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

दिनांक:07.08.2025

सेवा में:

Member Secretary, NRPC
Katwaria Sarai, New Delhi-110016

विषय: Report of the Committee on Review of Protection System And Load Management In RAPS, KTPS Generation Complex-reg

Ref: NRPC office order dated 06.06.2024 constituting a committee to analyse the issues responsible for the repeated cascade tripping of RAPS, KTPS generation complex.

Madam,

In reference to above NRPC order, the committee had deliberated in seven meetings including one site visit at KTPS, Kota and RAPS, Rawatbhata. The committee hereby submits its report. The key observations and recommendations in the report includes following:

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 (Auto Transfer Scheme) at RAPS B & C.
iv. Contingency analysis after revision in network configuration.
v. Revision in islanding scheme of RAPS.

07/08/2025

(Reeturaj Pandey)
EE (Protection), NRPC

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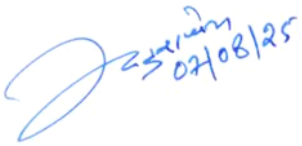
REPORT OF THE COMMITTEE ON REVIEW OF PROTECTION SYSTEM AND LOAD MANAGEMENT IN RAPS, KTPS GENERATION COMPLEX

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.



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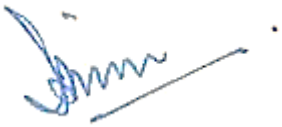

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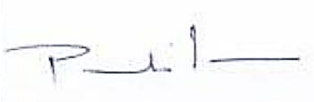

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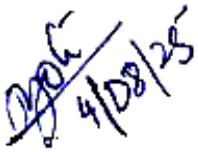

Jyoti Thakur

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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.

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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.

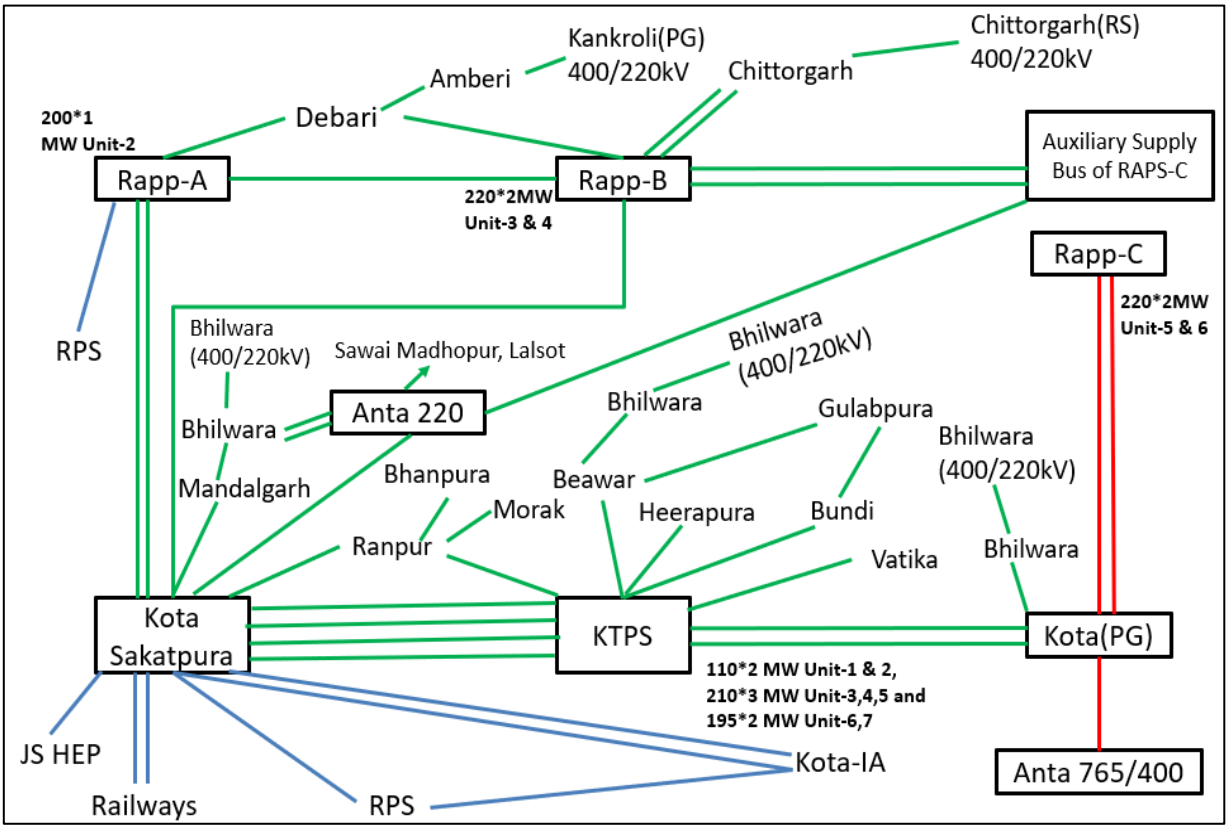

Figure 1: Network diagram of RAPS, KTPS generation complex

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.

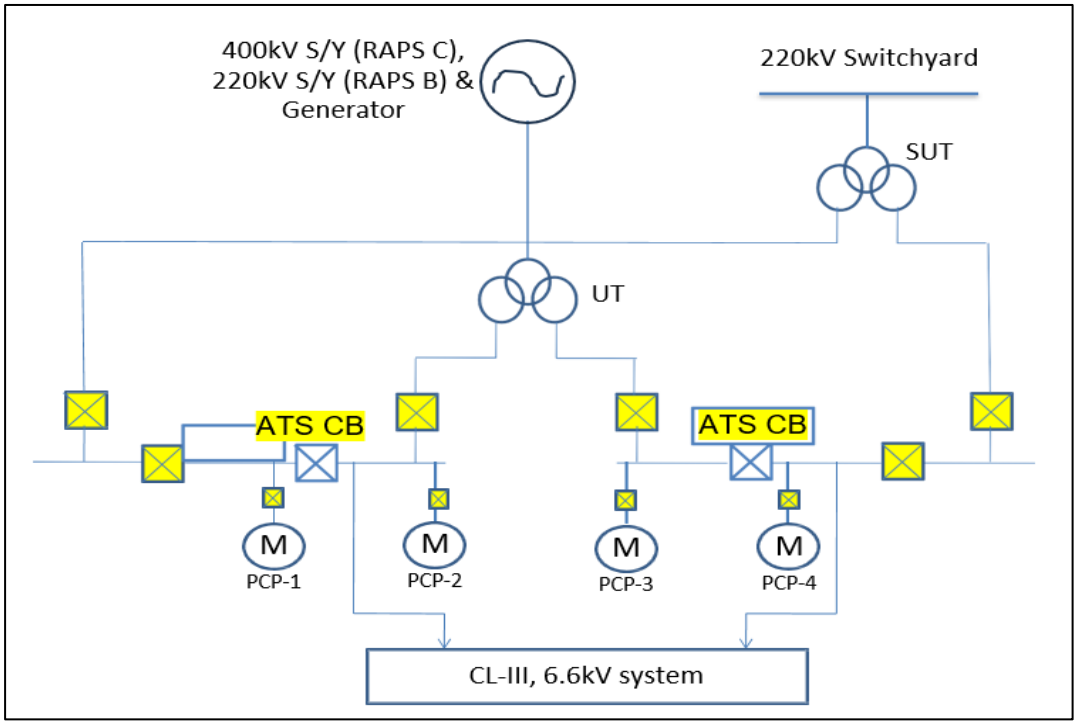

Fig.1 Auto Transfer Scheme (General)

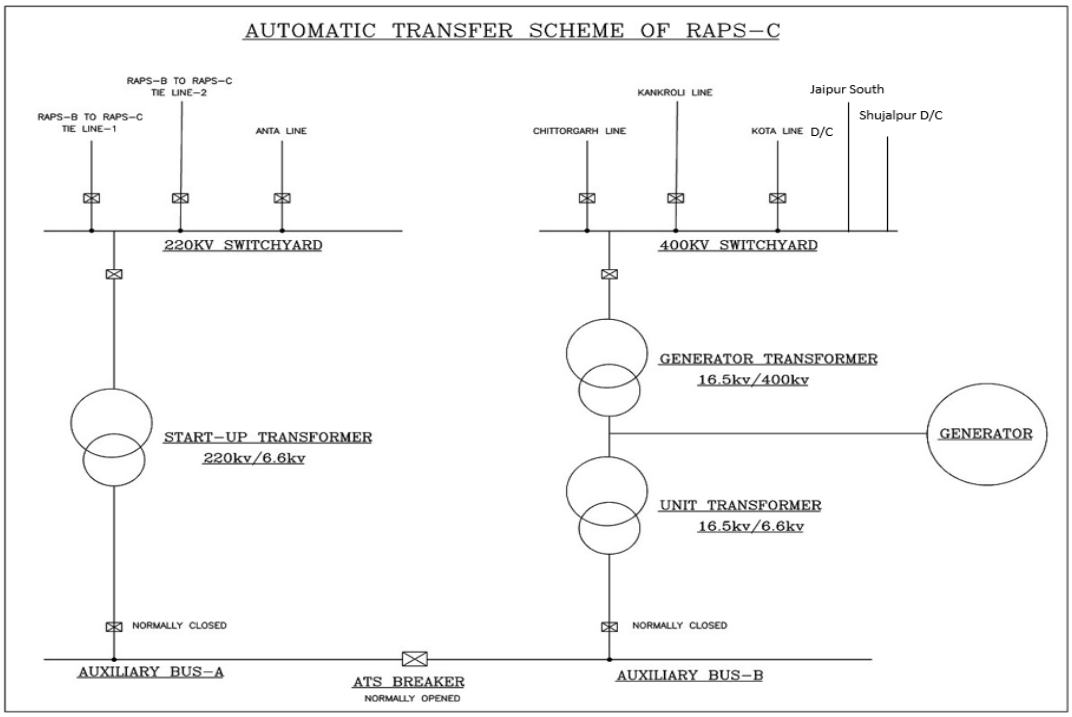

Fig.2 Auto Transfer Scheme at RAPS-C

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.

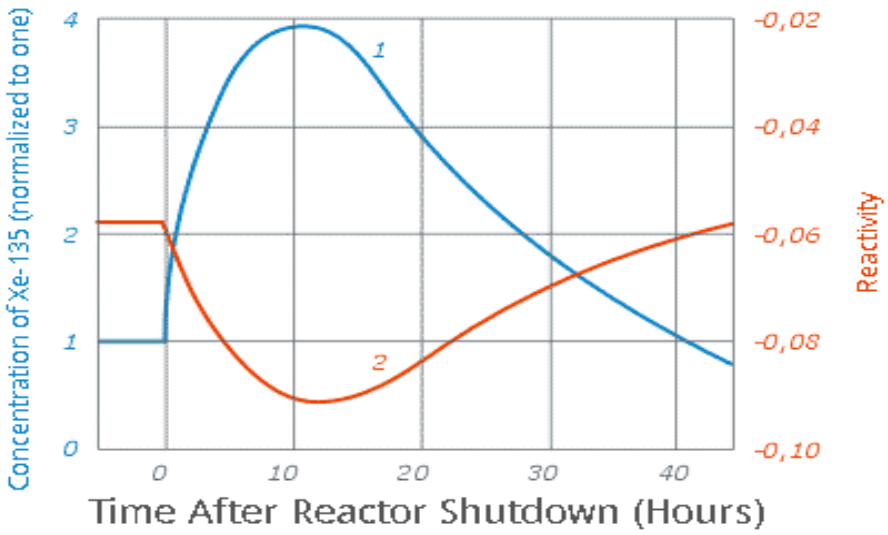

Fig 3 Xe-135 concentration in the reactor and neutrons reactivity

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).

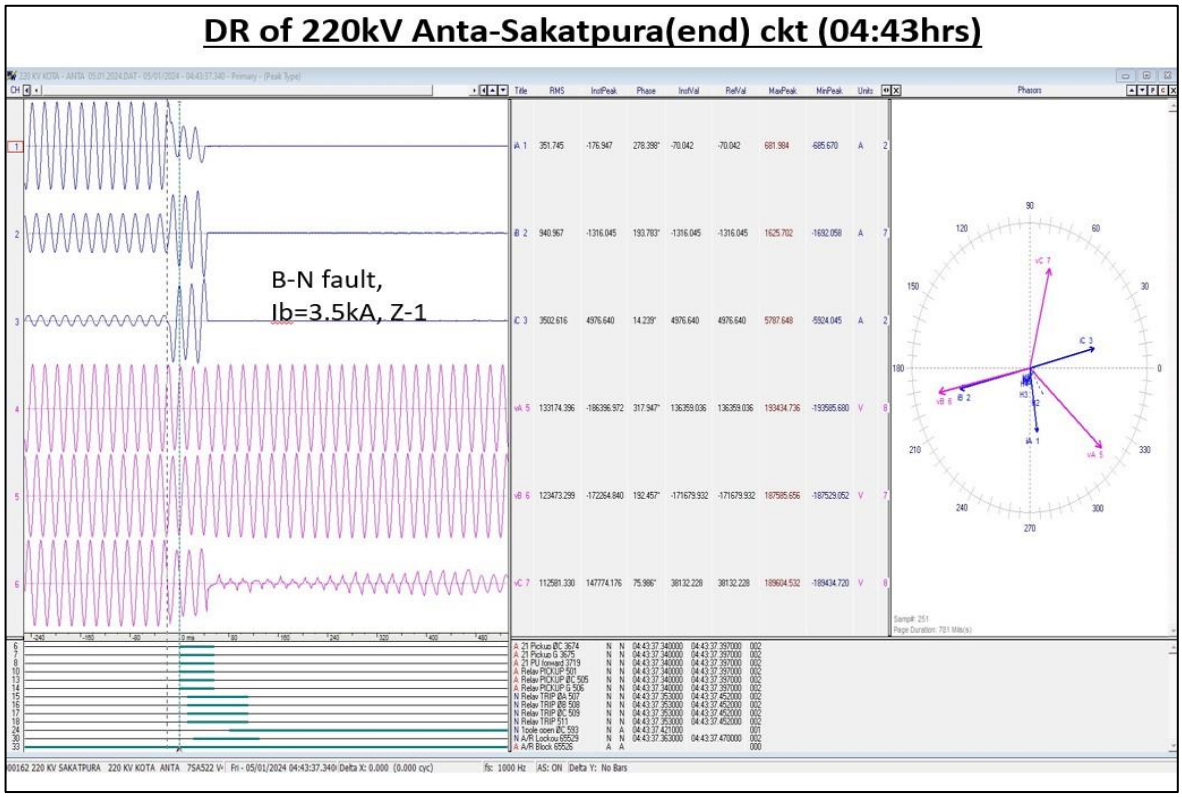

Fig.4 DR of 220kV Anta-Sakatpura(end) ckt (04:43hrs)

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)

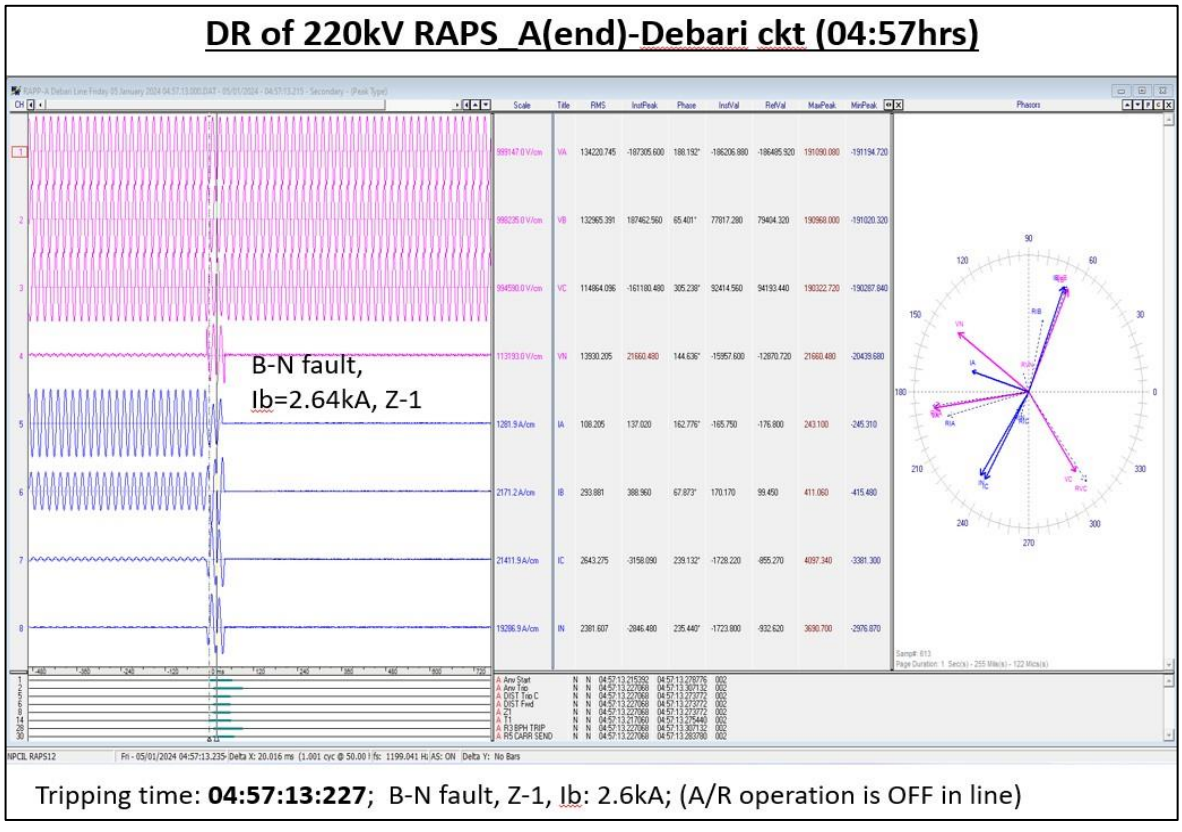

Fig.5 DR of 220kV RAPS_A(end)-Debari ckt (04:57hrs)

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.

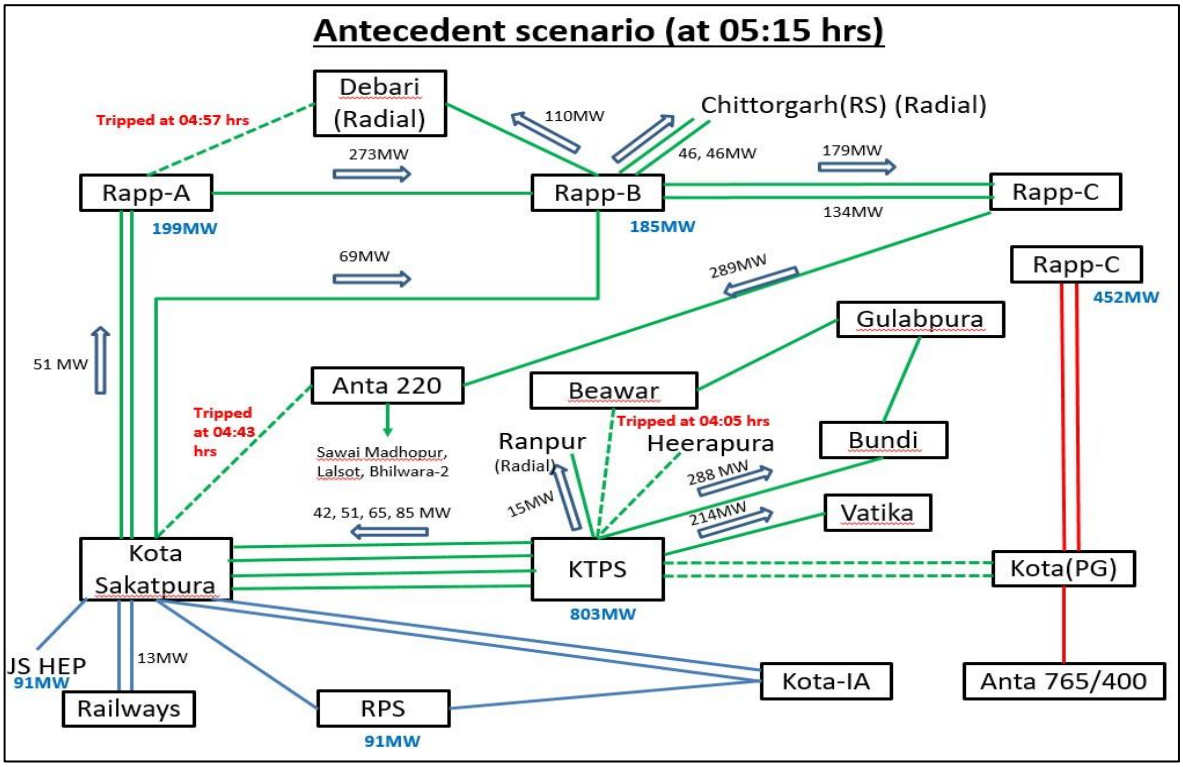

Fig.6 Antecedent scenario of the network complex

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.

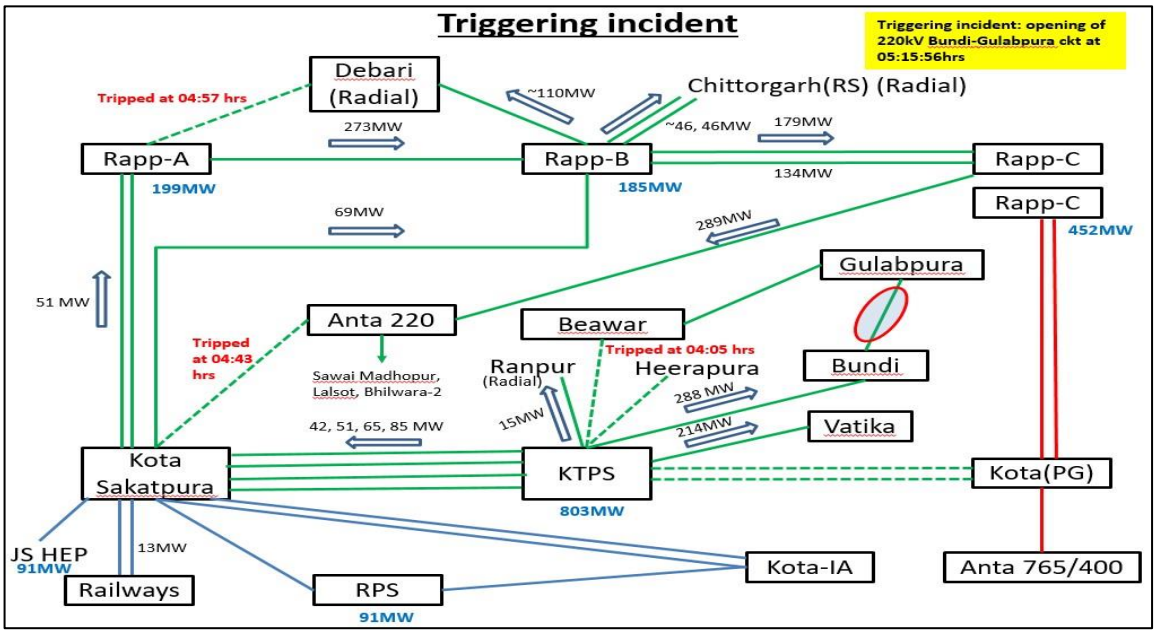

Fig.7 Triggering Incident Scenario

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.

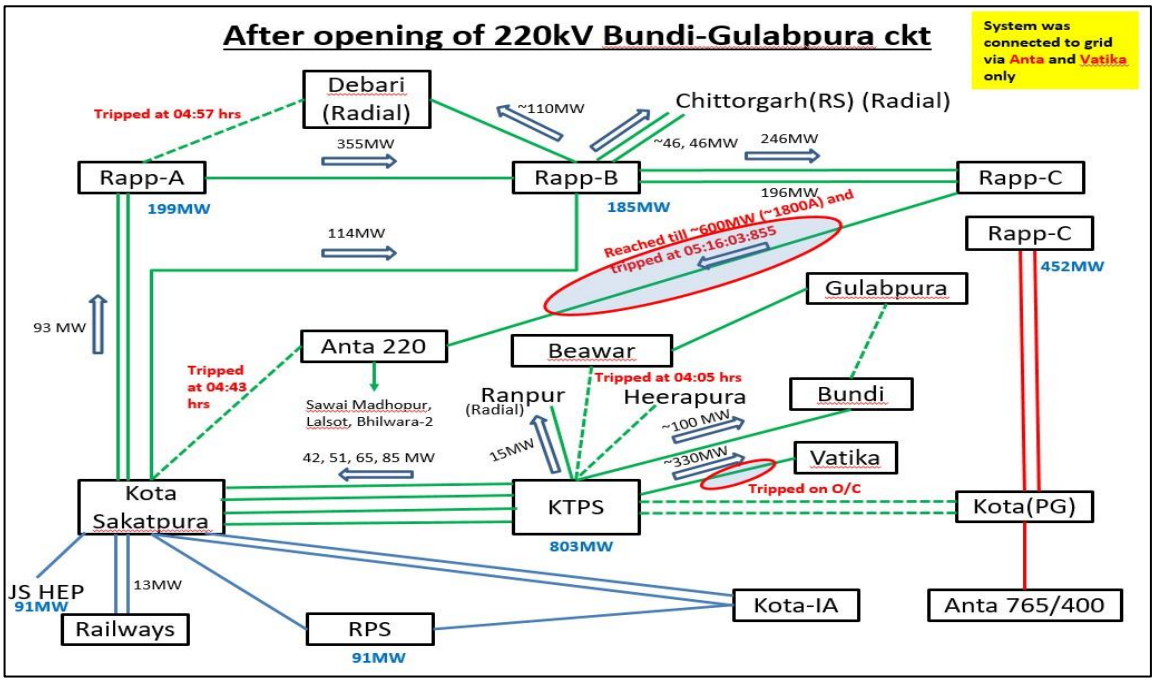

Fig.8 Scenario after opening of 220kV Bundi-Gulabpura ckt

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.

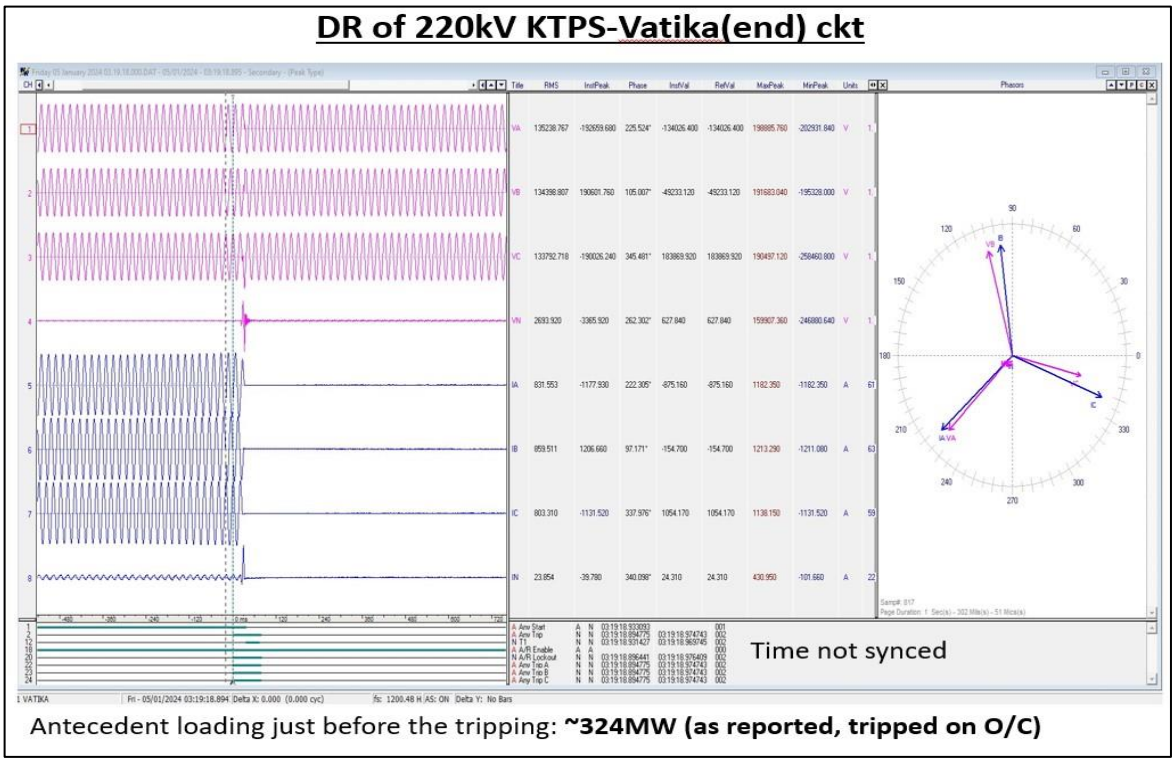

Fig.9 DR of 220kV KTPS-Vatika(end) ckt

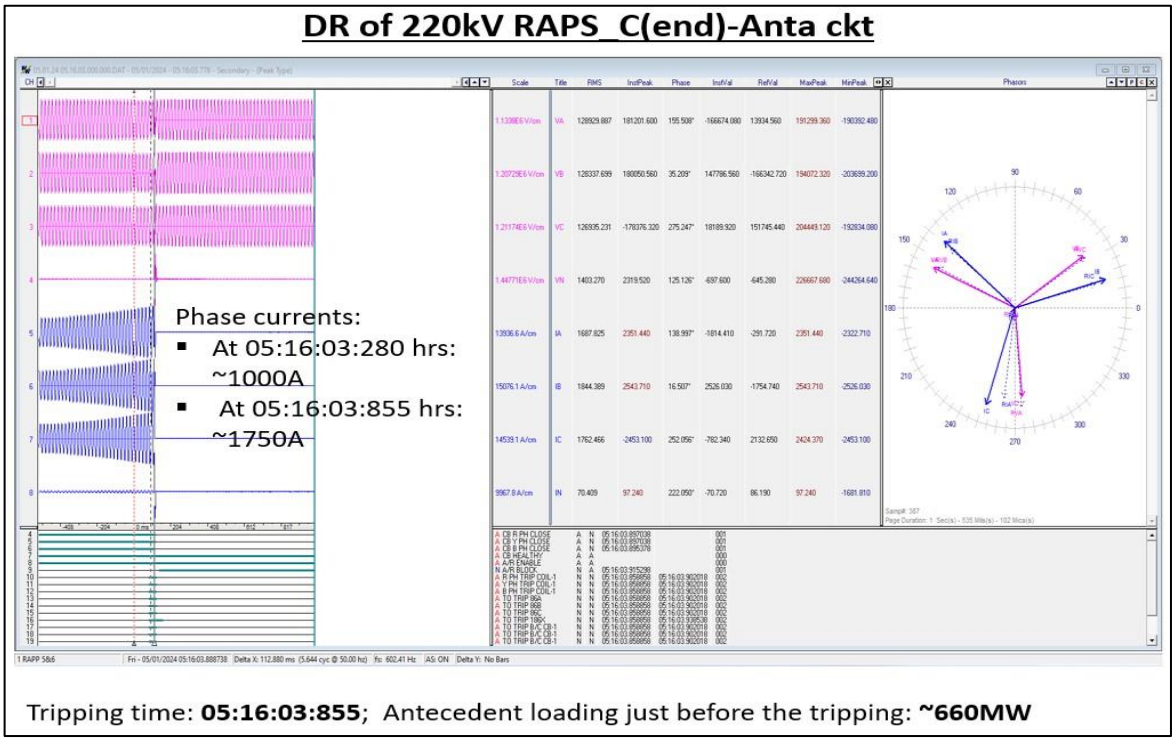

Fig.10 DR of 220kV RAPS_C(end)-Anta ckt

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.

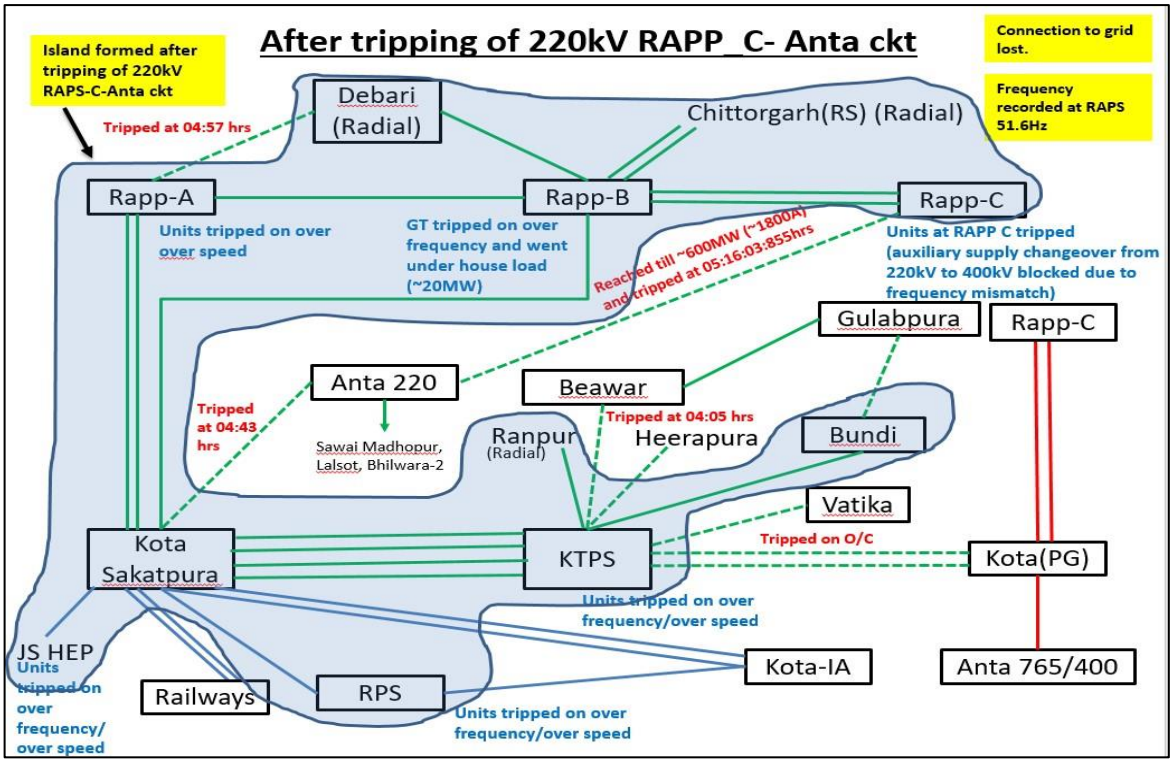

Fig.11 Island formation Scenario

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.

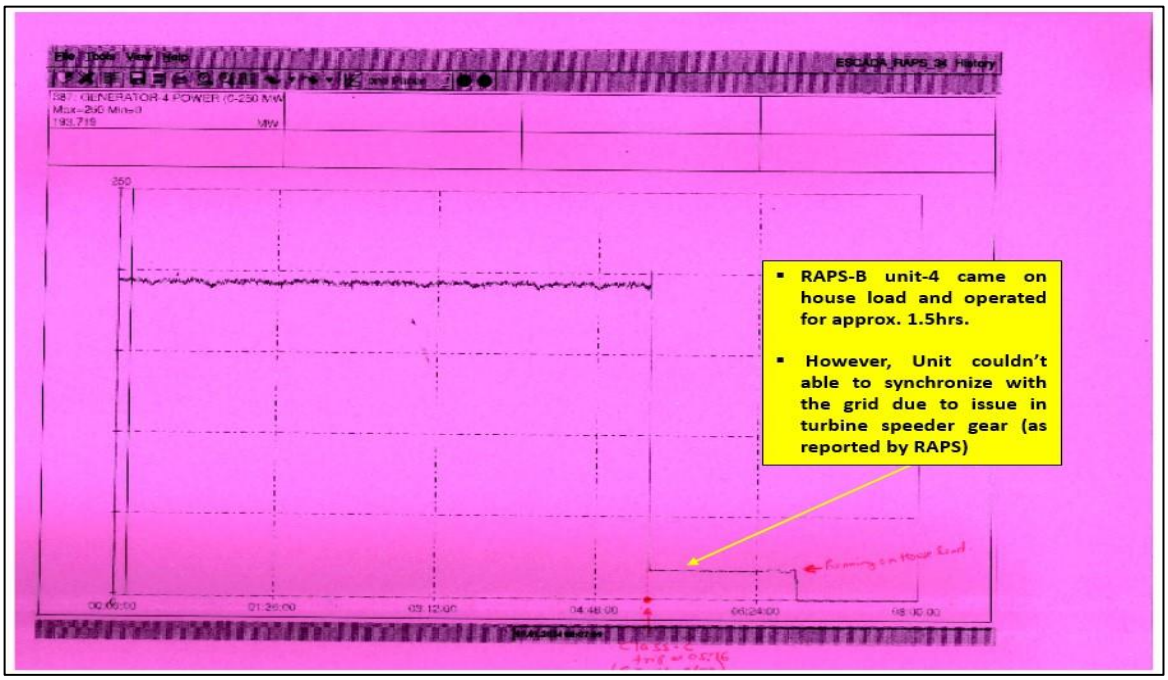

Fig.12 Generation plot of RAPS-B unit-4 (as shared by RAPS)

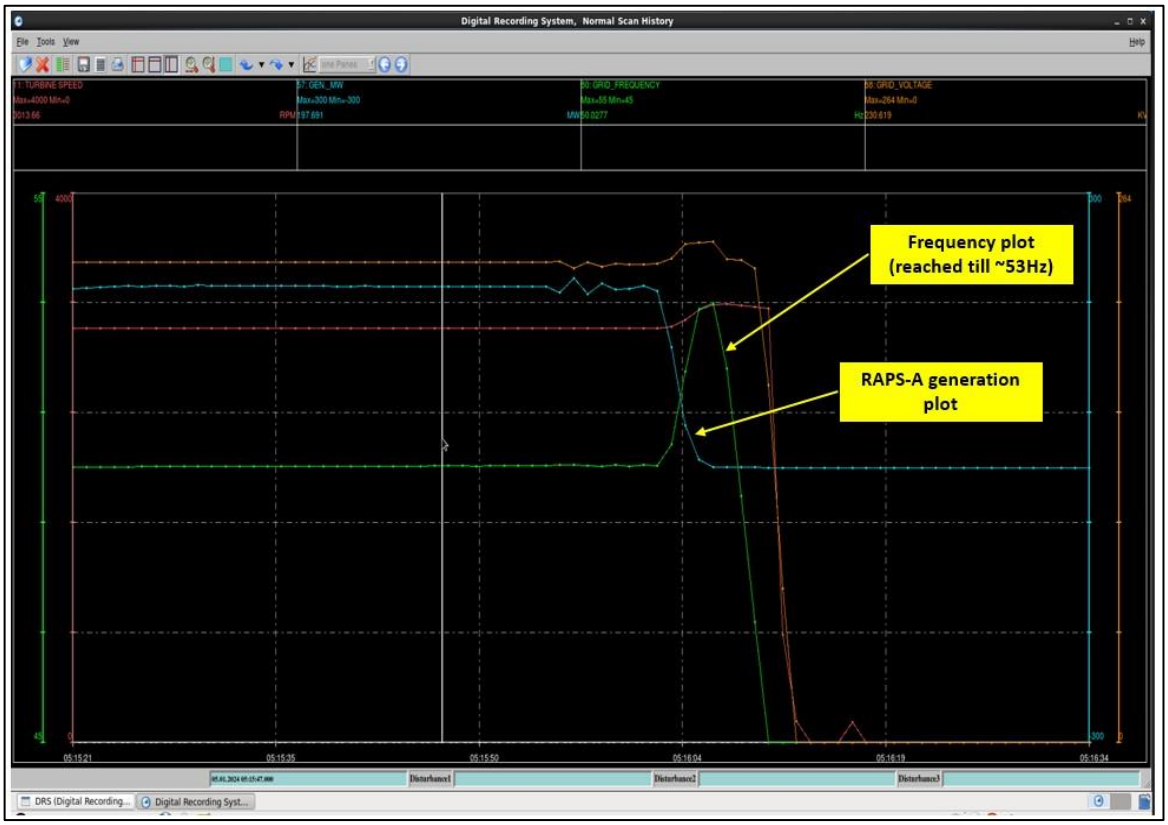

Fig.13 Digital recording system of RAPS-A during the event (as shared by RAPS)

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.

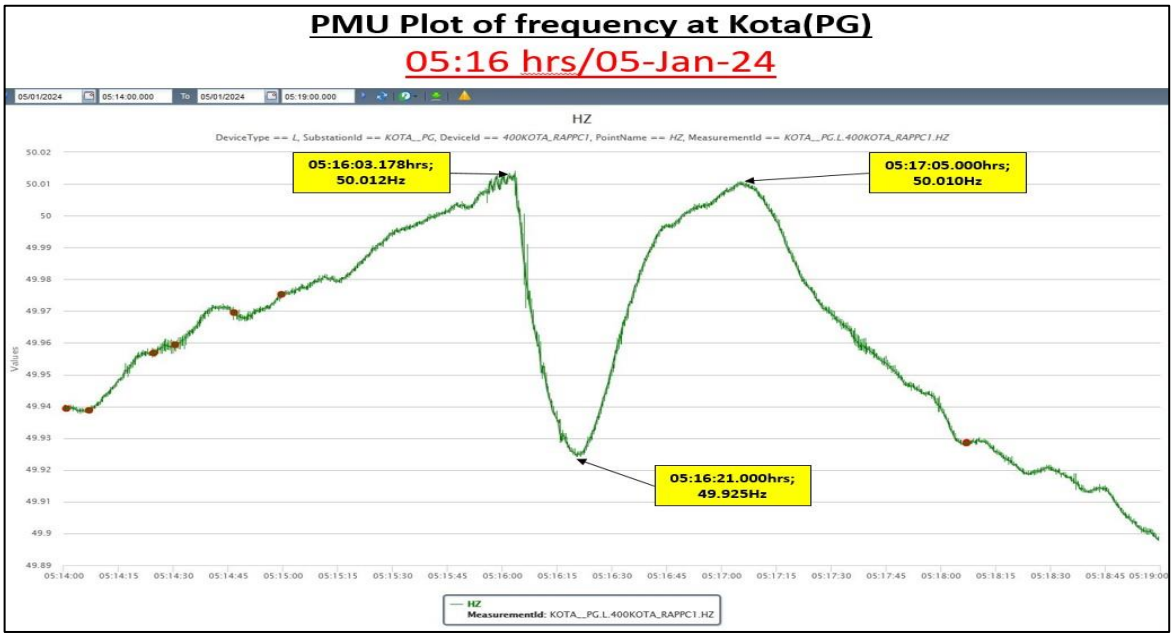

Fig.14 PMU plot of frequency at Kota(PG)

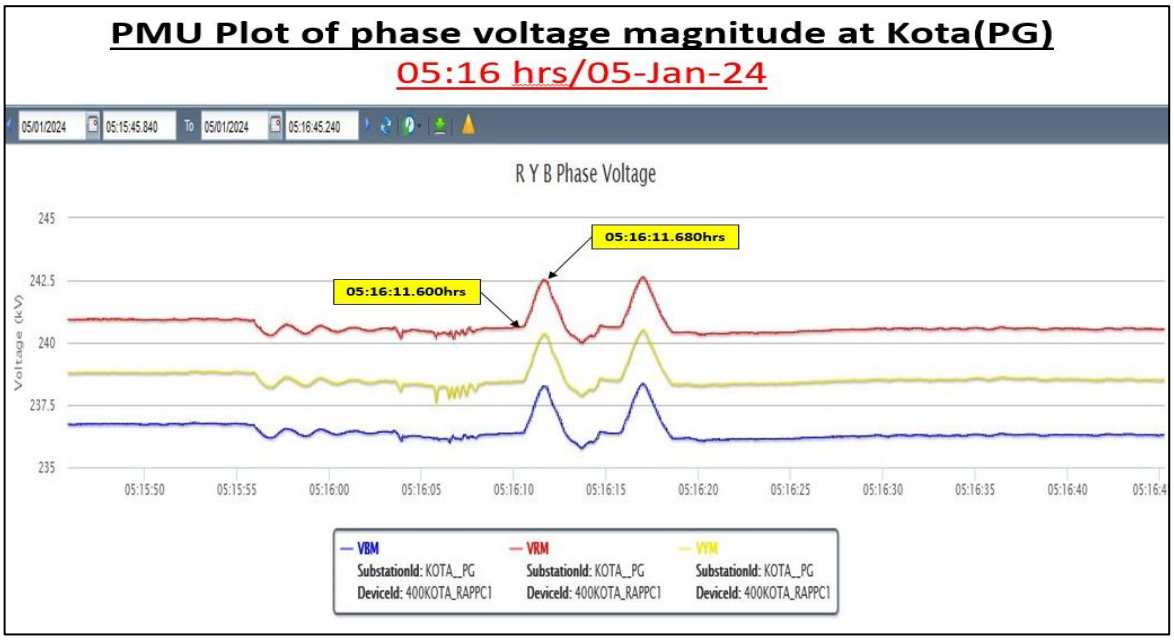

Fig.15 PMU plot of phase voltage magnitude at Kota(PG)

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.

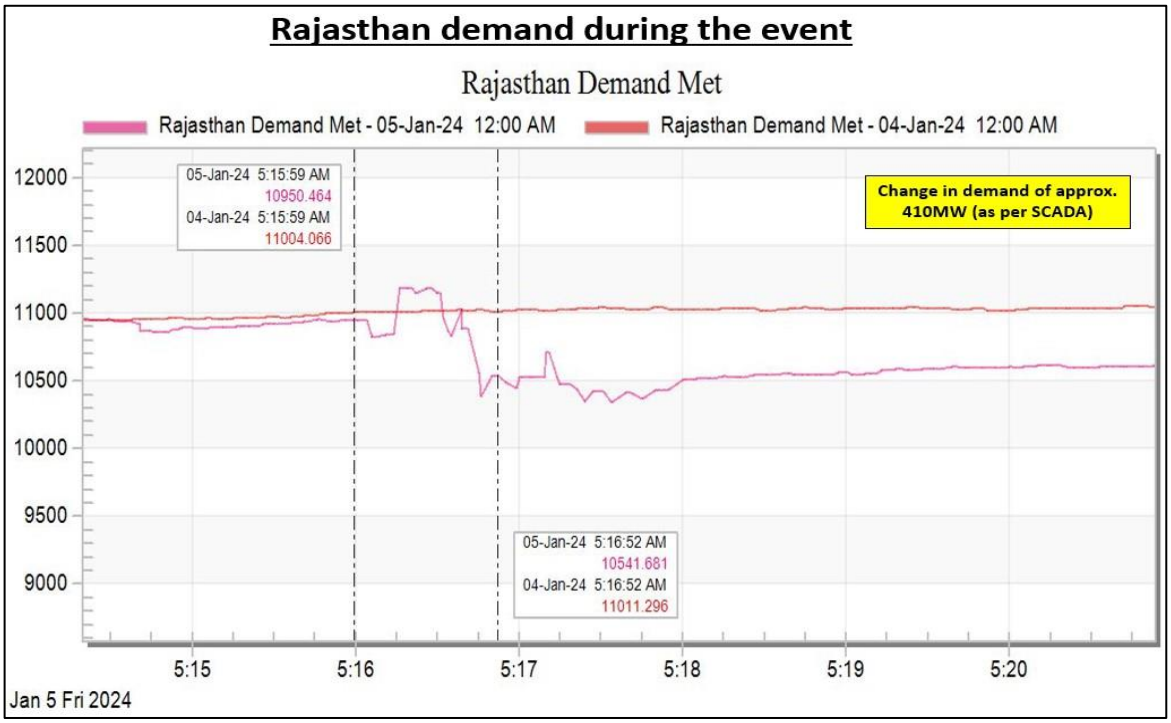

Fig.16 SCADA Plot of Rajasthan demand during the event

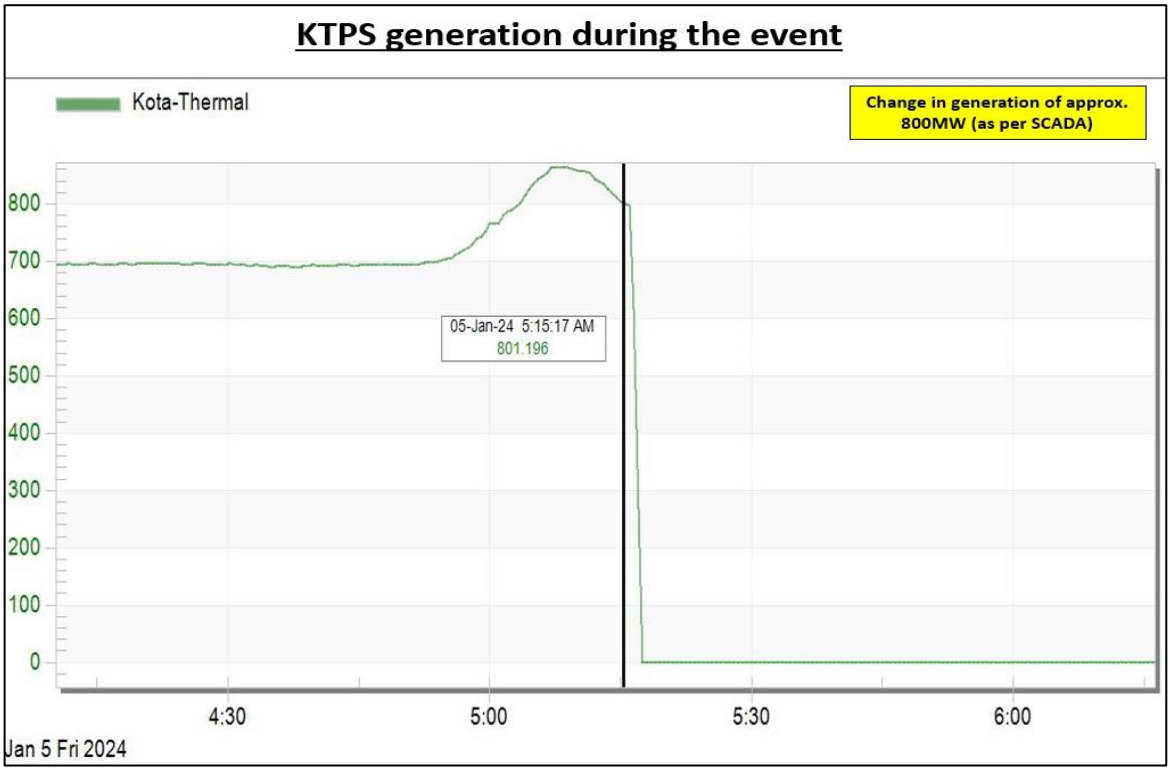

Fig.17 SCADA Plot of KTPS generation during the event

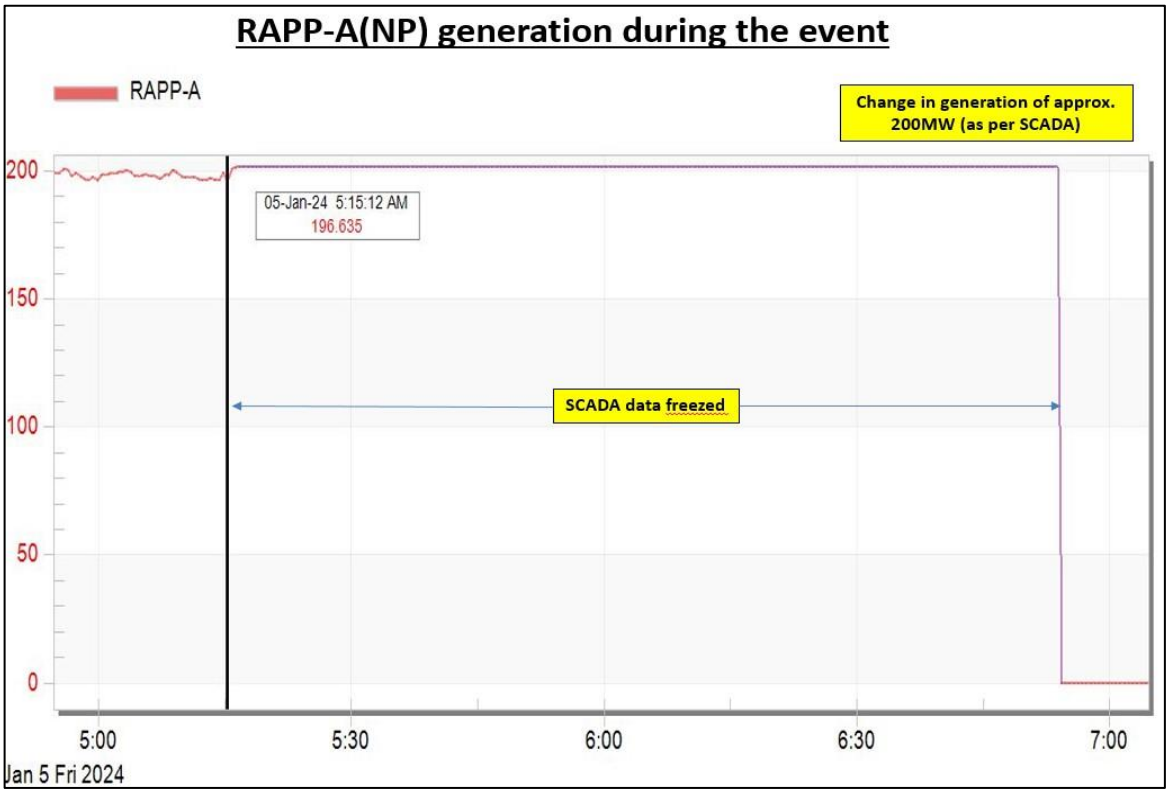

Fig.18 SCADA Plot of RAPS-A generation during the event

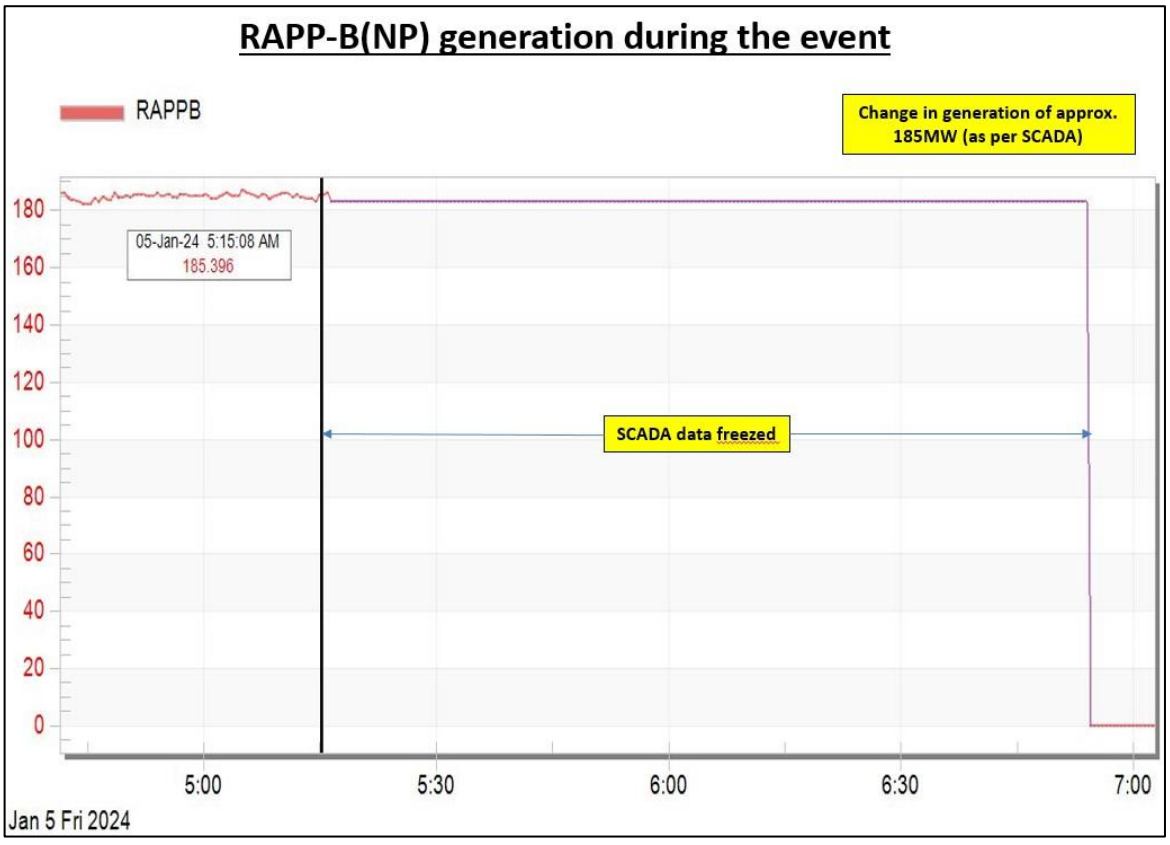

Fig.19 SCADA Plot of RAPS-B generation during the event

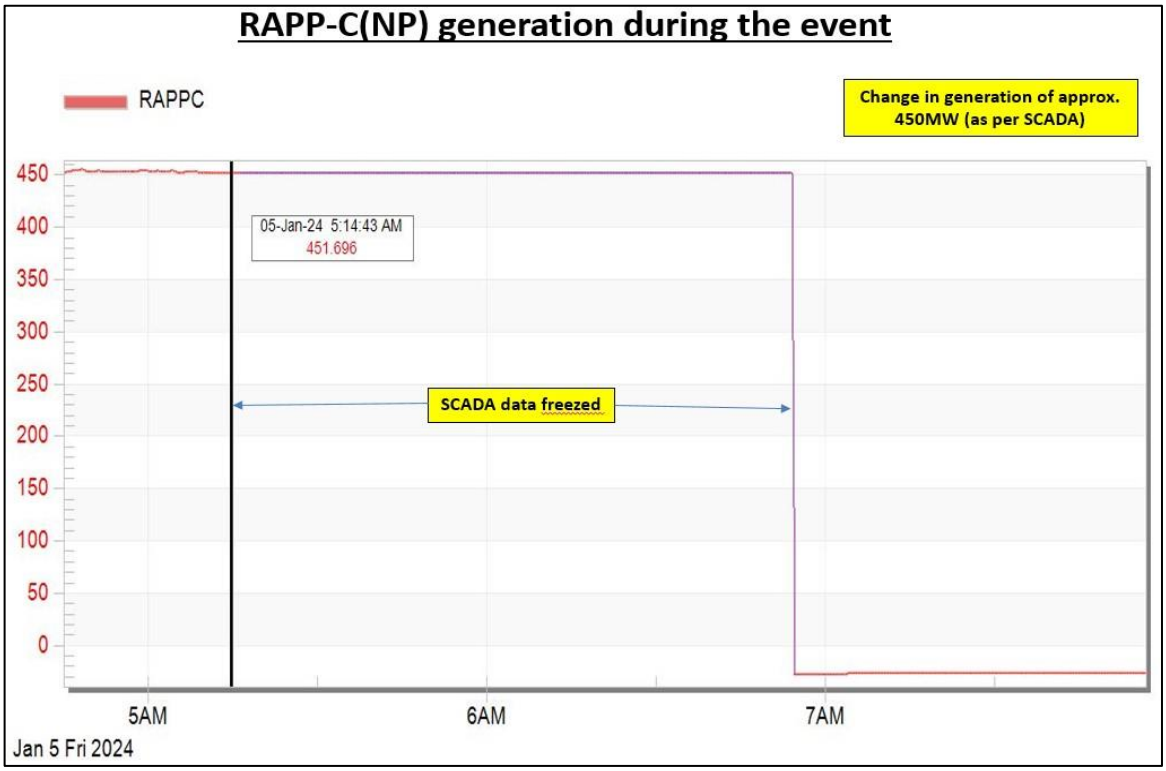

Fig.20 SCADA Plot of RAPS-C generation during the event

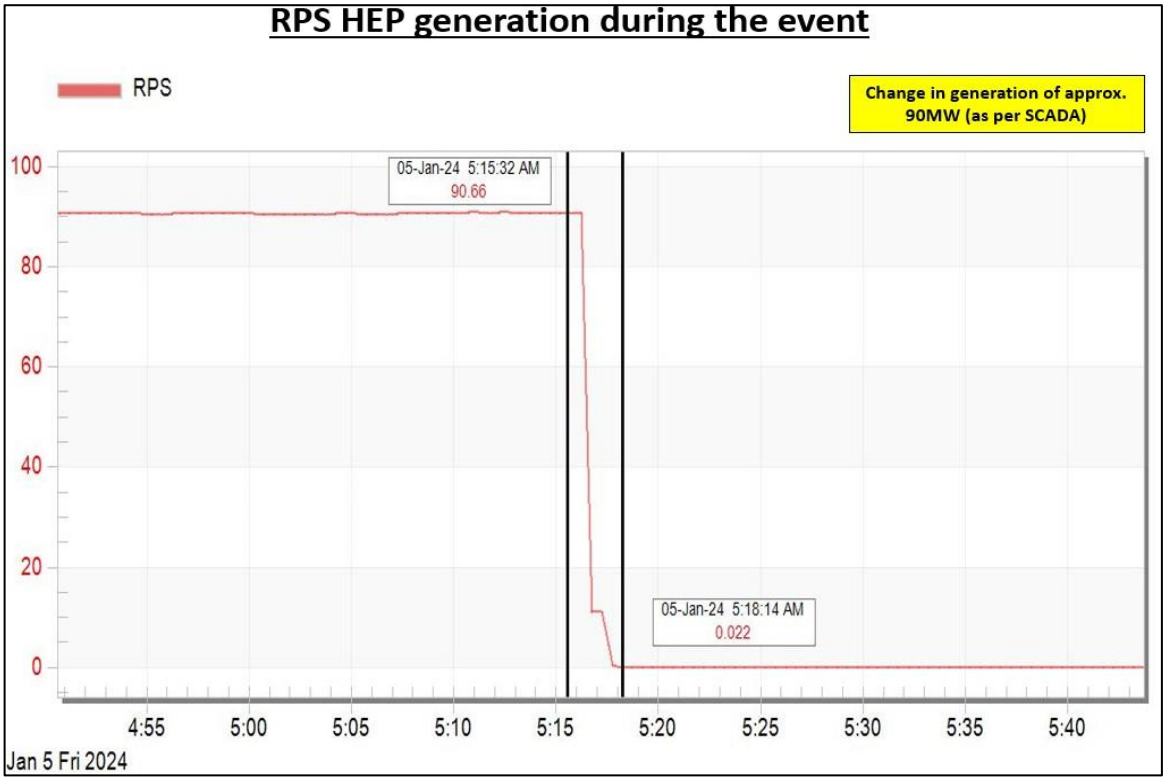

Fig.21 SCADA Plot of RPS HEP generation during the event

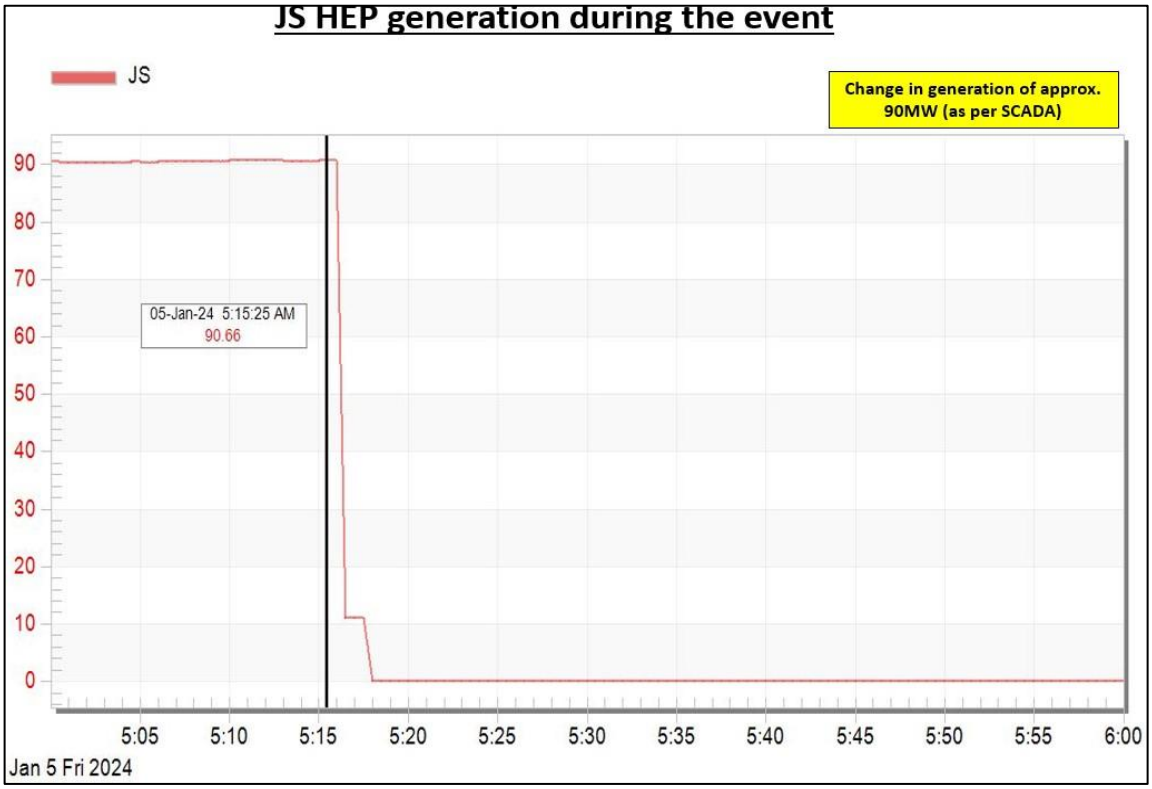

Fig.22 SCADA Plot of JS HEP generation during the event

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.

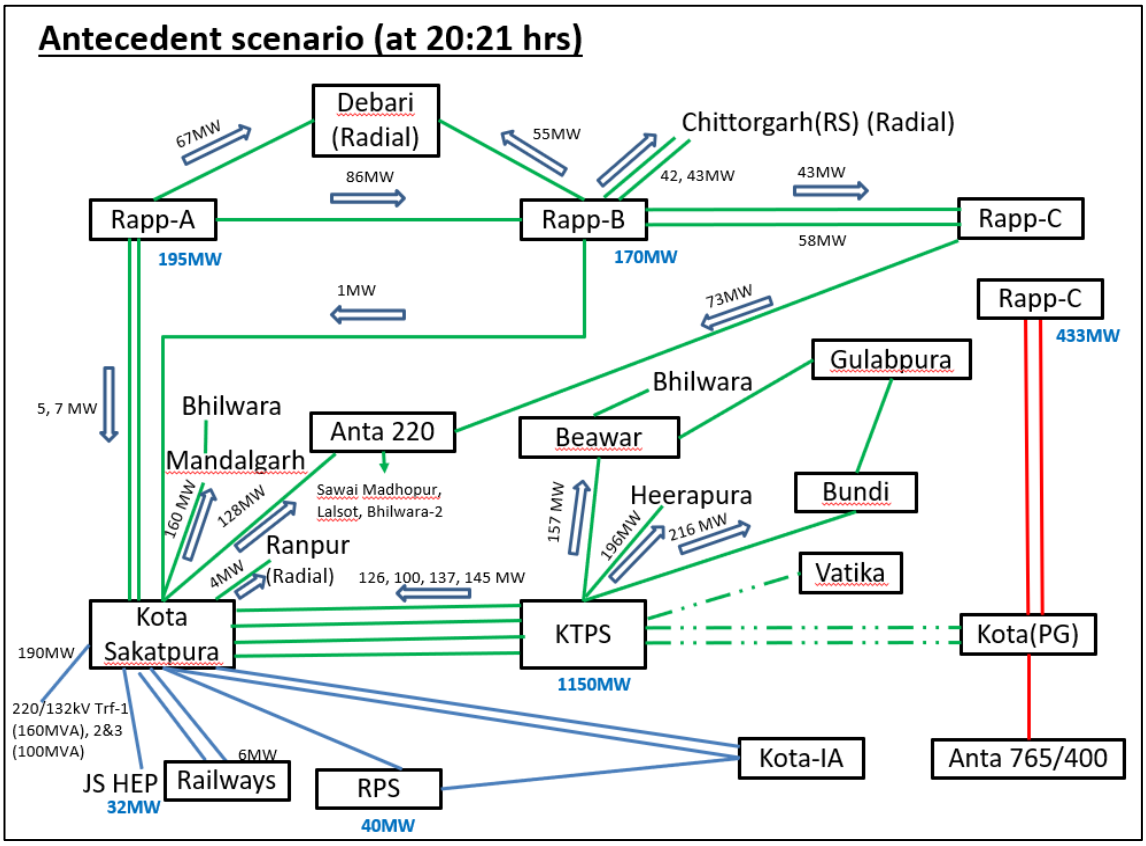

Fig.23 Antecedent scenario of the network complex

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.

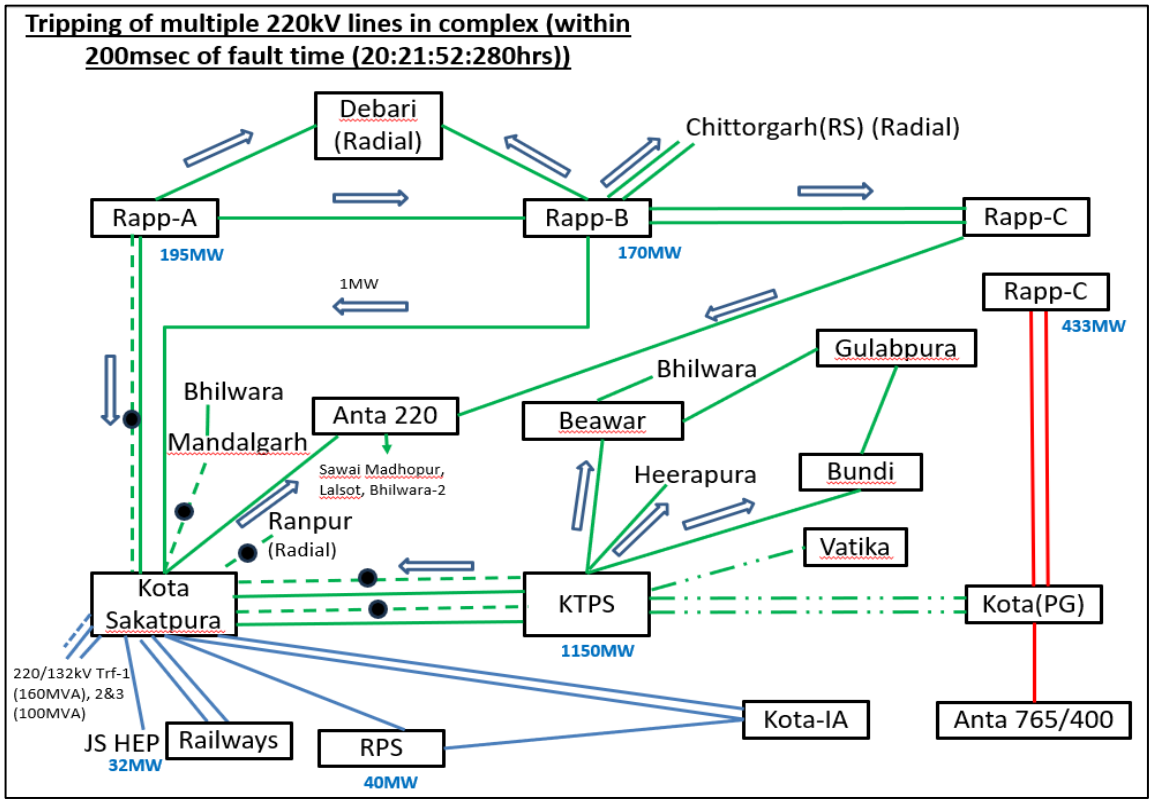

Fig.24 Tripping of multiple 220KV lines within 200msec of fault time

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.

