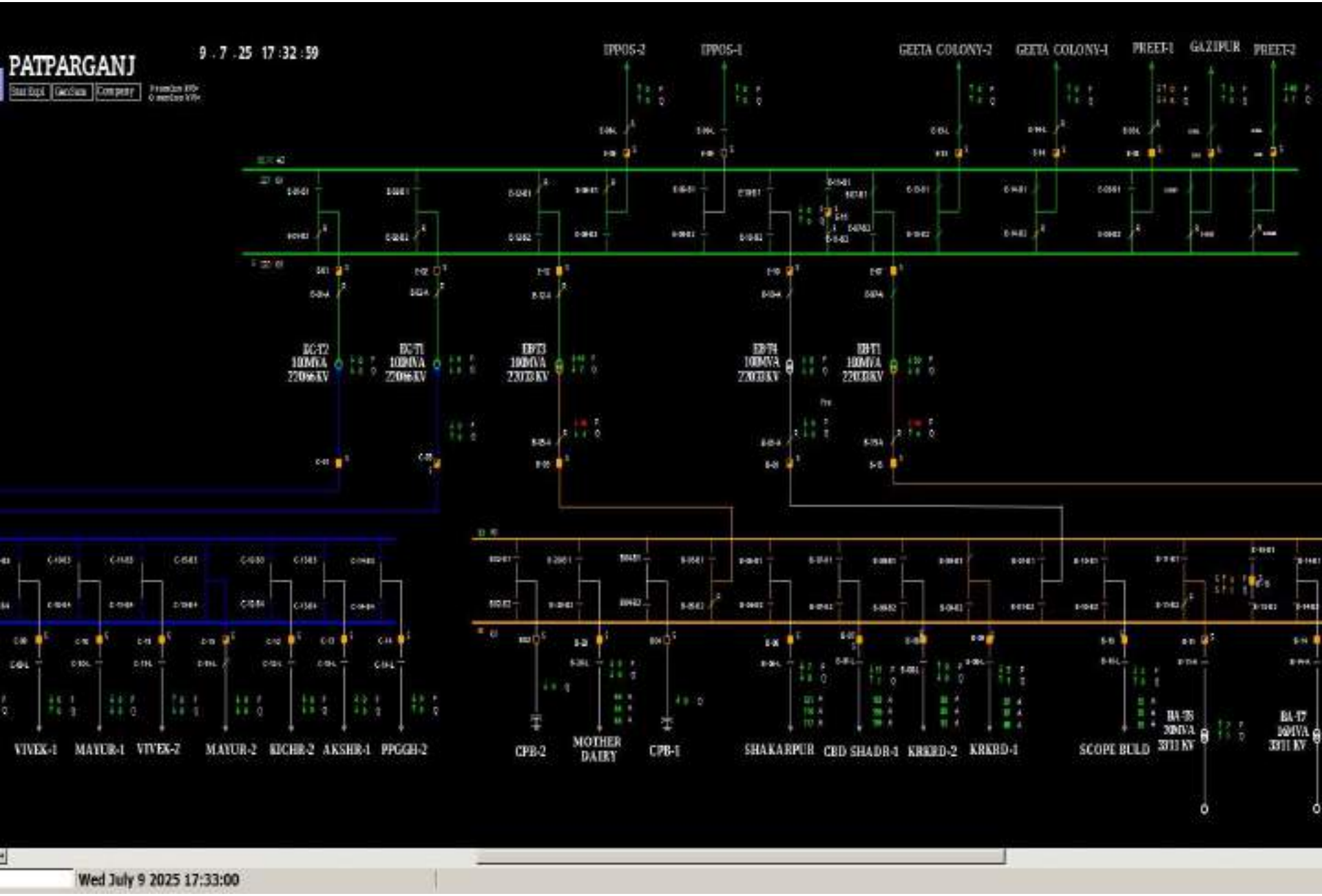
Network Diagram



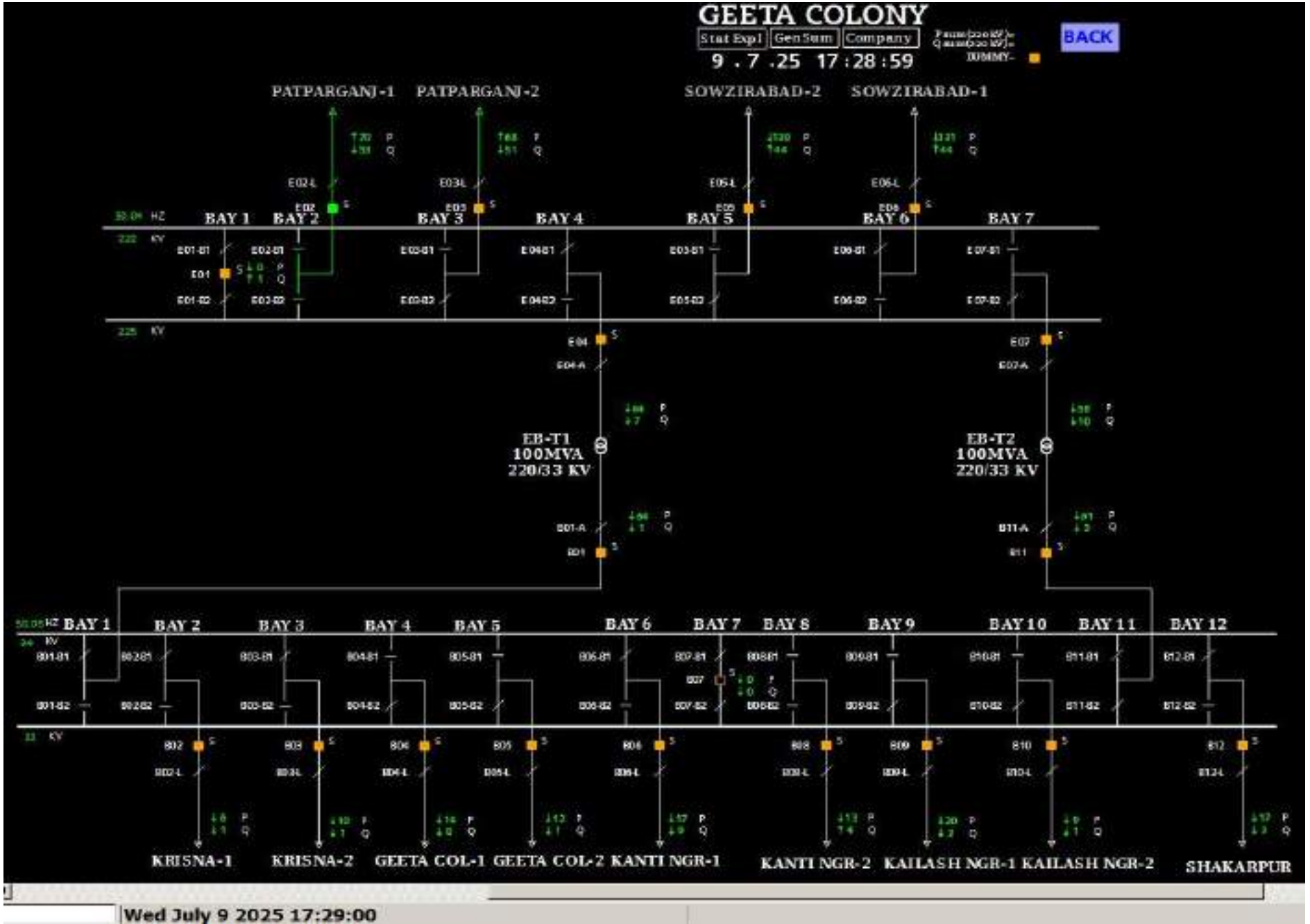
SLD of 220kV Patparganj(DTL) before the event



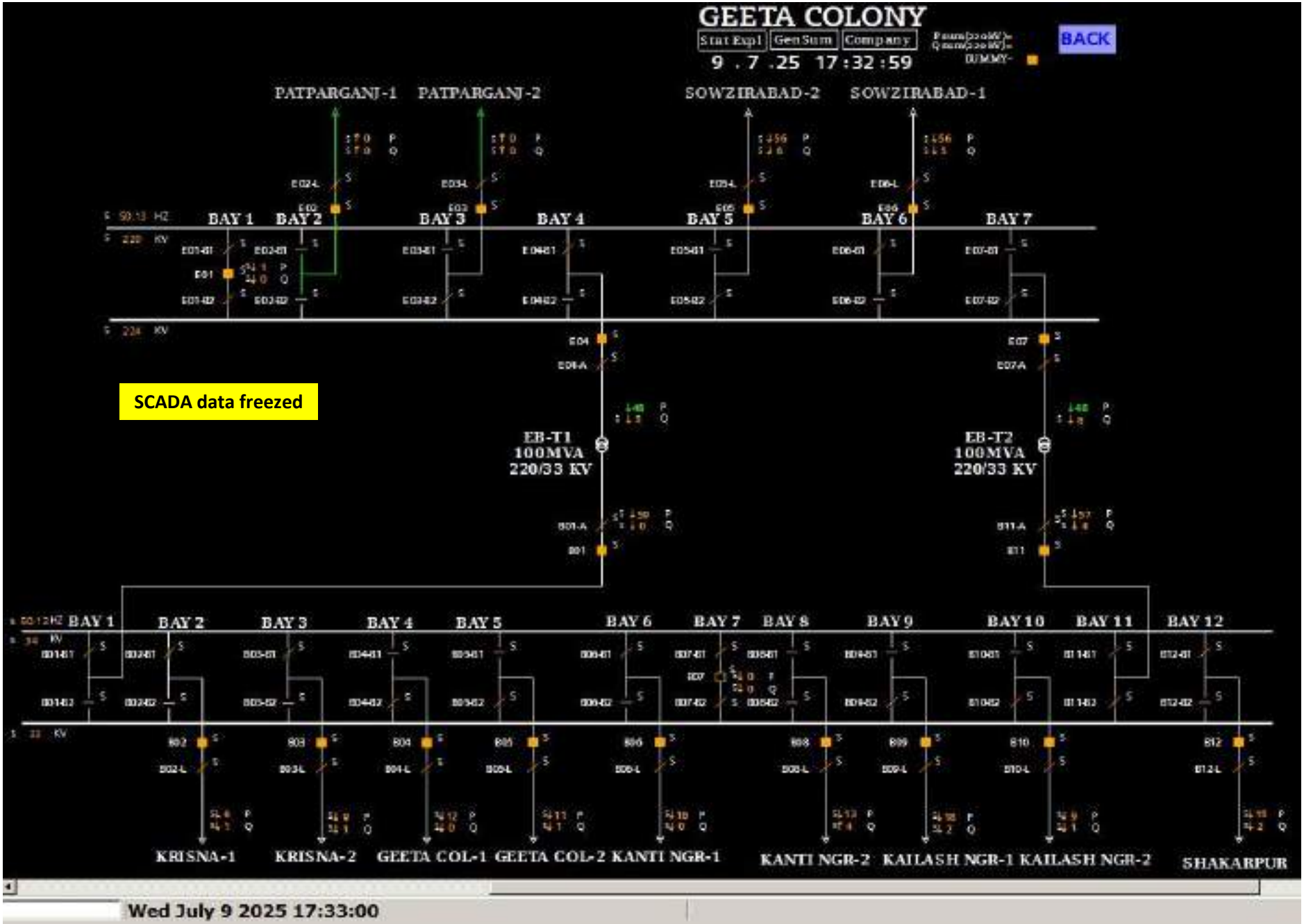
SLD of 220kV Patparganj(DTL) after the event



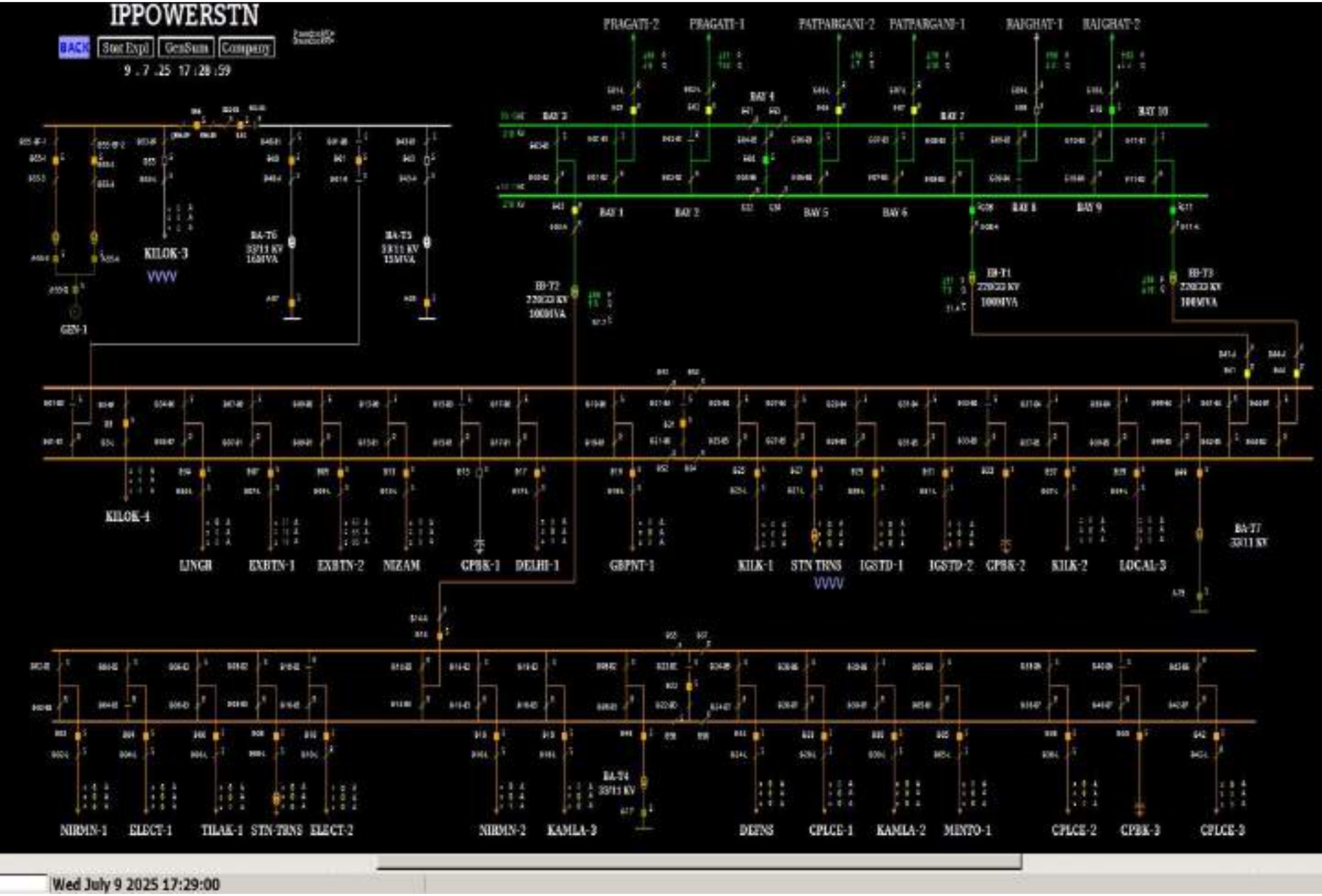
SLD of 220kV Geeta Colony(DTL) before the event



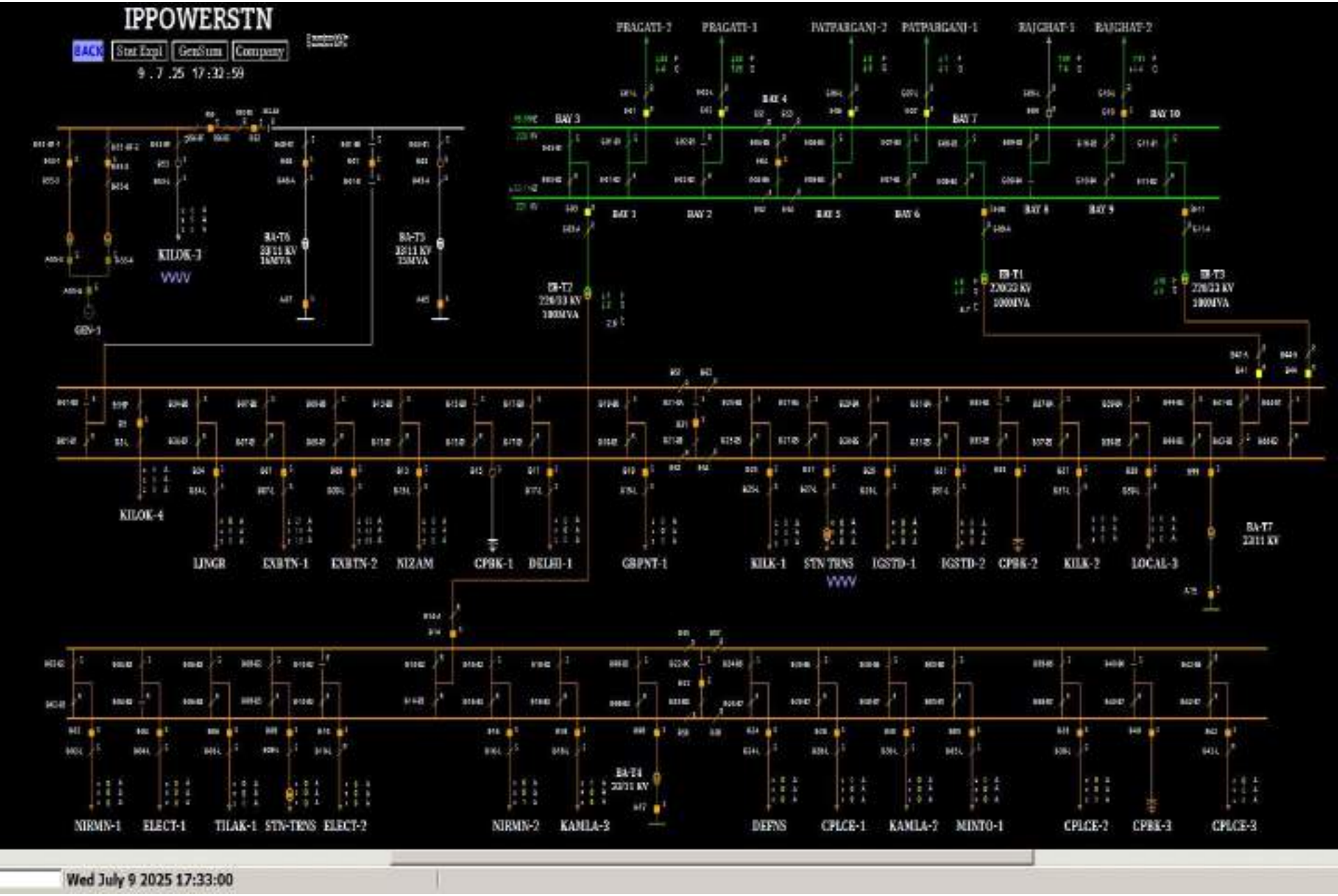
SLD of 220kV Geeta Colony(DTL) after the event



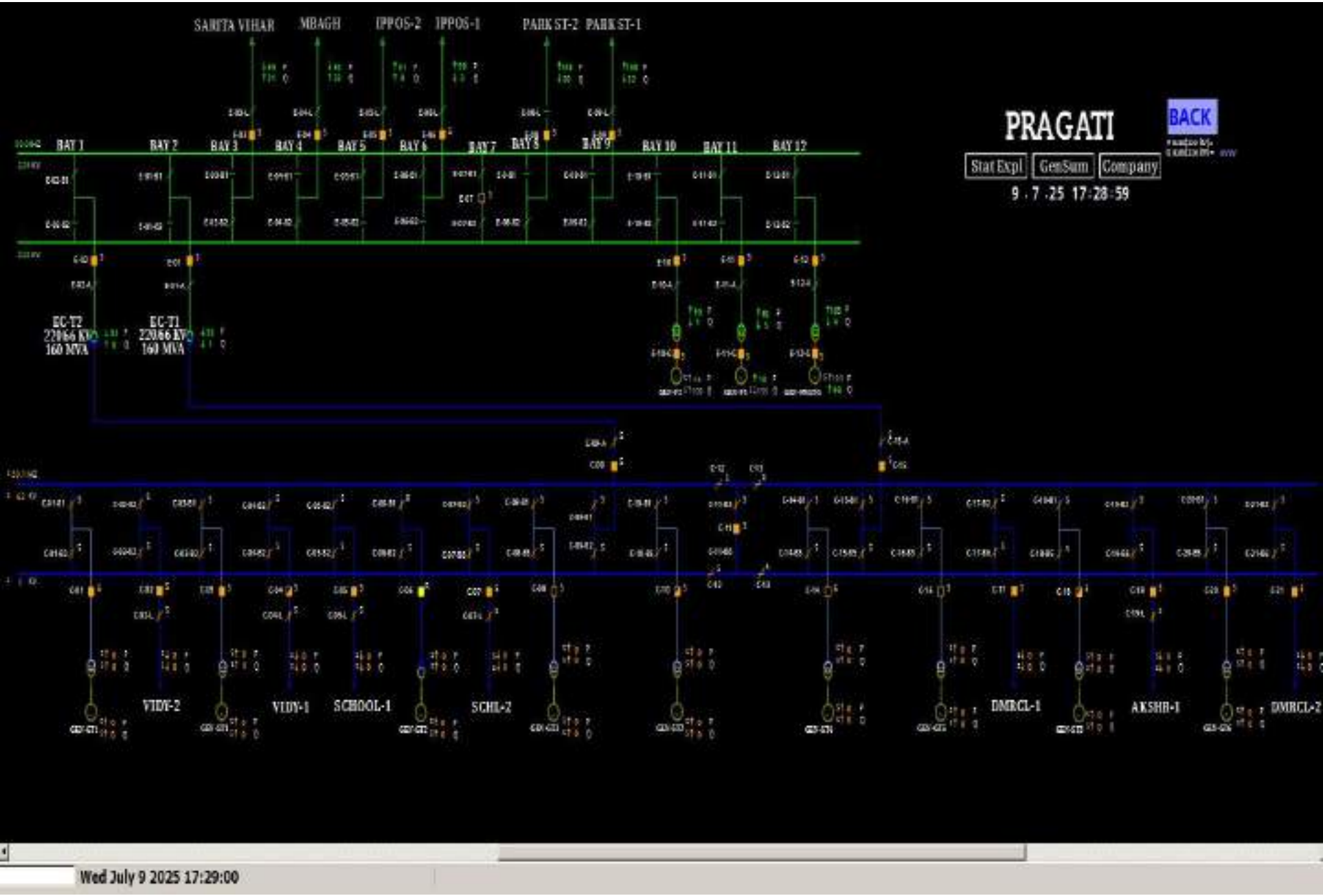
SLD of 220kV IPPOWERSTN(DTL) before the event



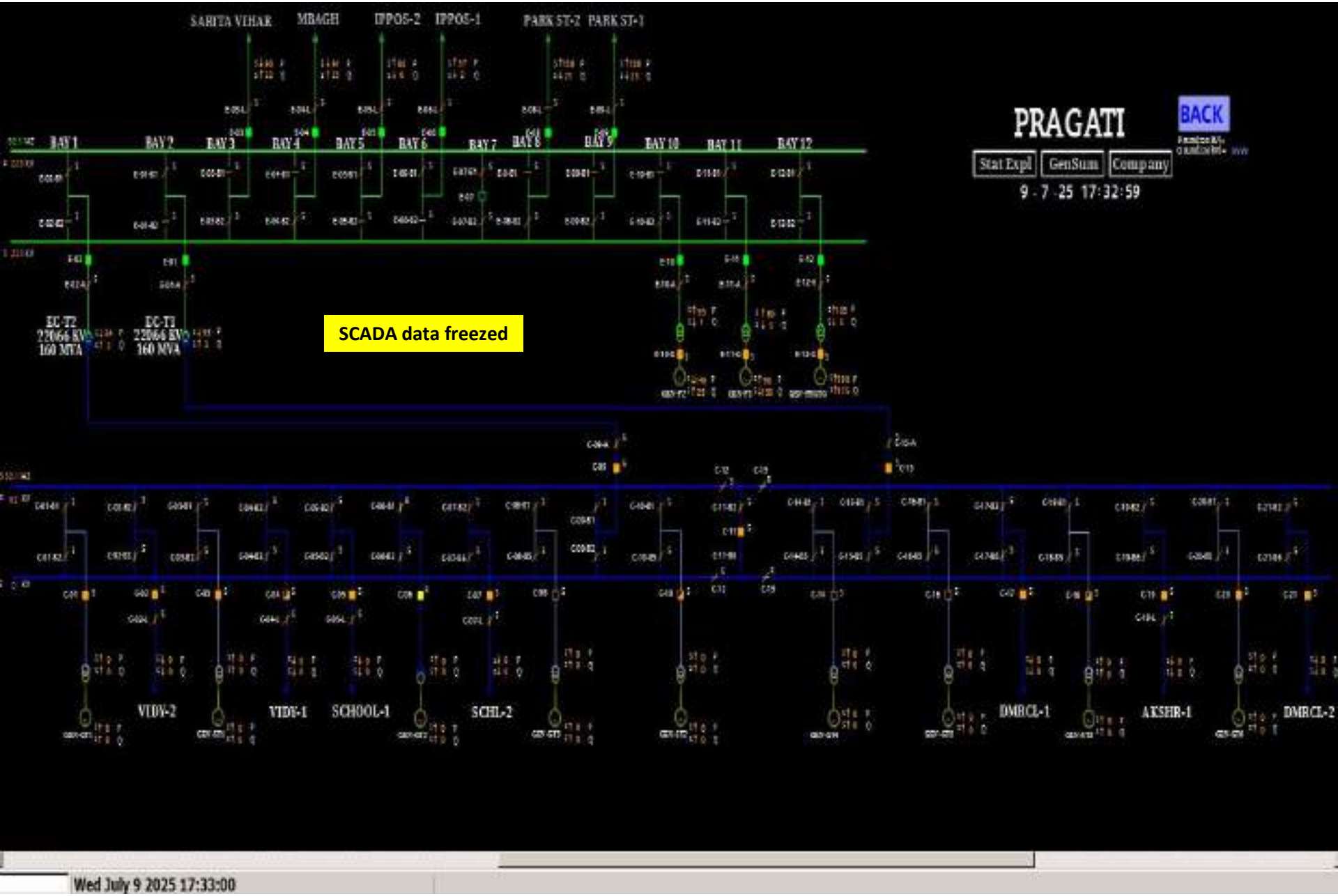
SLD of 220kV IPPOWERSTN(DTL) after the event



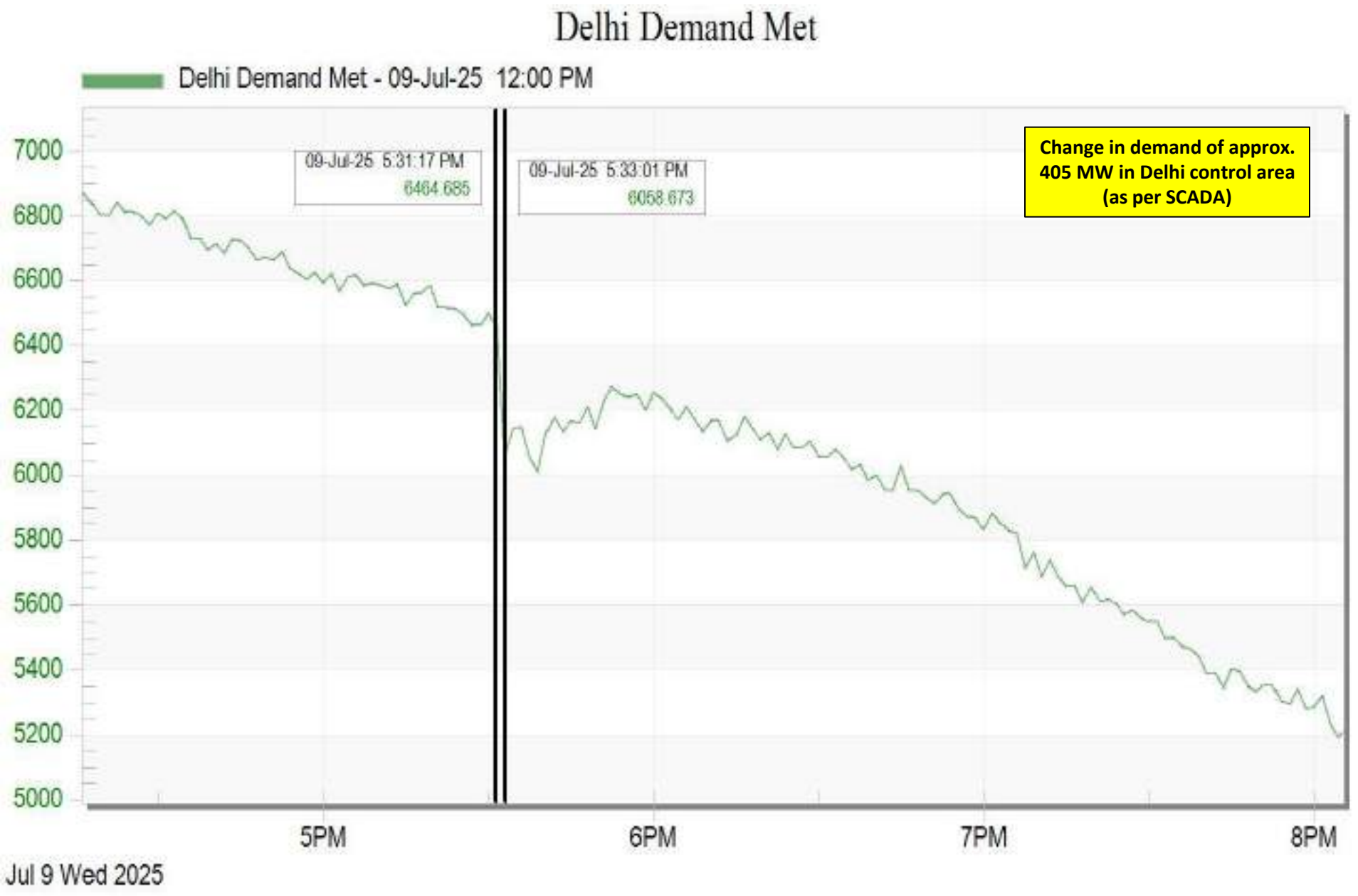
SLD of 220/66kV Pragati(PPCL) before the event



SLD of 220/66kV Pragati(PPCL) after the event



Delhi Demand during the event



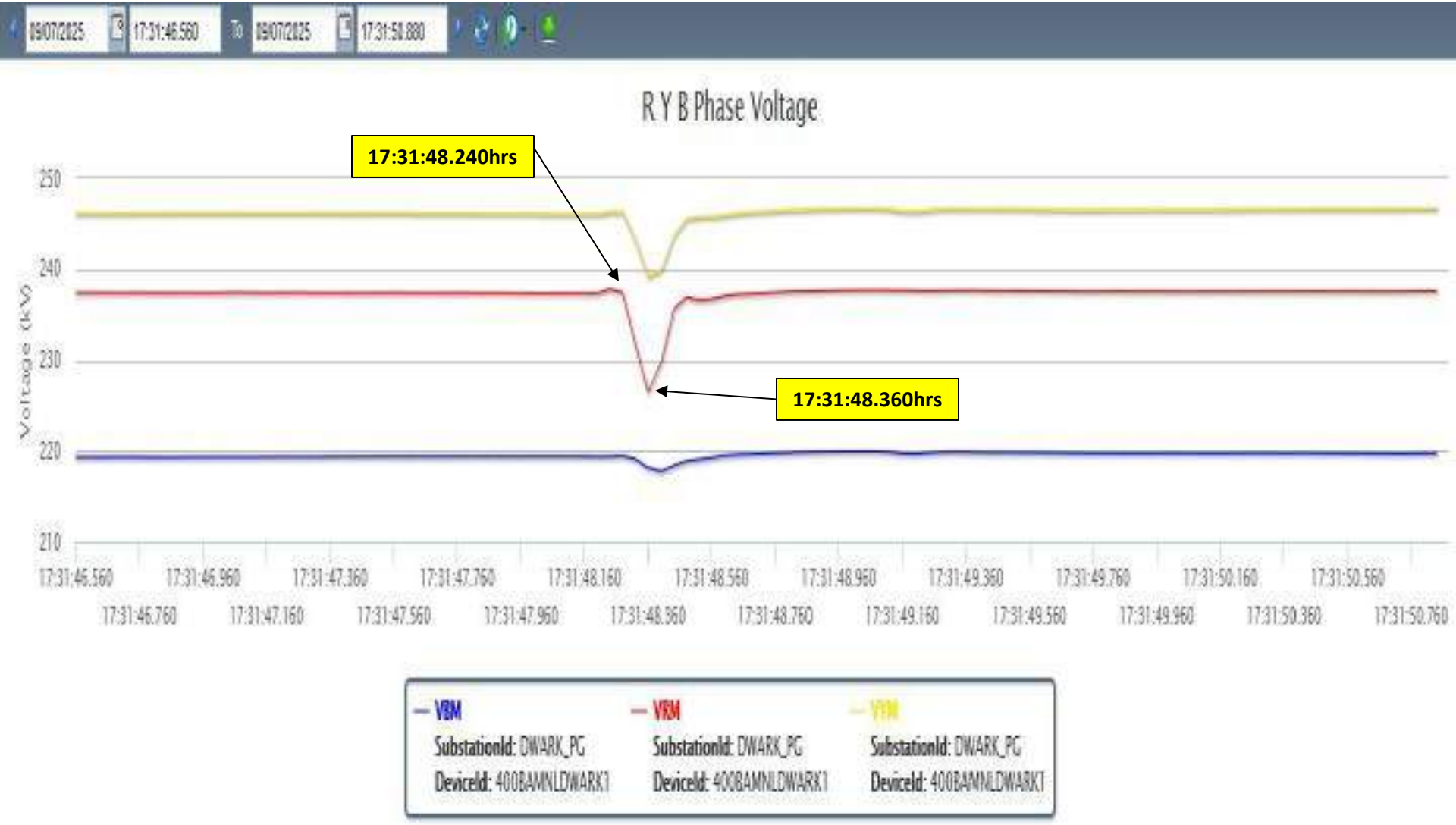
PMU Plot of frequency at Dwarka(PG)

17:31 hrs/09-Jul-25



PMU Plot of phase voltage magnitude at Dwarka(PG)

17:31 hrs/09-Jul-25



SCADA SOE

Time	Station Name	Voltage Level	Element Name	Element Type	Element Status	Remarks
17:31:02,097	PATPR_DV	220kV	09IPPOS1	Circuit Breaker	Open	Line CB at Patparganj(DTL) end of 220 kV Patparganj-IPPOS(DTL) ckt-1 opened
17:31:02,100	PATPR_DV	220kV	02T1	Circuit Breaker	Open	CB at 220kV side of 220/66kV 100MVA ICT-1 at Patparganj(DTL) opened

Points for Discussion

i. Exact nature, location and reason of fault need to be shared.
ii. Reason of tripping of 220 kV Rajghat-IPPOS (DTL) Ckt-1 & 2 and 104 MW GT-1 and 122 MW STG at Pragati (PPCL) need to be shared.
iii. SCADA data was freezed at 220kV Geeta Colony and Pragati(PPCL) during the event. Availability and healthiness of SCADA data need to be ensured.
iv. DR/EL (.dat/.cfg file) of all tripped elements along with detailed tripping report need to be shared.
v. Remedial action taken report need to be shared.

DELHI TRANSCO LIMITED

O/o Sr. Mgr. (Protection)-III, Park Street

Subject: Report on tripping occurred in Delhi system on dt.-09.07.2025 at 17:32 hrs.

1. Tripping details:-

S. No.	Name of the element tripped	Date/Time of Tripping	Relay Indications
1	(a) 220 kV Patparganj-Geeta colony Ckt.-I & II (b) 220 kV Patparganj-IP Ckt.-I & II (c) 220 kV Patparganj-Ghazipur (d) 220/66 kV 100 MVA Tr.-I & II	09.07.2025 17:32 hrs.	Busbar protection operated on 220 kV Bus-II at Patparganj Sub-stn. due to R-Y, phase-phase fault of 32 kA magnitude. Fault cleared in 65 ms.
2	220 kV IP-Patparganj Ckt.-I	09.07.2025 17:32 hrs.	Zone-1 trip
3	220 kV IP-Patparganj Ckt.-II	09.07.2025 17:32 hrs.	UFR Frequency-47.9 Hz
4	220 kV IP-Rajghat Ckt.-I & II	09.07.2025 17:32 hrs.	UFR Frequency-47.9 Hz
5	33 kV Bay No.-1,5,7,9,13,17,25,37, 4,6,10,18,24,28,30,42 at 220 kV IP	09.07.2025 17:32 hrs.	UFR Frequency-48.4 Hz

2. Bus arrangement at the time of incident:-

(a)At 220 kV Patparganj:-

220 kV Bus-II was connected with 220 kV Patparganj-Geeta colony ckt-I & II, 220 kV Patparganj-IP Ckt.-I & II, 220 kV Patparganj-Ghazipur ckt. and was feeding the load of 2 nos. 220/66 kV, 100 MVA Tr-I & II.

220 kV Bus-I was connected with 220 kV Patparganj-Preet vihar ckt-I & II and was feeding the load of 2 nos. 220/33 kV, 100 MVA Tr-I & III.

The 220 kV Bus coupler was in OFF position.

(b)At 220 kV Pragati:-

220 kV Bus-1 at Pragati was connected with IP Ckt.-I & II, 160 MVA Tr-I & II, GT#1 and STG. While 220 kV Bus-2 was connected with M.Bagh ckt.-I & II, GT#2 and were feeding the load of Park street-I & II. The 220 kV Bus coupler was in OFF condition.