PMU Plot of voltage of 220kV KTPS- Heerapura ckt at KTPS(RVUN)

20:22 hrs/29-Mar-24

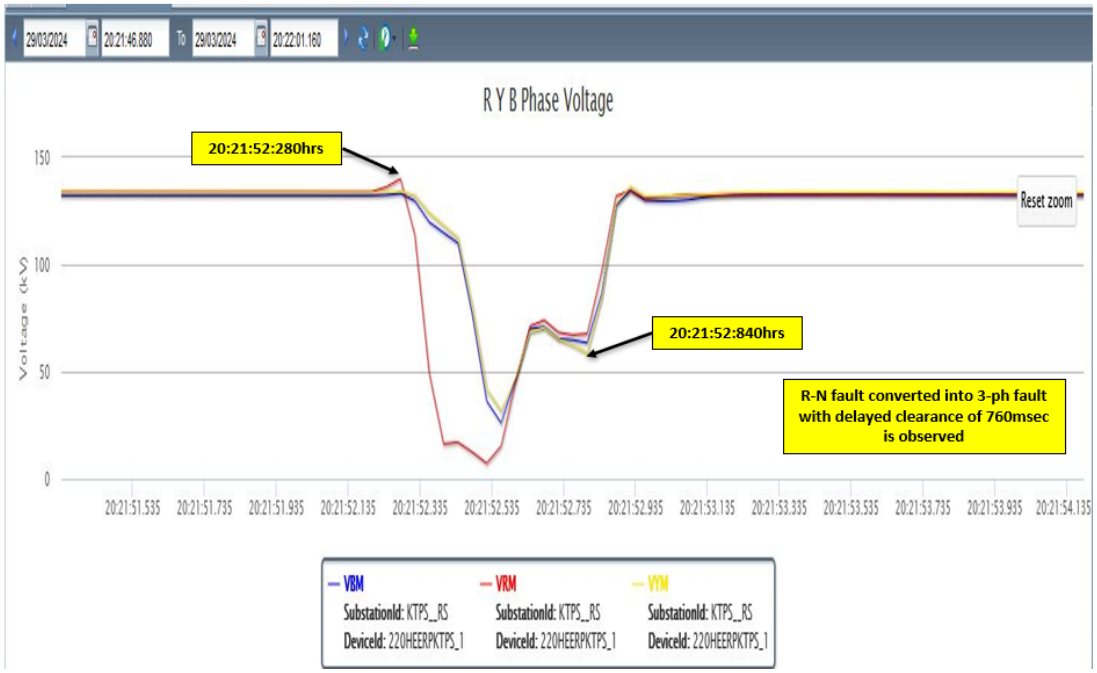

Fig.26 PMU plot of phase voltage of 220kV KTPS-Heerapura ckt

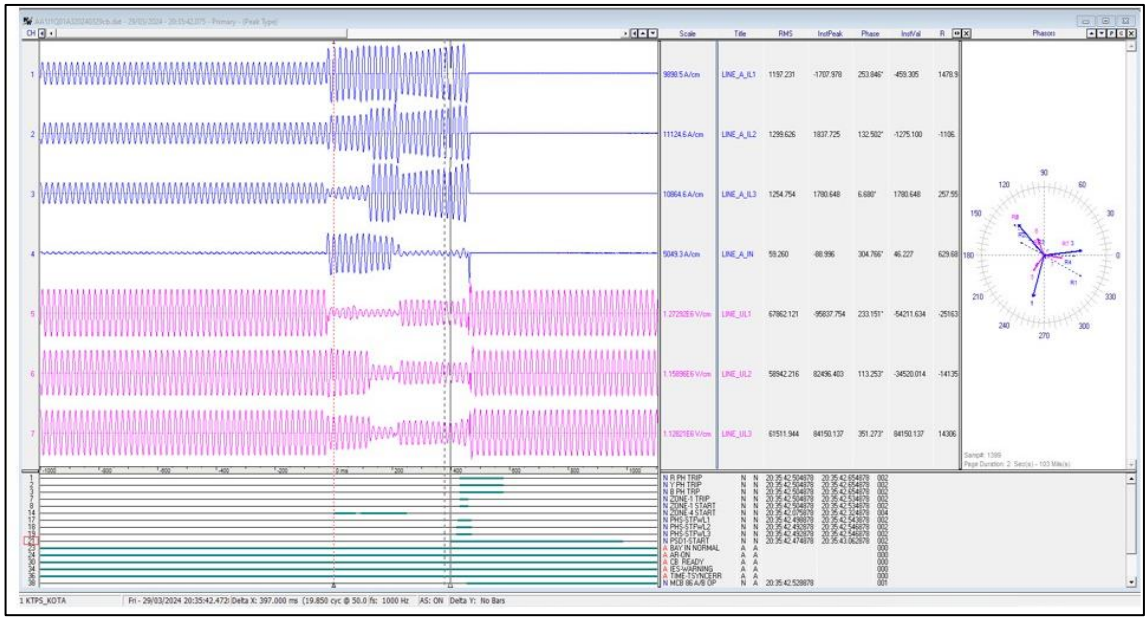

Fig.27 DR of 220kV KTPS-Sakatpura ckt at KTPS end

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).

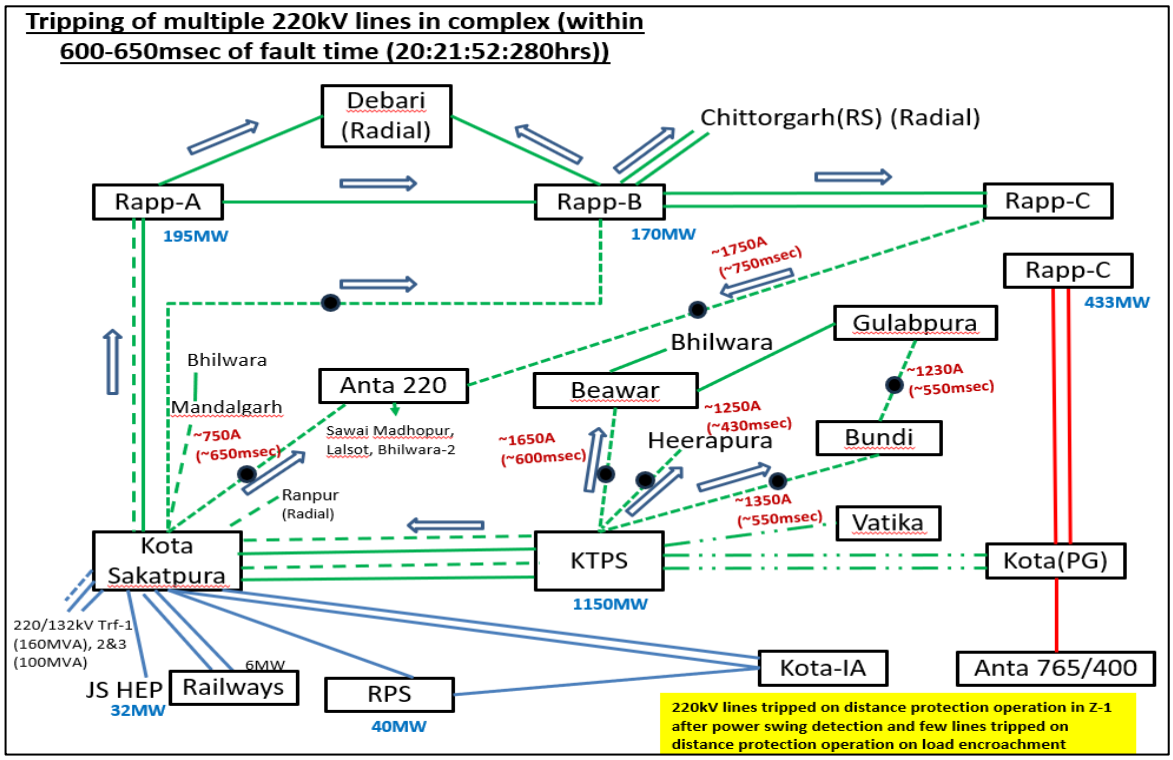

Fig.28 Tripping of multiple 220KV lines within 600-650msec of fault time

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.

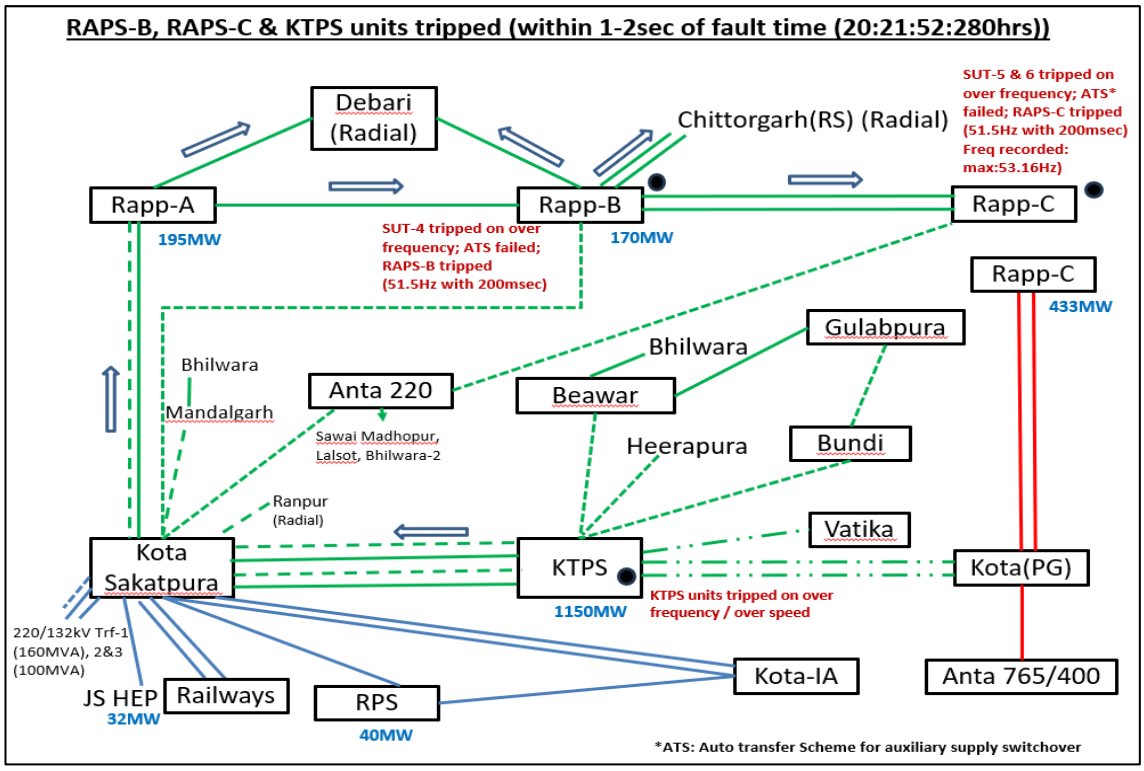

Fig.29 Tripping of units of RAPS-B, RAPS-C & KTPS within 1-2sec of fault time

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)

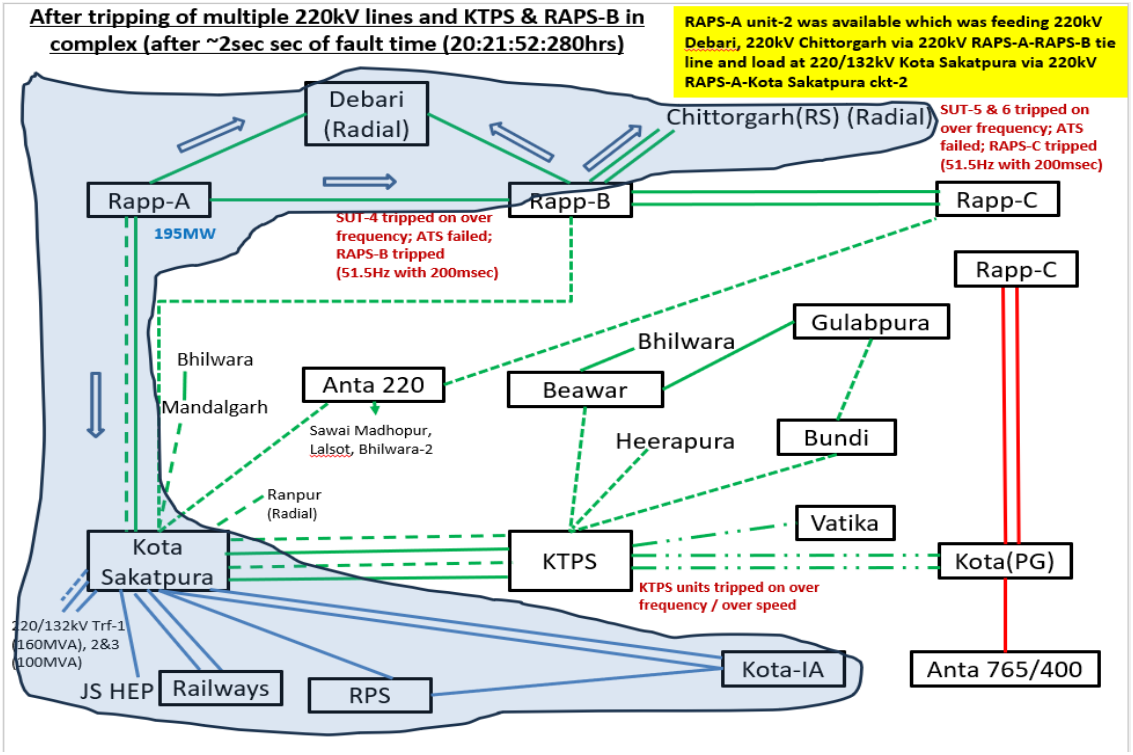

Fig.30 After tripping of RAPS, KTPS generation (after ~2sec of fault)

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.

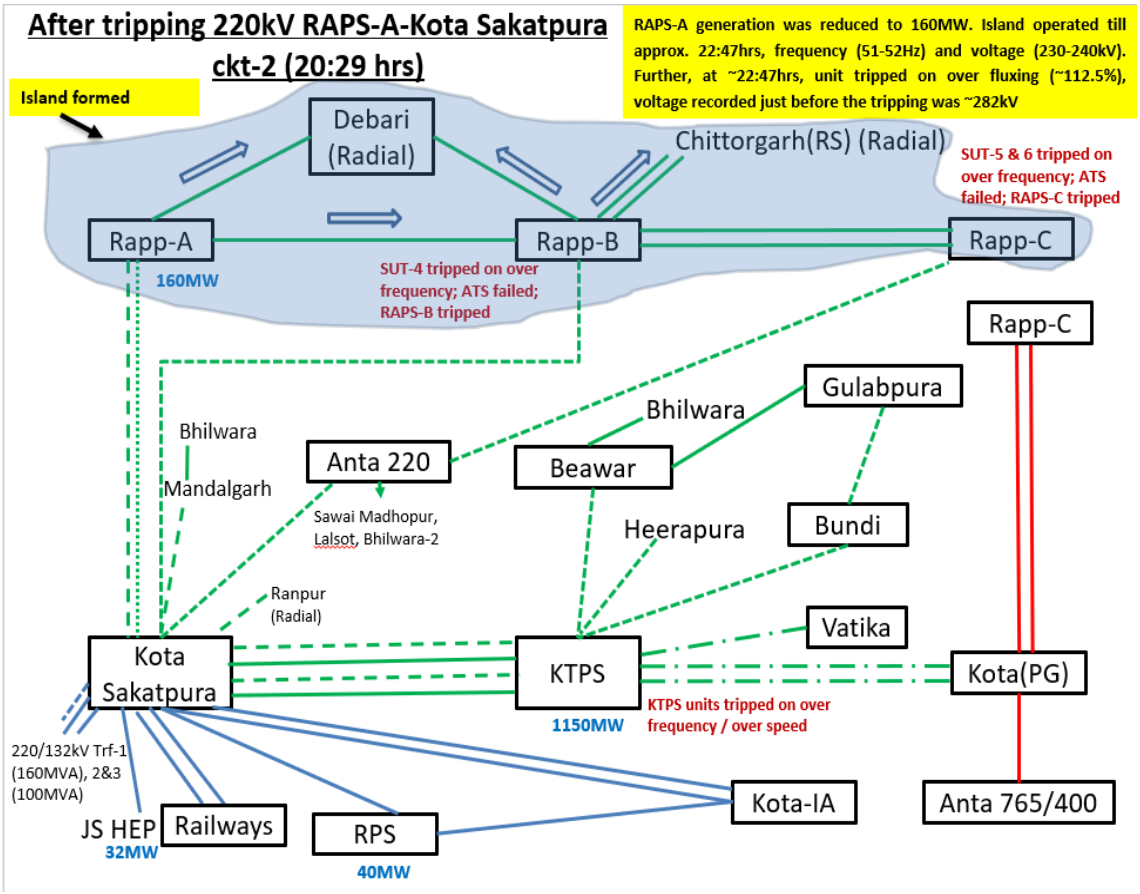

Fig.31 Island formation Scenario

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.

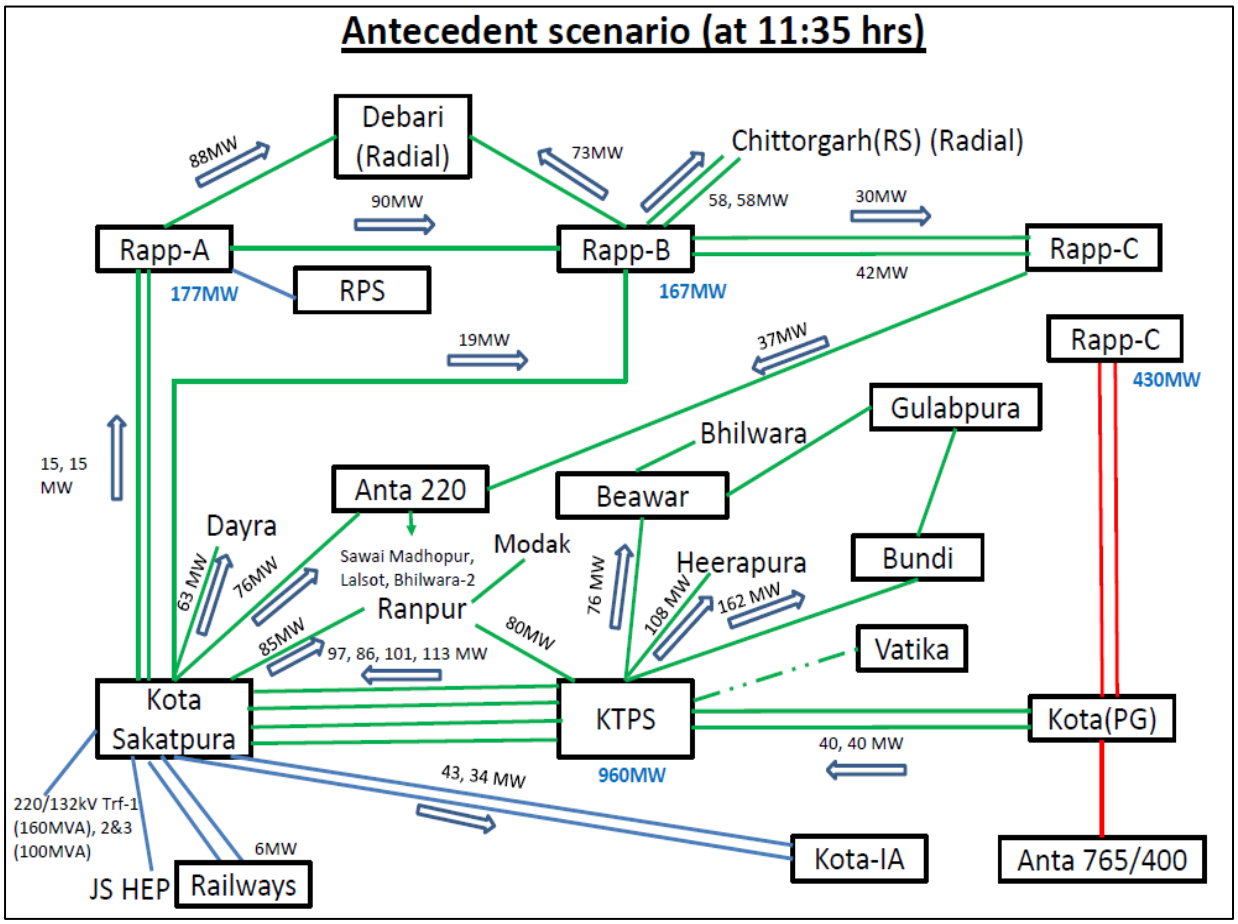

Fig. 32: load profile of the complex during antecedent condition

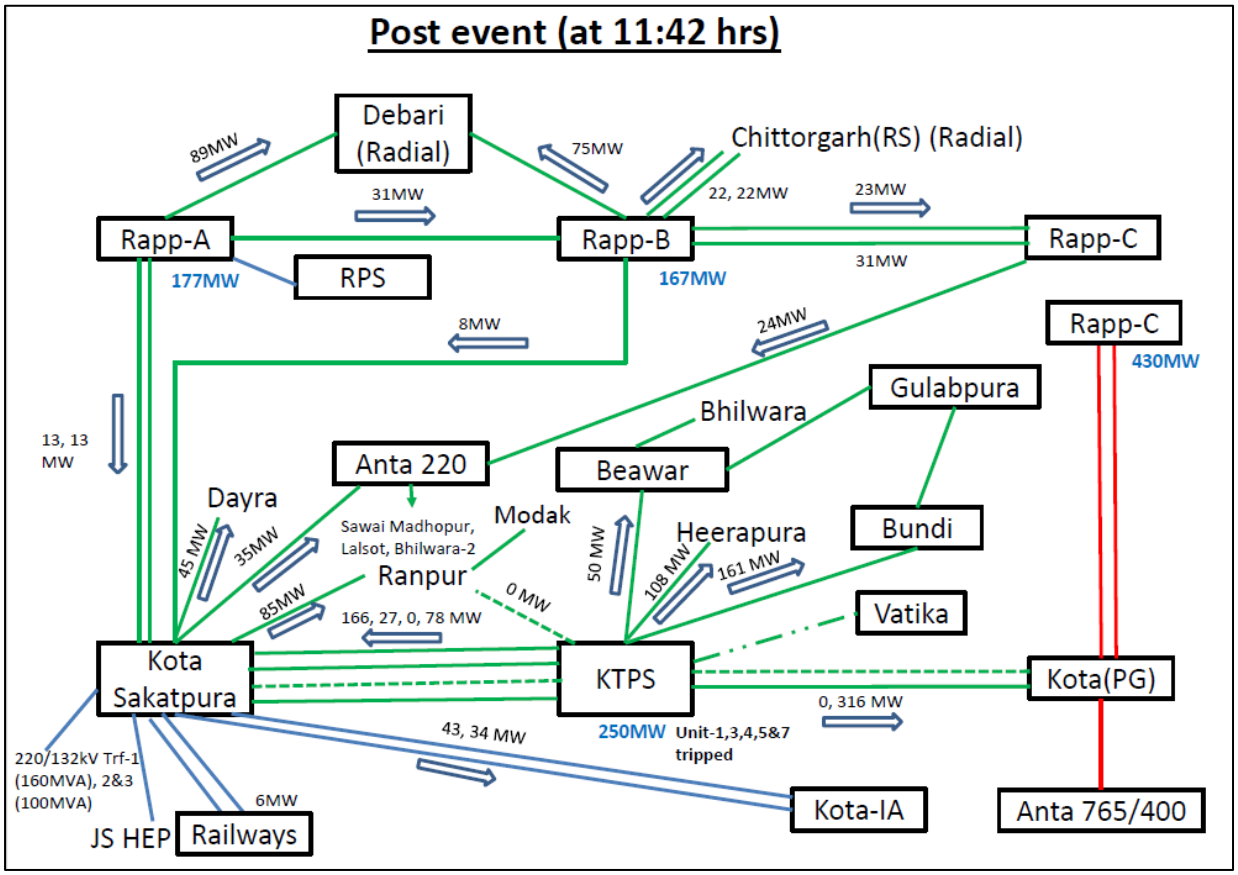

Fig. 33: loading of lines

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)
2. Sh. D.K. Jain, SE (protection Engg.), RVPN (se.prot.engg@rvpn.co.in)
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

RAJASTHAN RAJYA VIDYUT PRASARAN NIGAM LIMITED.
[Corporate Identity Number (CIN):U40109RJ2000SGC016485]
(Regd. Office: Vidyut Bhawan, Jan Path, Jyoti Nagar, Jaipur - 302 005)
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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

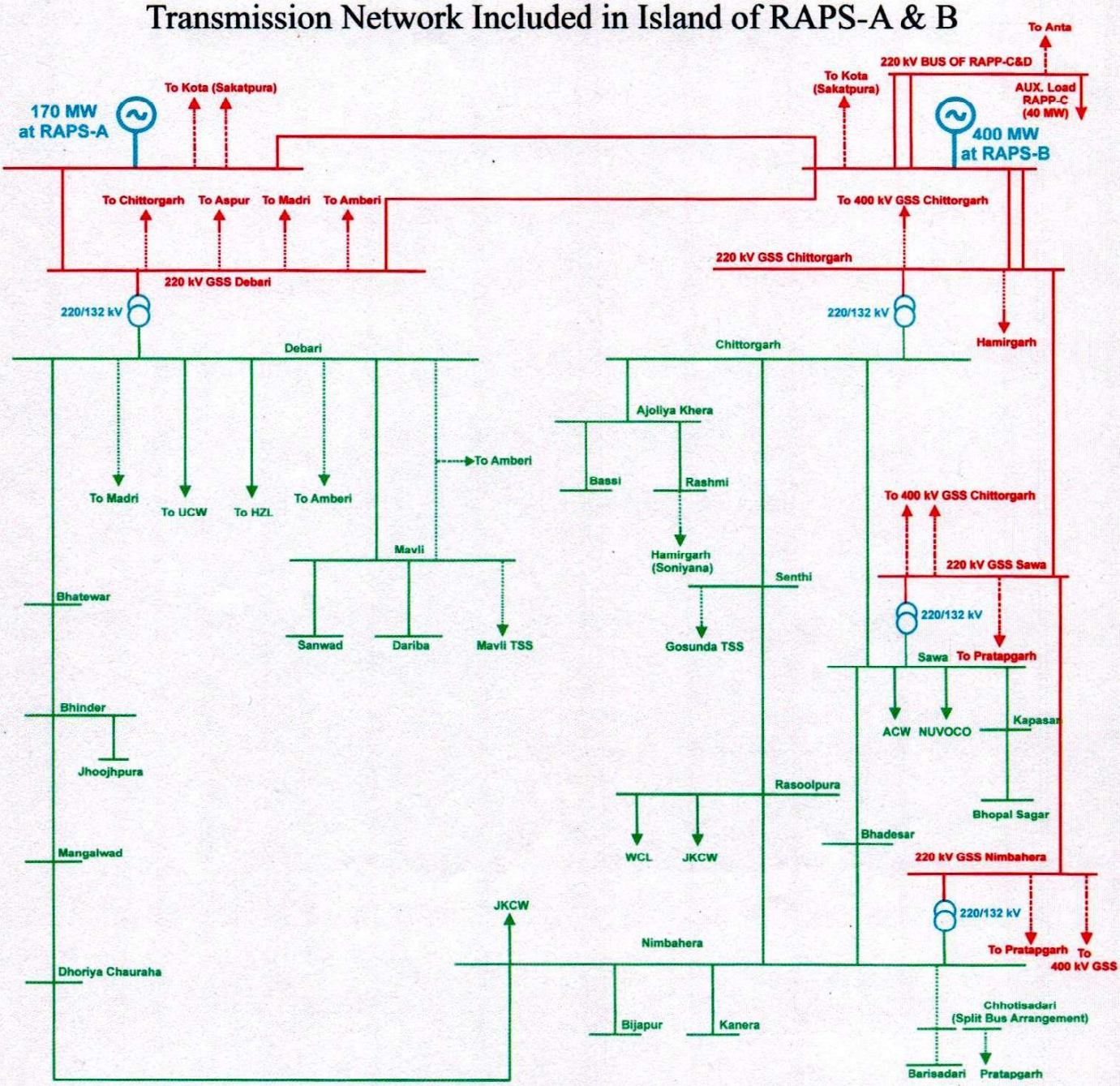
S. No.	Name of GSS	Maximum Load (MW)	Average Load (MW)
A	Gourp-A for 370 MW		
A.1	Load at 220 kV GSS Debari		
1	220 KV GSS Debari	26	16
2	132 KV GSS Mavli	26.28	12
3	132 KV GSS Sanwad	21.85	13
4	132 KV GSS Dariba	24.43	15
5	132 KV Hindustan Zinc Limited (Industry)	41	24.7
6	132 KV GSS Bhatewar	39.31	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.

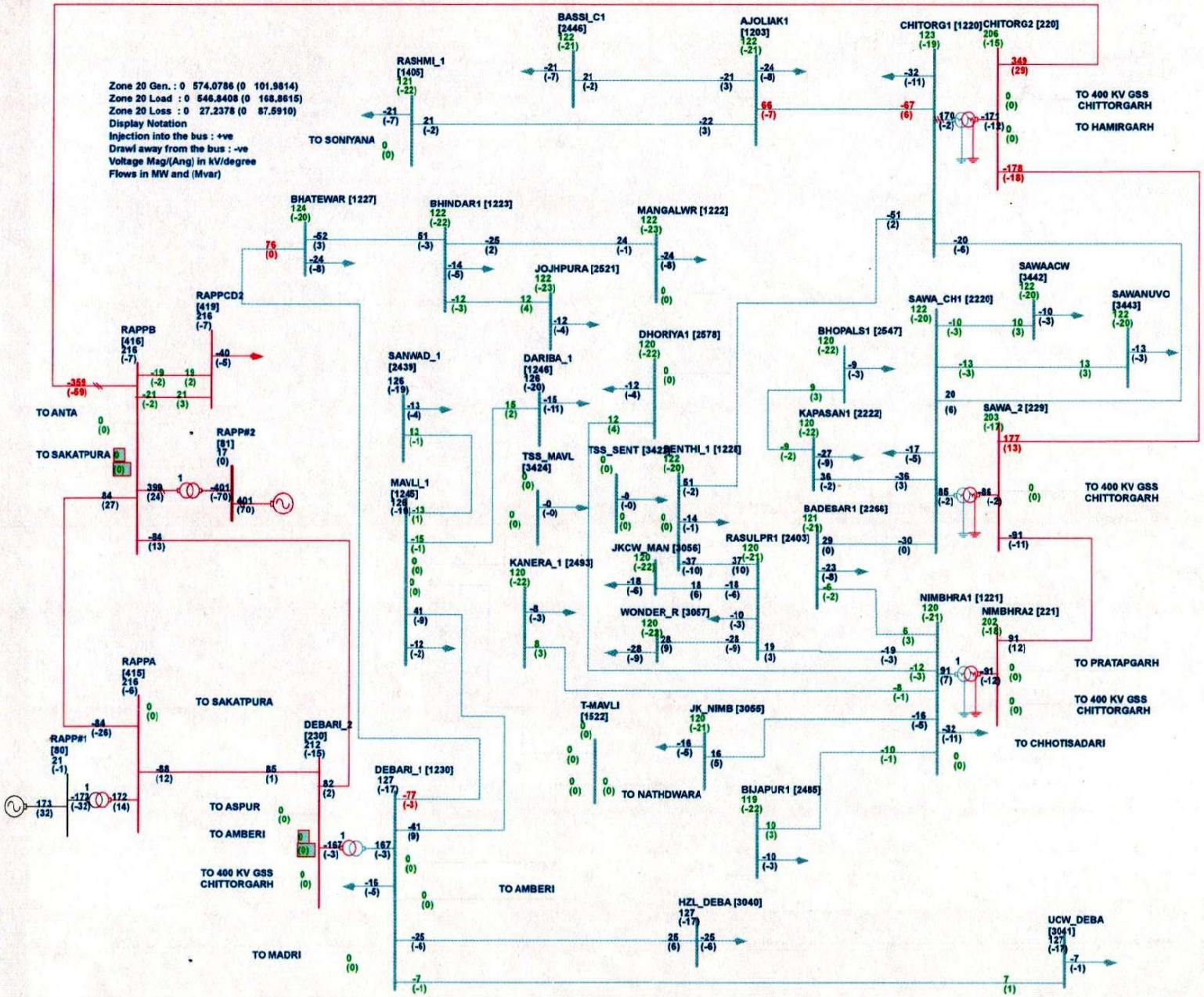
2.0 EFFECT ON STATION:

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

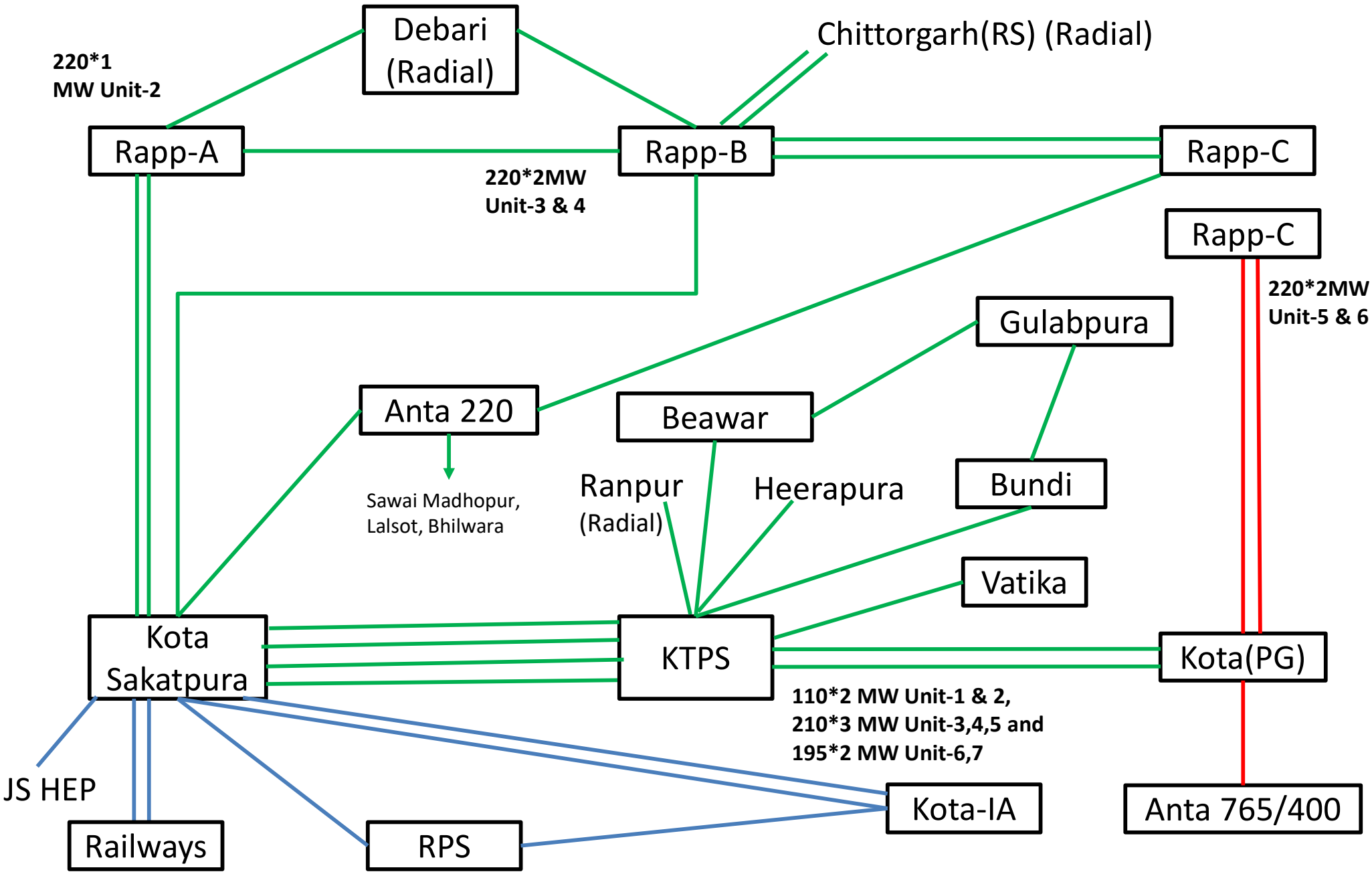
S. No.	Frequency (U/F Scenario)	Unit-3 & Unit-4
1.	48 Hz, INST	U/F Alarm initiates and Kota Line Will Trip and Anta Line Will Trip at RRS 5&6 End Rajasthan sub system separates from Northern grid (Chittor Ckt 1,Chittor Ckt 2 ,Udaipur Line and RRS 5&6 Tie Line Will remain Close)
2.	47.7 Hz + 5 Sec or 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]
BENTHI_1 [1224]
TSS_MAVL [3424]
MAVLI_1 [1245]
RAPP#2 [81]
TO SAKATPURA
BADESAR1 [2266]
RASULPR1 [2403]
JKCW_MAN [3056]
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 CHHOTISADARI
TO ASPUR
TO AMBERI
TO NATHDWARA
BIJAPUR1 [2485]
HZL_DEBA [3040]
UCW_DEBA [3041]
TO MADRI

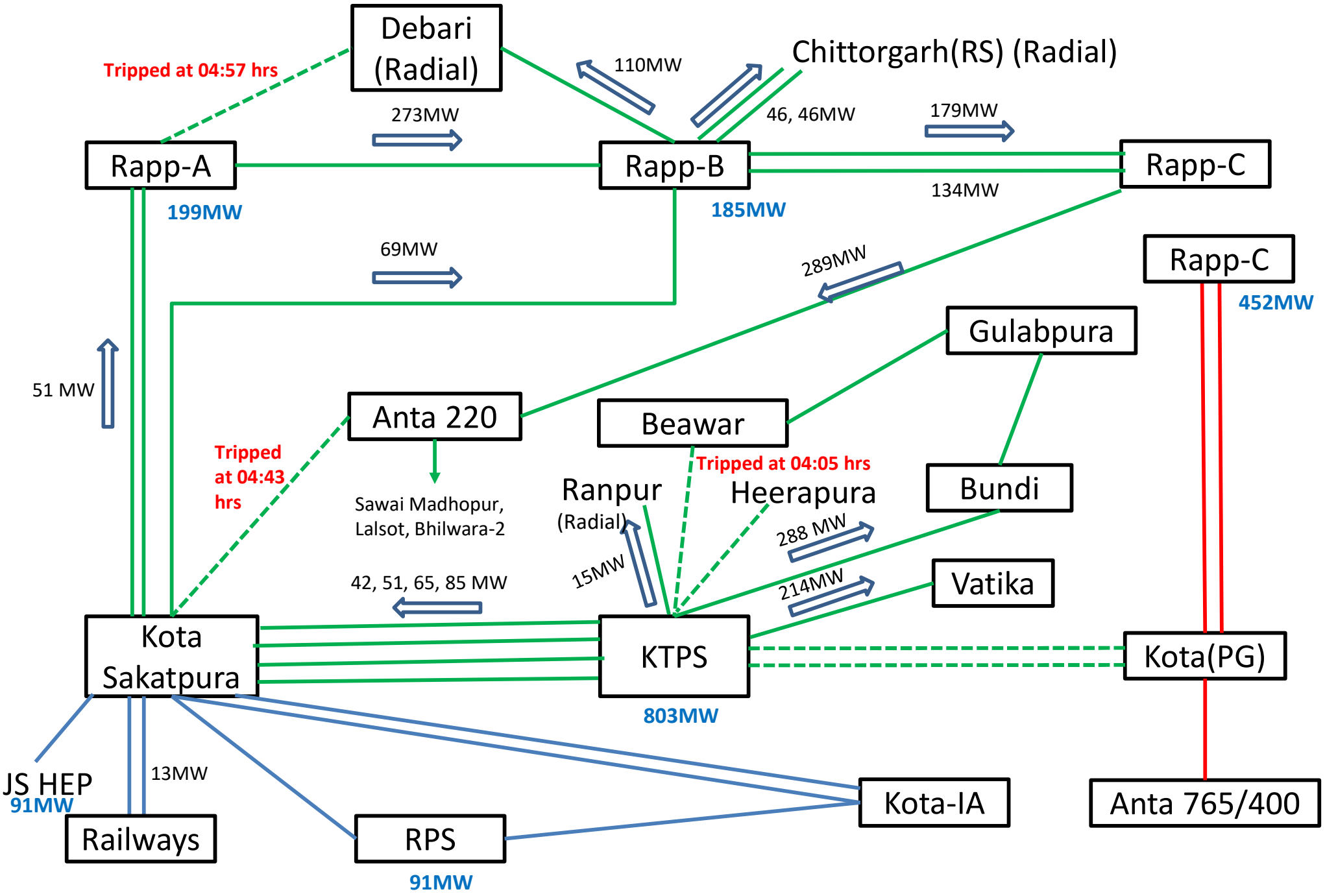
MULTIPLE ELEMENTS TRIPPING AT KTPS(RS), RAPP-A, RAPP-B AND RAPP-C

AT 05:16HRS ON 05TH JAN'2024

Connection Diagram between KTPS, RAPP-A, RAPP-B & RAPP-C

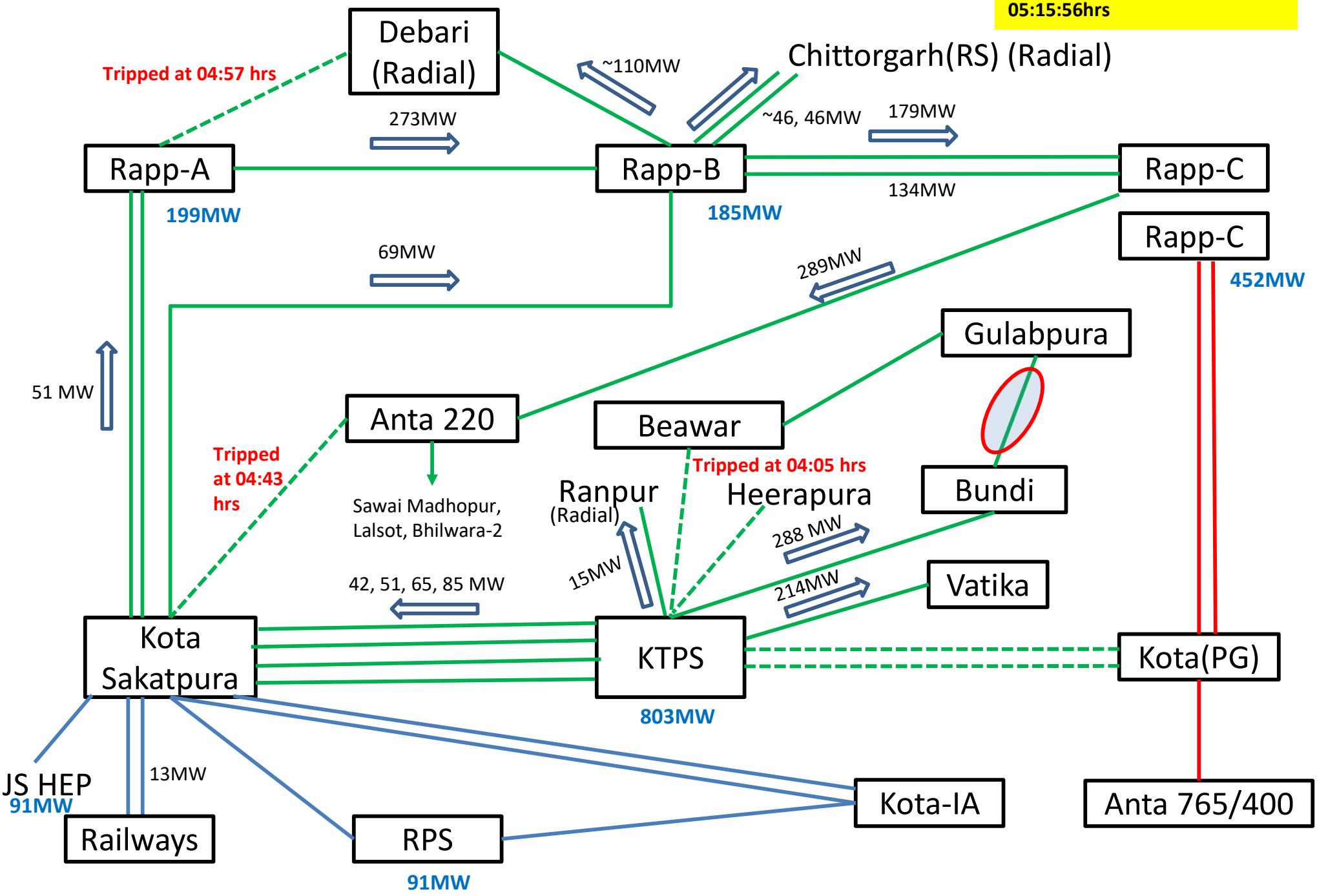


Antecedent scenario (at 05:15 hrs)



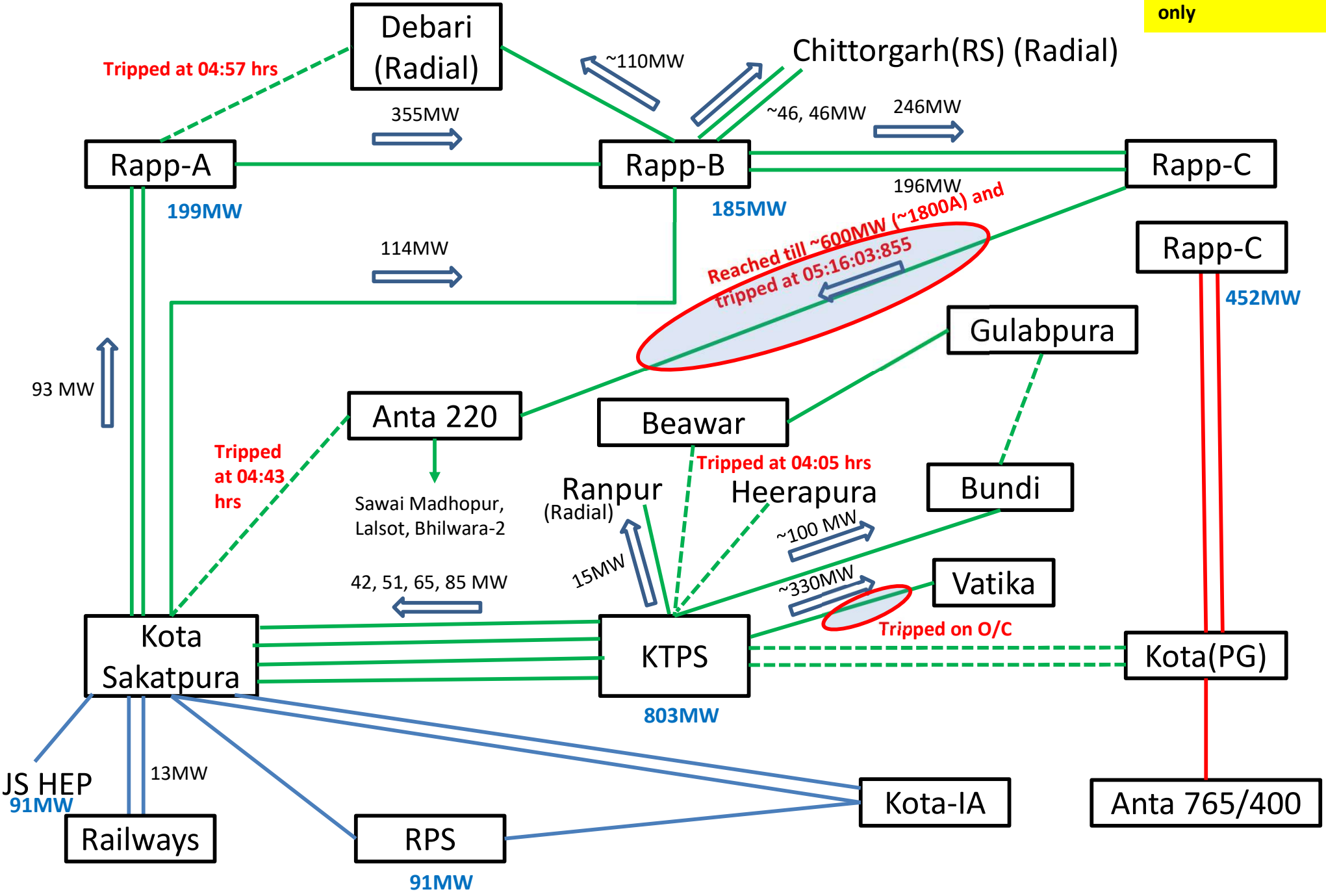
Triggering incident

Triggering incident: opening of 220kV Bundi-Gulabpura ckt at 05:15:56hrs

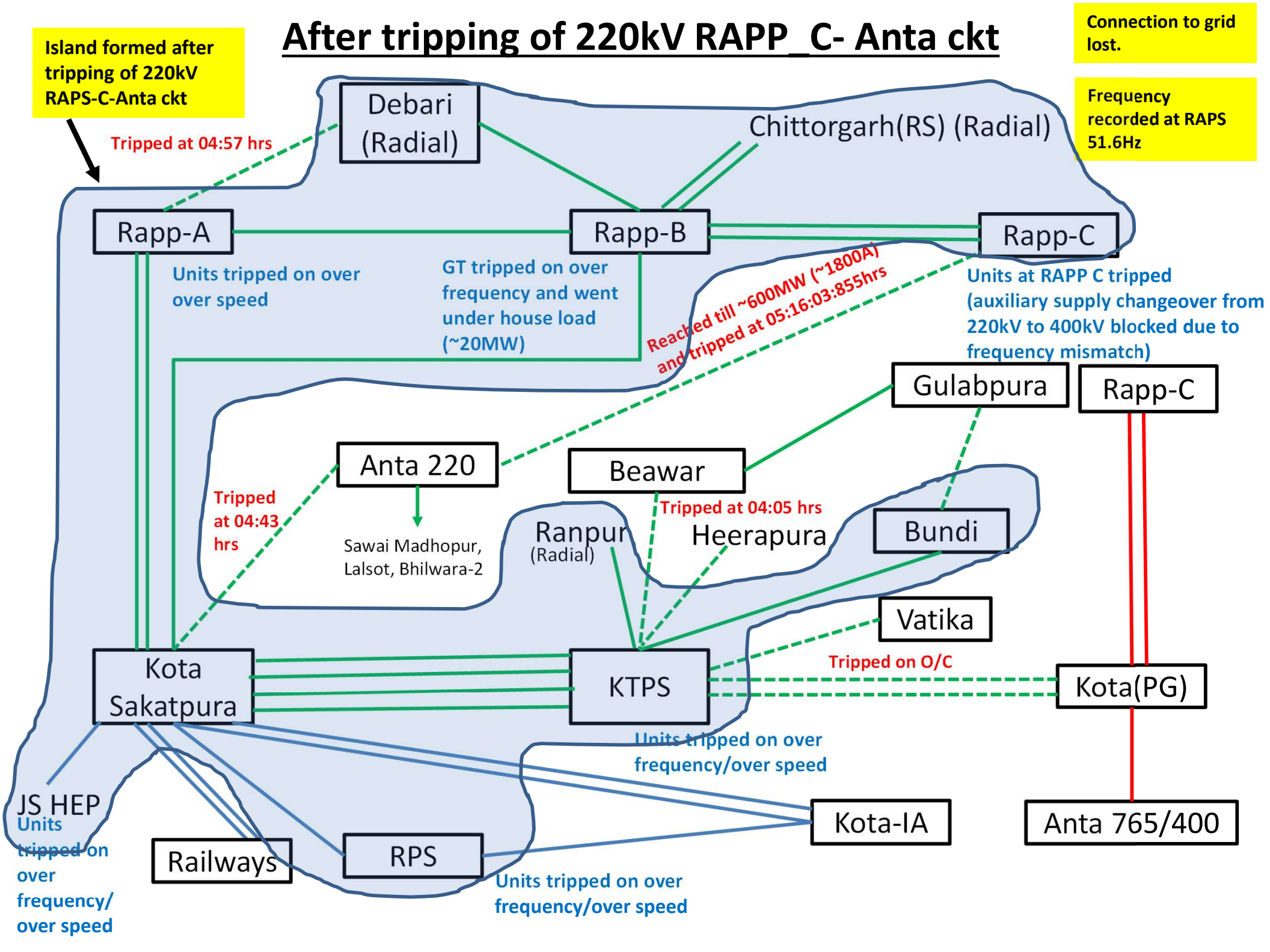


After opening of 220kV Bundi-Gulabpura ckt

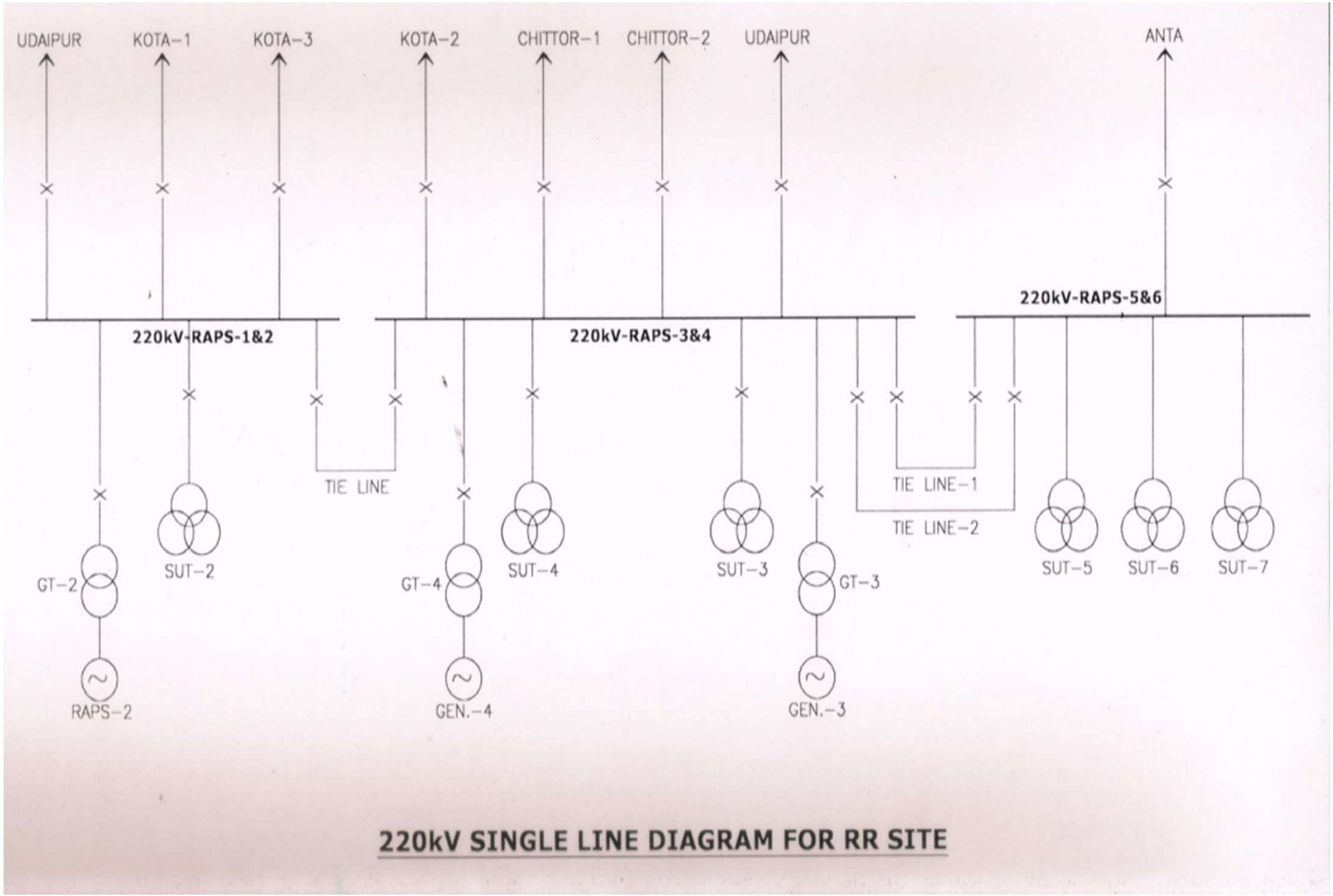
System was connected to grid via Anta and Vatika only



After tripping of 220kV RAPP_C- Anta ckt

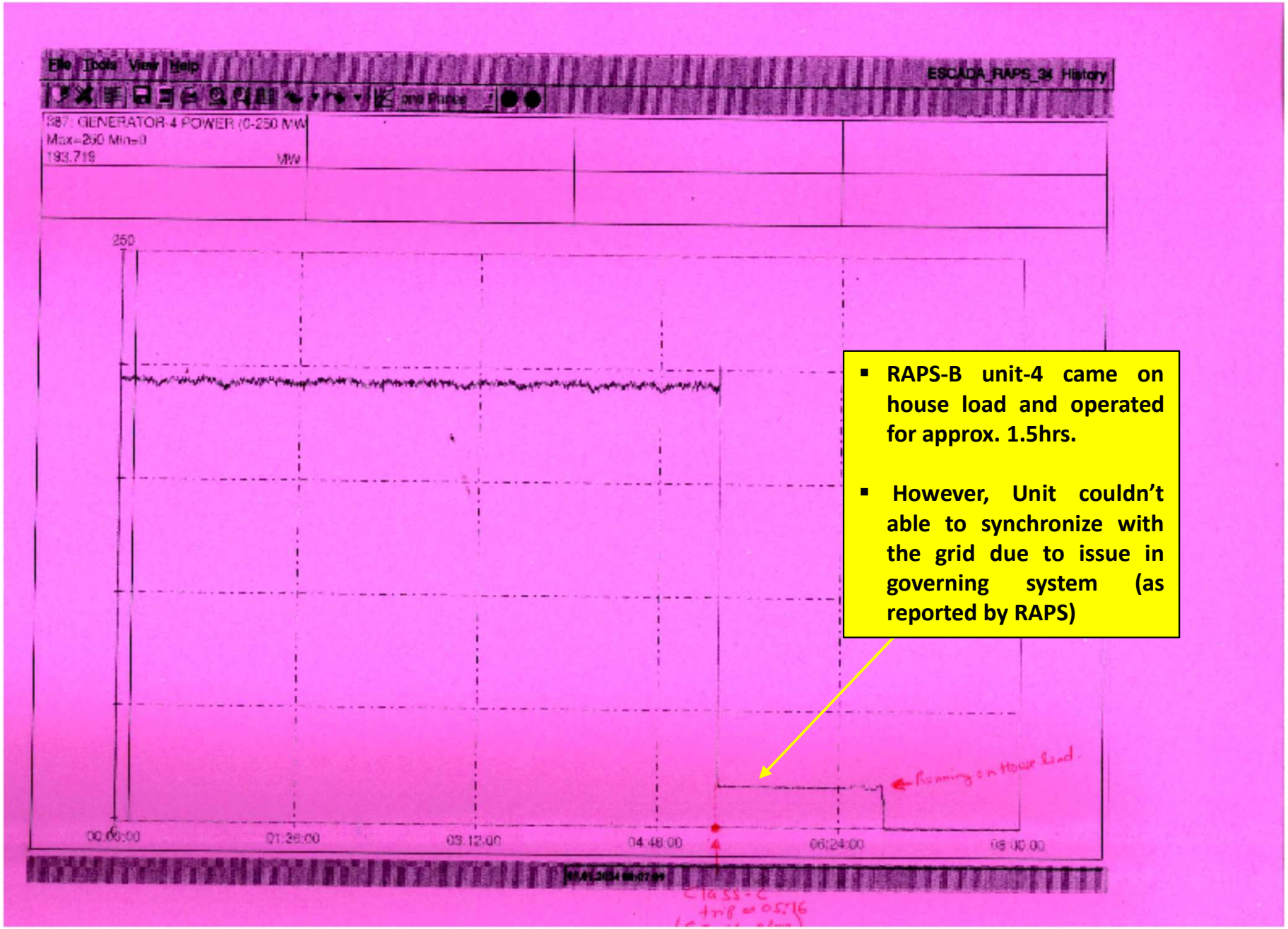


SLD and connectivity of RAPS- A, RAPS-B & RAPS-C



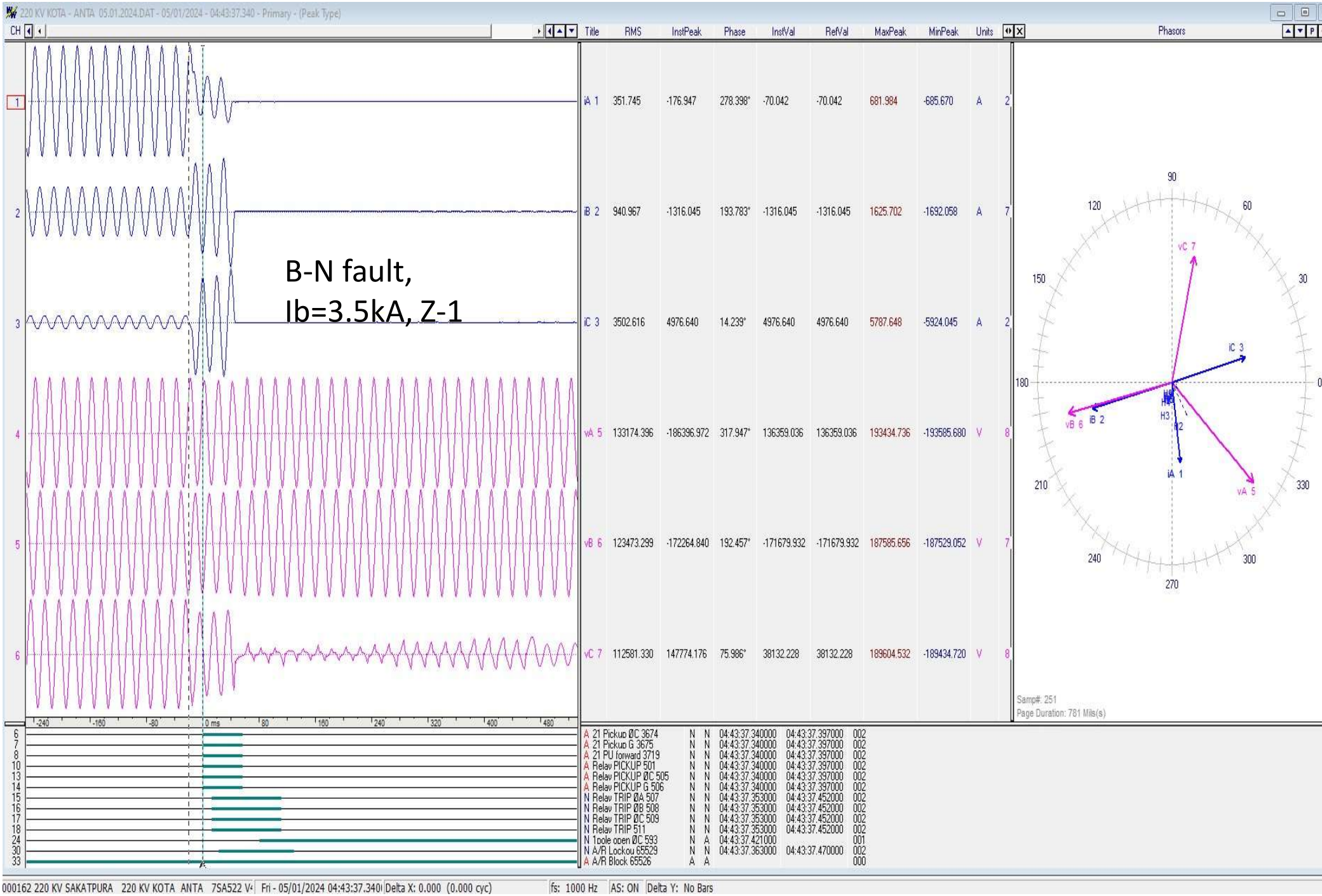
Digital recording system of RAPS-A during the event (shared by RAPS)

Generation plot of RAPS-B unit-4 (shared by RAPS)

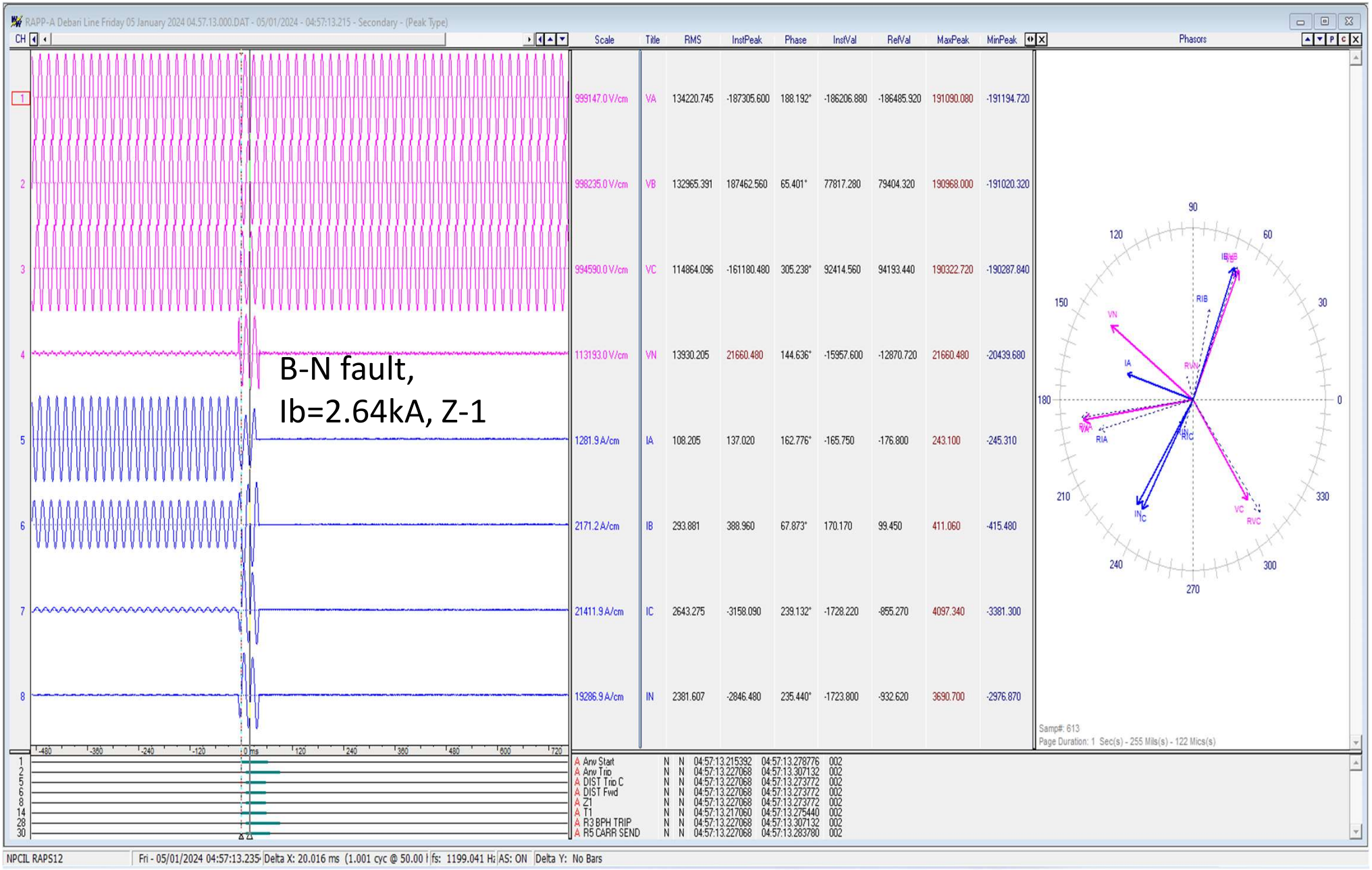


- **RAPS-B unit-4 came on house load and operated for approx. 1.5hrs.**
- **However, Unit couldn't able to synchronize with the grid due to issue in governing system (as reported by RAPS)**

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



DR of 220kV RAPS_A(end)-Debari ckt

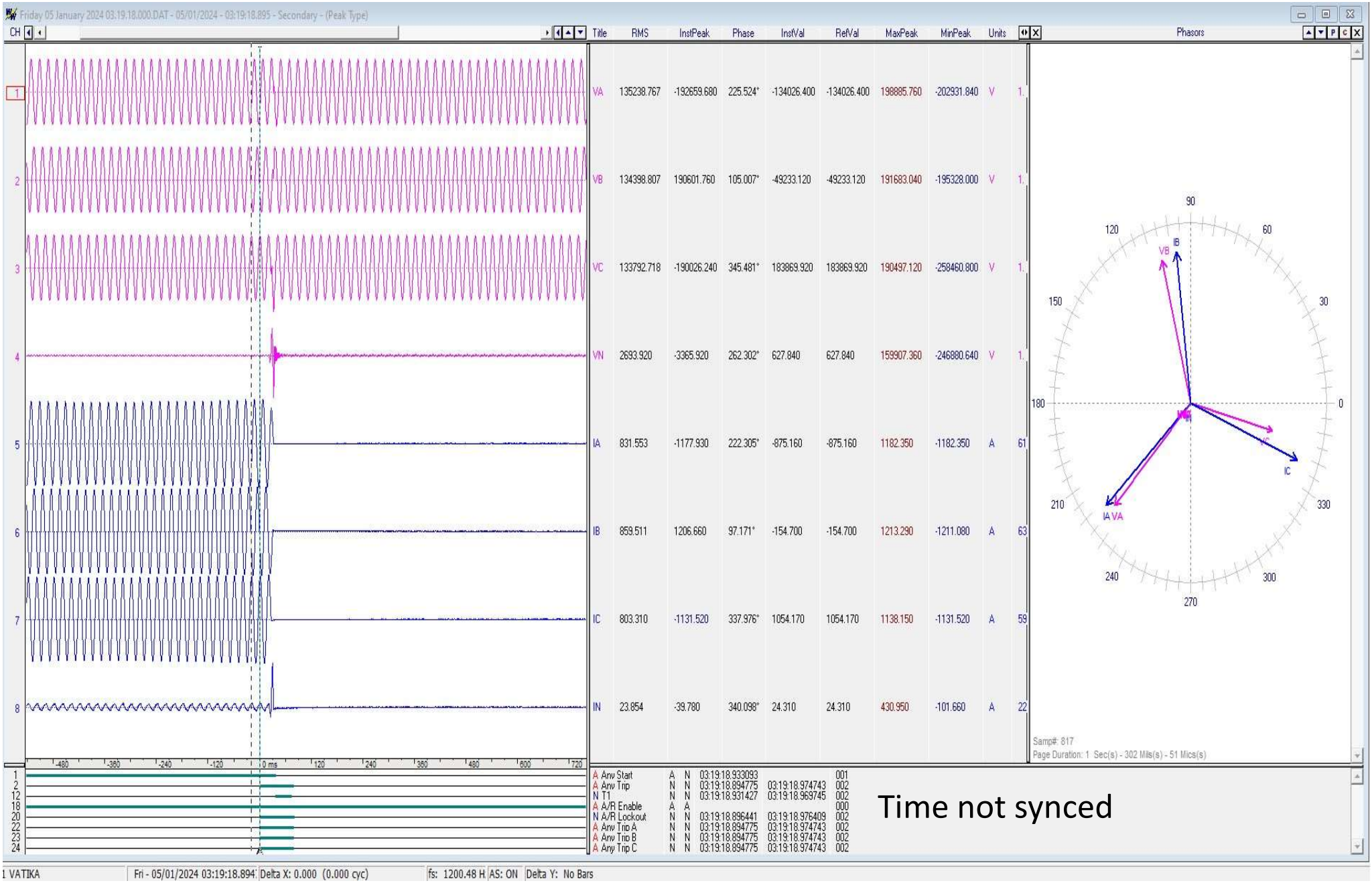


Title	Scale	RMS	InstPeak	Phase	InstVal	RefVal	MaxPeak	MinPeak
VA	999147.0 V/cm	134220.745	-187305.600	188.192°	-186206.880	-186485.920	191090.080	-191194.720
VB	998235.0 V/cm	132965.391	187462.560	65.401°	77817.280	79404.320	190968.000	-191020.320
VC	994590.0 V/cm	114864.096	-161180.480	305.238°	92414.560	94193.440	190322.720	-190287.840
VN	113193.0 V/cm	13930.205	21660.480	144.636°	-15957.600	-12870.720	21660.480	-20439.680
IA	1281.9 A/cm	108.205	137.020	162.776°	-165.750	-176.800	243.100	-245.310
IB	2171.2 A/cm	293.881	388.960	67.873°	170.170	99.450	411.060	-415.480
IC	21411.9 A/cm	2643.275	-3158.090	239.132°	-1728.220	-855.270	4097.340	-3381.300
IN	19286.9 A/cm	2381.607	-2846.480	235.440°	-1723.800	-932.620	3690.700	-2976.870

A Anw Start	N	N	04:57:13.215392	04:57:13.278776	002
A Anw Trip	N	N	04:57:13.227068	04:57:13.307132	002
A DIST Trip C	N	N	04:57:13.227068	04:57:13.273772	002
A DIST Fwd	N	N	04:57:13.227068	04:57:13.273772	002
A Z1	N	N	04:57:13.227068	04:57:13.273772	002
A T1	N	N	04:57:13.217060	04:57:13.275440	002
A R3 BPH TRIP	N	N	04:57:13.227068	04:57:13.307132	002
A R5 CARR SEND	N	N	04:57:13.227068	04:57:13.283780	002

Tripping time: **04:57:13:227**; B-N fault, Z-1, Ib: 2.6kA; (A/R operation is OFF in line)

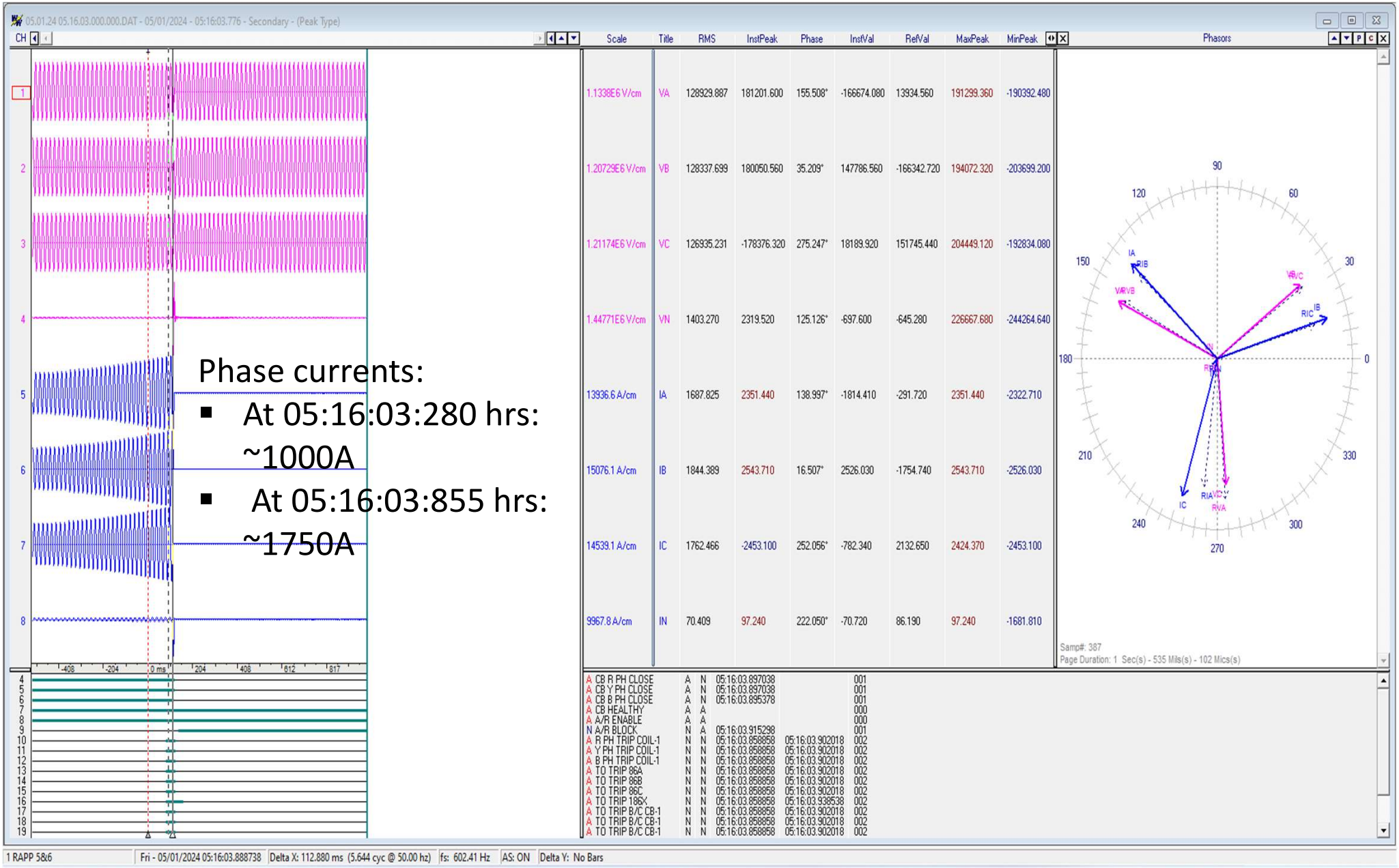
DR of 220kV KTPS-Vatika(end) ckt



Time not synced

Antecedent loading just before the tripping: **~324MW (as reported, tripped on O/C)**

DR of 220kV RAPS_C(end)-Anta ckt



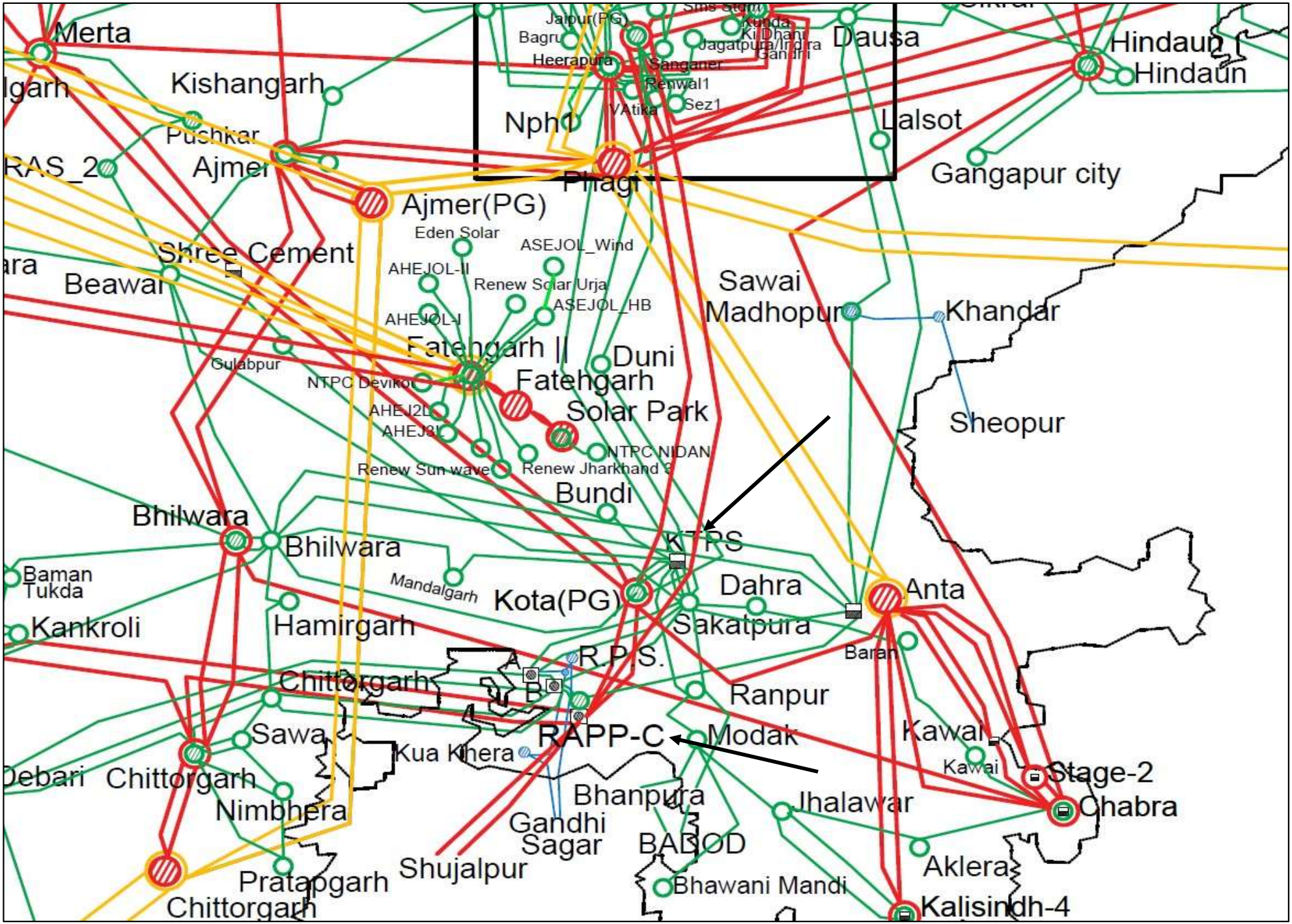
Tripping time: **05:16:03:855**; Antecedent loading just before the tripping: **~660MW**

SCADA SOE

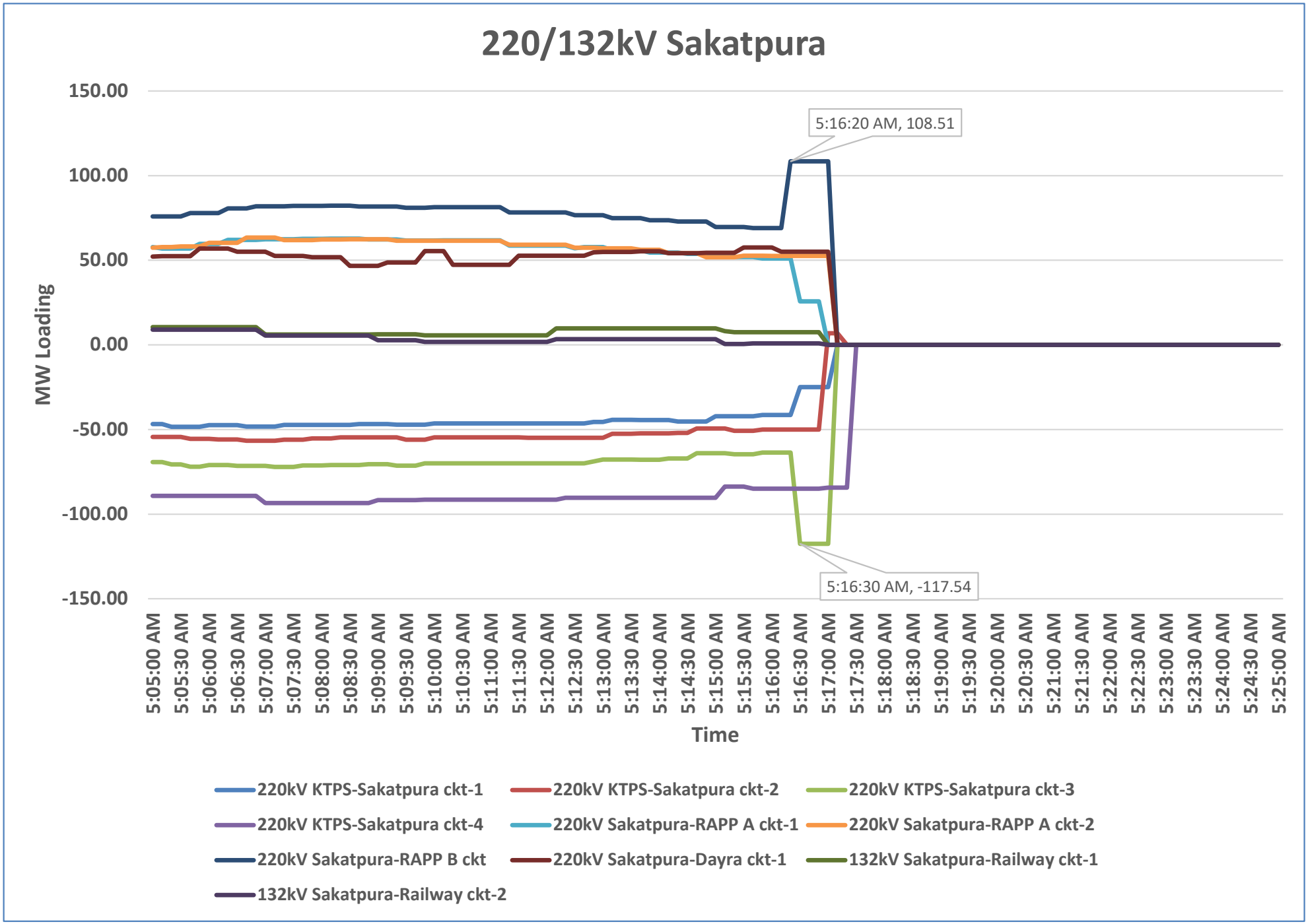
Time	Station Name	Voltage	Element Name	Element Type	Element Status	Remarks
05:15:55,853	GULPR_RS	220kV	02KTPS1	Circuit Breaker	disturbe	
05:15:56,058	GULPR_RS	220kV	02KTPS1	Circuit Breaker	Open	Line CB at Gulabpura(RS) end of 220kV Bundi(RS)-Gulabpura(RS) Ckt opened
05:16:03,939	RAPPC_NP	220kV	02ANTA	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

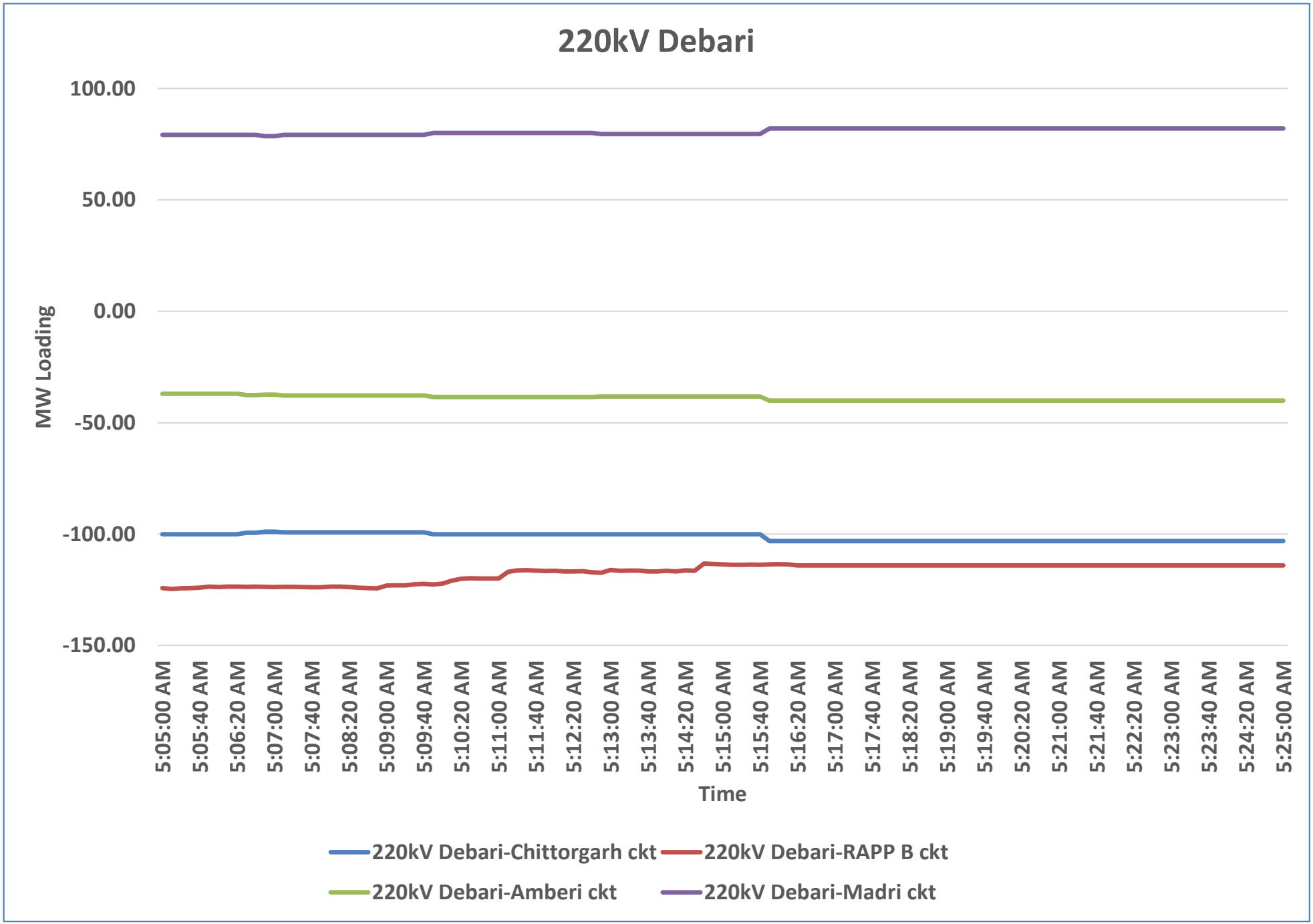
Network Diagram



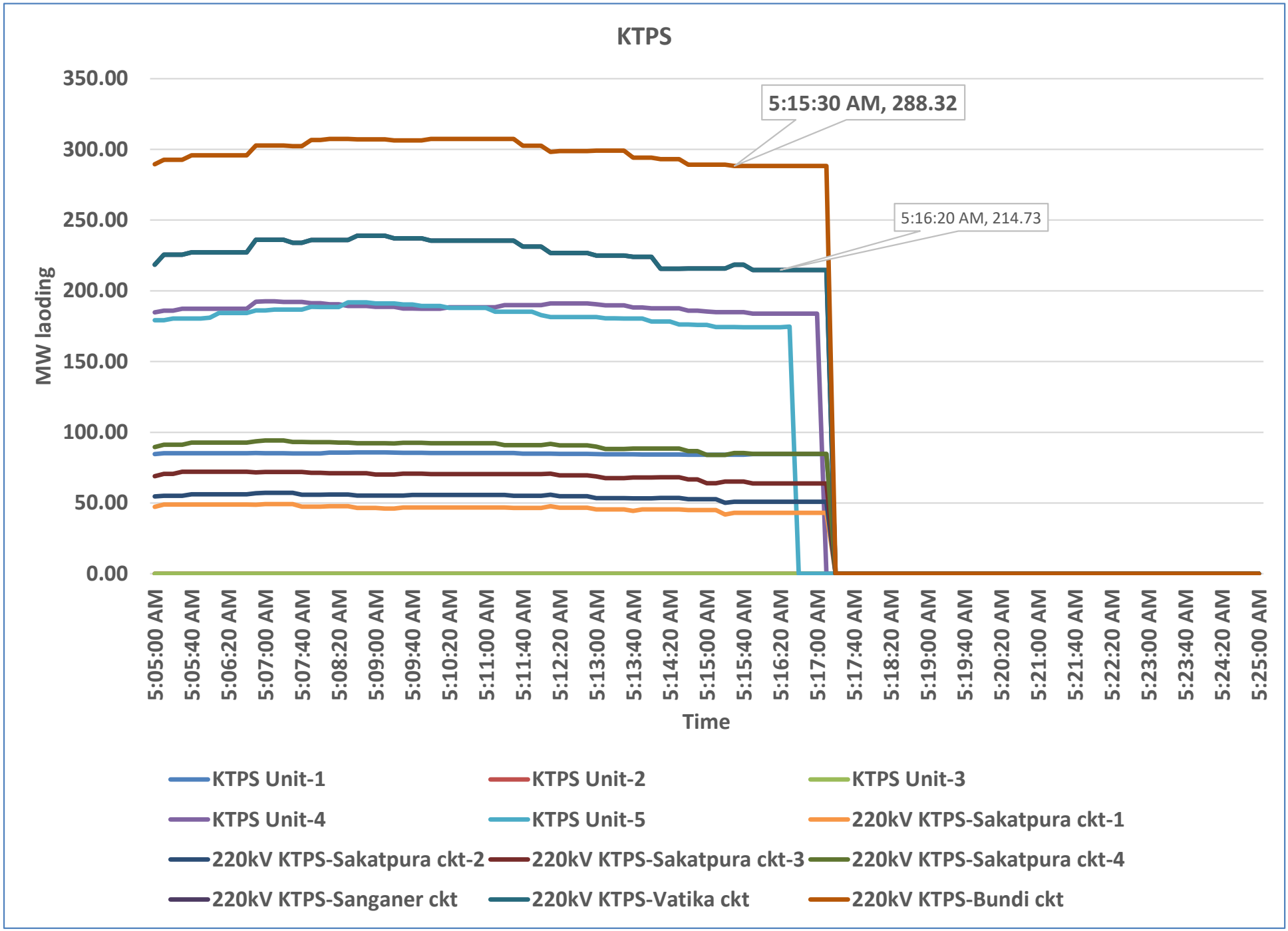
Element wise MW load flow



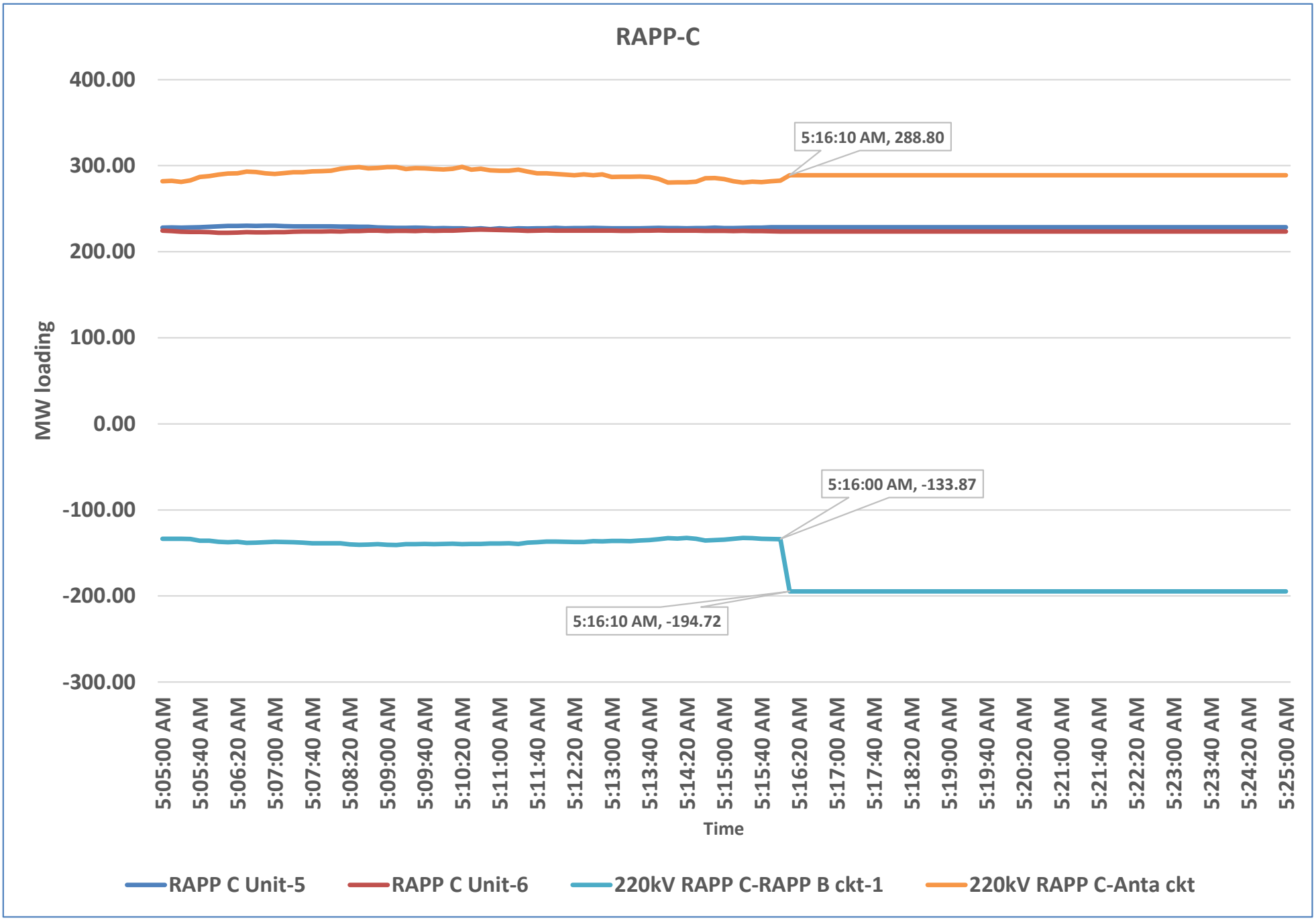
Element wise MW load flow



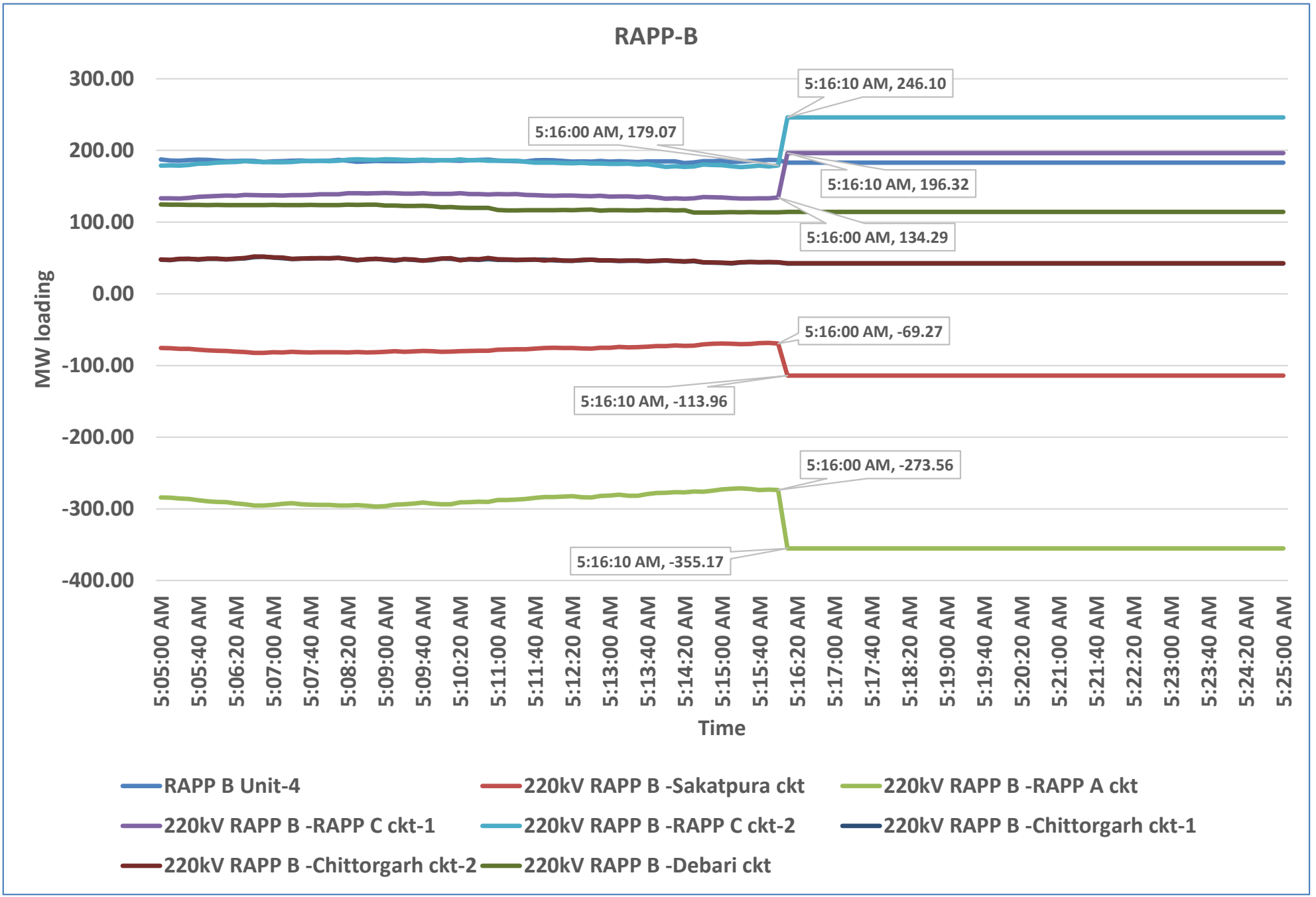
Element wise MW load flow



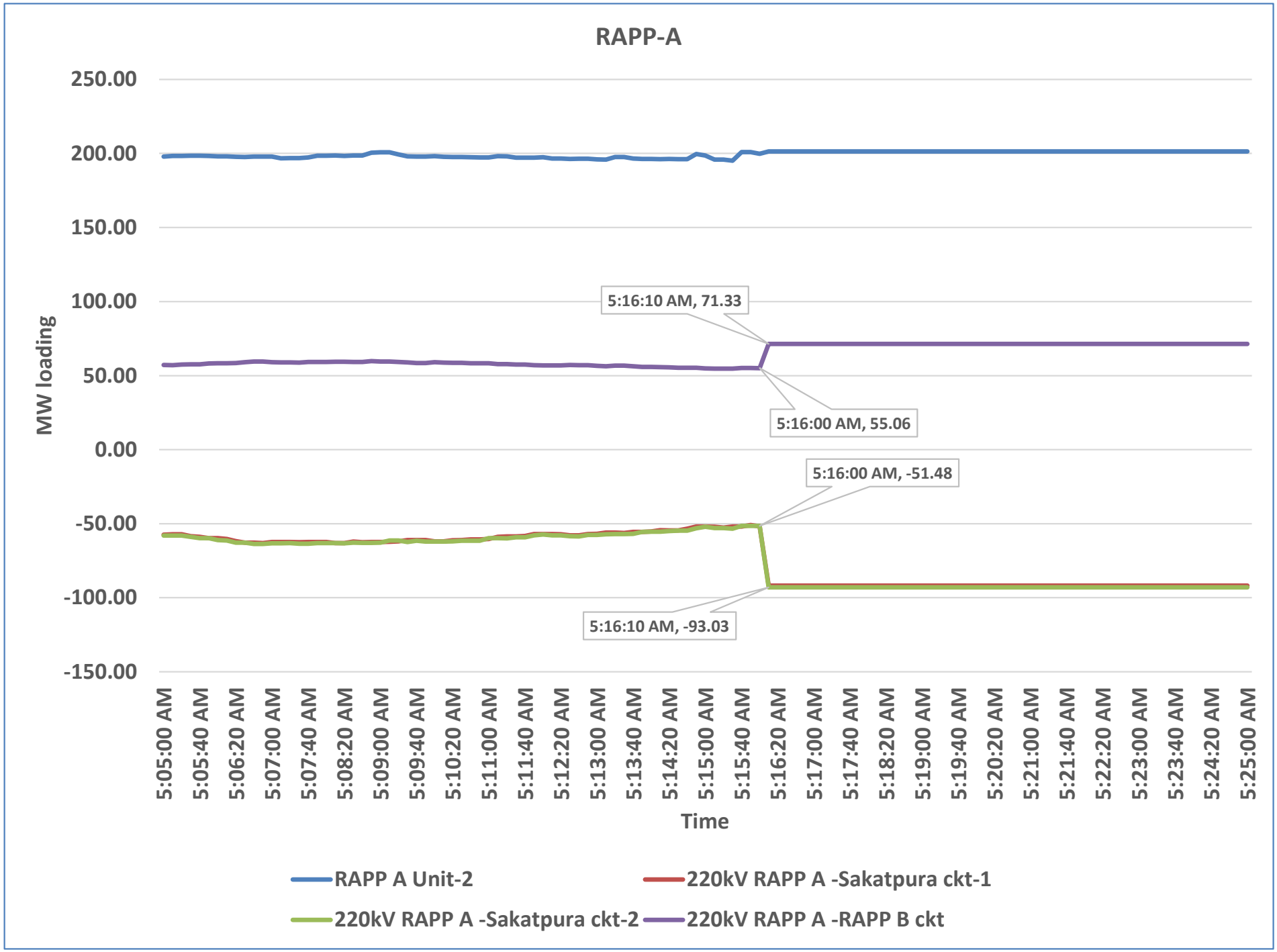
Element wise MW load flow



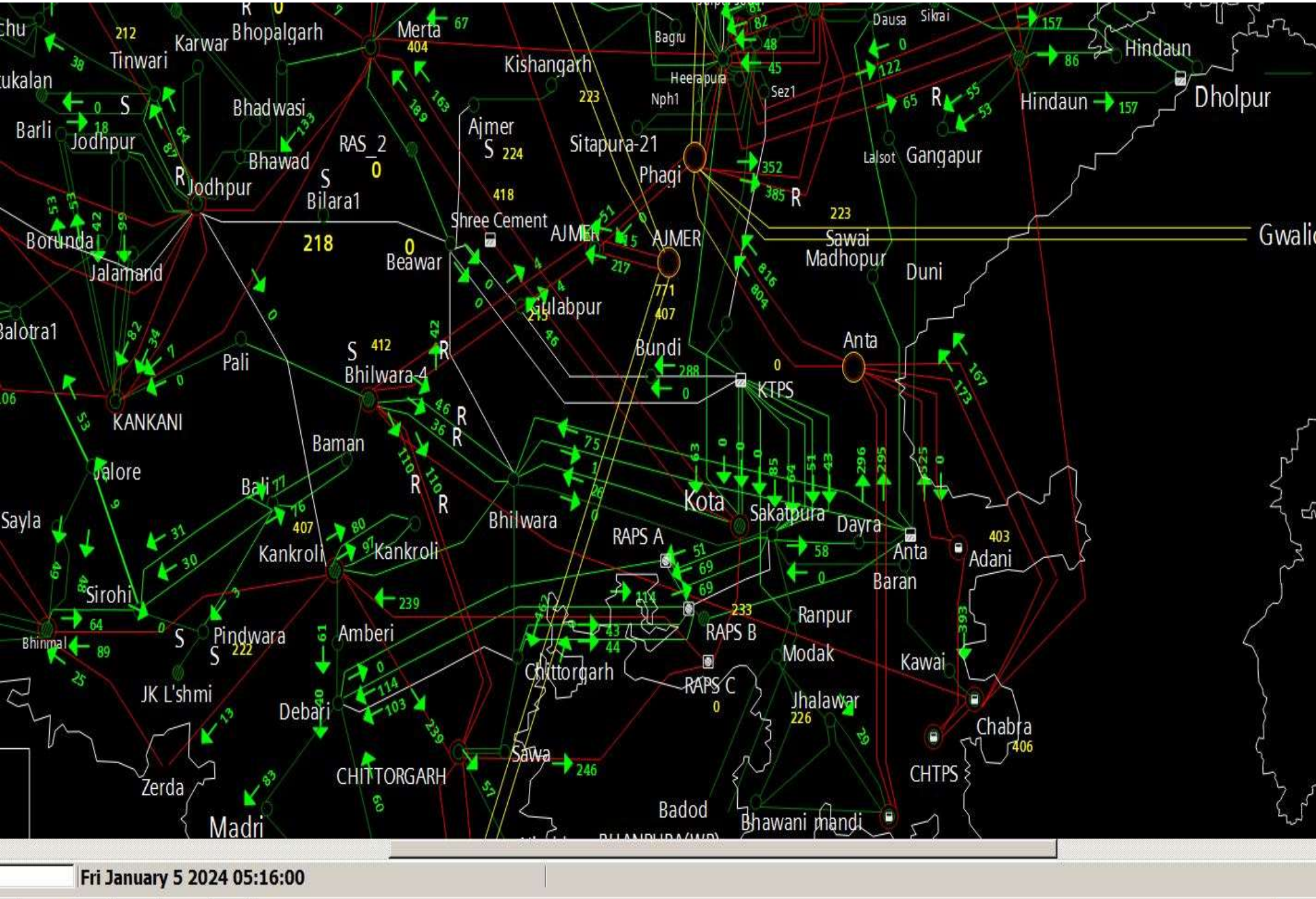
Element wise MW load flow



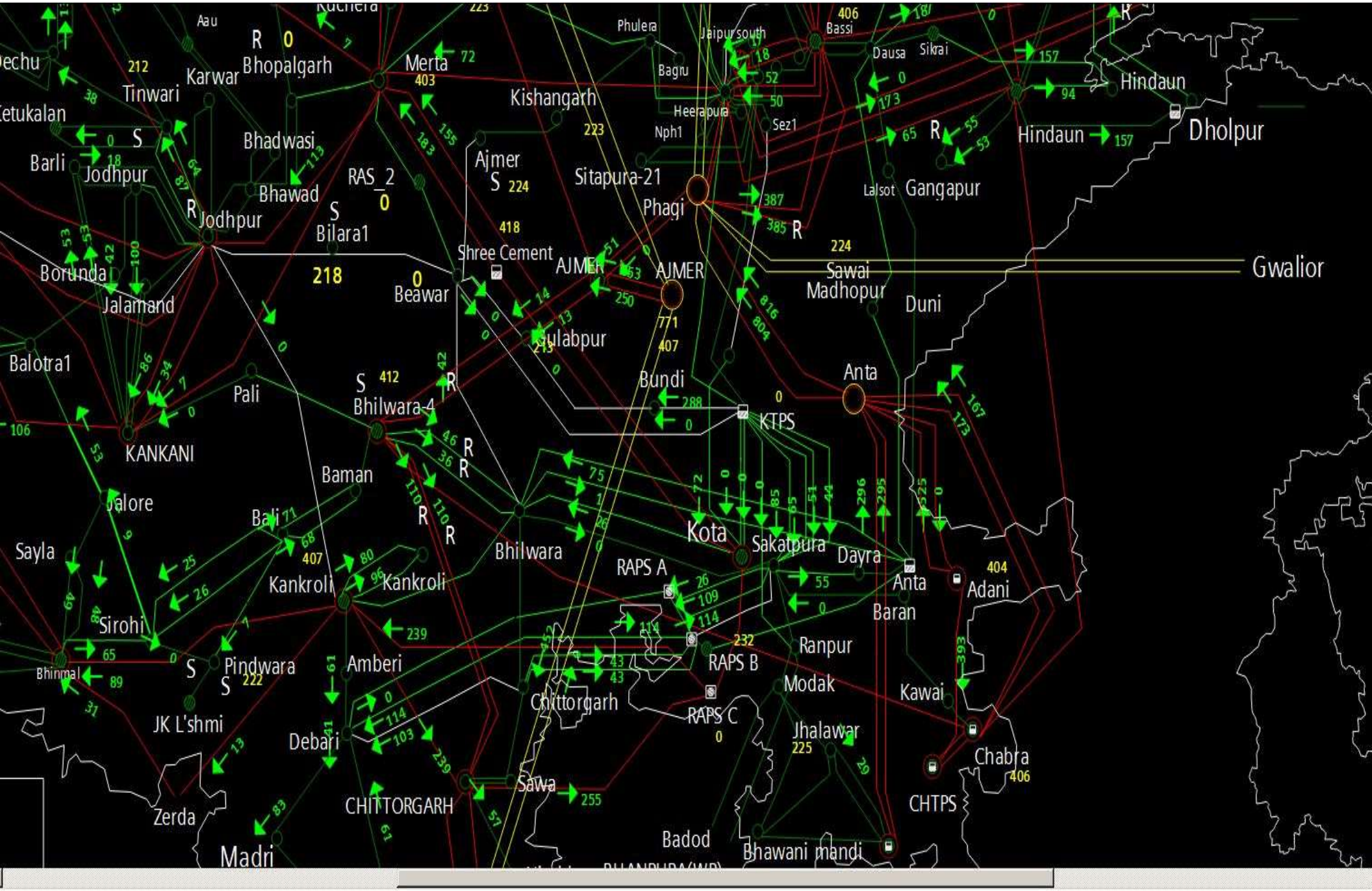
Element wise MW load flow



Network diagram @05:16:00hrs

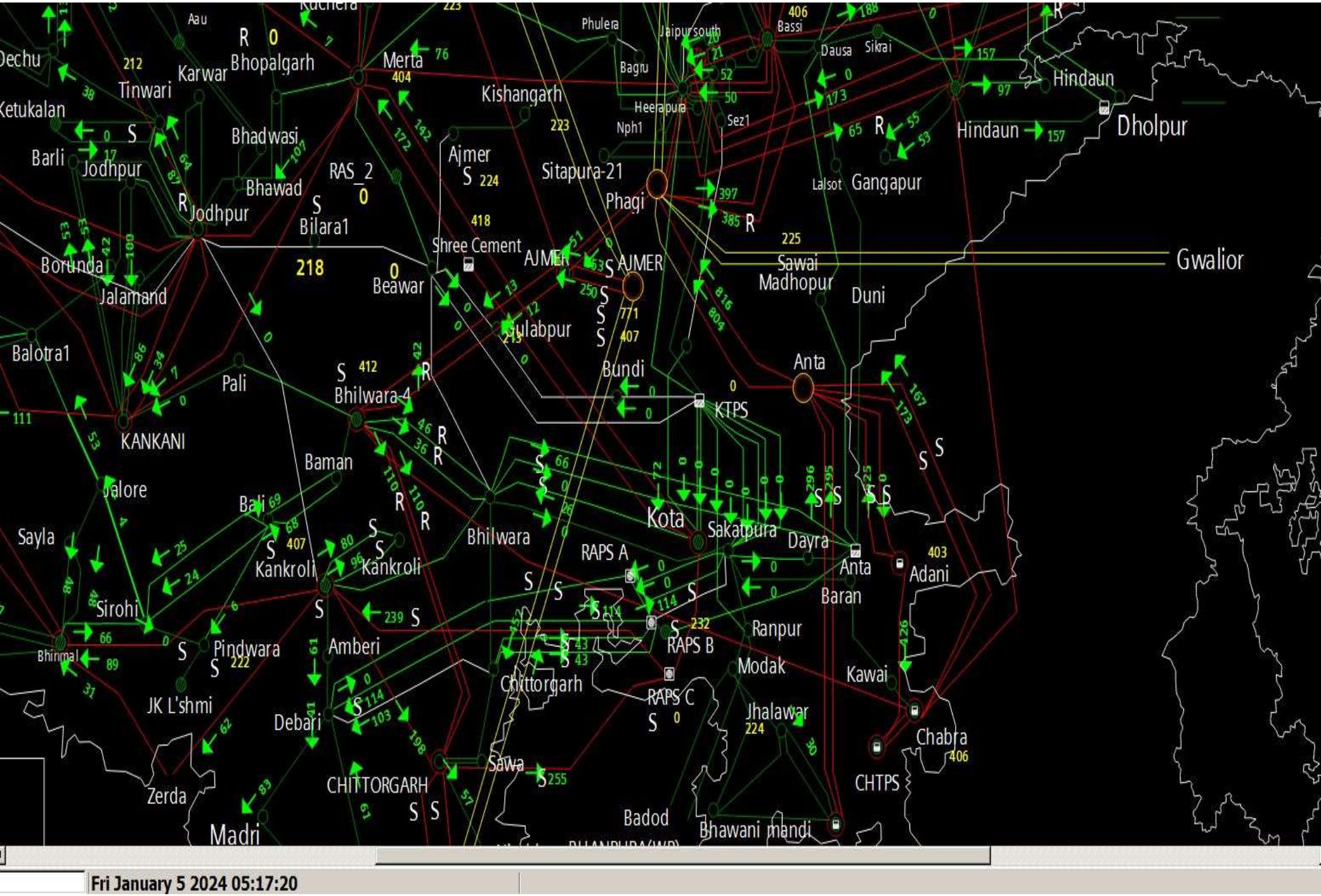


Network diagram @05:16:30hrs

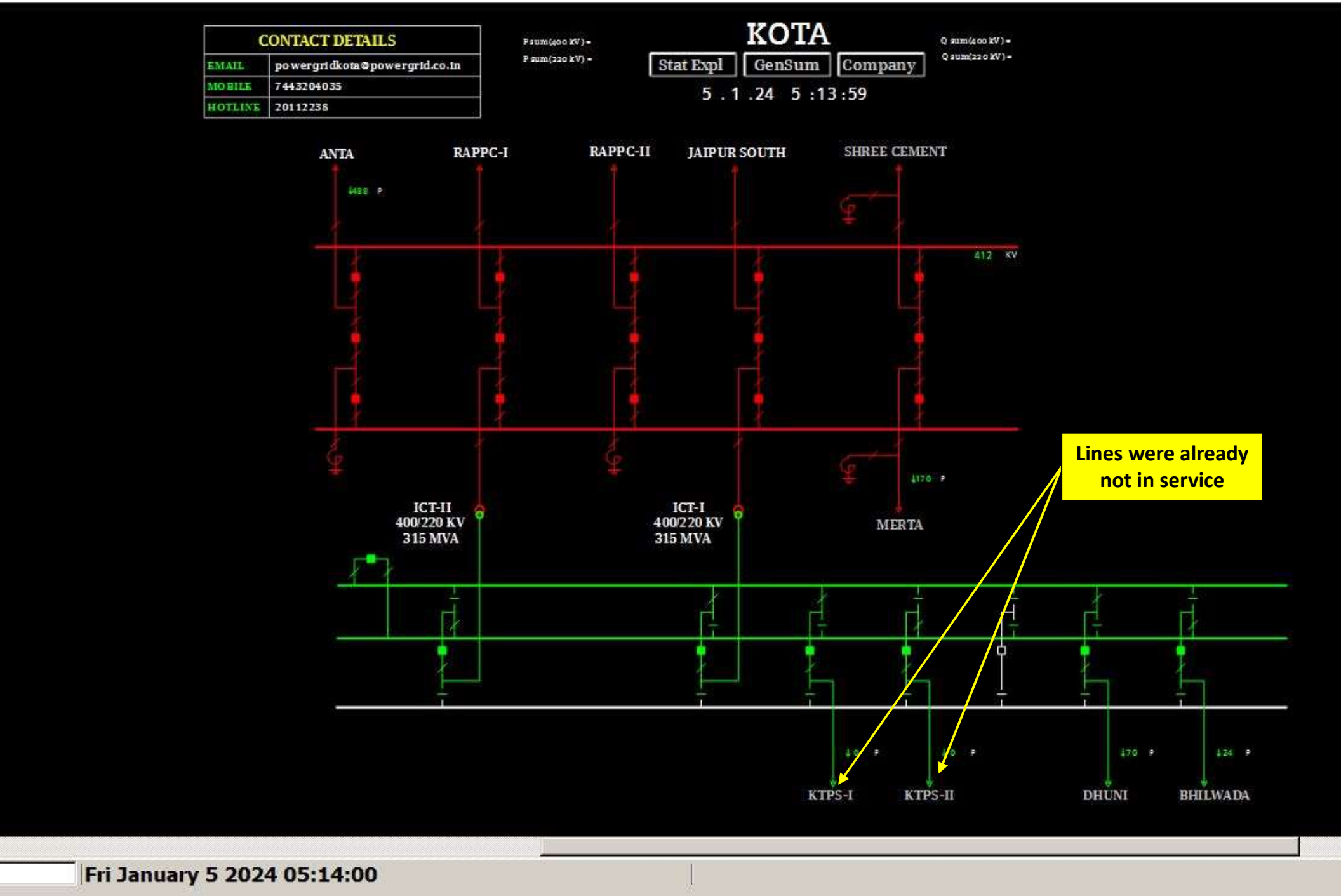


Fri January 5 2024 05:16:30

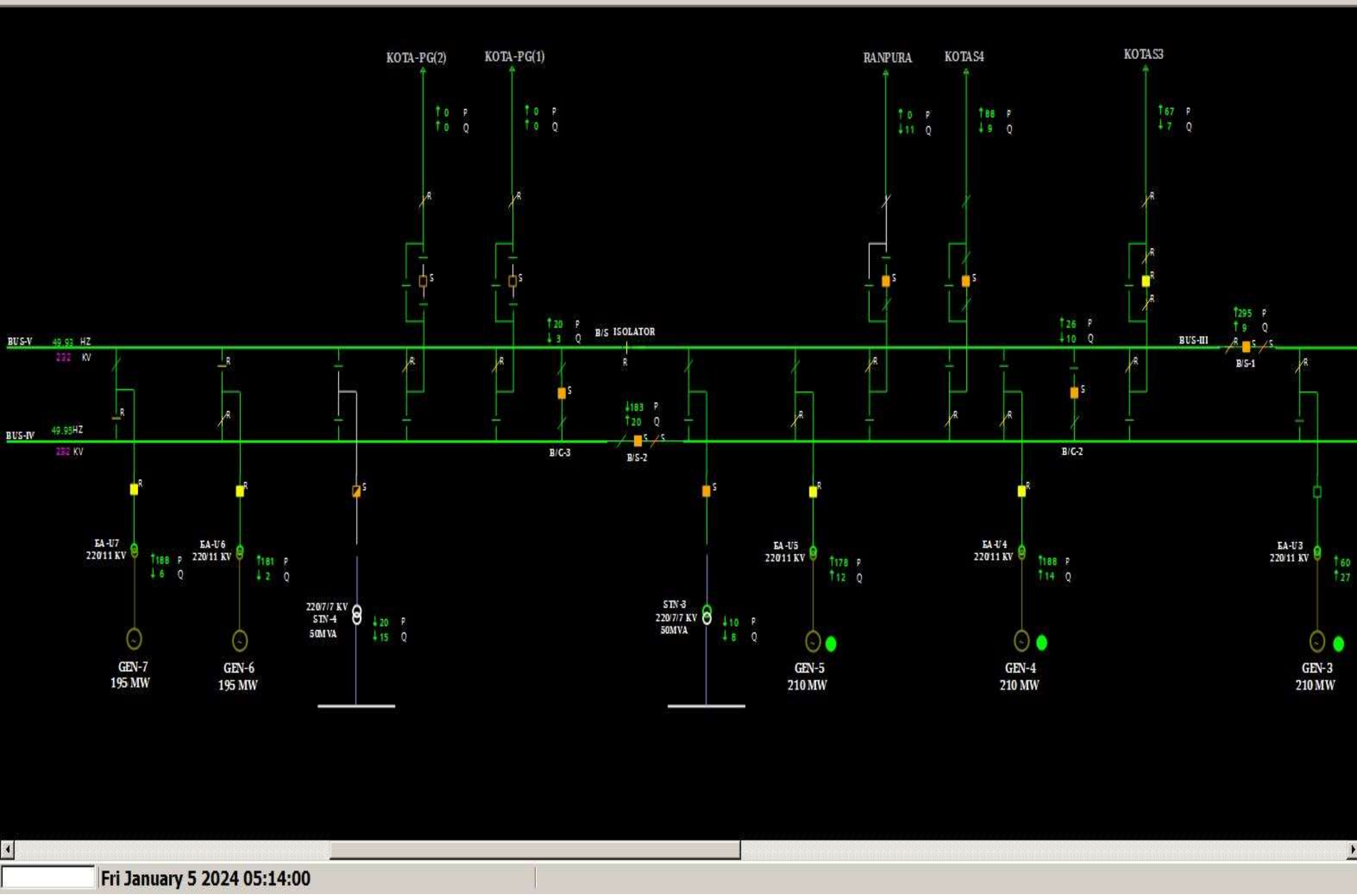
Network diagram @05:17:20hrs



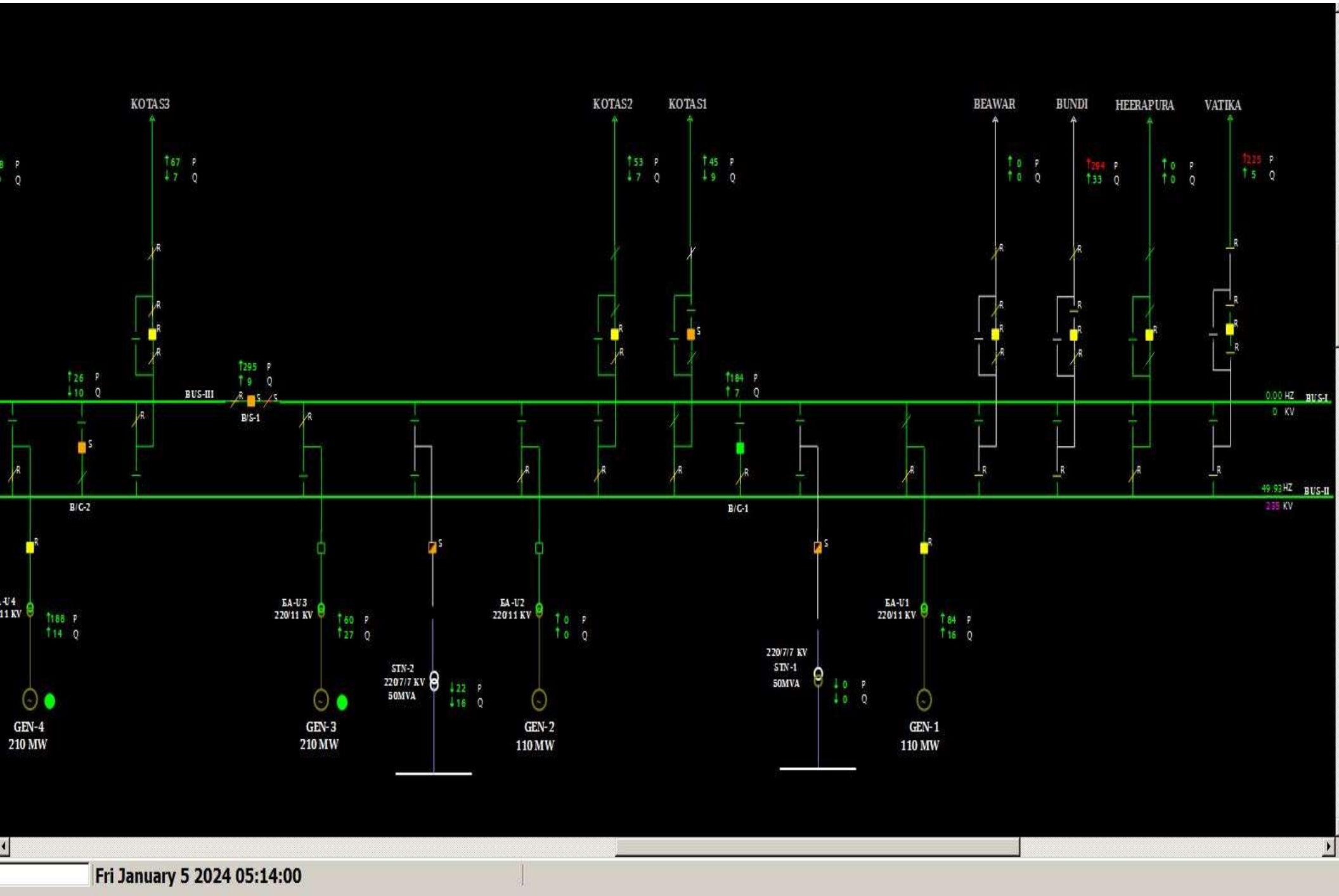
SLD of 400/220kV Kota(PG) before the event



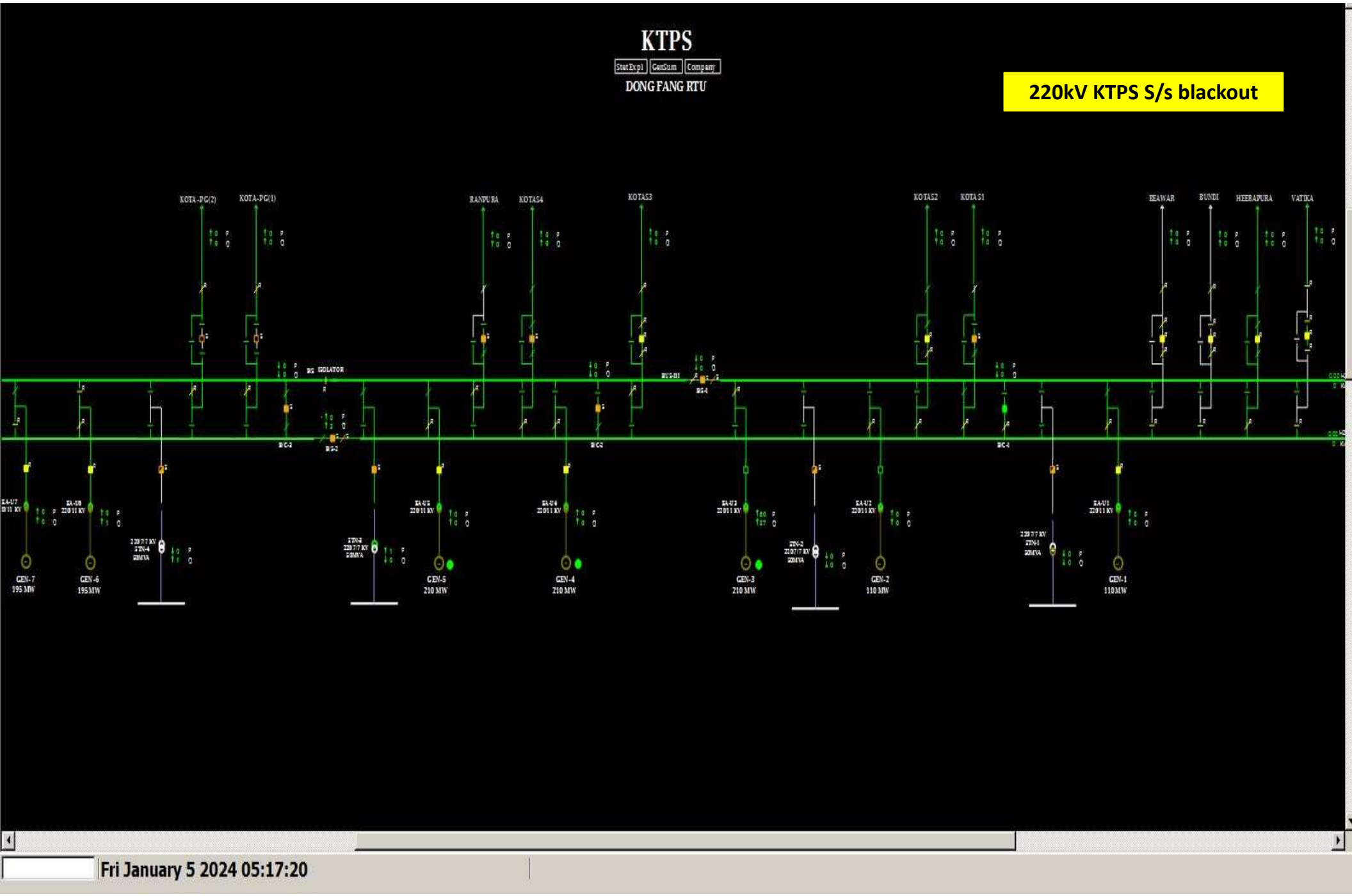
SLD of 220kV KTPS before the event (1/2)



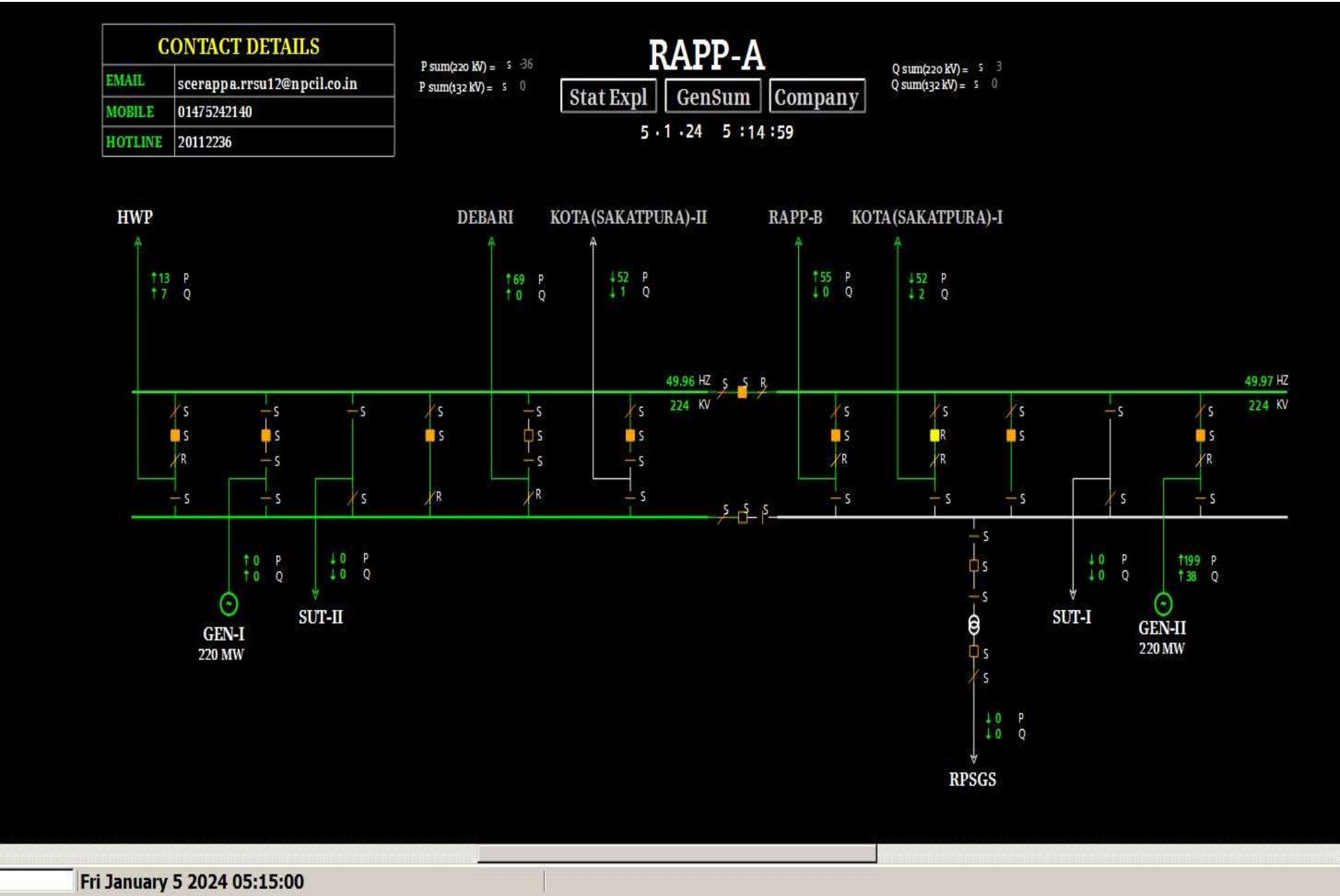
SLD of 220kV KTPS before the event (2/2)



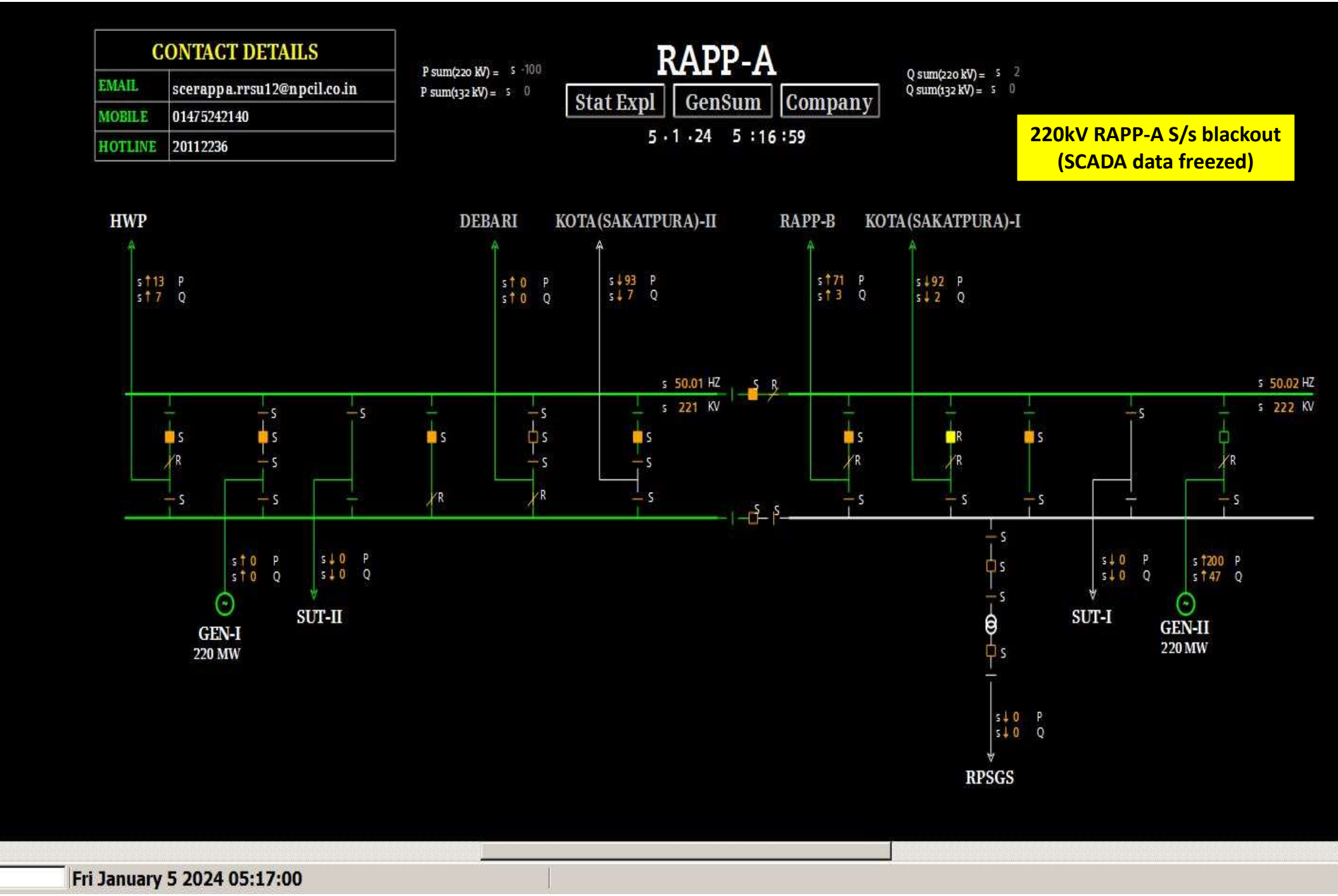
SLD of 220kV KTPS after the event



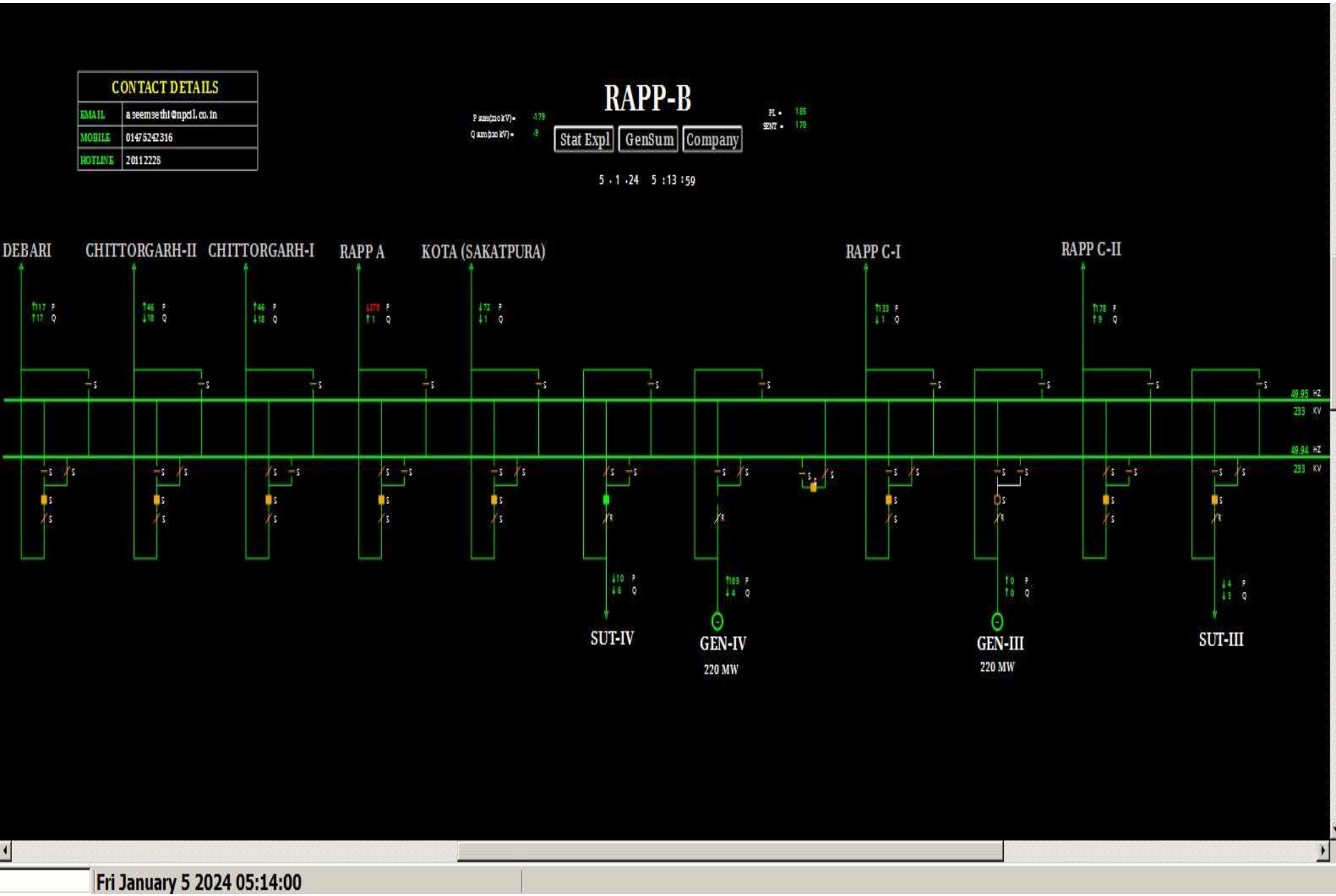
SLD of 220kV RAPP-A(NP) before the event



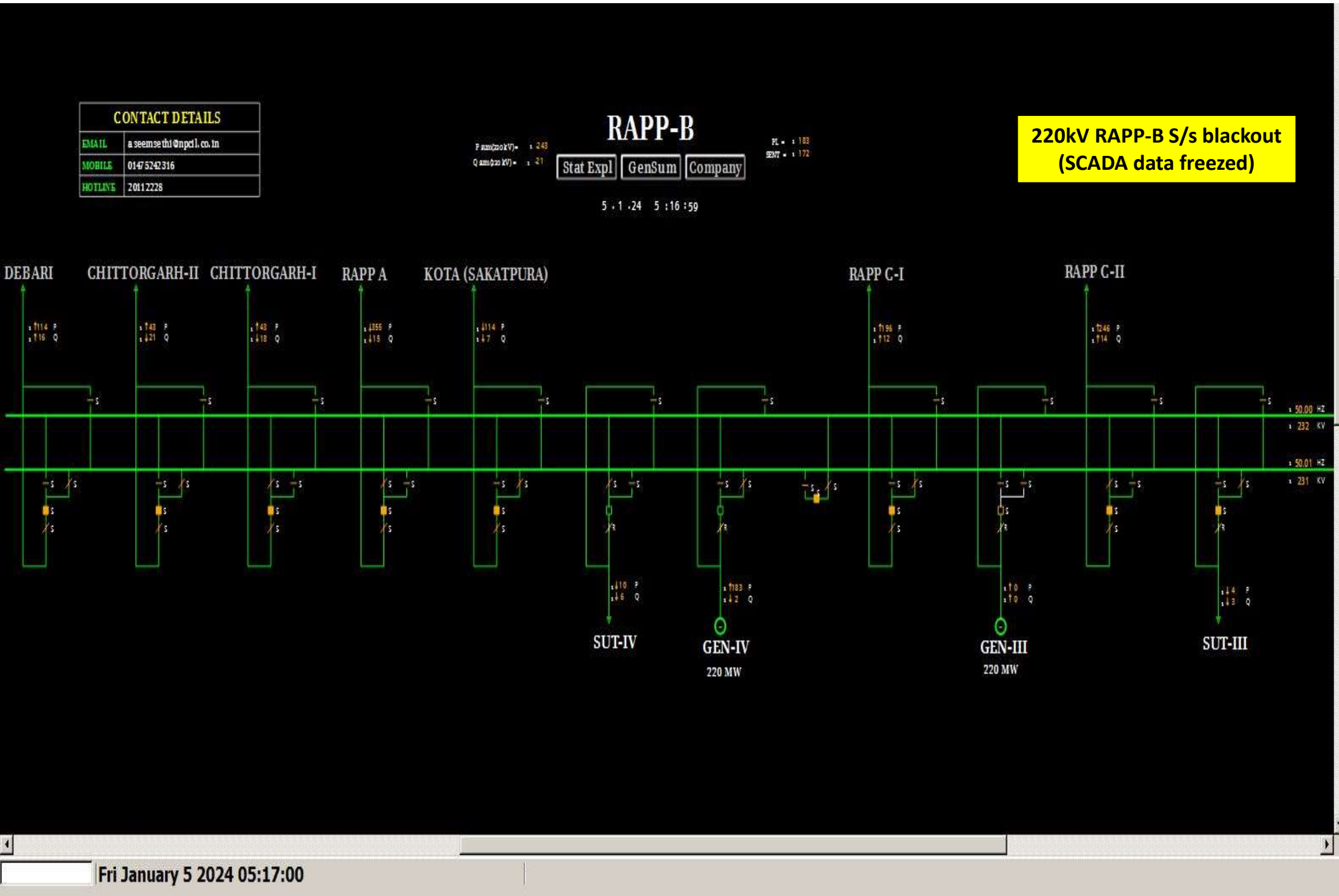
SLD of 220kV RAPP-A(NP) after the event



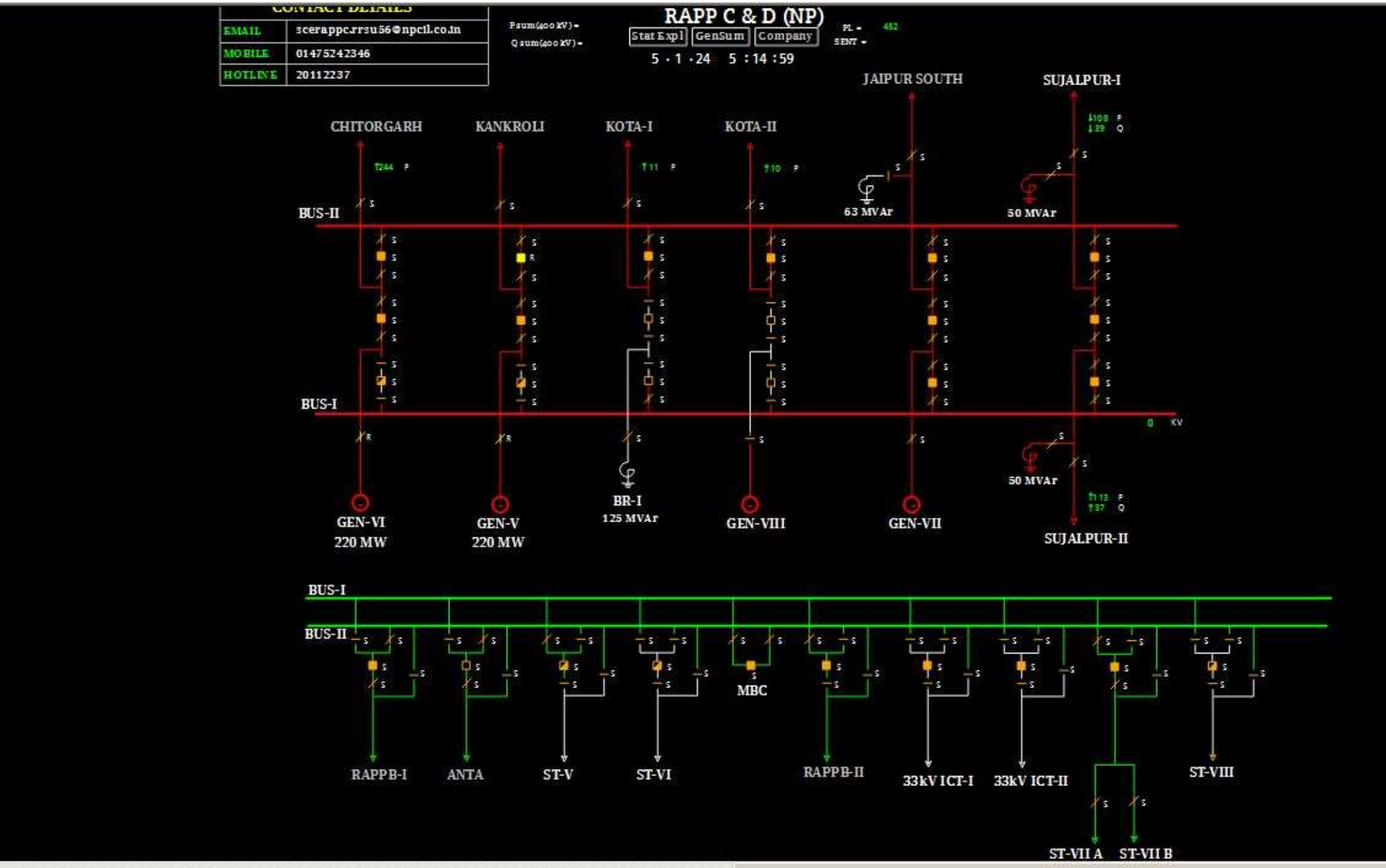
SLD of 220kV RAPP-B(NP) before the event