(c)At 220 kV IP:-

220 kV Bus-1 was connected with Pragati ckt.-1, Patparganj ckt.-1, Rajghat ckt.-1 and was feeding the load of 220/33 kV 100 MVA Tr-1, while 220 kV Bus-2 was connected with Pragati ckt.-2, Patparganj ckt.-2, Rajghat ckt.-2 and was feeding the load of 2 nos. 220/33 kV 100 MVA Tr-2 & 3. The 220 kV Bus coupler was in ON condition.

3. Tripping analysis:-

(a) Due to the 220 kV Bus-2 fault at Patparganj Sub-stn., both 220 kV Patparganj-IP ckt.-I & II tripped at Patparganj resulting islanding and load loss of GT#1 and STG at Pragati, which were connected to Bus-1 at Pragati.

(b) Due to islanding of GT#1 and STG at Pragati, 33 kV feeders, i.e. 33 kV Bay No. 1,5,7,9,13,17 25,37,4,6,10,18,24,28,30,42 at 220 kV IP Sub-station tripped on UFR at frequency-48.4 Hz.

(c) 220 kV IP-Patparganj ckt.-II and 220 kV IP-Rajghat ckt.-I & II at 220 kV IP Sub-stn. tripped on UFR due to further dip in frequency-47.9 Hz.

Shankar Kumar
Sr. Manager(T) Protection-III

Tripping Report – Multiple Elements Tripping in DTL

At 220kV Patparganj, IP & Pragati Substations on 09.07.2025 at 17:32hrs

Trippings Summary

- Multiple substations affected: 220kV Patparganj, 220kV IP & 220kV Pragati
- Tripping date & time: 09.07.2025 at 17:32 hrs
- Cause of trippings: Bus-bar fault at 220kV S/Stn Patparganj

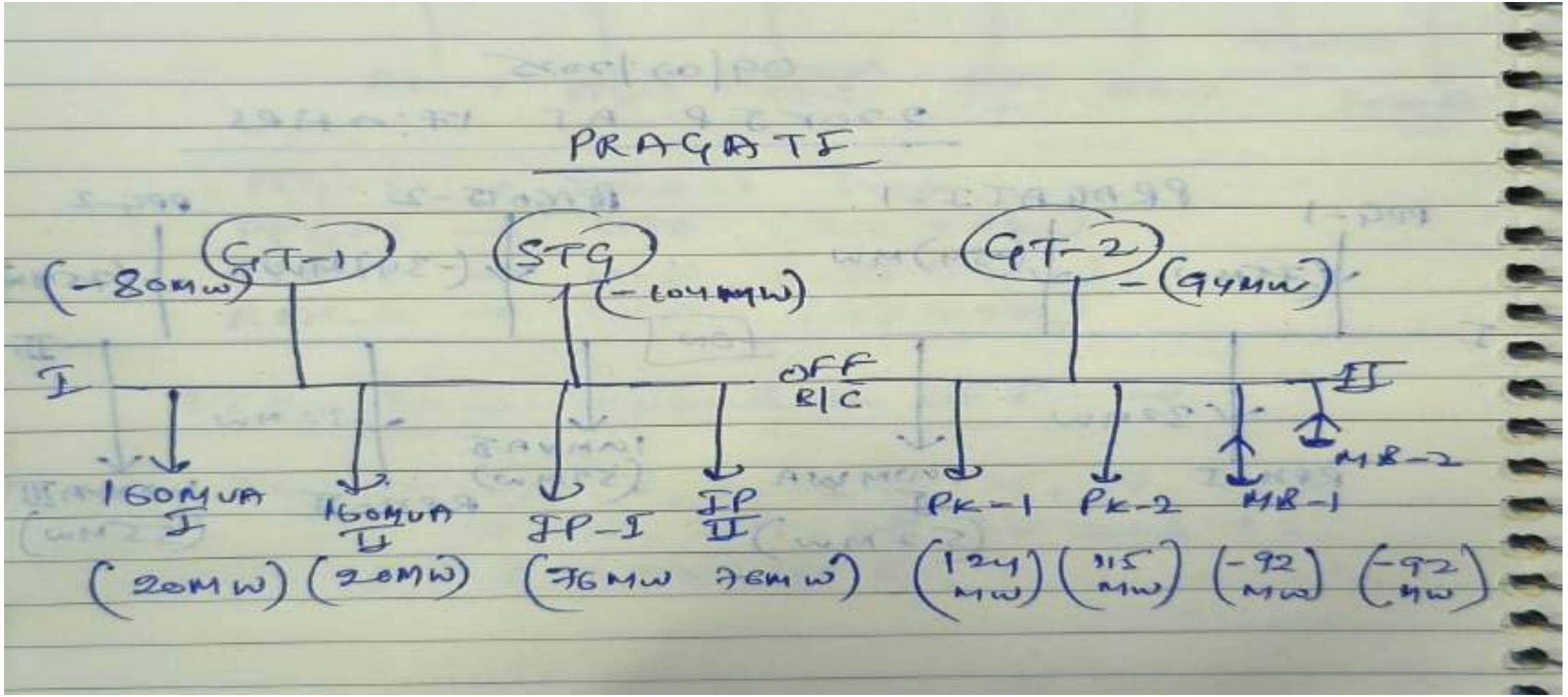
Tripping Details

S. No	Name of the Substation	Name of the elements tripped	Date/Time of Tripping	Relay Indications	DTL Observations
1	220kV Patparganj	220kV Geeta Colony Ckts-1 & 2	09.07.2025 at 17:32 hrs.	Busbar protection operated on 220 kV Bus-II at Patparganj Sub-stn. due to R-Y, phase-phase fault of 32 kA magnitude. Fault cleared in 65 ms.	Due to the 220 kV Bus-2 fault at Patparganj Sub-stn., both 220 kV IP Ckt.-I & II tripped at Patparganj resulting in islanding and load loss of GT#1 and STG at Pragati, which were connected to Bus-1 at Pragati.
		220kV IP Ckts-1 & 2			
		220kV Gazipur Ckt			
		100MVA (220/66kV) Transformers-1 & 2			
2	220kV IP	220kV Patparganj Ckt-1		Zone-1 trip	
		220kV Patparganj Ckt-2		UFR Frequency-47.9 Hz	Due to islanding of GT#1 and STG at Pragati, tripping occurred at 47.9Hz.
		220kV Rajghat Ckts-1 & 2		UFR Frequency-47.9 Hz	
		33 kV Bay No.- 1,5,7,9,13,17,25,37, 4,6,10,18,24,28,30,42		UFR Frequency-48.4 Hz	Due to islanding of GT#1 and STG at Pragati, 33kV feeders tripped at 48.4 Hz

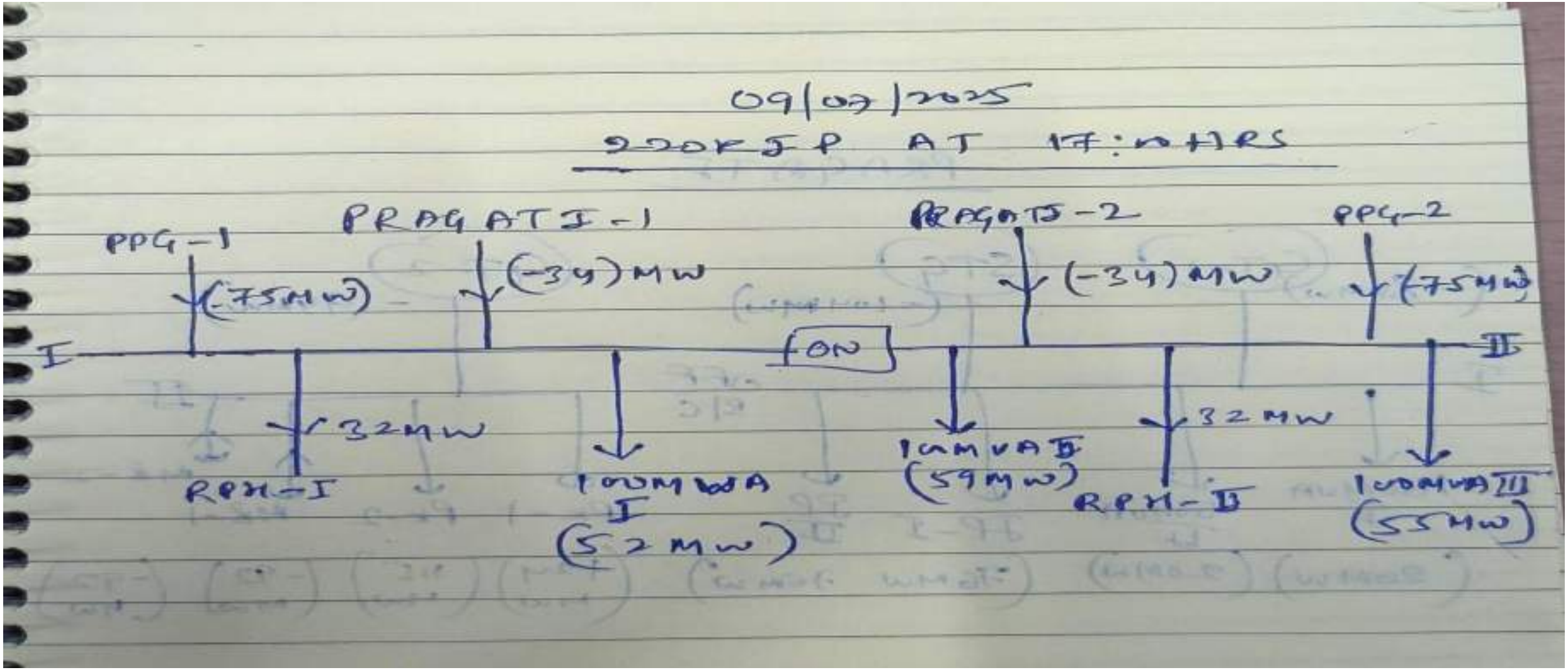
Compliance

S. No	Observations by NRPC	DTL Compliance
1.	Exact nature, location and reason of fault need to be shared.	Detailed tripping analysis report already shared. The same is agin being sent.
2.	Reason of tripping of 220 kV Rajghat-IPPOS(DTL) Ckt.-1 & 2 and 104 MW GT-1 and 122 MW STG at Pragati (PPCL) need to be shared.	The same is elaborated in the detailed tripping analysis report already shared. The same is again being sent.
3.	SCADA data was freezed at 220 kV Geeta colony and Pragati(PPCL) during the event. Availability and healthiness of SCADA data need to be ensured.	Needful will be complied through SLDC scada team.
4.	DR/EL(.dat/.cfg file) of all tripped elements along with detailed tripping report need to be shared.	Already sent.
5.	Remedial action taken report need to be shared.	Kite thread have been removed from the switchyard at different locations as a preventive measure to avoid such tripping.

Load flow of 220kV S/Stn Pragati



Load flow of 220kV S/Stn IP



Multiple Element Tripping Event at 220/66kV Narela(DTL)

At 15:41 hrs on 10.07.2025

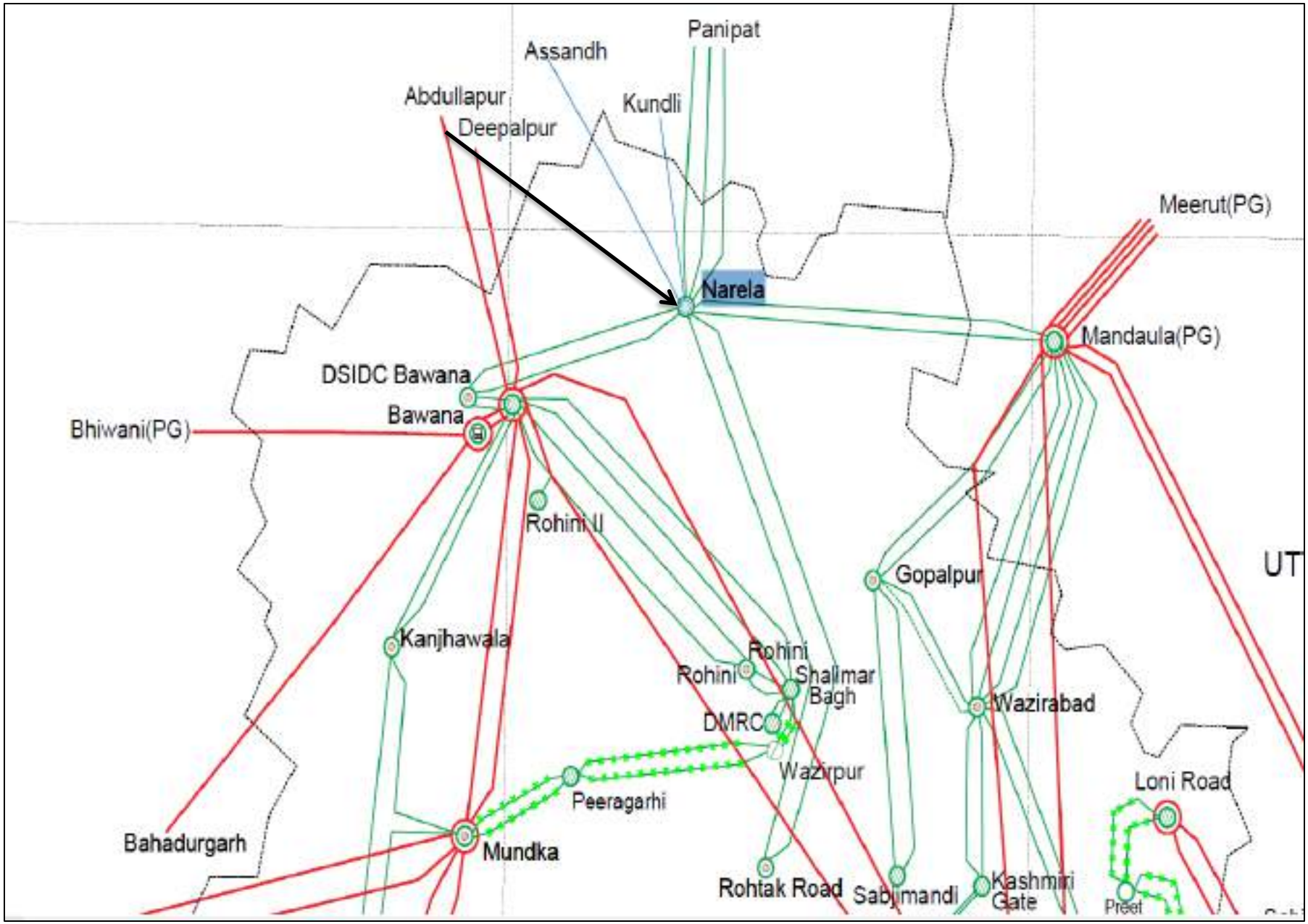
Tripped Elements

S. No	Name of Elements	Outage Time	Revival Time	Reason of tripping
1.	220 KV Mandola(PG)-Narela(DV) (DTL) Ckt-1	15:41 hrs	23:47 hrs	B-N Phase to earth fault
2.	220 KV Mandola(PG)-Narela(DV) (DTL) Ckt-2		17:45 hrs on 11th Jul'25	

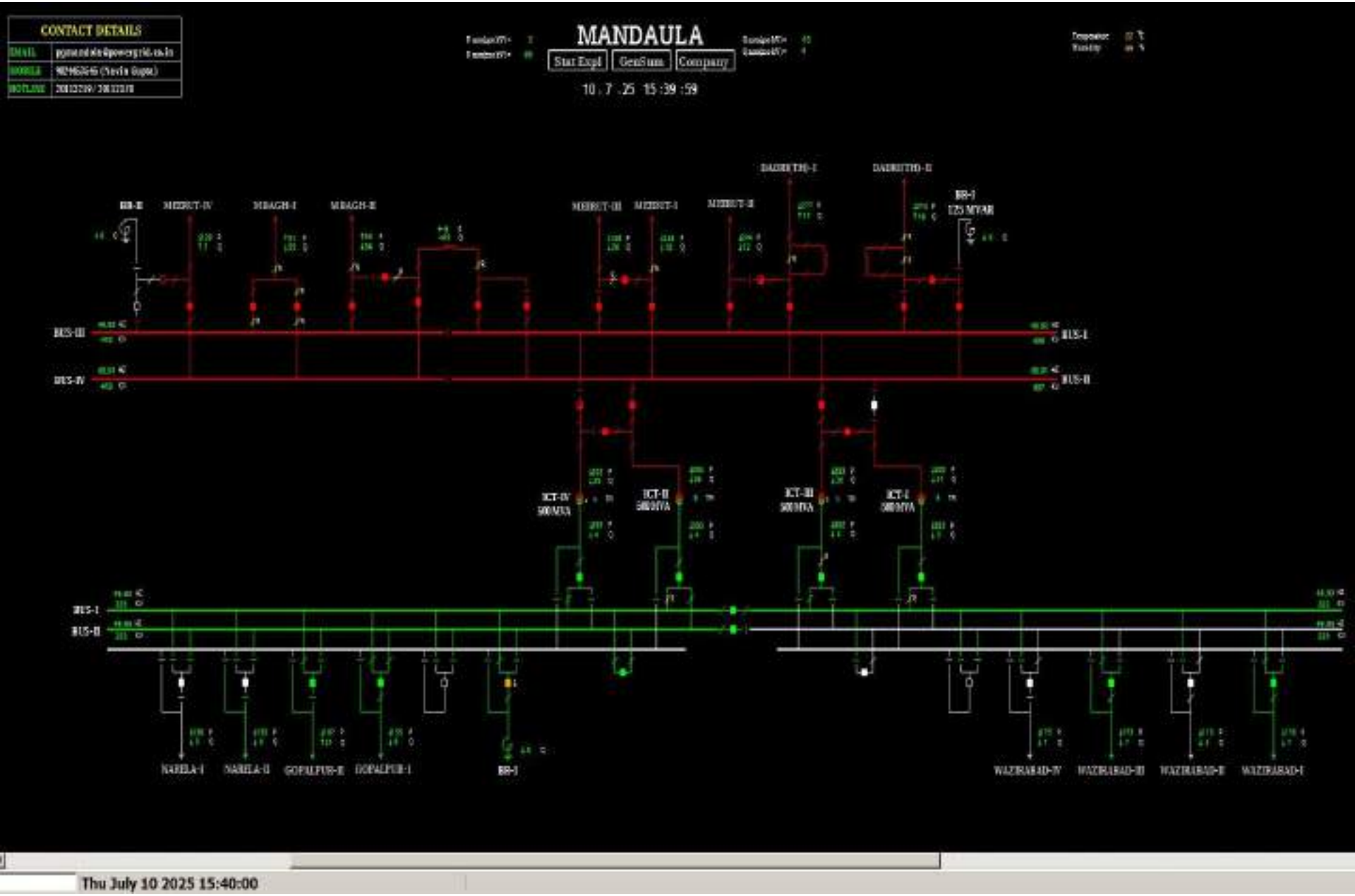
Brief details of the event

i. 220/66kV Narela(DTL) has double main Bus arrangement at 220kV side.
ii. As reported, at 15:41 hrs, 220 KV Mandola(PG)-Narela(DV) (DTL) Ckt-1 tripped on B-N phase to earth fault; fault sensed in zone-1 at Narela(DTL) end (exact nature, location and reason of fault yet to be shared).
iii. During the same time, 220 KV Mandola(PG)-Narela(DV) (DTL) Ckt-2 also tripped on B-N phase to earth fault; fault sensed in zone-2 at Narela(DTL) end (exact nature, location and reason of fault yet to be shared).
iv. As per PMU at Mandaula(PG), Y-N phase to earth fault followed by two consecutive B-N faults with fault clearance time of respectively 120 ms, 480 ms (delayed) and 160 ms was observed.
v. As per SCADA, change in demand of approx. 280 MW in Delhi control area was observed.

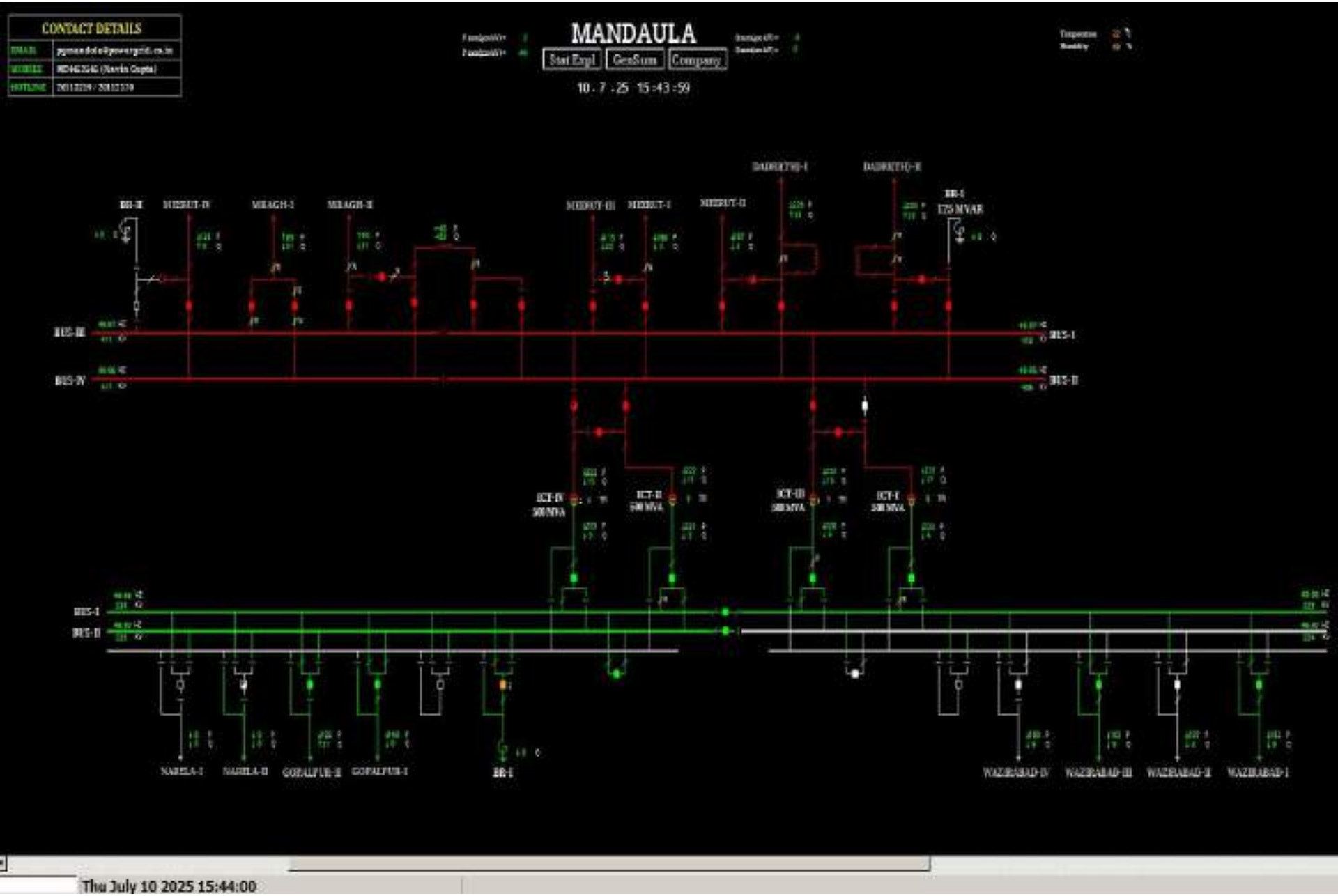
Network Diagram



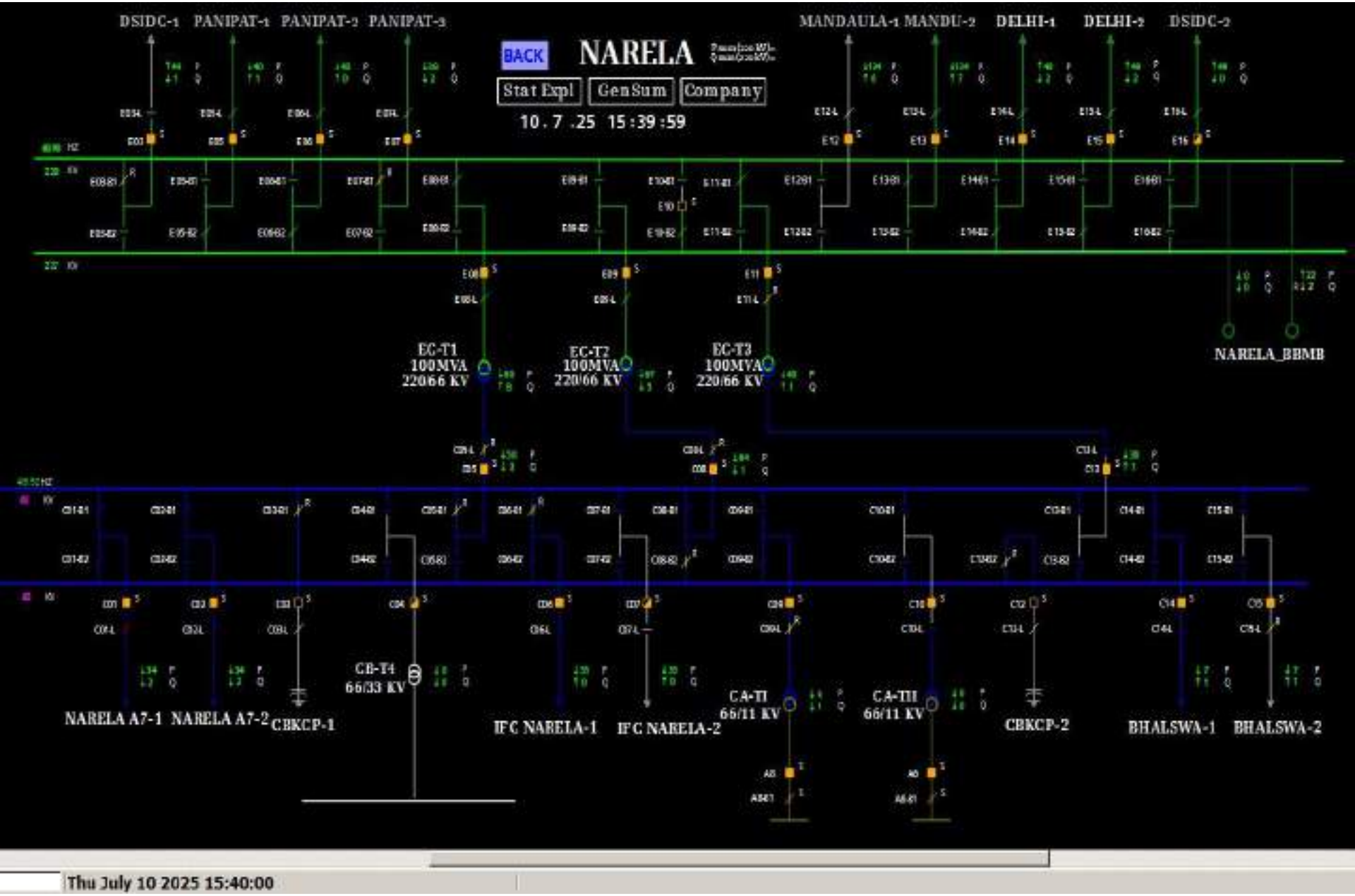
SLD of 400/220kV Mandaula(PG) before the event



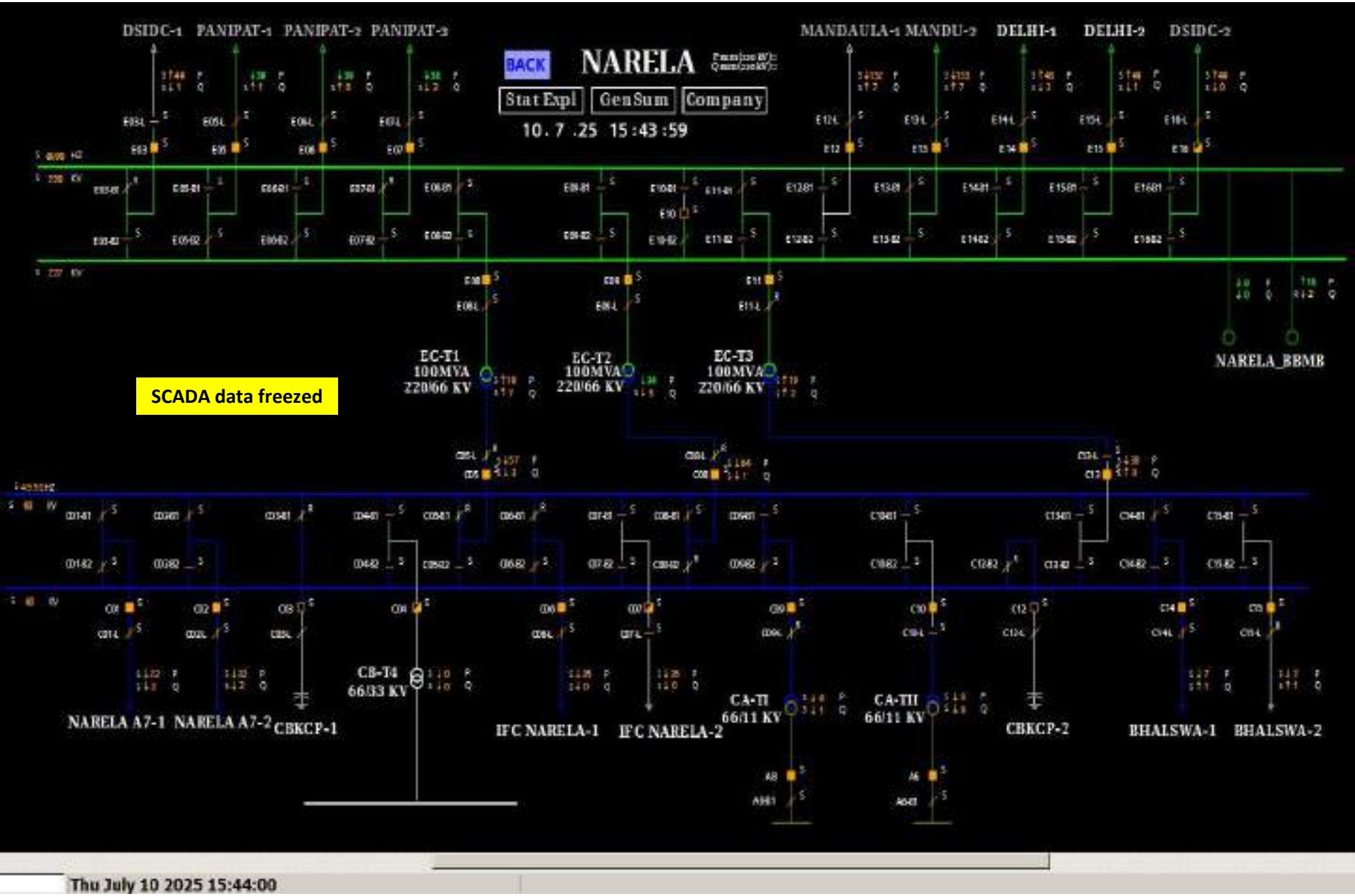
SLD of 400/220kV Mandaula(PG) after the event



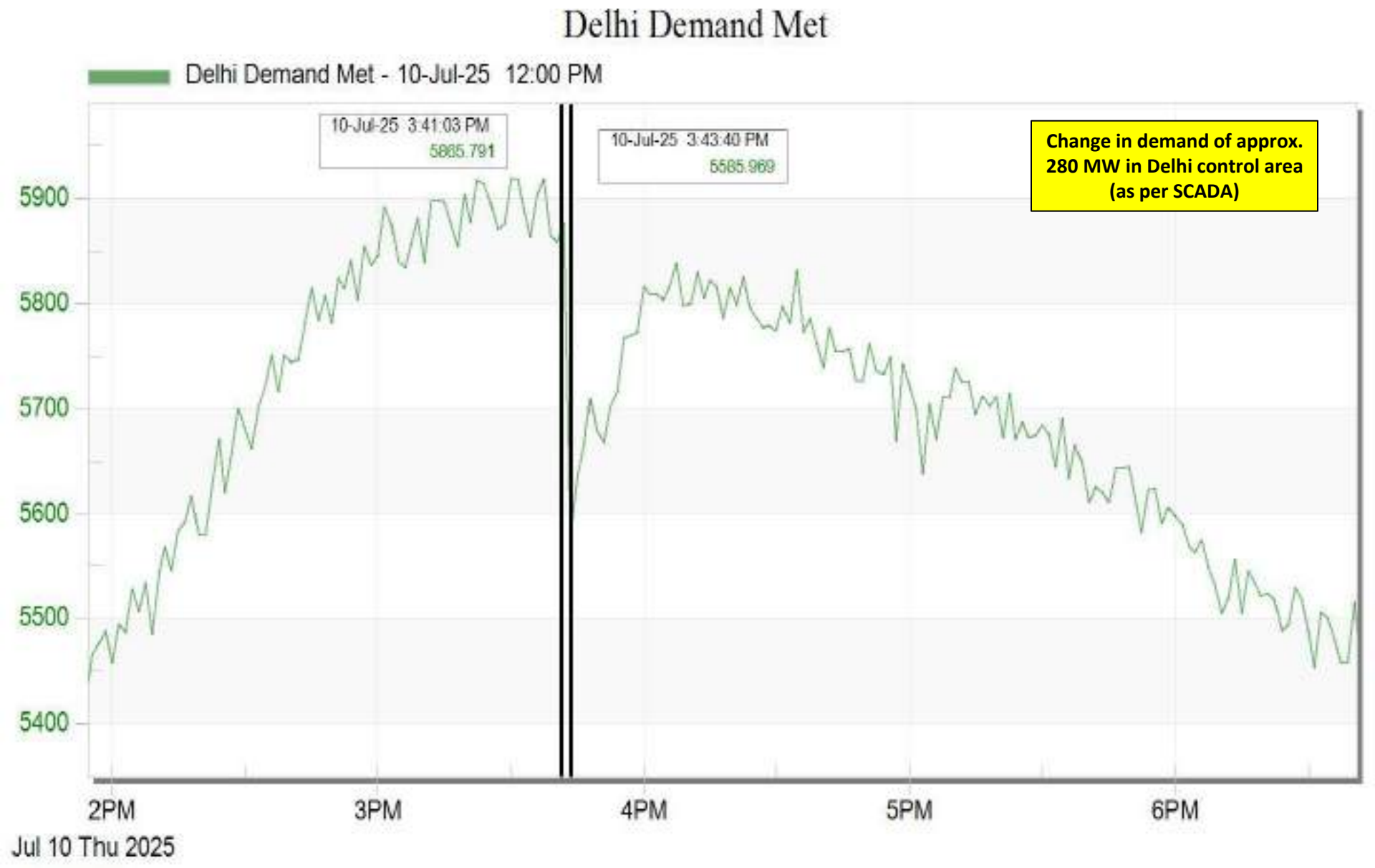
SLD of 220/66kV Narela(DTL) before the event



SLD of 220/66kV Narela(DTL) after the event



Delhi Demand during the event



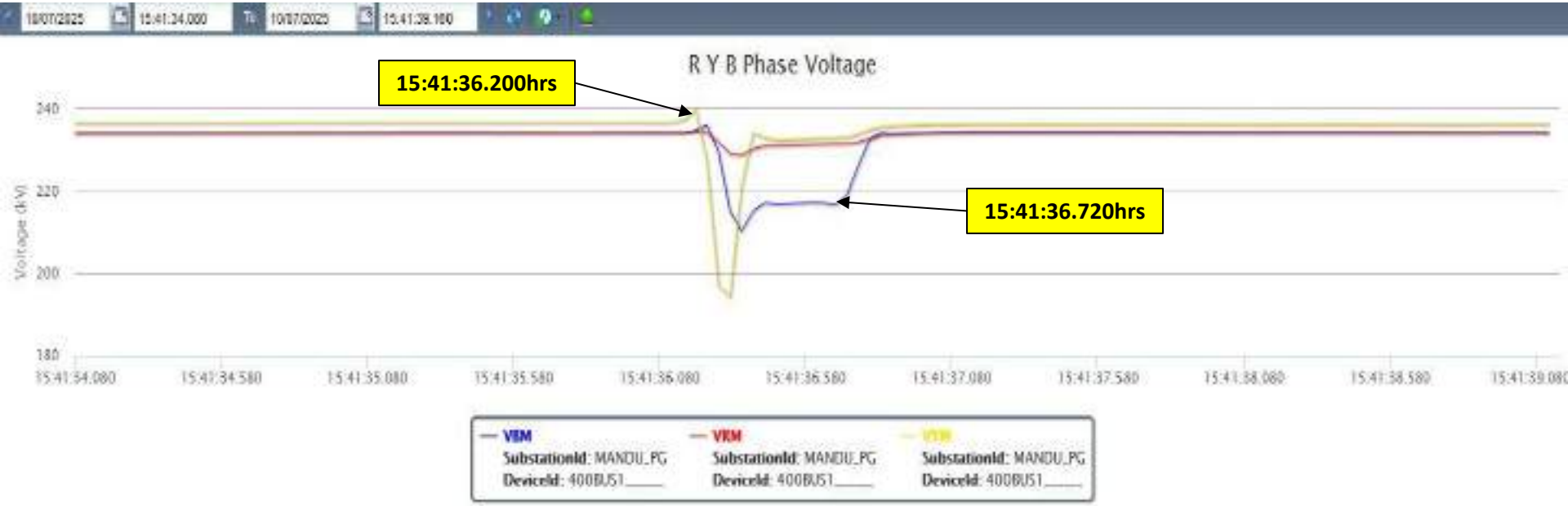
PMU Plot of frequency at Mandaula(PG)

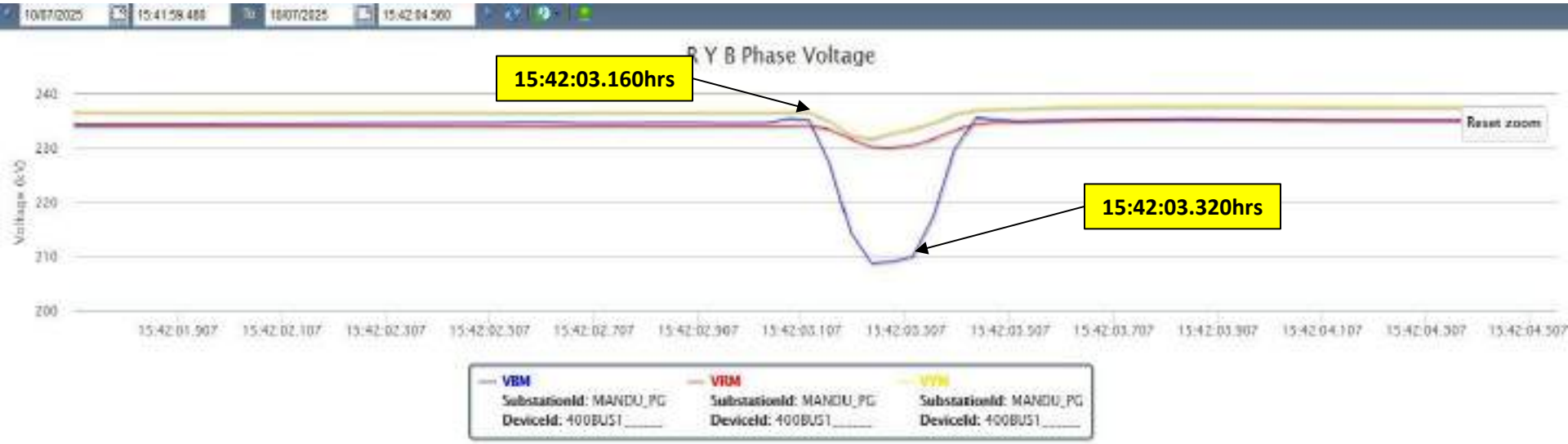
15:41 hrs/10-Jul-25



PMU Plot of phase voltage magnitude at Mandaula(PG)

15:41 hrs/10-Jul-25





SCADA SOE

Time	Station Name	Voltage Level	Element Name	Element Type	Element Status	Remarks
15:42:03,458	MANDU_PG	220kV	01NAREL1	Circuit Breaker	Open	Line CB at Mandaula(PG) end of 220 KV Mandola(PG)-Narela(DV) (DTL) Ckt-1 opened

Points for Discussion

i. Exact nature, location and reason of fault need to be shared.
ii. Reason of delayed clearance of fault need to be shared.
iii. SCADA data was freezed at 220/66kV Narela(DTL) during the event. Availability and healthiness of SCADA data need to be ensured.
iv. DR/EL (.dat/.cfg file) of all tripped elements along with detailed tripping report need to be shared.
v. Remedial action taken report need to be shared.

DTL Tripping Analysis Report
220kV Narela Sub Station on date 10 July 2025

A. INTRODUCTION

1. Time & Date of Event: - 15:43 Hrs. 10.07.2025
2. Substation affected along with voltage level: - 220kV Narela DTL
3. Brief event summary: -

Both Mandola Ckt 1 and 2 were connected to same Bus at DTL Narela with Mandola Sub station as source of supply. Pre fault load current Ir=343A,Iy=7.5A,Ib=333A on Line 2 was flowing. At 15:43Hrs, Y phase Voltage transient (dip Vy=55kV for 50mSec) followed by Mandola Ckt-2 got faulty due to C phase conductor snap sensed in Zone 2,location at 17.06 Km from Narela end at Tower T9. Consequently Mandola Ckt 2 got tripped from both ends. After tripping of Mandola Ckt 2, its load was automatically shared totally by Mandola Ckt 1 (Prefault Ir=650A,Iy=785A,Ib=618A))which continued for 20 seconds. After 20 Seconds, extra loading of Mandola Ckt 1 caused another fault and 1Phase tripping of Mandola Ckt 1 due to C phase conductor snap sensed in Zone 1 location at 1 Km from Narela end at Tower T70 , which was detected in Zone 1 distance reach and after 1 Second dead time Ckt 1 got auto- reclose successfully at DTL Narela end.

Although Mandola Ckt 1 Blue phase conductor got grounded due to conductor snap but auto reclosure at Narela end got successful due to DTL Bus and line dead condition at the time of reclosure. Fault values Vc=10.597kV, Ic=2.919 kA. Fault cleared in 52mSec. by Main 2 distance.

Fault Location:

220kV_ Narela_Mandola Ckt -1 at 1Km from Narela end at Tower T70
220kV_ Narela_Mandola Ckt -2 at 17.06 Km from Narela end at Tower T9

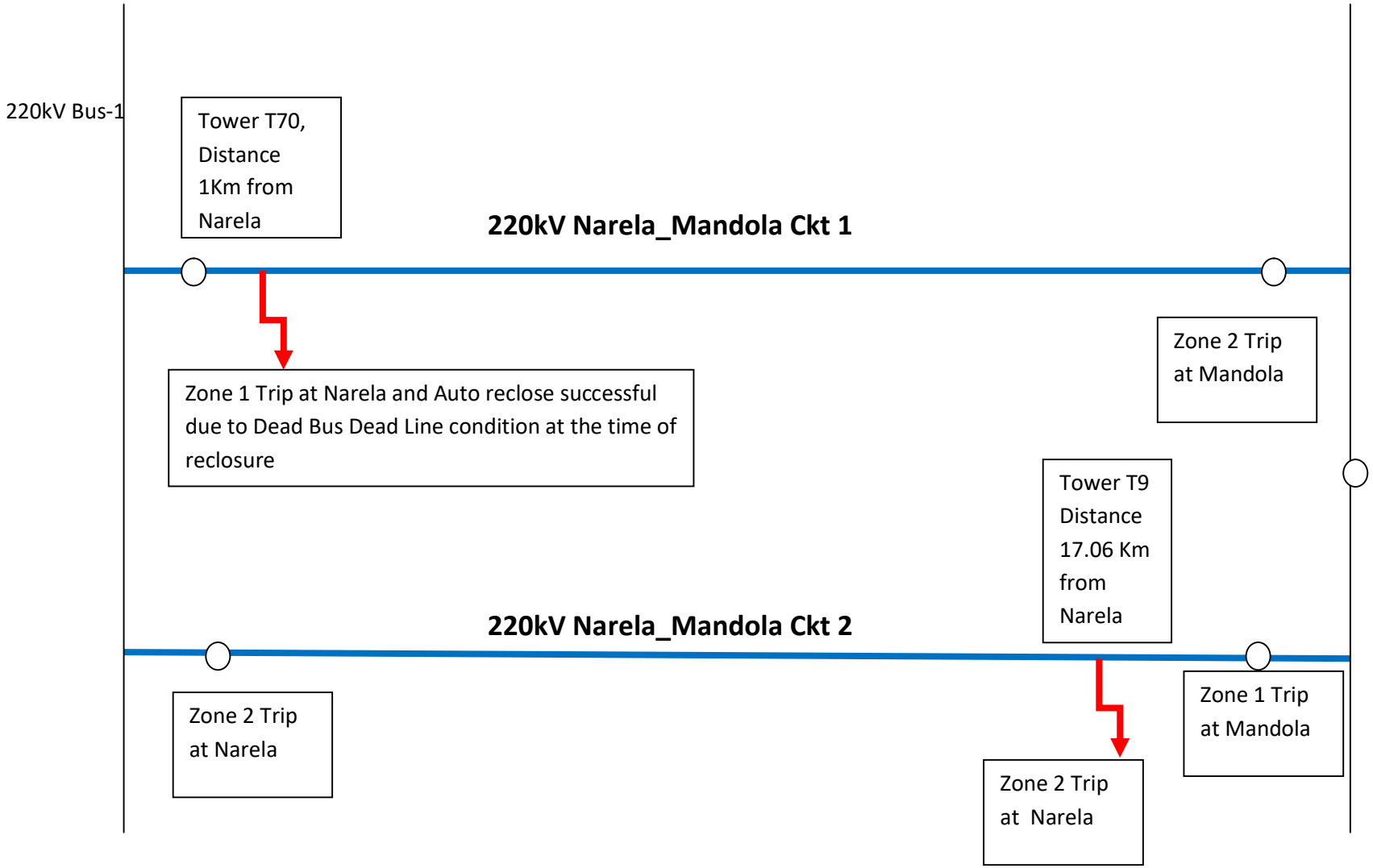
Restoration Time-

220kV_ Narela_Mandola Ckt -2 at 18.43 Hrs on 11 July 2025.
220kV_ Narela_Mandola Ckt -1 restored immediately by distance relay auto reclosure at Narela end by Main 2 distance relay on 10 July 2025 time 15:43 Hrs.

Remedial action: Zone 1 reach extended to 90% of PL till Tele-protection communication restoration.

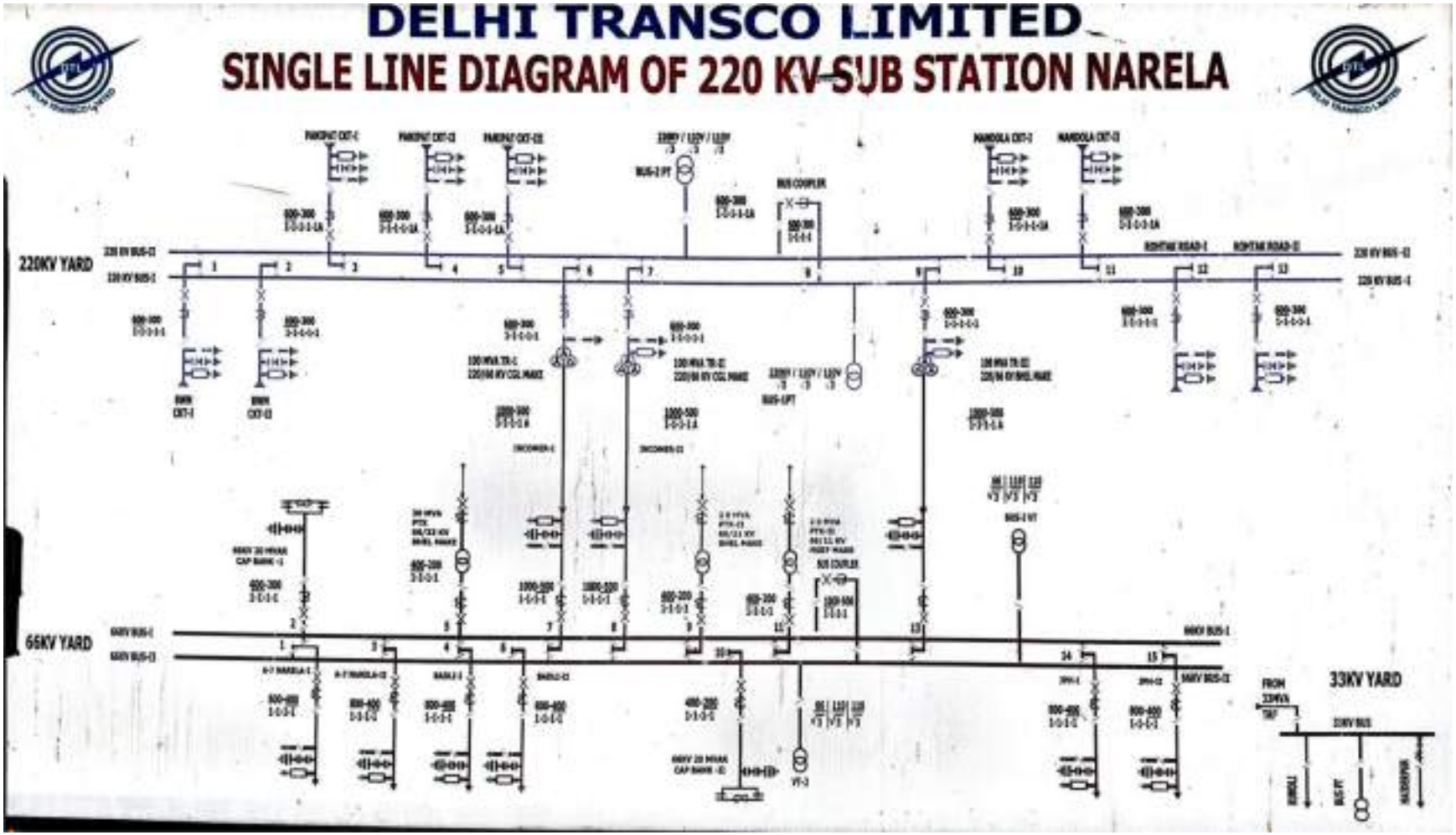
SLD of 220kV Narela at the time of fault

220kV Narela_Mandola Ckt 1&2 at 220kV Narela on 10 July 2025 at 15.43 Hrs.



DELHI TRANSCO LIMITED

SINGLE LINE DIAGRAM OF 220 KV SUB STATION NARELA



Multiple Element Tripping Event at 220kV Khodri(UK) and 220kV Chhibro(UK)

At 12:28 hrs on 15.07.2025

Tripped Elements

S. No	Name of Elements	Outage Time	Revival Time	Reason of tripping
1.	220 KV Khodri(UK)-Majri(HP) (UK) Ckt-1	12:28 hrs	14:20 hrs	Heavy flashover at B-phase insulator bushing of 220kV Khodri-Jhajra Ckt. Bus fault occurred.
2.	220 KV Khodri(UK)-Majri(HP) (UK) Ckt-2		14:23 hrs	
3.	220 KV Khodri - Chhibro (UK) Ckt-1		13:42 hrs	
4.	220 KV Khodri - Chhibro (UK) Ckt-2			
5.	220 KV Sarsawan(UP)-Khodri(UK) (UP) Ckt		13:42 hrs	
6.	220 KV Saharanpur(UP)-Khodri(UK) (UP) Ckt		14:22 hrs	
7.	220/132 kV 100 MVA ICT at Khodri(UK)		14:01 hrs	
8.	30 MW Unit-1 at Khodri(UK)		14:35 hrs	
9.	30 MW Unit-2 at Khodri(UK)		13:58 hrs	
10.	30 MW Unit-3 at Khodri(UK)		14:05 hrs	
11.	30 MW Unit-4 at Khodri(UK)		14:20 hrs	
12.	60 MW Unit-1 at Chhibro(UK)		13:58 hrs	Over-current protection operated
13.	60 MW Unit-2 at Chhibro(UK)		14:35 hrs	
14.	60 MW Unit-3 at Chhibro(UK)		14:20 hrs	
15.	60 MW Unit-4 at Chhibro(UK)		14:05 hrs	

Brief details of the event

i. 220KV Khodri(UK) and 220kV Chhibro(UK) generating station have 4 generating units each of 30MW and 60MW respectively and have double main bus scheme.

ii. During antecedent condition, 30 MW Unit-1, 2, 3 & 4 at Khodri(UK) were in running condition and were generating approx. 23 MW, 22 MW, 23 MW and 22 MW respectively. Also, 60 MW Unit-1, 2, 3 & 4 at Chhibro(UK) were in running condition and were generating approx. 51 MW, 52 MW, 47 MW and 52 MW respectively (as per SCADA). 220kV Khodri-Jhajra Ckt was under shutdown for tracing the DC supply fault in its control circuit.

iii. As reported, at 12:28 hrs, heavy flashover was observed at B-phase insulator bushing of 220kV Khodri-Jhajra Ckt which created bus fault at 220kV Khodri(UK).

iv. As bus bar protection was not healthy at 220kV Khodri(UK), all the feeders except 220 KV Khodri - Chhibro (UK) Ckt-1 & 2 tripped from Khodri end sensing the fault in zone-4. However, 220 KV Khodri - Chhibro (UK) Ckt-1 tripped from Chhibro end only (exact nature of protection operated at Chhibro yet to be shared).

v. As per DR of Main-2 relay at Khodri end of 220 KV Sarsawan(UP)-Khodri(UK) (UP) Ckt, fault was sensed in zone-3 at Khodri end (it seems that there is wrong DR channel configuration); fault current=~2.215kA from Khodri end and fault clearing time=~220ms.

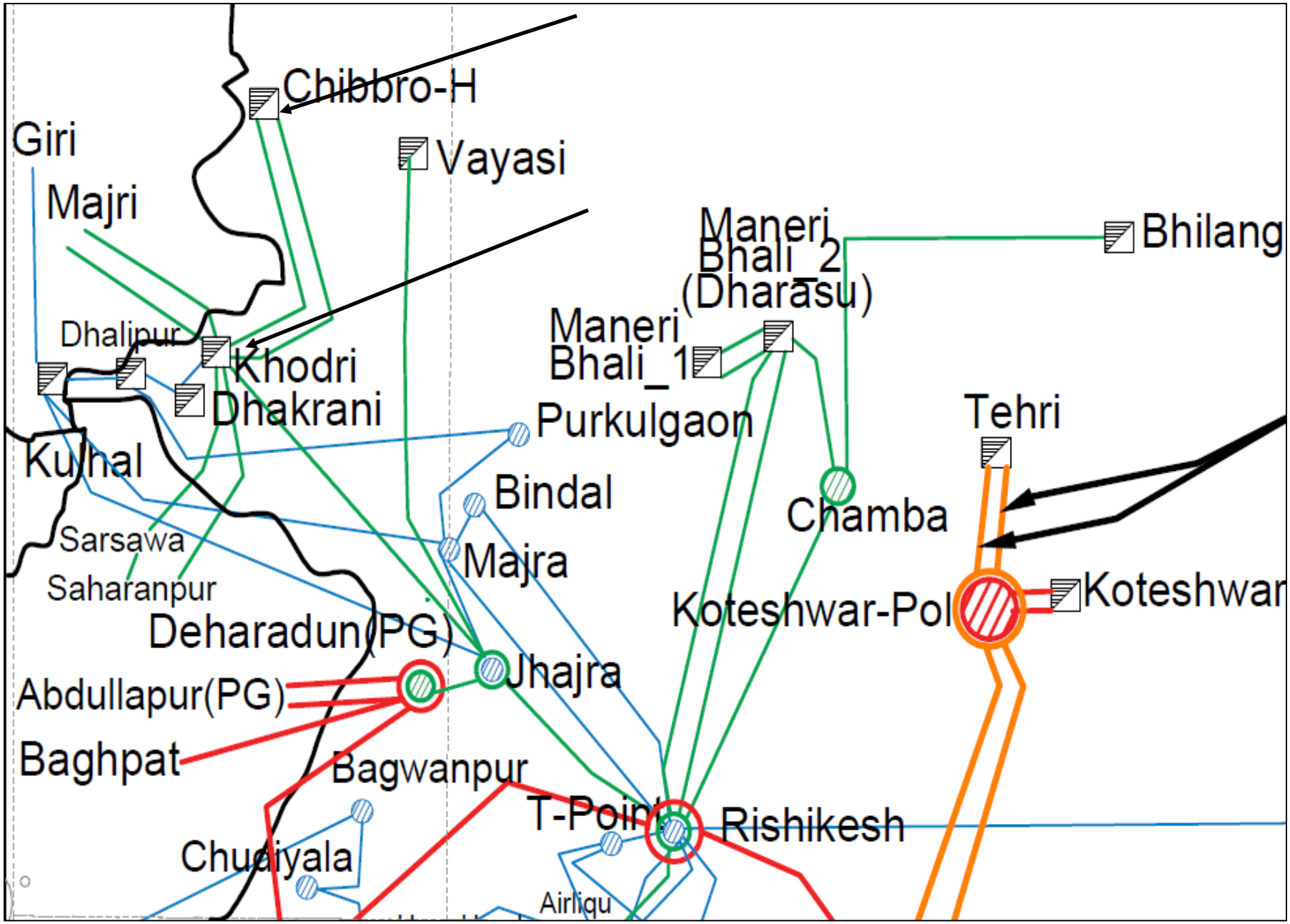
vi. As per DR at Khodri end of 220 KV Khodri(UK)-Majri(HP) (UK) Ckt-2, line tripped due to direction E/F protection operation at Khodri end.

vii. At the same time, all the units at Khodri(UK) and Chhibro(UK) tripped on over-current protection operation and complete blackout occurred at 220kV Khodri(UK) and 220kV Chhibro(UK).

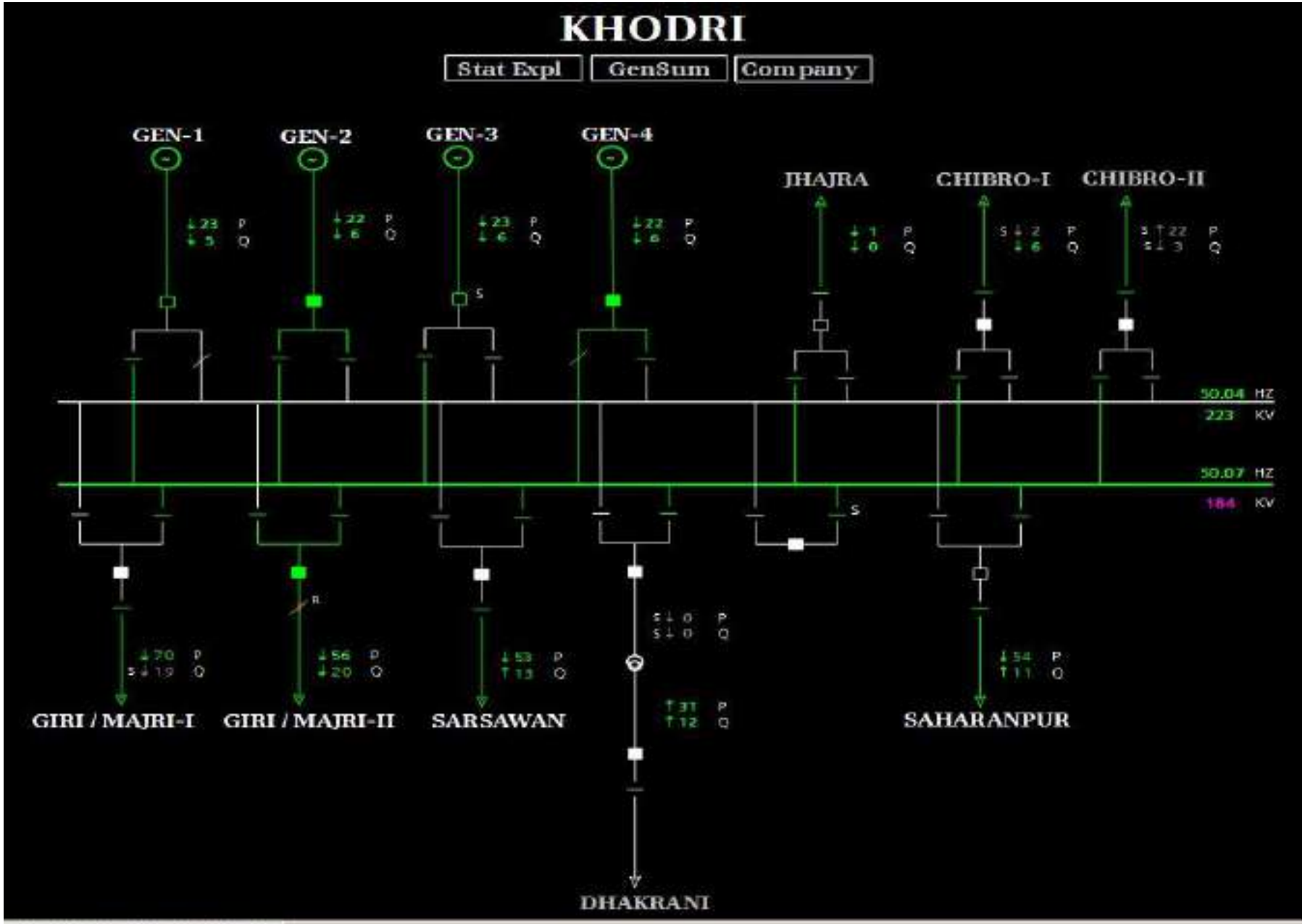
viii. As per PMU at Dehradun(PG), B-N phase to earth fault with fault clearing time of 240 ms was observed.

ix. As per SCADA, generation loss of approx. 290 MW was observed in Uttarakhand control area.

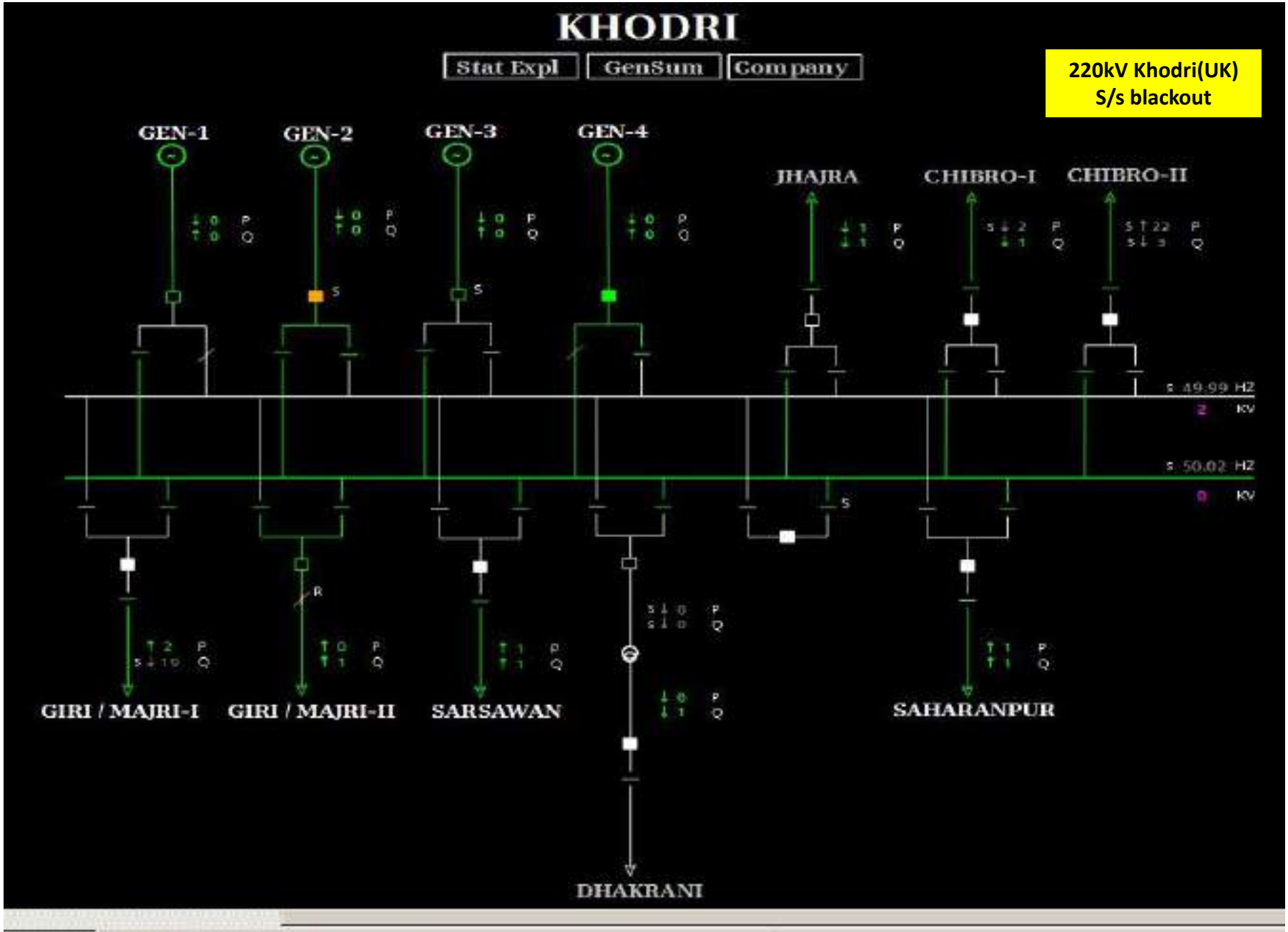
Network Diagram



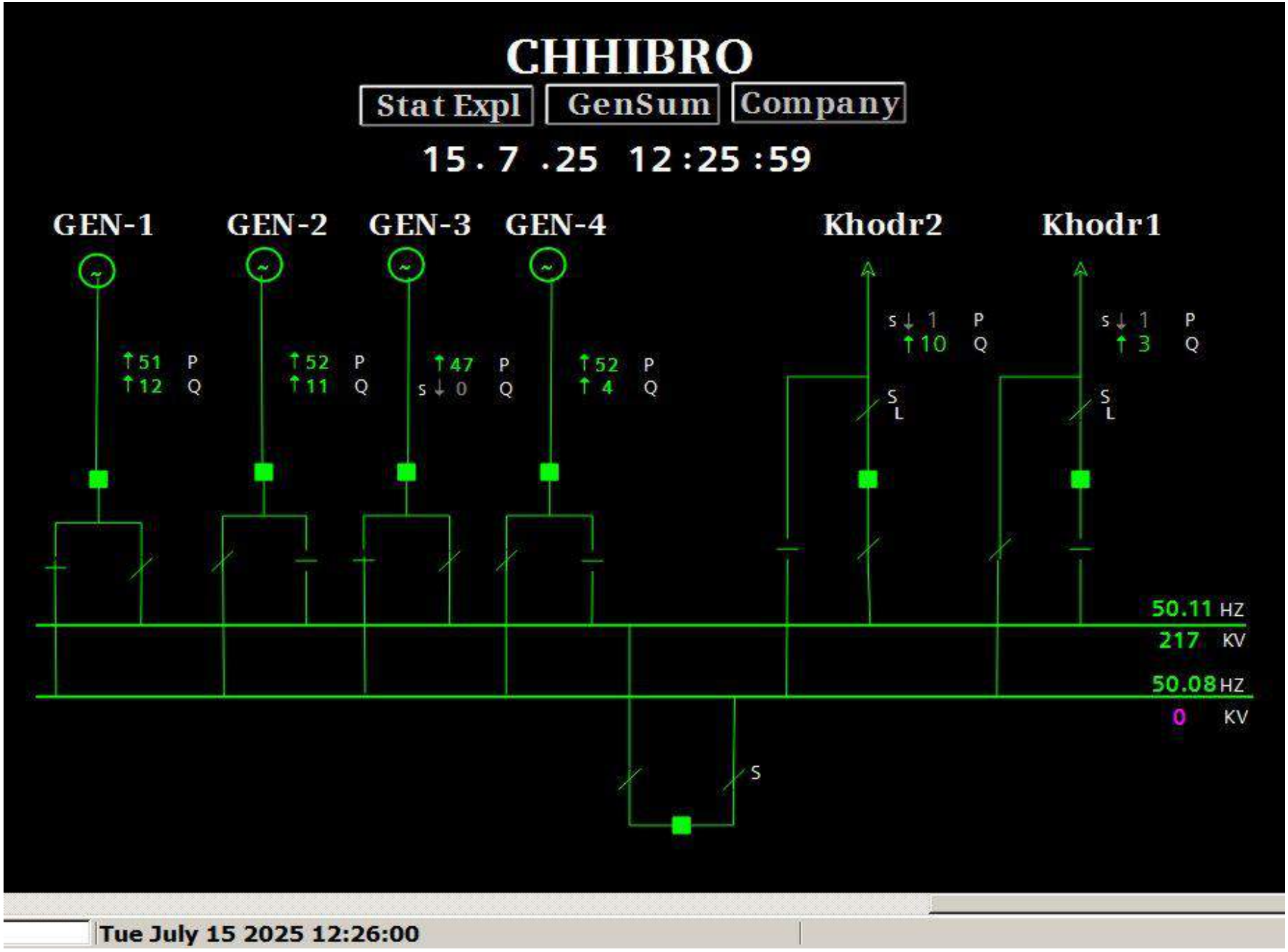
SLD of 220kV Khodri(UK) before the event



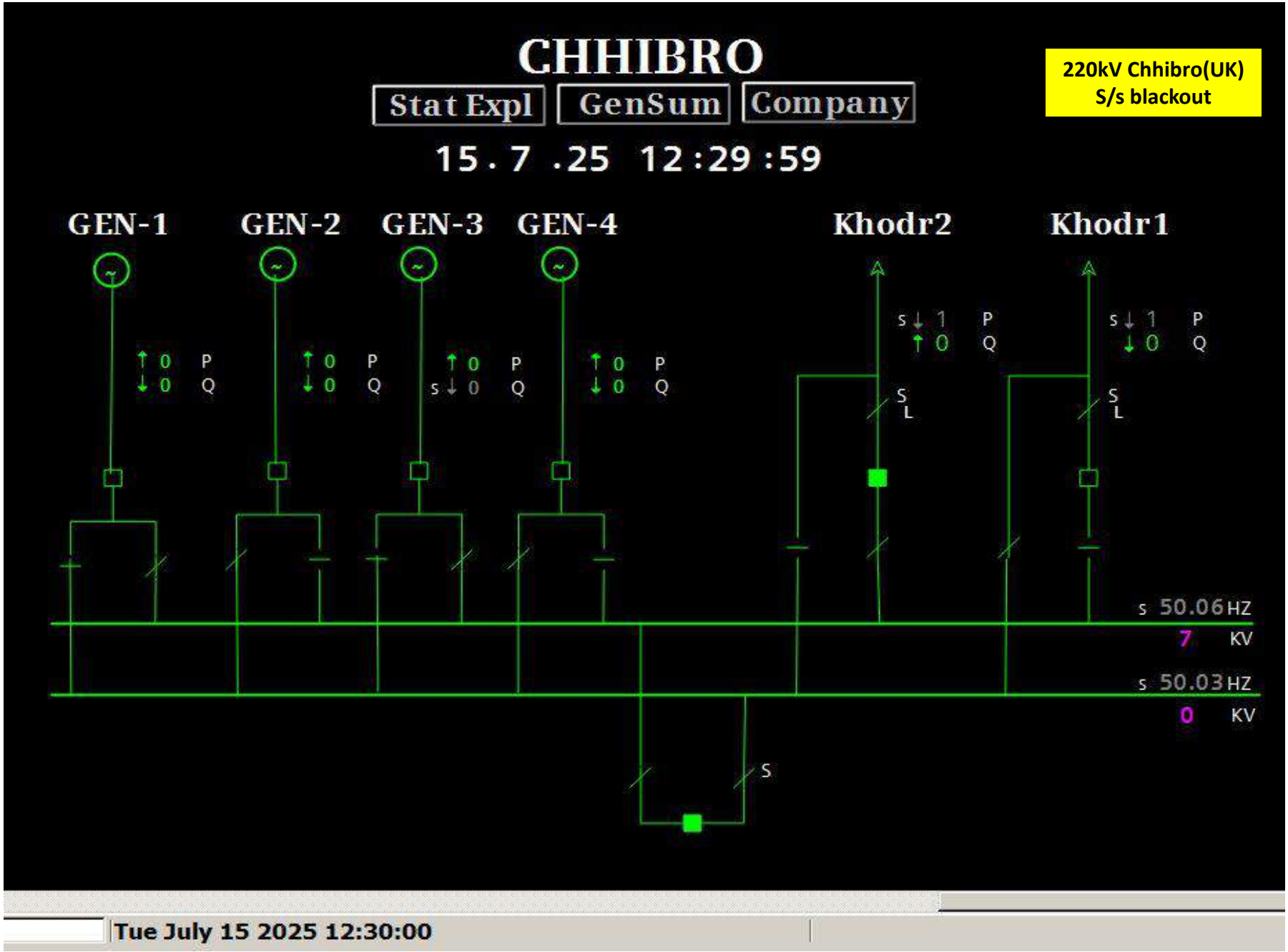
SLD of 220kV Khodri(UK) after the event



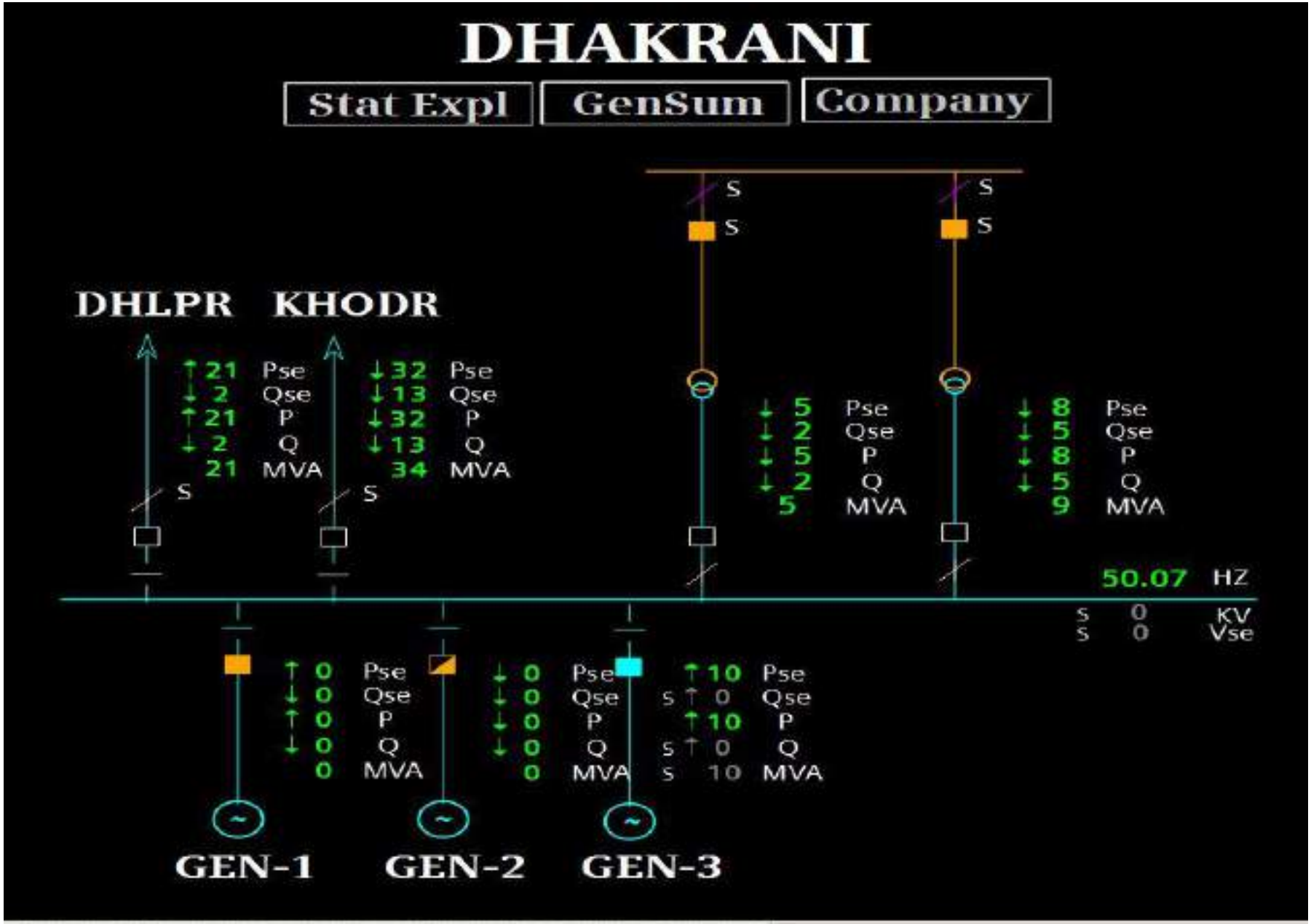
SLD of 220kV Chhibro(UK) before the event