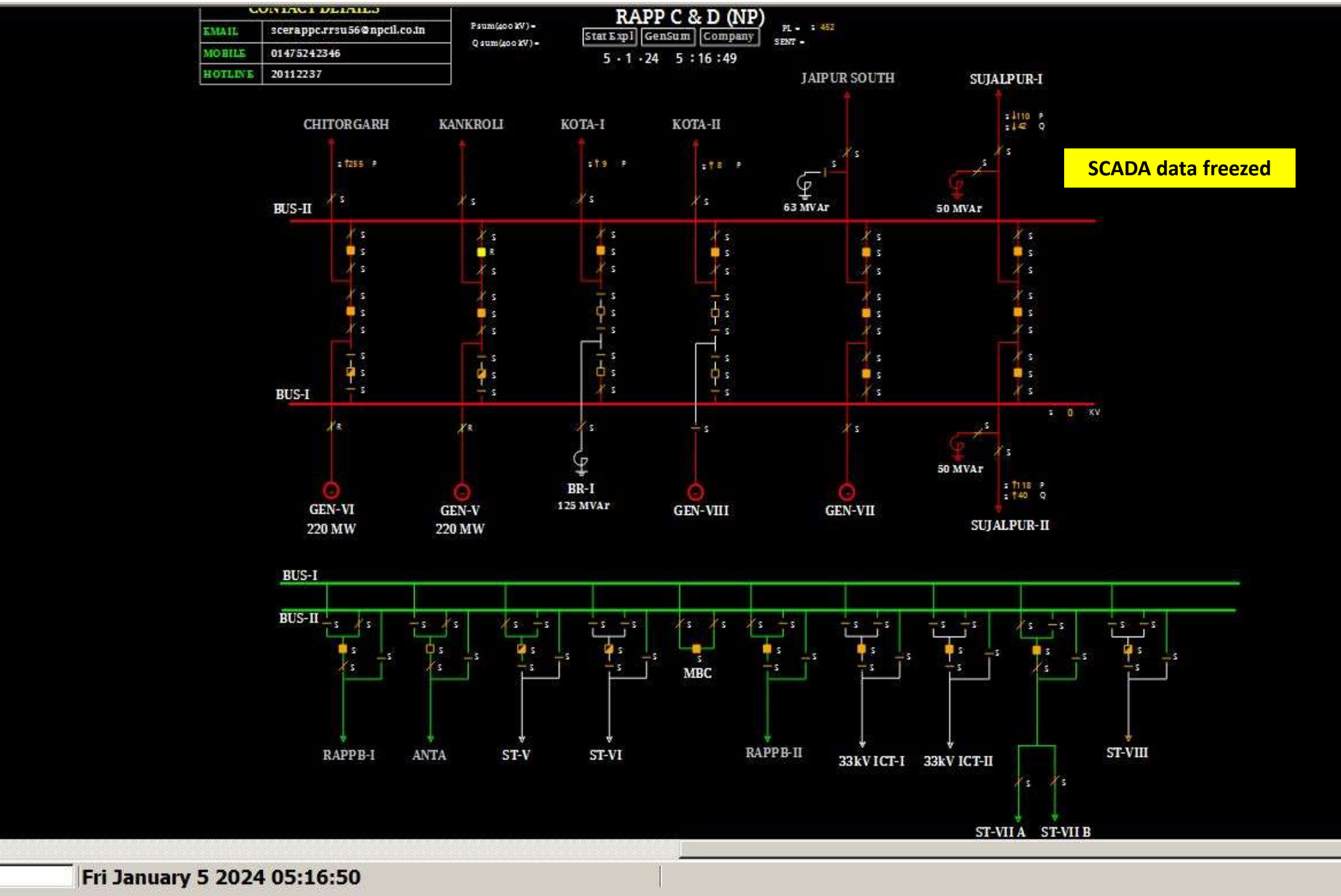
SLD of 220kV RAPP-B(NP) after the event



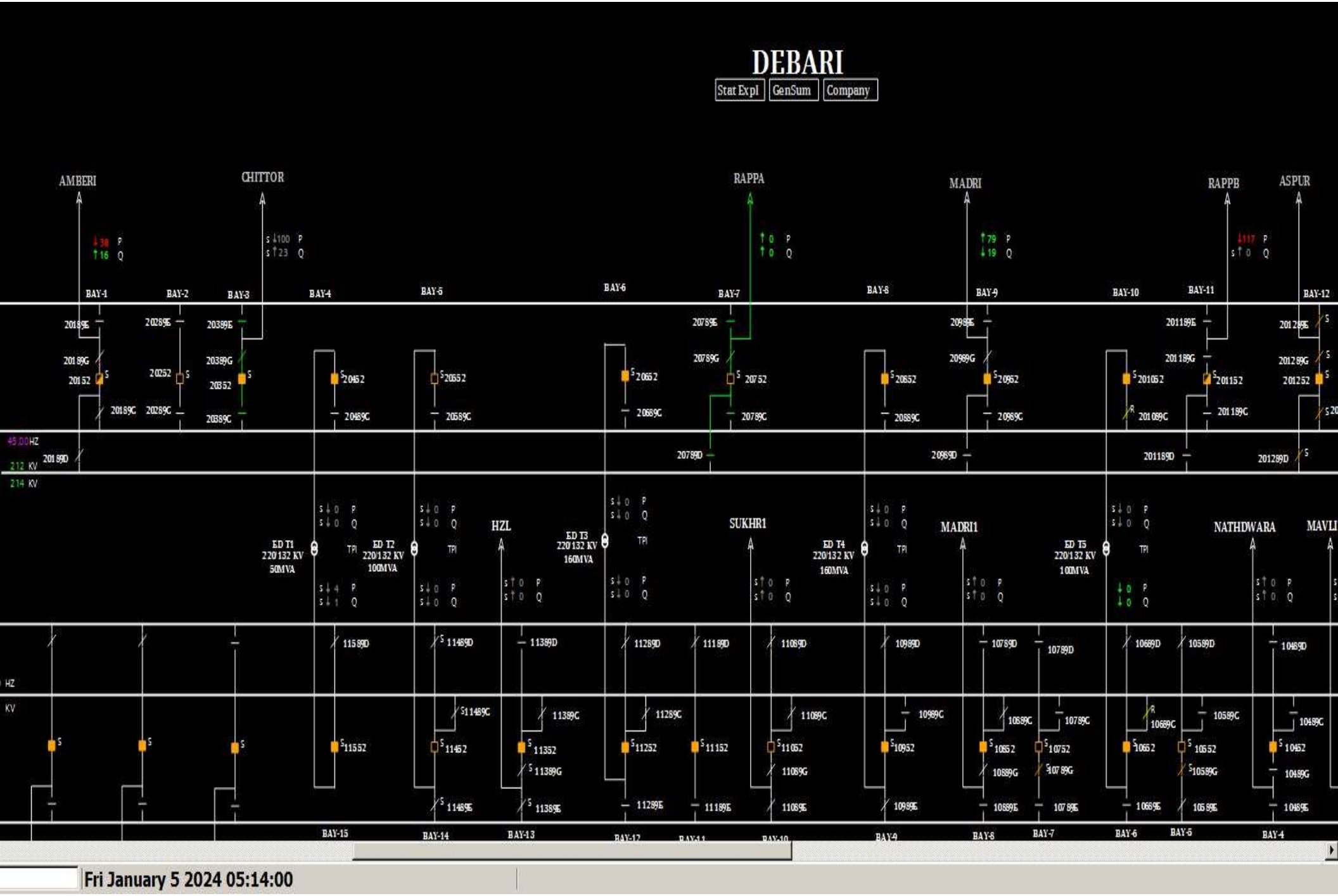
SLD of 400/220kV RAPP-C(NP) before the event



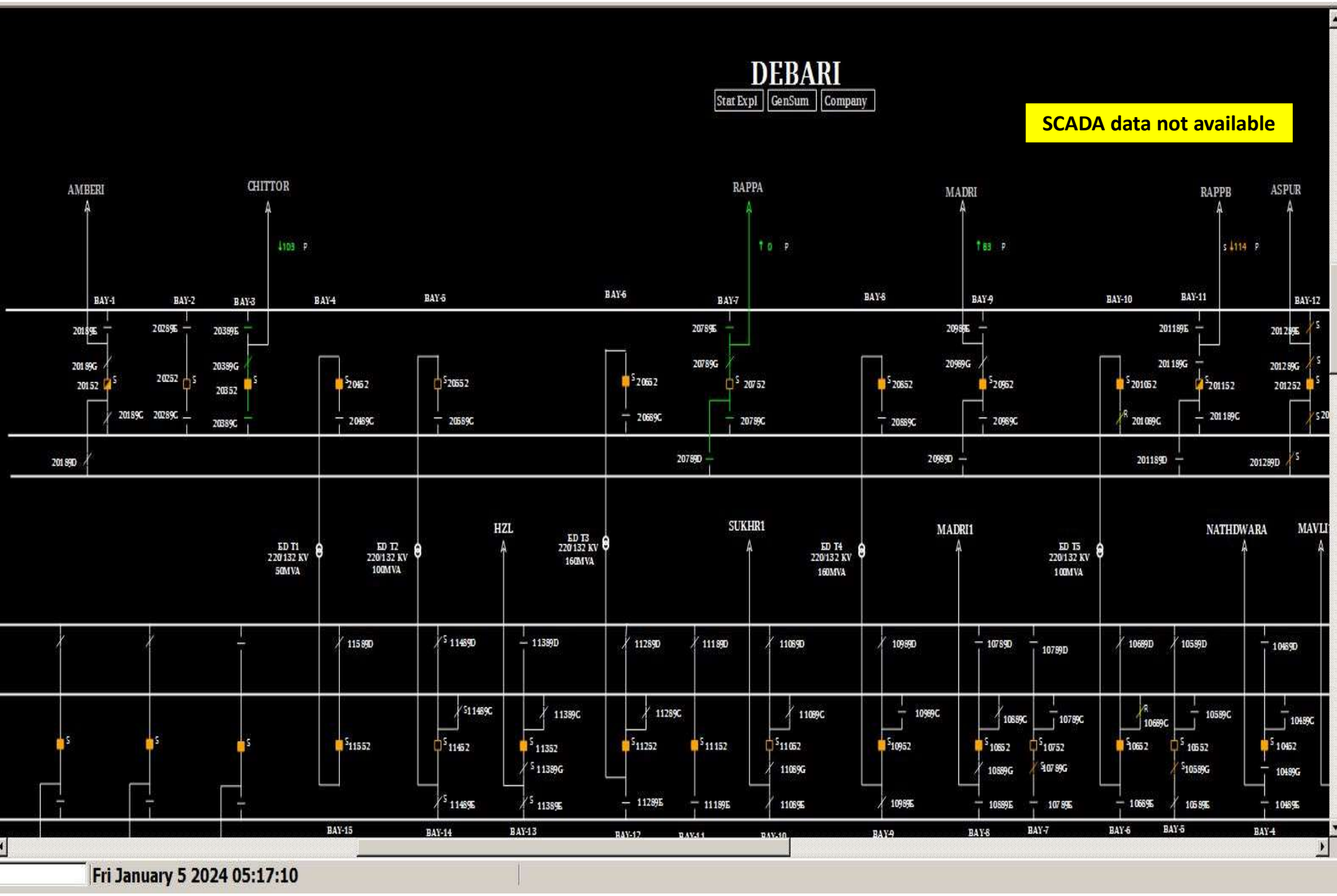
SLD of 400/220kV RAPP-C(NP) after the event



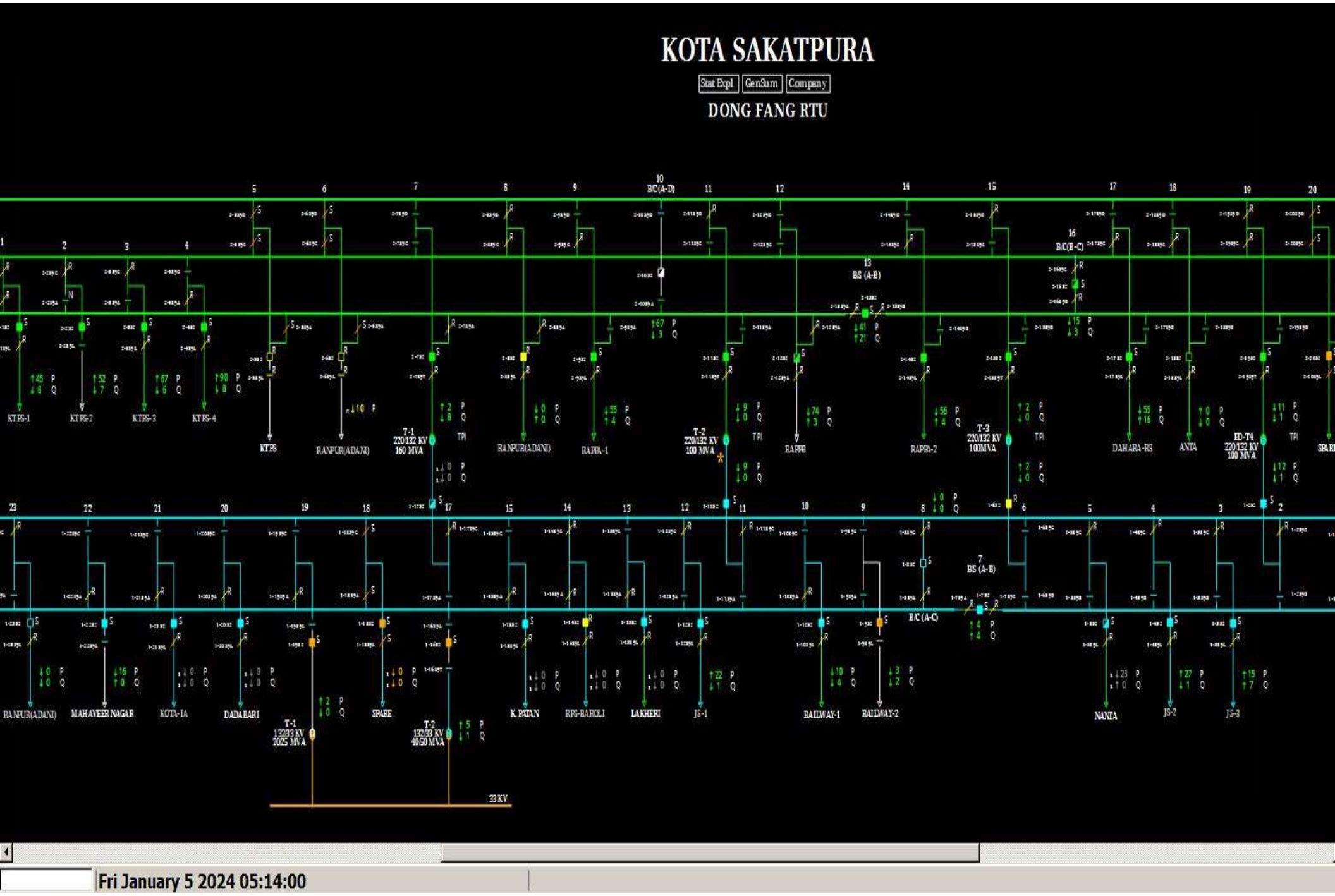
SLD of 220/132kV Debari(RS) before the event



SLD of 220/132kV Debari(RS) after the event

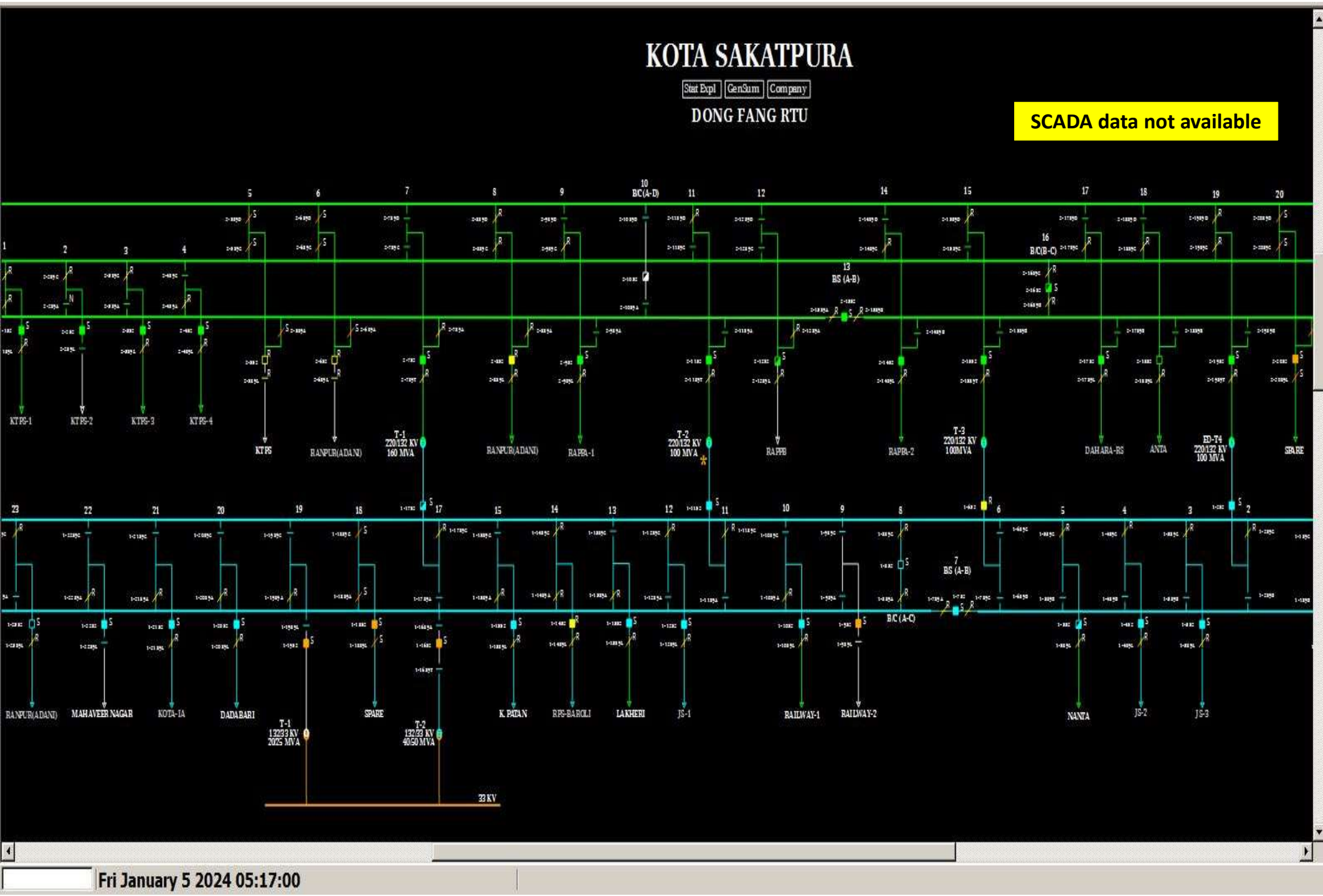


SLD of 220/132kV Kota Sakatpura(RS) before the event



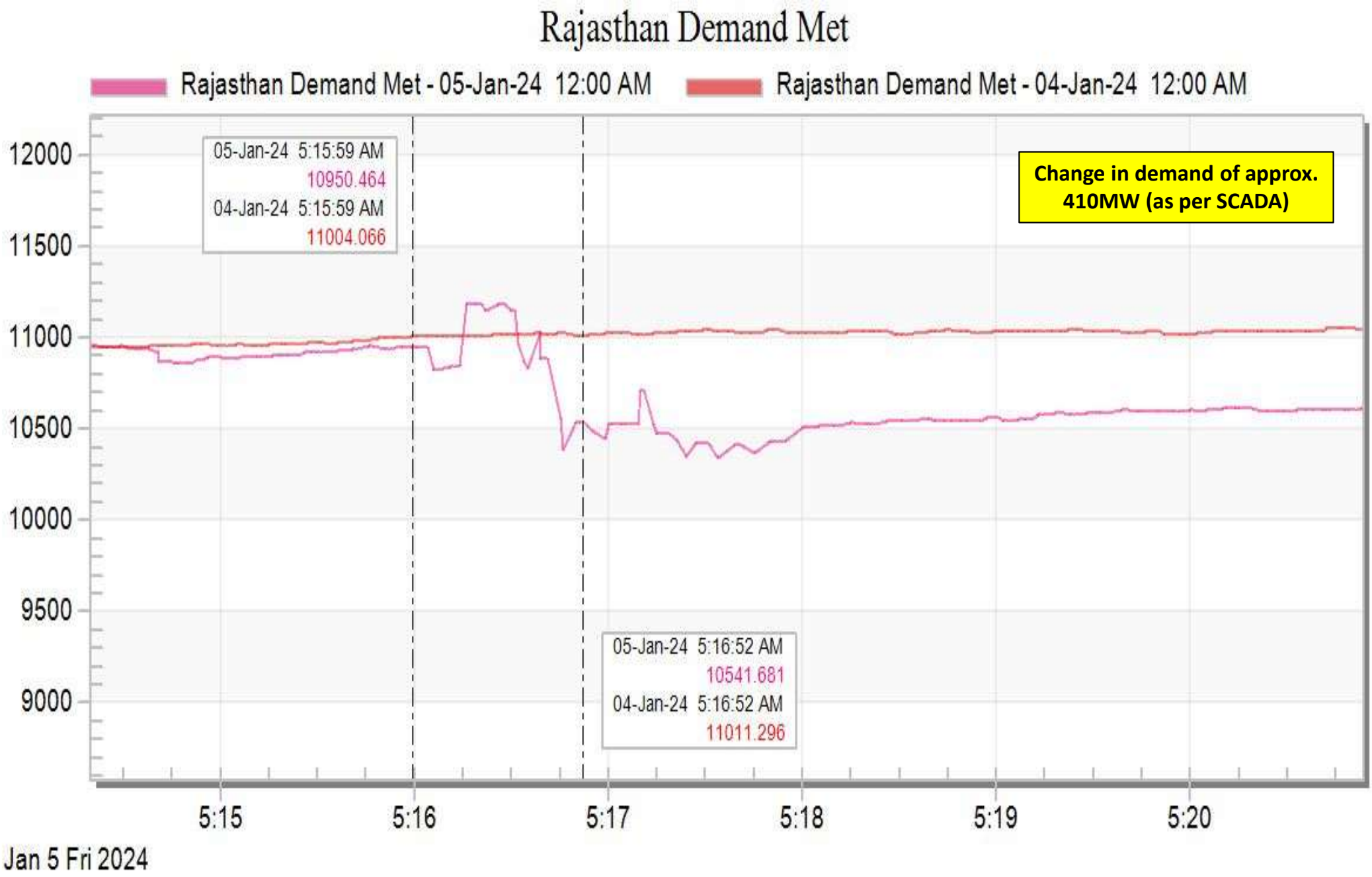
Fri January 5 2024 05:14:00

SLD of 220/132kV Kota Sakatpura(RS) after the event

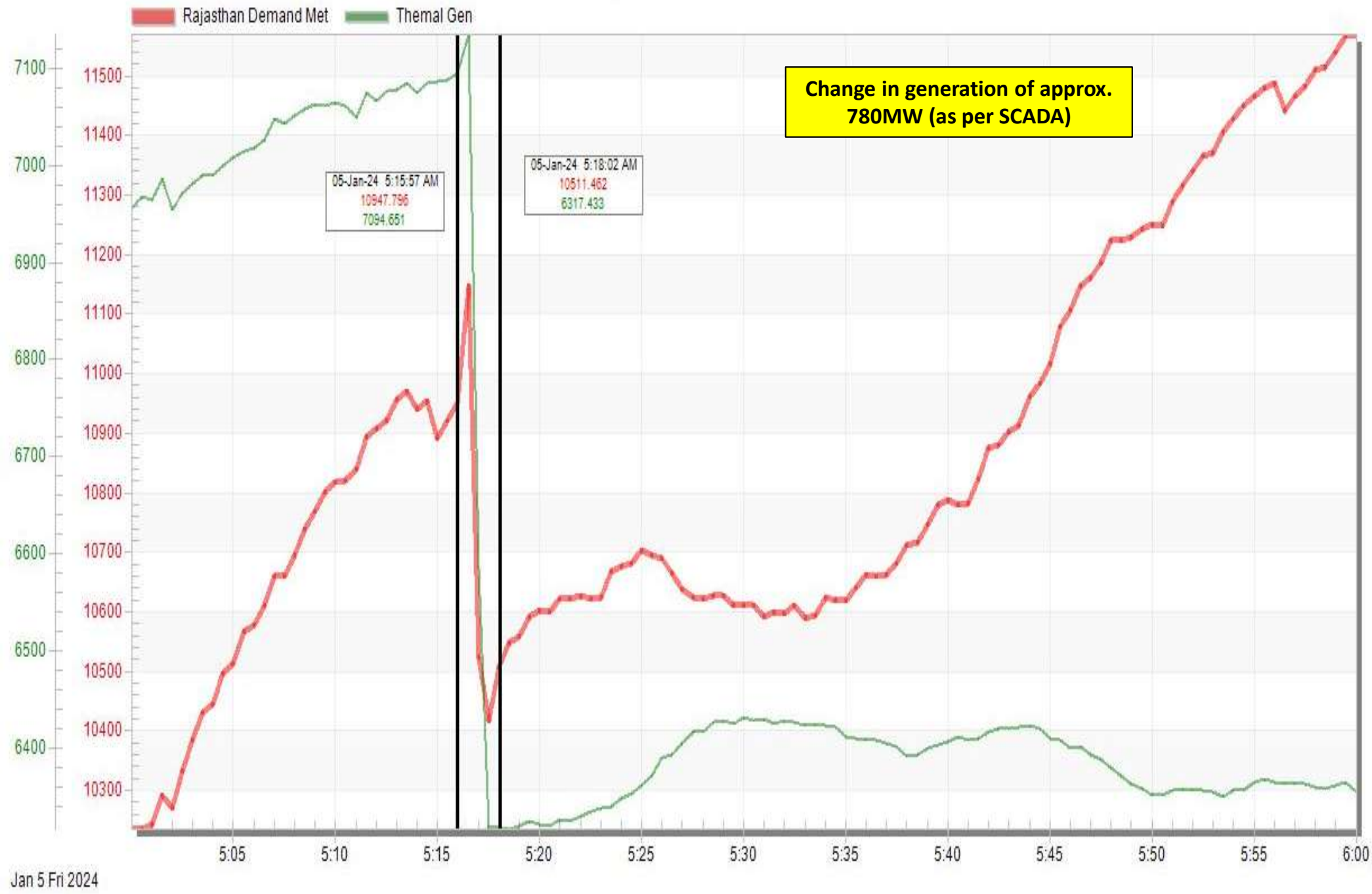


Fri January 5 2024 05:17:00

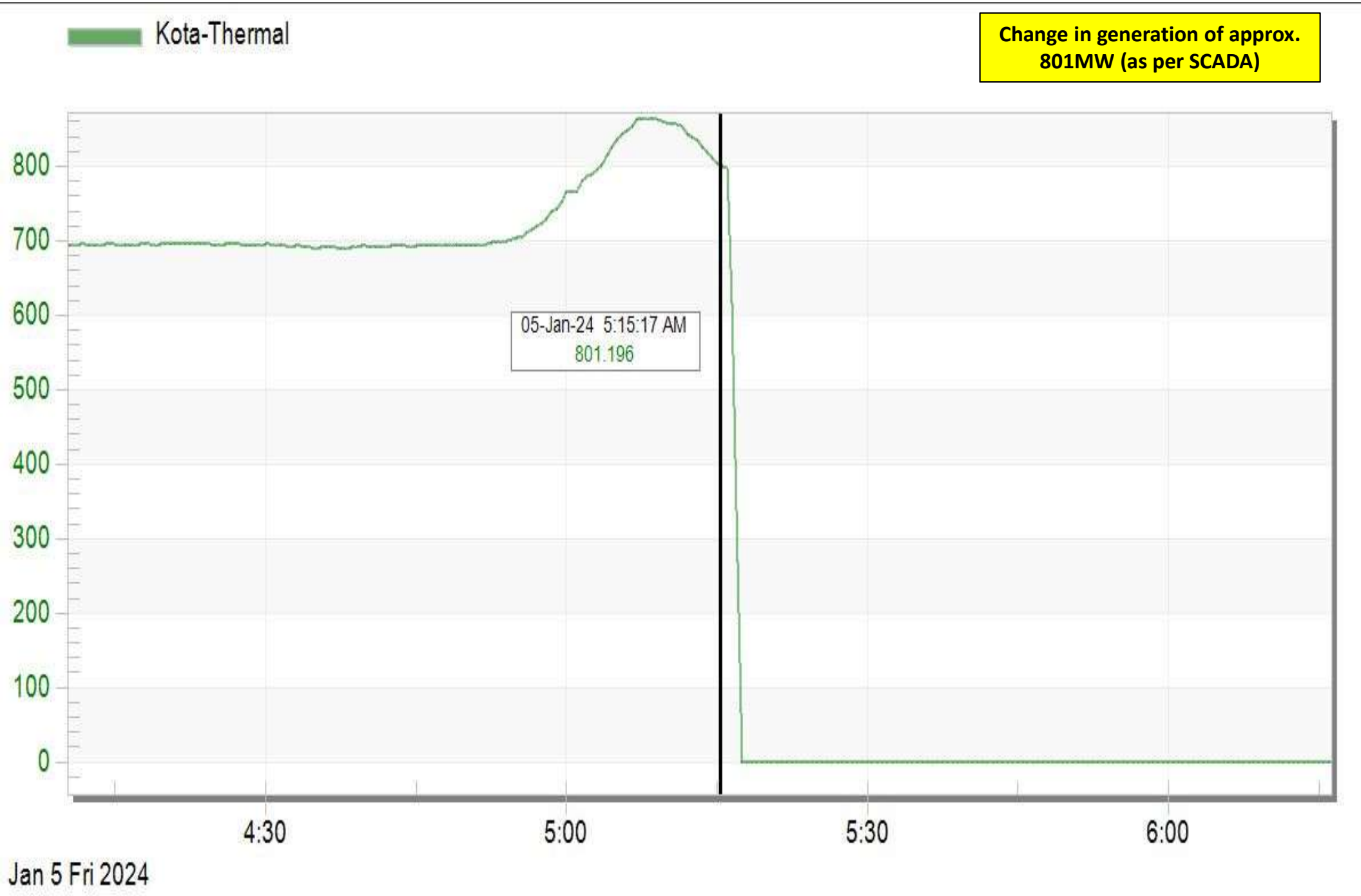
Rajasthan demand during the event



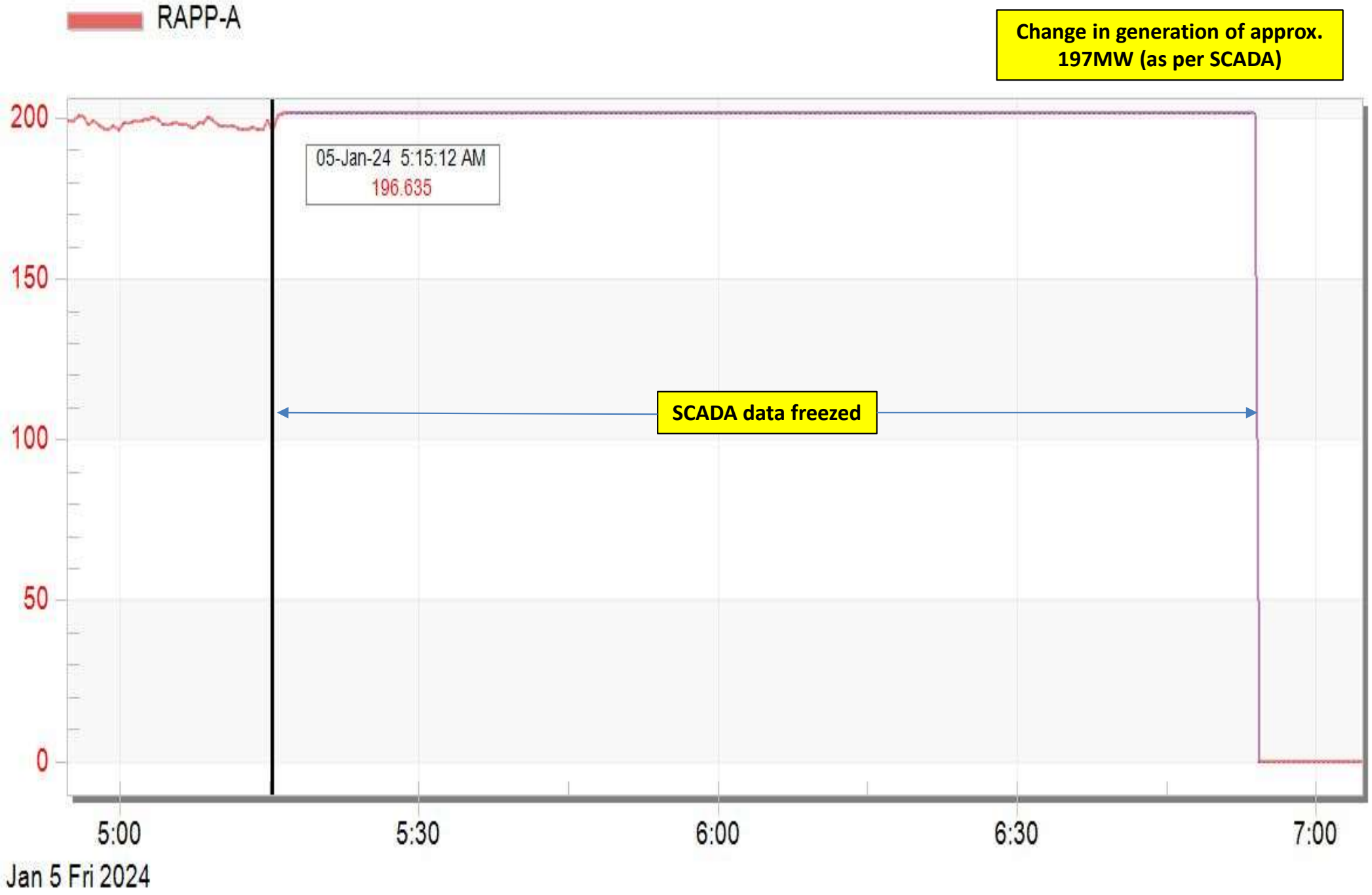
Rajasthan demand vs generation during the event



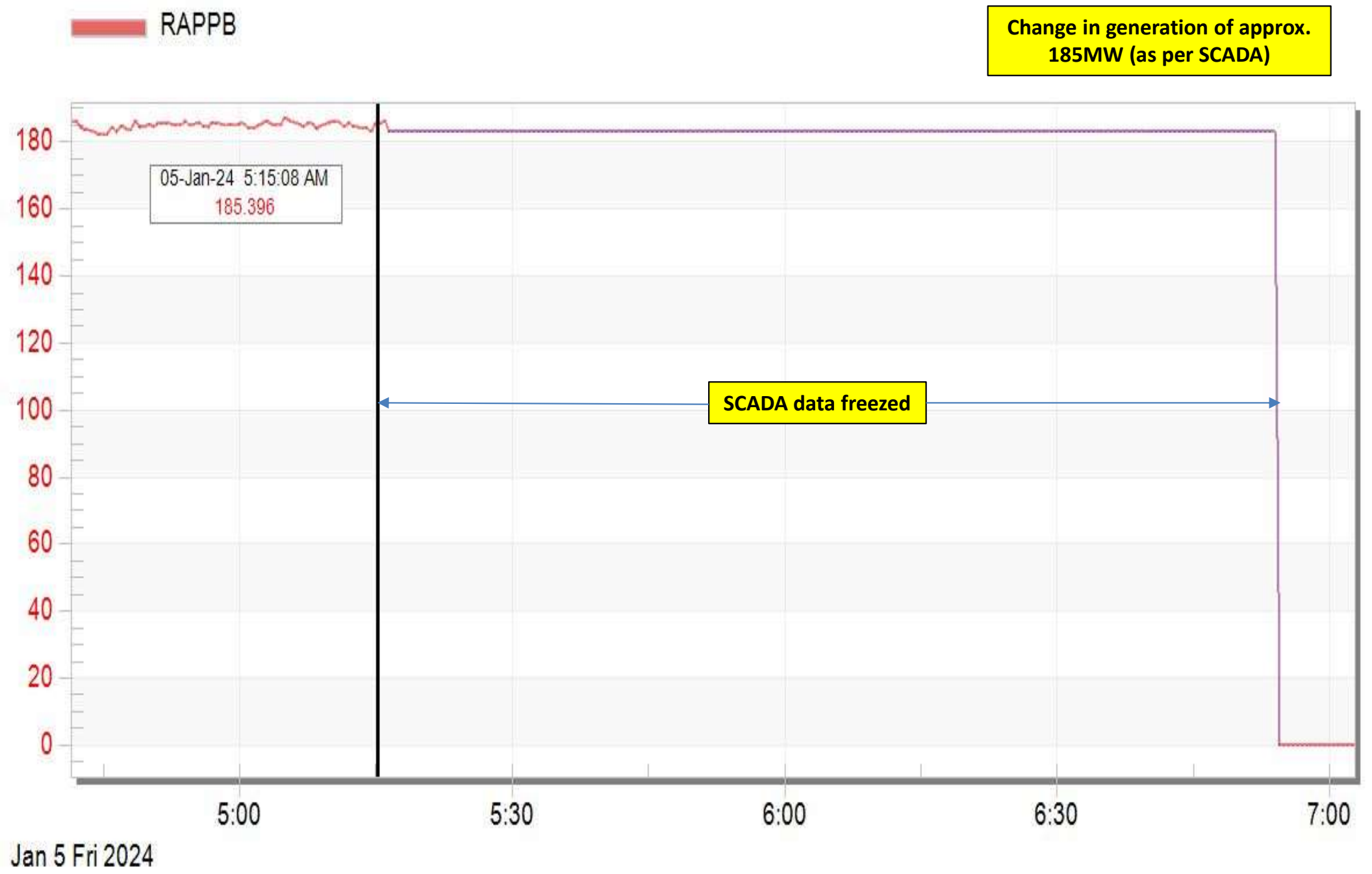
KTPS generation during the event



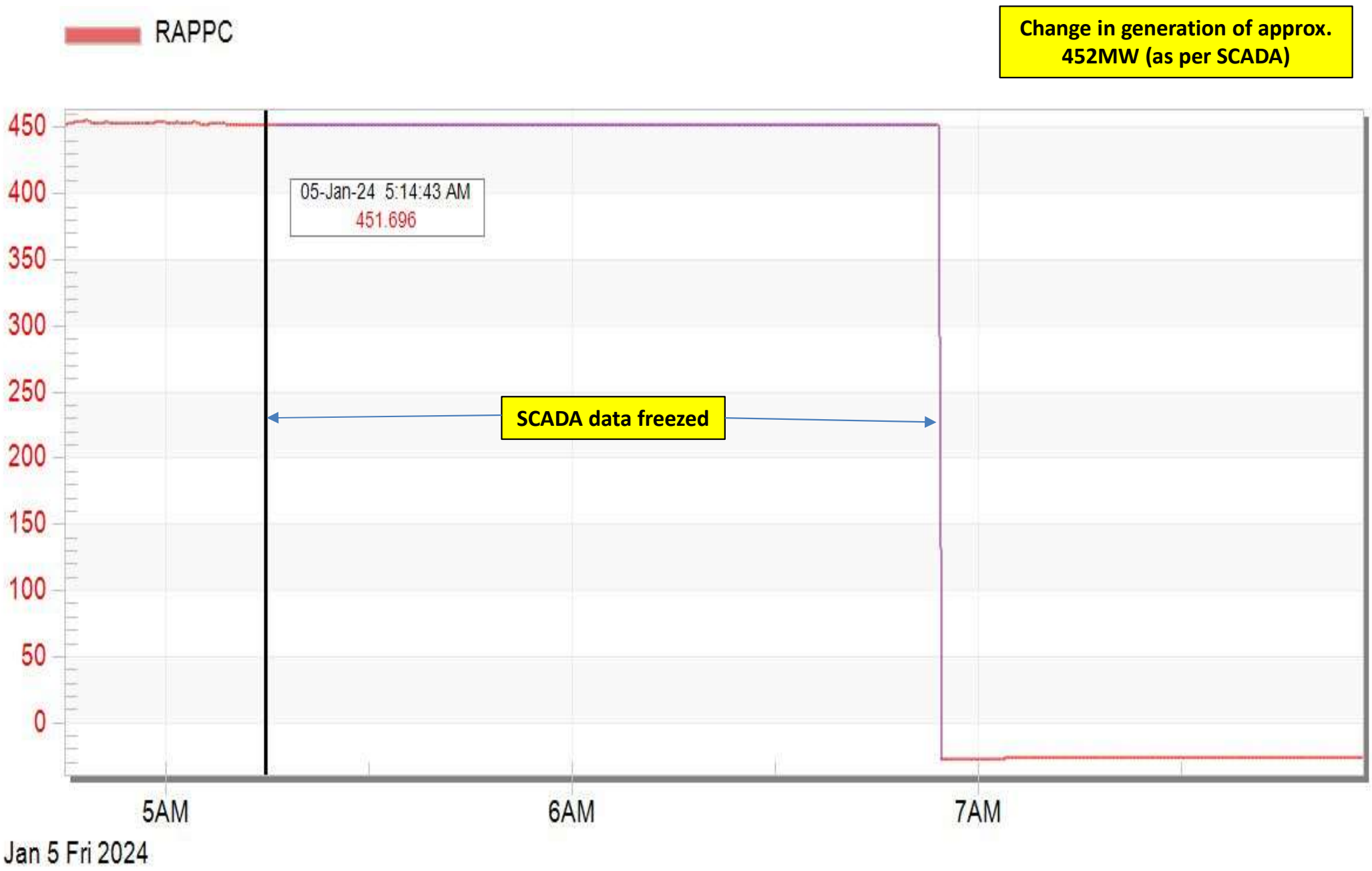
RAPP-A(NP) generation during the event



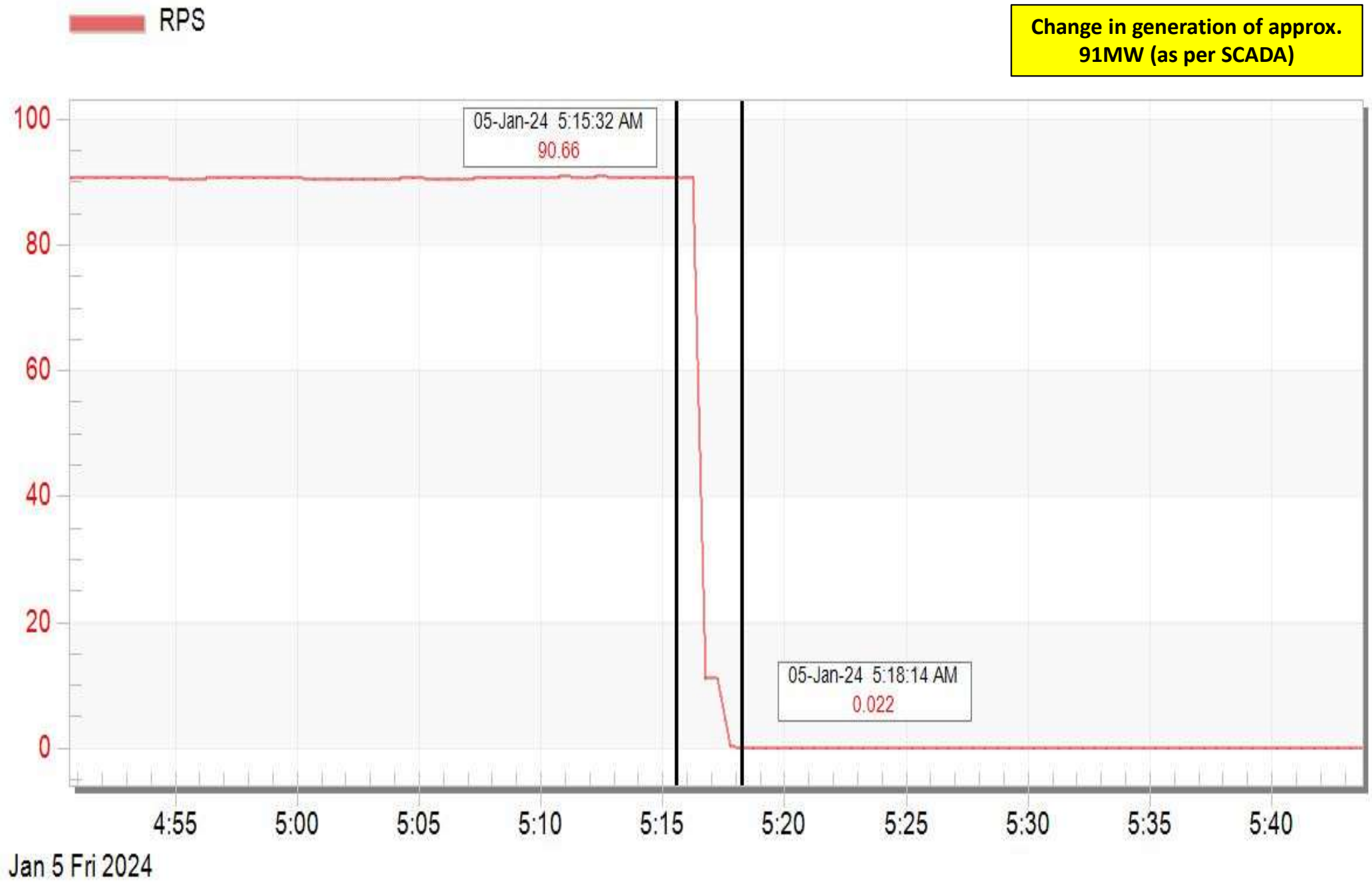
RAPP-B(NP) generation during the event



RAPP-C(NP) generation during the event

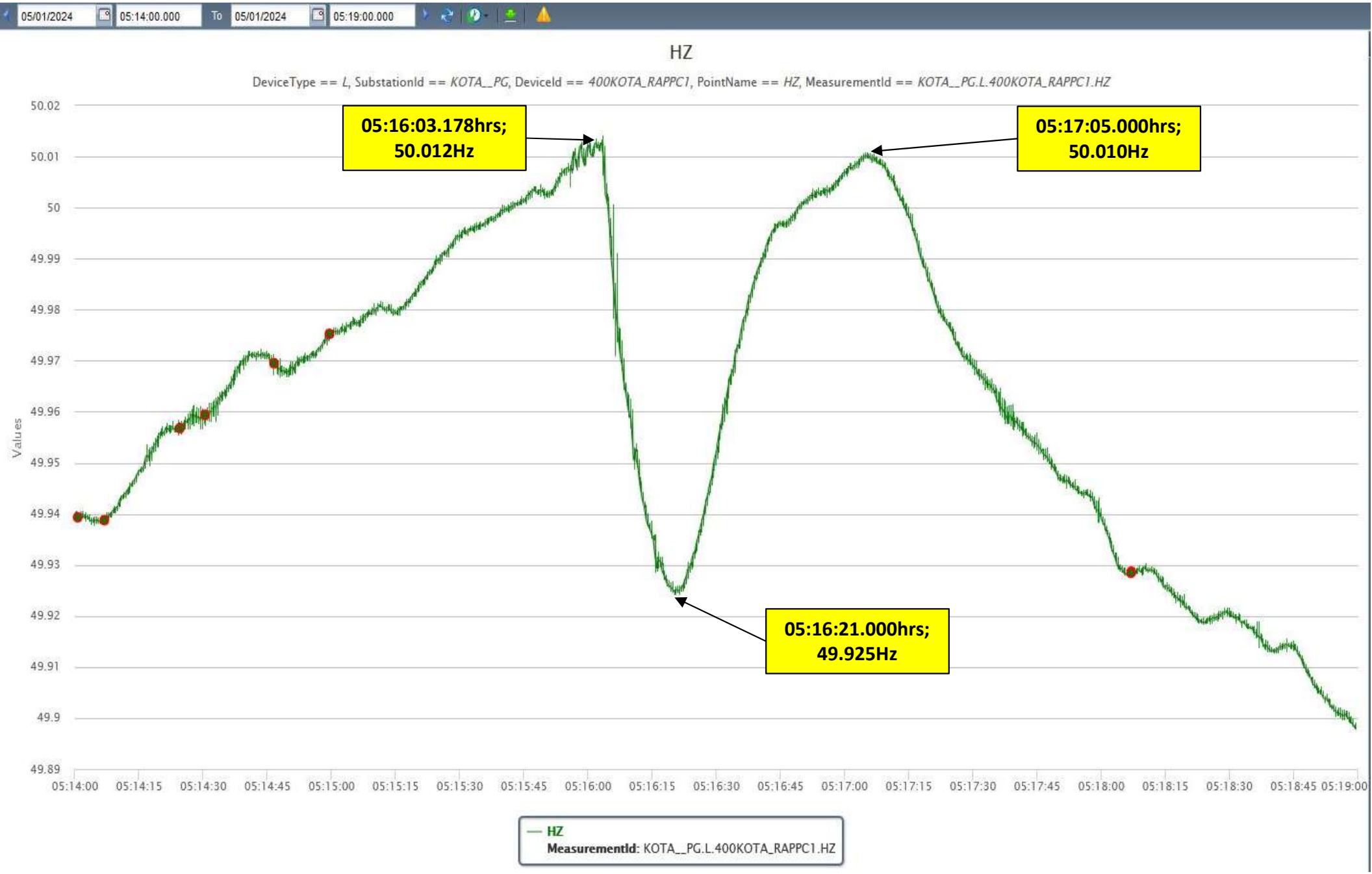


RPS HEP generation during the event



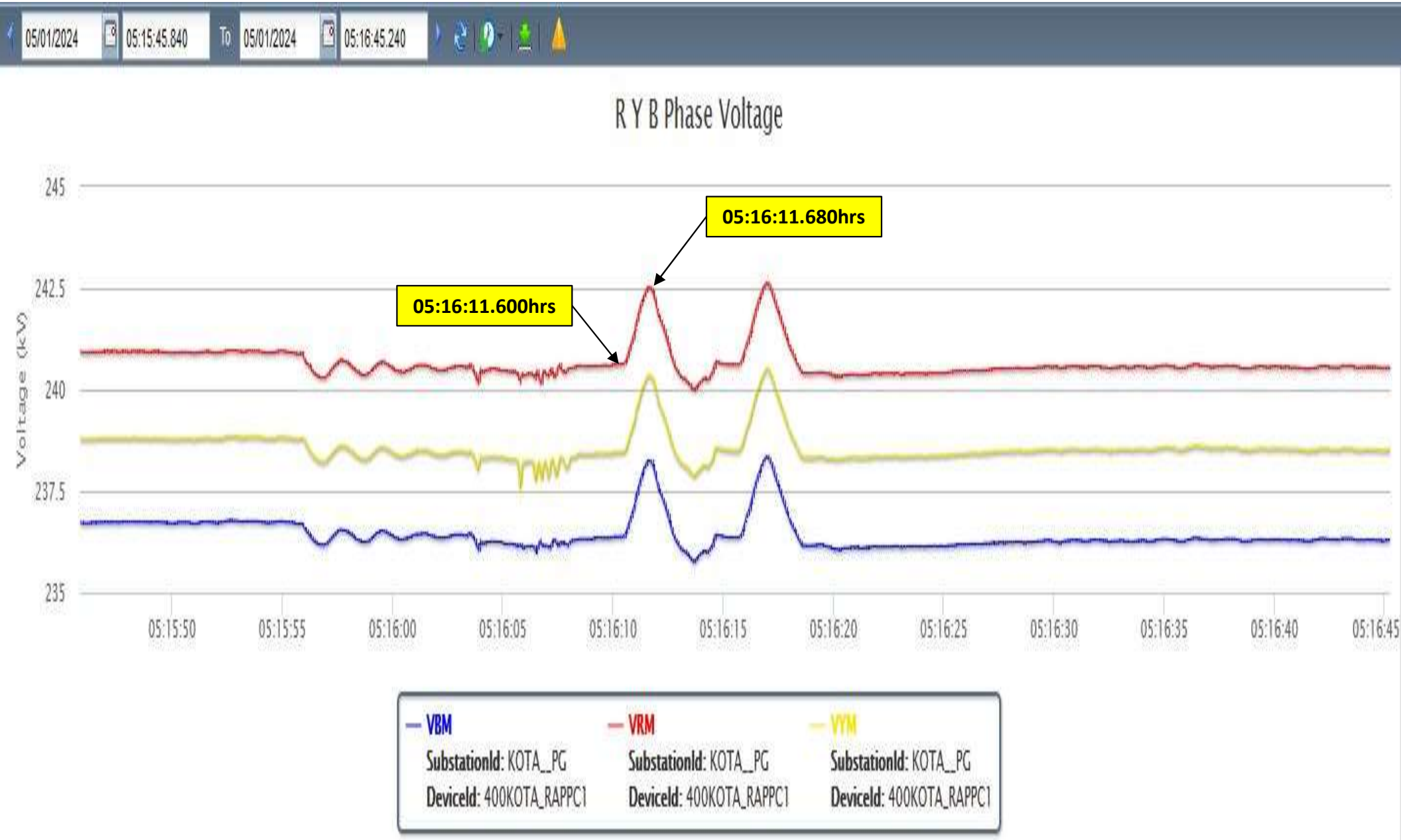
PMU Plot of frequency at Kota(PG)

05:16 hrs/05-Jan-24



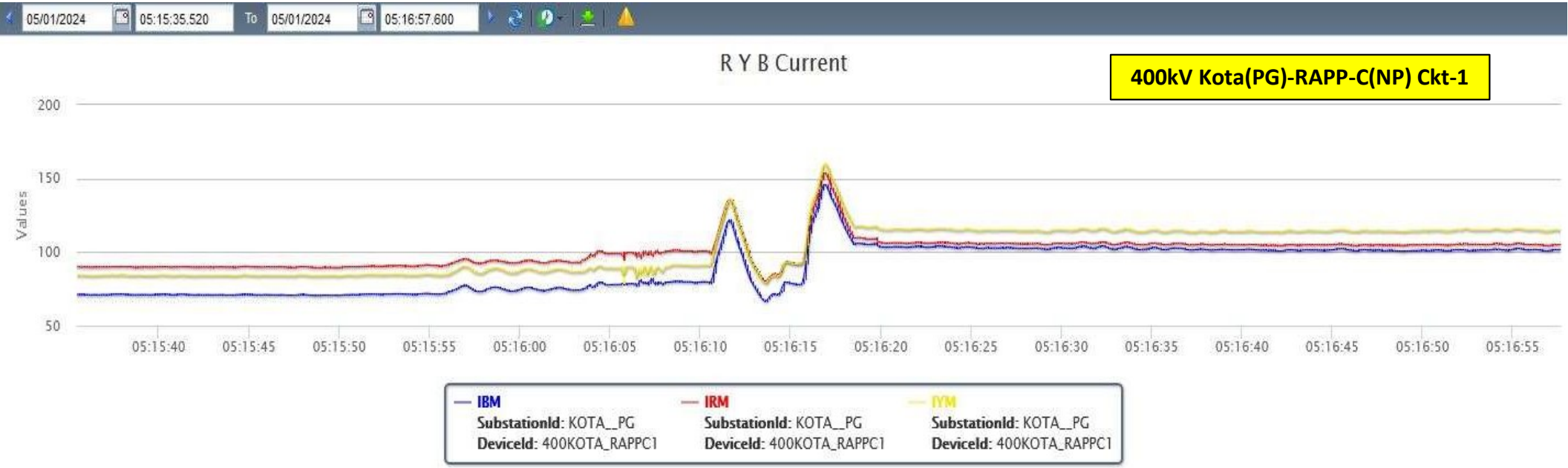
PMU Plot of phase voltage magnitude at Kota(PG)

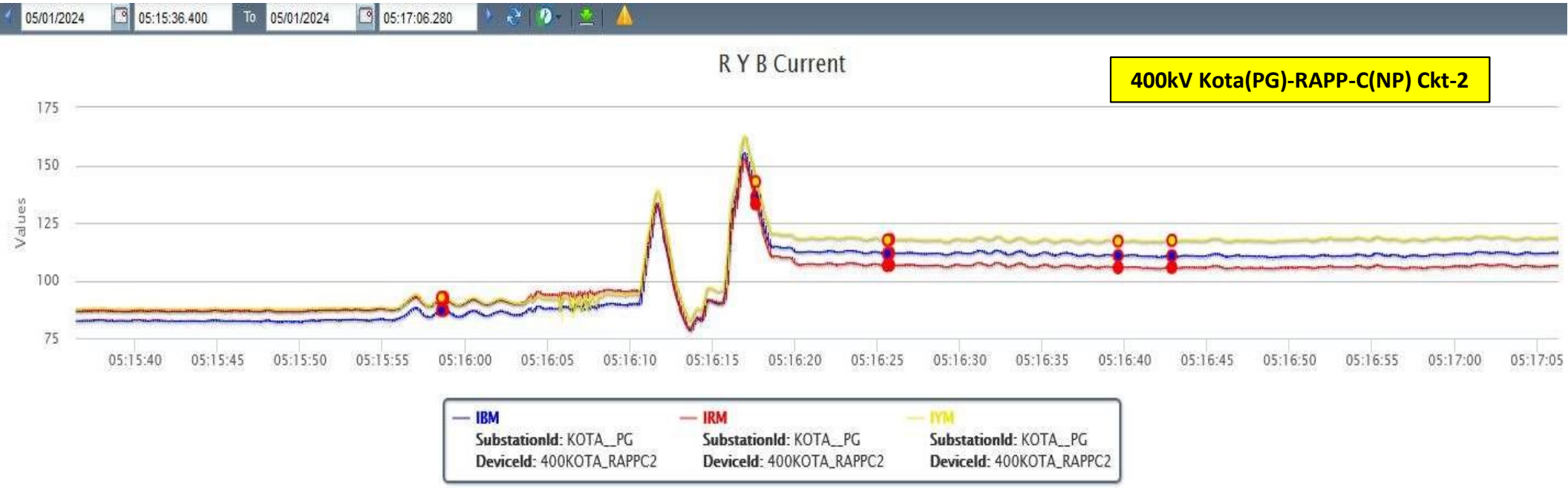
05:16 hrs/05-Jan-24



PMU Plot of phase current magnitude at Kota(PG)

05:16 hrs/05-Jan-24

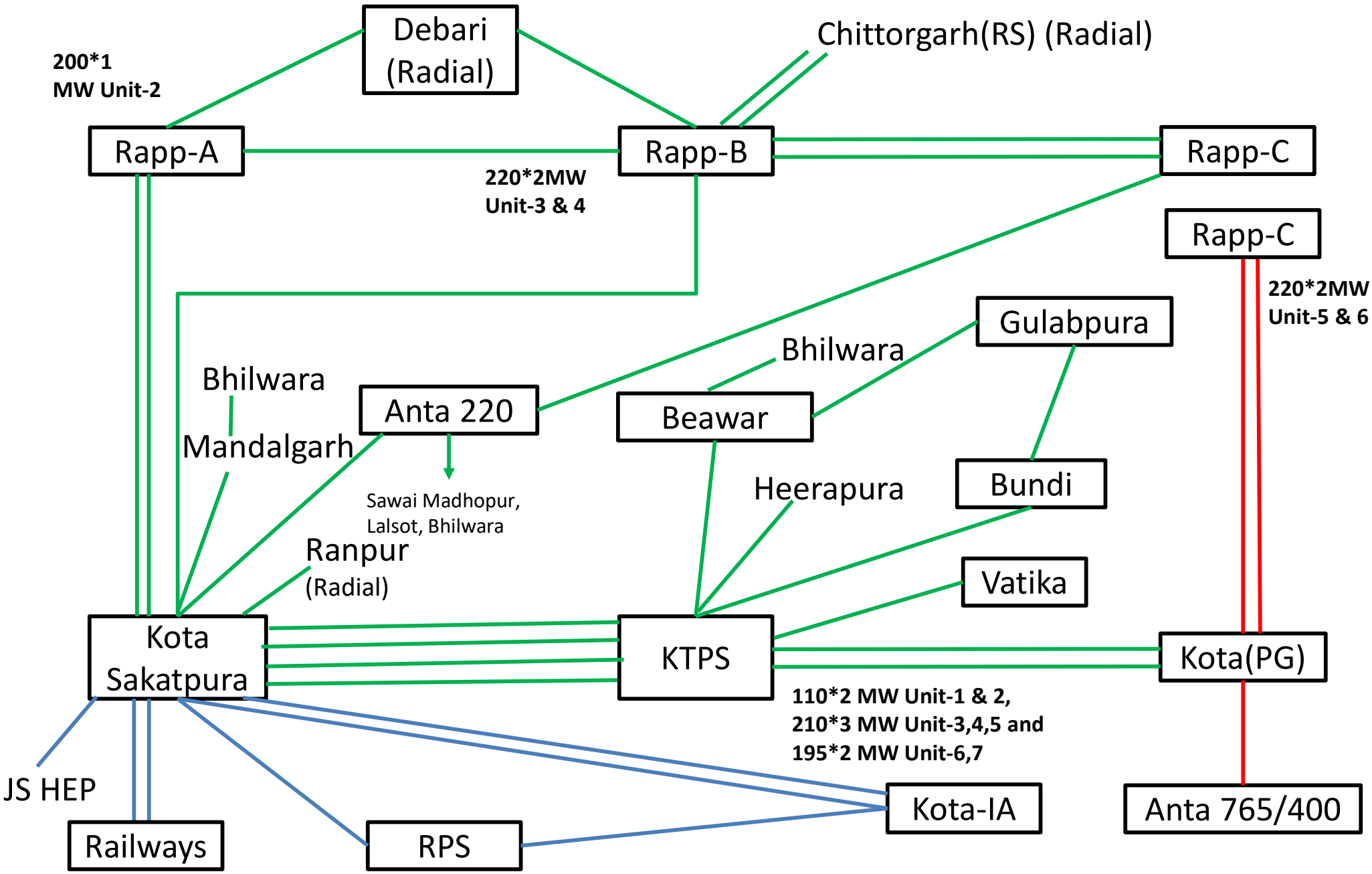




MULTIPLE ELEMENTS TRIPPING AT KTPS(RS), KOTA SAKATPURA, RAPP-A, RAPP-B AND RAPP-C

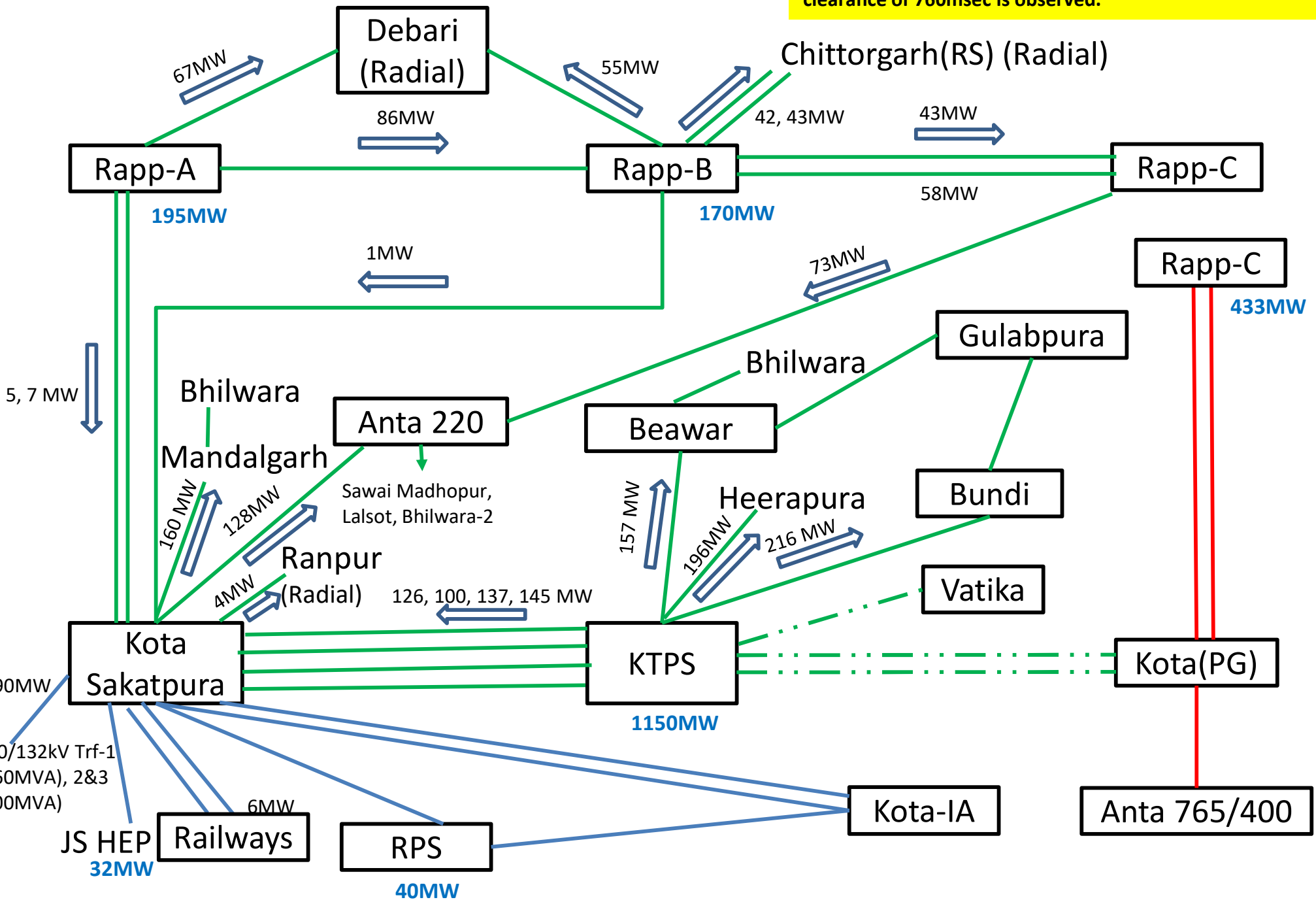
AT 20:22HRS ON 29TH MAR'2024

Connection Diagram between KTPS, RAPS generation complex



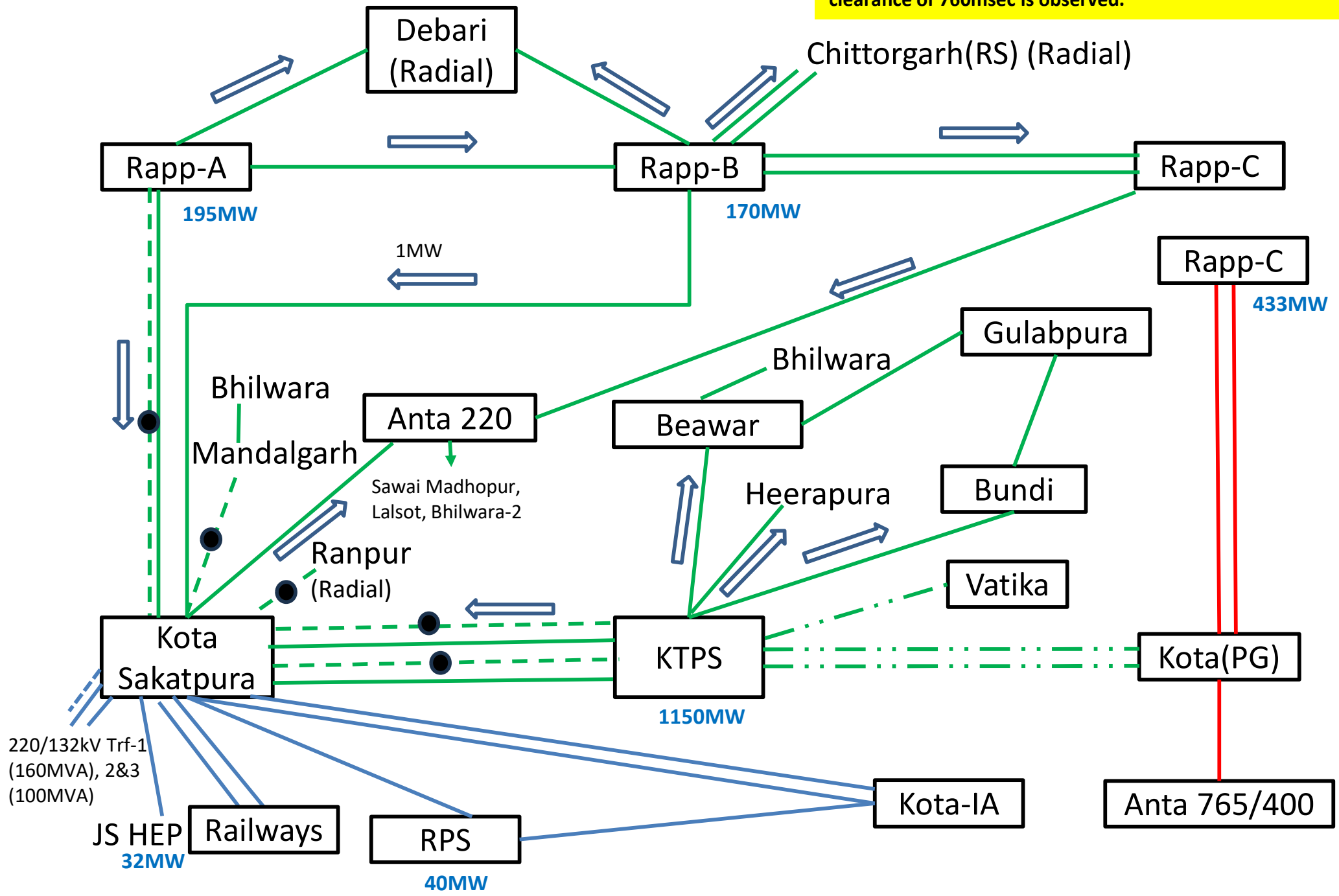
Antecedent scenario (at 20:21 hrs)

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.