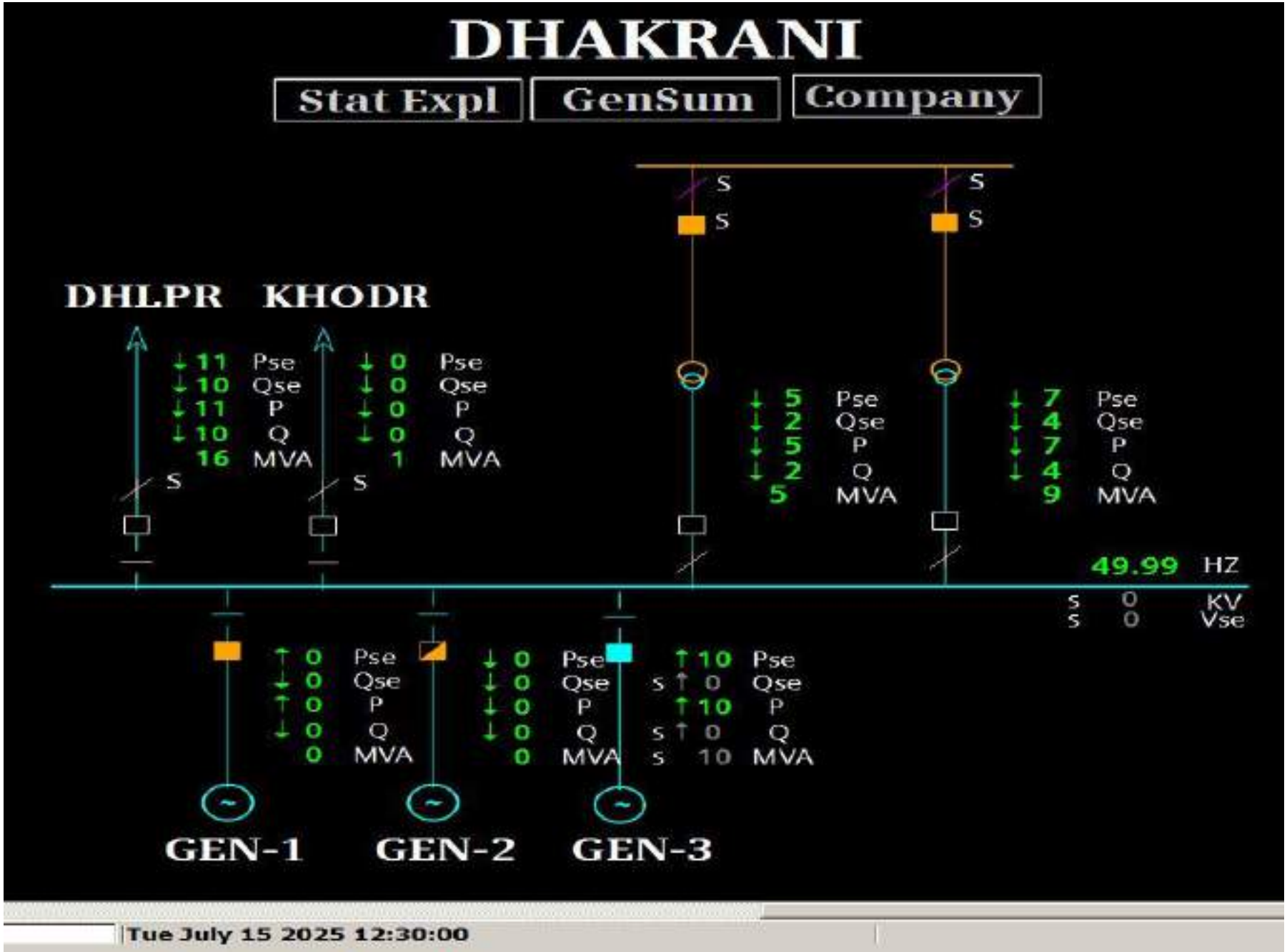
SLD of 220kV Chhibro(UK) after the event



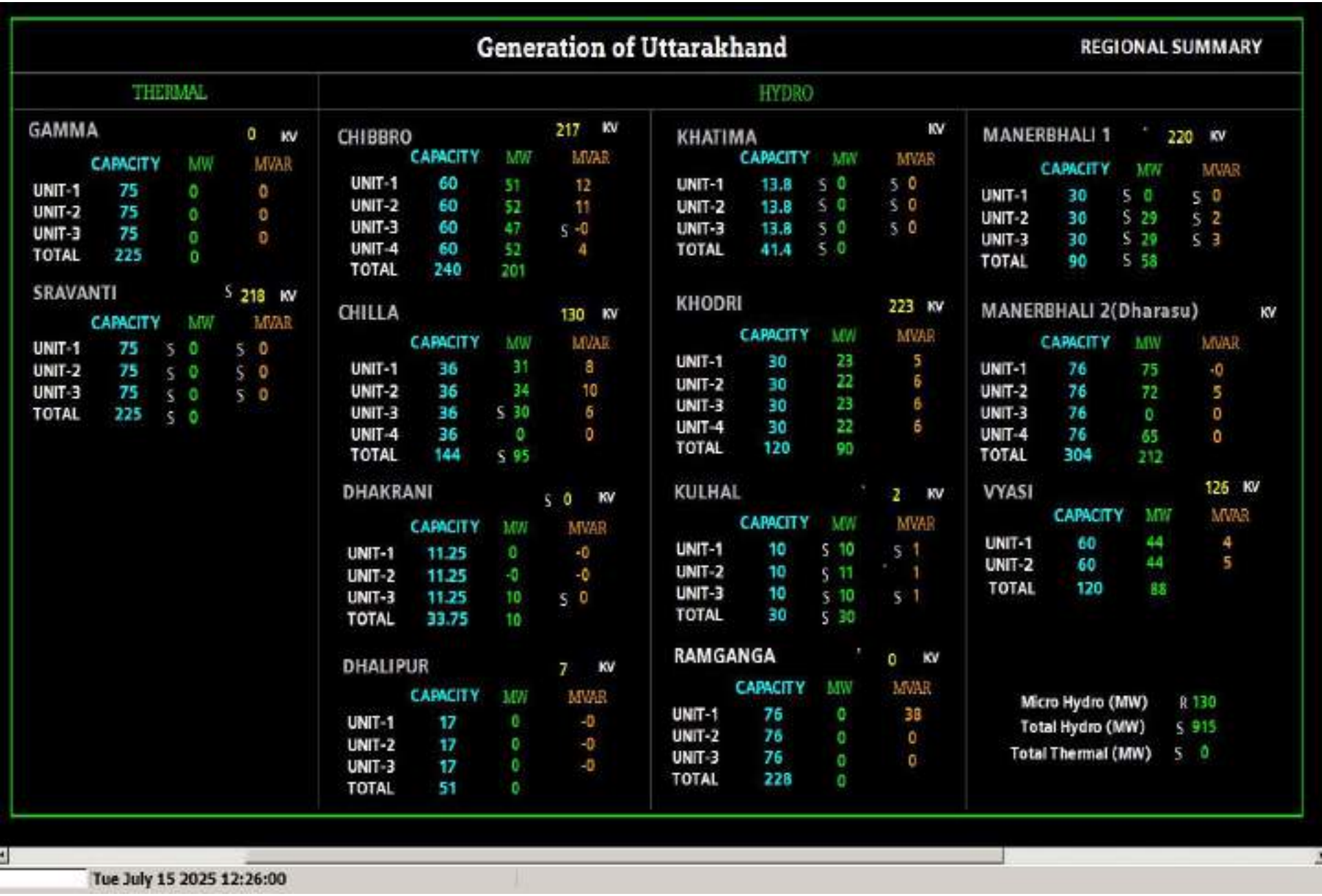
SLD of 132kV Dhakrani(UK) before the event



SLD of 132kV Dhakrani(UK) after the event



Uttarakhand Generation Summary before the event



Generation of Uttarakhand

REGIONAL SUMMARY

THERMAL

GAMMA 0 KV

	CAPACITY	MW	MVAR
UNIT-1	75	0	0
UNIT-2	75	0	0
UNIT-3	75	0	0
TOTAL	225	0	

SRAVANTI S 218 KV

	CAPACITY	MW	MVAR
UNIT-1	75	S 0	S 0
UNIT-2	75	S 0	S 0
UNIT-3	75	S 0	S 0
TOTAL	225	S 0	

HYDRO

CHIBBRO 217 KV

	CAPACITY	MW	MVAR
UNIT-1	60	51	12
UNIT-2	60	52	11
UNIT-3	60	47	S -0
UNIT-4	60	52	4
TOTAL	240	201	

CHILLA 130 KV

	CAPACITY	MW	MVAR
UNIT-1	36	31	8
UNIT-2	36	34	10
UNIT-3	36	S 30	6
UNIT-4	36	0	0
TOTAL	144	S 95	

DHAKRANI S 0 KV

	CAPACITY	MW	MVAR
UNIT-1	11.25	0	-0
UNIT-2	11.25	-0	-0
UNIT-3	11.25	10	S 0
TOTAL	33.75	10	

DHALIPUR 7 KV

	CAPACITY	MW	MVAR
UNIT-1	17	0	-0
UNIT-2	17	0	-0
UNIT-3	17	0	-0
TOTAL	51	0	

KHATIMA KV

	CAPACITY	MW	MVAR
UNIT-1	13.8	S 0	S 0
UNIT-2	13.8	S 0	S 0
UNIT-3	13.8	S 0	S 0
TOTAL	41.4	S 0	

KHODRI 223 KV

	CAPACITY	MW	MVAR
UNIT-1	30	23	5
UNIT-2	30	22	6
UNIT-3	30	23	6
UNIT-4	30	22	6
TOTAL	120	90	

KULHAL 2 KV

	CAPACITY	MW	MVAR
UNIT-1	10	S 10	S 1
UNIT-2	10	S 11	1
UNIT-3	10	S 10	S 1
TOTAL	30	S 30	

RAMGANGA 0 KV

	CAPACITY	MW	MVAR
UNIT-1	76	0	38
UNIT-2	76	0	0
UNIT-3	76	0	0
TOTAL	228	0	

MANERBHALI 1 220 KV

	CAPACITY	MW	MVAR
UNIT-1	30	S 0	S 0
UNIT-2	30	S 29	S 2
UNIT-3	30	S 29	S 3
TOTAL	90	S 58	

MANERBHALI 2(Dharasu) KV

	CAPACITY	MW	MVAR
UNIT-1	76	75	-0
UNIT-2	76	72	5
UNIT-3	76	0	0
UNIT-4	76	65	0
TOTAL	304	212	

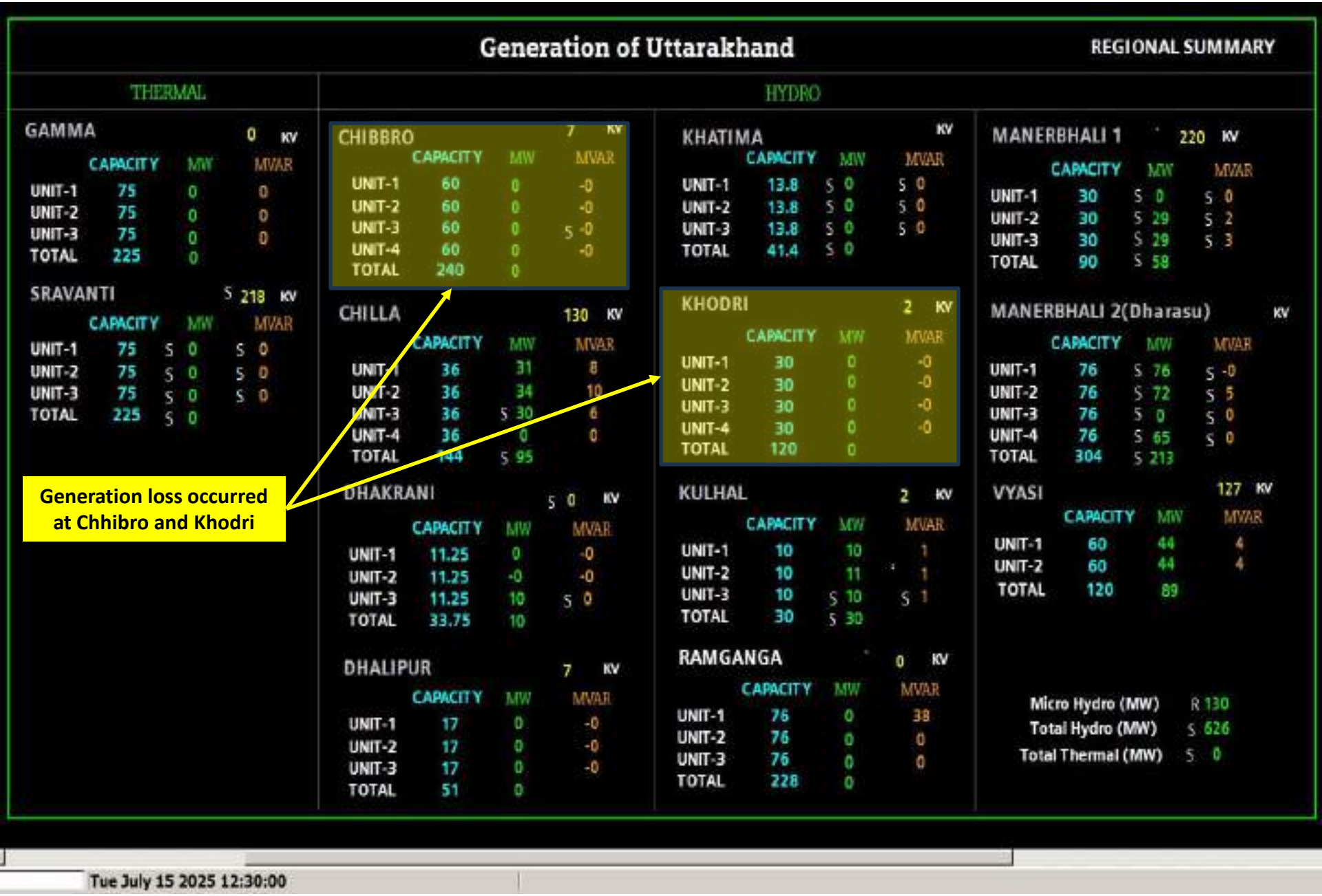
VYASI 126 KV

	CAPACITY	MW	MVAR
UNIT-1	60	44	4
UNIT-2	60	44	5
TOTAL	120	88	

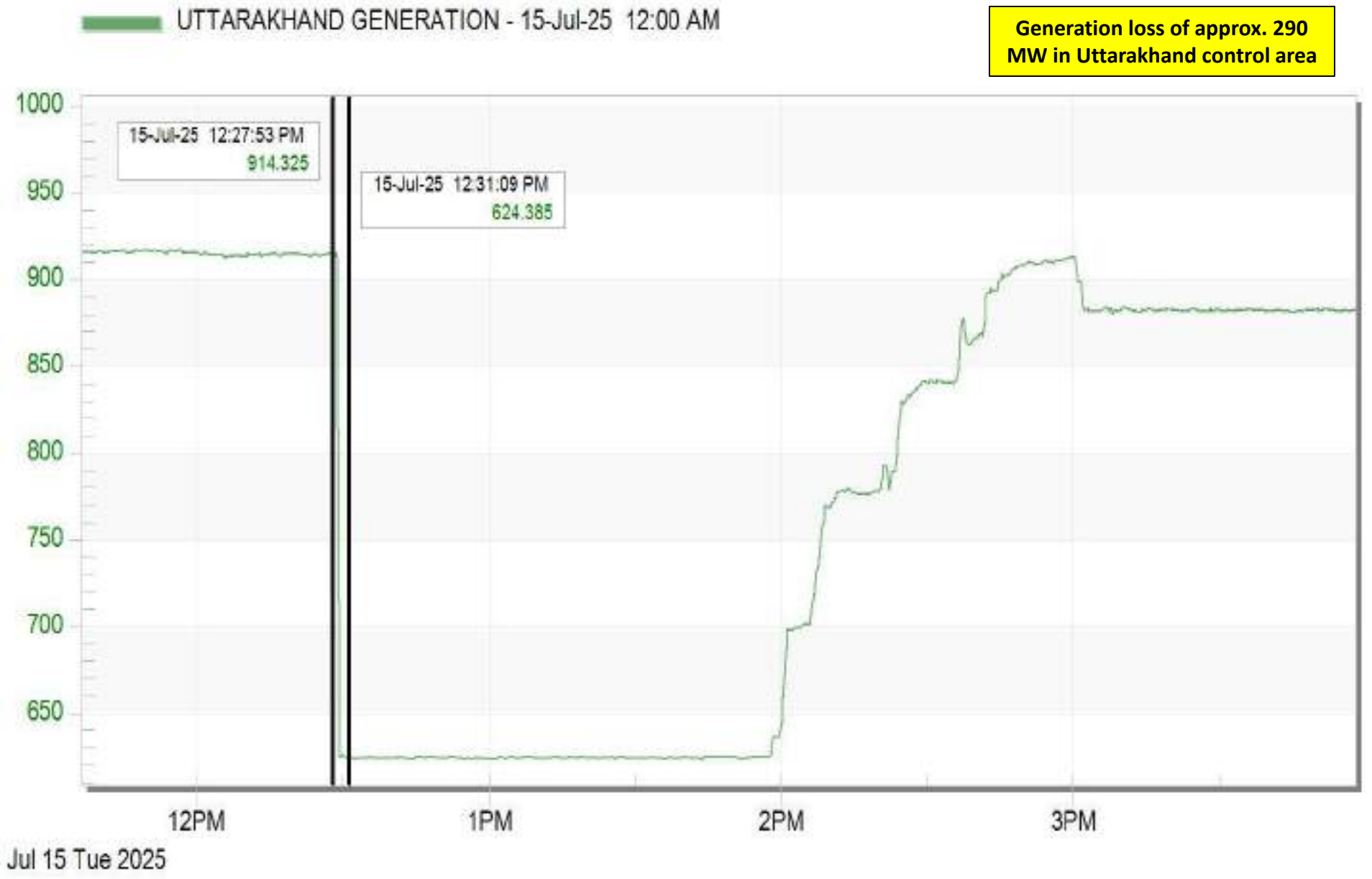
Micro Hydro (MW)	R 130
Total Hydro (MW)	S 915
Total Thermal (MW)	S 0

Tue July 15 2025 12:26:00

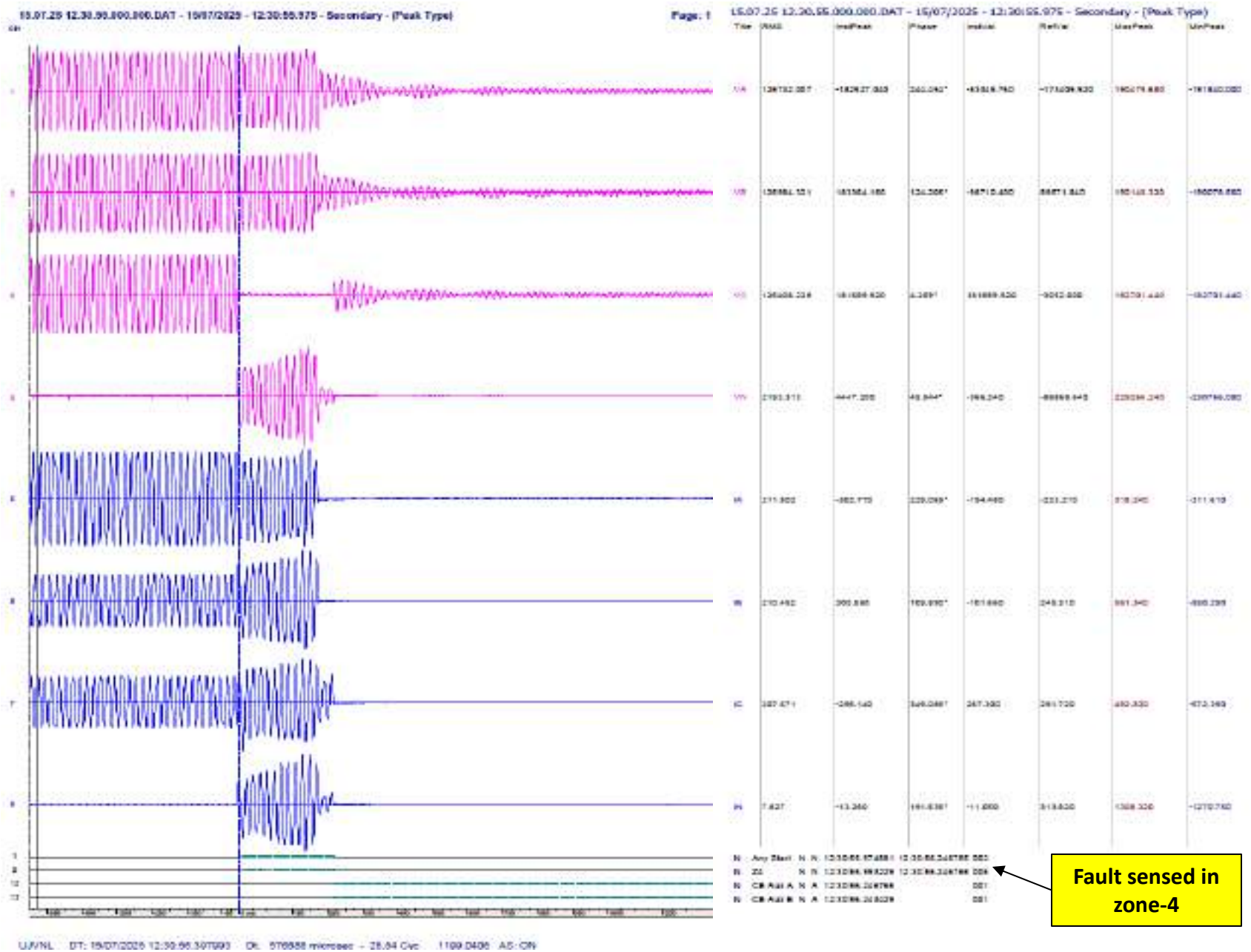
Uttarakhand Generation Summary after the event



Uttarakhand Generation during the event



DR of 220 KV Khodri(UK) (end)-Majri(HP) (UK) Ckt-1



DR of 220 KV Khodri(UK) (end)-Majri(HP) (UK) Ckt-2

ABB

Disturbance Short Report

Disturbance Recordings Information

Device Information

Recorder ID	1
IED type	L67I11 01
IED version	1.101
Station name	HPSEB KHODRI
Object name	MAJHRI LINE-2 M2
IED name	REL670

Fault Information

Trig date and time	15-07-2025 12:28:43.292
Trigger signal name	CB_BPH_OPEN
Recording number	388
Total recording time	3499 ms
Pre-trig recording time	499 ms
Post trig recording time	0 ms
Max. recording time	3000 ms

General Recordings Information

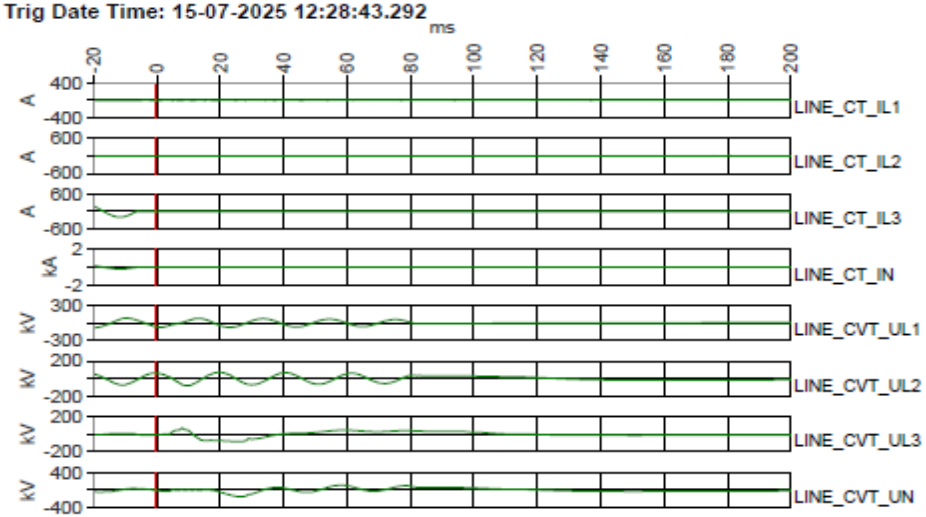
Disturbance recorder	Installed
Event recorder	Installed
System frequency	50 Hz
Sampling frequency	1 kHz
Active setting group during recording	1

Fault Location Information

Fault loop type	Not applicable
Fault location	Not applicable
Status of fault calculation	Not applicable
Fault direction	Not applicable

Analog Time Diagram

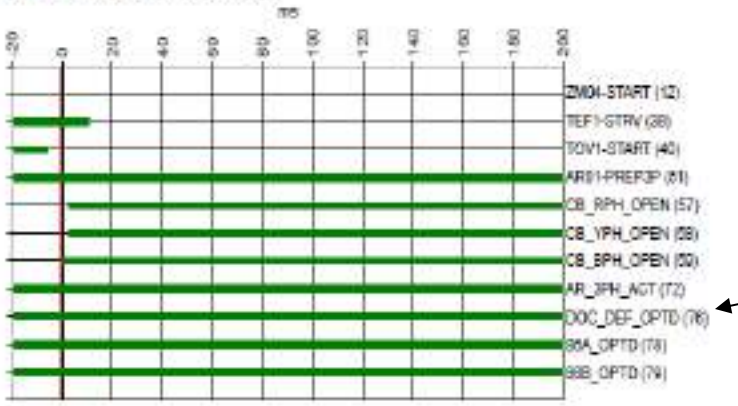
Trig Date Time: 15-07-2025 12:28:43.292



ABB

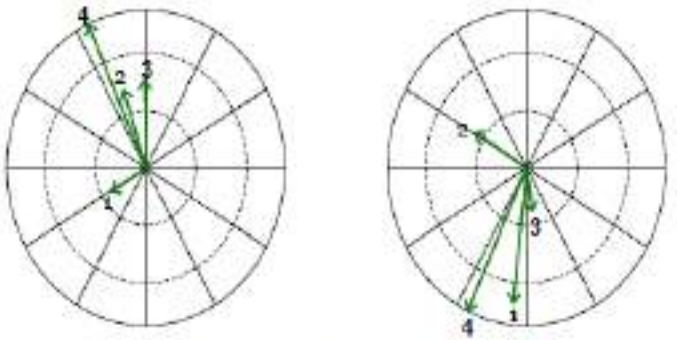
Binary Time Diagram

Trig Date Time: 16-07-2025 12:28:43.292



Vector Diagrams

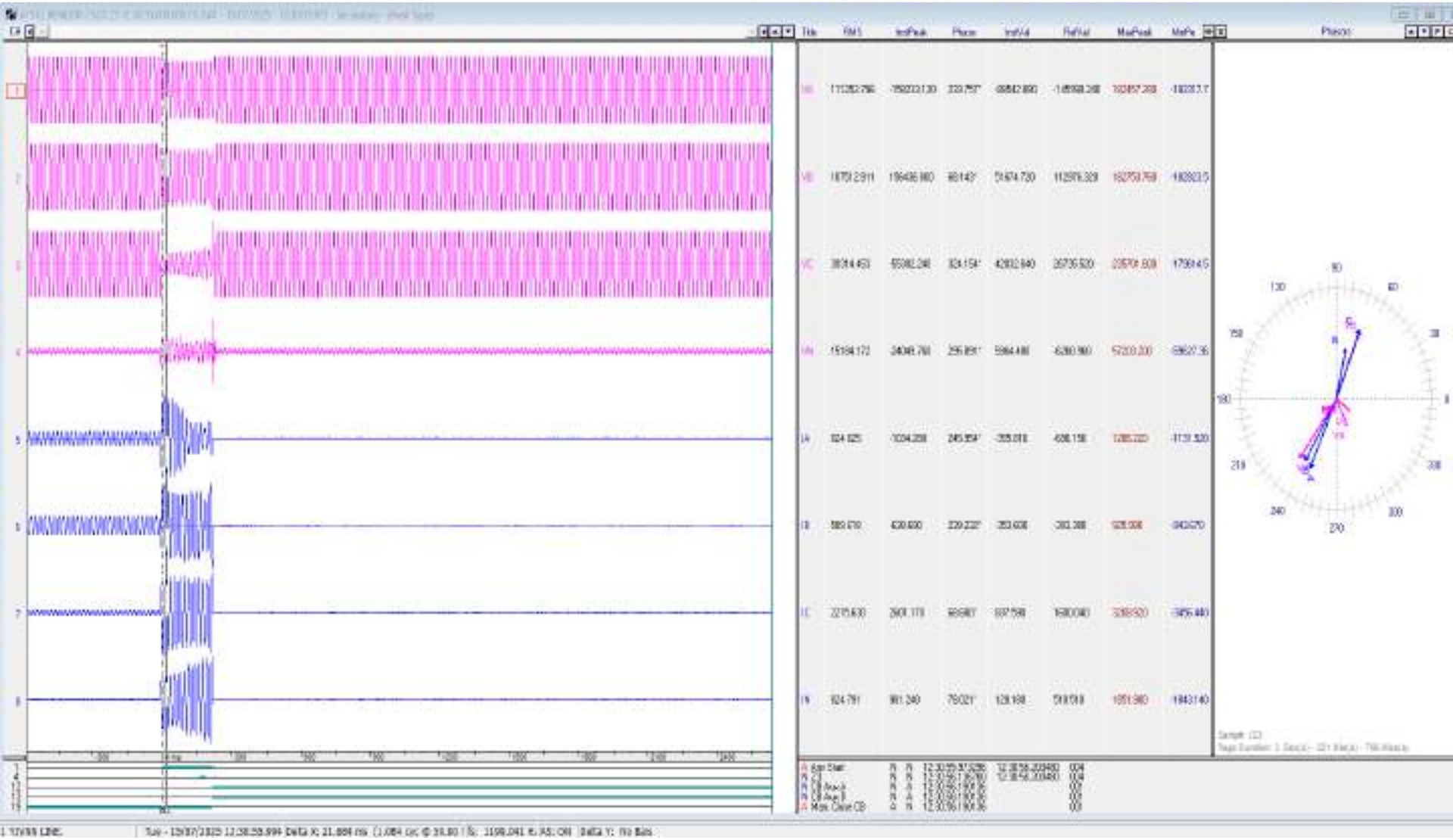
Calculation Time Period : -253 ms to -234 ms



No.	Name	RMS	Angle	No.	Name	RMS	Angle
1	LINE_CT_IL1	160.435(A)	211.6°	1	LINE_CVT_UL1	168437.109 (V)	263.6°
2	LINE_CT_IL2	290.427(A)	107.9°	2	LINE_CVT_UL2	84096.617(V)	148.6°
3	LINE_CT_IL3	309.046(A)	90.8°	3	LINE_CVT_UL3	53924.02(V)	278.2°
4	LINE_CT_IN	558.154(A)	114.6°	4	LINE_CVT_UN	196253.582 (V)	244.9°

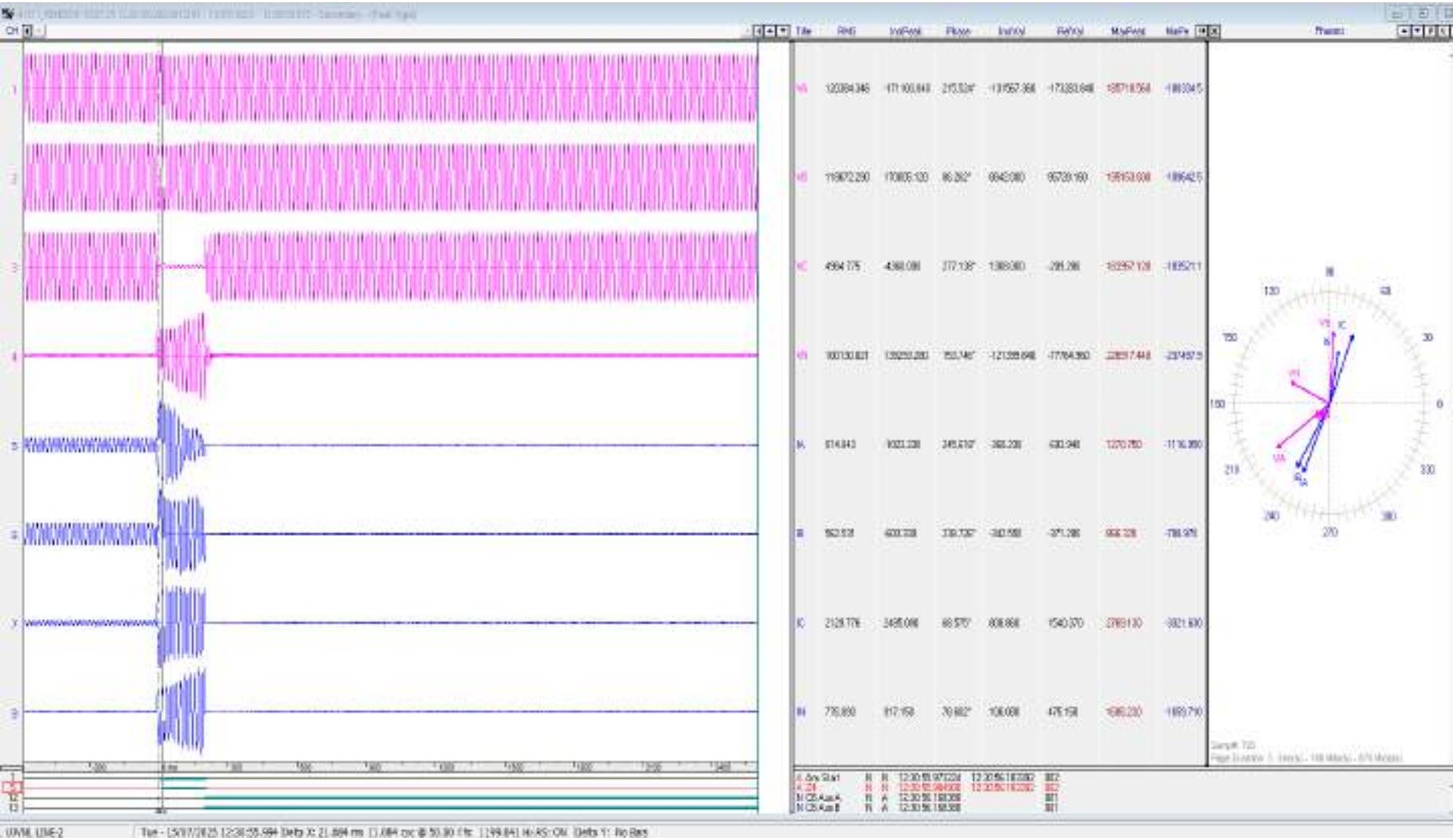
Directional E/F operated

DR of 220 KV Sarsawan(UP)-Khodri(UK) (end) (UP) Ckt



- ✓ B-N fault; Fault current=~2.215kA
- ✓ Fault clearing time=~220ms
- ✓ Fault sensed in zone-3 at Khodri end

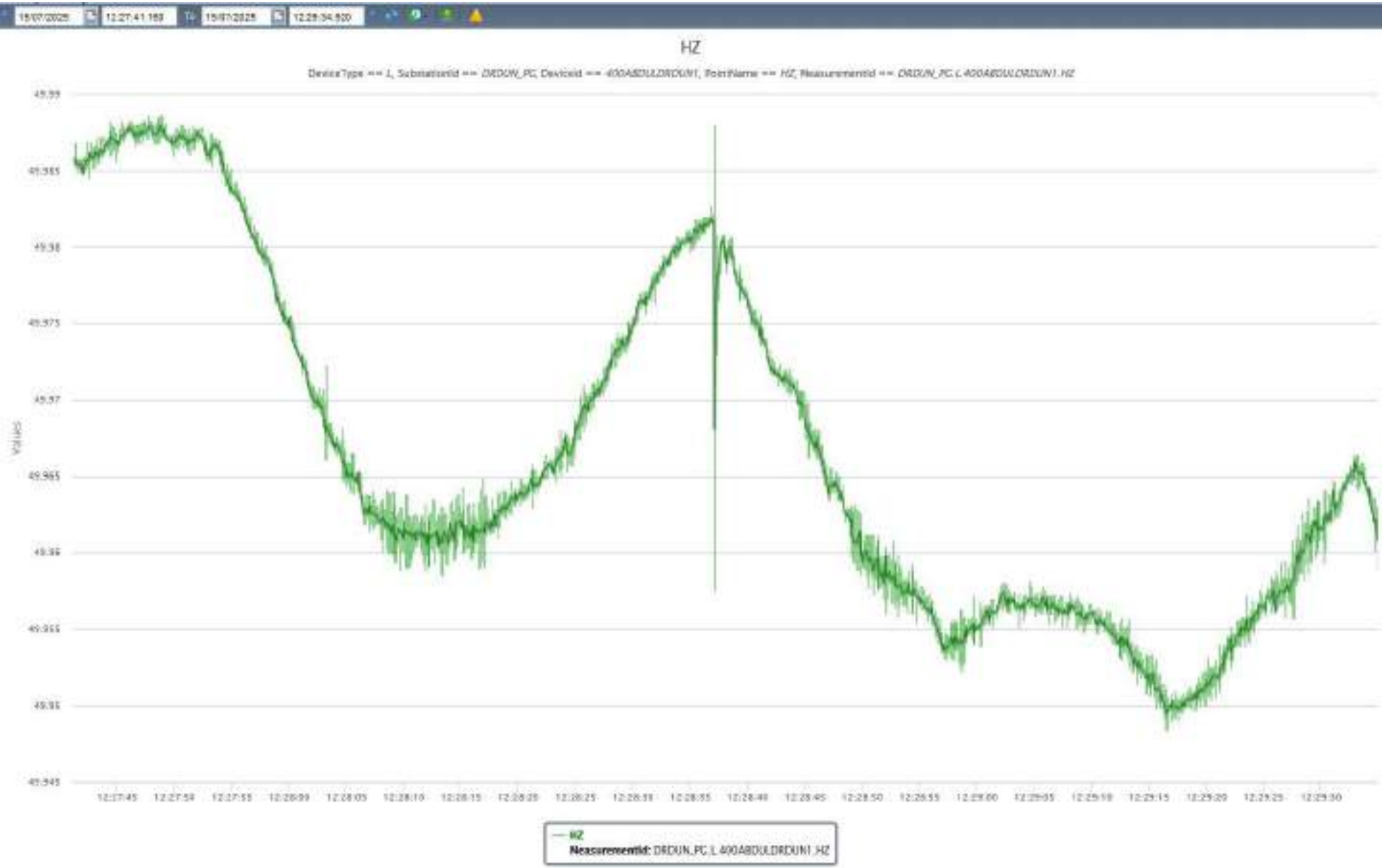
DR of 220 KV Saharanpur(UP)-Khodri(UK) (end) (UP) Ckt



- ✓ B-N fault; Fault current=~2.13kA
- ✓ Fault clearing time=~210ms
- ✓ Fault sensed in zone-4 at Khodri end

PMU Plot of frequency at Dehradun(PG)

12:28hrs/15-Jul-25



PMU Plot of Voltage at Dehradun(PG)

12:28hrs/15-Jul-25



SCADA SOE

Time	Station Name	Voltage Level	Element Name	Element Type	Element Status	Remarks
12:28:48,183	CHBRO_UK	220kV	G4G4	Circuit Breaker	Open	CB at 220kV side of 60 MW Chhibro Unit-4 opened
12:28:48,183	CHBRO_UK	220kV	G3G3	Circuit Breaker	Open	CB at 220kV side of 60 MW Chhibro Unit-3 opened
12:28:48,183	CHBRO_UK	220kV	G2G2	Circuit Breaker	Open	CB at 220kV side of 60 MW Chhibro Unit-2 opened
12:28:48,183	CHBRO_UK	220kV	G1G1	Circuit Breaker	Open	CB at 220kV side of 60 MW Chhibro Unit-1 opened
12:28:48,183	CHBRO_UK	220kV	F2KHODR1	Circuit Breaker	Open	Line CB at Chhibro(UK) end of 220 KV Khodri-Chhibro (UK) Ckt-1 opened
12:28:50,987	KHODR_UK	220kV	SRNPR2	Circuit Breaker	Close	Line CB at Khodri(UK) end of 220 KV Saharanpur(UP)-Khodri(UK) (UP) Ckt-1 opened
12:28:50,987	KHODR_UK	220kV	88MAJRI2	Circuit Breaker	Open	Line CB at Khodri(UK) end of 220 KV Khodri(UK)-Majri(HP) (UK) Ckt-2 opened
12:28:50,987	KHODR_UK	220kV	T1T1	Circuit Breaker	Open	CB at 220kV side of 220/132 kV 100 MVA ICT at Khodri(UK) opened

Points for Discussion

i. Reason of delayed clearance of fault need to be shared.
ii. Busbar protection need to be made healthy at Khodri at the earliest.
iii. Exact reason of non-operation of protection in 220 KV Khodri - Chhibro (UK) Ckt-1 need to be shared.
iv. Exact nature of protection operated in 220 KV Khodri - Chhibro (UK) Ckt-2 at Chhibro end need to be shared.
v. Direction E/F protection settings at Khodri end of 220 KV Khodri(UK)-Majri(HP) (UK) Ckt-2 need to be shared and reviewed.
vi. Reason of sensing the fault in zone-3 by Main-2 relay at Khodri end of 220 KV Sarsawan(UP)-Khodri(UK) (UP) Ckt need to be analysed.
vii. DR/EL(.dat/.cfg file) of all tripped units need to be shared along with detailed tripping report.
viii. Remedial action taken report need to be shared.

Report on Disturbance of various Elements at Khodri Power Station

Date& Time of event: 15.07.2025 at 12:28

Substation affected: 220 KV Khodri and Chibro

Date & Time of Restoration:15.07.2025 at 14:35

ANTECEDENT CONDITION:

During Antecedent condition 88 MW Power was being generated from Khodri and 199 MW Power was being evacuated from Chibro to Khodri through 220 kV Chibro-Khodri-Feeders.

Elements Tripped :

1. Unit # 1 KPS
2. Unit # 2 KPS
3. Unit # 3 KPS
4. Unit # 4 KPS
5. 220/132 KV ICT (885/785)
6. 220kV Khodri-Mazri -II(88) Feeder
7. 220kV Khodri-Mazri -I (86) Feeder
8. 220kV Khodri-Saharanpur -II(84) Feeder
9. 220kV Khodri-Sarsawa(83) Feeder
10. Unit # 1 CPS
11. Unit # 2 CPS
12. Unit # 3 CPS
13. Unit # 4 CPS
14. Chibro-Khodri-I (83) Feeder

Transmission/Generation element Tripped during the event:

S.NO	Name of Element	Tripping Time (Hrs)	Revival Time (Hrs)	Reason/Remarks/Relay
1.	Unit#1 KPS	12:28	14:35	Over Current Protection operated(51G)
2.	Unit#2 KPS	12:28	13:58	Over Current Protection operated(51G)
3.	Unit#3 KPS	12:28	14:05	Over Current Protection operated(51G)
4.	Unit#4 KPS	12:28	14:20	Over Current Protection operated(51G)
5.	220/132kV ICT (885/785)	12:28	14:01	Over Current Protection operated
6.	220kV Khodri-Mazri –II(88) Feeder	12:28	14:23	Directional Earth fault Protection Operated.
7.	220kV Khodri-Mazri – I(86)Feeder	12:28	14:20	Zone-4 Operated on Distance Protection Relay
8.	220kV Khodri-Saharanpur-II (84) Feeder	12:28	14:18	Zone-4 Operated on Distance Protection Relay
9.	220kV Khodri-Sarsawa (83) Feeder	12:28	13:42	Zone-4 Operated on Distance Protection Relay

10.	Unit # 1 CPS	12:28	13:58	Over Current Protection (51G), operated
11.	Unit # 2 CPS	12:28	14:35	Over Current Protection(51G), operated
12.	Unit # 3 CPS	12:28	14:20	Over Current Protection(51G), operated
13.	Unit # 4 CPS	12:28	14:05	Over Current Protection(51G), operated
14.	Chibro-Khodri-I Trip	12:28	13:42	186R2,186Y2,186B2 operated

Event Description:-

On date 15.07.2025 all four generation units were running on plant load = 88/199 MW from 08:31 hrs at Khodri Power Station. The test team and switchyard team were working jointly to trace the DC supply fault in control circuit of Khodri-Jhajhra Feeder Breaker (87). At around 12:28 hrs a heavy flashing was observed in its B phase insulator bushing. A loud sound was heard and all generation units and feeders connected at Khodri Power Station got tripped.

Immediate action & Fault analysis: All relays installed on generation units recorded heavy current, and got tripped on Overcurrent protection .All feeders also got tripped on Zone – 04 (protection of reverse side of circuit breaker). Since, all generation units at KPS were tripped, all the generation units at Chibro Power Station also got tripped simultaneously on Overcurrent protection.

Action taken: After isolation of faulty section, restoration of generation units and feeder was completed at 14:45 hrs. Electrical maintenance team checked for healthiness of post insulator & it was decided to replace the 'B' Phase isolator bushing with another one. Thereafter IR was taken and found 13 Giga ohm. Multiple operations of 220 KV Circuit breaker was performed with pole discrepancy protection checked, which was found satisfactory.Finally at 20:21 hrs. on dated 16.07.2025 feeder was normalized.

Multiple Element Tripping Event at 220kV Khodri(UK) and 220kV Chhibro(UK)

At 18:44 hrs on 20.07.2025

Tripped Elements

S. No	Name of Elements	Outage Time	Revival Time	Reason of tripping
1.	220 KV Khodri(UK)-Majri(HP) (UK) Ckt-1	18:44 hrs	11:10 hrs, 22.07.2025	Tripped from Majri end only during blast of R-ph LA at Majri end of 220kV Majri-VISCO feeder
2.	220 KV Khodri(UK)-Majri(HP) (UK) Ckt-2		20:07 hrs	Directional O/C E/F operated at Khodri
3.	220 KV Khodri - Chhibro (UK) Ckt-2		19:10 hrs	LBB of Unit-4 at Khodri operated
4.	220 KV Saharanpur(UP)-Khodri(UK) (UP) Ckt		20:05 hrs	
5.	220/132 kV 100 MVA ICT at Khodri(UK)		Under E/S	
6.	30 MW Unit-2 at Khodri(UK)		19:56 hrs	Stand-by E/F protection operated
7.	30 MW Unit-3 at Khodri(UK)		19:56 hrs	
8.	30 MW Unit-4 at Khodri(UK)		19:56 hrs	
9.	60 MW Unit-3 at Chhibro(UK)		19:56 hrs	Details yet to be received

Brief details of the event

i. 220KV Khodri(UK) and 220kV Chhibro(UK) generating station have 4 generating units each of 30MW and 60MW respectively and have double main bus scheme.

ii. During antecedent condition, 30 MW Unit-1, 2, 3 & 4 at Khodri(UK) were in running condition and were generating approx. 23 MW, 22 MW, 23 MW and 22 MW respectively. Also, 60 MW Unit-1, 2, 3 & 4 at Chhibro(UK) were in running condition and were generating approx. 51 MW, 53 MW, 47 MW and 52 MW respectively (as per SCADA).

iii. As reported, at 18:44 hrs, R-ph LA at Majri end of 220kV Majri-VISCO feeder blast. It led to the tripping of 220 KV Khodri(UK)-Majri(HP) (UK) Ckt-1 & 2. 220 KV Khodri(UK)-Majri(HP) (UK) Ckt-1 tripped from Majri end only. (exact reason, nature and location of fault yet to be shared).

iv. As per DR at Khodri end of 220 KV Khodri(UK)-Majri(HP) (UK) Ckt-2, direction E/F protection operated at Khodri end.

v. Due to this disturbance, Stand-by E/F protection operated at 30 MW Unit-2, 3 & 4 at Khodri(UK). But due to delayed opening of CB at Unit-4, LBB protection operated which led to further tripping of 220 KV Khodri - Chhibro (UK) Ckt-2, 220 KV Saharanpur(UP)-Khodri(UK) (UP) Ckt, and 220/132 kV 100 MVA ICT at Khodri(UK).

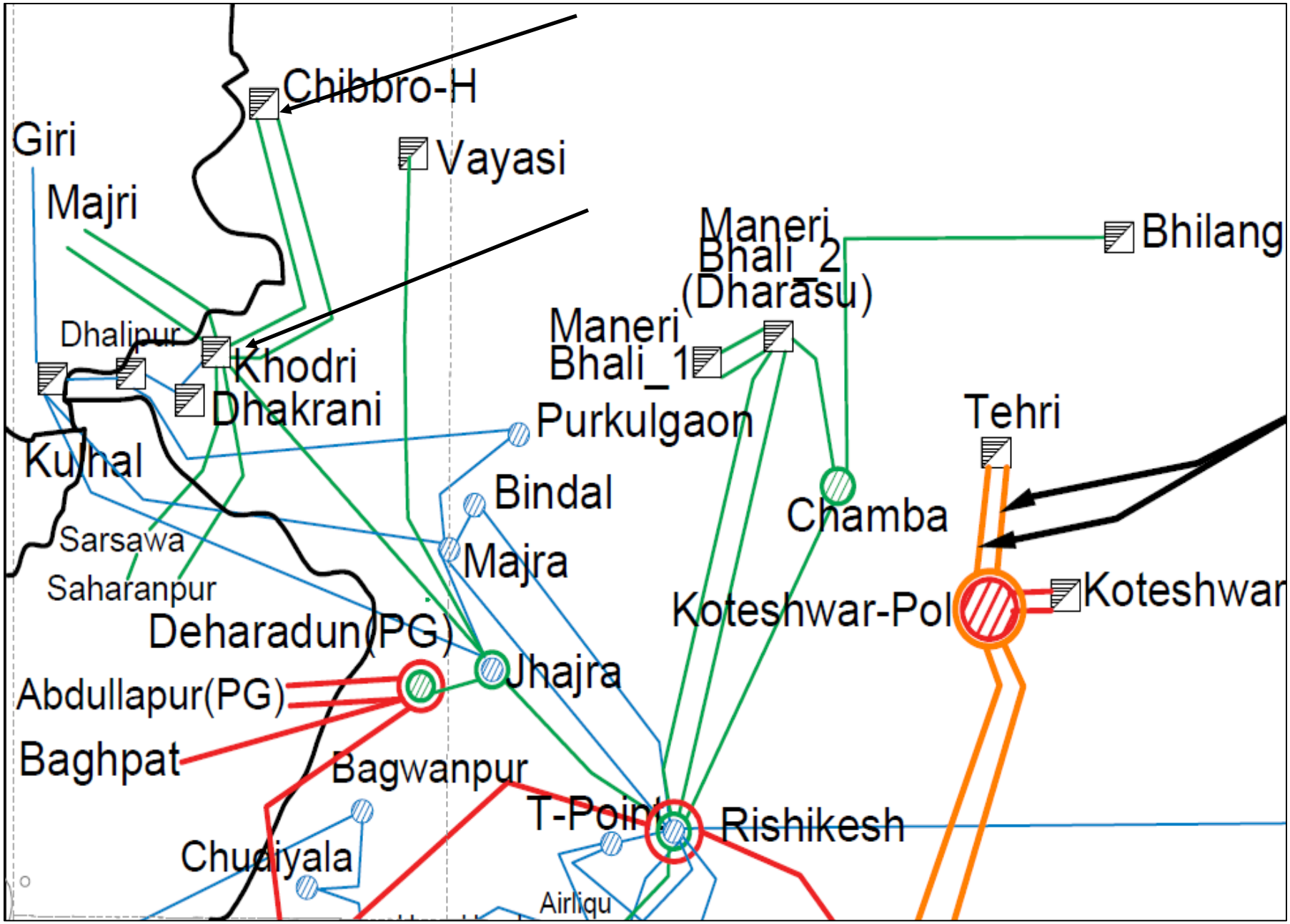
vi. As per DR at Khodri end of 220 KV Saharanpur(UP)-Khodri(UK) (UP) Ckt, line tripped from Khodri end only. R-N fault with fault current of ~1.05kA from Khodri and fault clearing time of ~160ms was observed.

vii. During the same time, 60 MW Unit-3 at Chhibro(UK) also tripped (exact reason of protection operated yet to be shared).

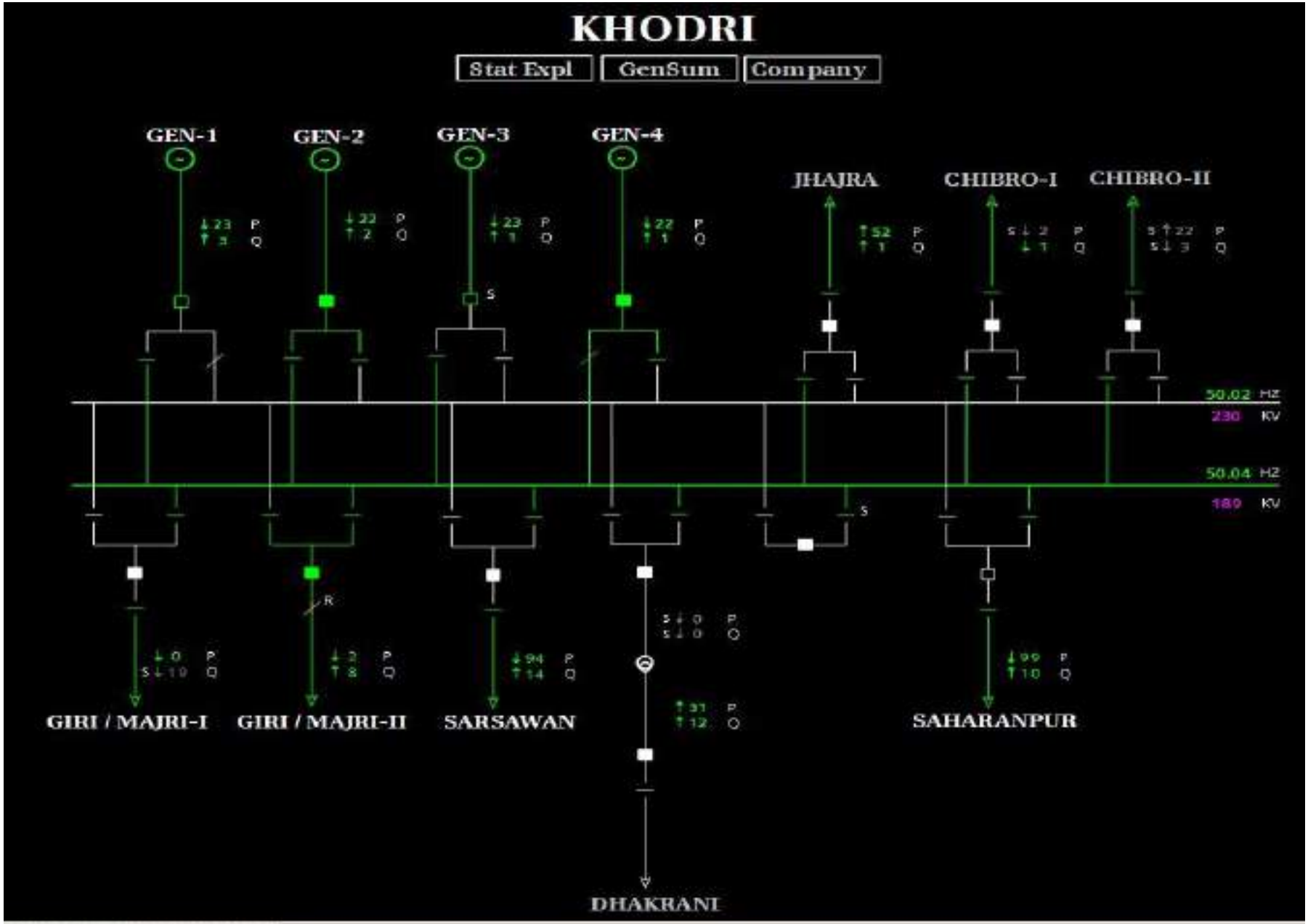
viii. As per PMU at Dehradun(PG), R-N phase to earth fault with fault clearing time of 160 msec was observed.

ix. As per SCADA, generation loss of approx. 114 MW was observed in Uttarakhand control area.

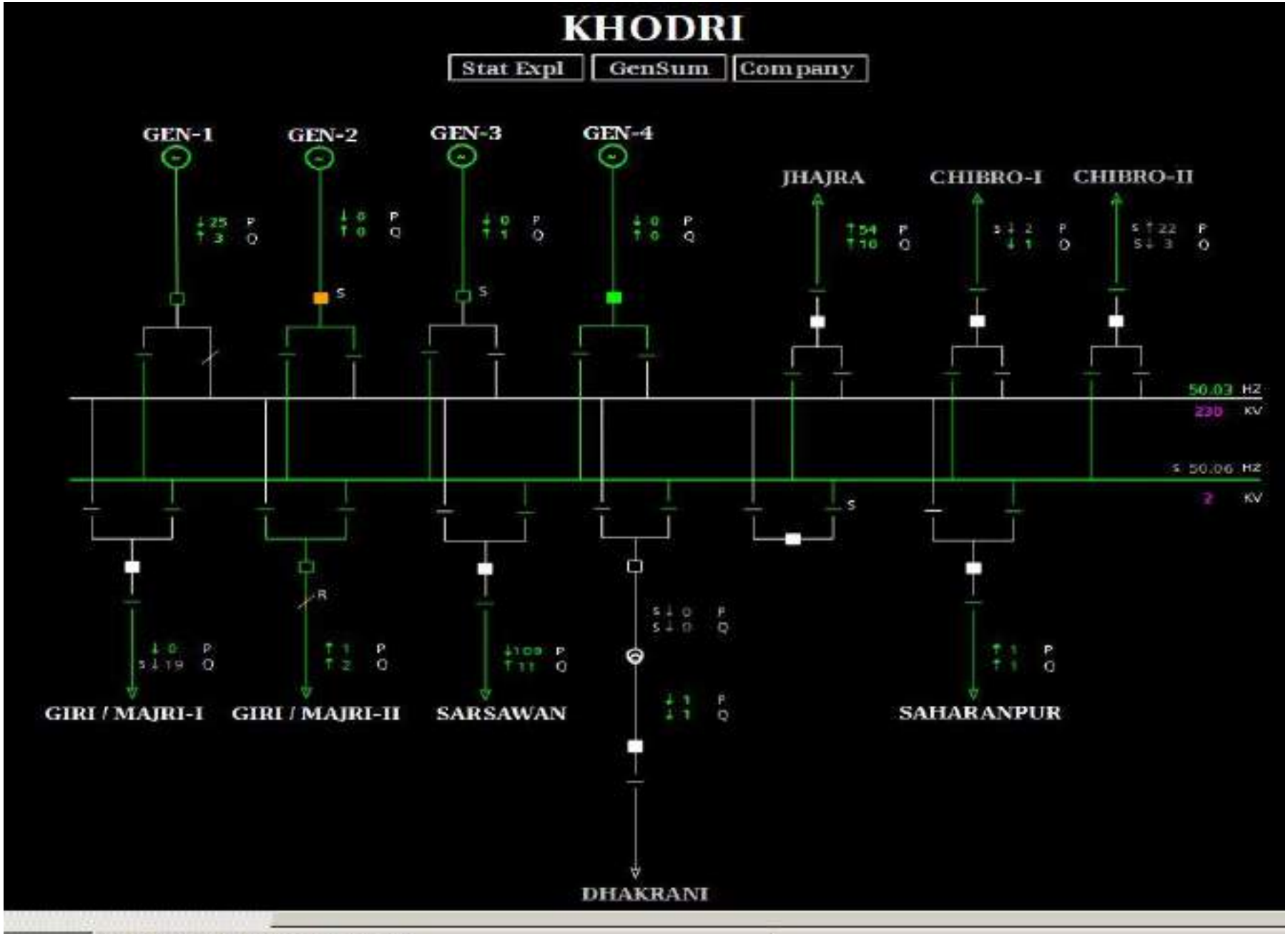
Network Diagram



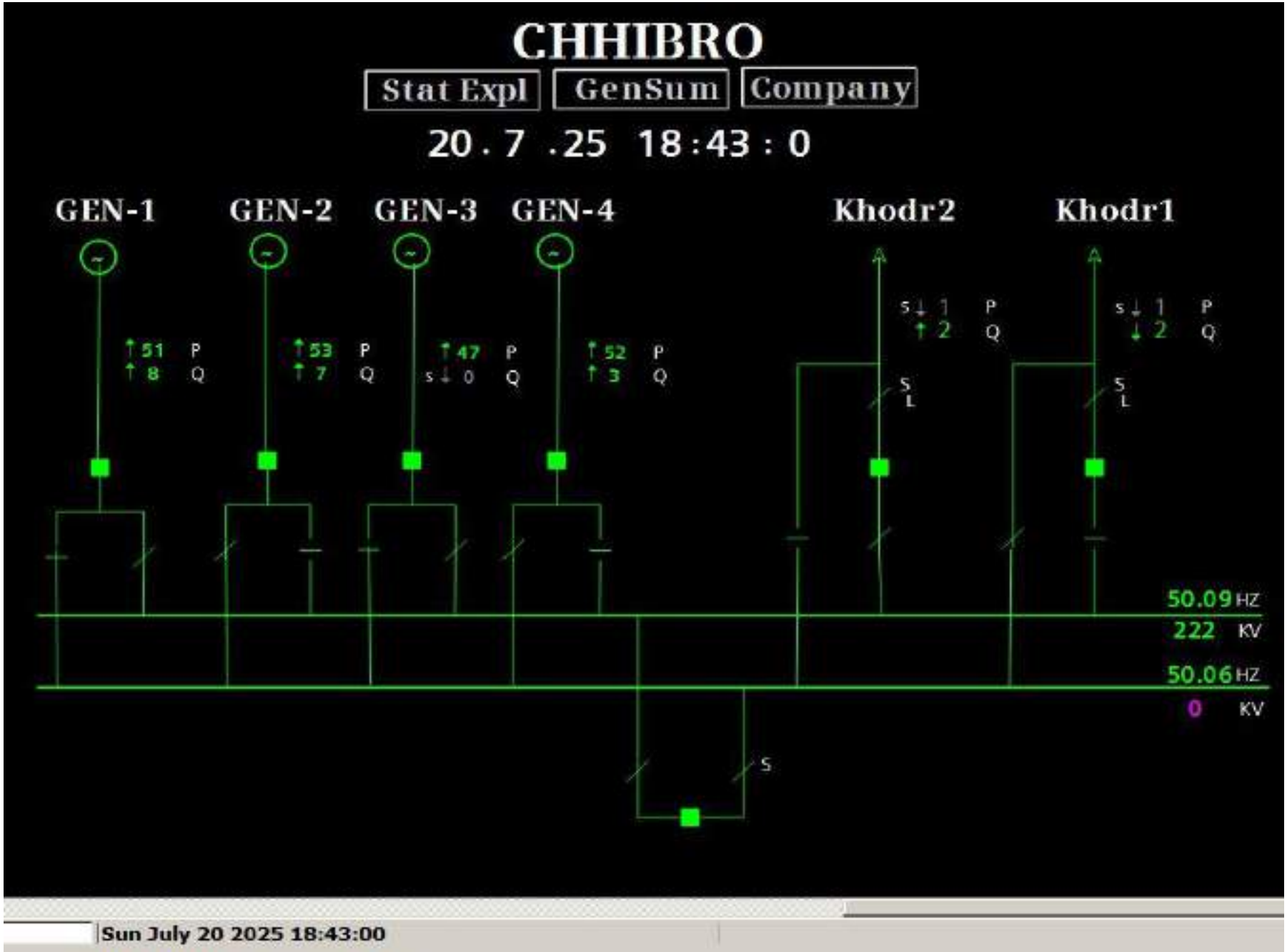
SLD of 220kV Khodri(UK) before the event



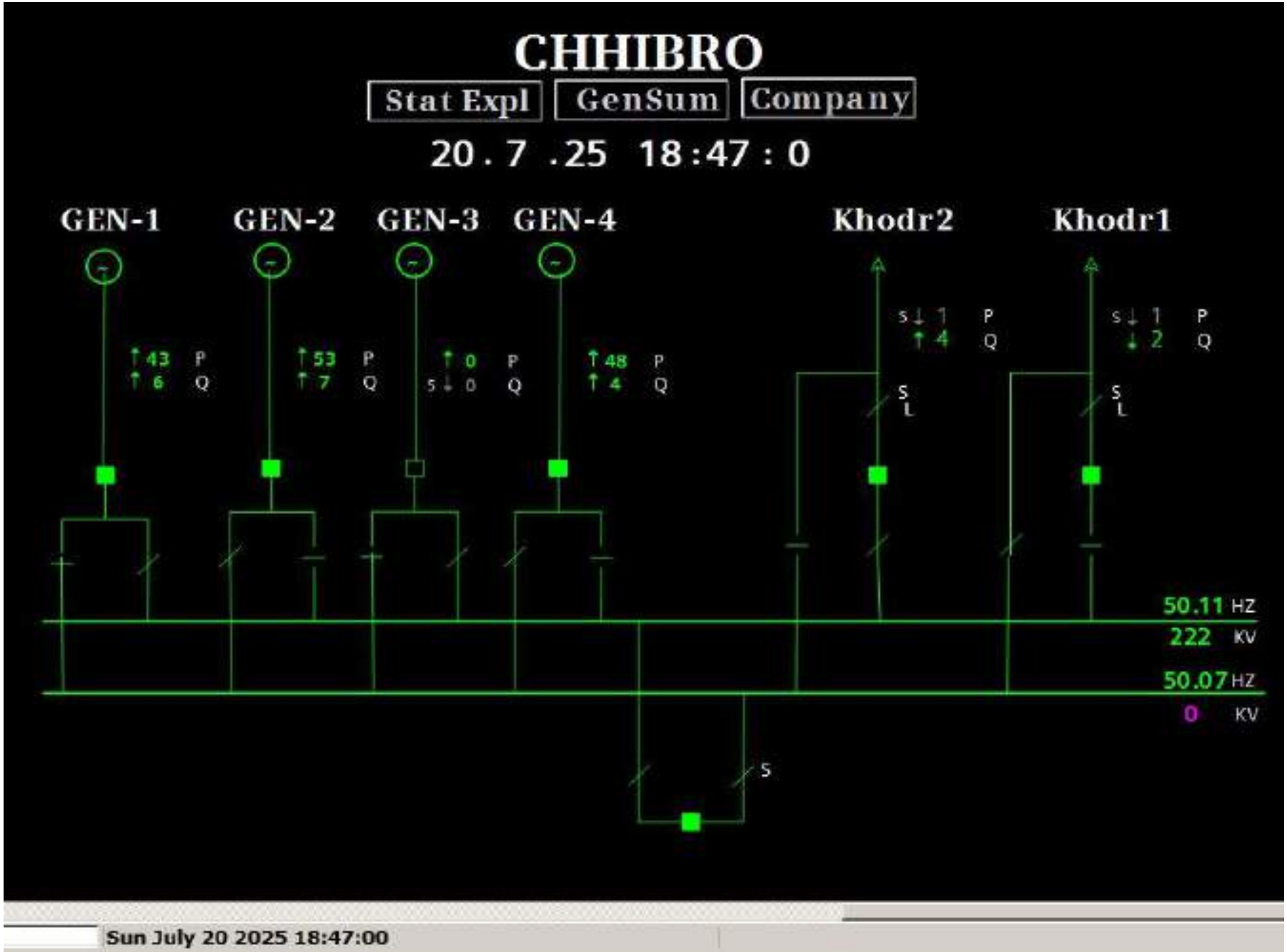
SLD of 220kV Khodri(UK) after the event



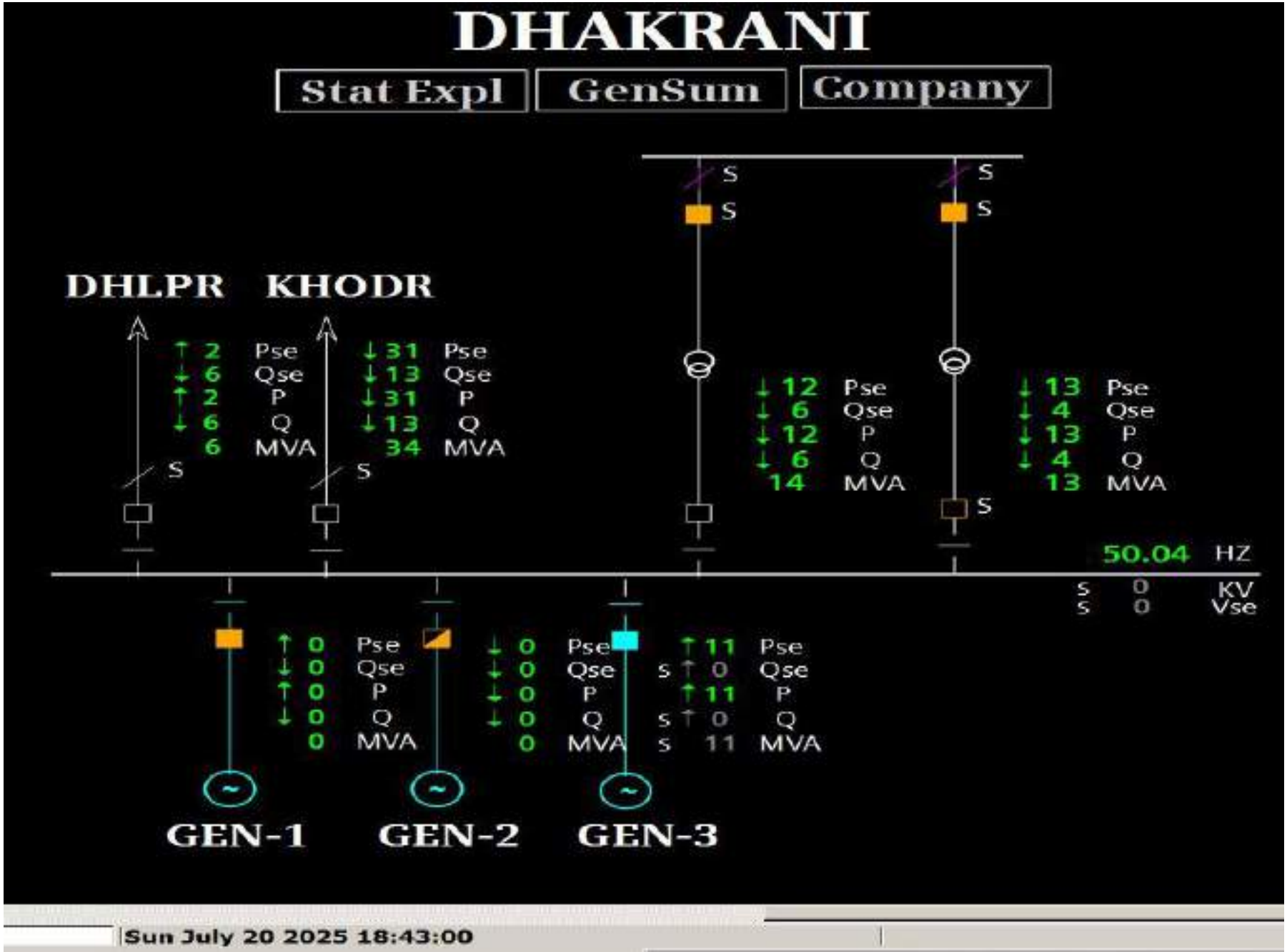
SLD of 220kV Chhibro(UK) before the event



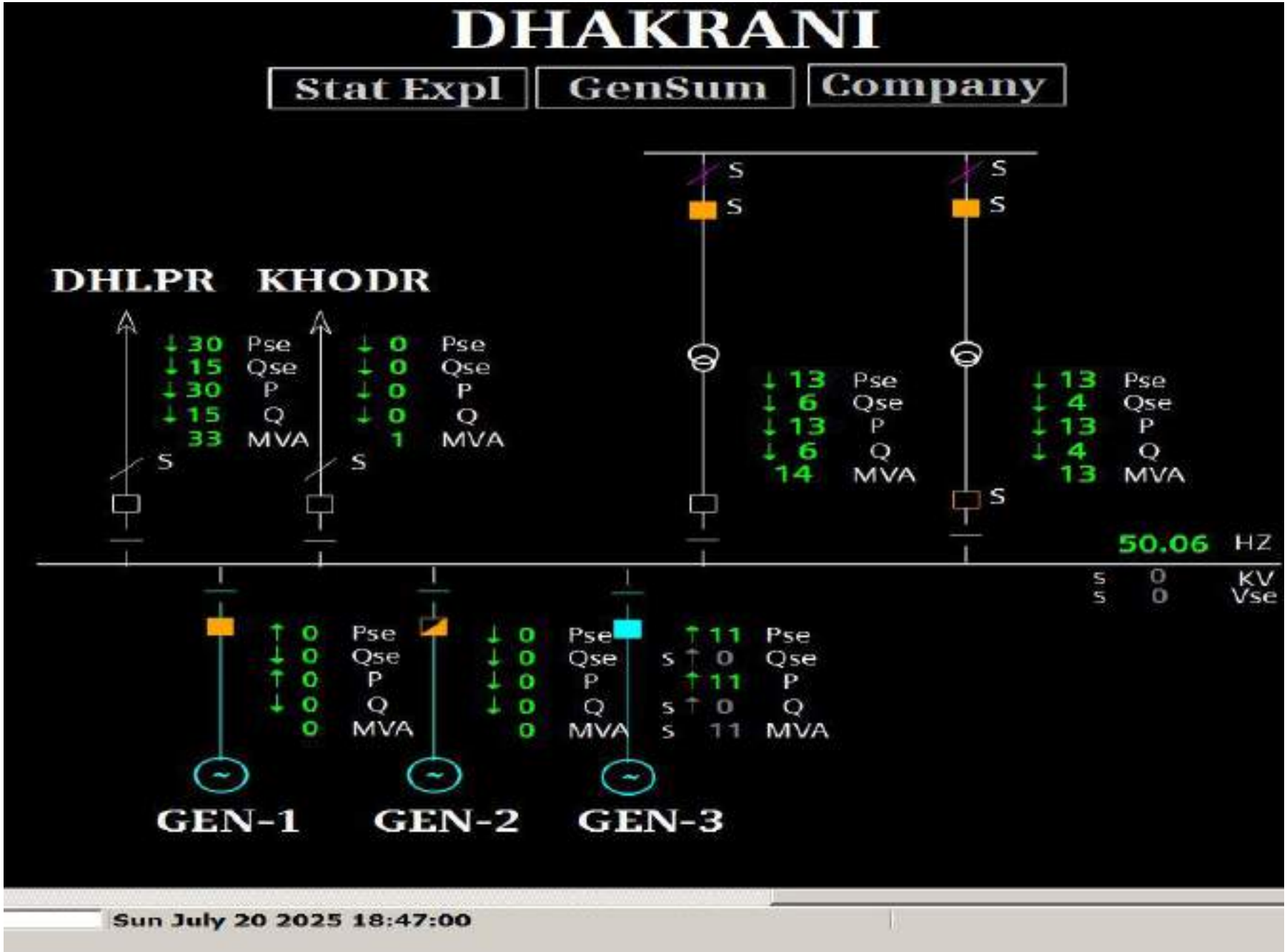
SLD of 220kV Chhibro(UK) after the event