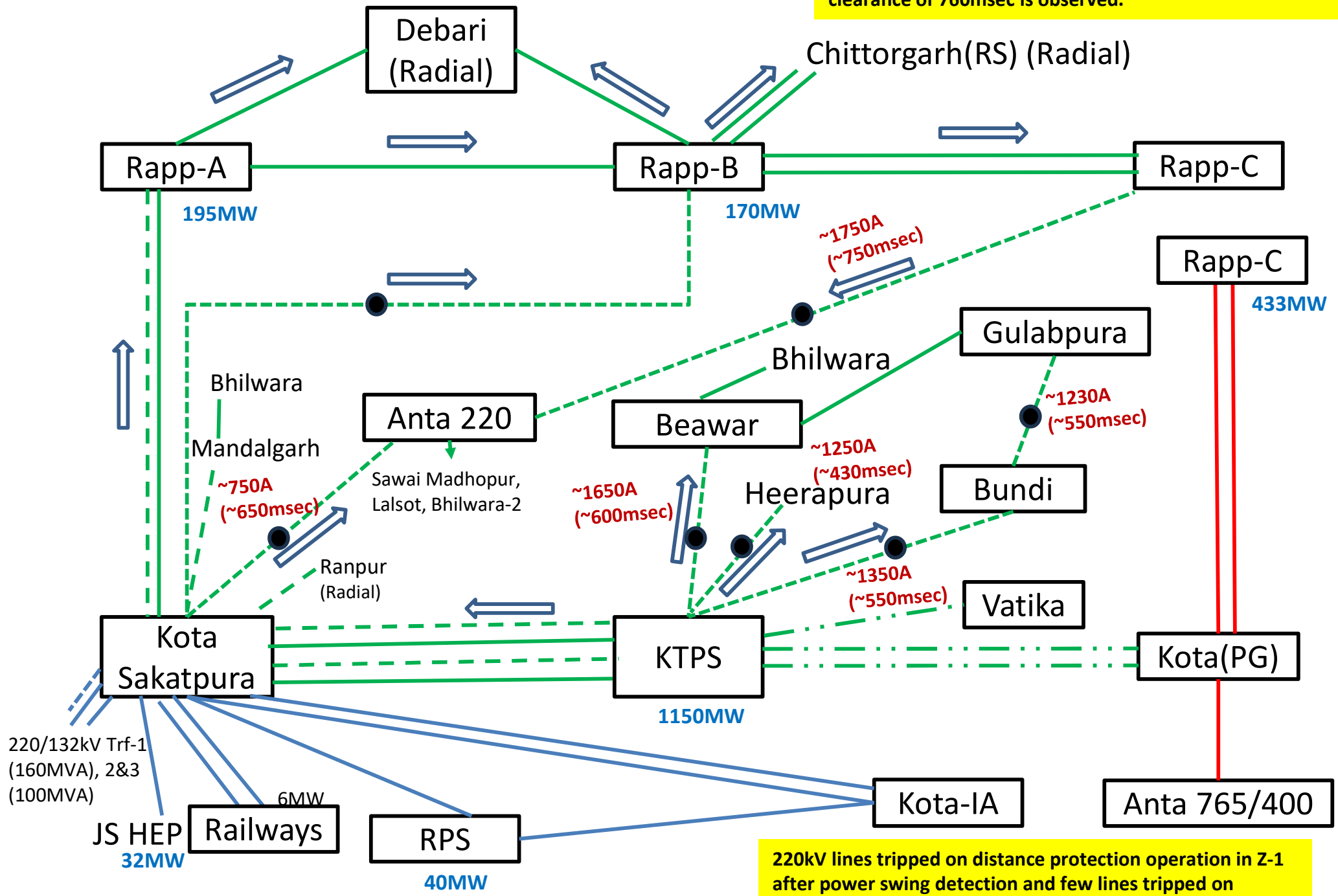
Tripping of multiple 220kV lines in complex (within 200msec of fault time (20:21:52:280hrs))

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))

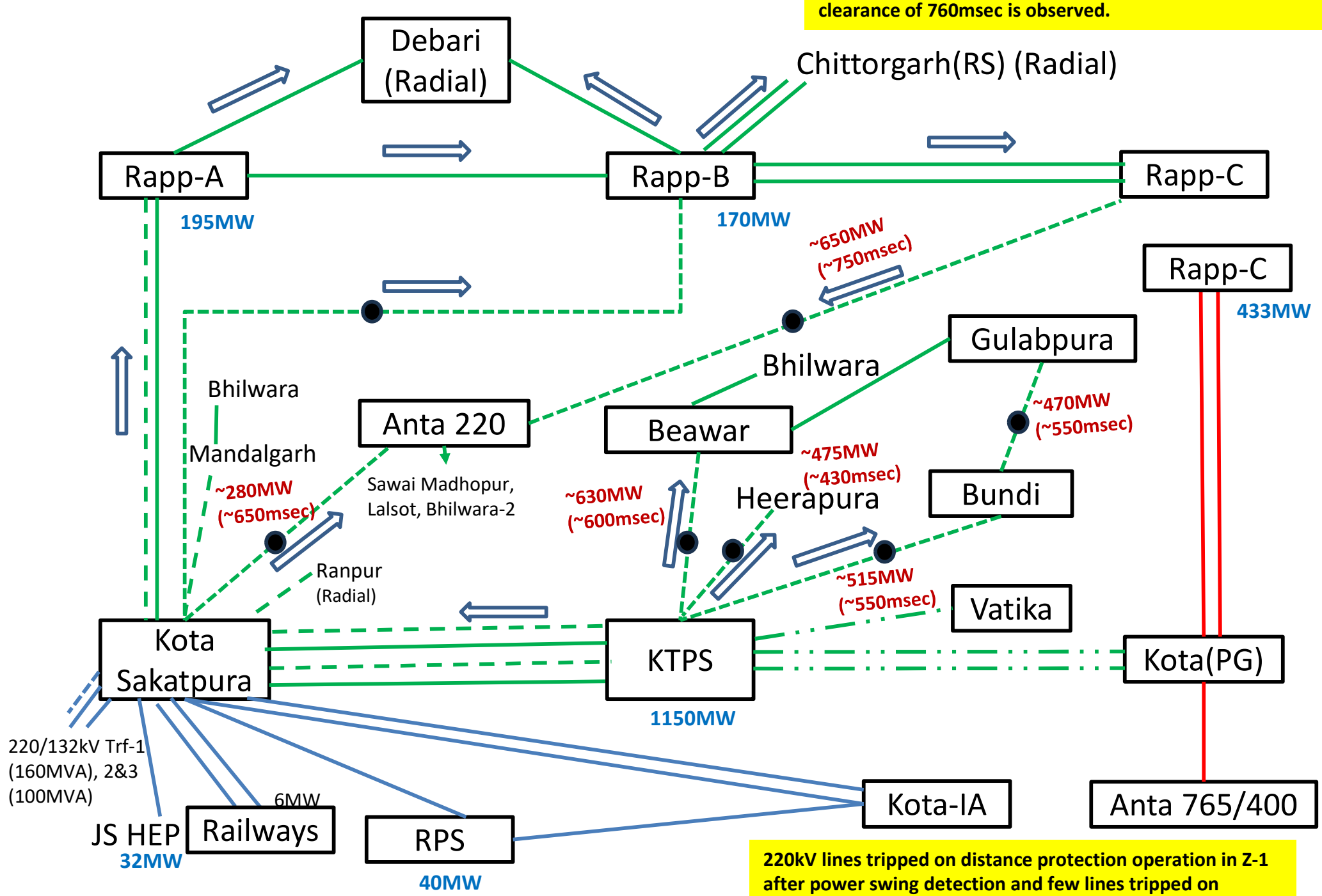
Triggering incident: R-ph CT (220 kV side) of 220 kV/132 kV ICT-1 at Kota Sakatpura blast. As per PMU, R-N fault at 20:21:52:280hrs converted into 3-ph fault with delayed clearance of 760msec is observed.



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

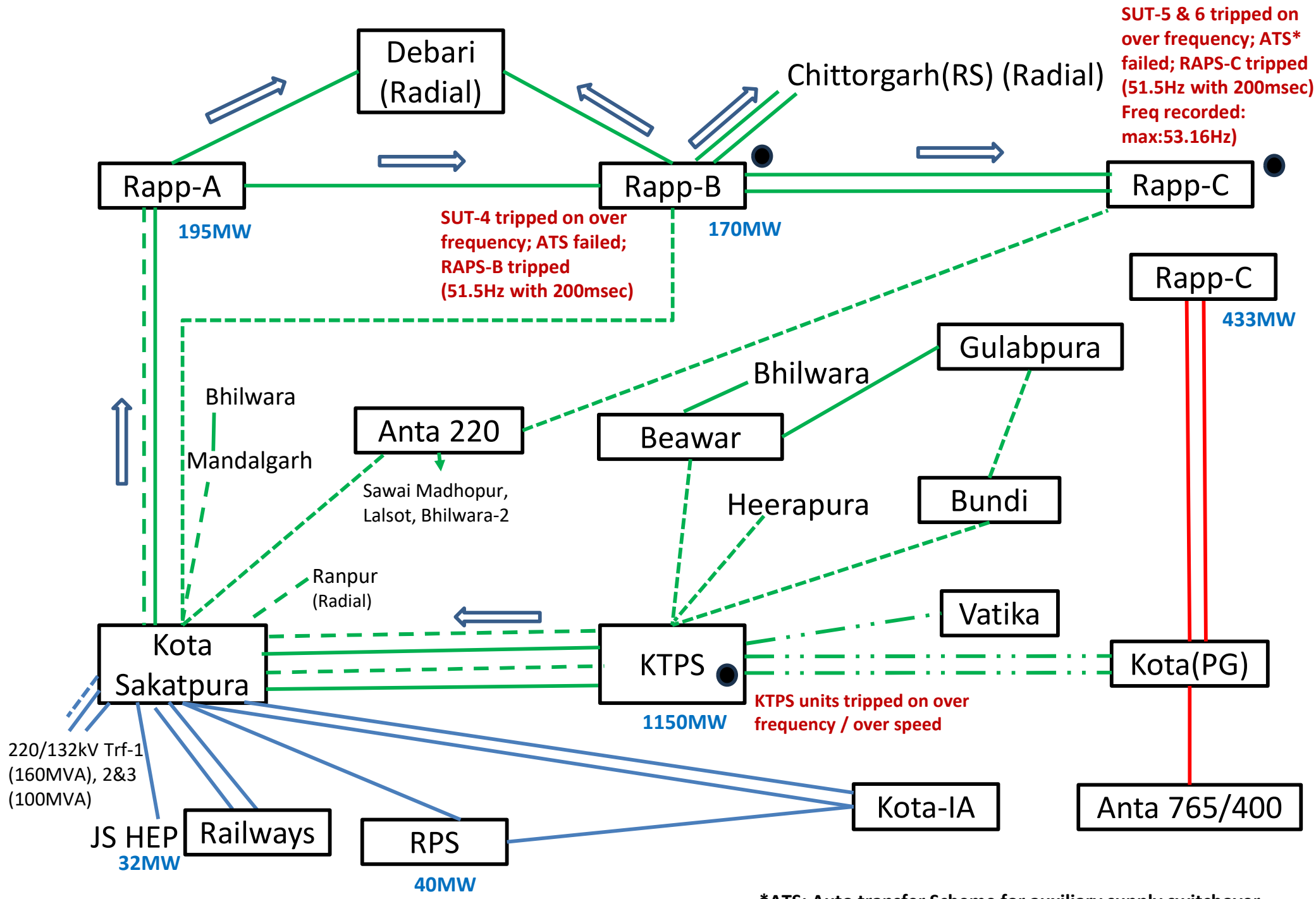
Tripping of multiple 220kV lines in complex (within 600-650msec of fault time (20:21:52:280hrs))

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

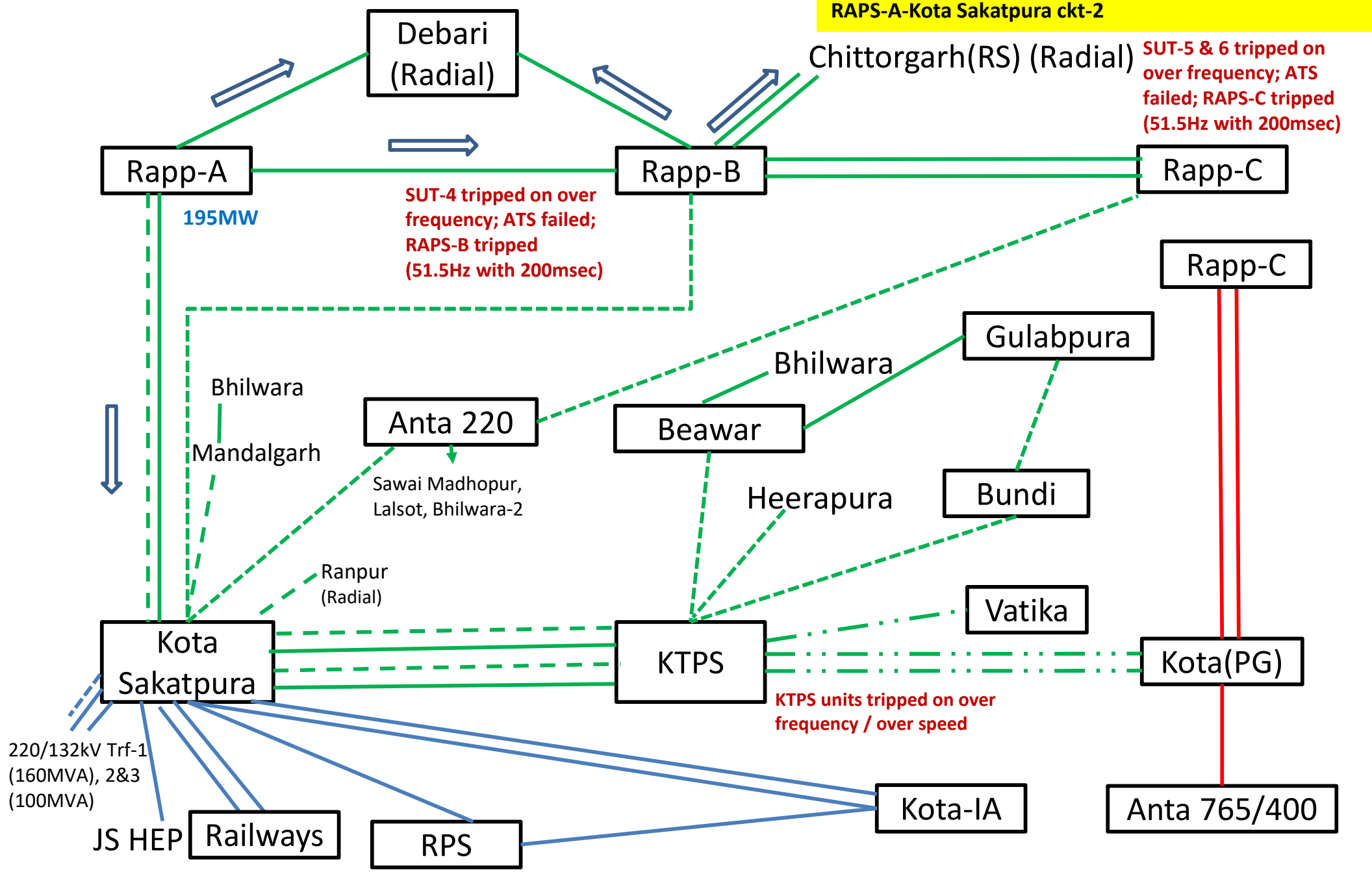
RAPS-B, RAPS-C & KTPS units tripped (within 1-2sec of fault time (20:21:52:280hrs))

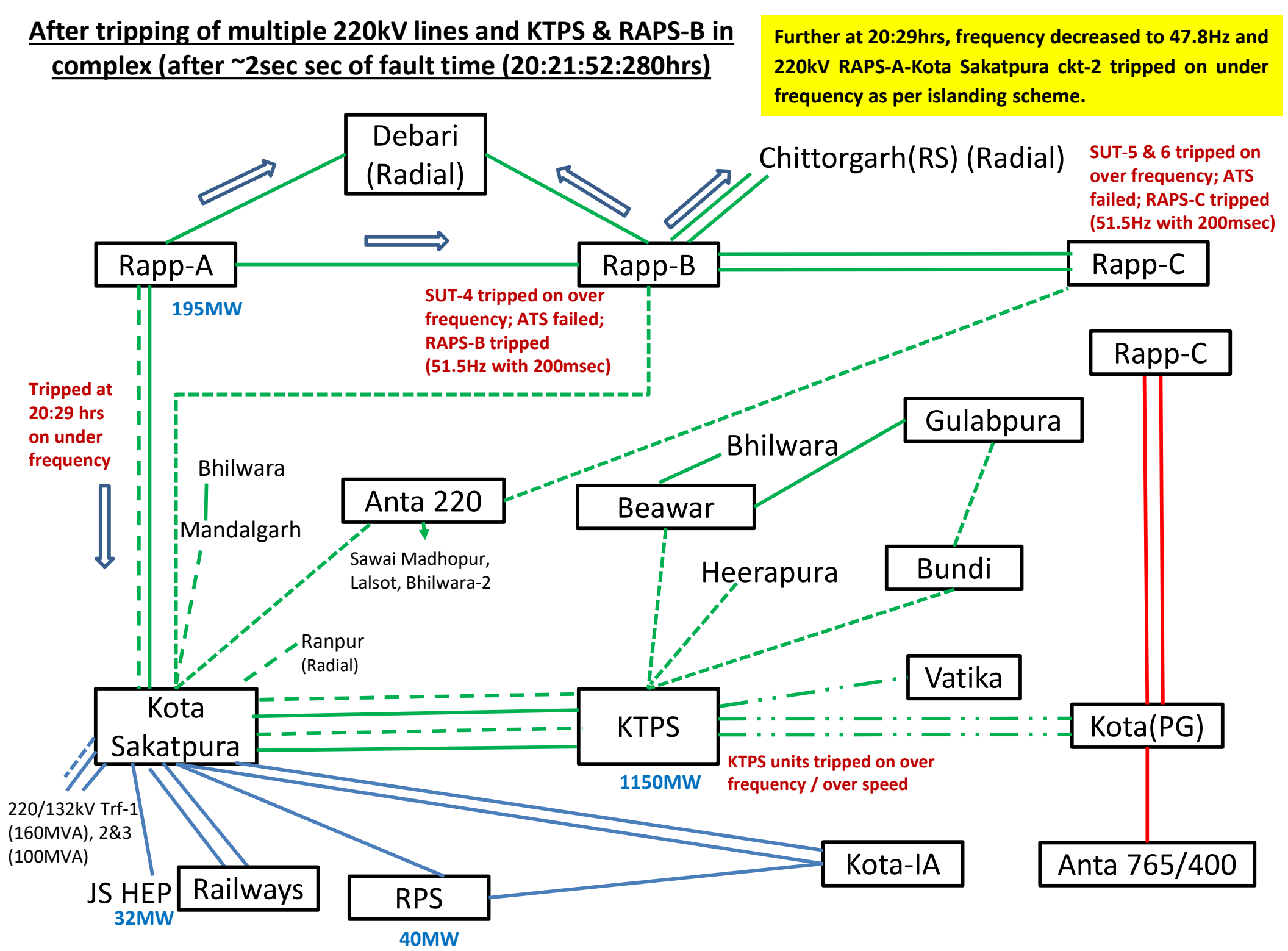


*ATS: Auto transfer Scheme for auxiliary supply switchover

After tripping of multiple 220kV lines and KTPS & RAPS-B in complex (after ~2sec sec of fault time (20:21:52:280hrs)

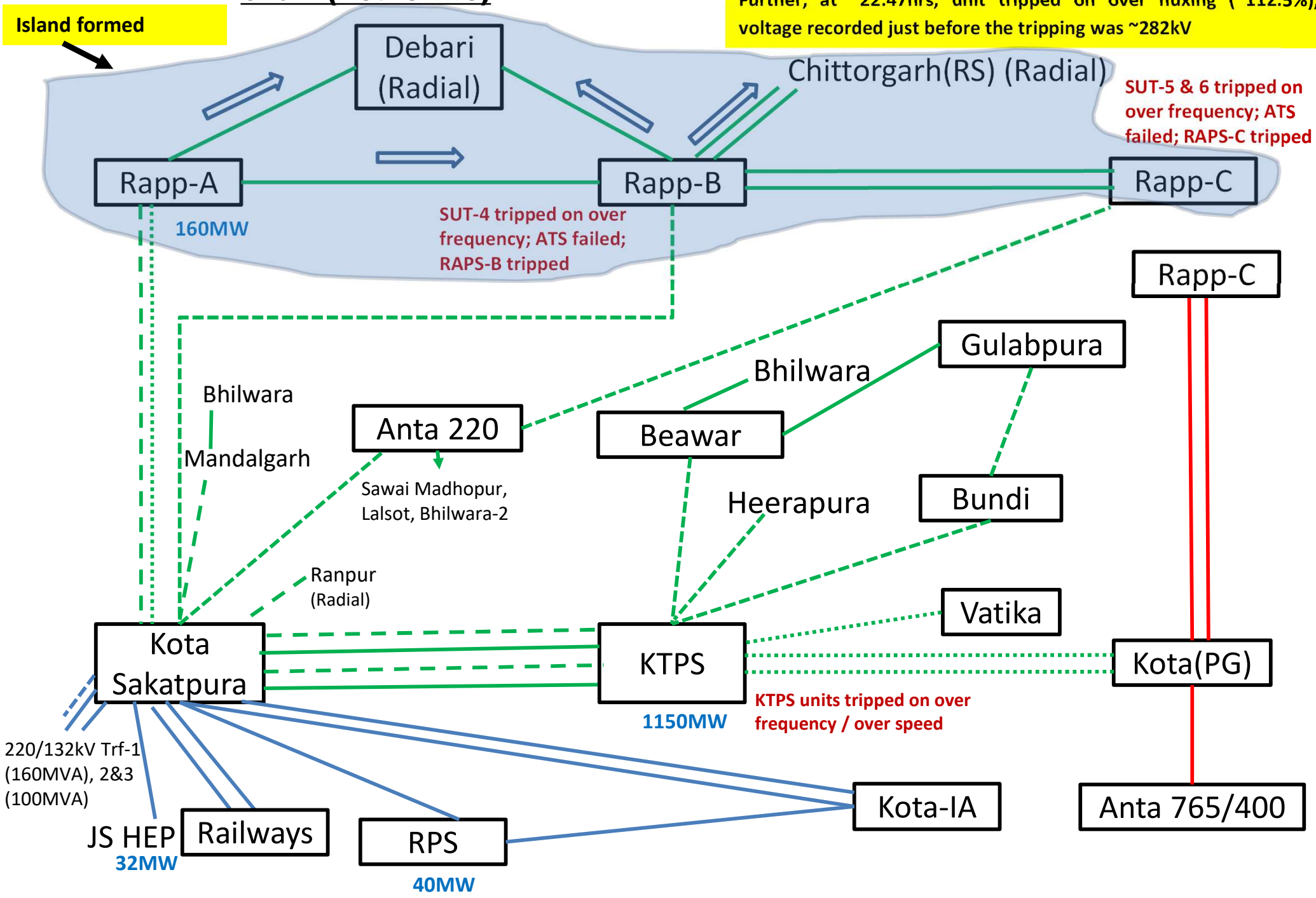
RAPS-A unit-2 was available which was feeding 220kV Debari, 220kV Chittorgarh via 220kV RAPS-A-RAPS-B tie line and load at 220/132kV Kota Sakatpura via 220kV RAPS-A-Kota Sakatpura ckt-2



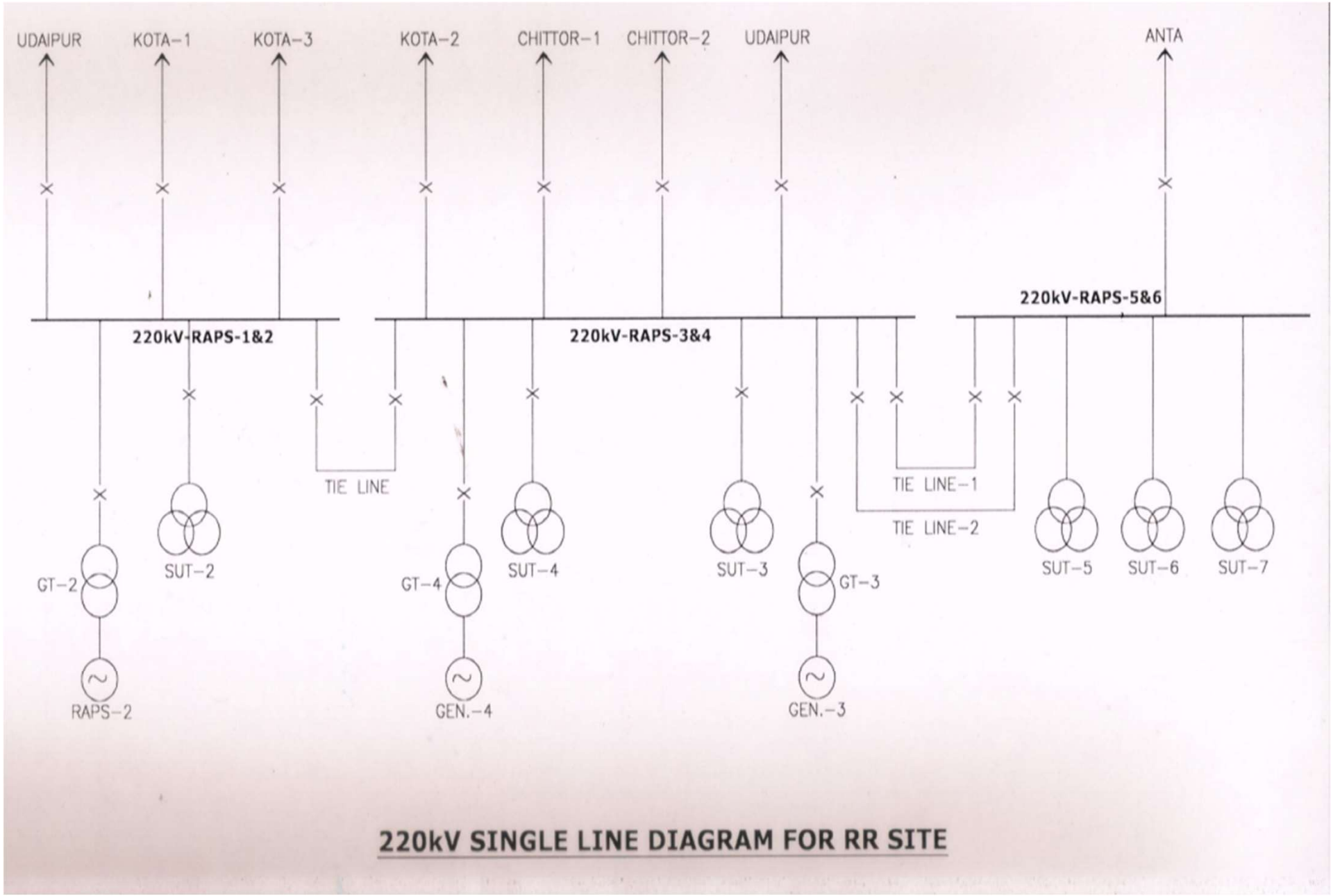

After tripping of multiple 220kV lines and KTPS & RAPS-B in complex (after ~2sec sec of fault time (20:21:52:280hrs)
Further at 20:29hrs, frequency decreased to 47.8Hz and 220kV RAPS-A-Kota Sakatpura ckt-2 tripped on under frequency as per islanding scheme.
Debari (Radial)
Chittorgarh(RS) (Radial)
SUT-5 & 6 tripped on over frequency; ATS failed; RAPS-C tripped (51.5Hz with 200msec)
Rapp-A
195MW
Rapp-B
Rapp-C
SUT-4 tripped on over frequency; ATS failed; RAPS-B tripped (51.5Hz with 200msec)
Tripped at 20:29 hrs on under frequency
Rapp-C
Gulabpura
Bhilwara
Bhilwara
Anta 220
Beawar
Mandalgarh
Sawai Madhopur, Lalsot, Bhilwara-2
Heerapura
Bundi
Ranpur (Radial)
Vatika
Kota Sakatpura
KTPS
Kota(PG)
1150MW
KTPS units tripped on over frequency / over speed
220/132kV Trf-1 (160MVA), 2&3 (100MVA)
Kota-IA
Anta 765/400
JS HEP
32MW
Railways
RPS
40MW

After tripping 220kV RAPS-A-Kota Sakatpura ckt-2 (20:29 hrs)

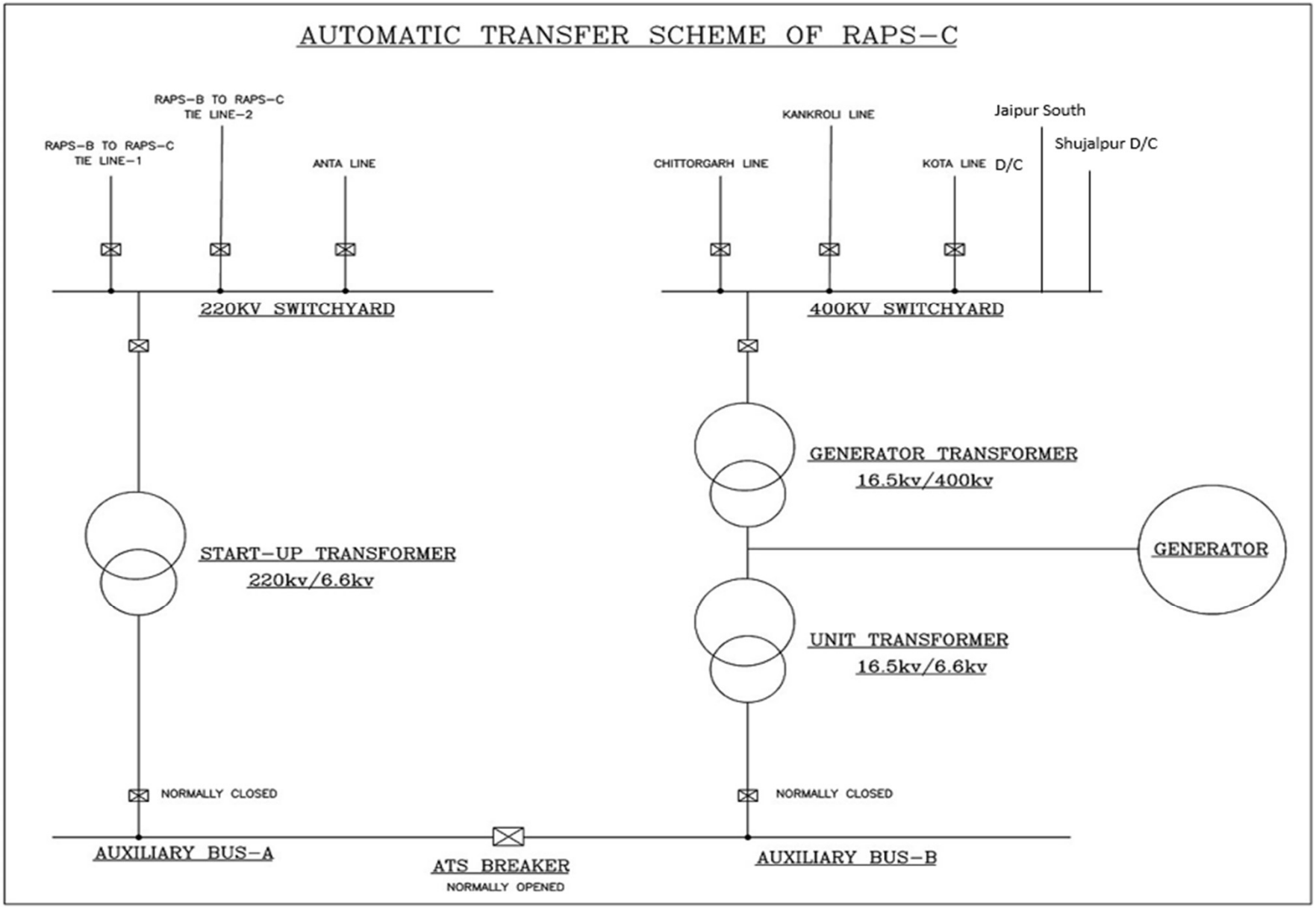
RAPS-A generation was reduced to 160MW. Island operated till approx. 22:47hrs, frequency (51-52Hz) and voltage (230-240kV). Further, at ~22:47hrs, unit tripped on over fluxing (~112.5%), voltage recorded just before the tripping was ~282kV



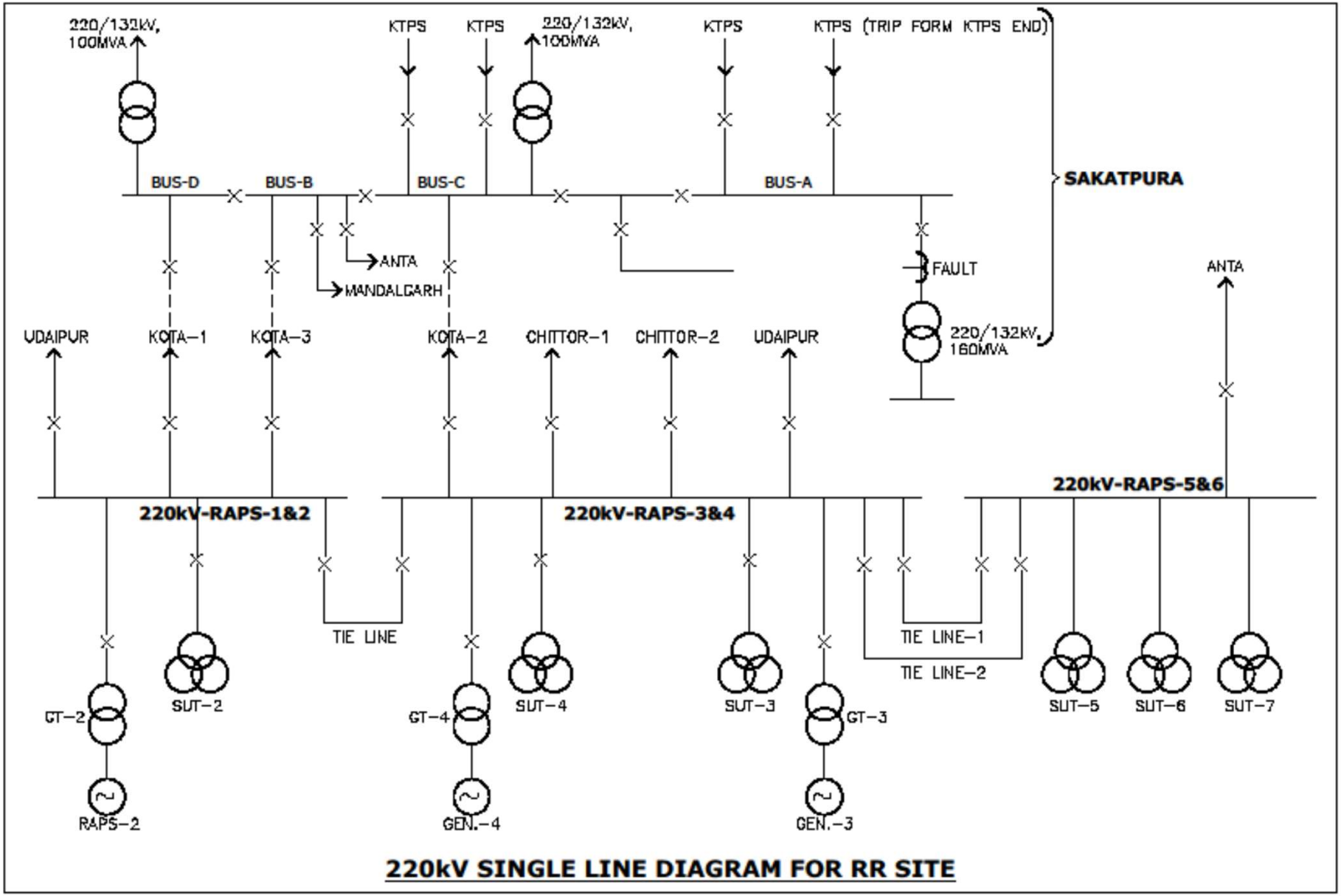
SLD and connectivity of RAPS- A, RAPS-B & RAPS-C



Auto Transfer Scheme at RAPS-C

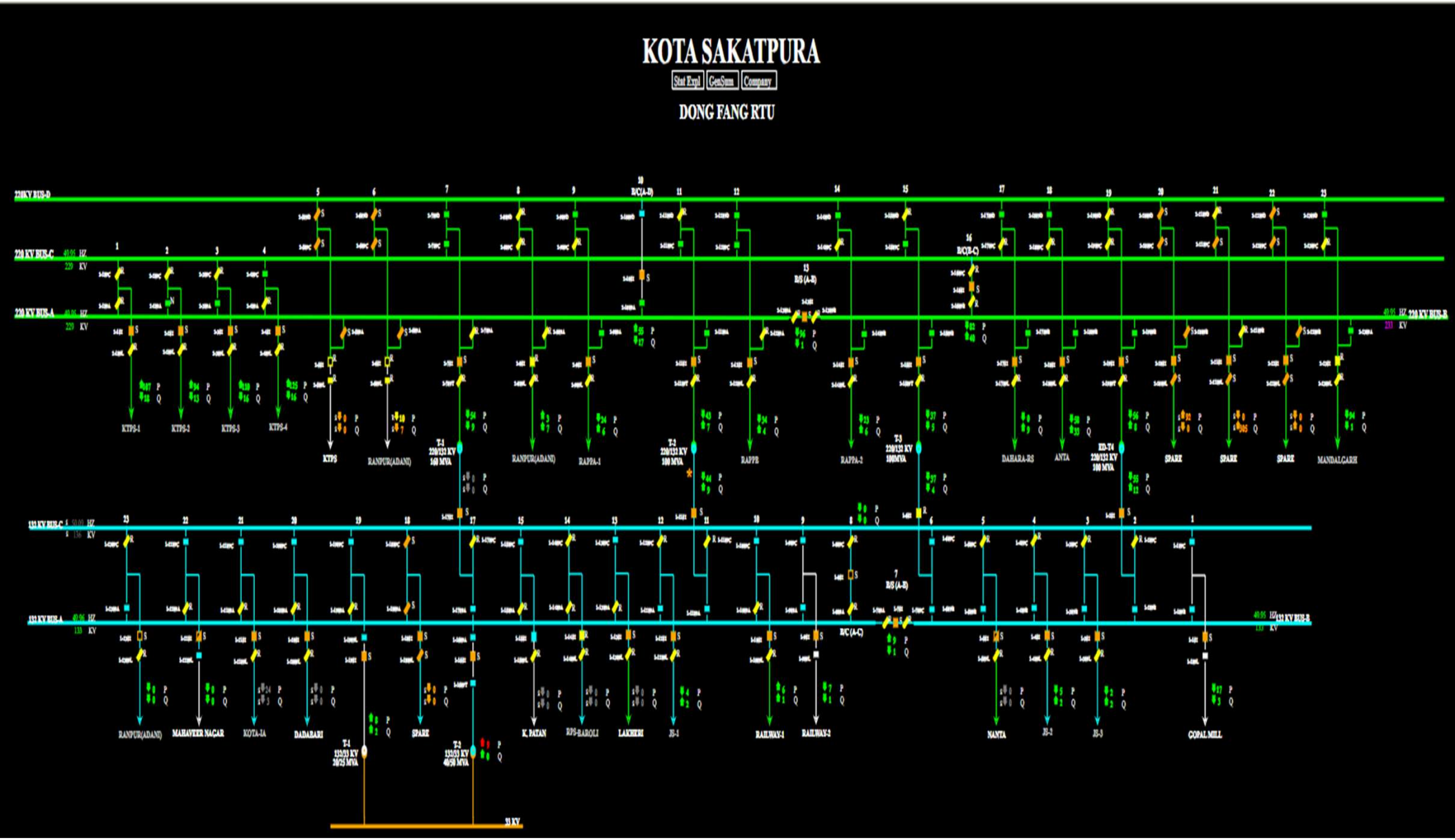


Auto Transfer Scheme at RAPS-C

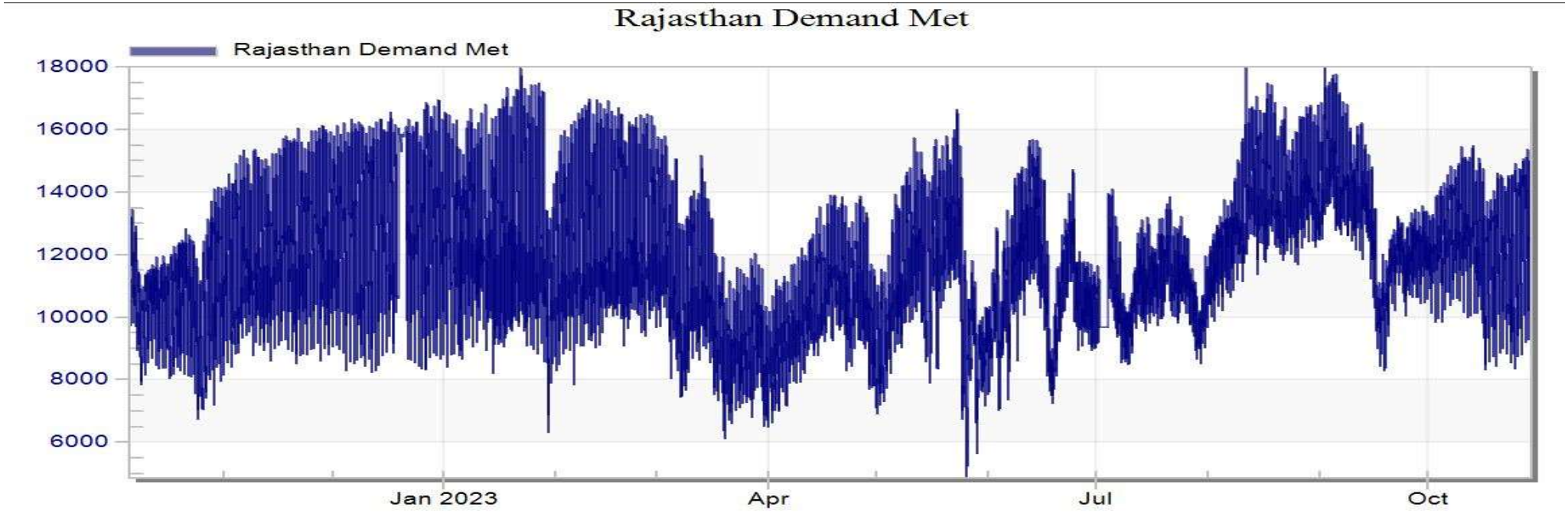


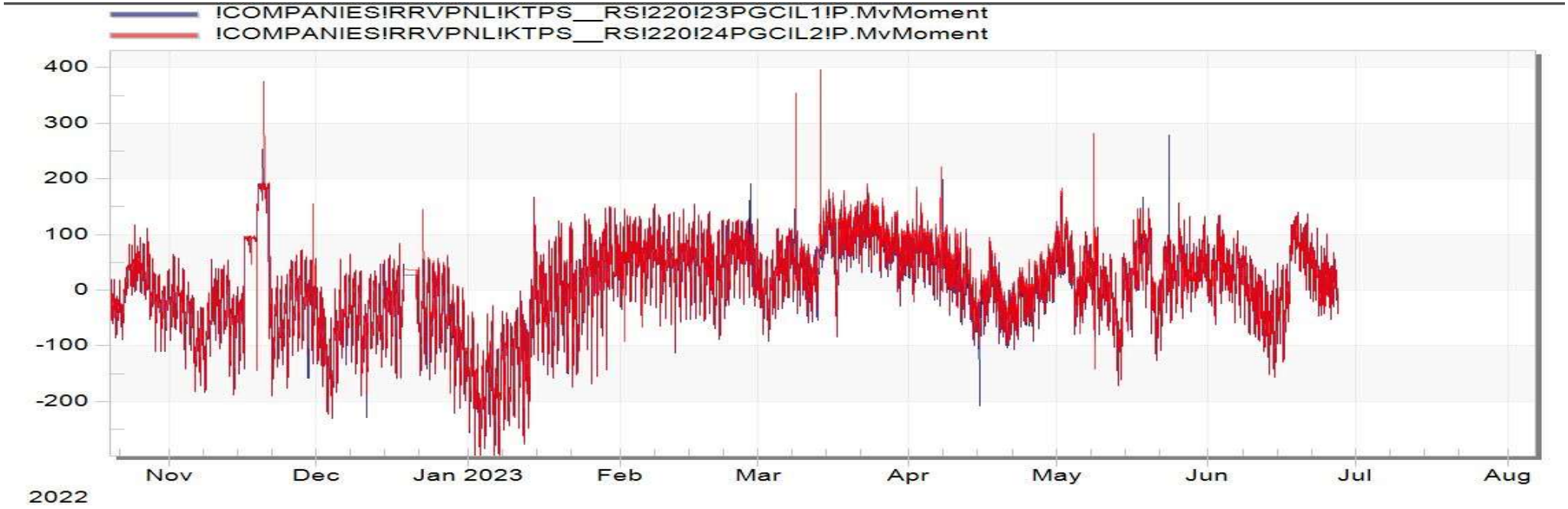
220kV SINGLE LINE DIAGRAM FOR RR SITE

SLD of 220/132kV Kota Sakatpura

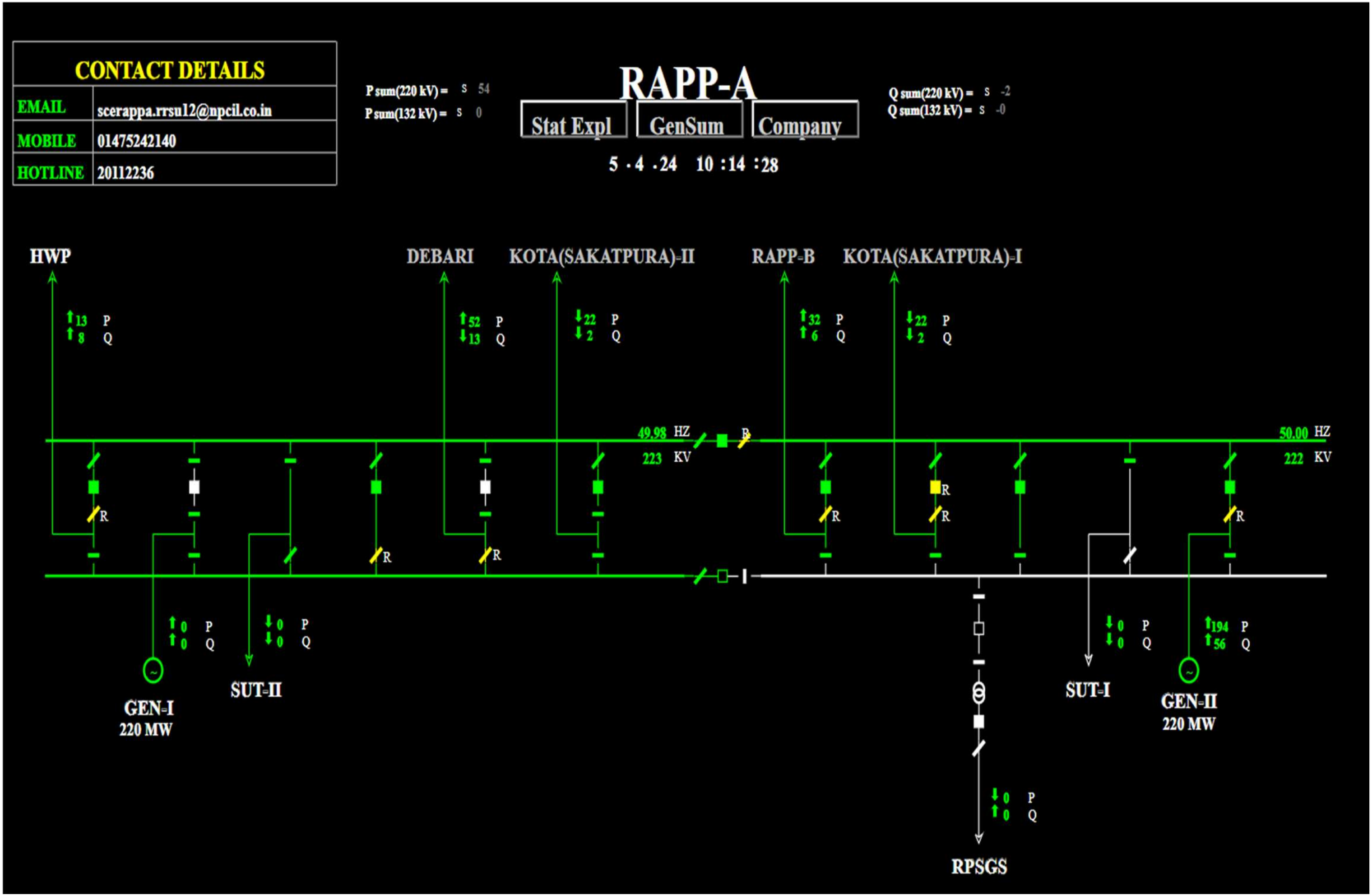


Loading pattern of 220kV KTPS-Kota(PG) D/C

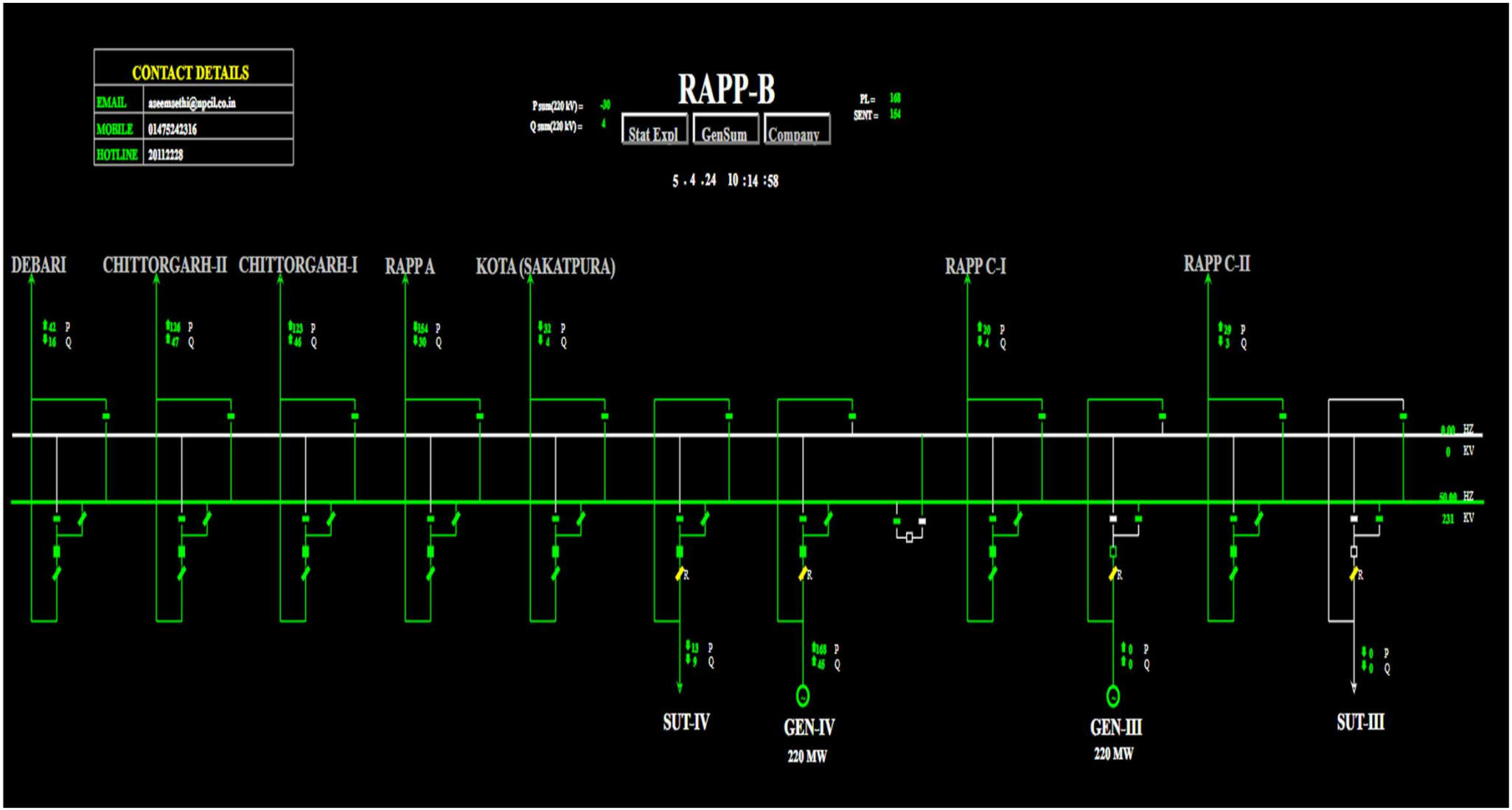




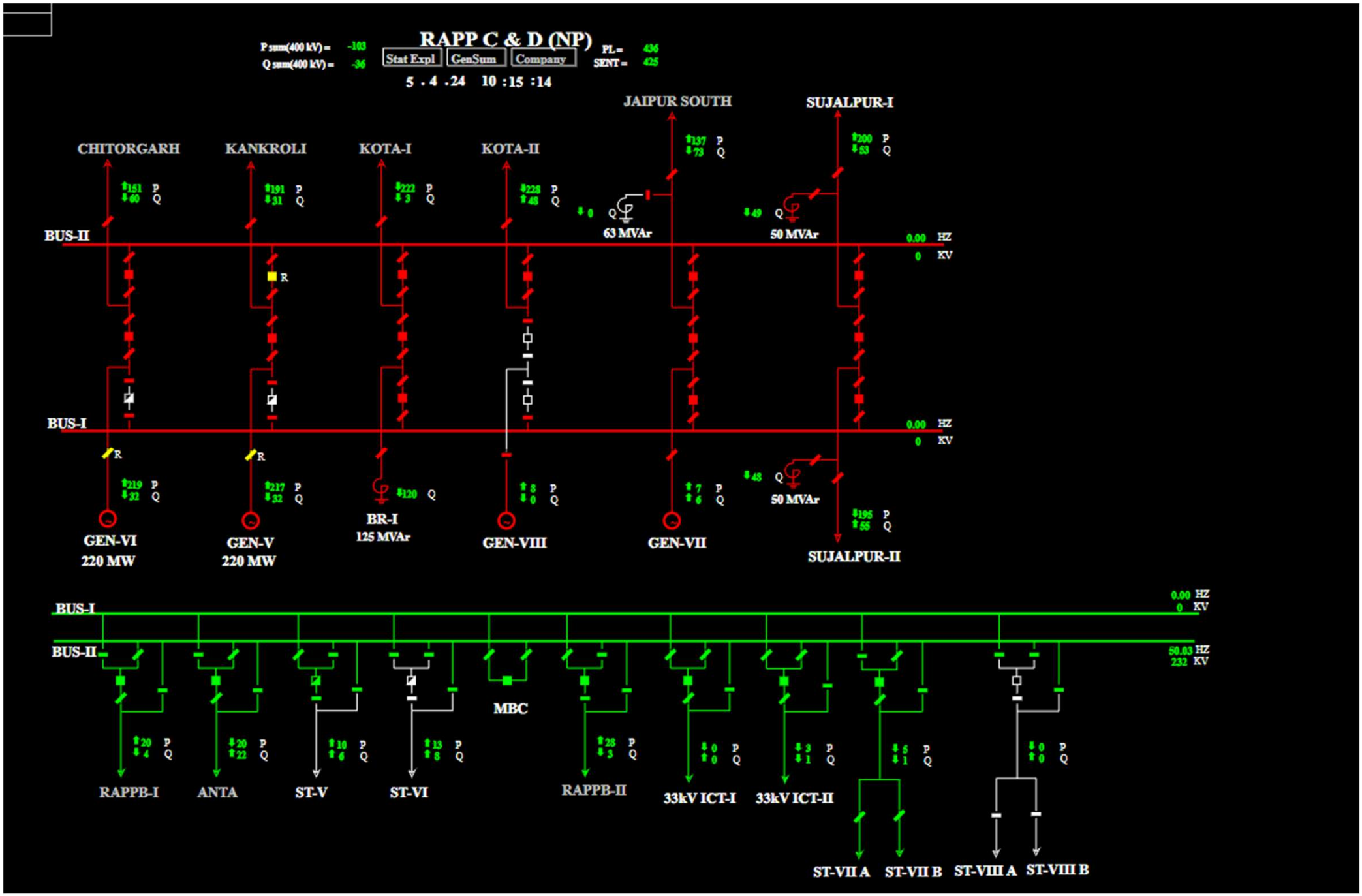
SLD of 220kV RAPS-A(NPCIL)



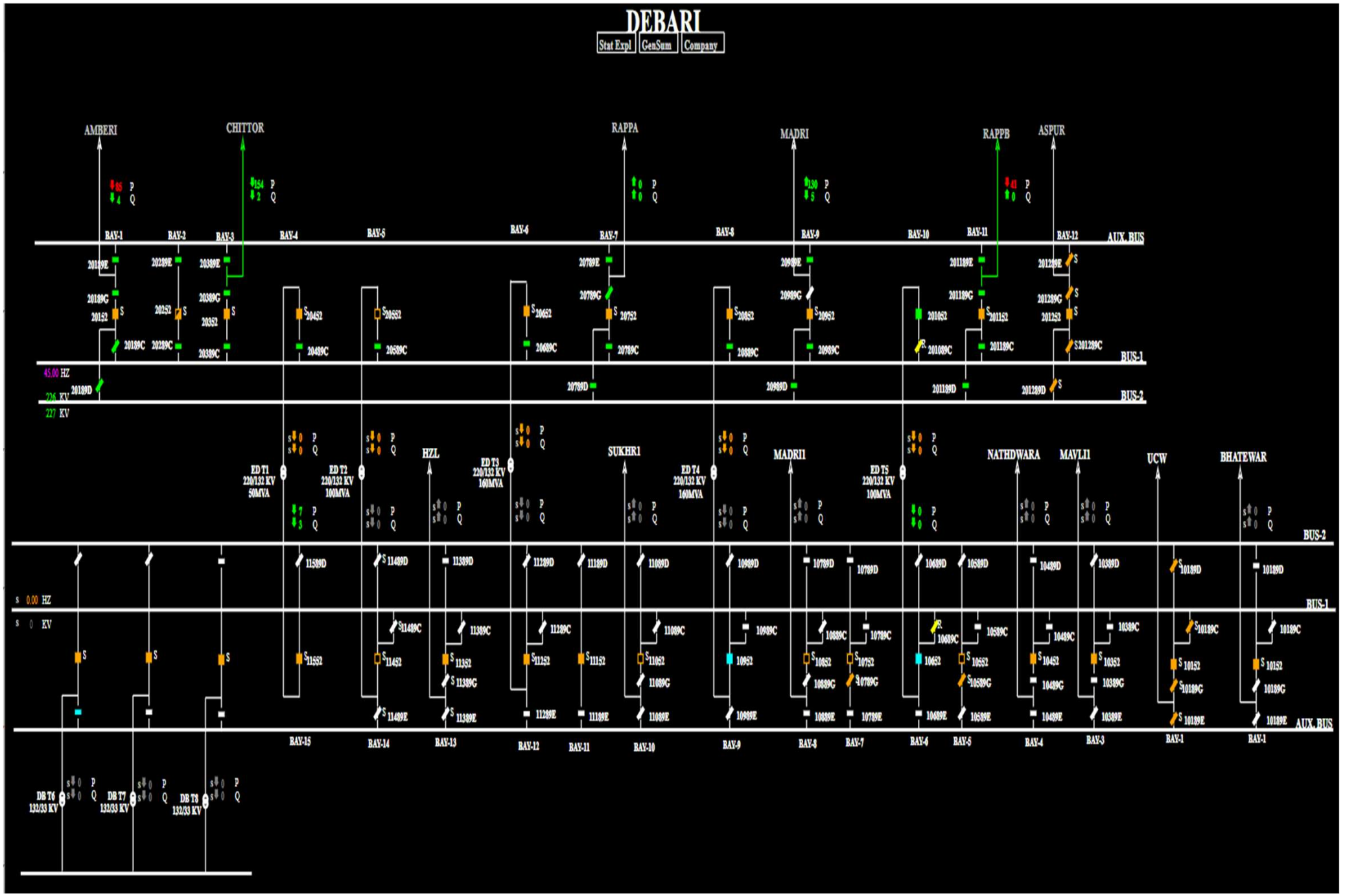
SLD of 220kV RAPS-B(NPCIL)



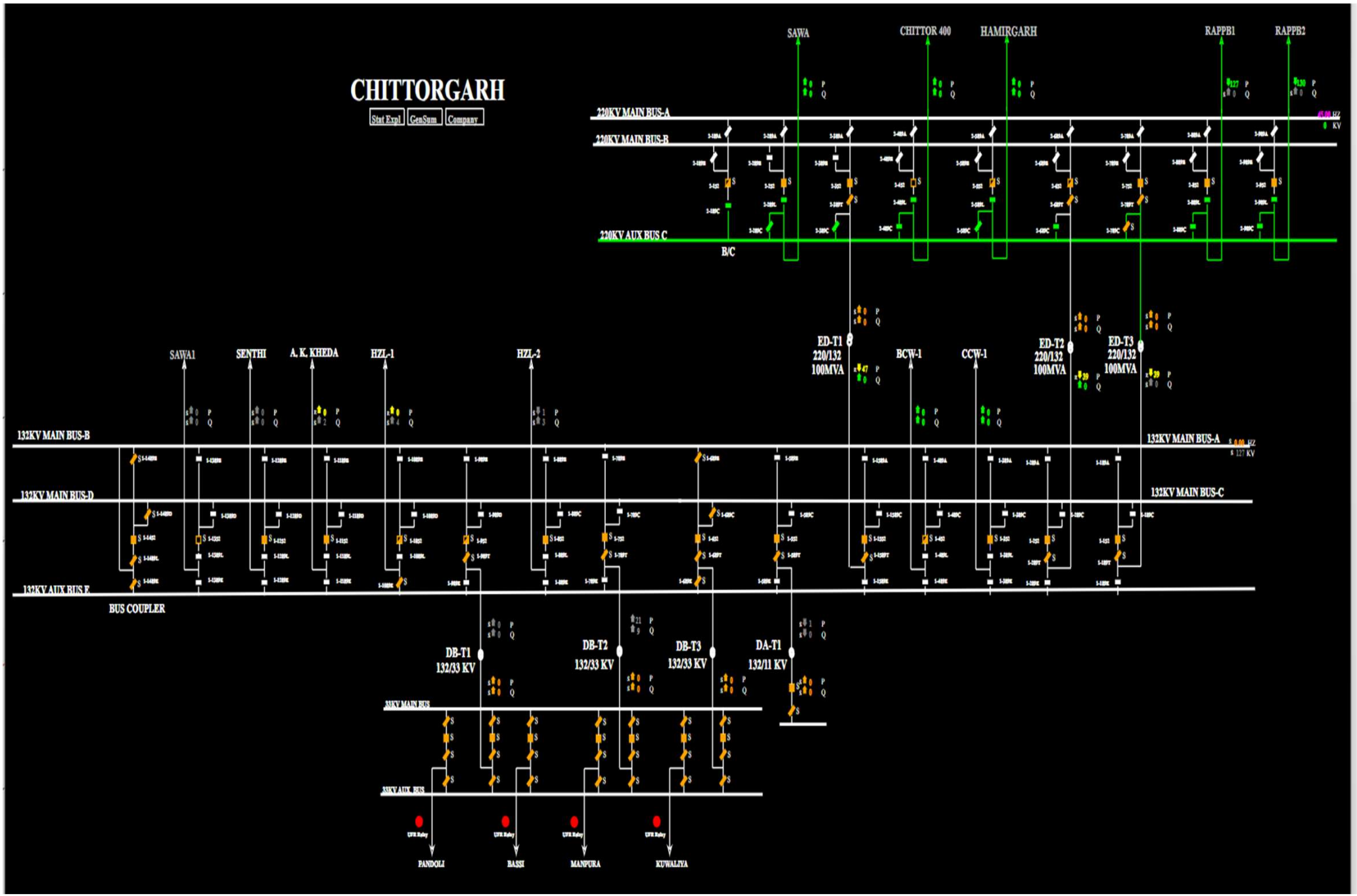
SLD of 220kV RAPS-C(NPCIL)



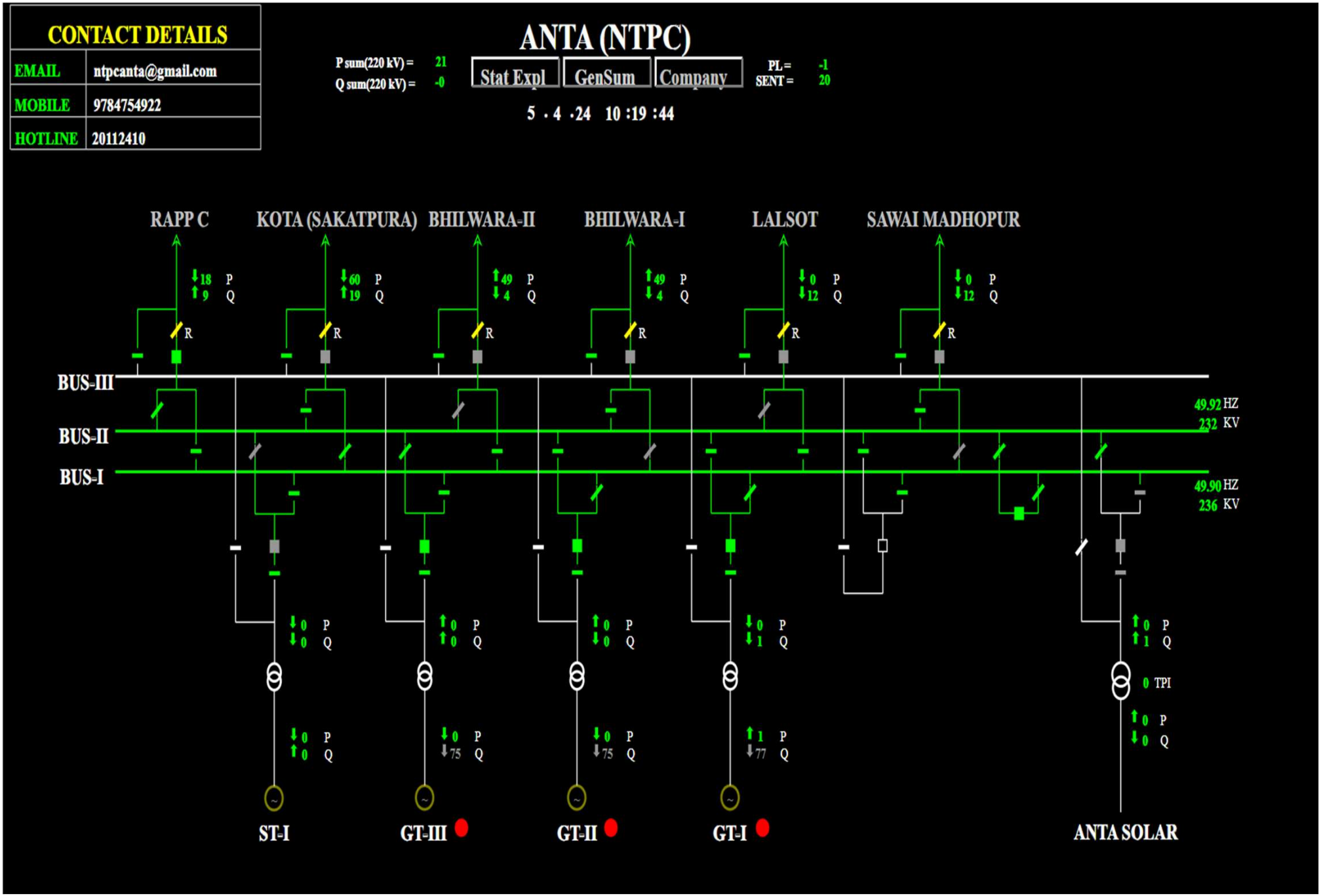
SLD of 220/132kV Debari



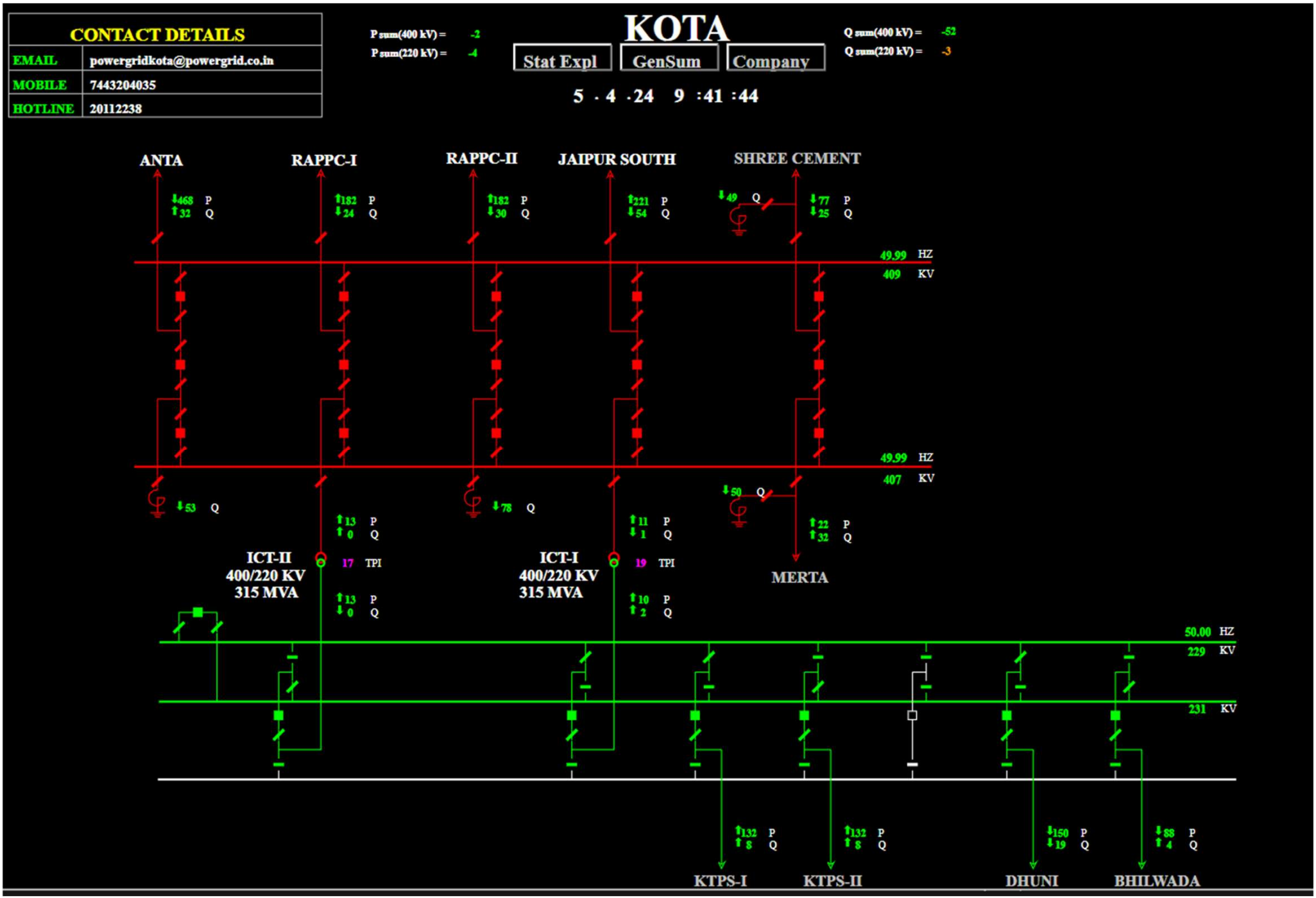
SLD of 220/132kV Chittorgarh



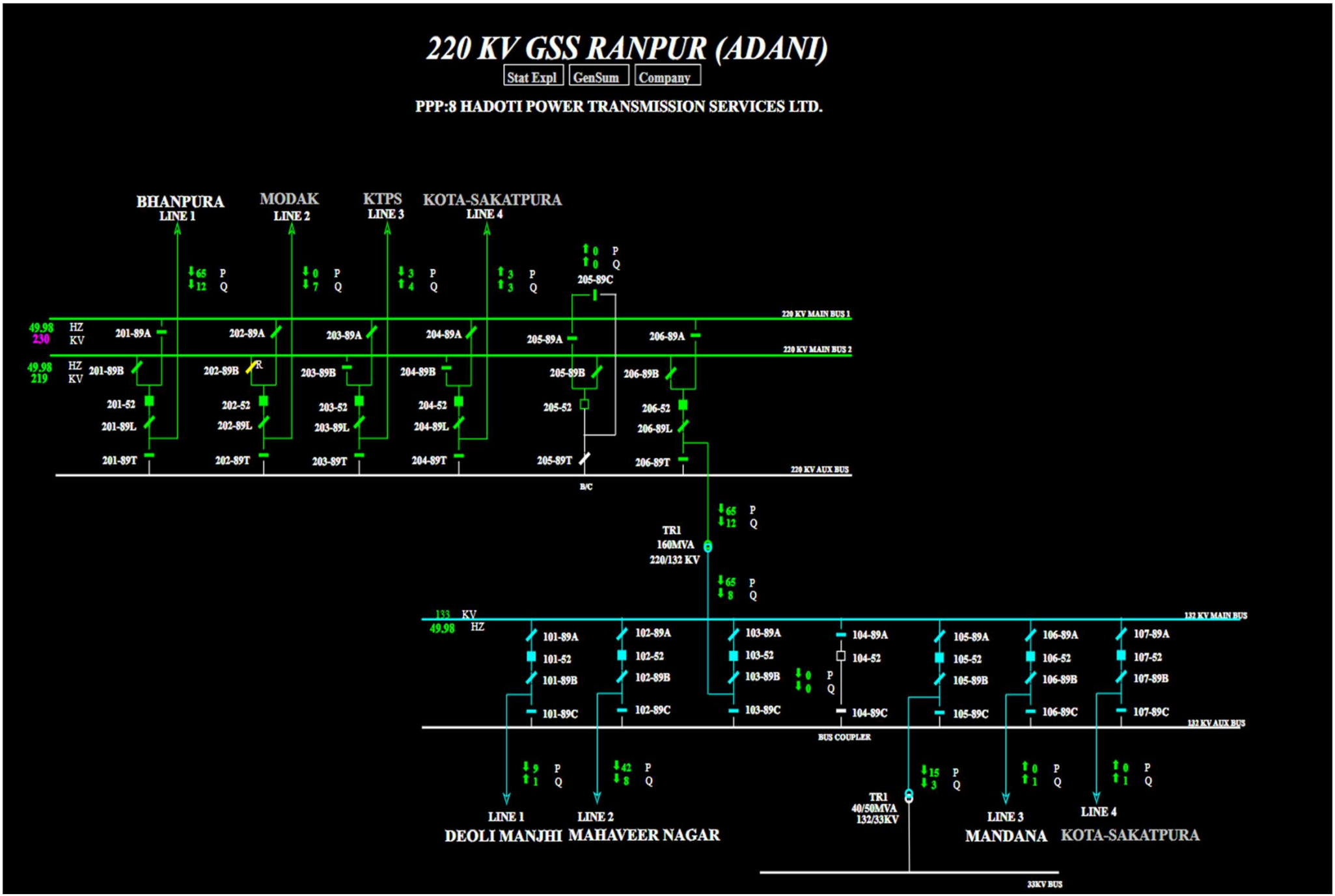
SLD of 220kV Anta(NTPC)



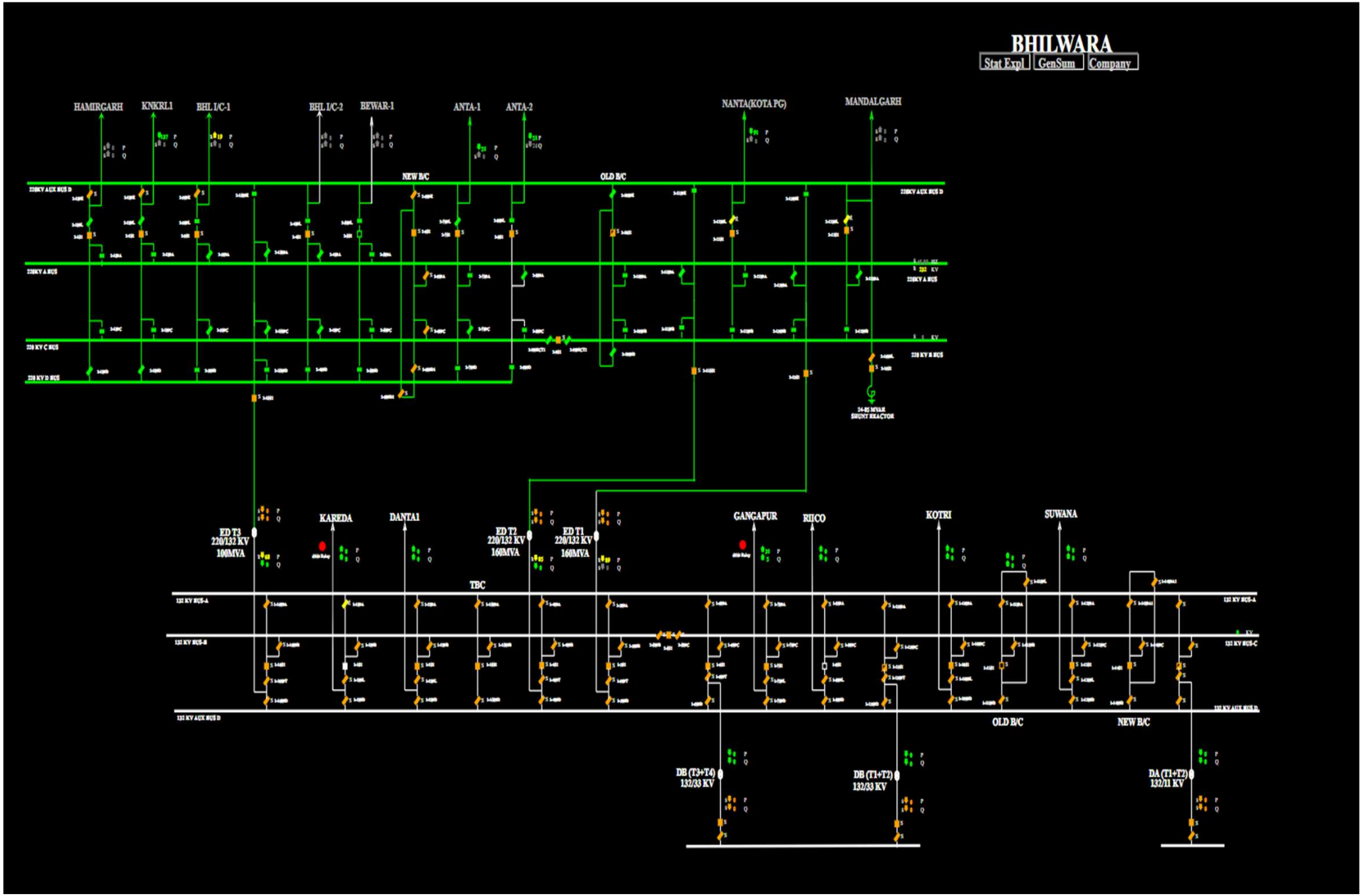
SLD of 400/220kV Kota(PG)



SLD of 220/132kV Ranpur

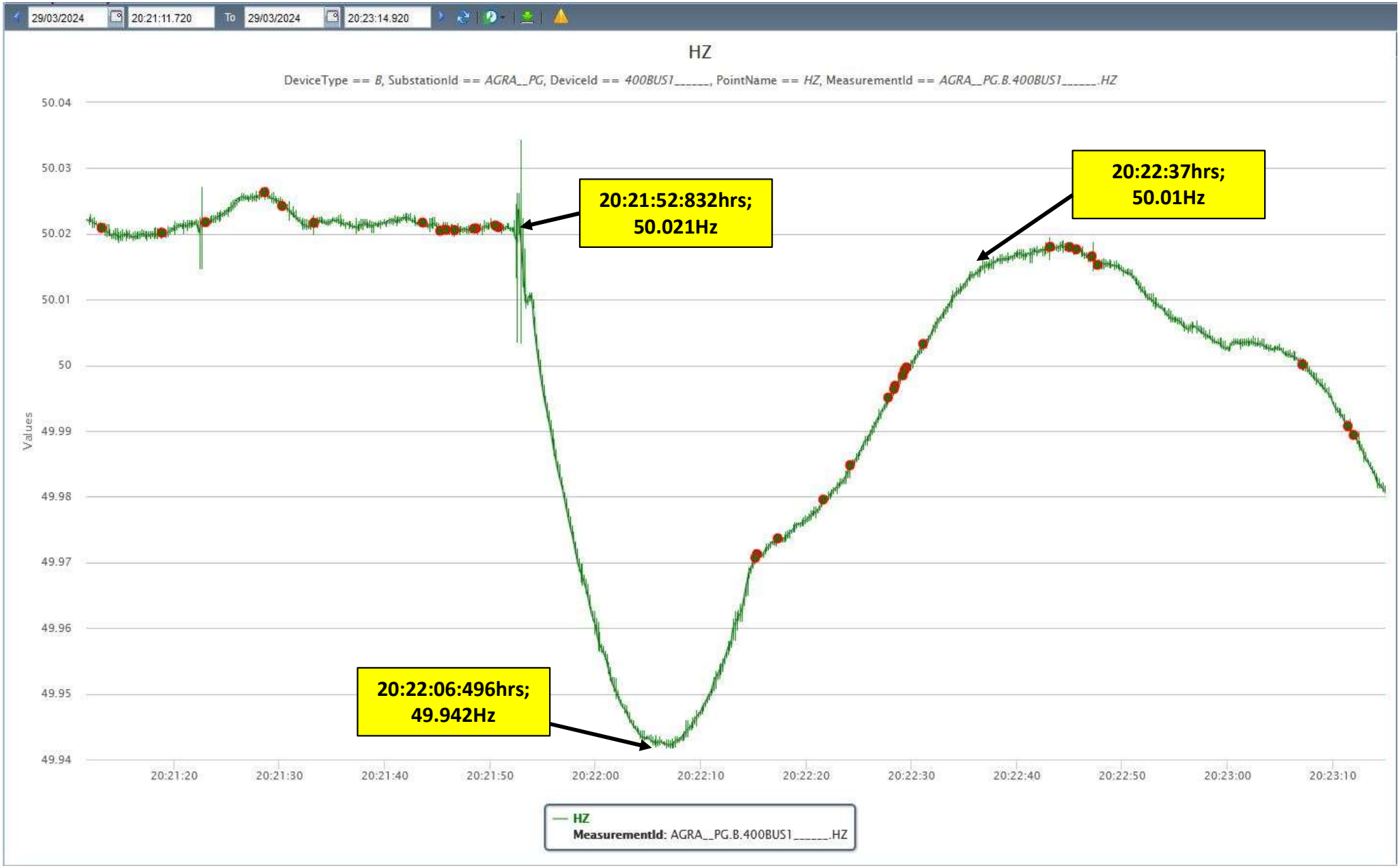


SLD of 220/132kV Bhilwara



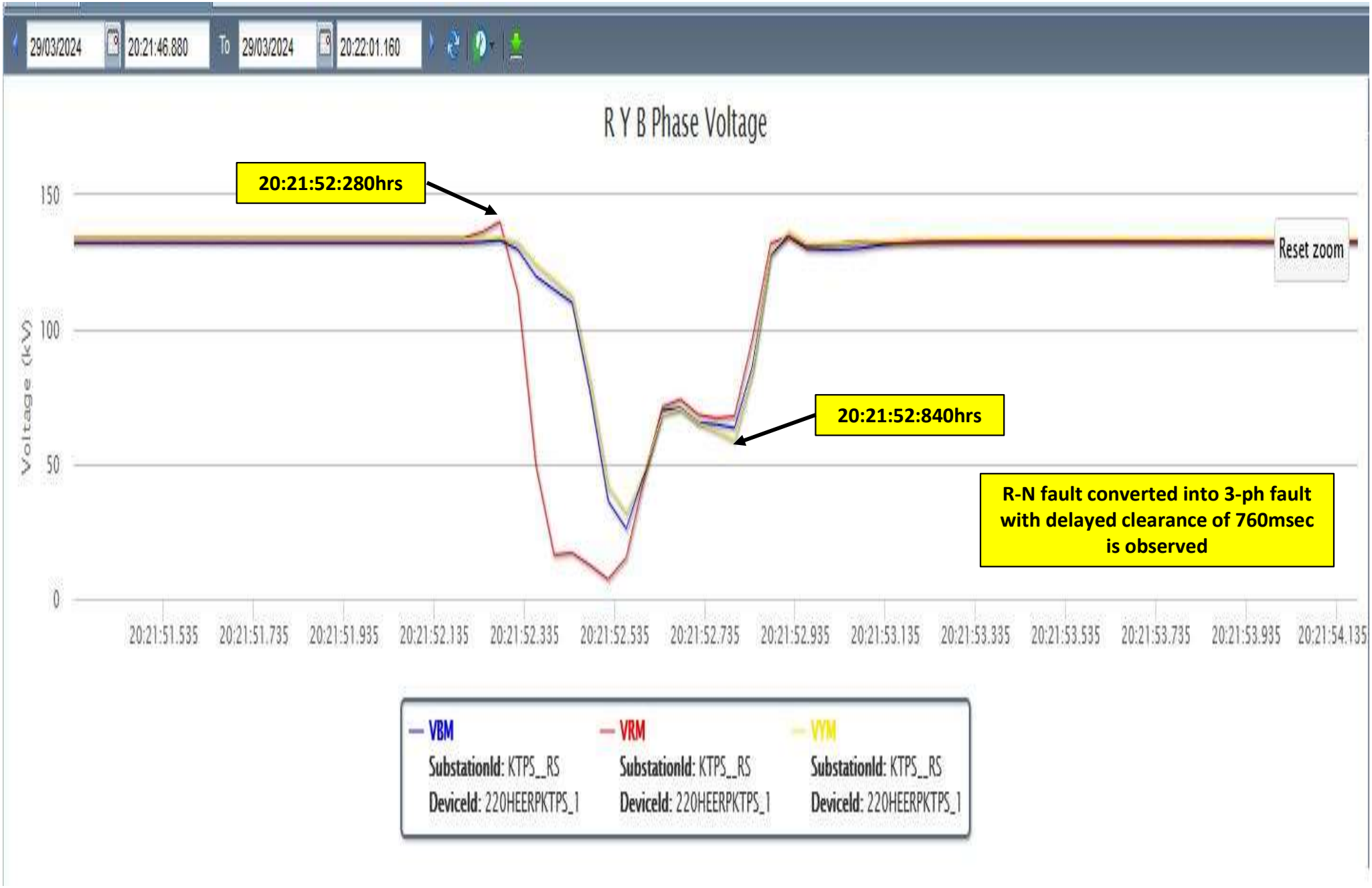
PMU Plot of frequency at Agra(PG)

20:22 hrs/29-Mar-24

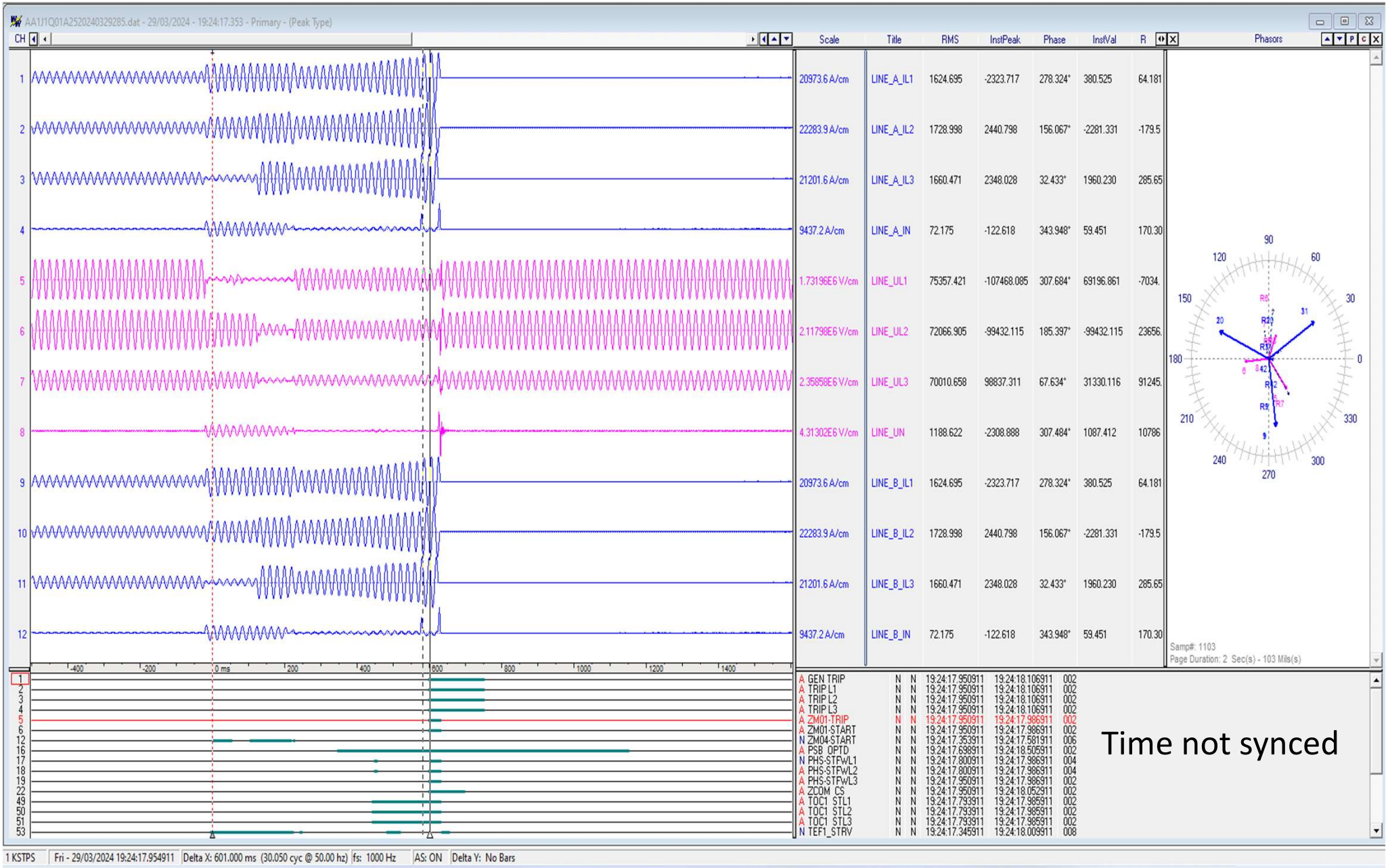


PMU Plot of voltage of 220kV KTPS-Heerapur ckt at KTPS(RVVN)

20:22 hrs/29-Mar-24

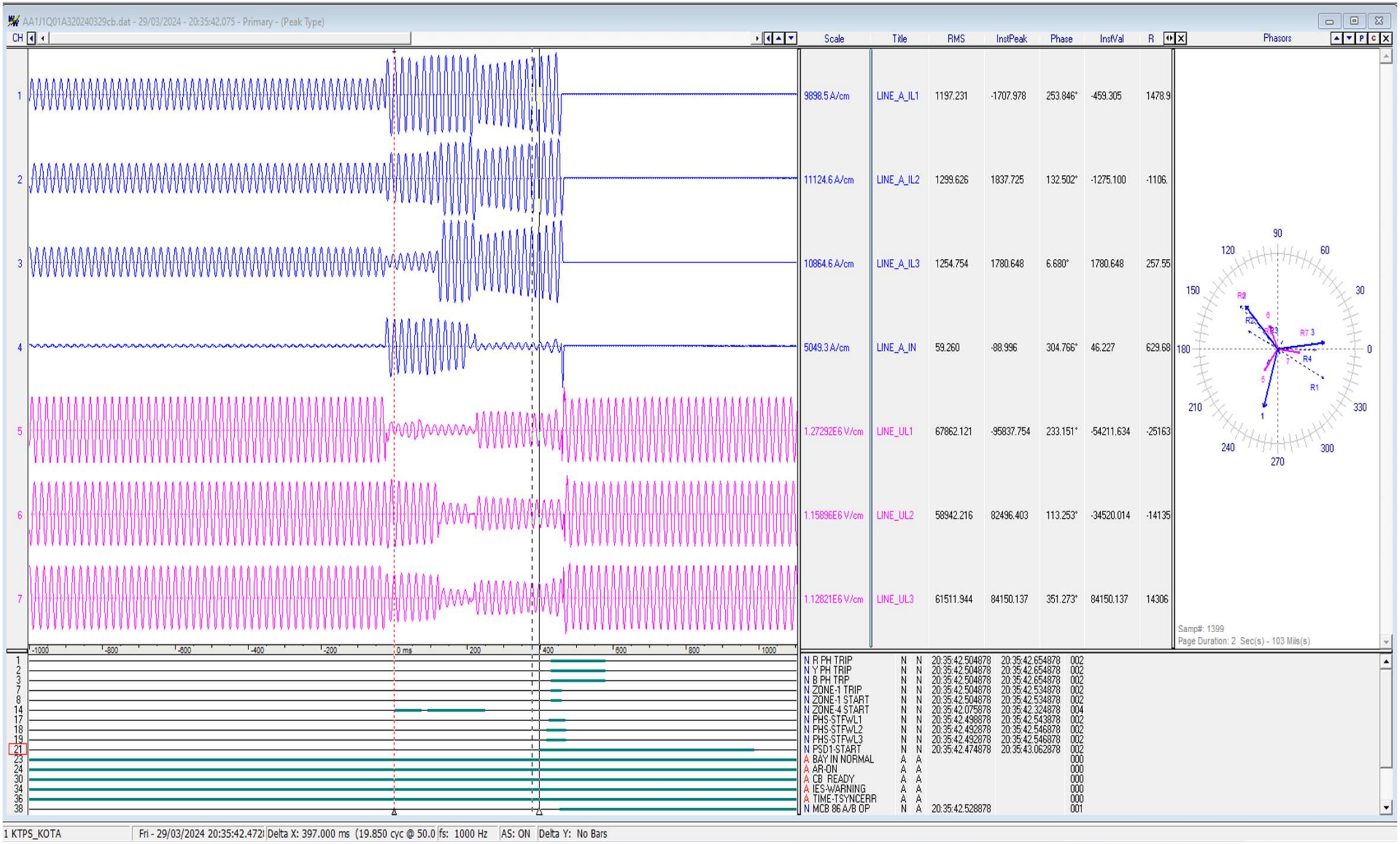


DR of 220kV KTPS(end)-Beawar ckt



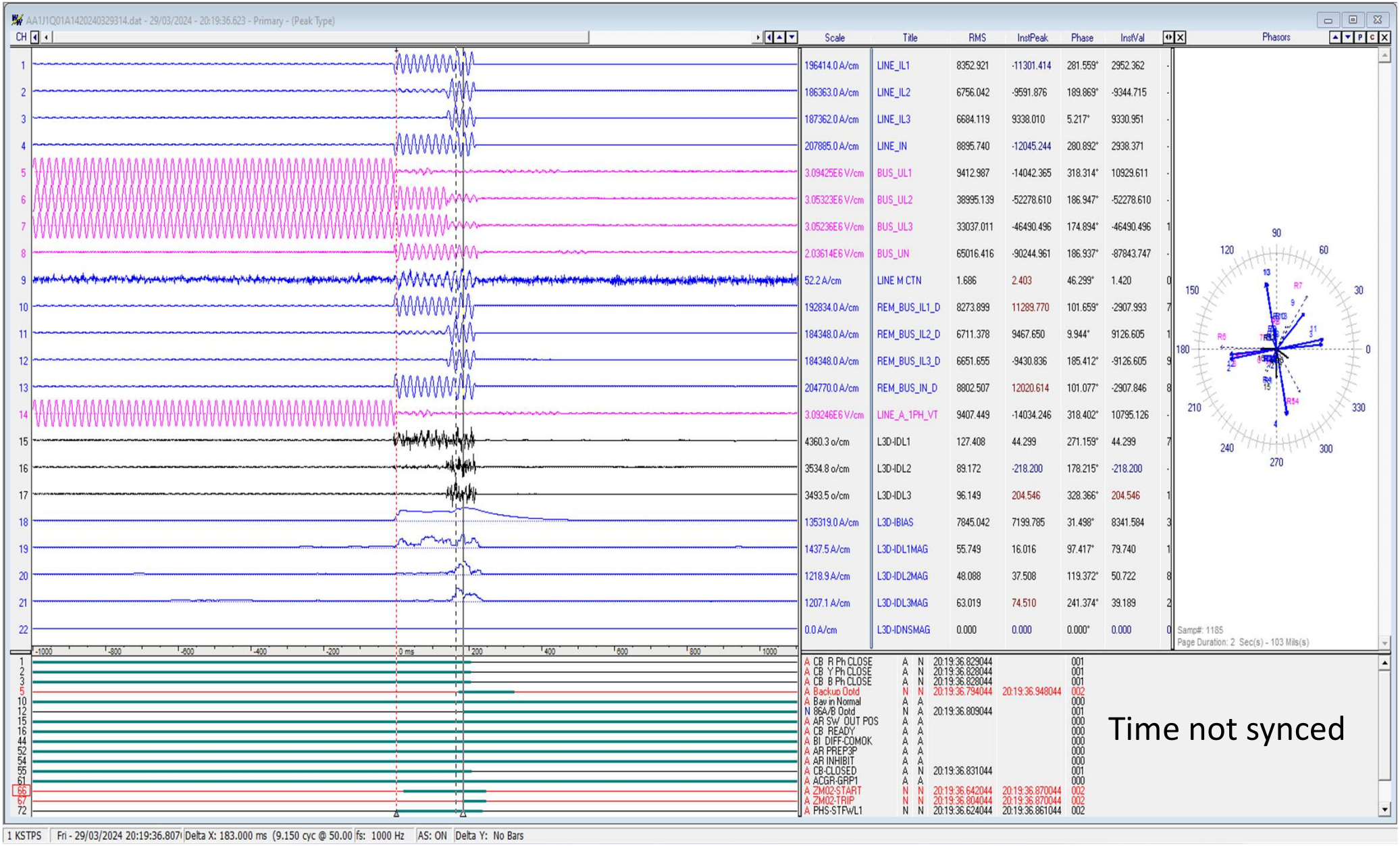
After ~350msec of R-N fault, power swing blocking operated and ~600msec of R-N fault, line tripped on Z-1 distance protection operation.

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

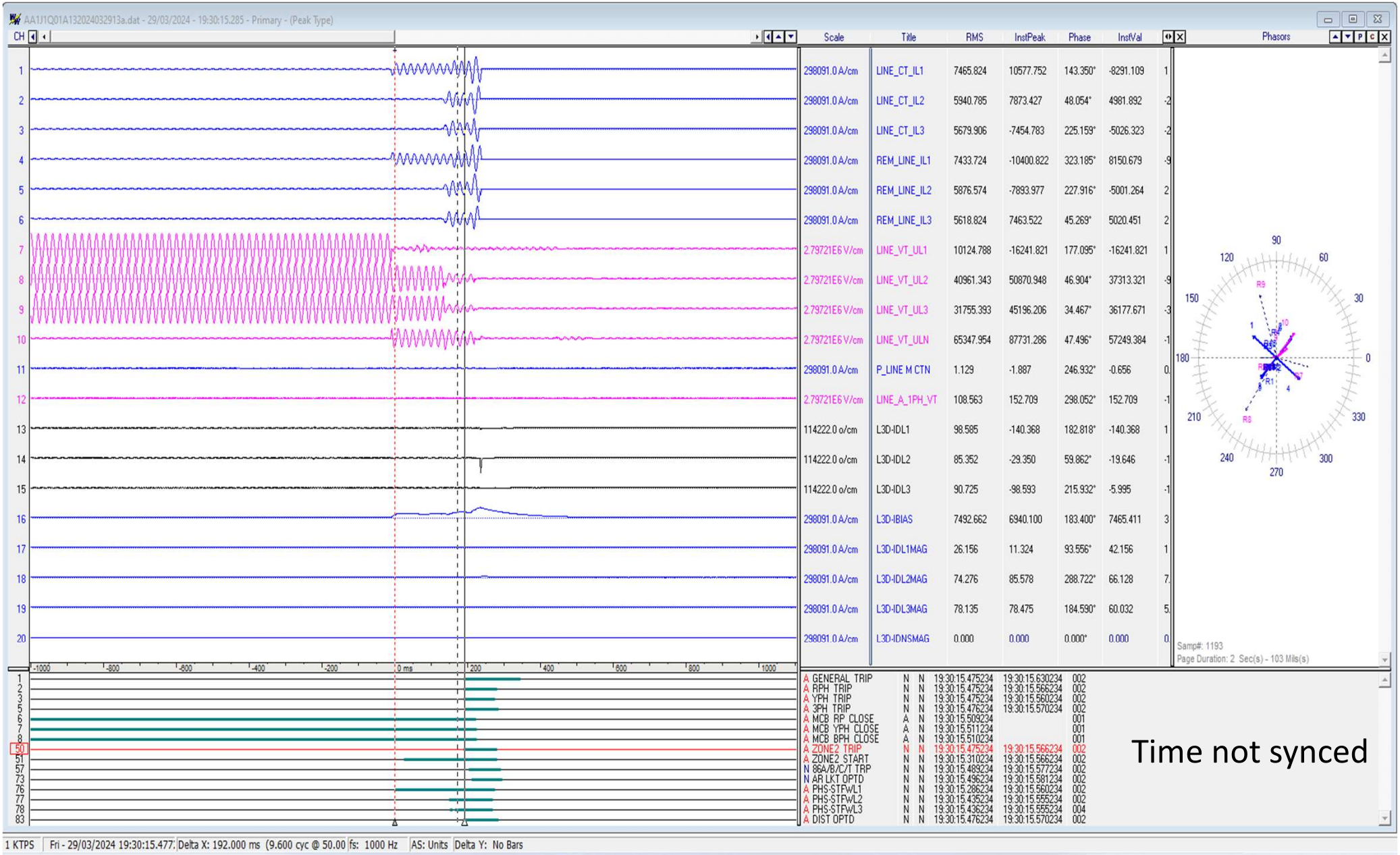
DR of 220kV KTPS(end)-Kota Sakatpura ckt-1



Time not synced

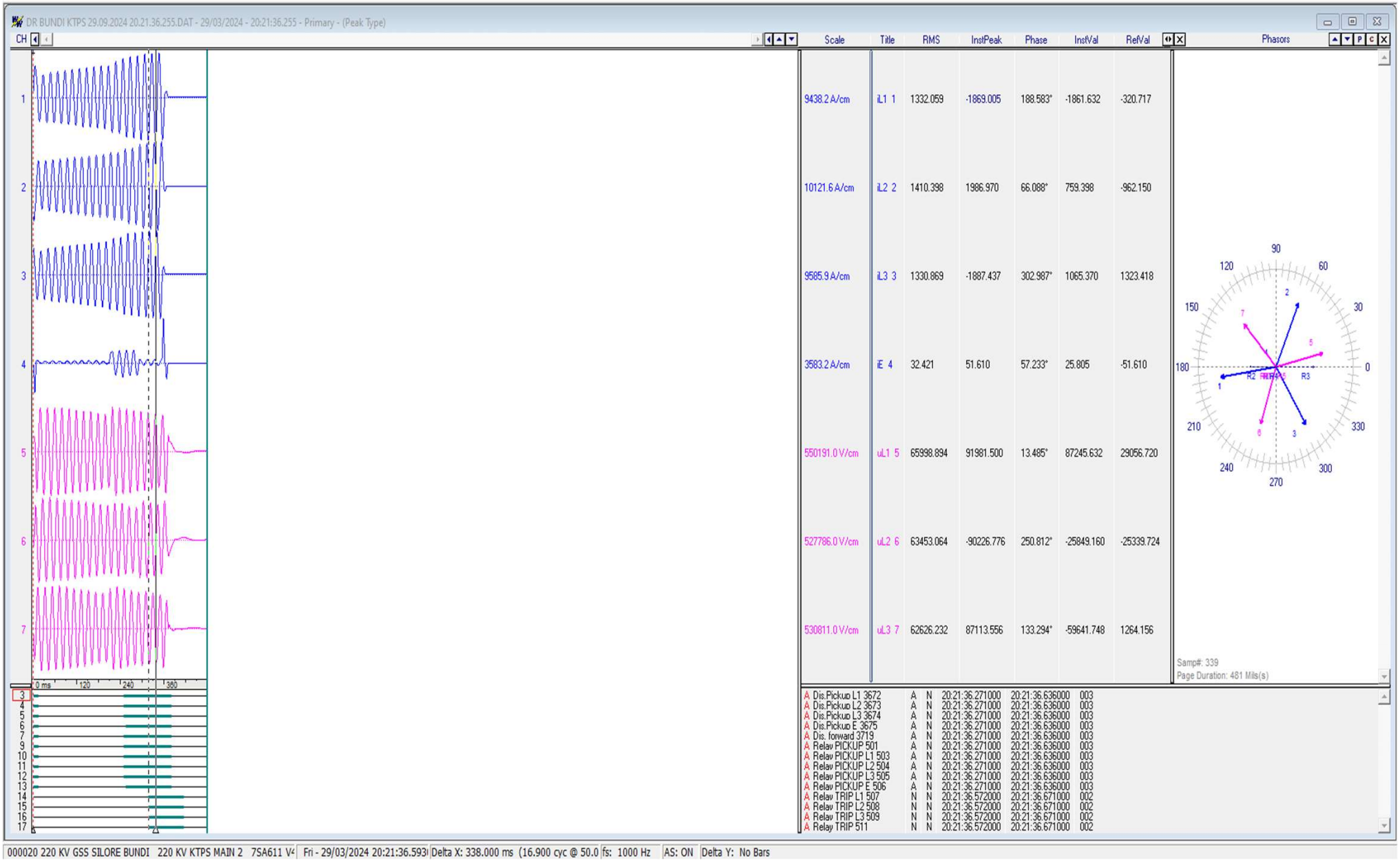
After ~20msec of R-N fault, distance protection sensed fault in Z-2 and after ~200msec of R-N fault, line tripped on Z-2 distance protection operation.

DR of 220kV KTPS(end)-Kota Sakatpura ckt-3



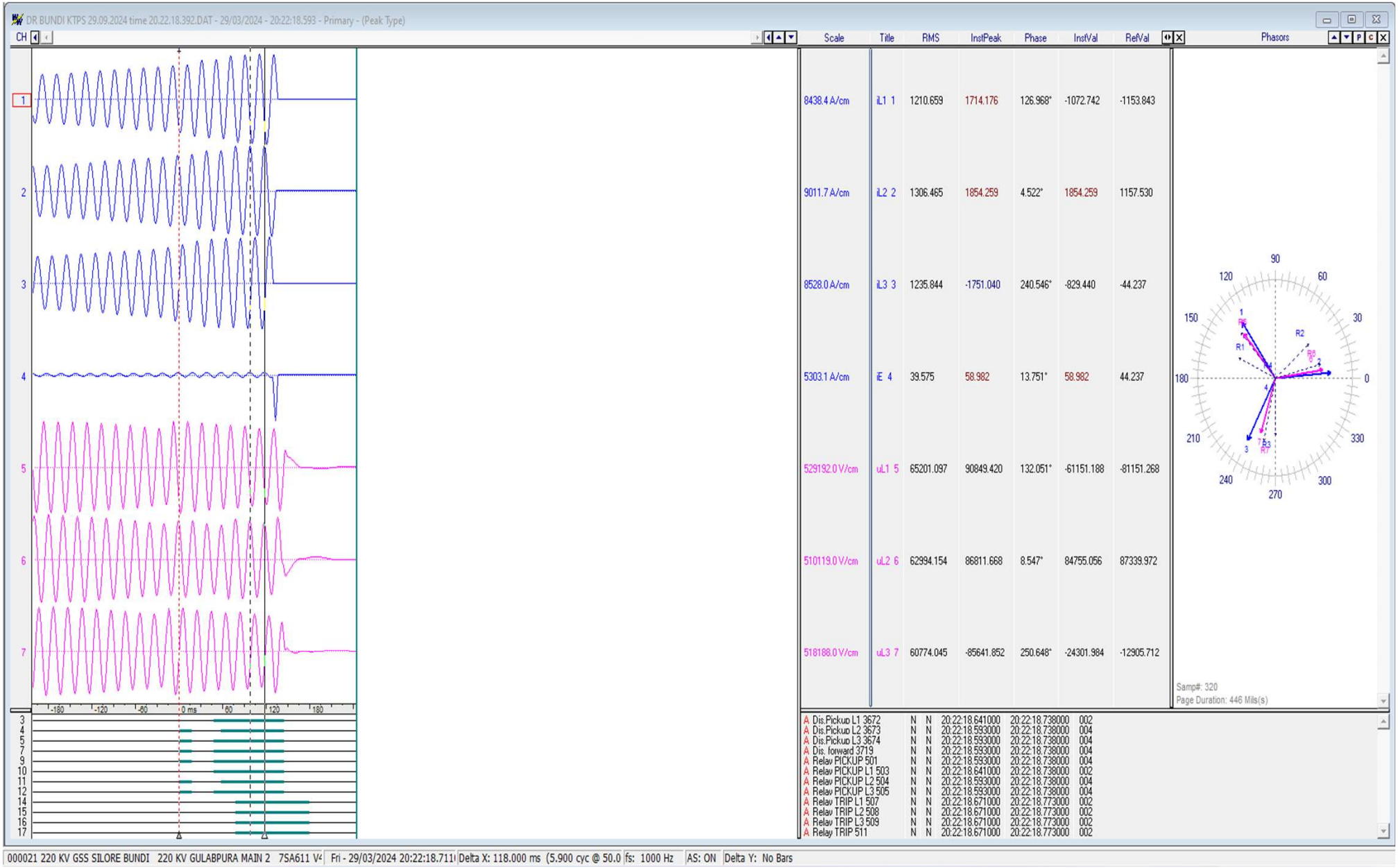
After ~20msec of R-N fault, distance protection sensed fault in Z-2 and after ~200msec of R-N fault, line tripped on Z-2 distance protection operation.

DR of 220kV KTPS-Bundi(end) ckt



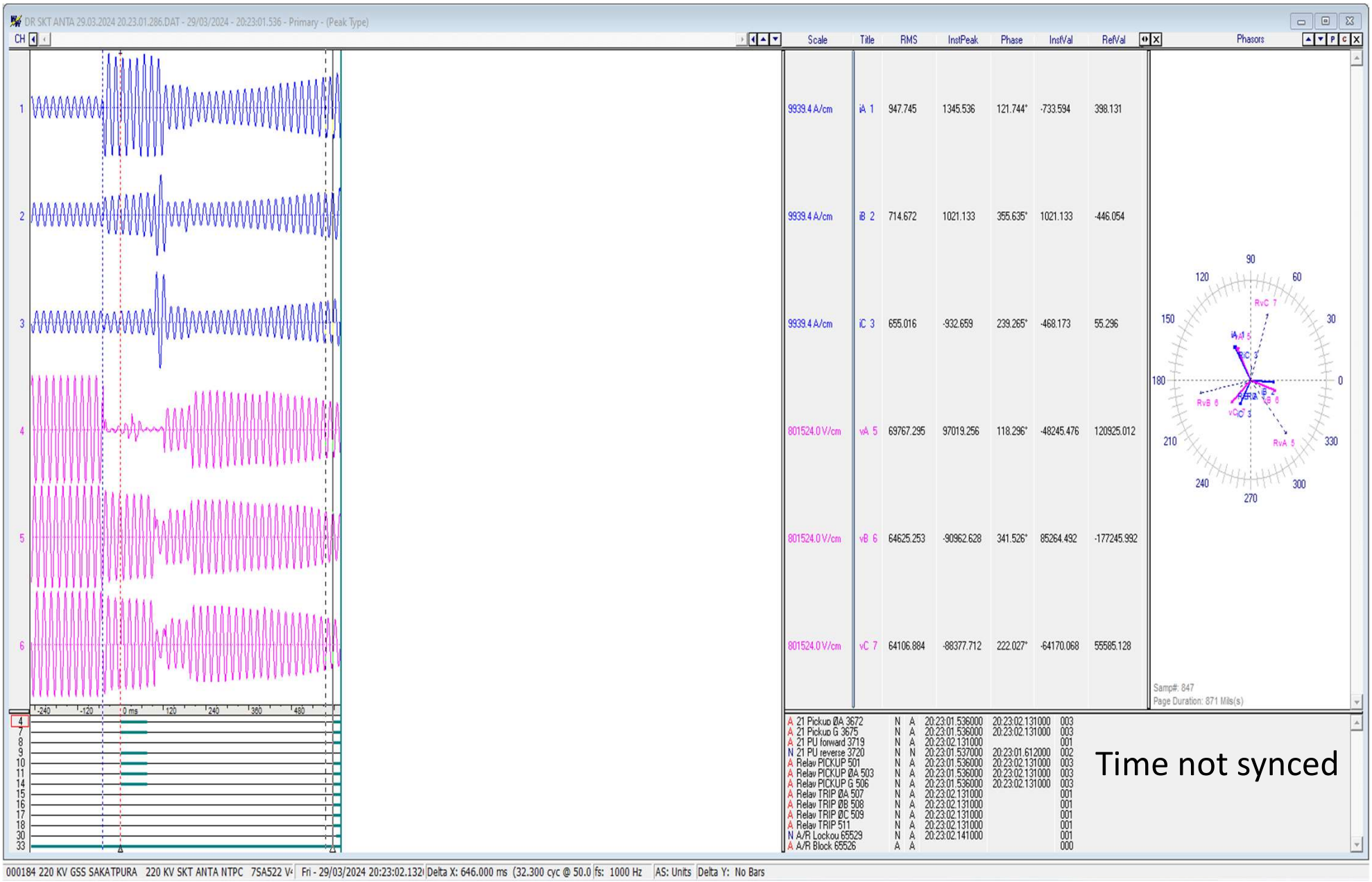
After ~550msec of R-N fault detection, line tripped on distance protection operation; phase currents in the range of 1330-1410A.

DR of 220kV Bundi(end)-Gulabpura ckt



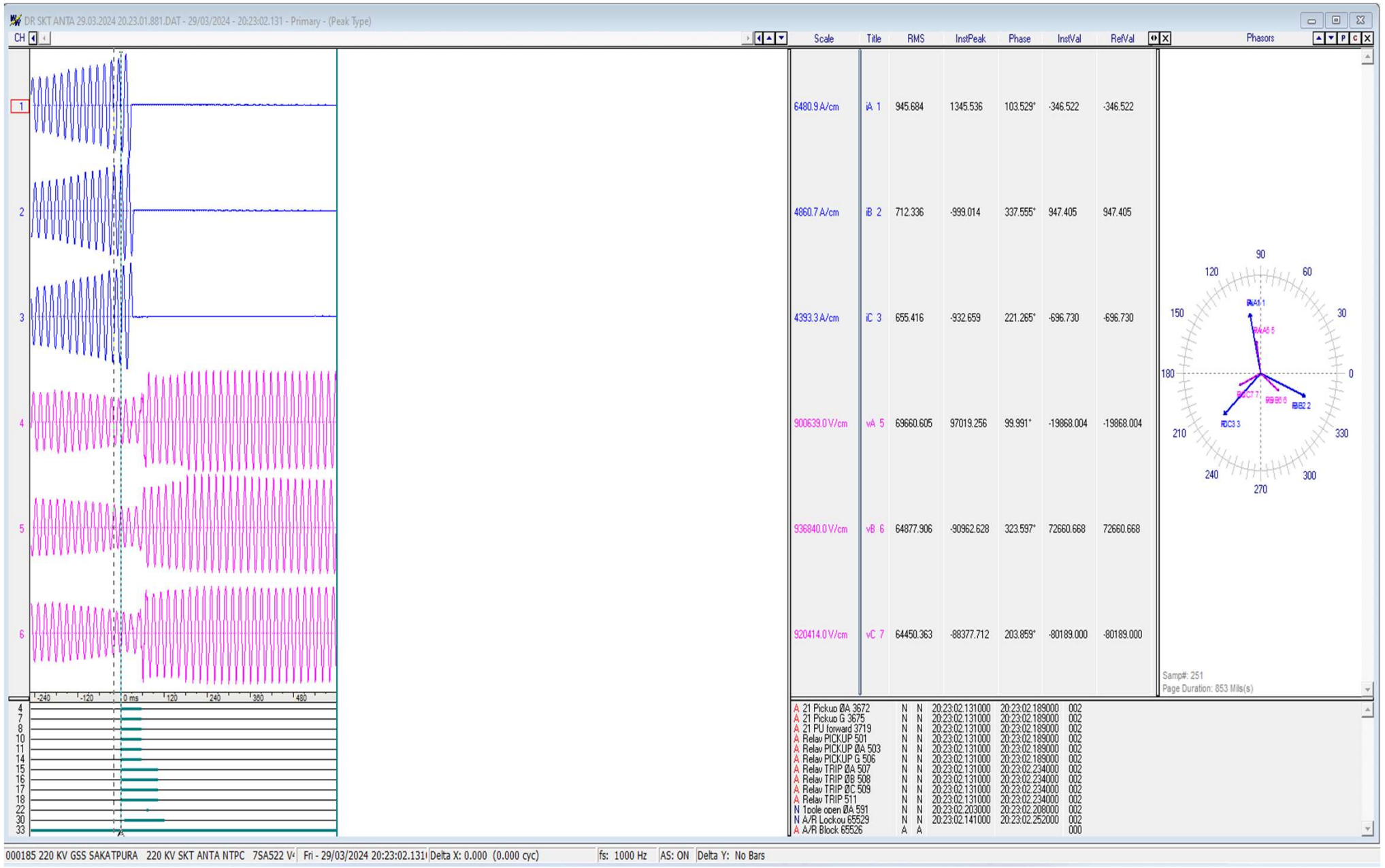
Line tripped on distance protection operation; phase currents in the range of 1200-1300A.

DR of 220kV Kota Sakatpura(end)-Anta ckt



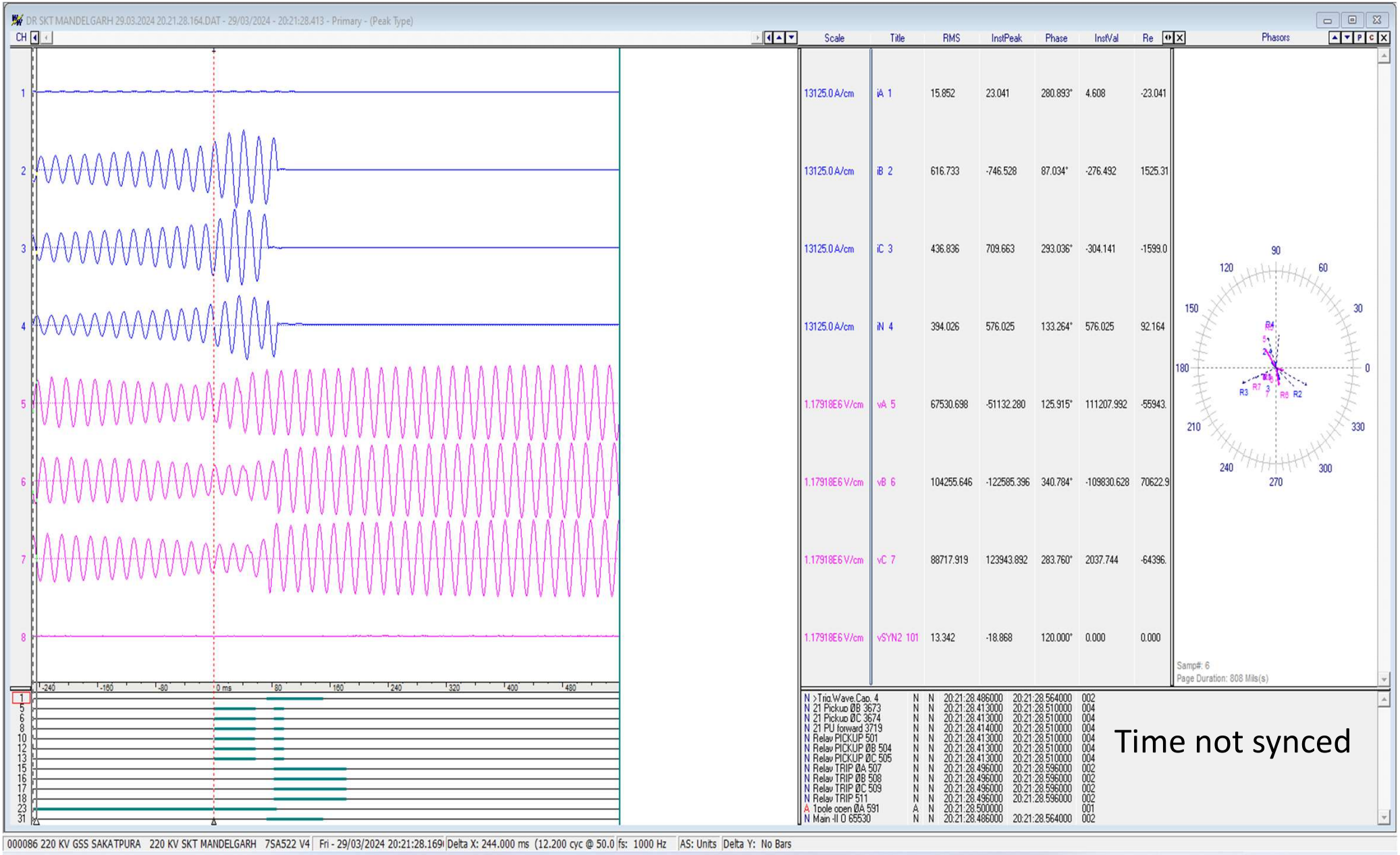
Sensed fault in Z-4 and reset and after ~650msec of R-N fault, line tripped on distance protection operation.

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.

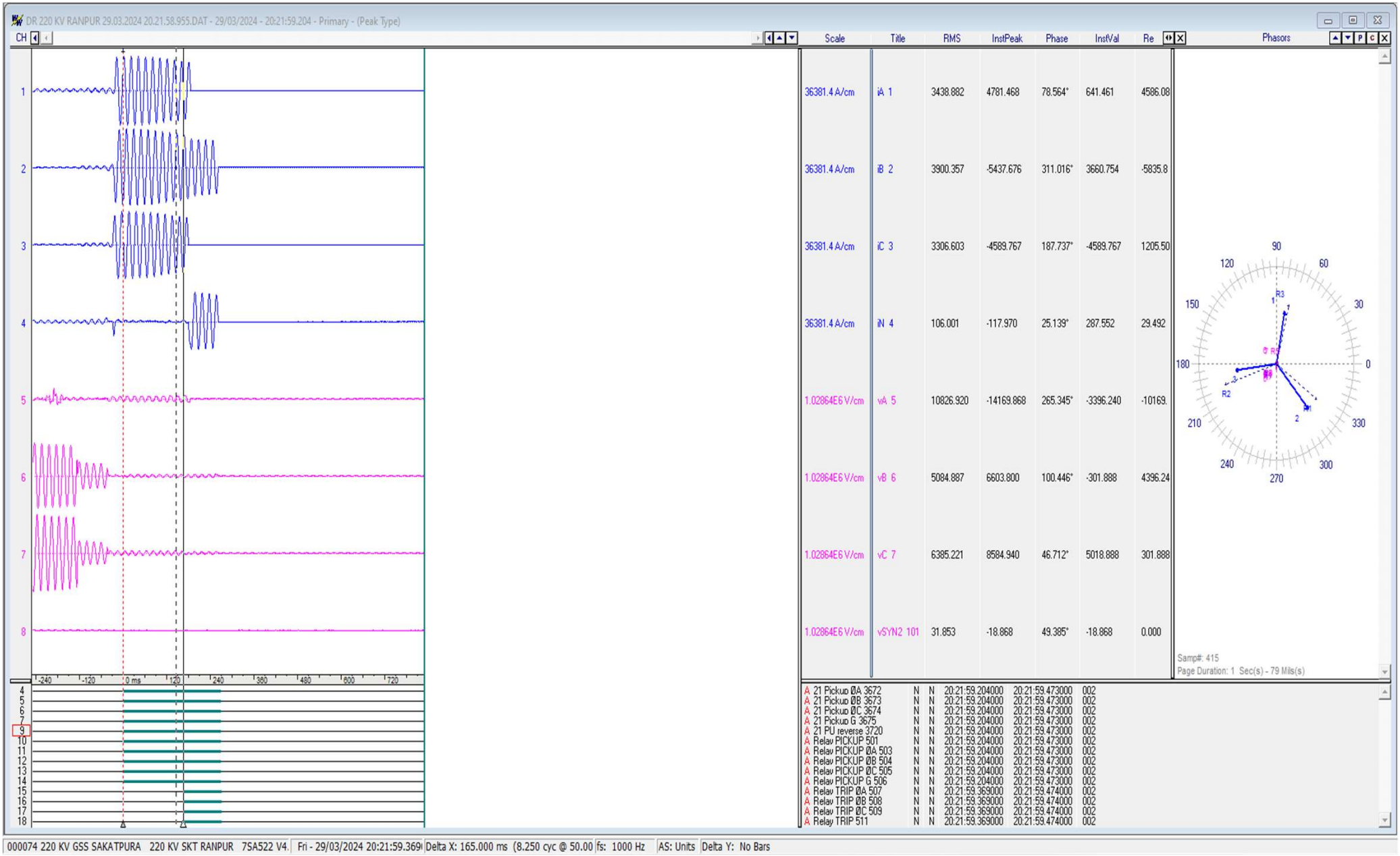
DR of 220kV Kota Sakatpura(end)-Mandalgarh ckt



Time not synced

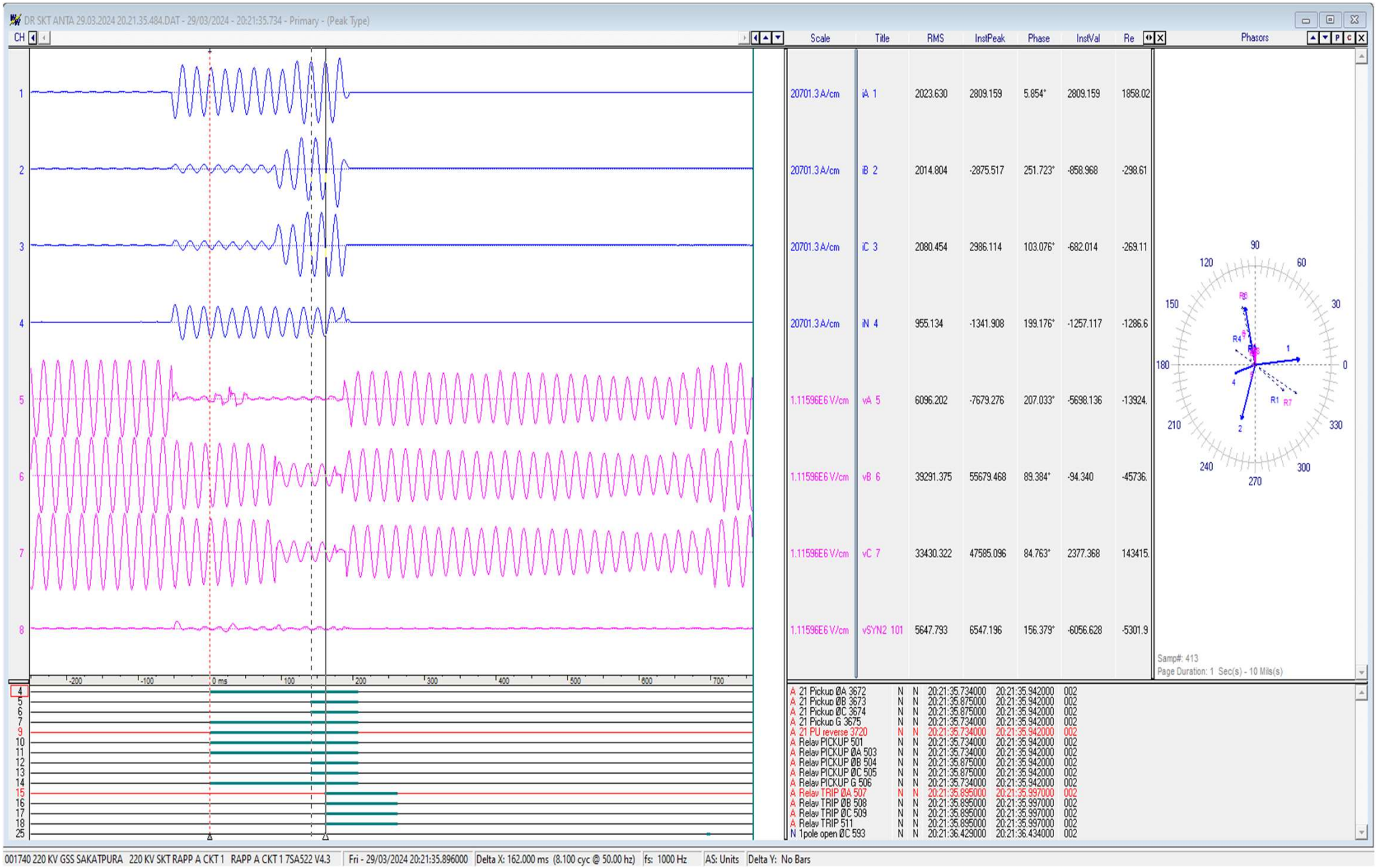
R-ph pole tripping followed by 3-ph trip observed.

DR of 220kV Kota Sakatpura(end)-Ranpur ckt



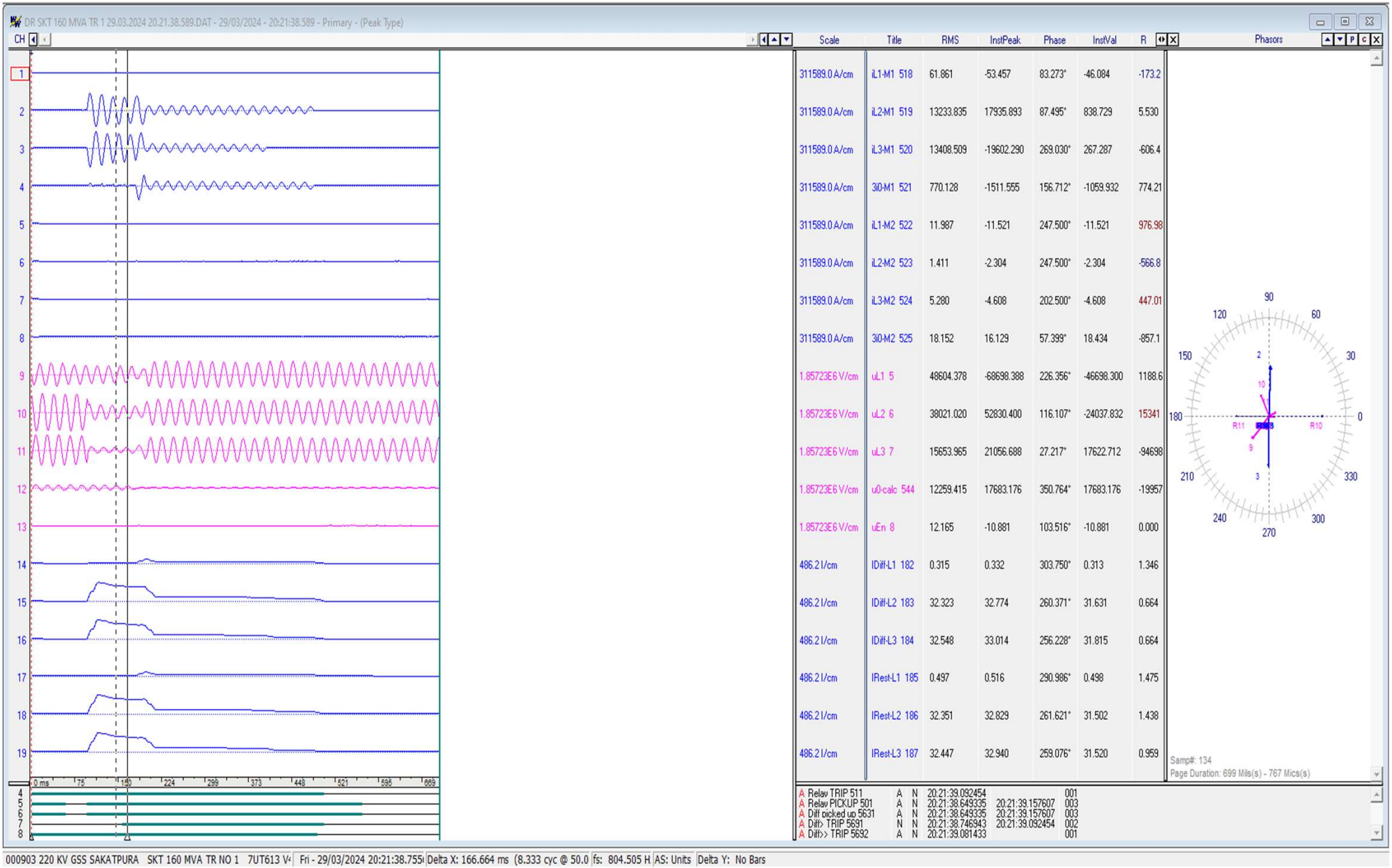
Fault sensed in Z-4, 3-ph trip after ~160msec of fault is observed.

DR of 220kV Kota Sakatpura(end)-RAPS-A ckt-1



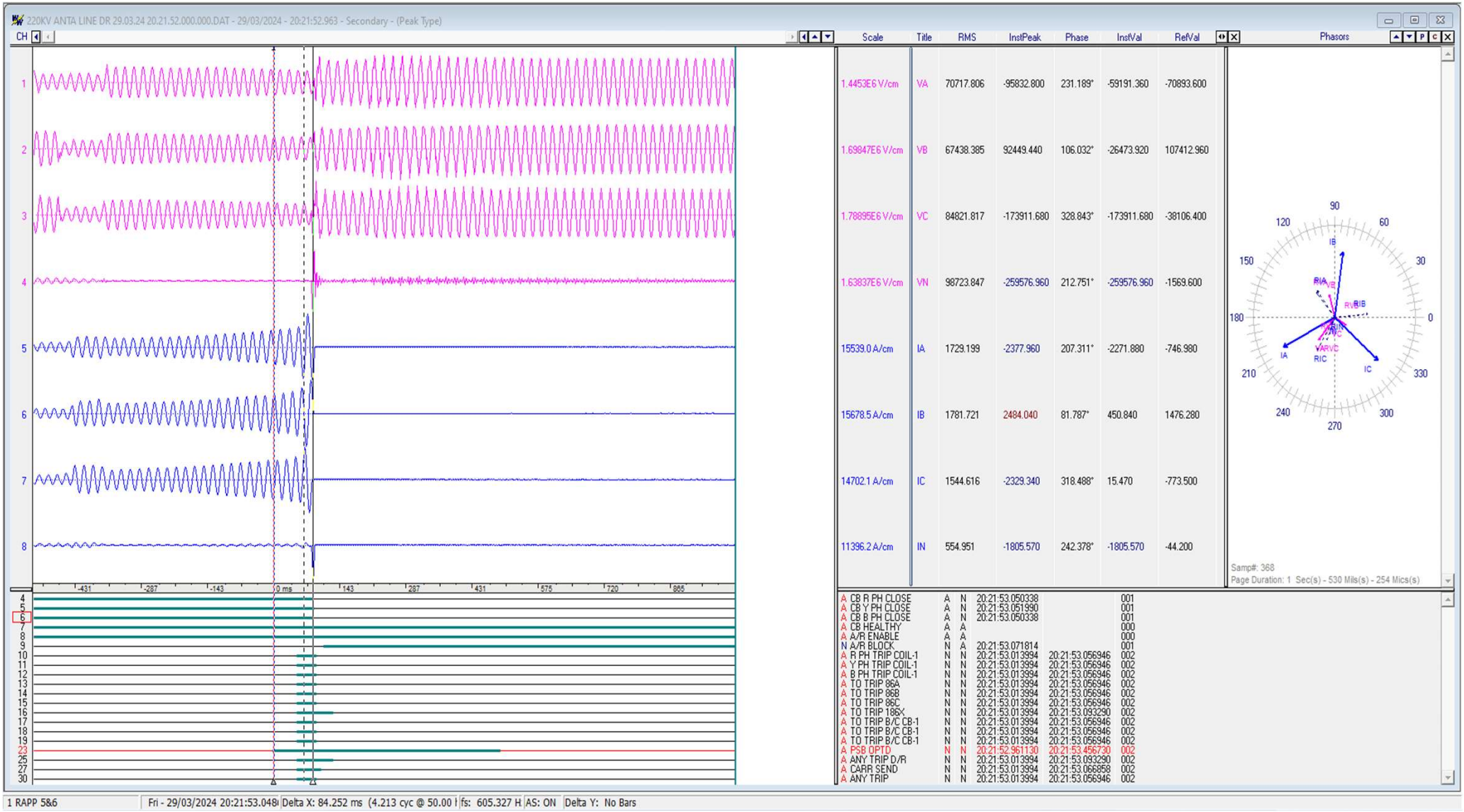
Fault sensed in Z-4, 3-ph trip after ~160msec of fault is observed.