SLD of 132kV Dhakrani(UK) before the event



SLD of 132kV Dhakrani(UK) after the event



Uttarakhand Generation Summary before the event

Generation of Uttarakhand

REGIONAL SUMMARY

THERMAL

GAMMA 0 KV

	CAPACITY	MW	MVAR
UNIT-1	75	0	0
UNIT-2	75	0	0
UNIT-3	75	0	0
TOTAL	225	0	

SRAVANTI S 218 KV

	CAPACITY	MW	MVAR
UNIT-1	75	S 0	S 0
UNIT-2	75	S 0	S 0
UNIT-3	75	S 0	S 0
TOTAL	225	S 0	

HYDRO

CHIBBRO 222 KV

	CAPACITY	MW	MVAR
UNIT-1	60	51	8
UNIT-2	60	53	7
UNIT-3	60	47	S -0
UNIT-4	60	52	3
TOTAL	240	202	

CHILLA 131 KV

	CAPACITY	MW	MVAR
UNIT-1	36	29	1
UNIT-2	36	34	4
UNIT-3	36	S 30	2
UNIT-4	36	0	0
TOTAL	144	S 94	

DHAKRANI S 0 KV

	CAPACITY	MW	MVAR
UNIT-1	11.25	0	-0
UNIT-2	11.25	-0	-0
UNIT-3	11.25	11	S 0
TOTAL	33.75	11	

DHALIPUR 7 KV

	CAPACITY	MW	MVAR
UNIT-1	17	S 0	-0
UNIT-2	17	0	-0
UNIT-3	17	S 0	-0
TOTAL	51	S 0	

KHATIMA KV

	CAPACITY	MW	MVAR
UNIT-1	13.8	S 0	S 0
UNIT-2	13.8	S 0	S 0
UNIT-3	13.8	S 0	S 0
TOTAL	41.4	S 0	

KHODRI 230 KV

	CAPACITY	MW	MVAR
UNIT-1	30	23	-3
UNIT-2	30	22	-2
UNIT-3	30	23	-1
UNIT-4	30	22	-1
TOTAL	120	90	

KULHAL 2 KV

	CAPACITY	MW	MVAR
UNIT-1	10	S 10	S 1
UNIT-2	10	S 10	1
UNIT-3	10	10	1
TOTAL	30	S 30	

RAMGANGA 0 KV

	CAPACITY	MW	MVAR
UNIT-1	76	0	38
UNIT-2	76	0	0
UNIT-3	76	0	0
TOTAL	228	0	

MANERBHALI 1 220 KV

	CAPACITY	MW	MVAR
UNIT-1	30	28	3
UNIT-2	30	27	2
UNIT-3	30	26	3
TOTAL	90	81	

MANERBHALI 2(Dharasu) KV

	CAPACITY	MW	MVAR
UNIT-1	76	78	-7
UNIT-2	76	64	3
UNIT-3	76	78	-13
UNIT-4	76	72	0
TOTAL	304	291	

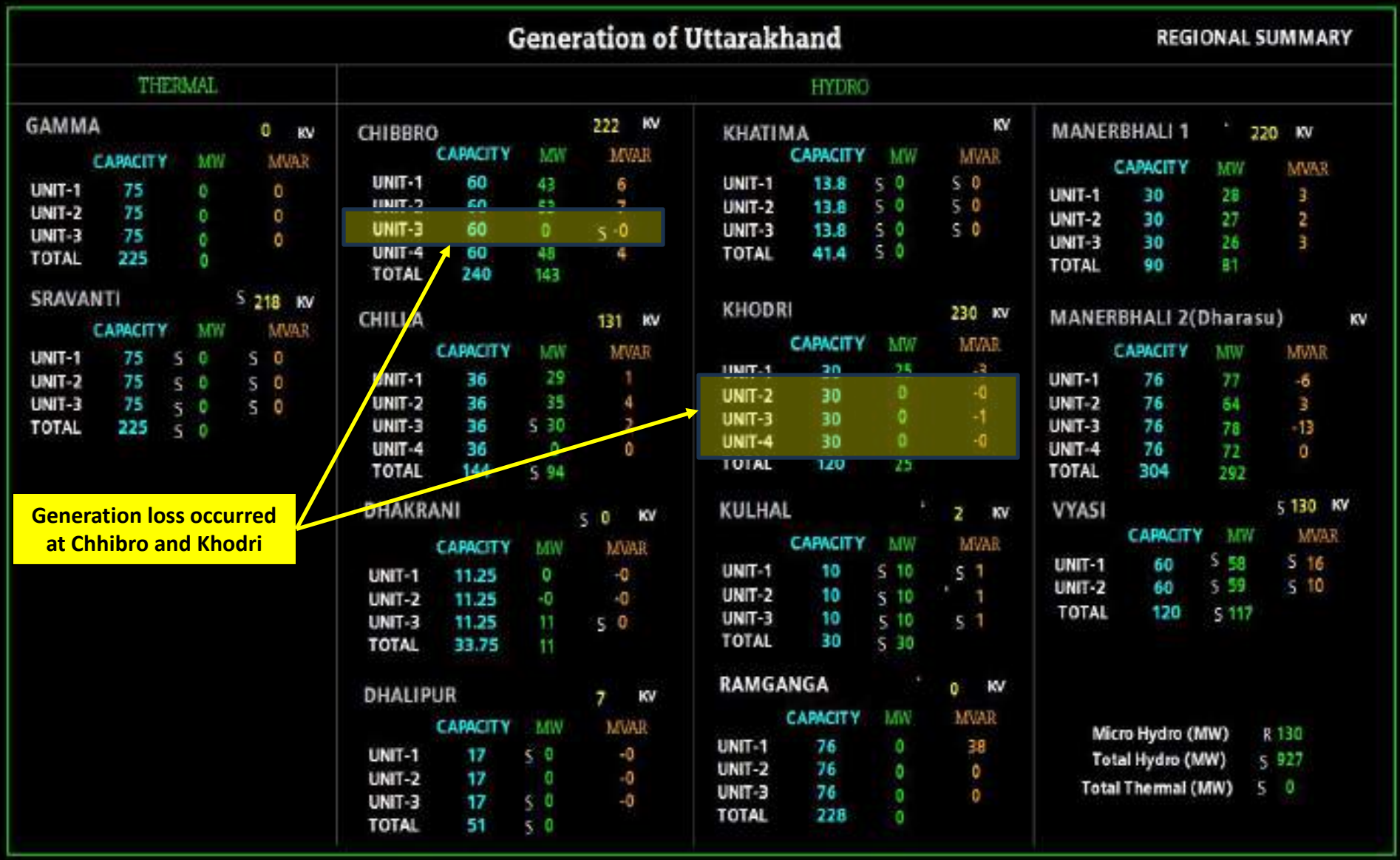
VYASI S 130 KV

	CAPACITY	MW	MVAR
UNIT-1	60	S 58	S 16
UNIT-2	60	S 59	S 10
TOTAL	120	S 117	

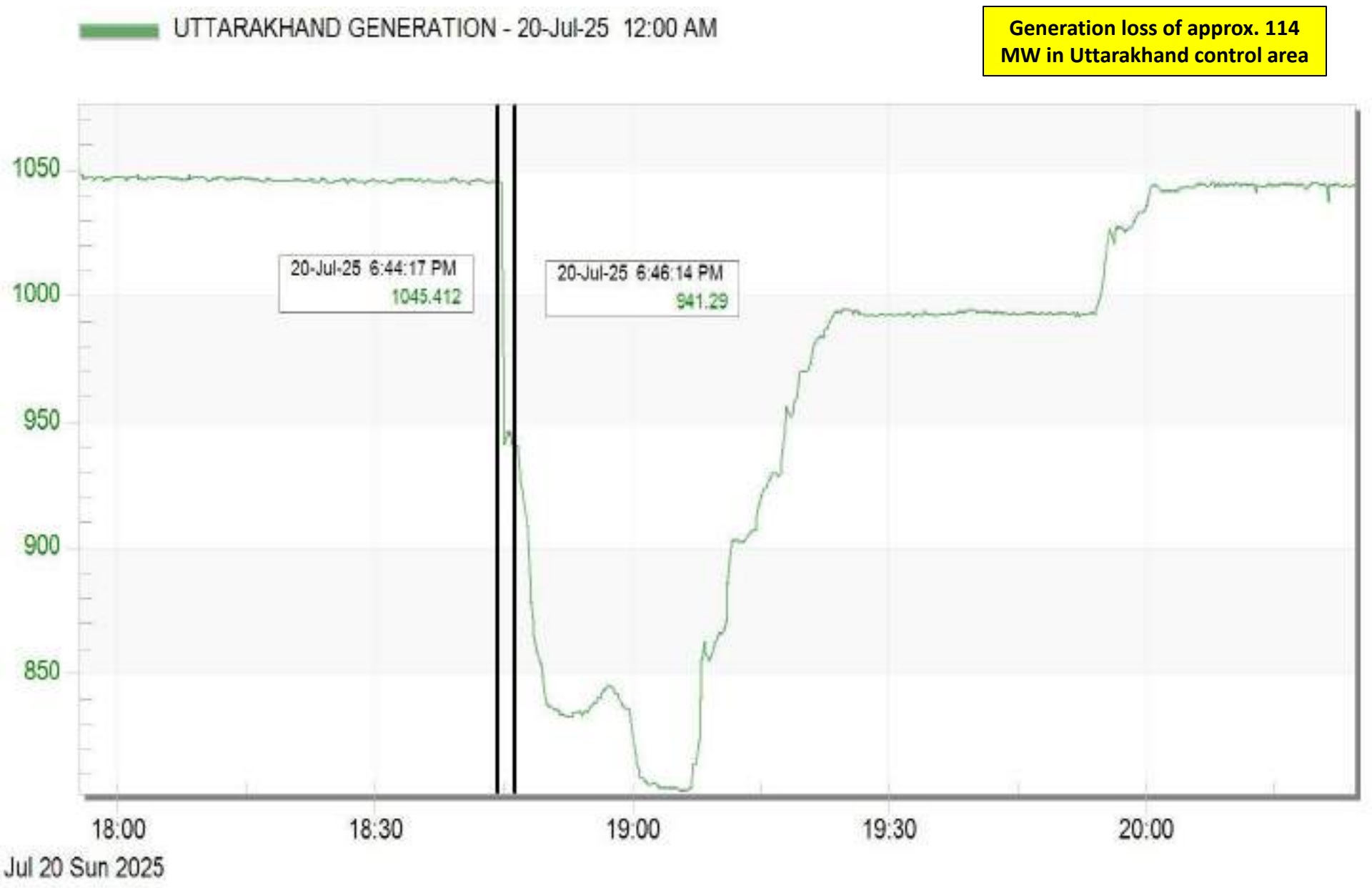
Micro Hydro (MW)	R 130
Total Hydro (MW)	S 1045
Total Thermal (MW)	S 0

Sun July 20 2025 18:43:00

Uttarakhand Generation Summary after the event

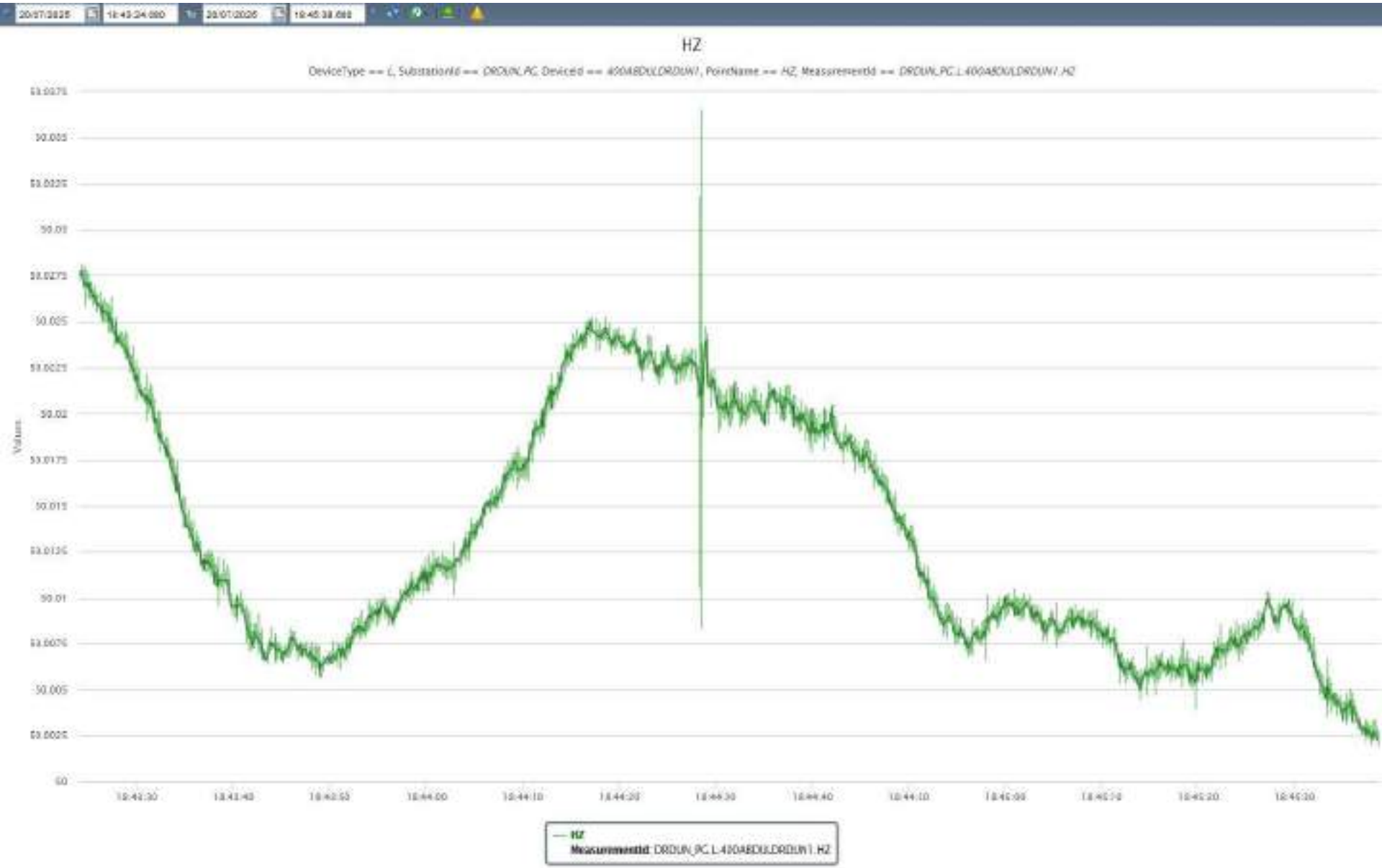


Uttarakhand Generation during the event



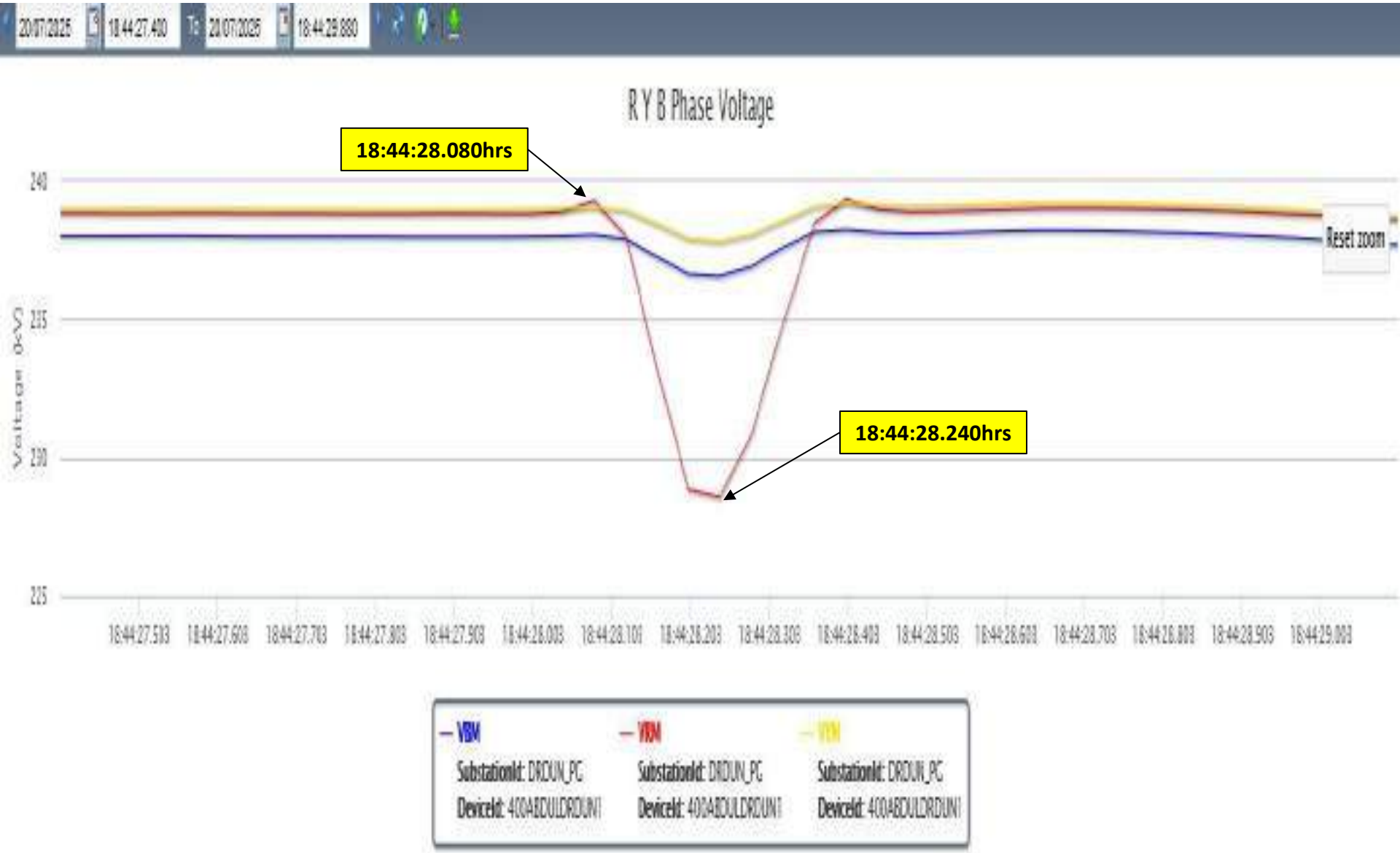
PMU Plot of frequency at Dehradun(PG)

18:44hrs/20-Jul-25



PMU Plot of Voltage at Dehradun(PG)

18:44hrs/20-Jul-25



DR of 220 KV Khodri(UK) (end)-Majri(HP) (UK) Ckt-2

ABB

Disturbance Short Re

Disturbance Recordings Information

Device Information

Recorder ID	1
IED type	L67I11 01
IED version	1.101
Station name	HPSEB KHOI
Object name	MAJHRI LINE
IED name	REL670

Fault Information

Trig date and time	20-07-2025 18
Trigger signal name	PHS-STFWL1
Recording number	389
Total recording time	3104 ms
Pre-trig recording time	500 ms
Post trig recording time	2499 ms
Max. recording time	3000 ms

General Recordings Information

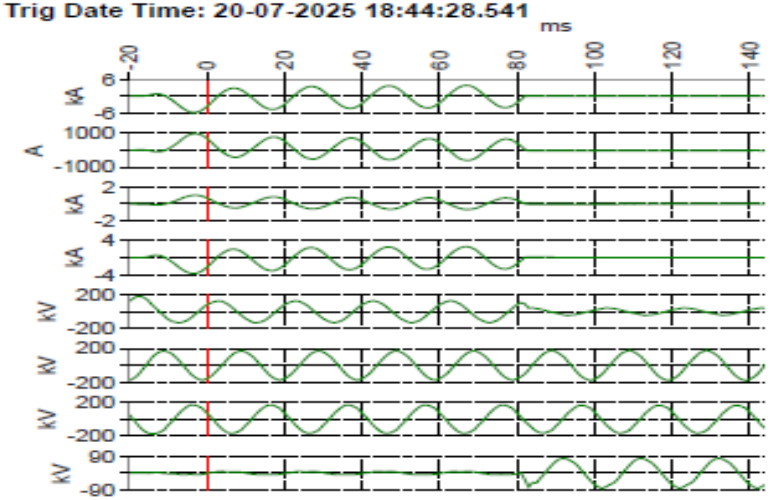
Disturbance recorder	Installed
Event recorder	Installed
System frequency	50 Hz
Sampling frequency	1 kHz
Active setting group during recording	1

Fault Location Information

Fault loop type	L1-N
Fault location	35.2 (100.0 %
Status of fault calculation	Ok
Fault direction	Forward

Analog Time Diagram

Trig Date Time: 20-07-2025 18:44:28.541

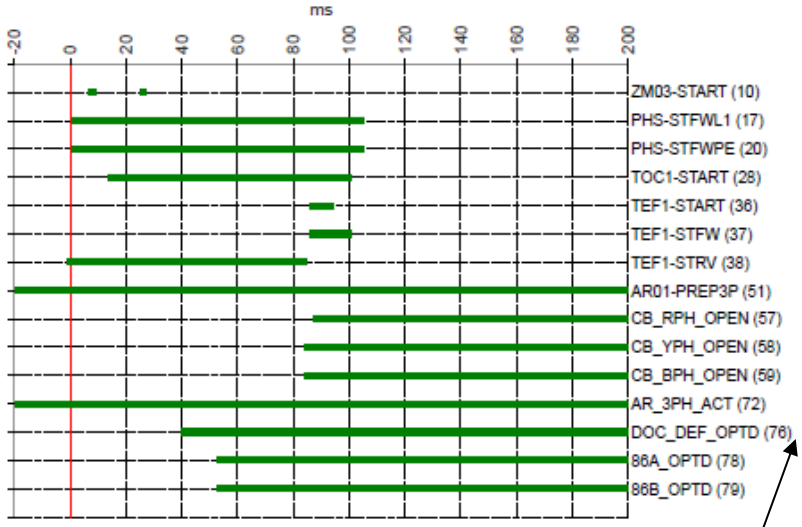


ABB

Pag

Binary Time Diagram

Trig Date Time: 20-07-2025 18:44:28.541

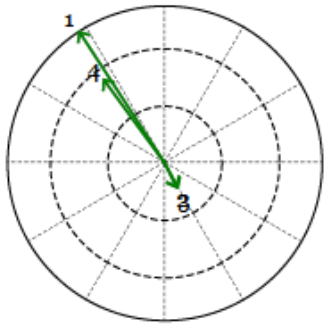


Directional E/F operated

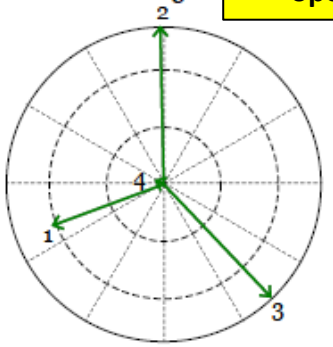
Vector Diagrams

Calculation Time Period : -1 ms to 18 ms

Currents

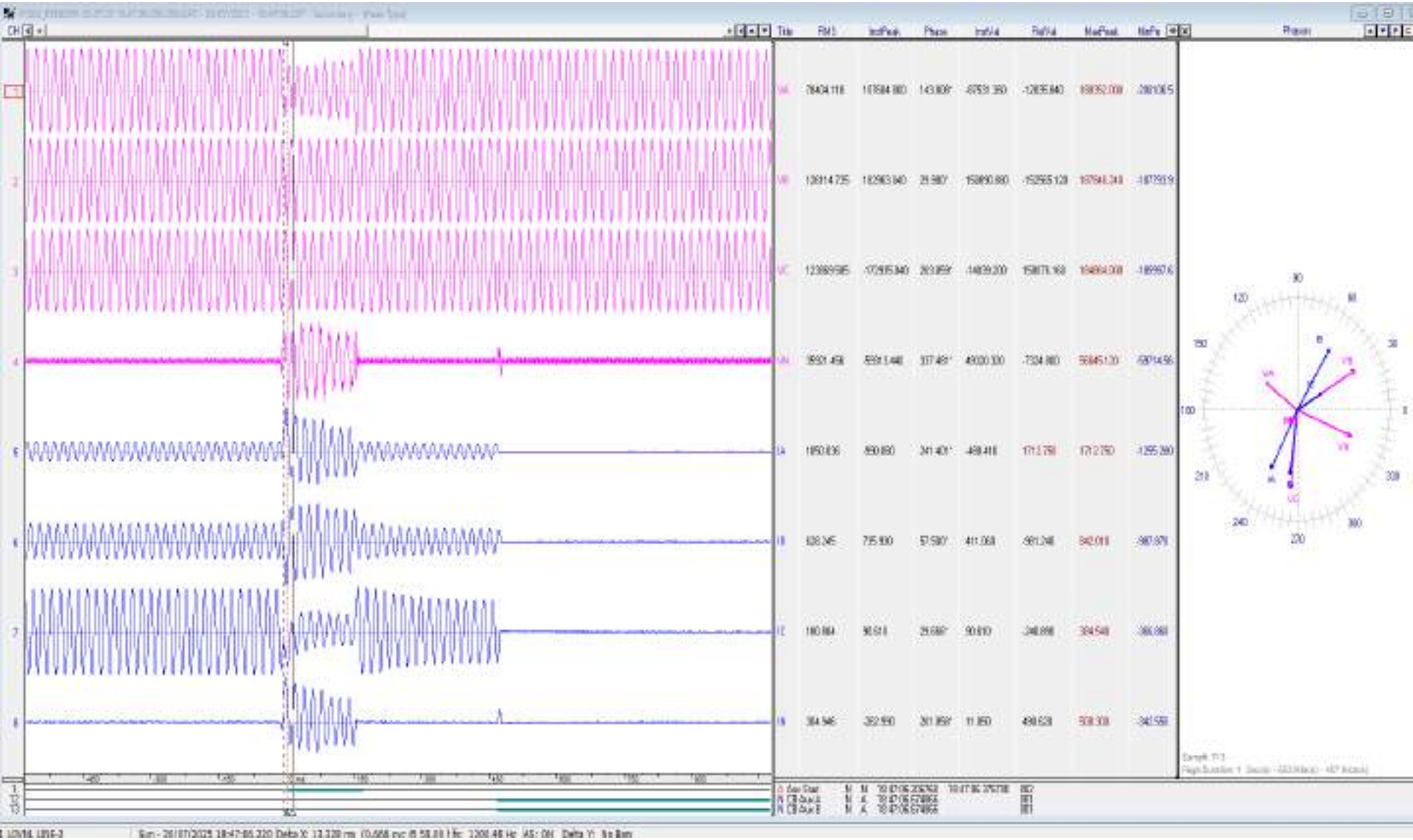


Voltages



No.	Name	RMS	Angle	No.	Name	RMS	Angle
1	LINE_CT_IL1	2934.327(A)	123.0°	1	LINE_CVT_UL1	90415.992(V)	200.3°
2	LINE_CT_IL2	483.705(A)	296.2°	2	LINE_CVT_UL2	120196.32(V)	91.3°
3	LINE_CT_IL3	513.039(A)	297.9°	3	LINE_CVT_UL3	118711.391 (V)	313.5°
4	LINE_CT_IN	1937.498(A)	126.1°	4	LINE_CVT_UN	6528.05(V)	154.3°

DR of 220 KV Saharanpur(UP)-Khodri(UK) (end) (UP) Ckt



- ✓ R-N fault; Fault current=~1.05kA; line tripped from Khodri end only
- ✓ Fault clearing time=~160ms

SCADA SOE

Time	Station Name	Voltage Level	Element Name	Element Type	Element Status	Remarks
18:44:38,309	KHODR_UK	220kV	SRNPR2	Circuit Breaker	Close	
18:44:38,309	KHODR_UK	220kV	88MAJRI2	Circuit Breaker	Open	Line CB at Khodri(UK) end of 220 KV Khodri(UK)-Majri(HP) (UK) Ckt-2 opened
18:44:38,309	KHODR_UK	220kV	T1T1	Circuit Breaker	Open	CB at 220kV side of 220/132 kV 100 MVA ICT at Khodri(UK) opened
18:44:41,513	CHBRO_UK	220kV	G3G3	Circuit Breaker	Open	CB at 220kV side of 60 MW Chhibro Unit-3 opened

Points for Discussion

i. Exact reason, nature and location of fault need to be shared.
ii. Exact nature of protection operated at 60 MW Unit-3 at Chhibro(UK) need to be shared.
iii. Exact reason of non-operation of protection in 220 KV Khodri - Chhibro (UK) Ckt-1 need to be shared.
iv. DR/EL(.dat/.cfg file) of all tripped units need to be shared along with detailed tripping report.
v. Remedial action taken report need to be shared.

Report on Disturbance of various Elements at Khodri Power Station

Date& Time of event: 20.07.2025 at 18:45 hrs

Substation affected: 220 KV Khodri

Date & Time of Restoration:20.07.2025 at 19:53 hrs

ANTECEDENT CONDITION:

During Antecedent condition 88 MW Power was being generated from Khodri and 199 MW Power was being evacuated from Chibro to Khodri through 220 kV Chibro-Khodri-Feeders.

Elements Tripped :

1. Unit # 2 KPS
2. Unit # 3 KPS
3. Unit # 4 KPS
4. 220/132 KV ICT (885)
5. 220kV Khodri-Mazri -II(88) Feeder
6. 220kV Khodri-Saharanpur -II(84) Feeder
7. 220kV Chibro-Khodri(82) Feeder

Bus Arrangement :

1. Bus A – U #2, U#4, 220 KV Feeder Chibro-Khodri-I(81) Feeder, 220kV Khodri-Sarsawa -II(83), 220kV Khodri-Mazri -I(86) Feeder,220 KV Khodri-Jhajra(87)
2. Bus A – U #1, U#3, 220 KV Feeder Chibro-Khodri-II(82), 220kV Khodri-Saharanpur -I(84), 220kV Khodri-Mazri -II(88)

Transmission/Generation element Tripped during the event:

S.NO	Name of Element	TrippingTime (Hrs)	Revival Time (Hrs)	Reason/Remarks/Relay
1.	Unit#2 KPS	18:45	19:12	Standby earth fault protection (51N)
2.	Unit#3 KPS	18:45	19:15	Standby earth fault protection (51N)
3.	Unit#4 KPS	18:45	19:53	Standby earth fault protection (51N)
4.	220/132kV ICT (885)	18:45	19:25	LBB protection operated
5.	220kV Khodri-Mazri –II(88) Feeder	18:45	20:07	LBB protection operated
6.	220kV Khodri-Saharanpur-II (84) Feeder	18:45	20:05	LBB protection operated
7.	Khodri-Chibro-II Trip	18:45	20:05	LBB protection operated

Event Description:-

On date 20.07.2025 all four generation units were running on plant load = 88/199 MW at Khodri Power Station. A heavy jerk was observed at 18:45 hrs on 220 KV Khodri-Mazri-I & II feeders and get tripped from remote end only. Unit #2,3 & 4 of khodri and 220 KV feeders Khodri-Saharanpur-II, Khodri-Chibro-II, Khodri-Mazri-II and220/132 KV ICT also get tripped at same time due to this grid disturbance.All Numerical generator protection relays sensed standby earth fault(51N) and LBB operated on U#4 (DR attached), due to which Feeder no-82,84,88 & ICT(885) get de-energized.

Action taken:: No anomaly found in control circuit of U#4 during checking. Closing and trip circuit found in healthy condition. All protection of feeders and generating units were working normally. Thus at 19:53 hrs on date 20.07.25 all units were synchronised with grid.

Multiple Element Tripping Event at 220/132kV Ziankote(J&K)

At 10:18 hrs on 24.07.2025

Tripped Elements

S. No	Name of Elements	Outage Time	Revival Time	Reason of tripping
1.	220 KV Amargarh (INDIGRID)-Ziankote(JK) (PDD JK) Ckt-1	10:18 hrs	15:16 hrs	B-N phase to earth fault on ckt-2, Ib=4.7kA, FD:11.7km from Ziankote
2.	220 KV Amargarh (INDIGRID)-Ziankote(JK) (PDD JK) Ckt-2		13:53 hrs	

Brief details of the event

i. 220/132kV Ziankote S/s have two bus at 220kV side i.e., main bus & reserve bus. 220kV Amargarh-Ziankote ckt-1&2 are on the same tower (D/C tower) and line length is ~21.4km.

ii. During antecedent condition, 220kV Amargarh (INDIGRID) –Ziankote (JK) D/C were carrying 194 MW each and feeding load of Ziankote & Alustang both. 220kV Wagoora-Ziankote D/C were under planned outage.

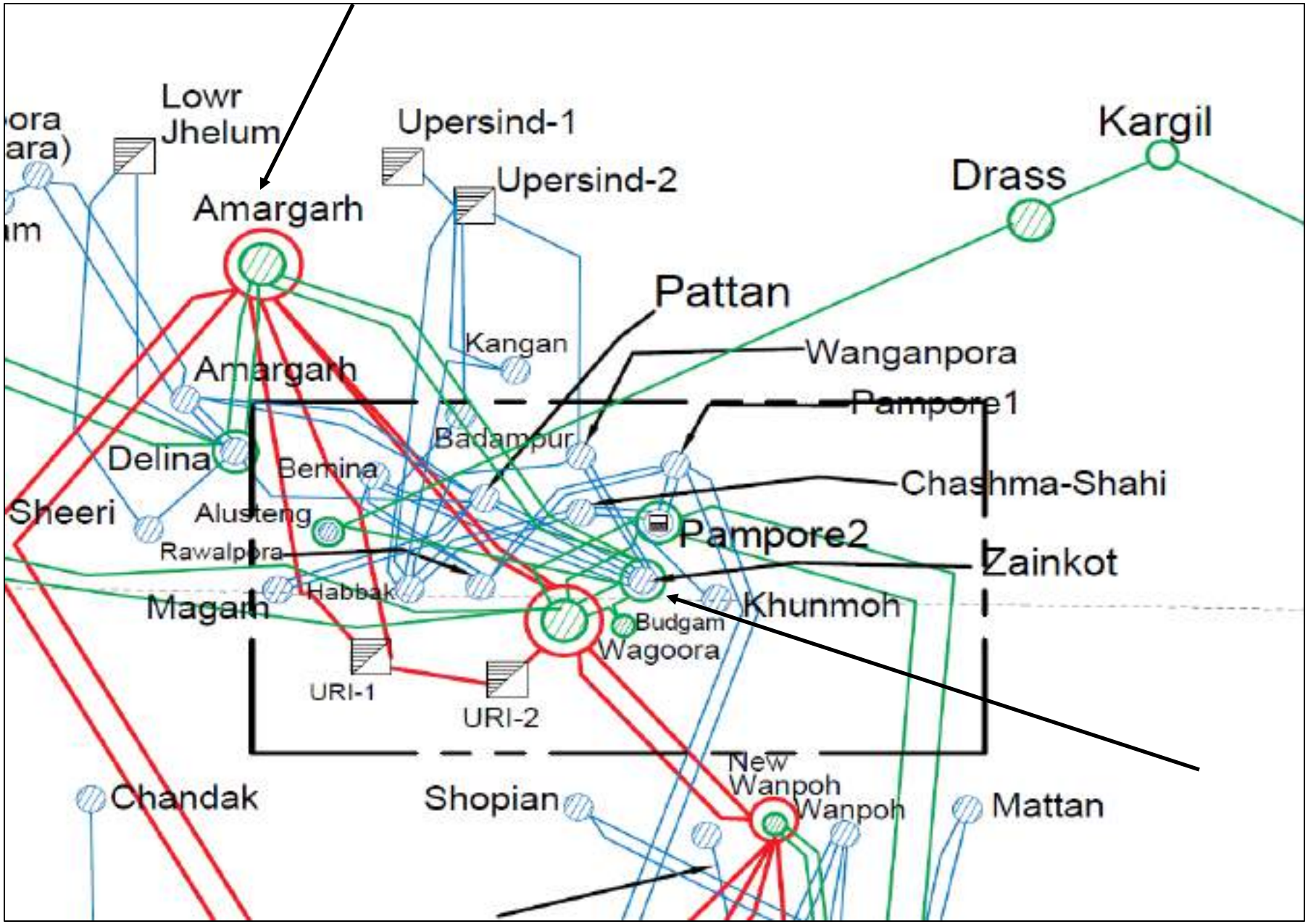
iii. As reported, at 10:18 hrs 220 KV Amargarh (INDIGRID)-Ziankote(JK) (PDD JK) Ckt-2 tripped on B-N fault. Fault current was ~4.7kA and fault location was 11.7km from Ziankote end. At the same time, 220 KV Amargarh (INDIGRID)-Ziankote(JK) (PDD JK) Ckt-1 also tripped.

iv. As per telephonic communication with Ziankote S/s, 220 KV Amargarh (INDIGRID)-Ziankote(JK) (PDD JK) Ckt-2 tripped within 100 msec from Ziankote end. As Z-2 time delay setting of 220 KV Amargarh (INDIGRID)-Ziankote(JK) (PDD JK) D/C is kept as instantaneous, Line-1 also tripped instantaneously from Amargarh end.