DR of 220/132kV ICT-1 at Kota Sakatpura



Differential protection operated

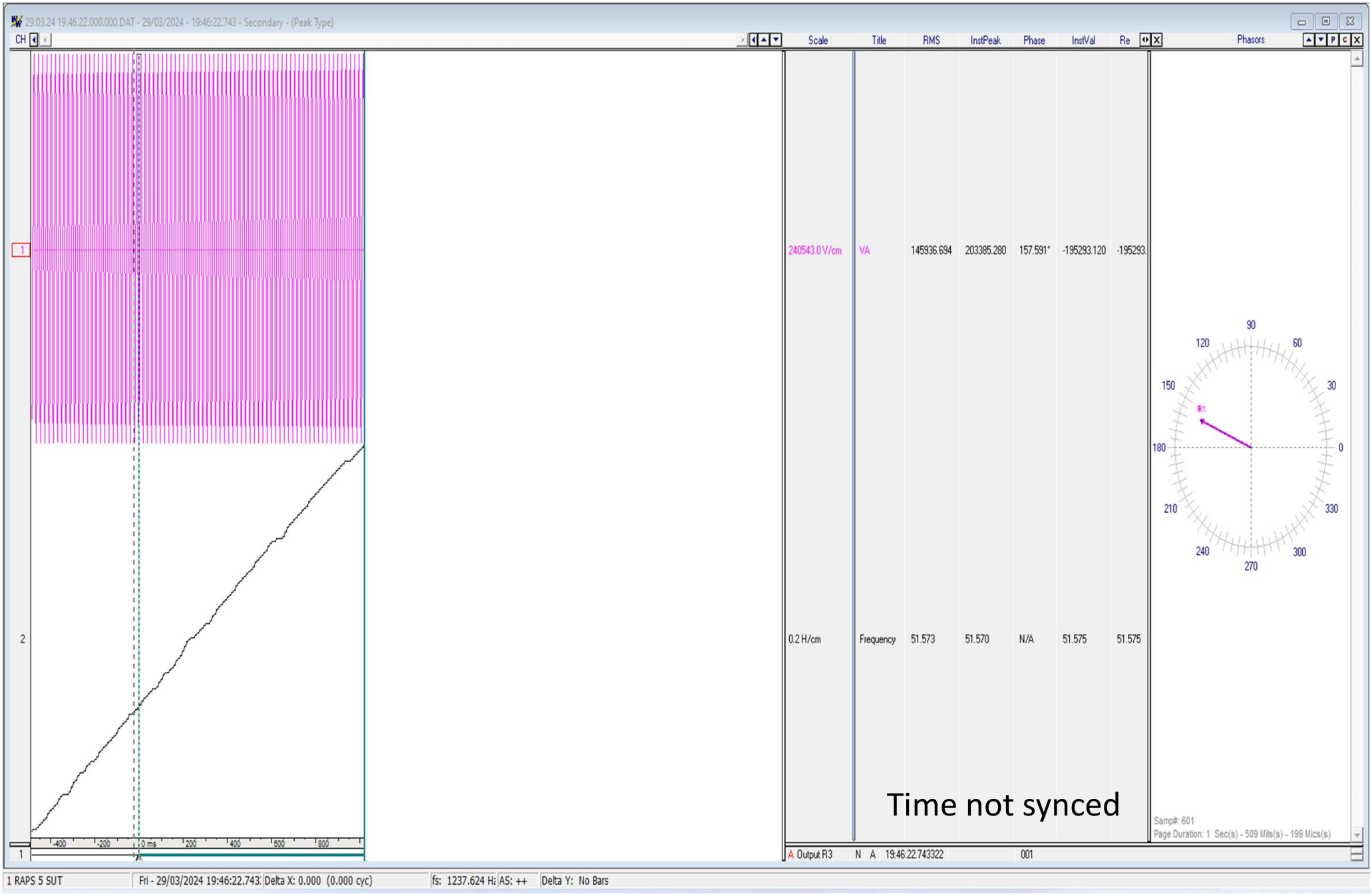
DR of 220kV RAPS_C(end)-Anta ckt



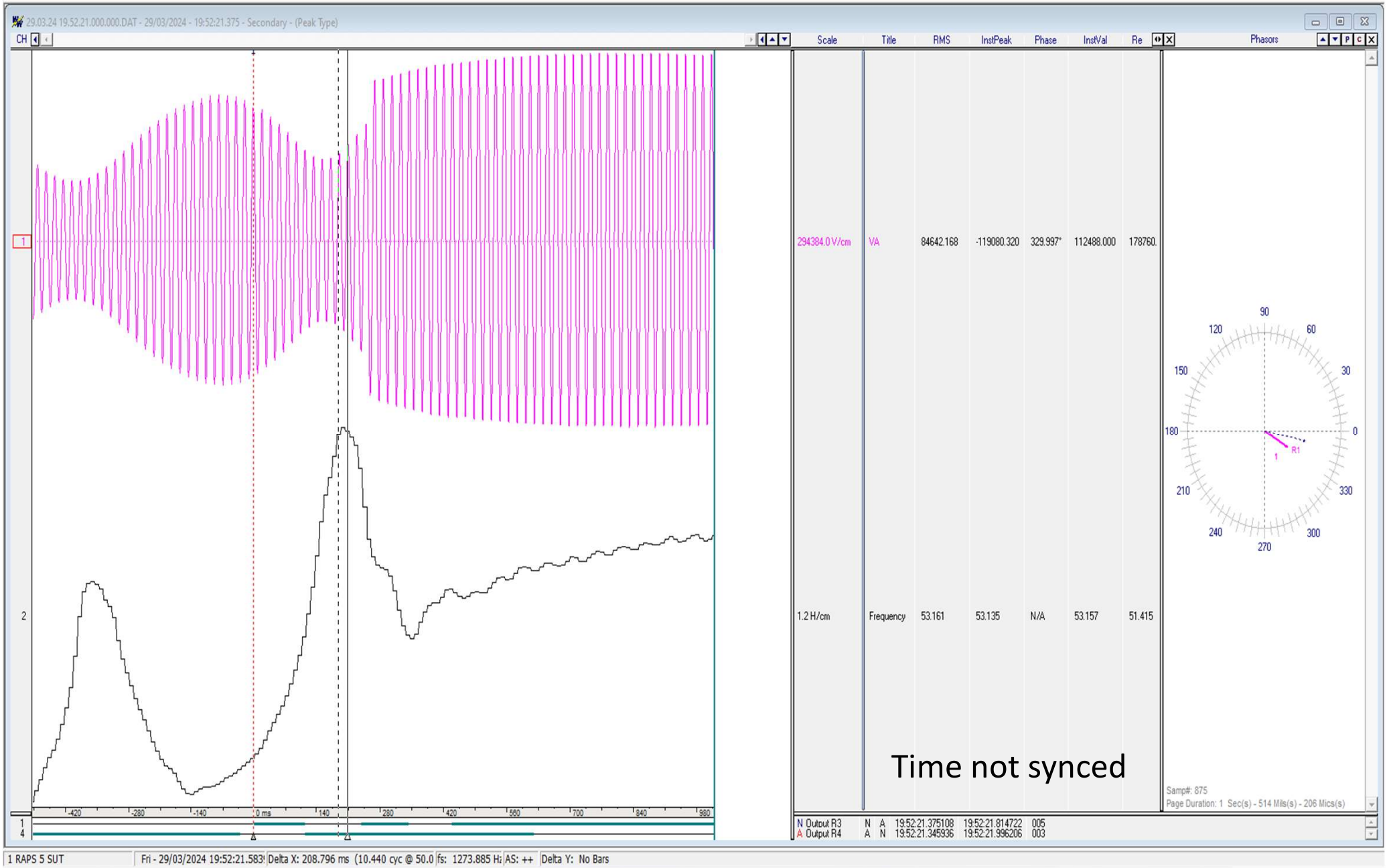
Phase currents:

- 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

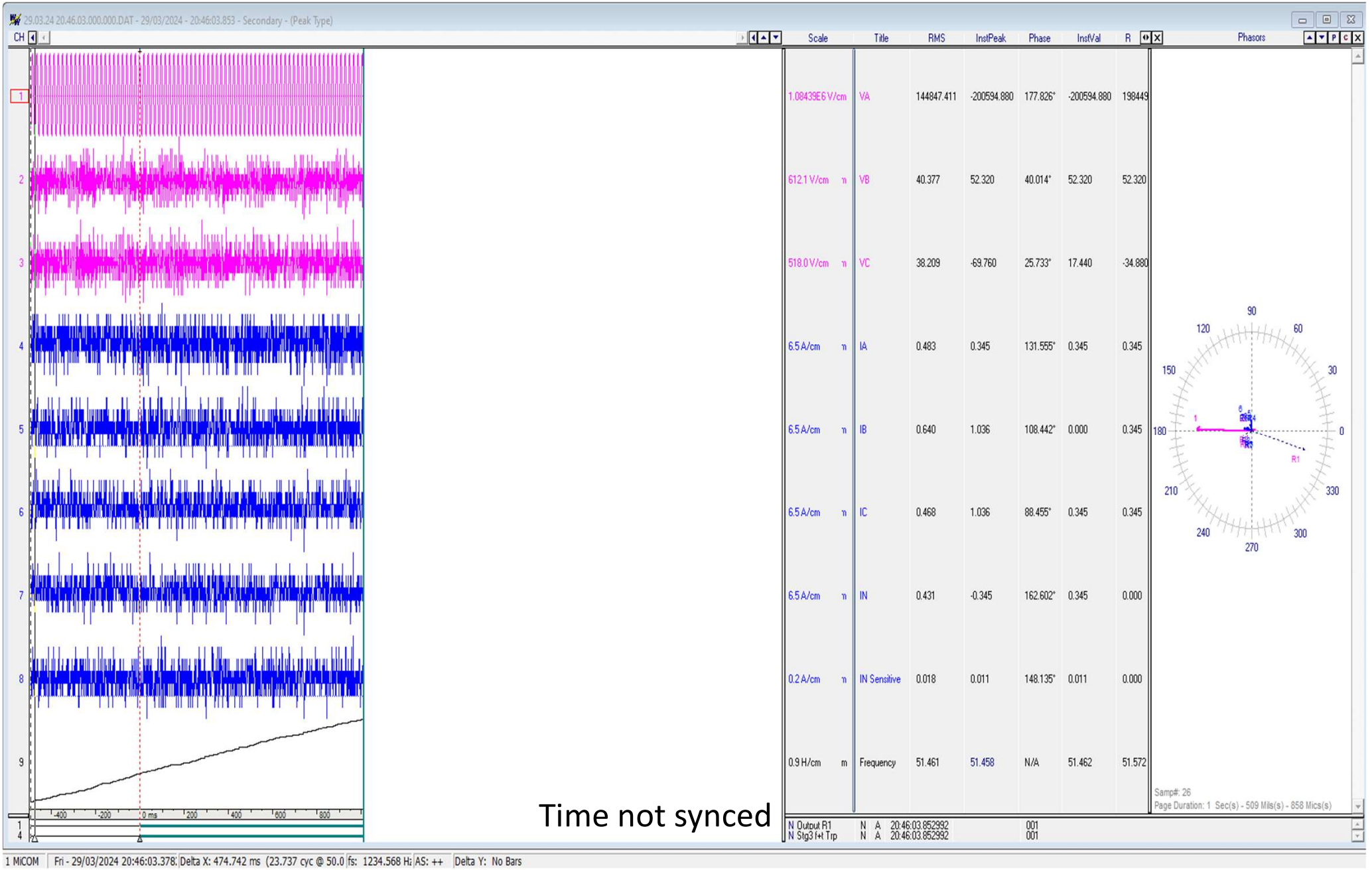


DR of SUT-5 at RAPP-B



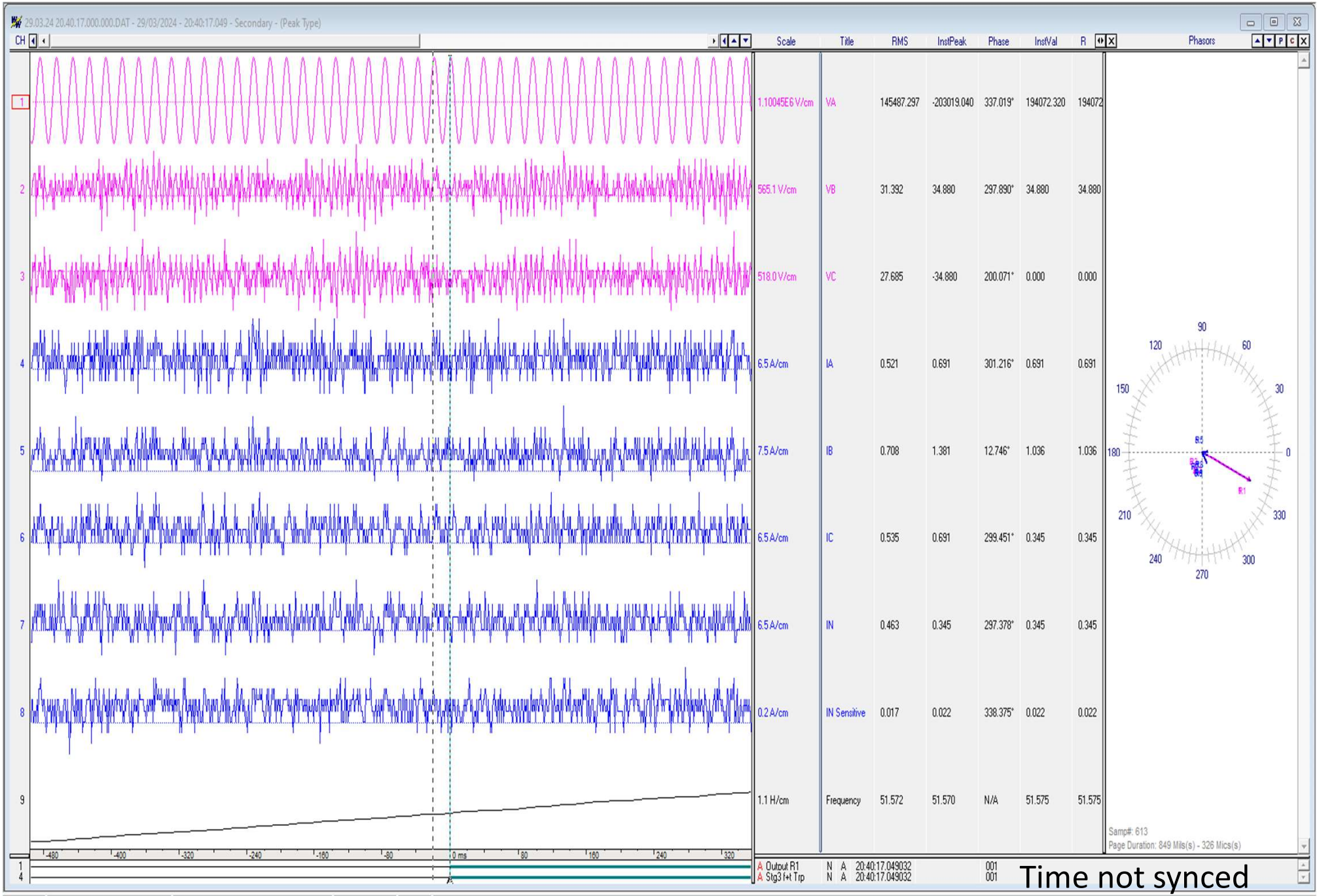
Max. frequency recorded:53.15Hz

DR of SUT-6 at RAPP-B



Time not synced

DR of SUT-6 at RAPP-B

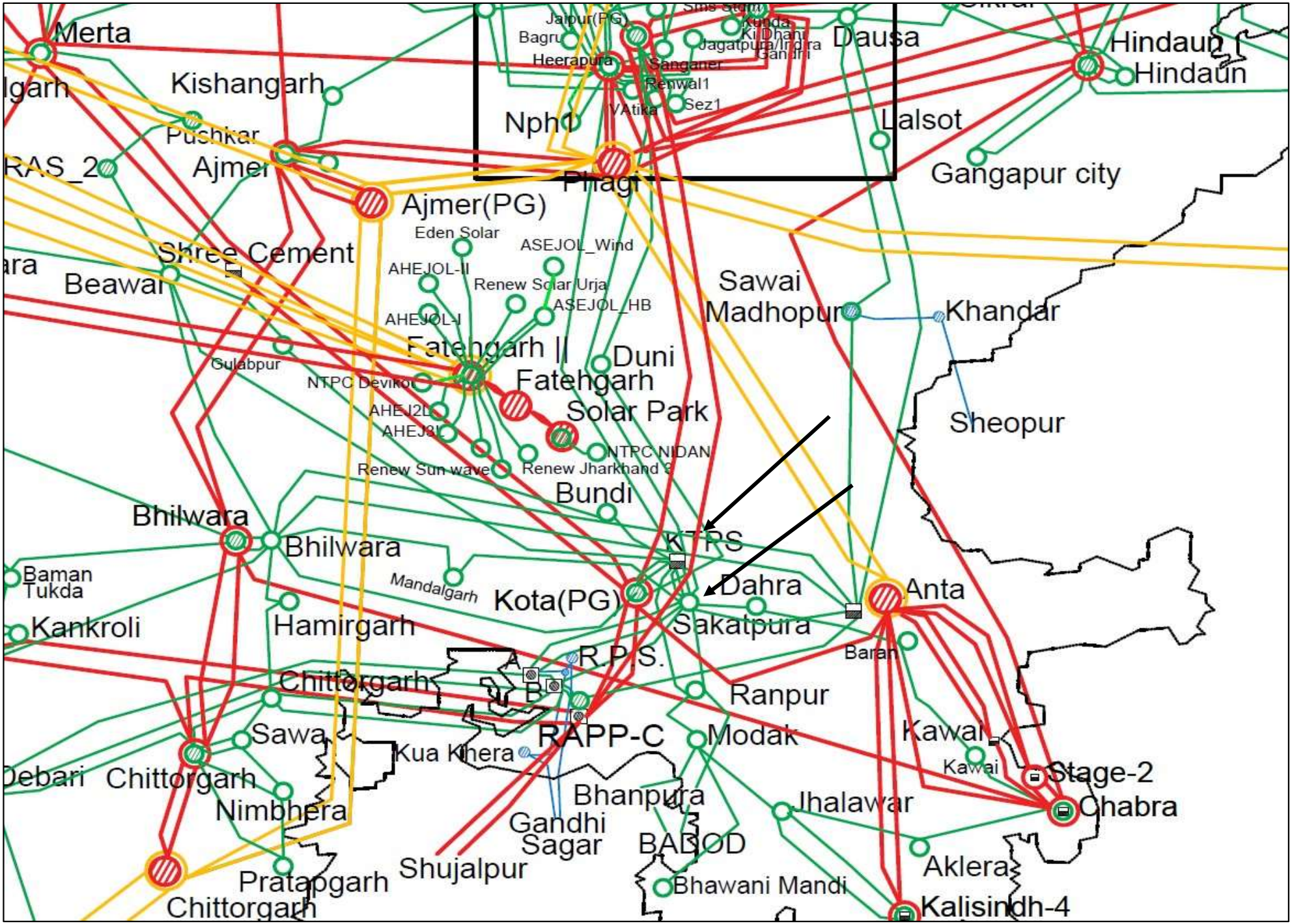


Time not synced

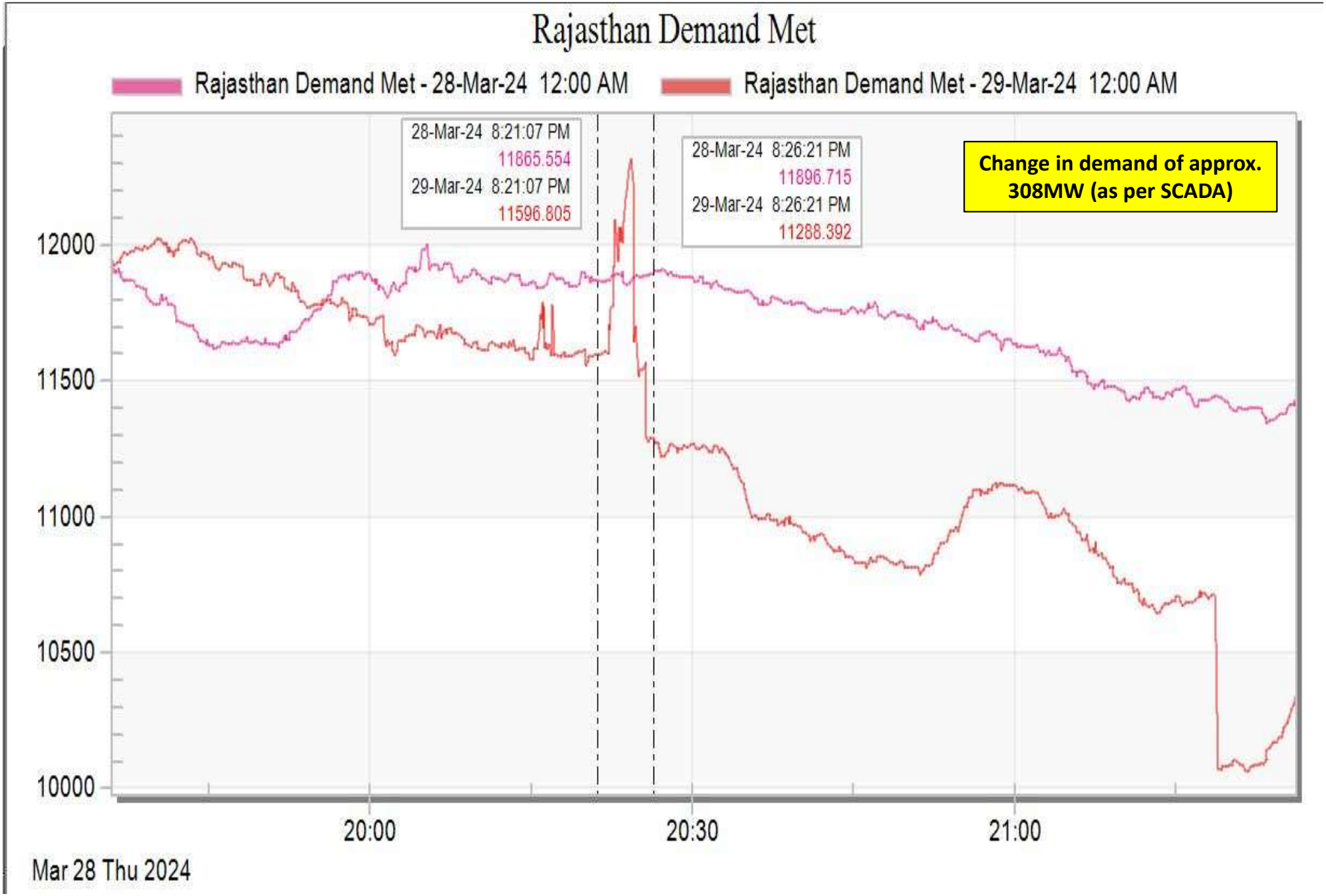
SCADA SOE

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	

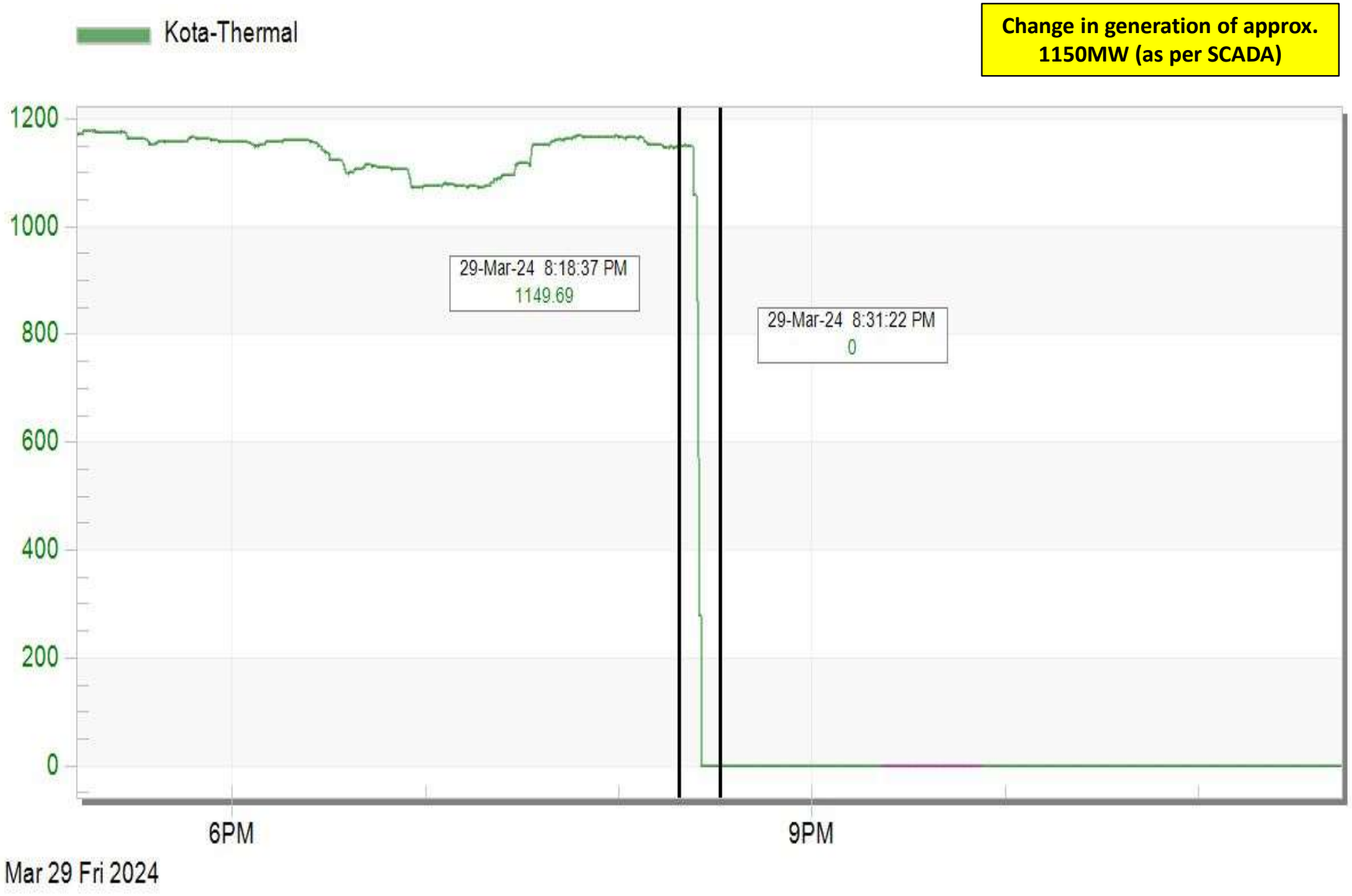
Network Diagram



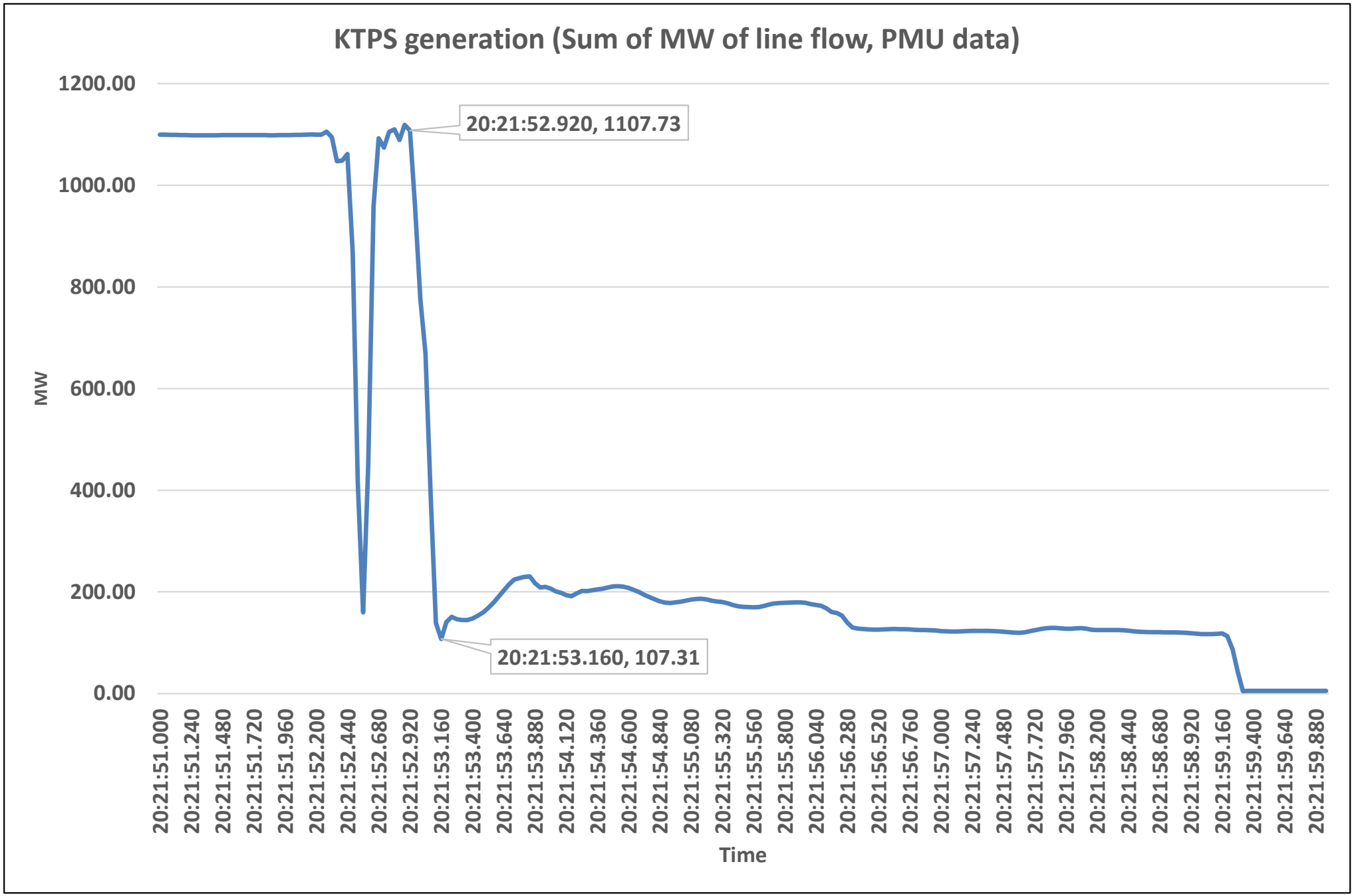
Rajasthan demand during the event



KTPS generation during the event(SCADA data)

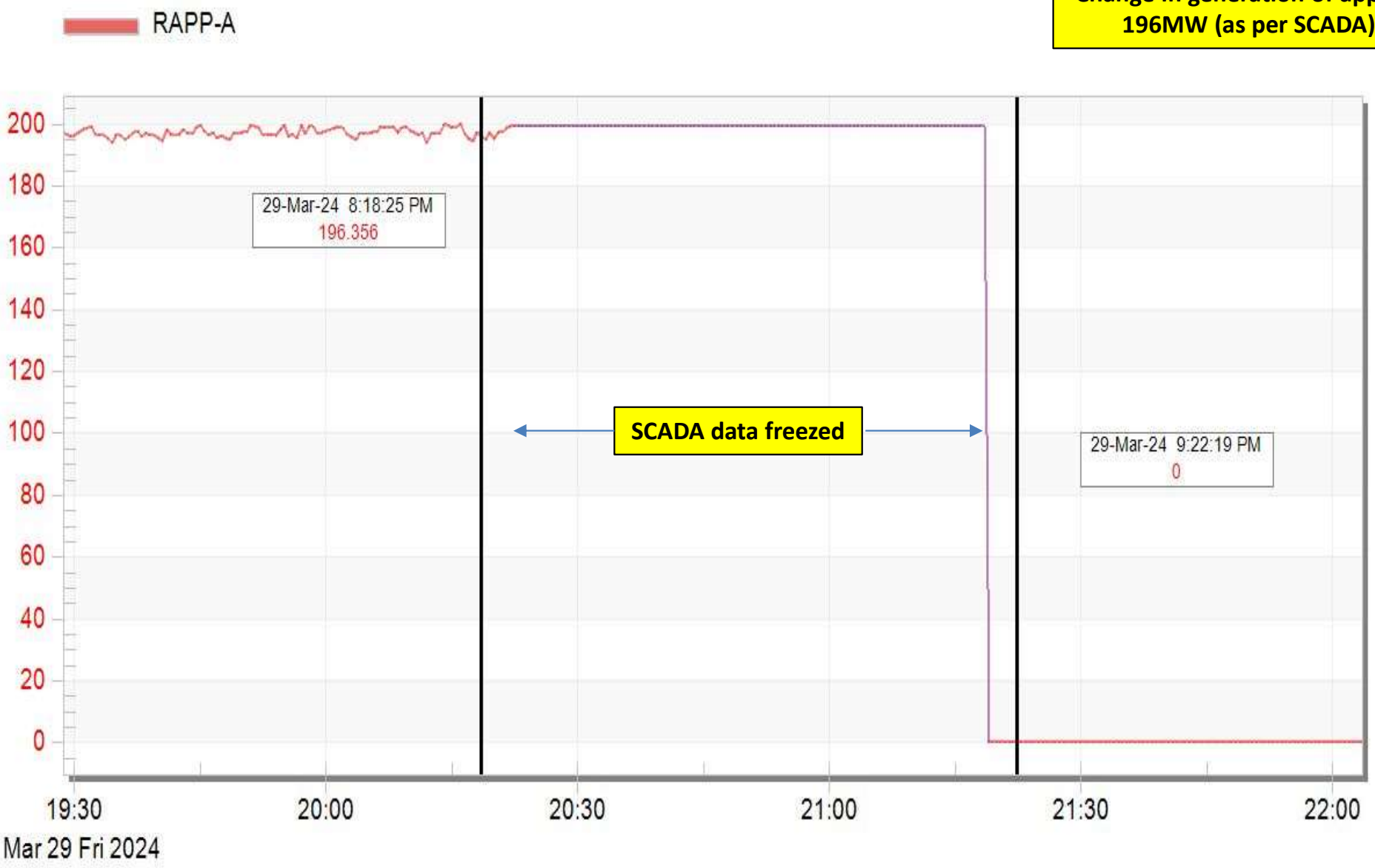


KTPS generation during the event (PMU data)

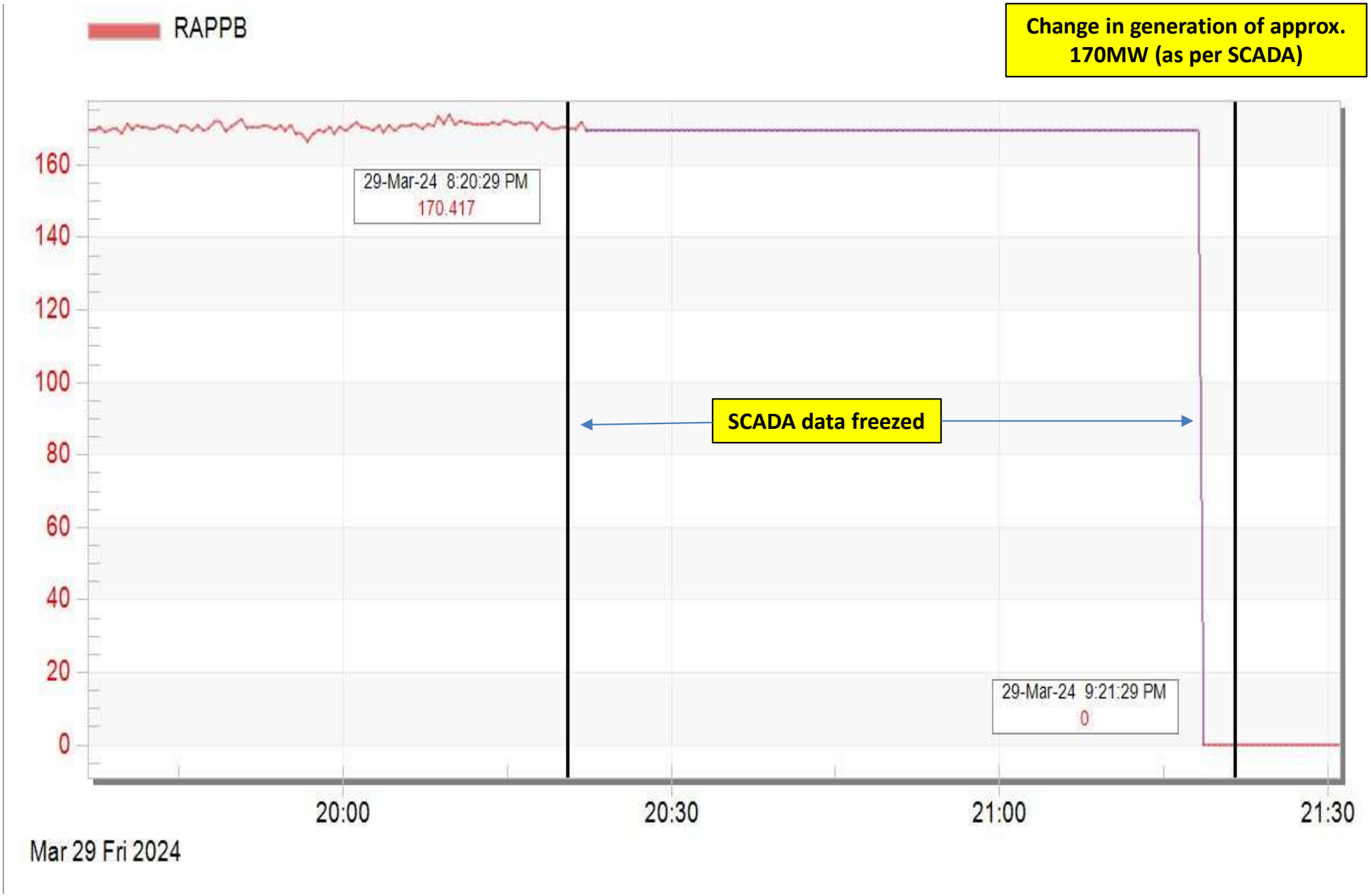


RAPP-A(NP) generation during the event

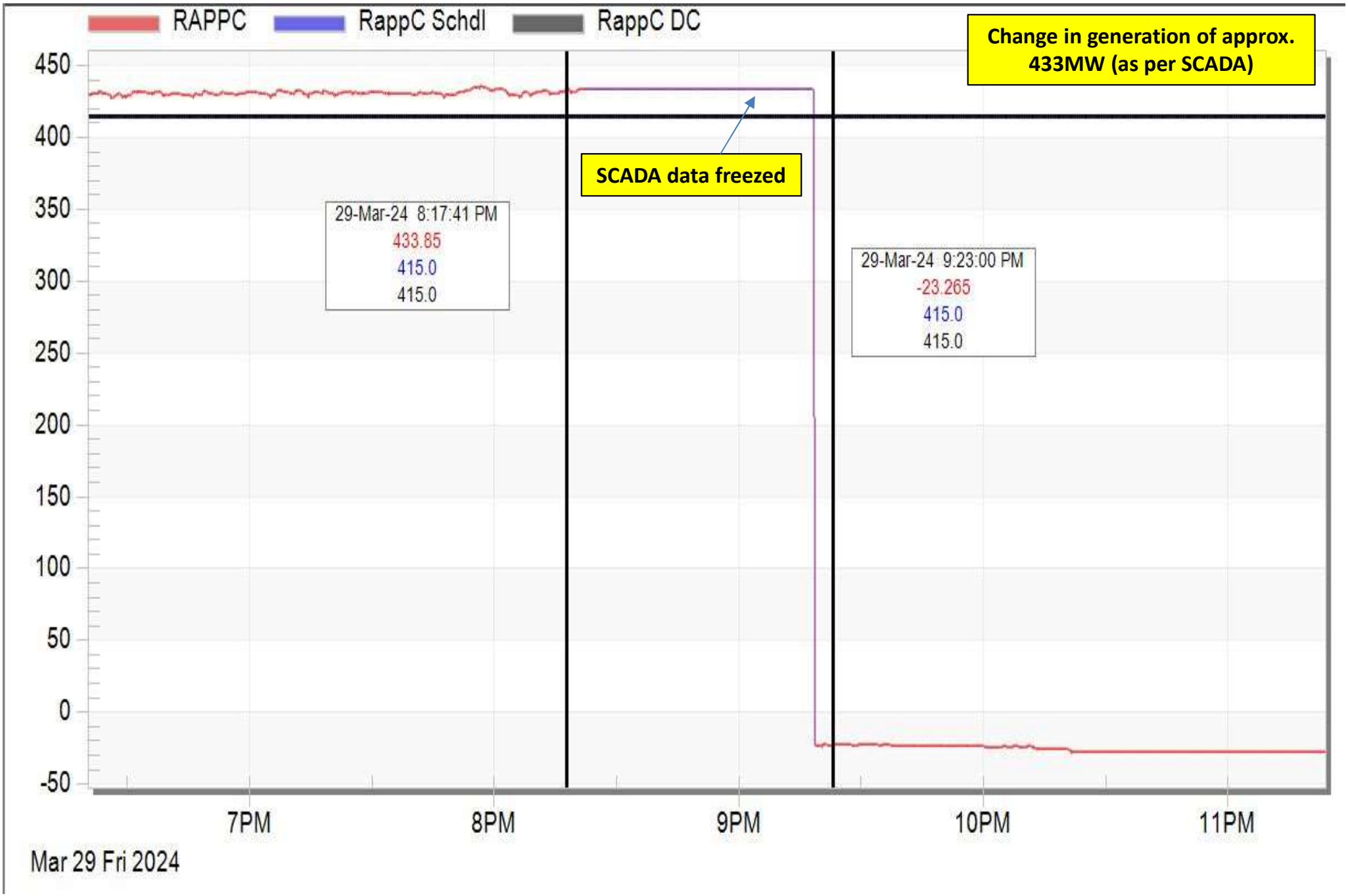
Change in generation of approx. 196MW (as per SCADA)



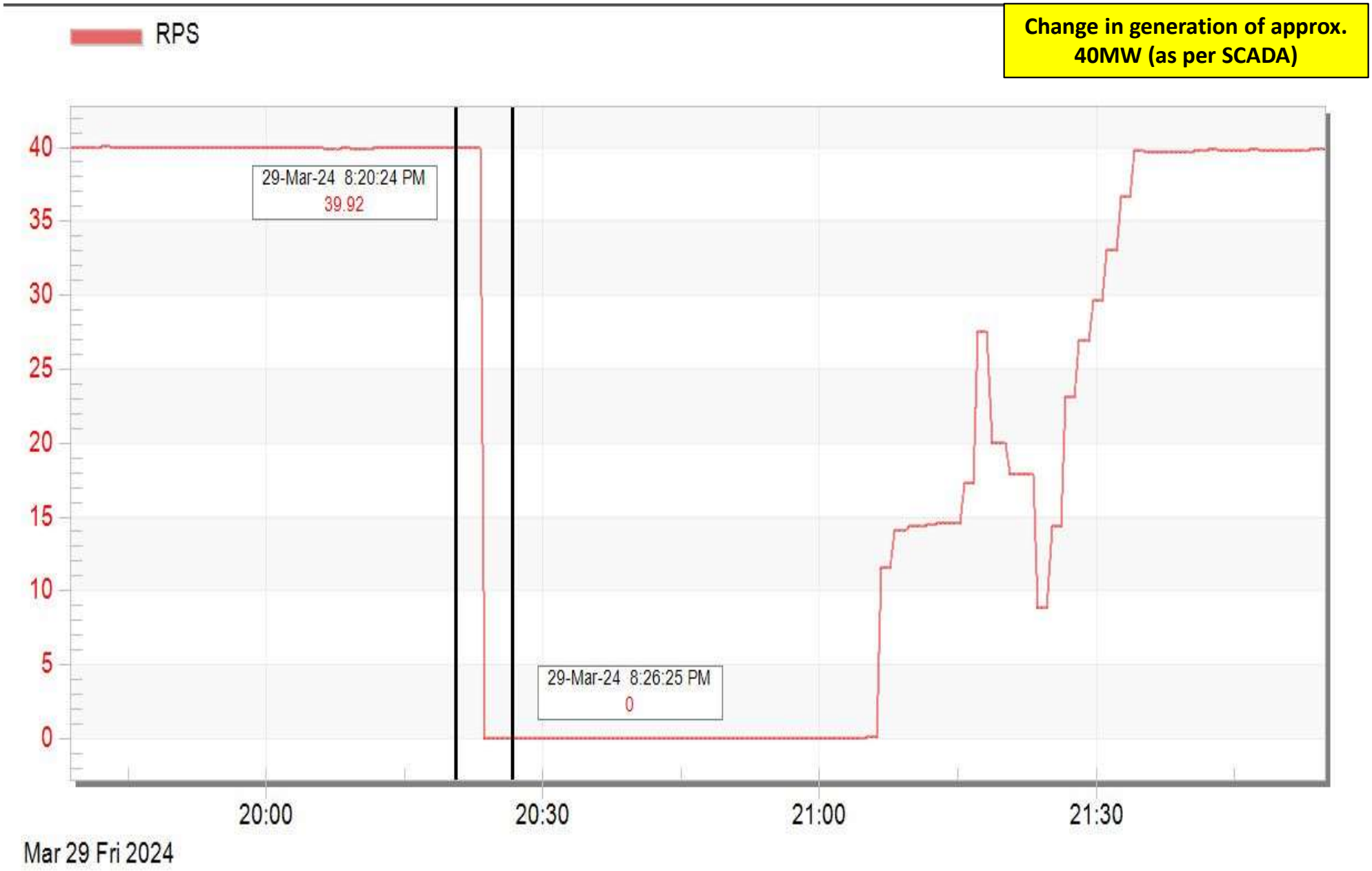
RAPP-B(NP) generation during the event



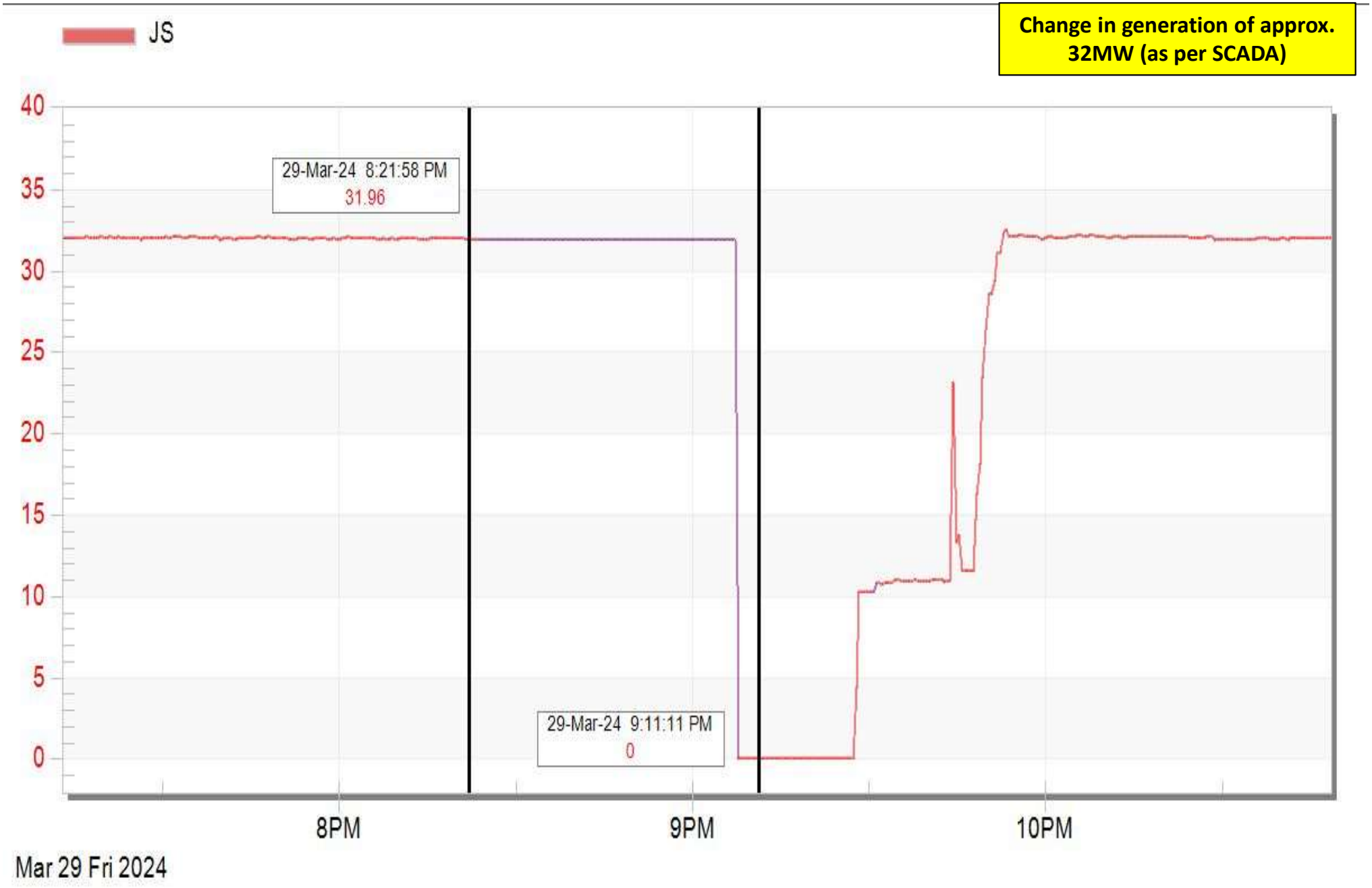
RAPP-C(NP) generation during the event



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

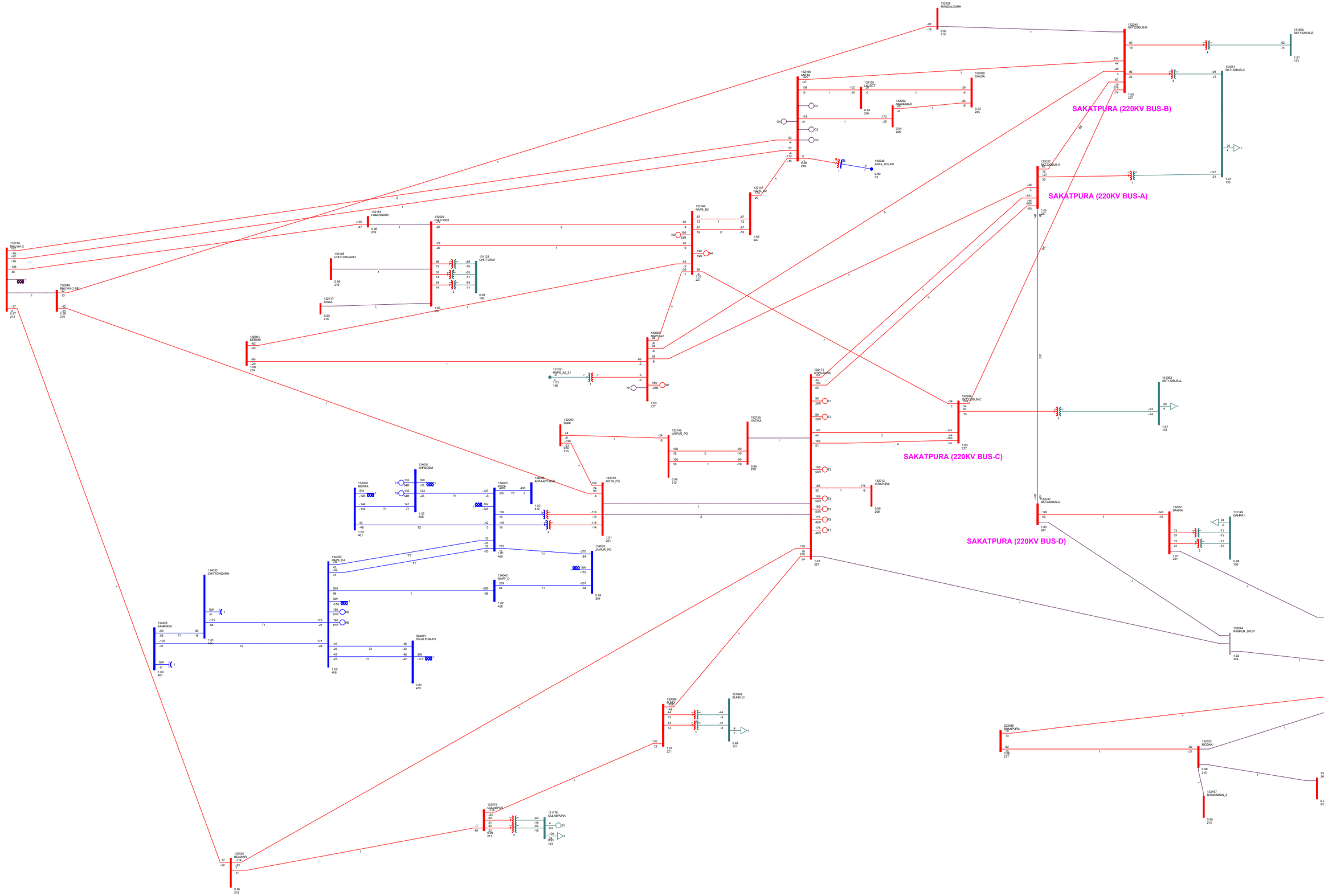
S. No.	Particulars of Case	Power flow from RAPP Complex to Sakatpura	Reverse power flow (from Sakatpura to RAPP Compex)	Ref	Remark
1A	**Base Case-1 (Scenario-1)**	**112 MW**	**-**	**Exhibit-1A**	**Power flow on all 220 KV lines are within limits.**
1B	**Base Case-2 (Scenario-2)**	**108 MW**	**-**	**Exhibit-1B**	
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.

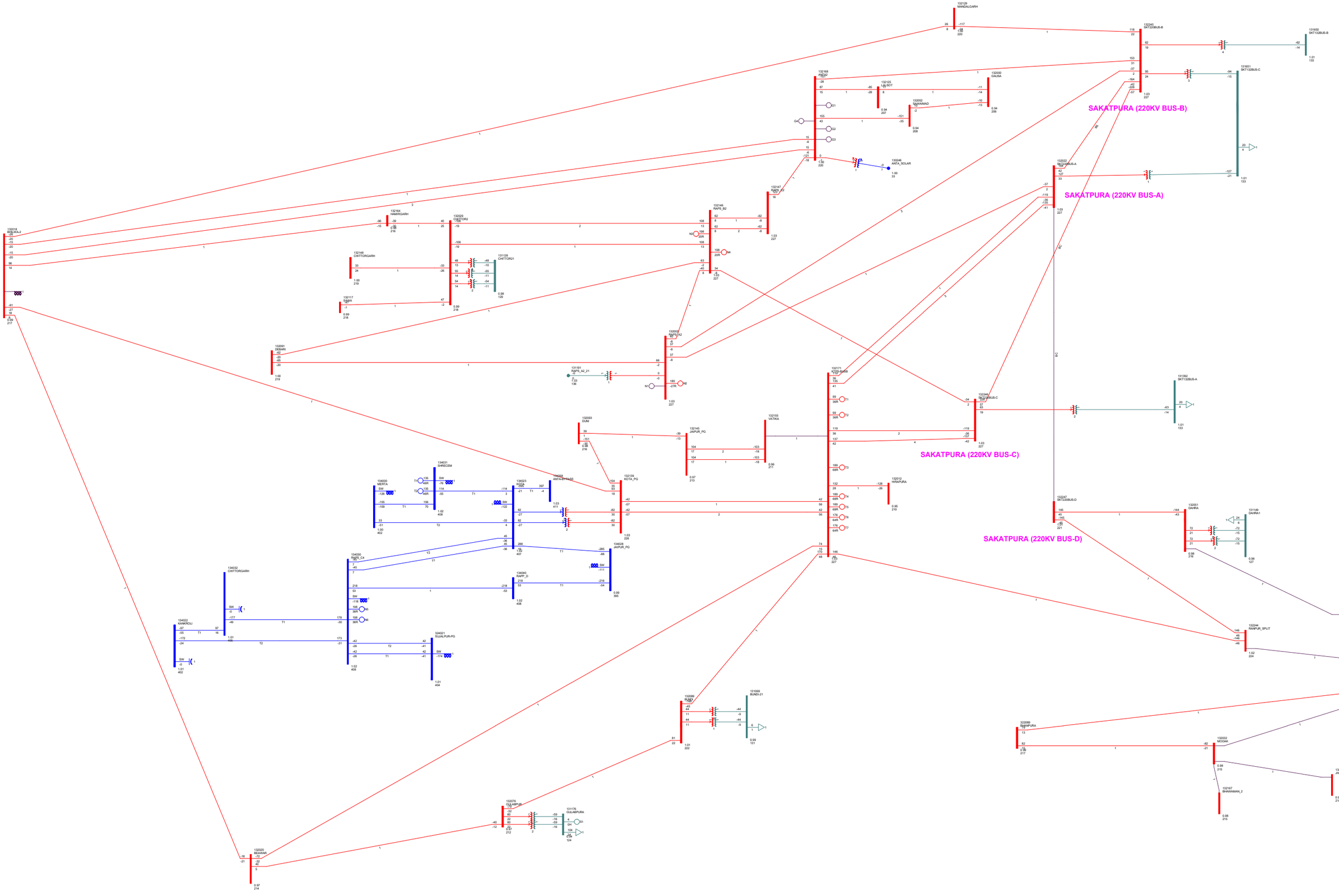
BASE CASE-1 : LOAD FLOW STUDY IN BASE CASE IN SCENARIO-1

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

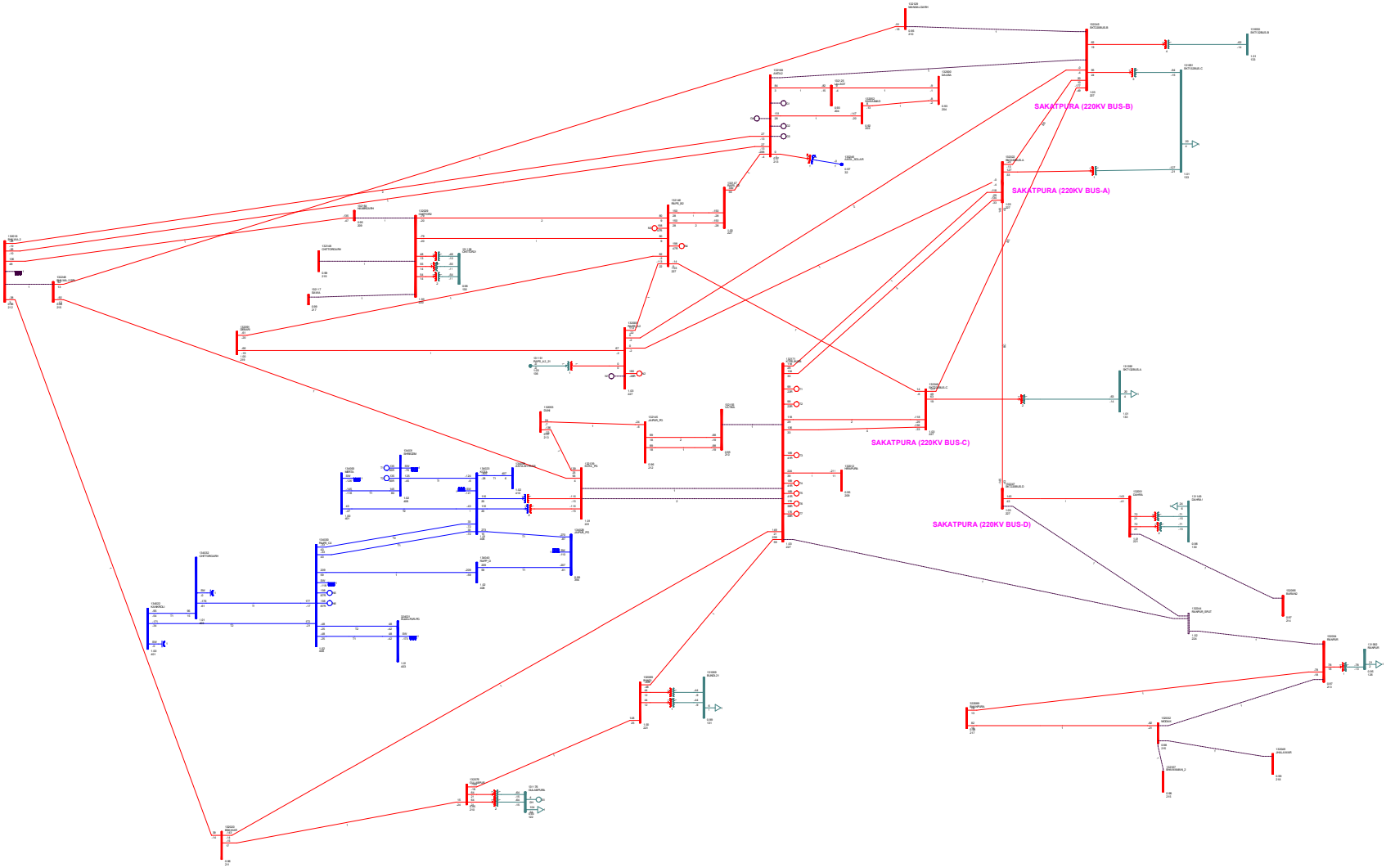
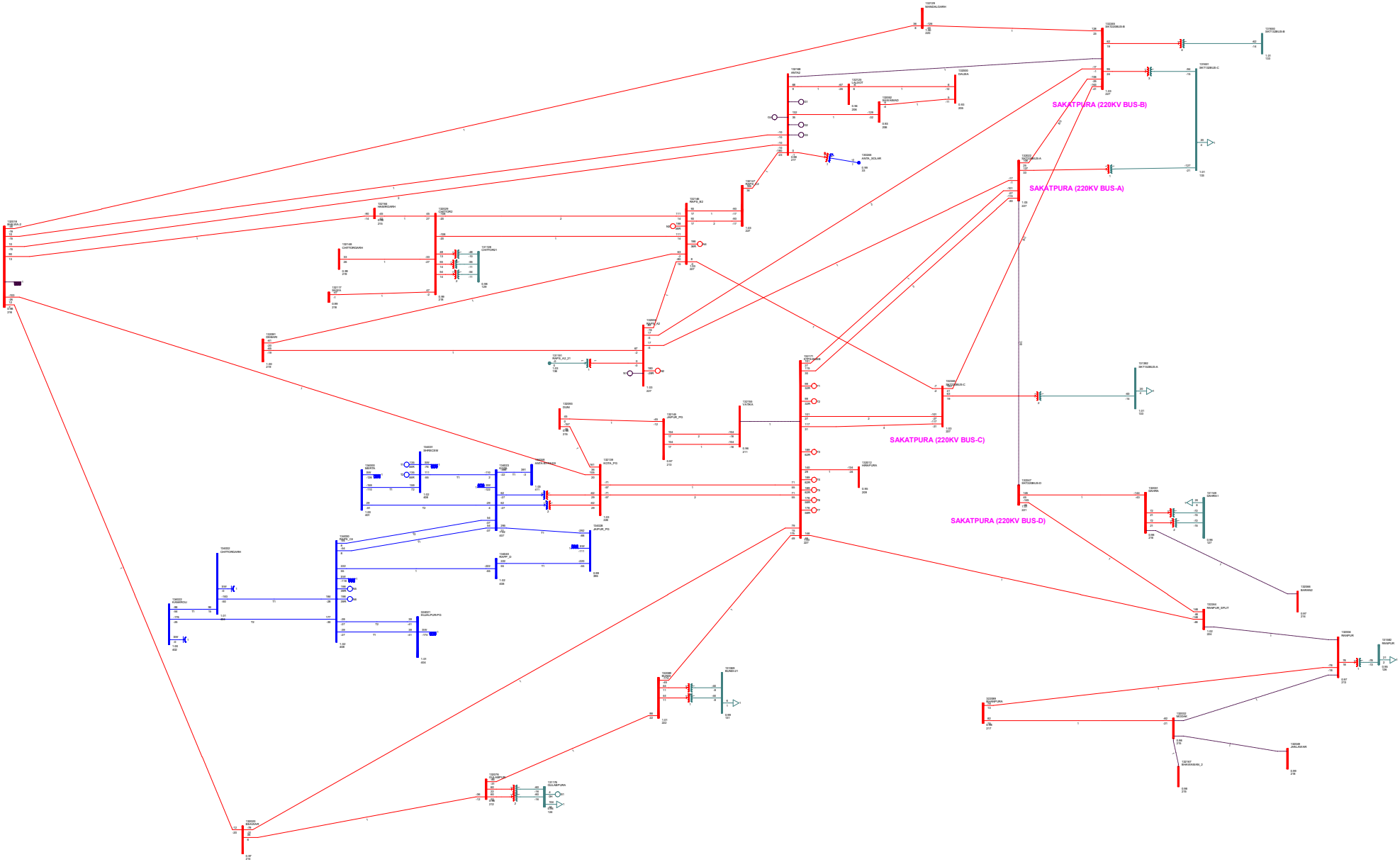


EXHIBIT-2B

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

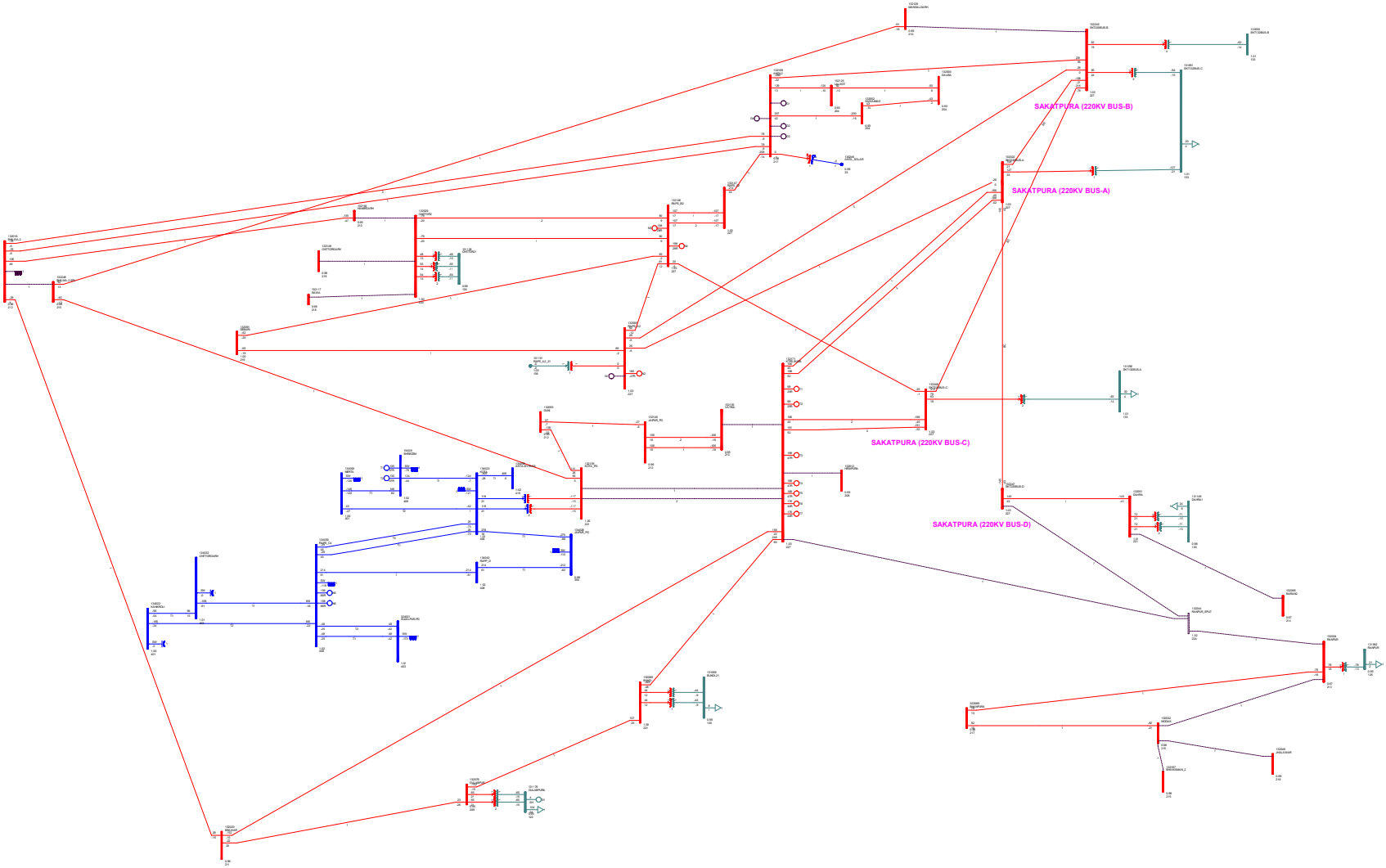
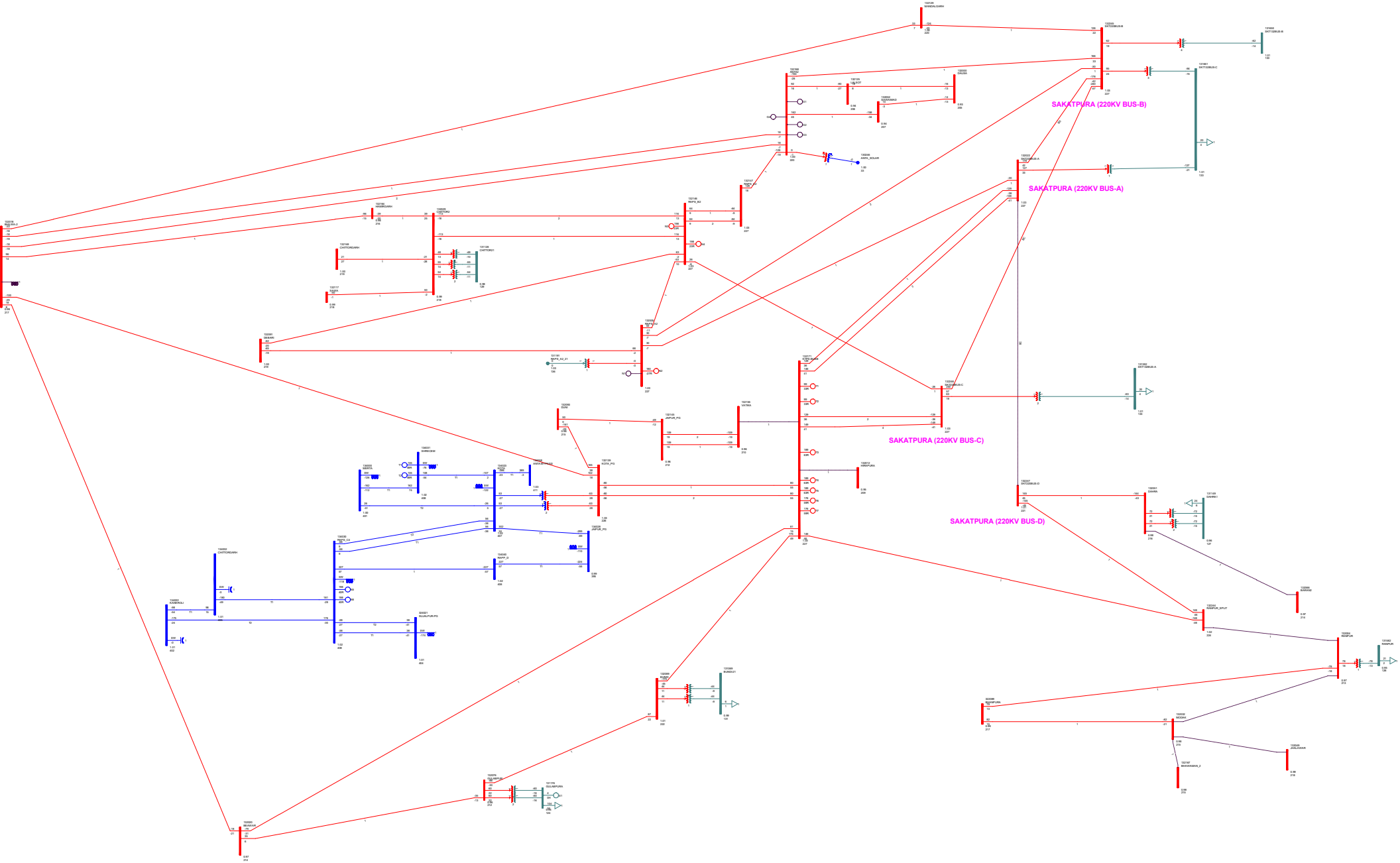