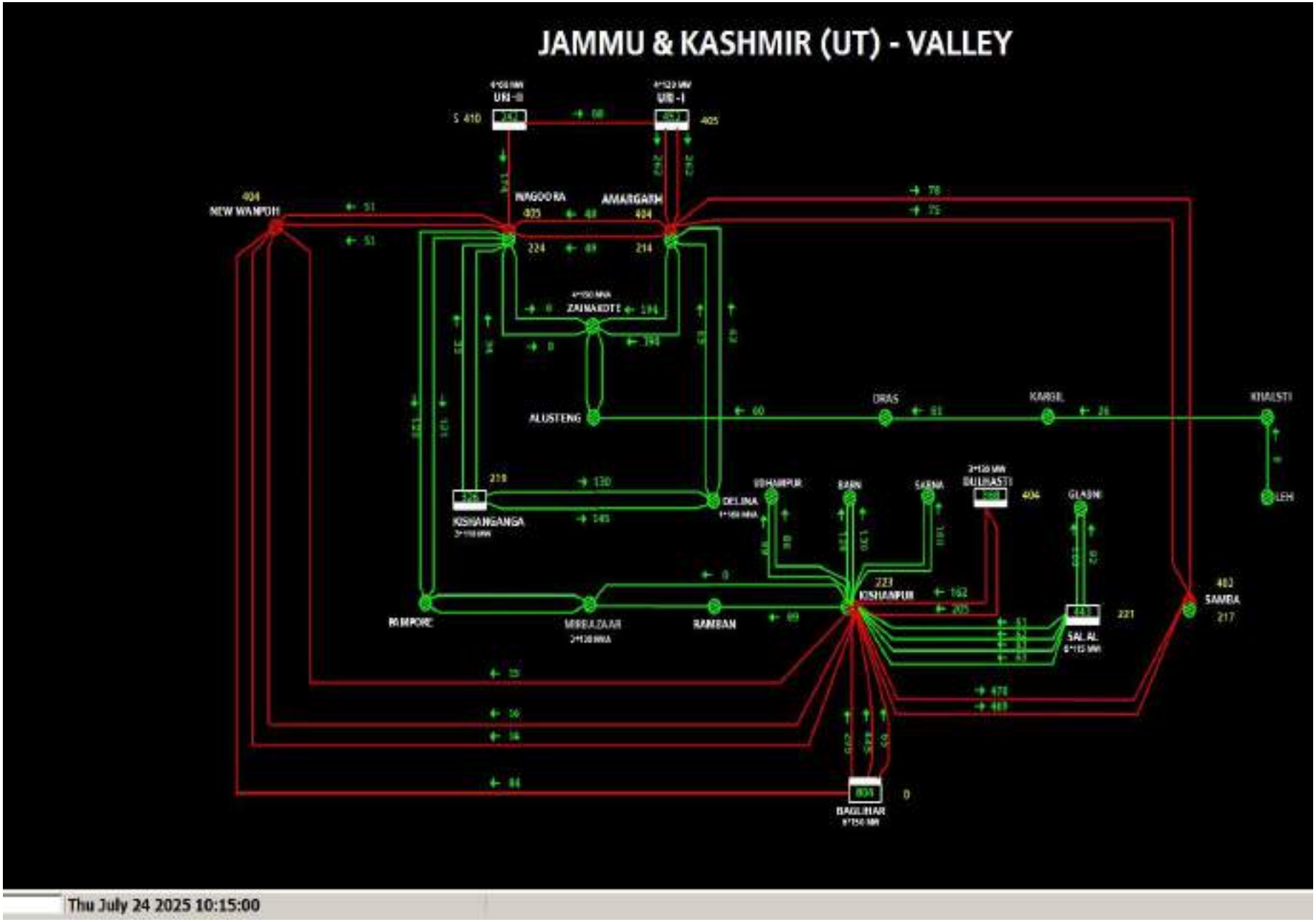
v. As per PMU at Amargarh (INDIGRID), B-N phase to earth fault cleared within 120msec is observed.

vi. As per SCADA, change in demand of approx. 400 MW is observed in J&K control area.

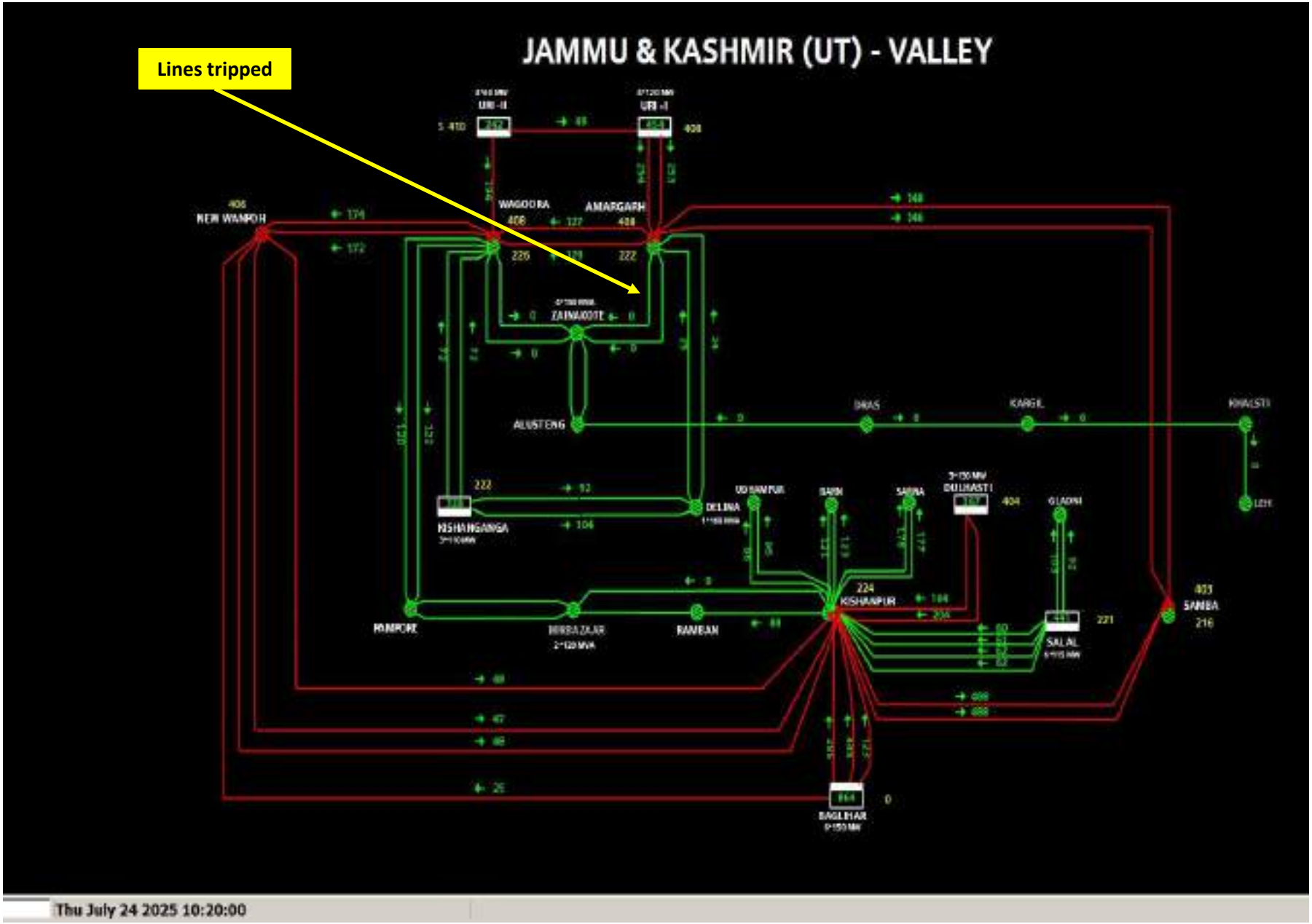
Network Diagram



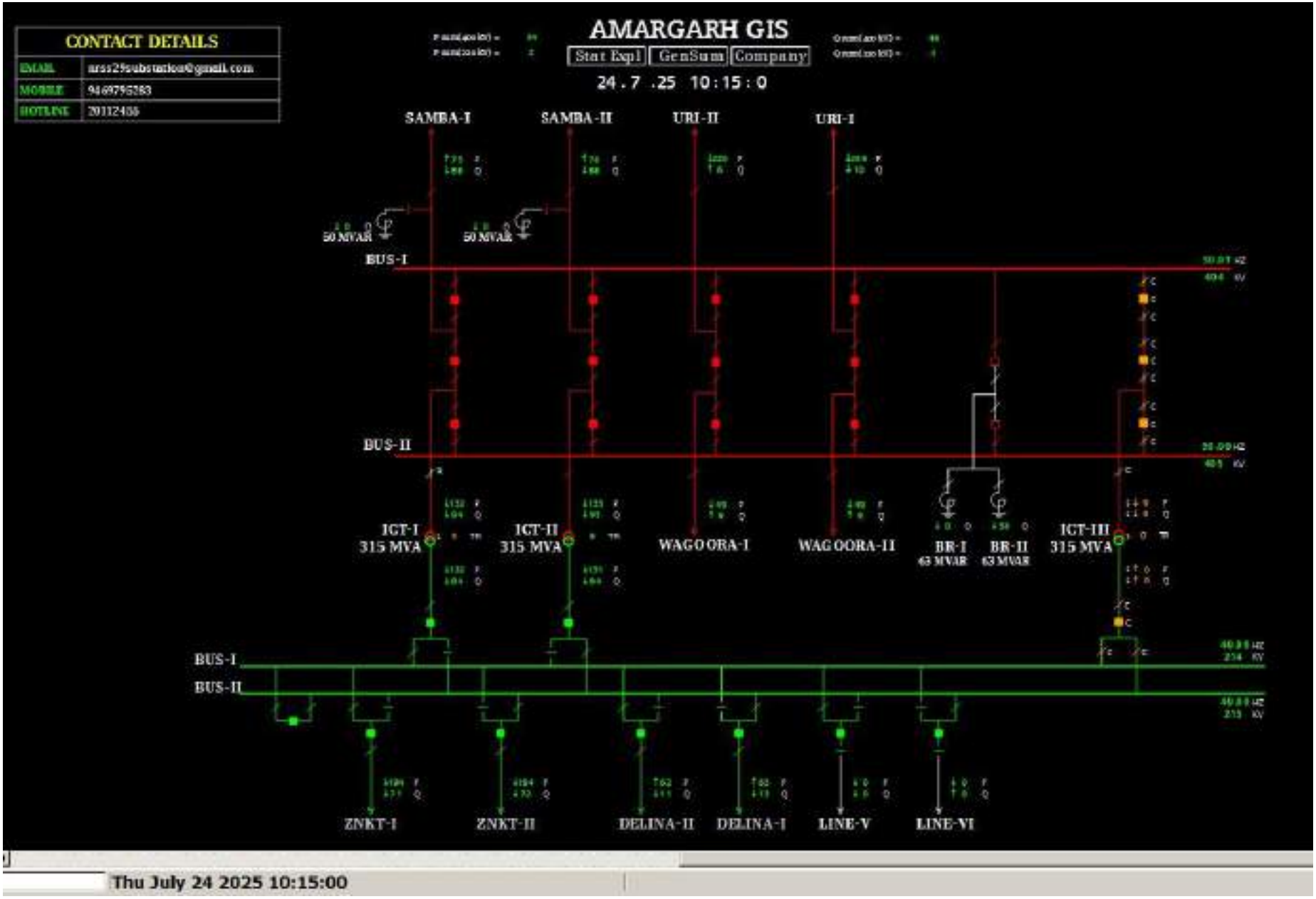
J&K Valley Network Diagram before the event



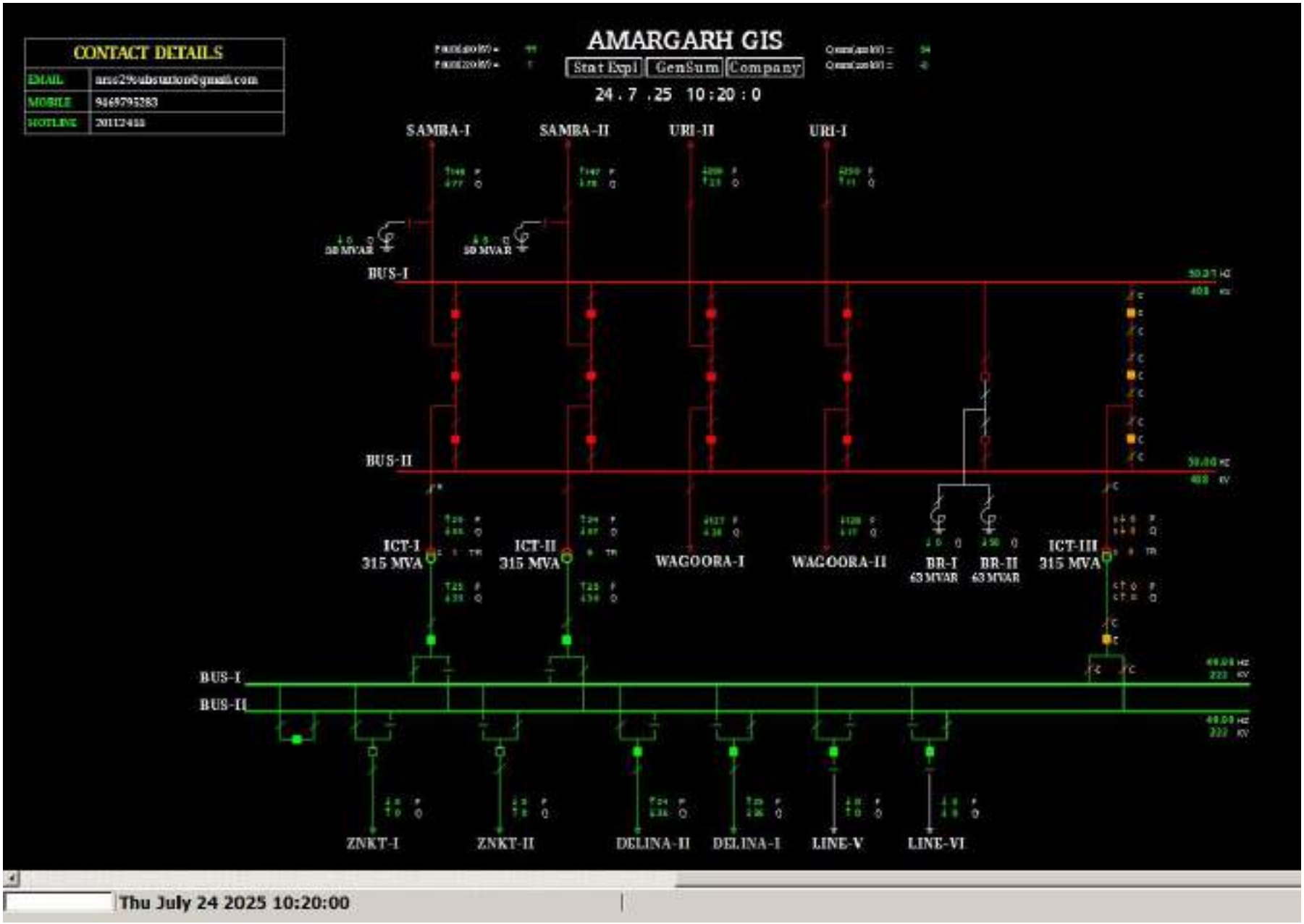
J&K Valley Network Diagram after the event



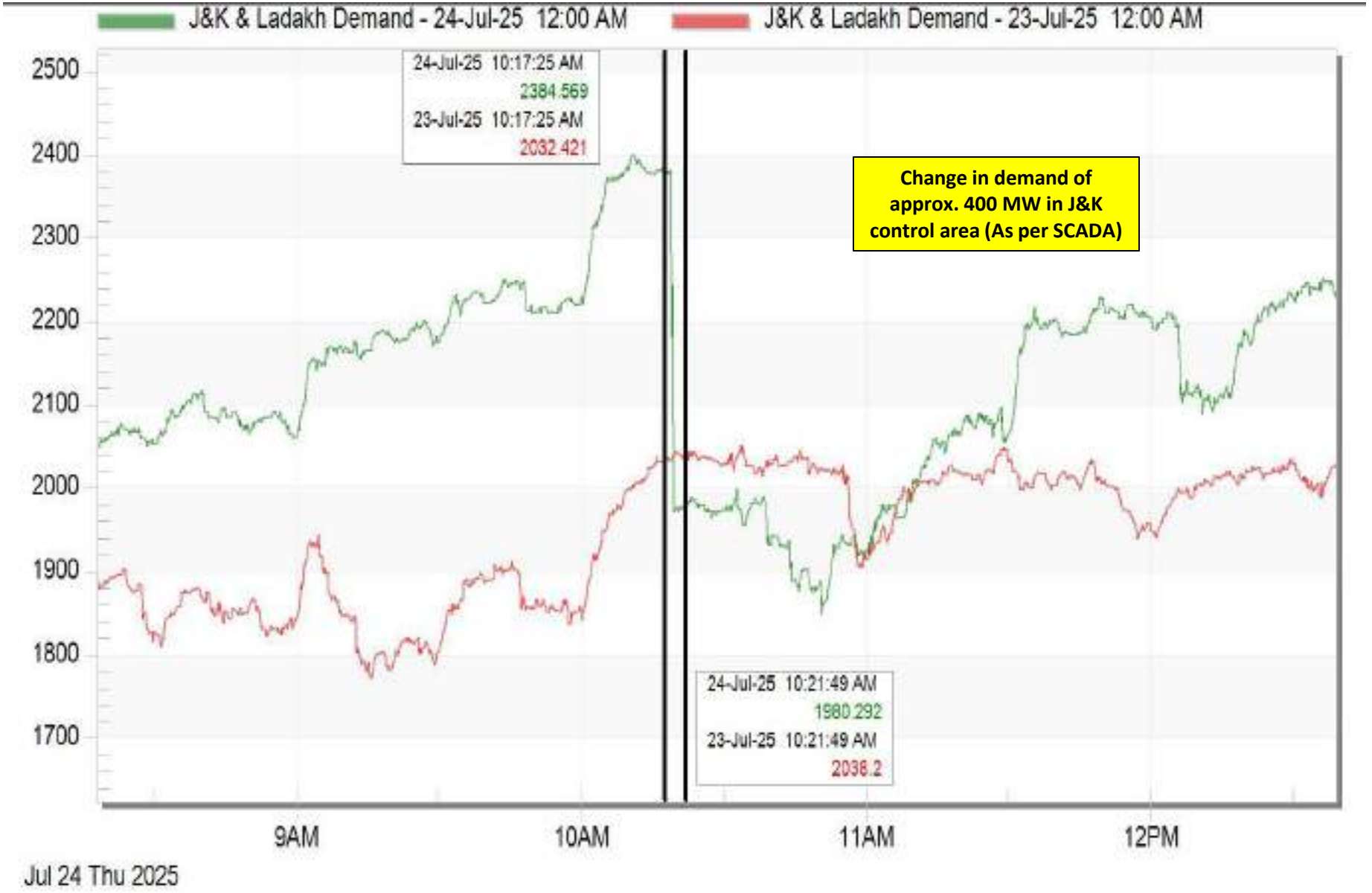
SLD of 400/220kV Amargarh(INDIGRID) before the event



SLD of 400/220kV Amargarh(INDIGRID) after the event



J&K demand during the event



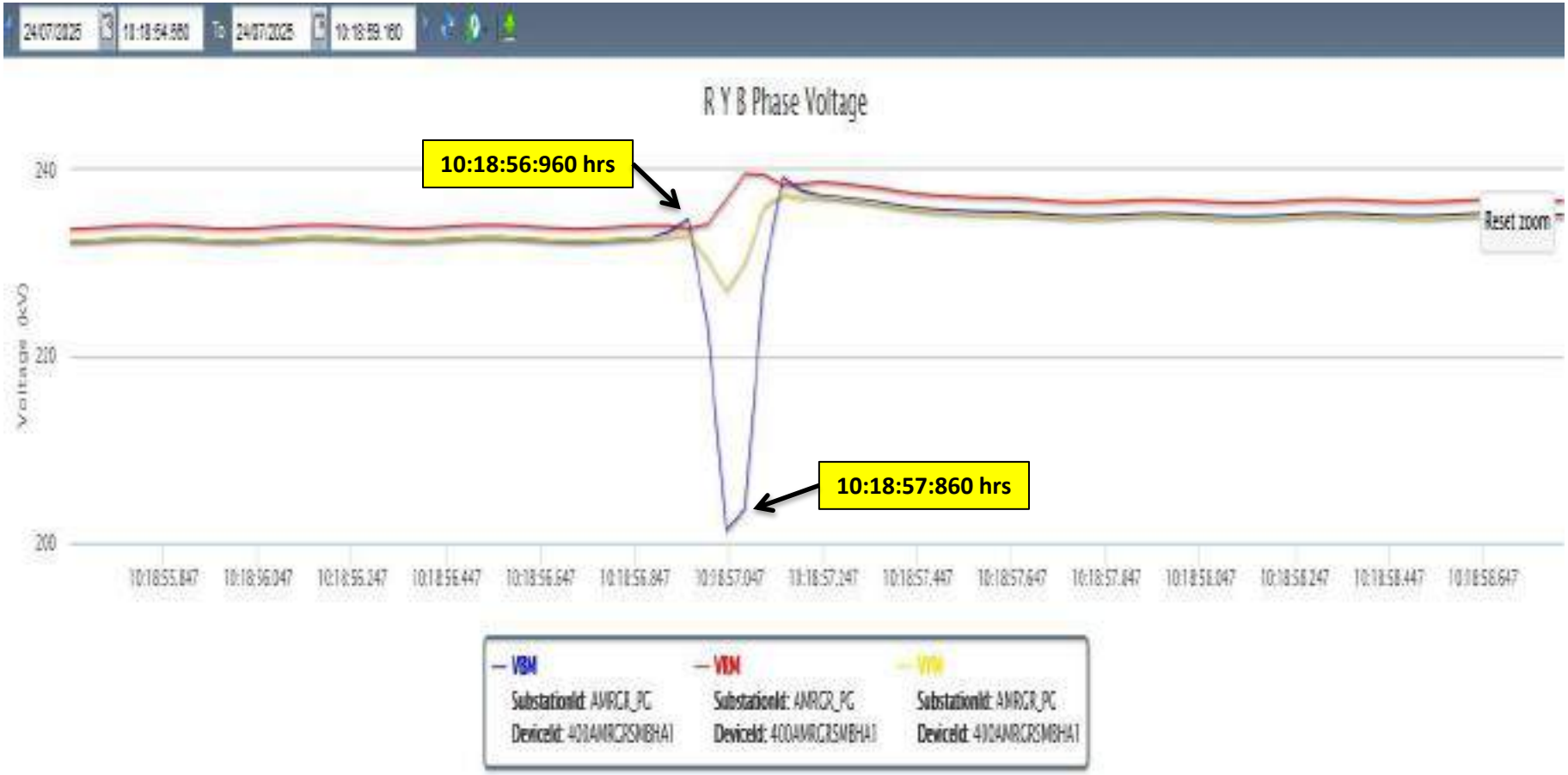
PMU Plot of frequency at Amargarh(INDIGRID)

10:18hrs/24-July-25



PMU Plot of phase voltage magnitude at Amargarh(INDIGRID)

10:18hrs/24-July-25



SCADA SOE

TIME	STATION NAME	Voltage	Element Name	Element Type	Element Status	Remarks
10:18:55,731	AMRGR_P	220	04ZNKT2	Circuit Breaker	Open	Tripping of 220KV Main CB of 220 KV AMARGARH(NRSS XXIX)-ZIANKOTE(JK) (PDD JK) CKT-2 at Amargarh end
10:18:55,745	AMRGR_P	220	02ZNKT1	Circuit Breaker	Open	Tripping of 220KV Main CB of 220 KV AMARGARH(NRSS XXIX)-ZIANKOTE(JK) (PDD JK) CKT-1 at Amargarh end

Points for Discussion

i. SCADA data of 220/132kV Ziankote(JK) S/s is not available. Availability and healthiness of the same need to be ensured.
ii. DR/EL (.dat/.cfg) file of all the tripped elements along with tripping report need to be shared from both the ends.
iii. Z-2 time delay setting at Amargarh (INDIGRID) end need to be reviewed and revised so that both the lines don't trip instantaneously.
iv. Remedial action taken report to be shared.

Multiple Element Tripping Event at 220/132kV Kangoo(HP)

At 16:46 hrs on 27.07.2025

Tripped Elements

S. No	Name of Elements	Outage Time	Revival Time	Reason of tripping
1.	220kV Kangoo-Raruri(HP) Ckt	16:46 hrs		B-N phase to earth fault
2.	220 KV Dehar(BB)-Kangoo(HP) (HP) Ckt		20:06 hrs	LBB protection operated
3.	132 KV Dehar(BB)-Kangoo(HP) (HPPTCL) Ckt		21:15 hrs	
4.	220/132kV 80/100 MVA ICT at Kangoo(HP)			

Brief details of the event

i. 220/132kV Kangoo(HP) S/s has single main and transfer bus scheme at 220kV and 132kV level. During antecedent condition, 220/132kV 80/100 MVA ICT at Kangoo(HP) was carrying ~30 MW.

ii. As reported, at 16:46 hrs, B-N phase to earth fault occurred in 220kV Kangoo-Raruri(HP) Ckt (exact nature, location and reason of fault yet to be shared). However, due to non-clearance of fault, LBB protection operated.

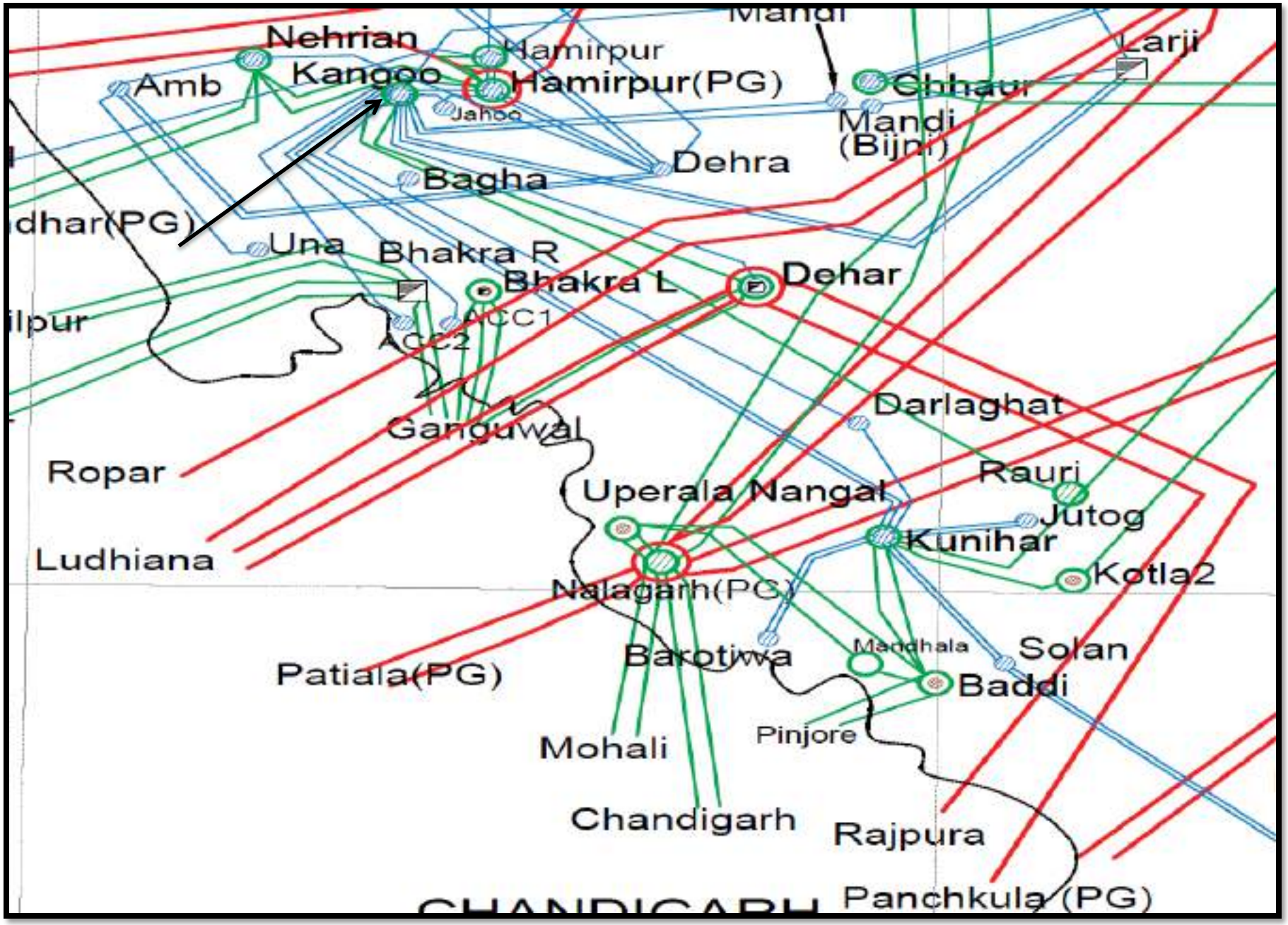
iii. Due to LBB operation, 220 KV Dehar(BB)-Kangoo(HP) (HP) Ckt and 220/132kV 80/100 MVA ICT at Kangoo(HP) tripped along with all the 132 kV elements connected at Kangoo(HP).

iv. Due to tripping of all 220kV and 132kV elements at Kangoo(HP), both 220kV and 132kV bus at Kangoo(HP) became dead and complete blackout occurred at 220.132kV Kangoo(HP) S/s.

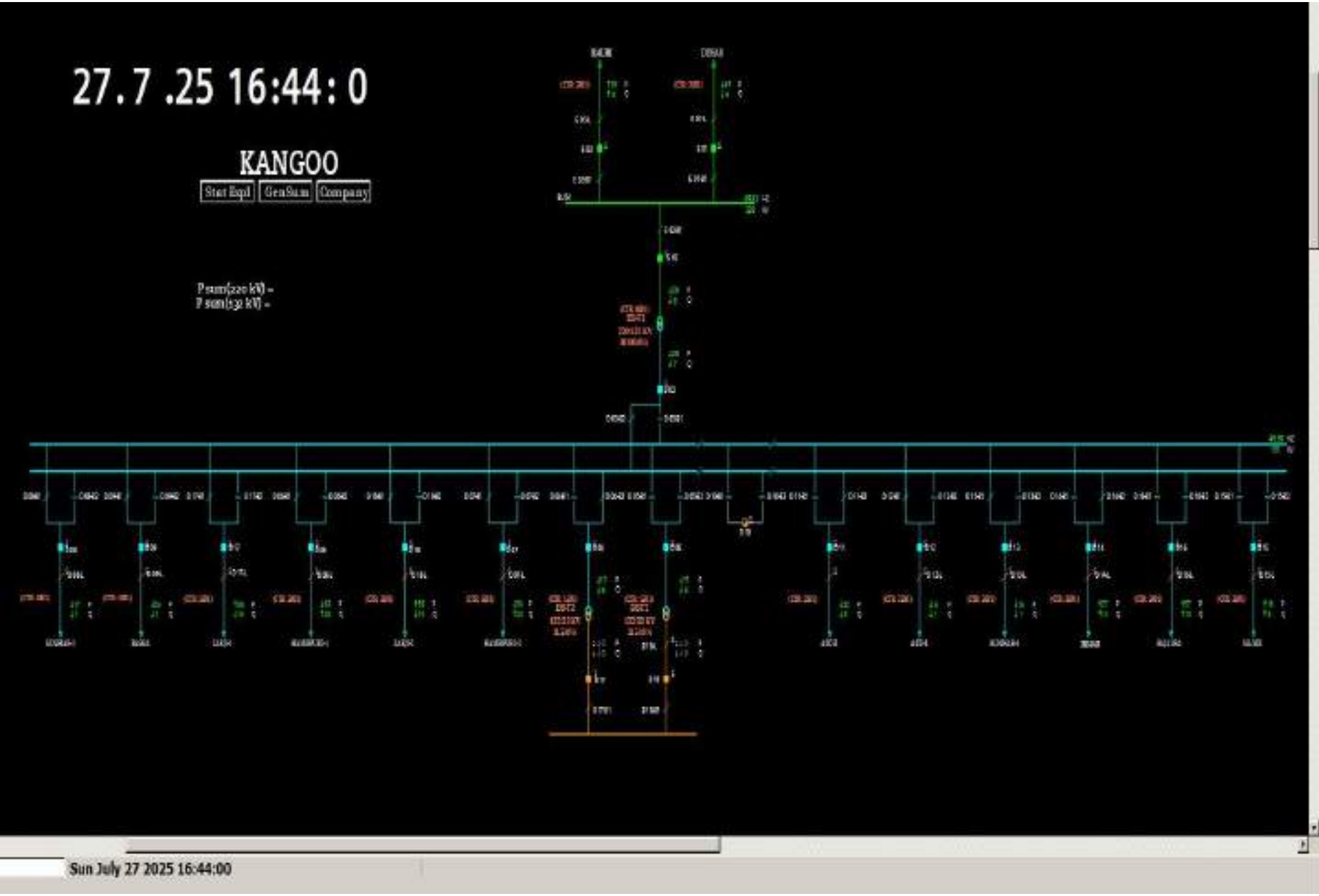
v. As per PMU at Dehar(BB), B-N phase to earth fault was observed with fault clearing time of 120 ms.

vi. As per SCADA, change in demand of approx. 100 MW in HP control area was observed. However, as reported by SLDC HP, load loss of 75 Mw occurred in HP control area.

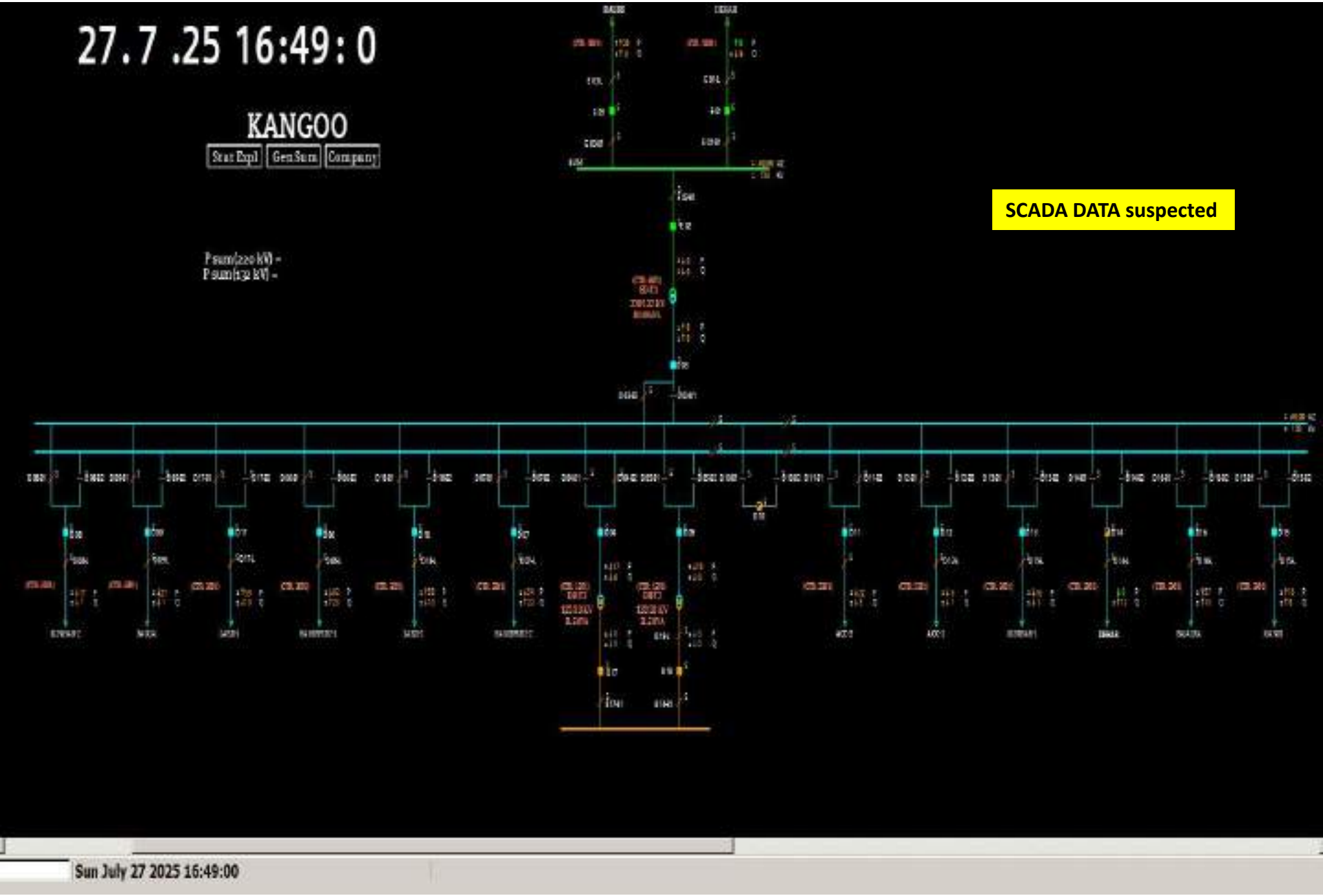
Network Diagram



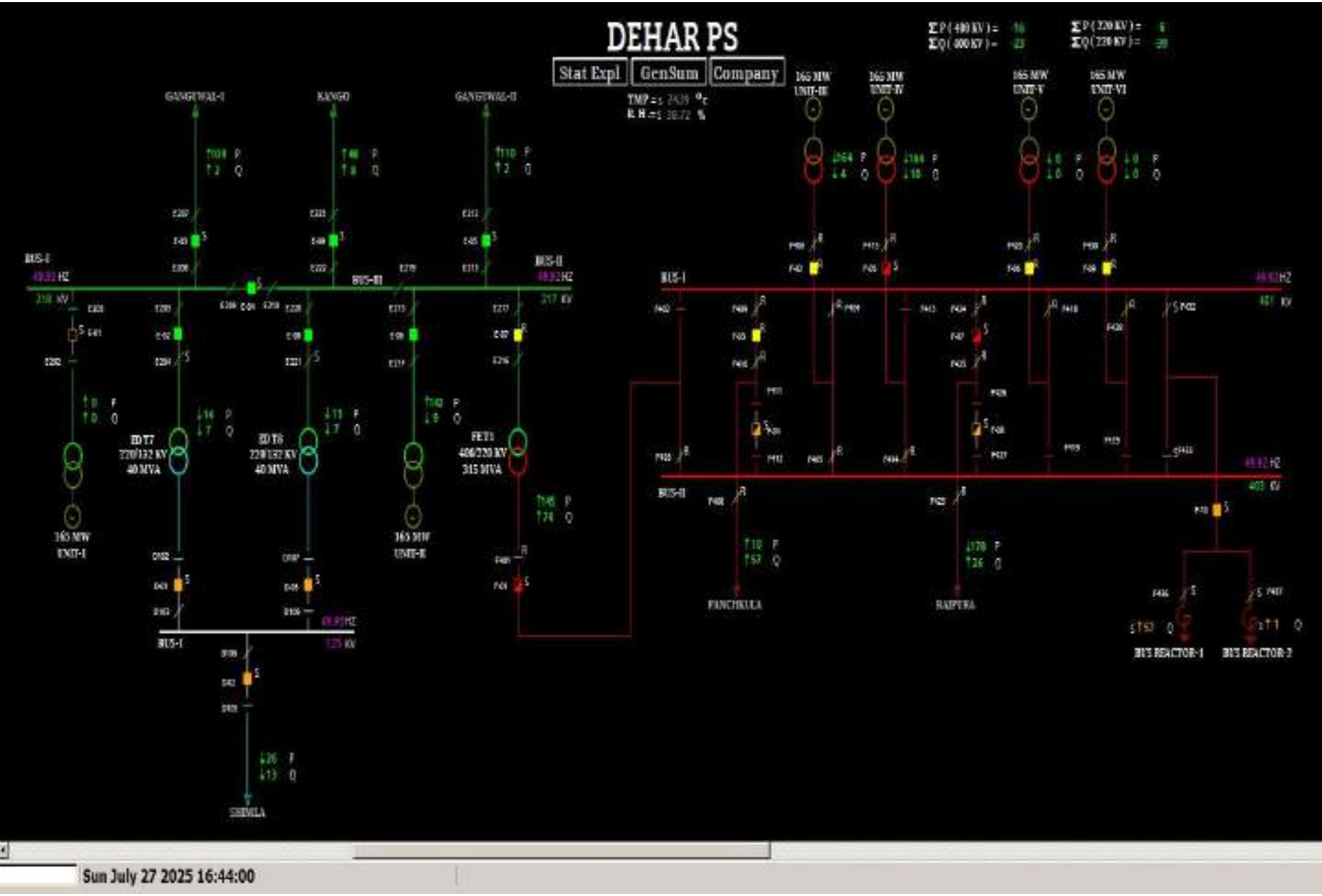
SLD of 220/132kV Kangoo(HP) before the event



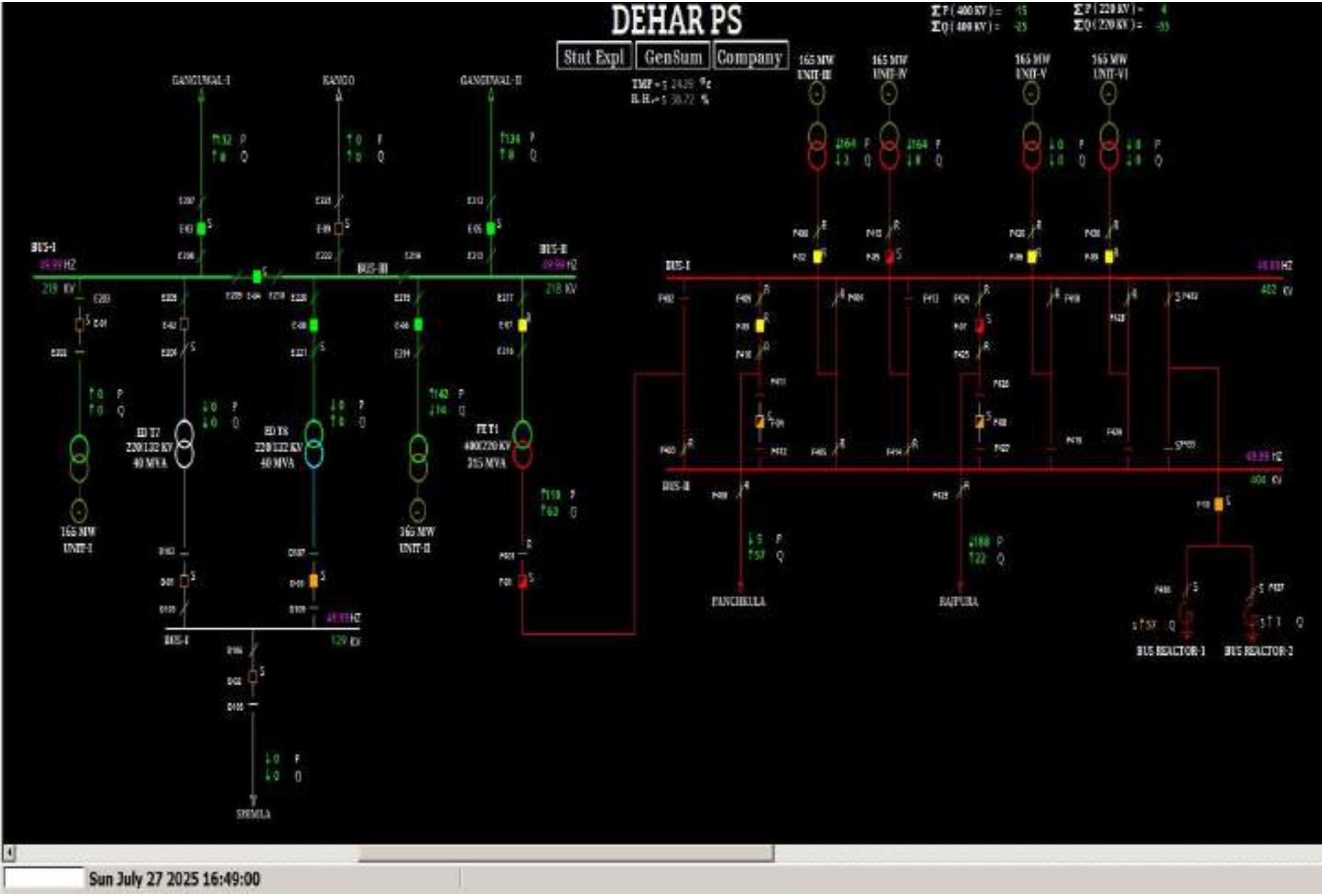
SLD of 220/132kV Kangoo(HP)after the event



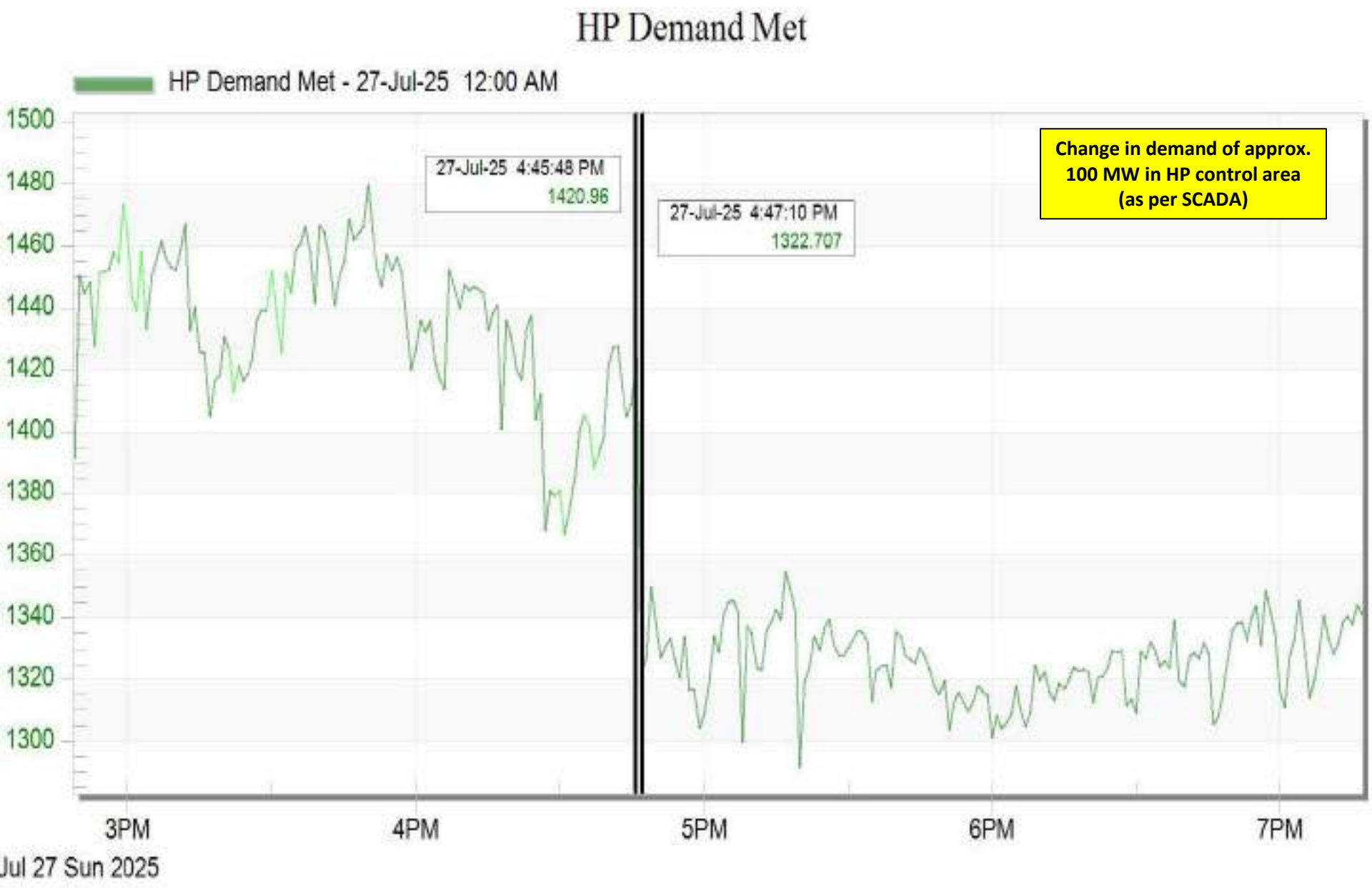
SLD of 400/220/132kV Dehar(BB) before the event



SLD of 400/220/132kV Dehar(BB) after the event

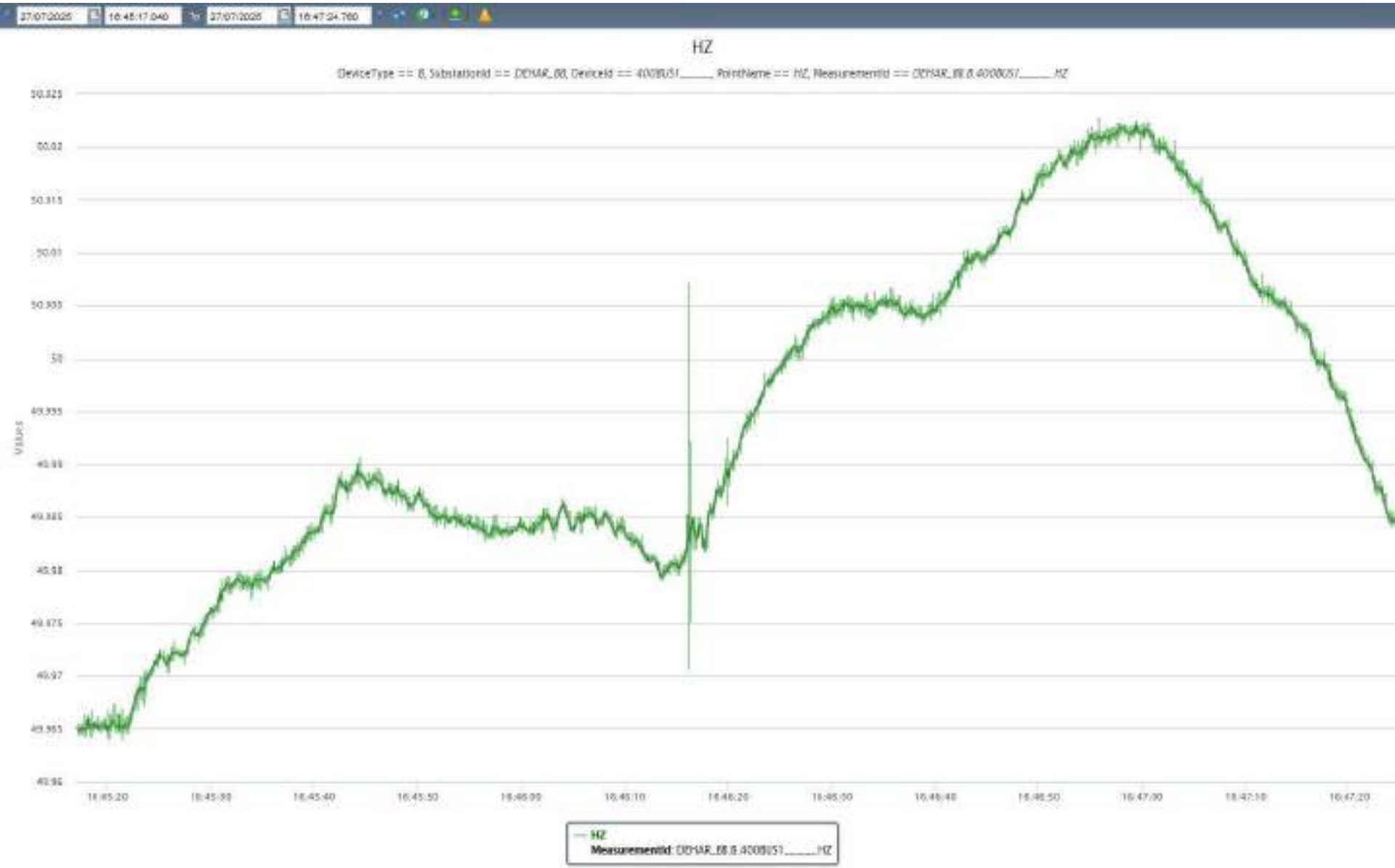


Himachal Pradesh Demand during the event



PMU Plot of frequency at Dehar(BB)

16:46 hrs/27-Jul-25



PMU Plot of phase voltage magnitude at Dehar(BB)

16:46 hrs/27-Jul-25



SCADA SOE

Time	Station Name	Voltage Level	Element Name	Element Type	Element Status	Remarks
16:46:16,225	DEHAR_BB	220kV	09KANGO	Circuit Breaker	Open	Line CB at Dehar(BB) end of 220 KV Dehar(BB)-Kangoo(HP) (HP) Ckt opened
16:46:16,256	DEHAR_BB	220kV	02T2	Circuit Breaker	Open	CB at 220kV side of 220/132kV 40 MVA ICT-2 at Dehar(BB) opened
16:46:16,256	DEHAR_BB	132kV	01T2	Circuit Breaker	Open	CB at 132kV side of 220/132kV 40 MVA ICT-2 at Dehar(BB) opened
16:46:16,287	DEHAR_BB	132kV	02KANGO	Circuit Breaker	disturbe	
16:46:16,315	DEHAR_BB	132kV	02KANGO	Circuit Breaker	Open	Line CB at Dehar(BB) end of 132 KV Dehar(BB)-Kangoo(HP) (HPPTCL) Ckt opened
16:46:16,374	KANGO_HP	132kV	14DEHAR	Circuit Breaker	disturbe	

Points for Discussion

i. Exact reason, location and nature of fault need to be shared.
ii. Exact reason of non-clearance of fault/LBB operation need to be analysed. LBB time delay settings need to be shared.
iii. DR/EL (.dat/.cfg file) of all tripped elements along with tripping report needs to be shared from both the ends.
iv. SCADA data at 220/132kV Kangoo(HP) S/s was suspected after the event. Availability and healthiness of SCADA data need to be ensured.
v. Remedial action taken report need to be shared.

HIMACHAL PRADESH STATE ELECTRICITY BOARD Ltd.

(A State Govt. undertaking)

Registered office: Vidyut Bhawan, HPSEBL, Shimla-171004 (H.P)
Number (CIN): U40109HP2009SGC031255
GST No.: HPSEBL, 02AACCH4094E1ZD
Telephone Number: 01970-222336, 01907-286837
Address: Electrical System Division, HPSEBL, Bilaspur
Email: sr.xen.esdivisionblp@gmail.com

No. HPSEBL/220KV/SSK/S-9/2025-26- 344-46 Dated:- 28-7-2025

To

Power Controller
SLDC, Totu, Shimla-II
Distt. Shimla (H.P)

Sub:- Tripping detail of 220 KV Dehar Kangoo information thereof.

Sir,

"Jai Hind"

Please find the requisite information is as under:-

Name of feeder:- 220 KV Dehar Kangoo

Sr.No	Description	Detail
	Tripping Report	220 KV Dehar Kangoo
1.	Tripping date & time	27.07.2025 at 16:46 hrs
2.	DR & EL	Copy attached
3.	Fault Reason	• SF-6 Breaker tripped off both end. • Same time 132 KV Dehar Kangoo line Tripped off both end. **Due to same time 220 KV Rouri (Ambuja Cement Plant) SF6 Breaker tripped off both end & Distance protection relay operated on 22.066 KM Vill. Koon (Darlaghat)Heavy Rain & Heavy lightning.**
4.	Restoration time	20:07 hrs
5.	Generation /Load losses	220 KV Rouri - 19 MW 132 KV ACC-II-22 MW 132/33KV, 25/31.5MVA TRF Bank-34 MW

This is for kind information & necessary action please.

Your Faithfully,

Assistant Engineer
220/132/33 KV Sub Station
Sub Division HPSEB Ltd
Kangoo Distt Mandi (H.P)

Copy to :-

1. The Superintending Engineer, ES Circle, HPSEBL, Hamirpur.
2. The Sr. Executive Engineer Electrical System Division Bilaspur for information please.

Assistant Engineer
220/132/33 KV Sub Station
Sub Division HPSEB Ltd

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S.No. (क्र० सं०)	Tran/Gen element name (संचरण लाइन / विद्युत उत्पादन इकाई का नाम)	Trip Time (बंद होने का समय)	Restoration Time (वापस आने का समय)	Reason/ Relay Indication (कारण/ रिले संकेत)
01	220kV Dehar to Kangoo	16:46	20:07	03-21. Breaker tripped both end.
02				
03				
04				
05				

10. Action Taken by Control Room (राज्य भा०प्रे०के० के द्वारा की गयी कार्यवाही):-

11. Current Status of Restoration (पपूर्वावस्था मे लाने की वर्तमान स्थित):- Normal

12. All Relevant system data including copies of records of all recording instruments including Disturbance Recorder, Event Logger, DAS etc. :-

14. Remedial measures (if any):-

15. Estimated time of return to service:-

16. Any other relevant information:-

Date & Time of the Report (रिपोर्ट की तारीख और समय): 28-7-025 At 11:05 Hrs. Hrs /_____.

Name and designation of reporting officer:-

J.E. S/Stn.

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Flash report of tripping at 220 KV AIS/GIS Kangoo S/s Area
(To be submitted by users as per HPEGC section 5.10.6 (a) (c)

1. Date and Time of the Grid Event (ग्रिड घटना की तिथि और समय):- 27-7-025 - 16.46 Hrs. / ____

2. Location (स्थान):- 220/132/33 KV s/stn Kangoo

3. Weather Condition (मौसम स्थिति) : - Cloudy

3. Name of the Substation Station Affected (सब-स्टेशन का नाम):- 220 KV AIS / GIS Kangoo S/s

4. Relay Operated (Name) :-

5. Antecedent Conditions (पूर्ववर्ती स्थिति):-

	Frequency(Hz)	Feeder Load(MW)	Feeder Load(MW)
Pre-Event (घटना पूर्व)	50.02	15 MW	
Post Event (घटना के बाद)	50.18	18 MW	

*Pre and post data of 1 minute before and after the event

Important Transmission Line/Unit if under Outage महत्वपूर्ण संचरण लाइनें / विद्युत उत्पादन इकाइयां जो बंद हैं	NIL

6. Generation Loss/Load loss (MW) (उत्पादन/भार क्षति):- I H.P. Area 34 MW. Duration = 16.46 to 17.15 = 00-29 Hrs
II 220 KV Rowiline (Ambujaland) = 19 MW. 16-46 to 02.34 Duration 09-48
III 132 KV ACC CKT NO = II 16.46 to 21.16 Duration = 04-30 Hrs 22 MW.

7. Duration of interruption (रुकावट की अवधि):-

8. Brief Details of the Grid Event (ग्रिड घटना का संक्षिप्त विवरण):-
220 KV Dehar to Kangoo line breaker tripped off both end Kangoo end Dehar end.

9. Transmission/Generation element Tripped during the event (संचरण लाइन / विद्युत उत्पादन इकाई जो घटना के दौरान बंद हो गयी):- 220 KV Dehar to Kangoo.

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ABB

Disturbance Short Report

Disturbance Recordings Information

Device Information

Recorder ID	1
IED type	REL670
IED version	2.1.0
Station name	HPSEB_KANGOO
Object name	DEHAR LINE
IED name	REL670_M1

Fault Information

Trig date and time	7/27/2025 4:42:56.263 PM
Trigger signal name	AR01-INHBIT
Recording number	418
Total recording time	4000 ms
Pre-trig recording time	1000 ms
Post trig recording time	0 ms
Max. recording time	3000 ms

General Recordings Information

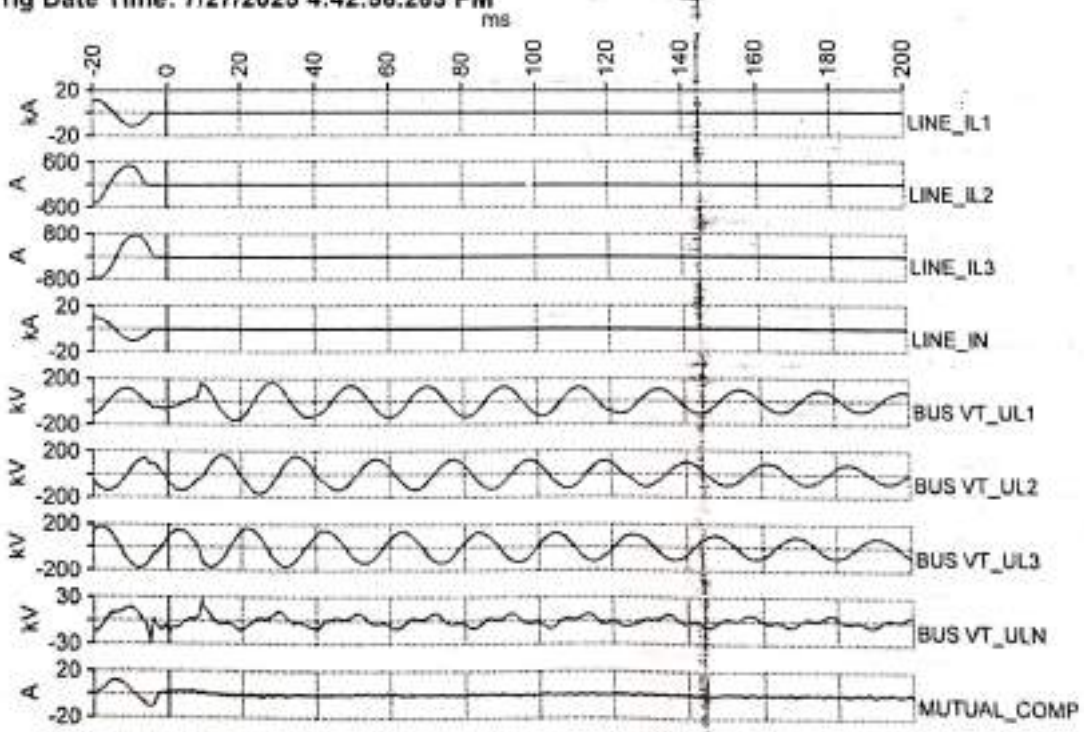
Disturbance recorder	Installed
Event recorder	Installed
System frequency	50 Hz
Sampling frequency	1 kHz
Active setting group during recording	1

Fault Location Information

Fault loop type	Not applicable
Fault location	Not applicable
Status of fault calculation	Not applicable
Fault direction	Not applicable

Analog Time Diagram

Trig Date Time: 7/27/2025 4:42:56.263 PM

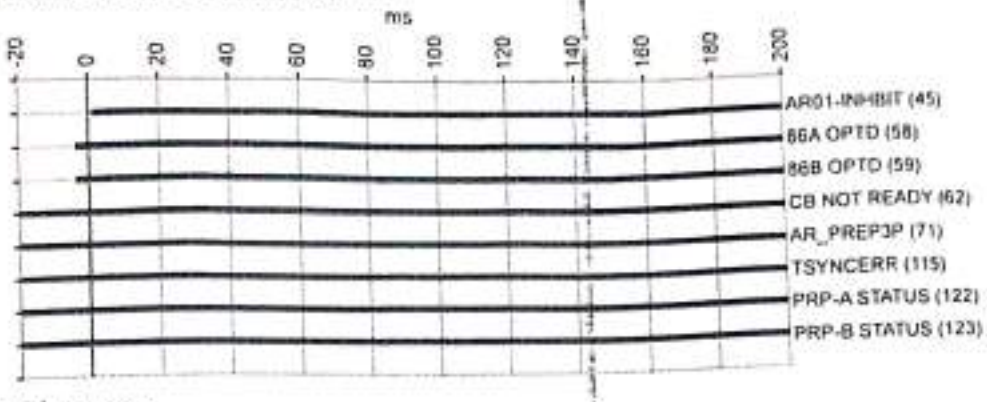


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ABB

Binary Time Diagram

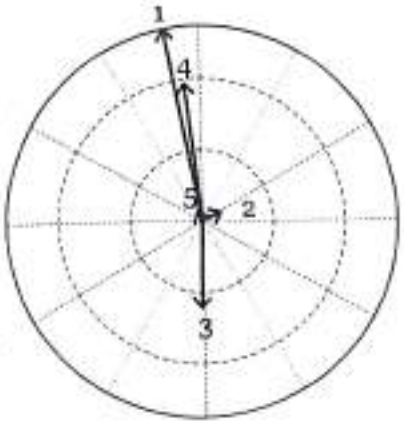
Trig Date Time: 7/27/2025 4:42:56.263 PM



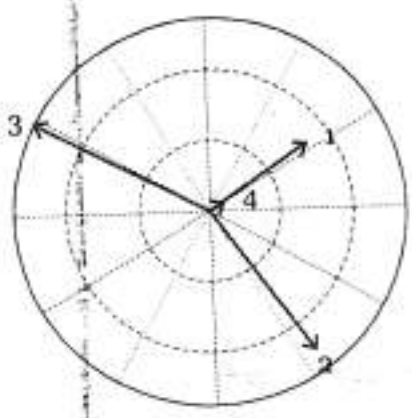
Vector Diagrams

Calculation Time Period : -4 ms to 15 ms

Currents



Voltages



No.	Name	RMS	Angle
1	LINE_IL1	48.103(A)	100.7°
2	LINE_IL2	5.068(A)	27.1°
3	LINE_IL3	21.334(A)	268.5°
4	LINE_IN	34.107(A)	96.5°
5	MUTUAL_COMP	2.679(A)	113.1°

No.	Name	RMS	Angle
1	BUS VT_UL1	69065.812(V)	33.8°
2	BUS VT_UL2	101864.422 (V)	305.2°
3	BUS VT_UL3	115002.281 (V)	151.8°
4	BUS VT_ULN	9357.683(V)	29.3°

Events List

Channel Number	Name	Status	Time
58	86A OPTD	On	7/27/2025 4:42:56.259 PM
59	86B OPTD	On	7/27/2025 4:42:56.259 PM
45	AR01-INHBIT	On	7/27/2025 4:42:56.263 PM

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Sr No	Element Name	Outage Date	Outage Time	Reason	Discussions during 62nd PSC Meeting and PSC recommnedations
1	250 MW (PSP) TEHRI HPS - UNIT 5	07-Jun-25	09:00	Due to low head.	NRLDC representative highlighted that frequent tripping of transmission elements affects the reliability and security of the grid. NRLDC representative emphasized on the frequent tripping of U#5 and U#6 of Tehri PSP and reason of frequent tripping were discussed in detail. Representative from Tehri PSP confirmed that no. of tripping is more in the pumping mode as compared to generating mode. No specific reason was recognised. However, corrective actions are taken continuously for each reason of tripping identified and thereafter units are not tripping for the repetitive reasons. He also stated that some tripping occurred during the time of testing. It was mentioned that DR is not triggered at the time of any tripping. MS NRPC highlighted that as unit is recently synchronised, so it may be facing the teething issues for which corrective actions need to be taken at the earliest. CGM(SO) NRLDC also highlighted that unit was synchronised without any study in PSCAD which is normally beyond the normal practice and data for study in PSCAD is still pending. Tehri PSP units are also getting tripped with the tripping of nearby 76kV lines. It was also emphasized that as two more units of capacity 250 MW each is going to be synchronised with grid, such type of tripping may further lead to the generation loss of 1000 MW from grid which is detrimental from grid seurity and reliability point of view. **PSC Recommendations:** **i) All the teething related issues of the units need to be rectified at the earliest.** **ii) Data for PSCAD study need to be submitted at the earliest.** **iii) Tehri PSP need to take up this issues with the OEM team to resolve them at the earliest.**
		09-Jun-25	12:36	PSP Unit taken out (earlier running in Pumping mode). Later Tehri HEP units were synchronised from 1300 hrs onwards.	
		09-Jun-25	21:17	Oil leakage in GOPU Unit led to SPMAX Major fault	
		11-Jun-25	01:19	Due to Communication failure in SPMAX System (Specific Power Maximum).	
		13-Jun-25	15:30	Tripped due to Rotor over frequency	
		14-Jun-25	23:10	Tripping due to disturbance in the Unit Controller System	
		17-Jun-25	09:00	Failure of K105 relay in Unit controller, which further triggered multiple relays for zero speed signal in SPMAX & Unit protection relays.	
		26-Jun-25	10:12	Generator Fault due to failure of Generator Remote I/O field controller	
		28-Jun-25	08:00	Tripped due to absence of communication of SPMax with UCS	
		28-Jun-25	18:00	DC fail due to Diode bridge in DCDB at GIS burnt	
		01-Jul-25	18:30	Non equalization of pressure in MIV	
		04-Jul-25	08:24	VSI fault due to Improper AC voltage feedback to VSI	
		05-Jul-25	18:30	HP oil injection system fault.	
		09-Jul-25	09:15	HP Oil Injection Combined Fault	
		13-Jul-25	09:13	Labyrinth CWS system MOV Stuck	
		14-Jul-25	14:36	Stator Differential protection 87G operated	
		15-Jul-25	12:32	QSD due to Shaft seal cooling water flow too low.	
		16-Jul-25	09:29	ESD due to grid voltage assymetrical dip detected by VSI	
		17-Jul-25	19:40	Manually tripped because of sudden rise in unit speed above dead band	
		19-Jul-25	18:45	Governor OPU Safety Solenoid Valve did not pick up due to loose wiring connection	
		22-Jul-25	19:46	Loss of evacuation path	
		25-Jul-25	08:05	Machine went into dead band due to higher head which requires further tunning of machine by the experts.	
2	250 MW (PSP) TEHRI HPS - UNIT 6	10-Jul-25	09:00	Stator under power protection fault	
		10-Jul-25	10:02	Tripped on ESD Due to Oil Pressure too high at BFV	
		14-Jul-25	14:36	Turbine RTU IHR Controller Failure.	
		16-Jul-25	09:29	ESD due to grid voltage assymetrical dip detected by VSI	
		16-Jul-25	21:03	VSI Fault	
		20-Jul-25	18:45	VSI crowbar fault due to ingress of carbon dust in slip ring	
		21-Jul-25	00:00	Generator Fault	
		27-Jul-25	13:30	VSI Chopper temperature increased leading to tripping of Unit	
		31-Jul-25	09:00	Absence of pump operation readiness condition (Internal logic for head condition)	
3	220 KV Meerut(PG)-Nara(UP) (PG) Ckt	06-Jun-25	03:33	Phase to earth fault Y-N	POWERGRID informed that tripping occurred due to insulator puncture (flashover in insulator) at multiple locations. Insulators are replaced. There was also intermittent issue of cacrrier communication. **PSC forum recommended to check the healthiness of the other insulators before winter and also ensure healthiness of carrier communication in the line.**
		18-Jun-25	02:34	Phase to earth fault R-N	
		23-Jun-25	17:28	Phase to earth fault R-N	
		25-Jun-25	17:45	Phase to earth fault R-N	
		29-Jun-25	18:29	Phase to earth fault B-N	
		30-Jun-25	02:28	Phase to earth fault Y-N	
		30-Jun-25	15:20	Phase to earth fault B-N	
4	220 KV Debari(RS)-RAPS_A(NP) (RS) Ckt-1	10-Jun-25	13:46	Phase to earth fault B-N	NRLDC representative highlighted that both the lines tripped multiple times due to A/R issue at RAPS end. NPCIL representative informed that RAPS has addressed this A/R issue.
		11-Jun-25	13:51	Phase to earth fault B-N	
		14-Jun-25	14:58	Phase to earth fault B-N	
		14-Jun-25	16:50	Phase to Phase Fault R-Y	
		16-Jun-25	14:28	Phase to earth fault R-N	
5	220 KV RAPS_B(NP)-Sakatpura(RS) (RS) Ckt-1	10-Jun-25	12:11	Phase to earth fault B-N	
		10-Jun-25	15:06	Phase to Phase Fault Y-B	
		16-Jun-25	00:28	Phase to earth fault B-N	
		27-Jun-25	10:10	Phase to Phase Fault R-Y	
6	220 KV Sarsawan(UP)-Khodri(UK) (UP) Ckt-1	05-Jun-25	20:05	Phase to earth fault R-N	UP representative informed that line tripped due to issue in disc insulator and insulators are replaced gradually. **PSC forum recommended for thorough patrolling of the line to take necessary remedial action.**
		18-Jun-25	09:30	Phase to earth fault Y-N	
		24-Jun-25	09:05	Phase to earth fault B-N	
		26-Jun-25	14:01	Phase to earth fault R-N	
7	220 KV NAPP(NP)-Simbholi(UP) (UP) Ckt-1	05-Jul-25	04:04	Phase to earth fault B-N	
		05-Jul-25	09:25	Snapping of Earth wire	
		10-Jul-25	17:06	Phase to earth fault R-N	
		11-Jul-25	08:11	Phase to earth fault B-N	
		16-Jul-25	18:42	Phase to earth fault R-N	
		17-Jul-25	03:14	Phase to earth fault B-N	
		23-Jul-25	19:11	Phase to earth fault B-N	
		27-Jul-25	09:05	Phase to earth fault B-N	
8	220 KV Nara(UP)-Roorkee(UK) (UP) Ckt-1	07-Jul-25	11:53	Phase to earth fault R-N	UP represenative informed that CB related issues are resolved, however insulator related issues still persits and insulators are being replaced gradually. **PSC forum recommended for thorough patrolling of the line to take necessary remedial action.**
		28-Jul-25	19:11	Phase to earth fault R-N	
		30-Jul-25	17:57	Phase to earth fault R-N	
		31-Jul-25	12:09	Phase to Ground Fault R-N	
		31-Jul-25	22:22	Phase to earth fault R-N	
9	220 KV Panipat-Kurukshetra (BB) Ckt-1	16-Jul-25	12:58	Phase to earth fault Y-N	BBMB informed that fault was permanent in nature, A/R operated at BBMB end and A/R attempt was unsuccessful.
		24-Jul-25	09:49	Bus Bar Protection Operated	
		26-Jul-25	12:22	Phase to earth fault Y-N	
		26-Jul-25	14:55	Phase to earth fault B-N	