EXHIBIT-3B

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

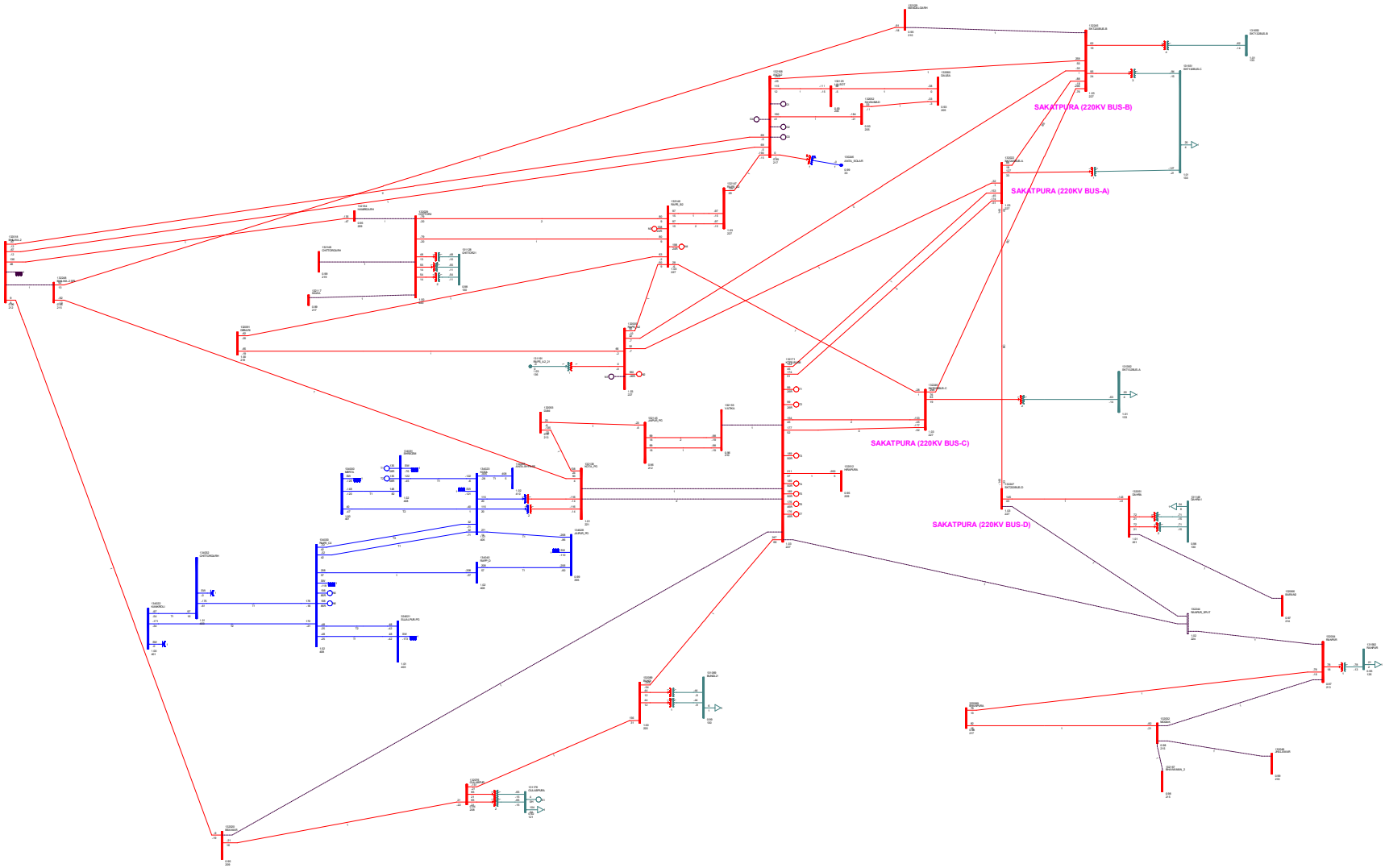


EXHIBIT-4B

CASE-3B : LOAD FLOW STUDY IN SCENARIO-2 WITH OUTAGE OF 220 KV S/C KTPS-BEAWAR LINE

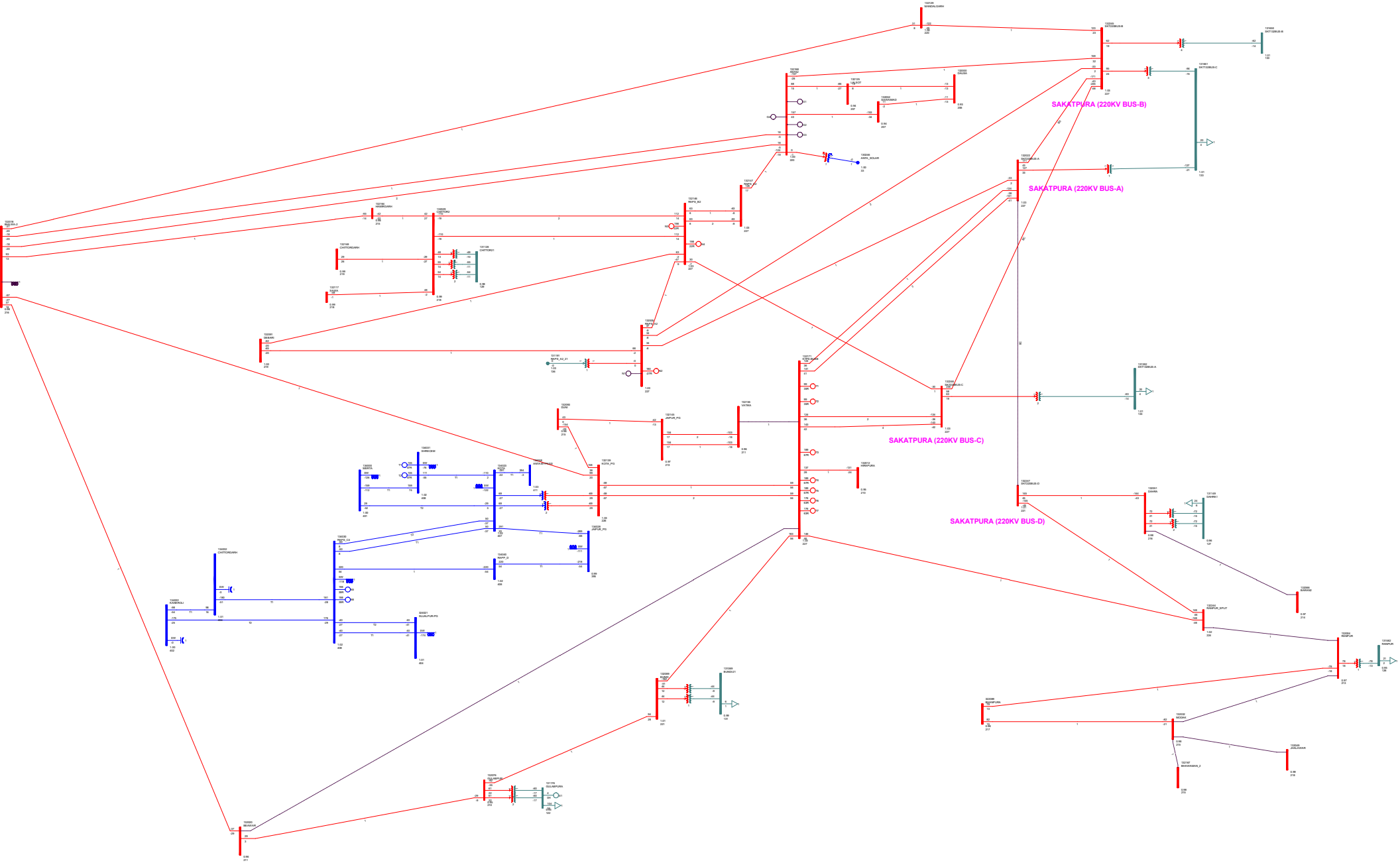


EXHIBIT-5A

CASE-4A : LOAD FLOW STUDY IN SCENARIO-1 WITH OUTAGE OF ALL THREE CIRCUITS BETWEEN SAKTPUA AND RAPP GENERATION COMPLEX

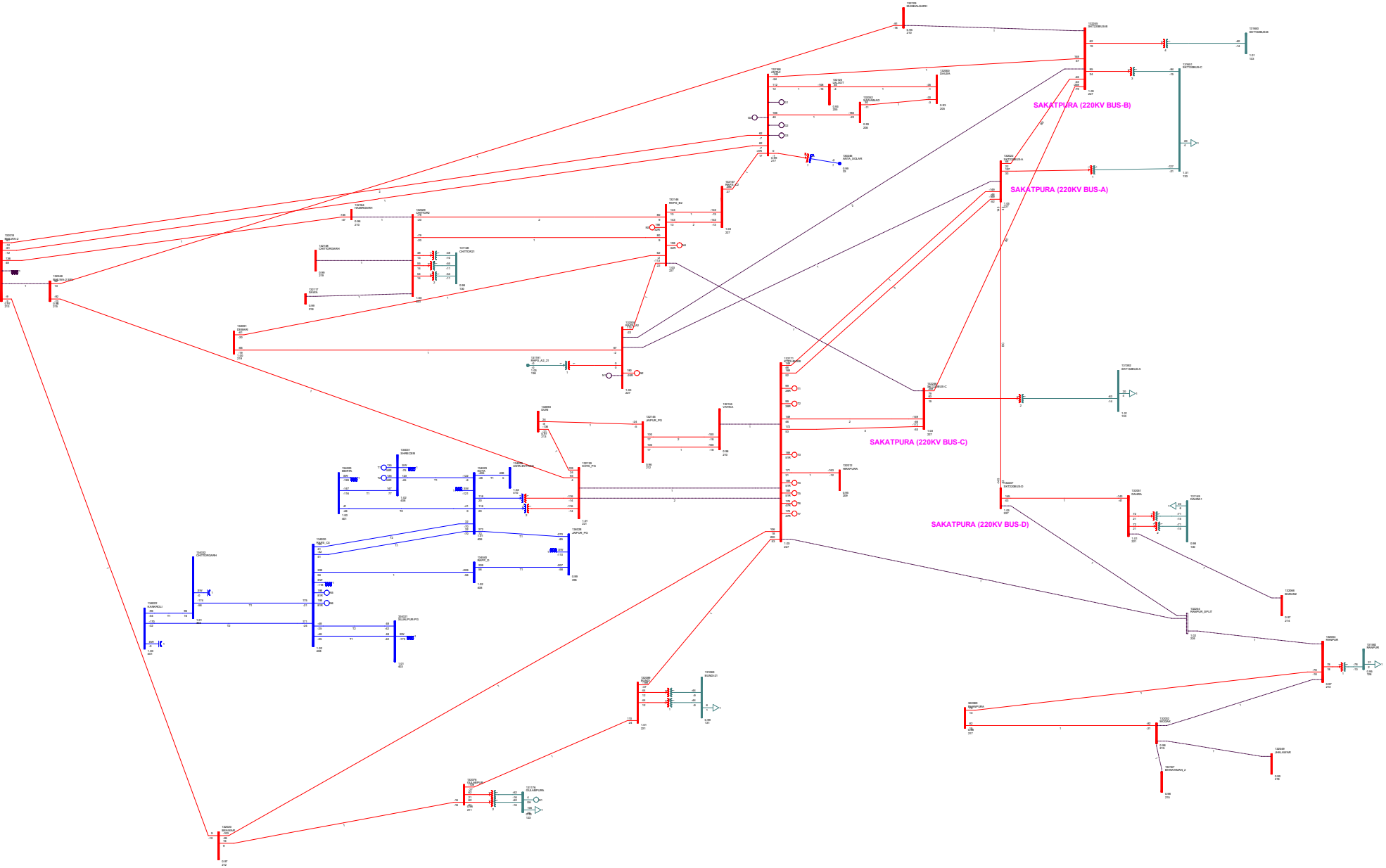


EXHIBIT-5B

CASE-4B : LOAD FLOW STUDY IN SCENARIO-2 WITH OUTAGE OF ALL THREE CIRCUITS BETWEEN SAKTPUA AND RAPP GENERATION COMPLEX

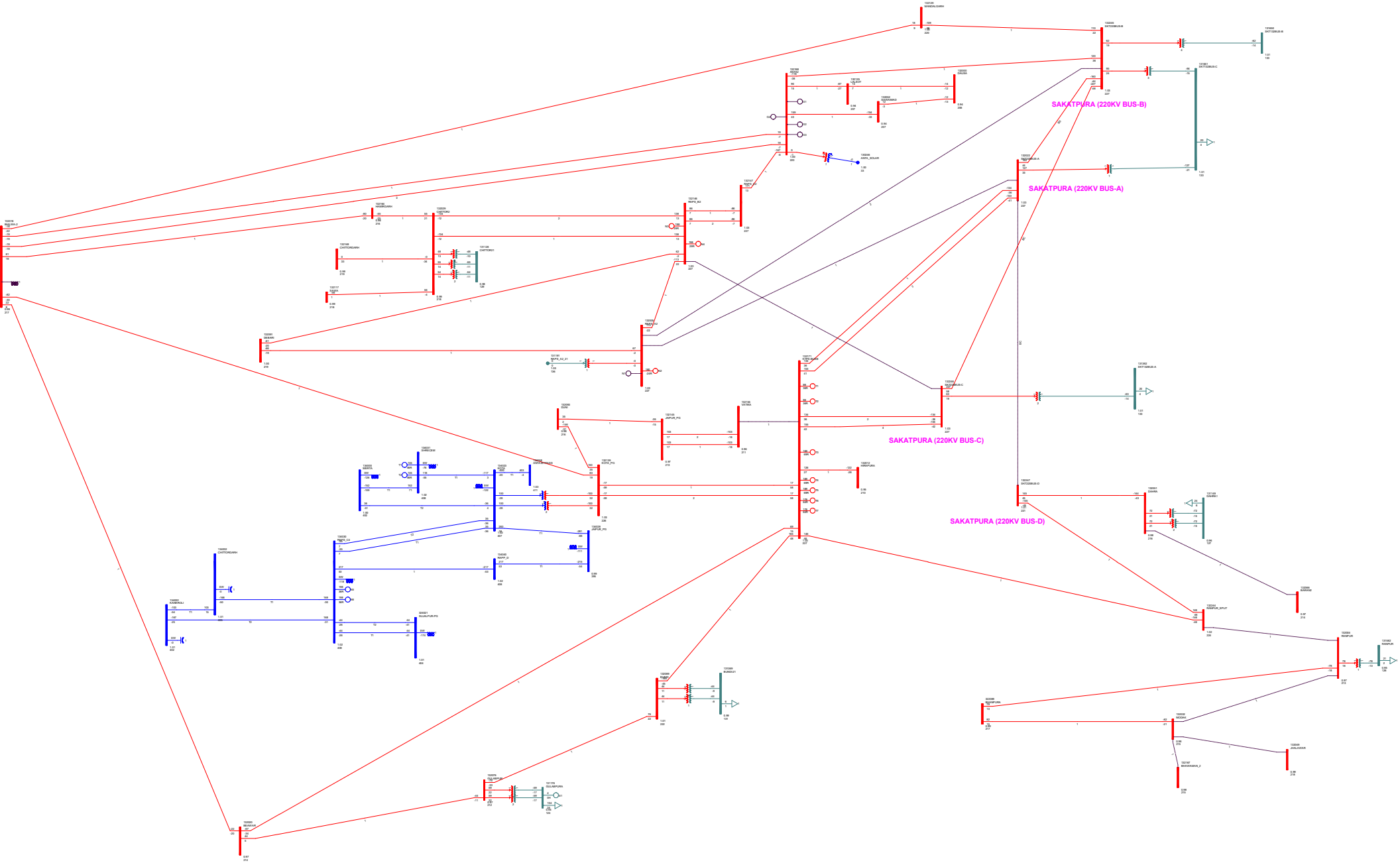


EXHIBIT-5B2

CASE-4B1 : LOAD FLOW STUDY IN SCENARIO-2 WITH OUTAGE OF ALL THREE CIRCUITS BETWEEN SAKTPUA AND RAPP GENERATION COMPLEX

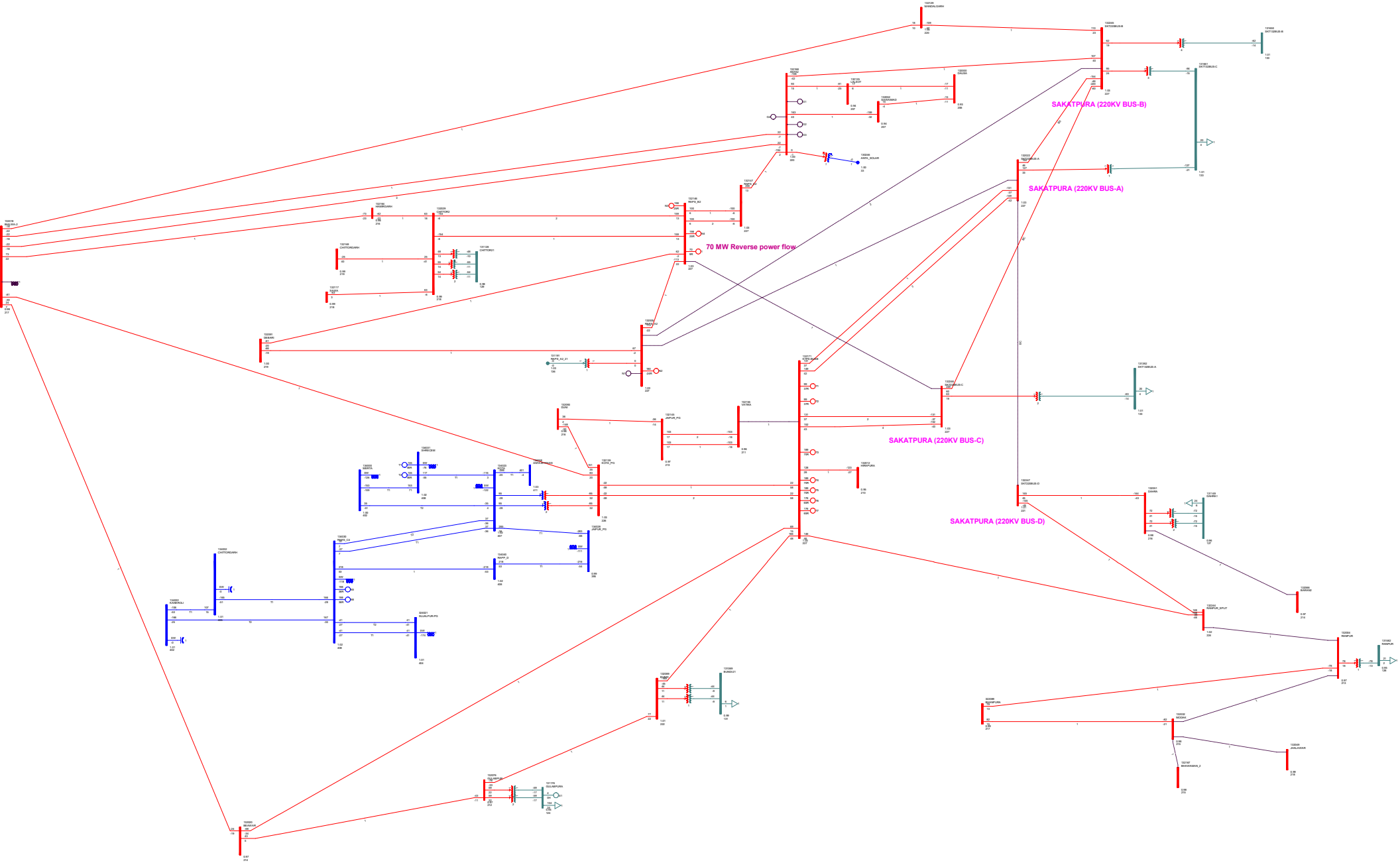


EXHIBIT-6A

CASE-6A : LOAD FLOW STUDY IN SCENARIO-1 WITH OUTAGE OF 220 KV S/C SAKATPURA-ANTA LINE AND KTPS-HEERAPURA LINE

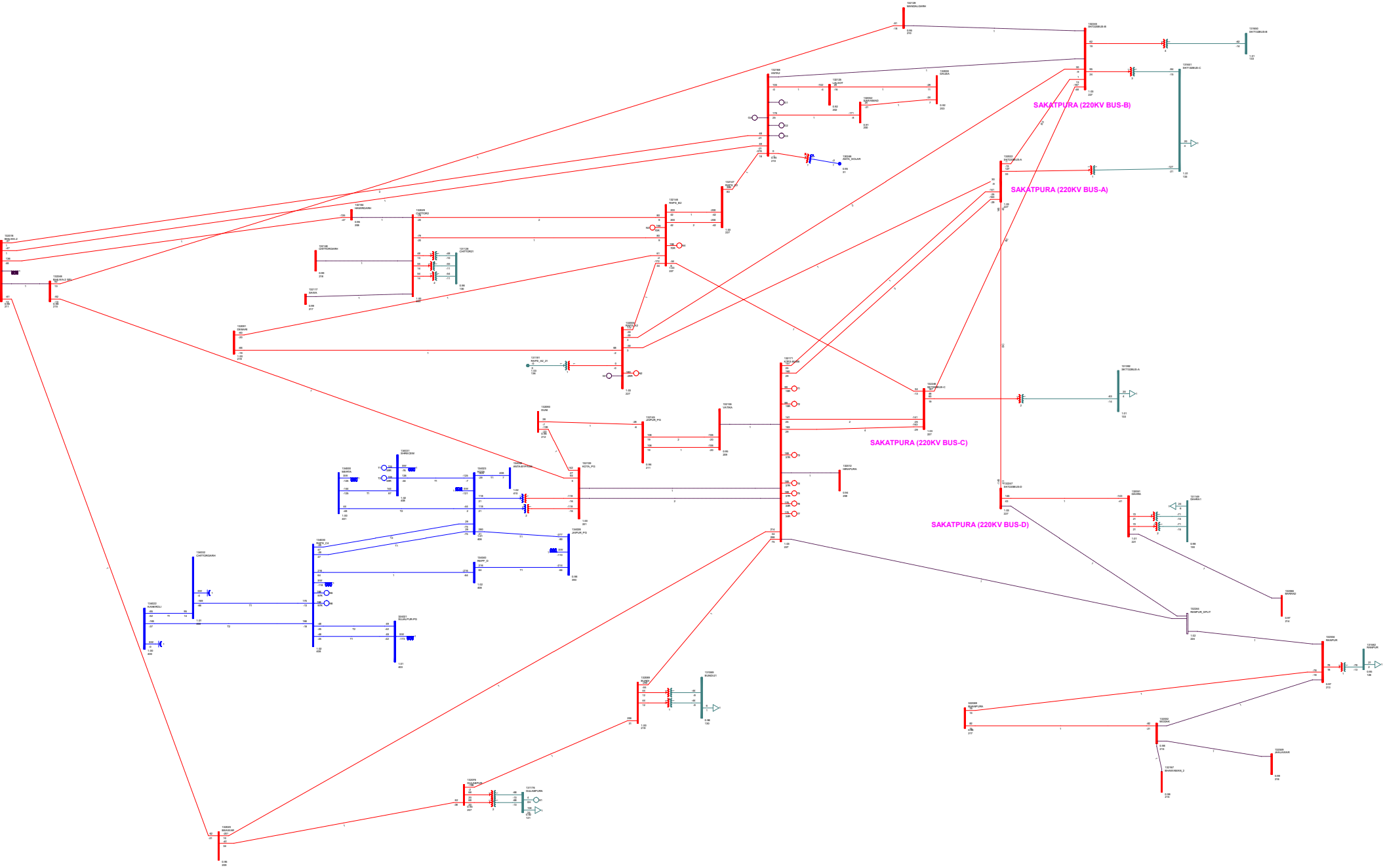
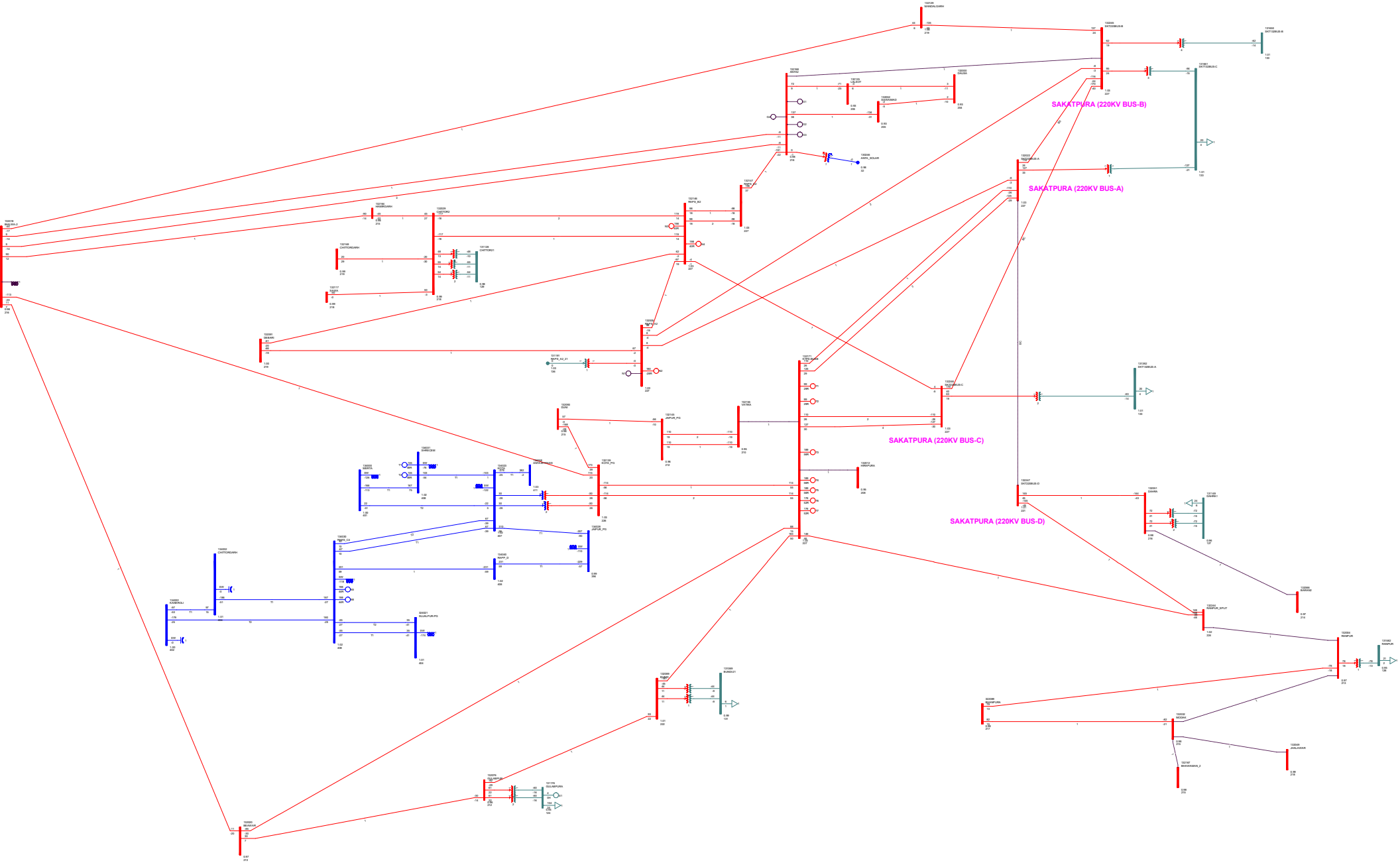


EXHIBIT-6B

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				

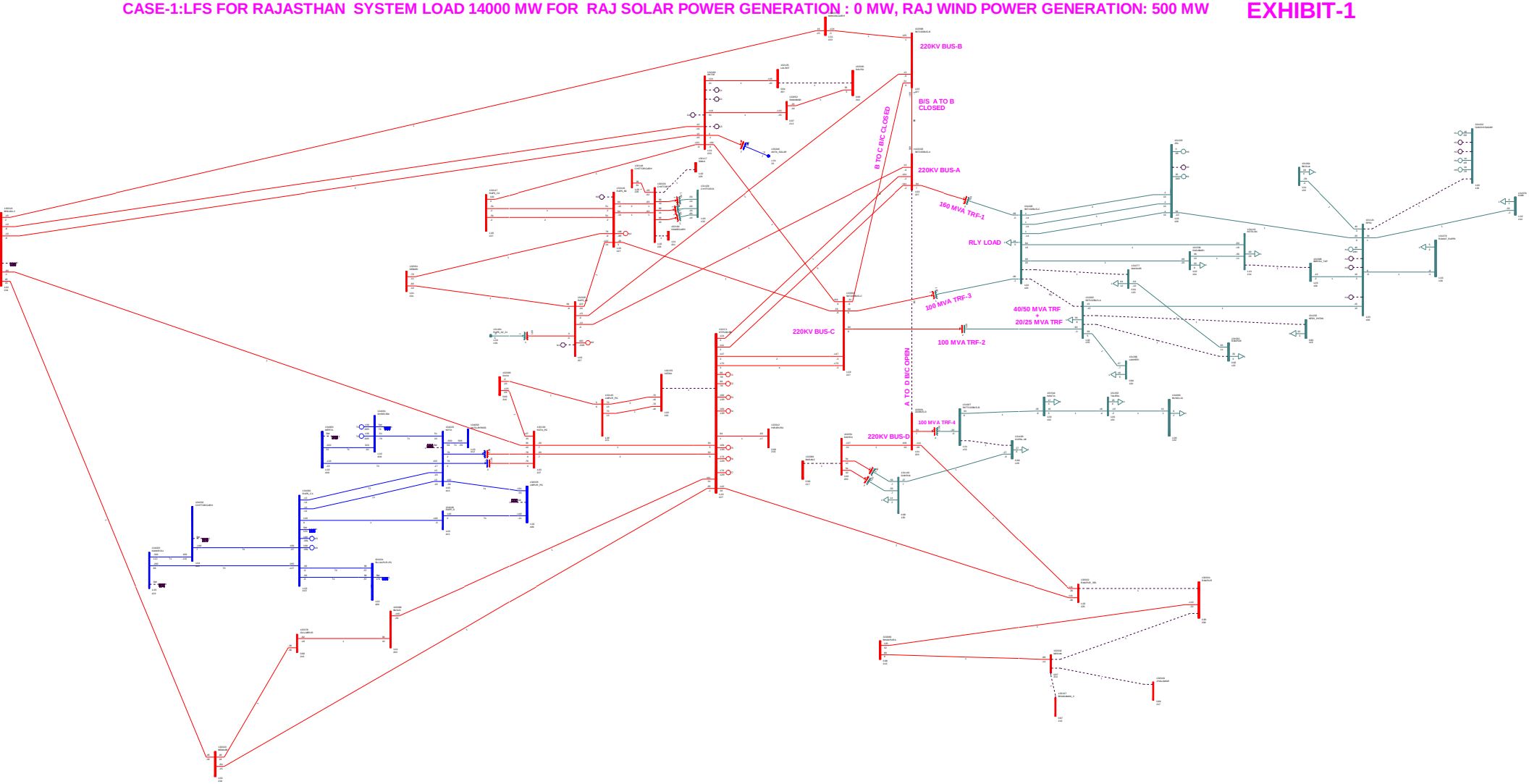
Annexure-4

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						

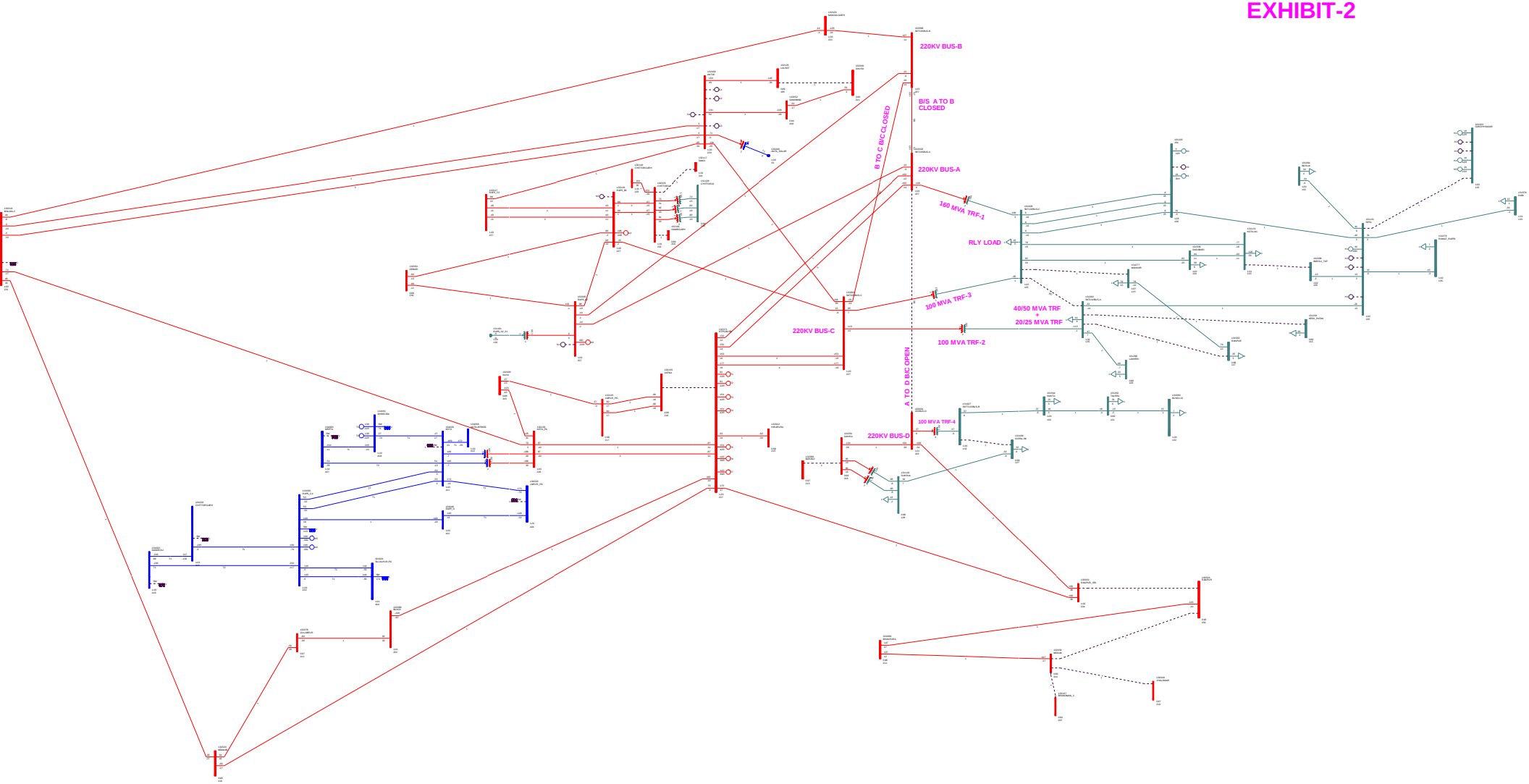
CASE-1:LFS FOR RAJASTHAN SYSTEM LOAD 14000 MW FOR RAJ SOLAR POWER GENERATION : 0 MW, RAJ WIND POWER GENERATION: 500 MW

EXHIBIT-1



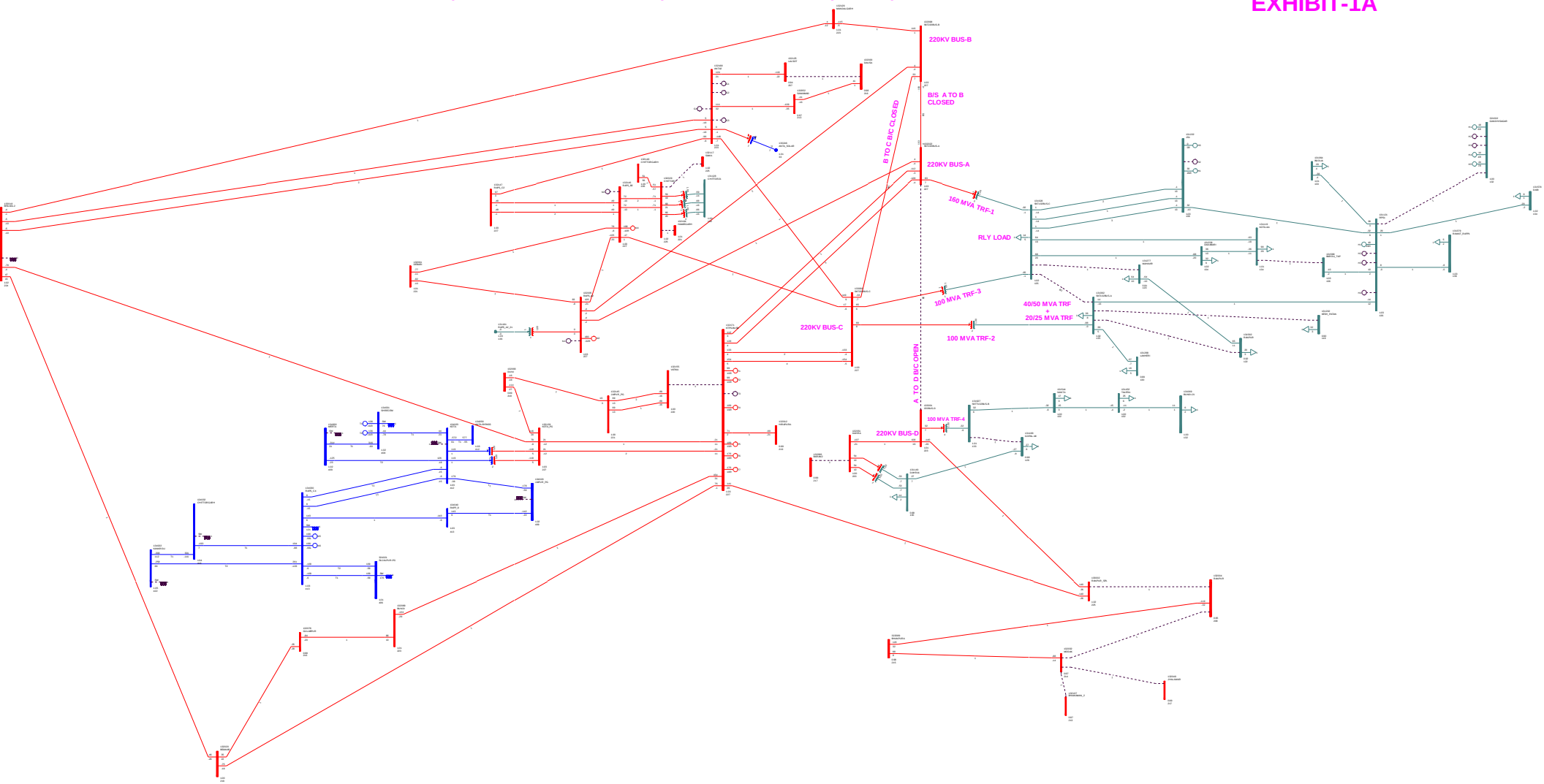
CASE-2:LFS FOR RAJASTHAN SYSTEM LOAD 17000 MW FOR RAJ SOLAR POWER GENERATION : 3864 MW, RAJ WIND POWER GENERATION: 500 MW

EXHIBIT-2



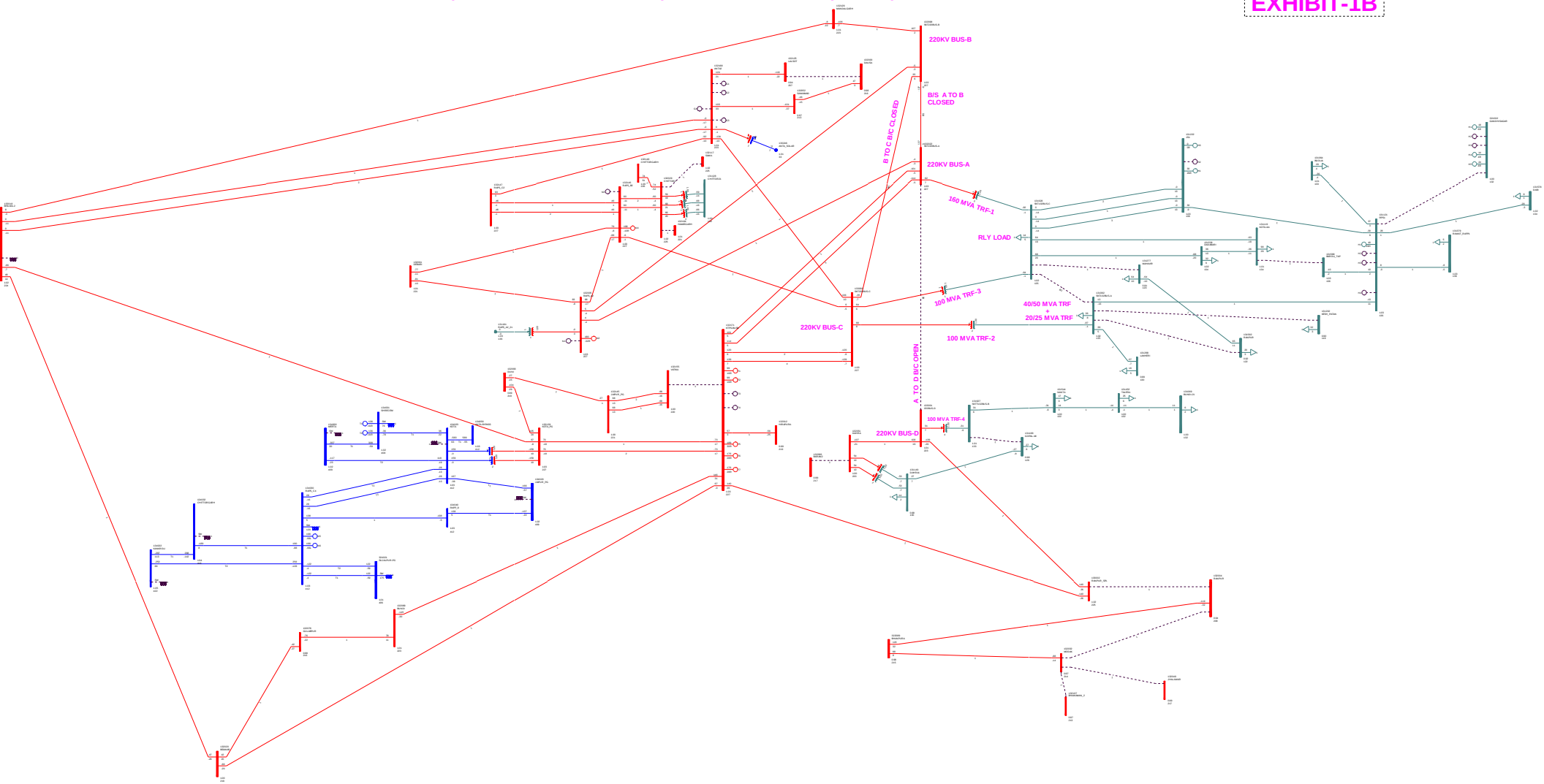
CASE-1A (CONTINGENCY-1 IN CASE-1) : OUTAGE OF UNIT-3 (210 MW) AT KTPS

EXHIBIT-1A



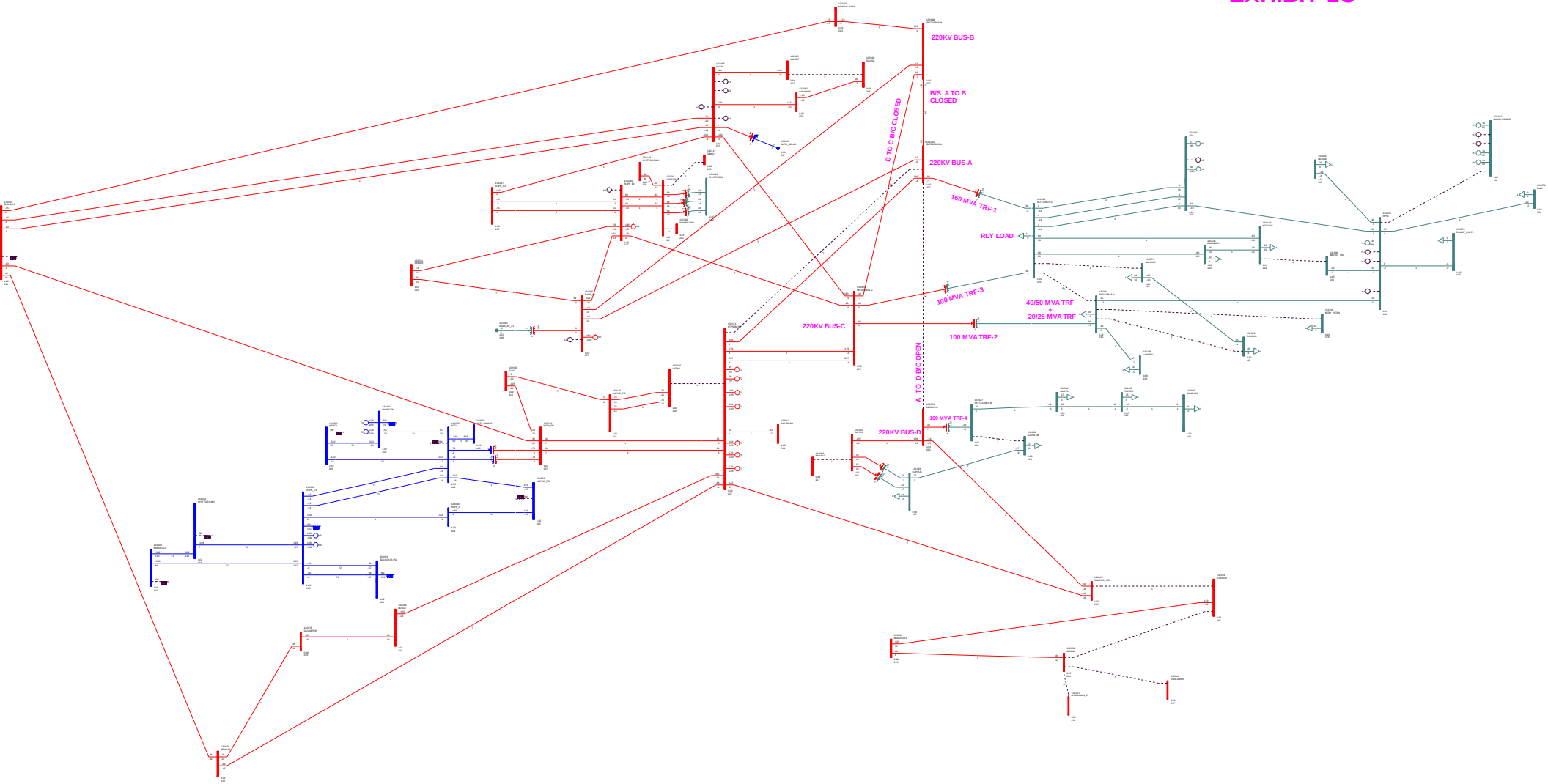
CASE-1B (CONTINGENCY-2 IN CASE-1) : OUTAGE OF UNIT-3 (210 MW) AT KTPS

EXHIBIT-1B



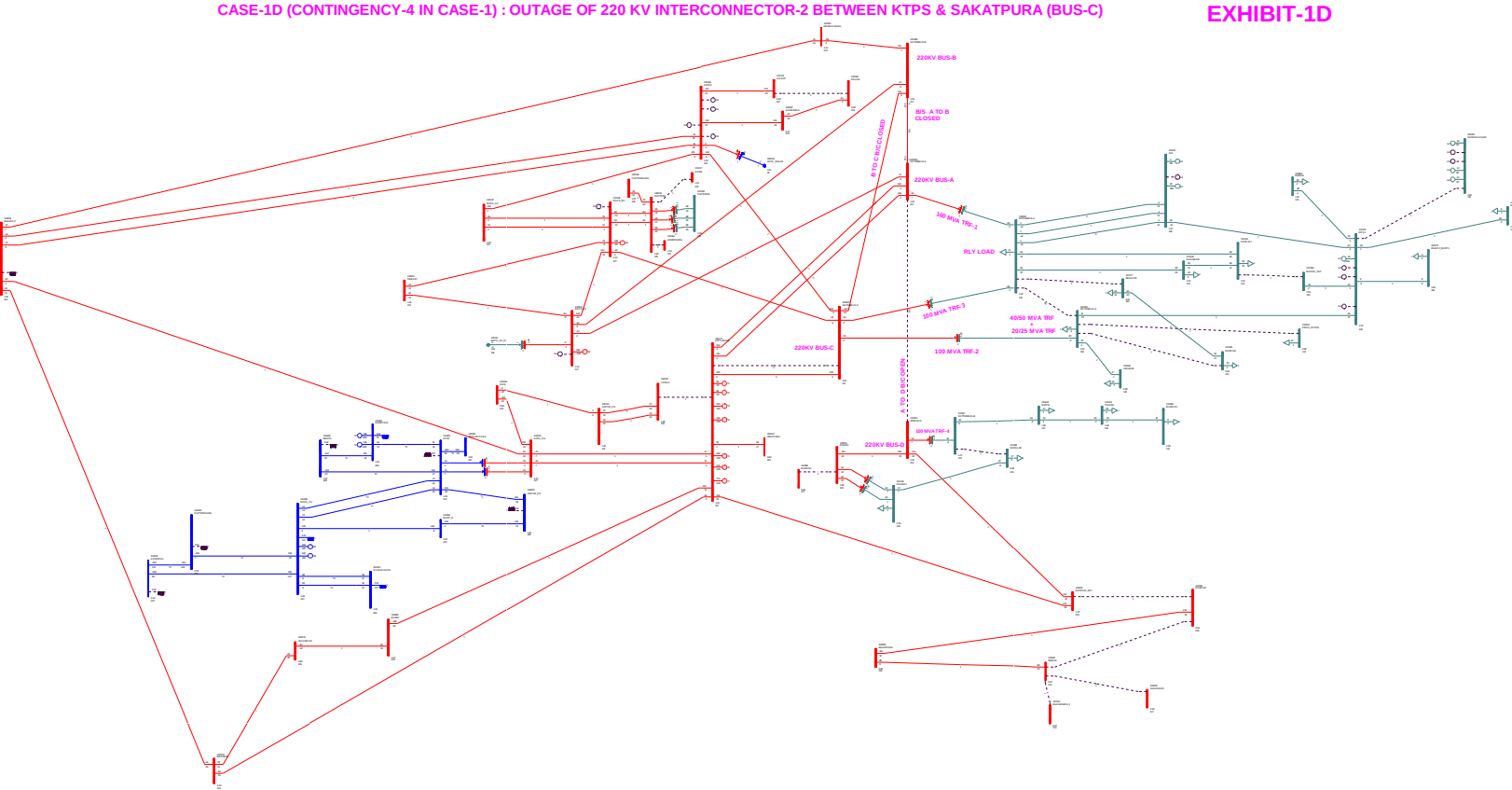
CASE-1C (CONTINGENCY-3 IN CASE-1) : OUTAGE OF 220 KV INTERCONNECTOR-1 BETWEEN KTPS & SAKATPURA (BUS-A)

EXHIBIT-1C



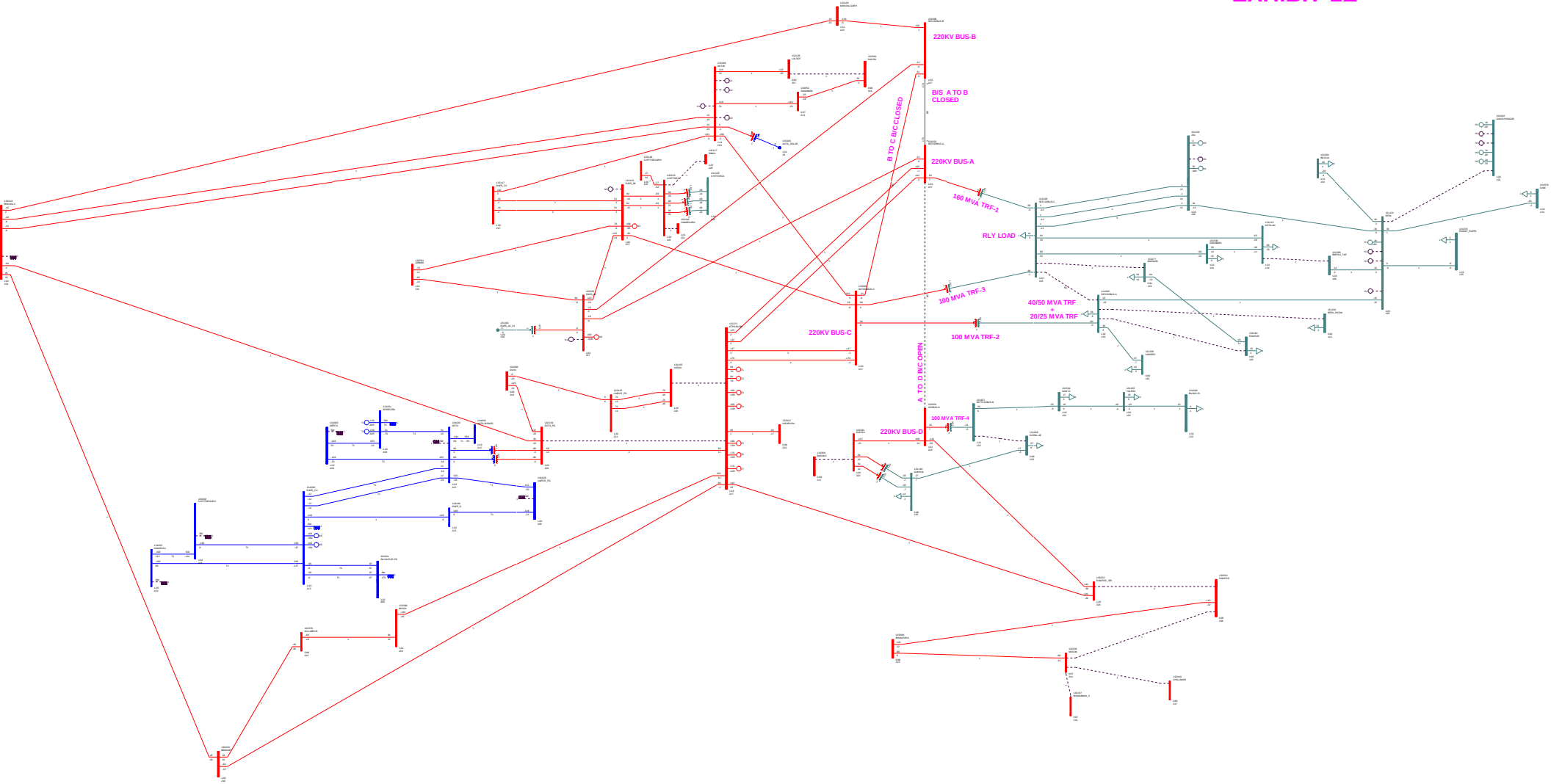
CASE-1D (CONTINGENCY-4 IN CASE-1) : OUTAGE OF 220 KV INTERCONNECTOR-2 BETWEEN KTPS & SAKATPURA (BUS-C)

EXHIBIT-1D



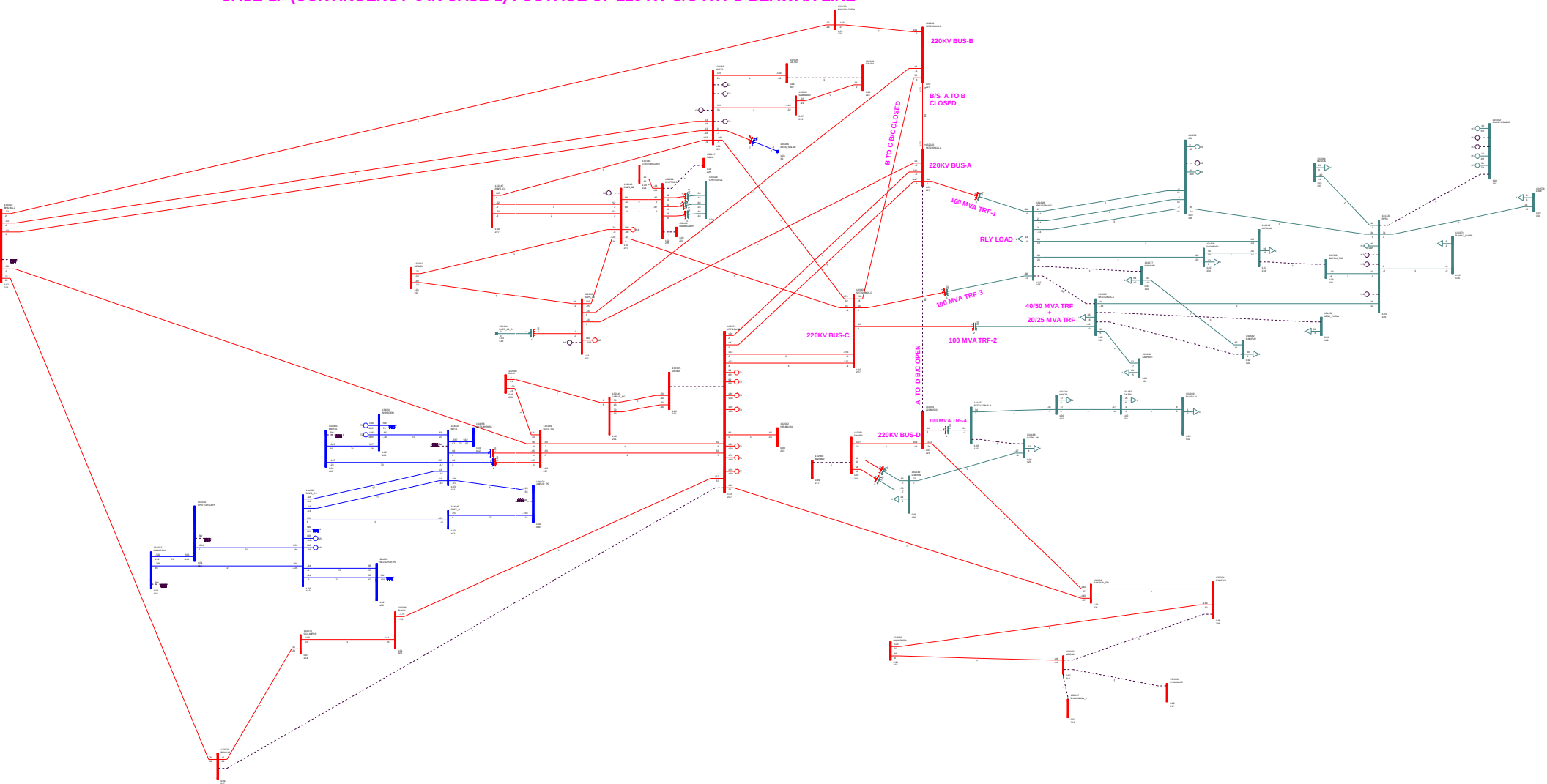
CASE-1E (CONTINGENCY-5 IN CASE-1) : OUTAGE OF ONE CIRCUIT OF 220 KV D/C KTPS-KOTA(PG) LINE

EXHIBIT-1E



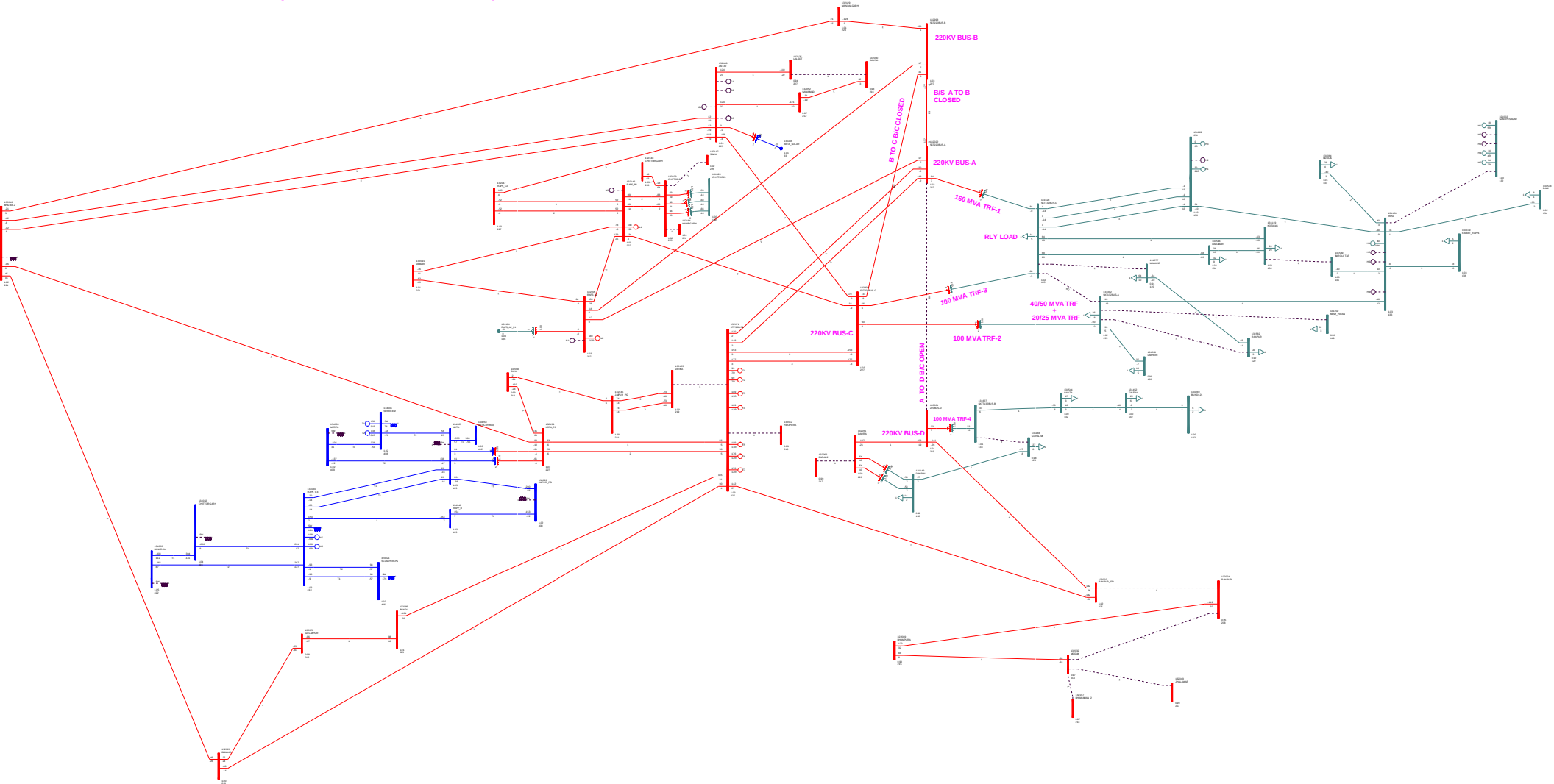
CASE-1F (CONTINGENCY-6 IN CASE-1) : OUTAGE OF 220 KV S/C KTPS-BEAWAR LINE

EXHIBIT-1F



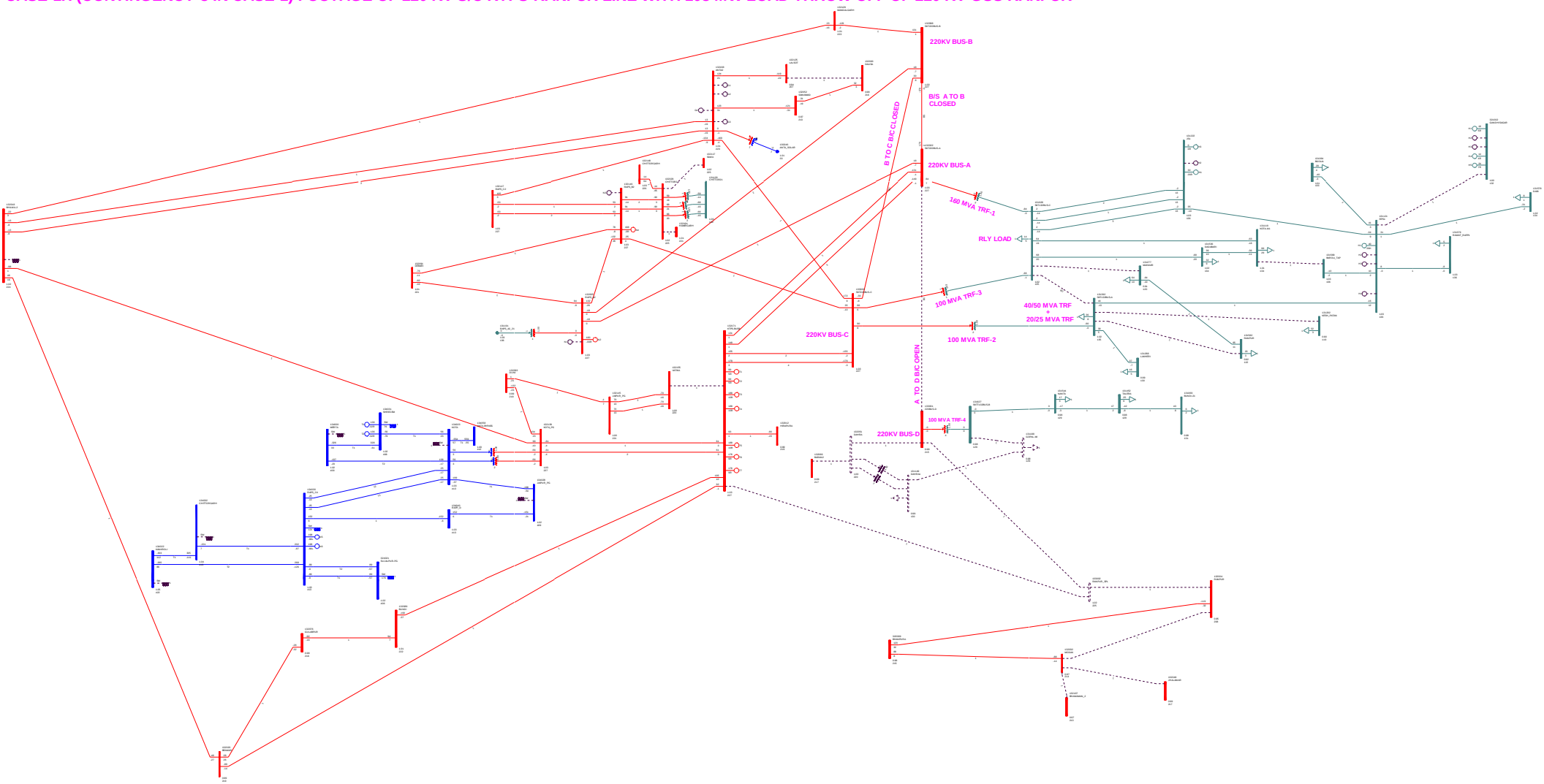
CASE-1G (CONTINGENCY-7 IN CASE-1) : OUTAGE OF 220 KV S/C KTPS-HEERAPURA LINE

EXHIBIT-1G



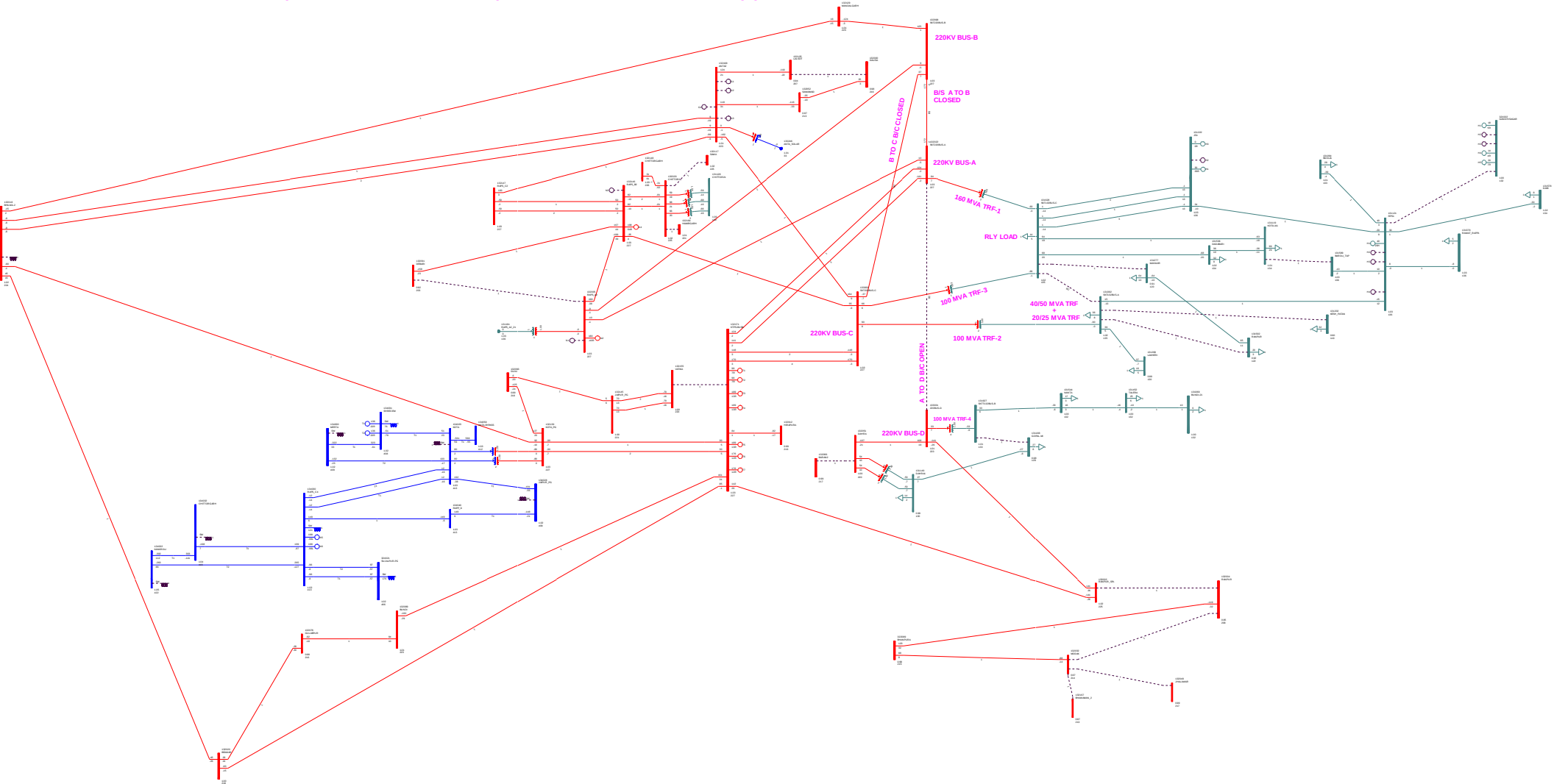
CASE-1H (CONTINGENCY-8 IN CASE-1) : OUTAGE OF 220 KV S/C KTPS-RANPUR LINE WITH 108 MW LOAD THROW OFF OF 220 KV GSS RANPUR

EXHIBIT-1H



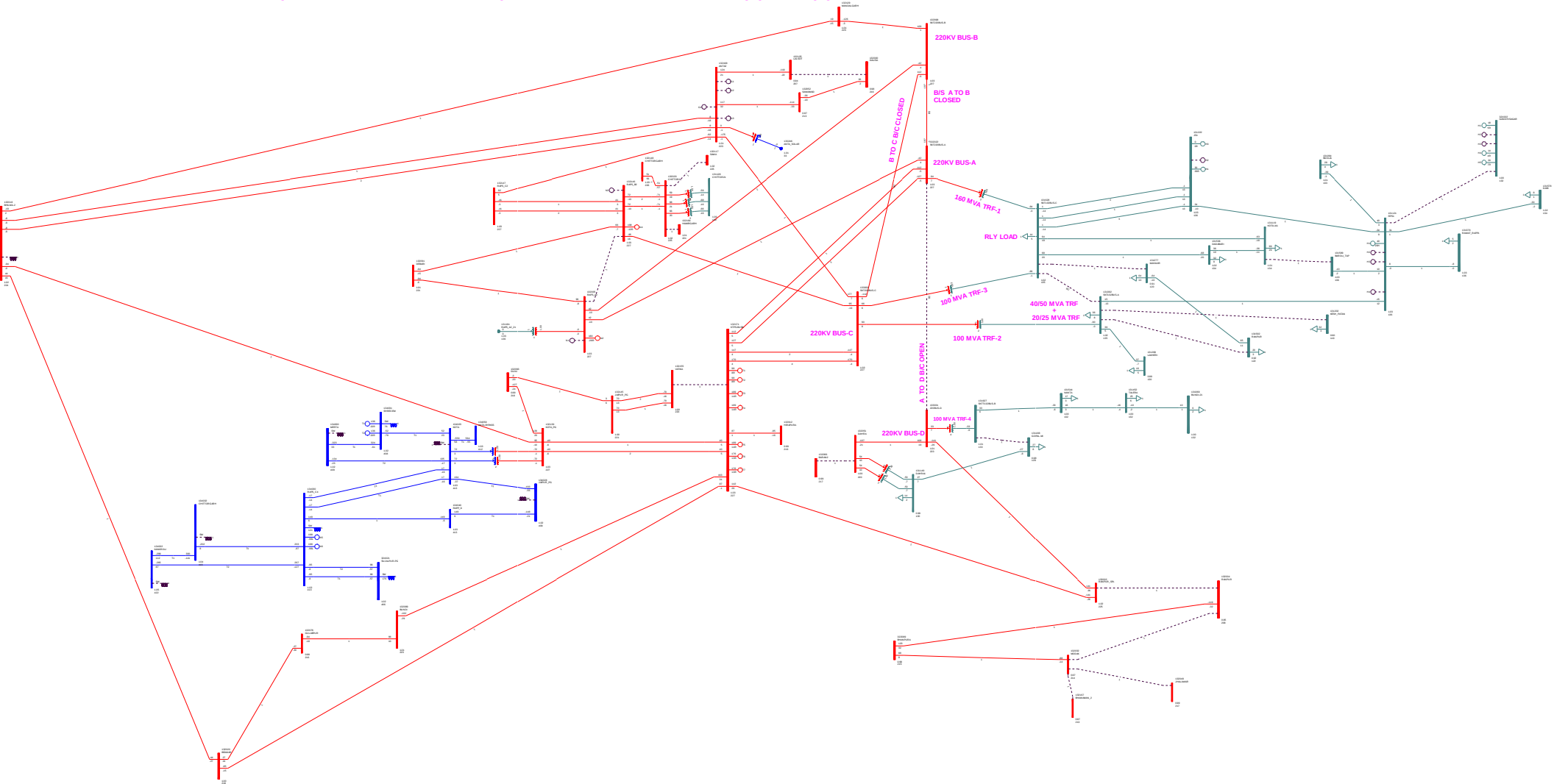
CASE-1I (CONTINGENCY-9 IN CASE-1) : OUTAGE OF 220 KV S/C RAPP(A)-DEBARI LINE

EXHIBIT-1I



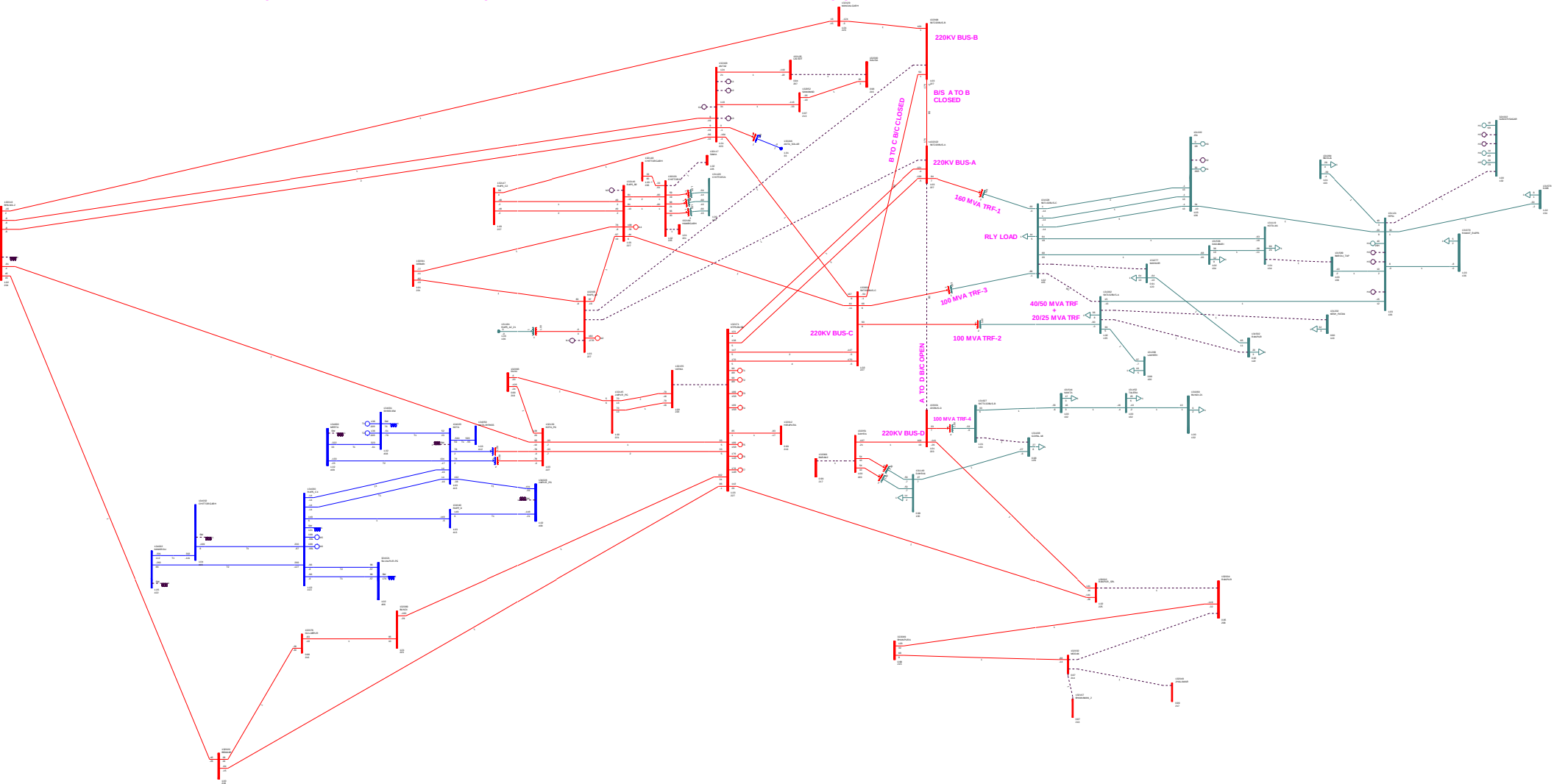
CASE-1J (CONTINGENCY-10 IN CASE-1) : OUTAGE OF 220 KV S/C RAPP(A)-RAPP(B) LINE

EXHIBIT-1J



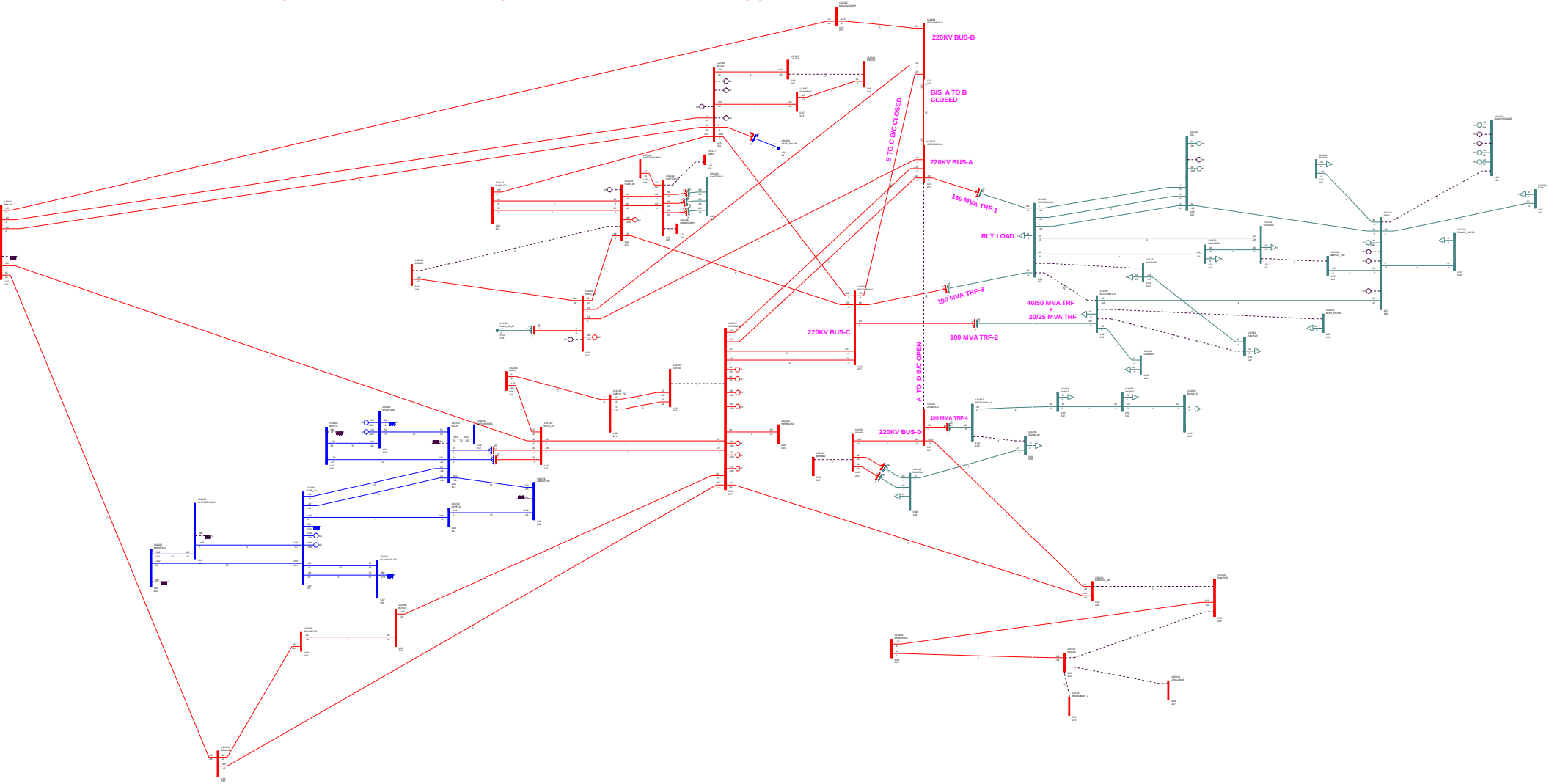
CASE-1K (CONTINGENCY-11 IN CASE-1) : OUTAGE OF 220 KV D/C SAKATPURA-RAPP(A) LINE

EXHIBIT-1K



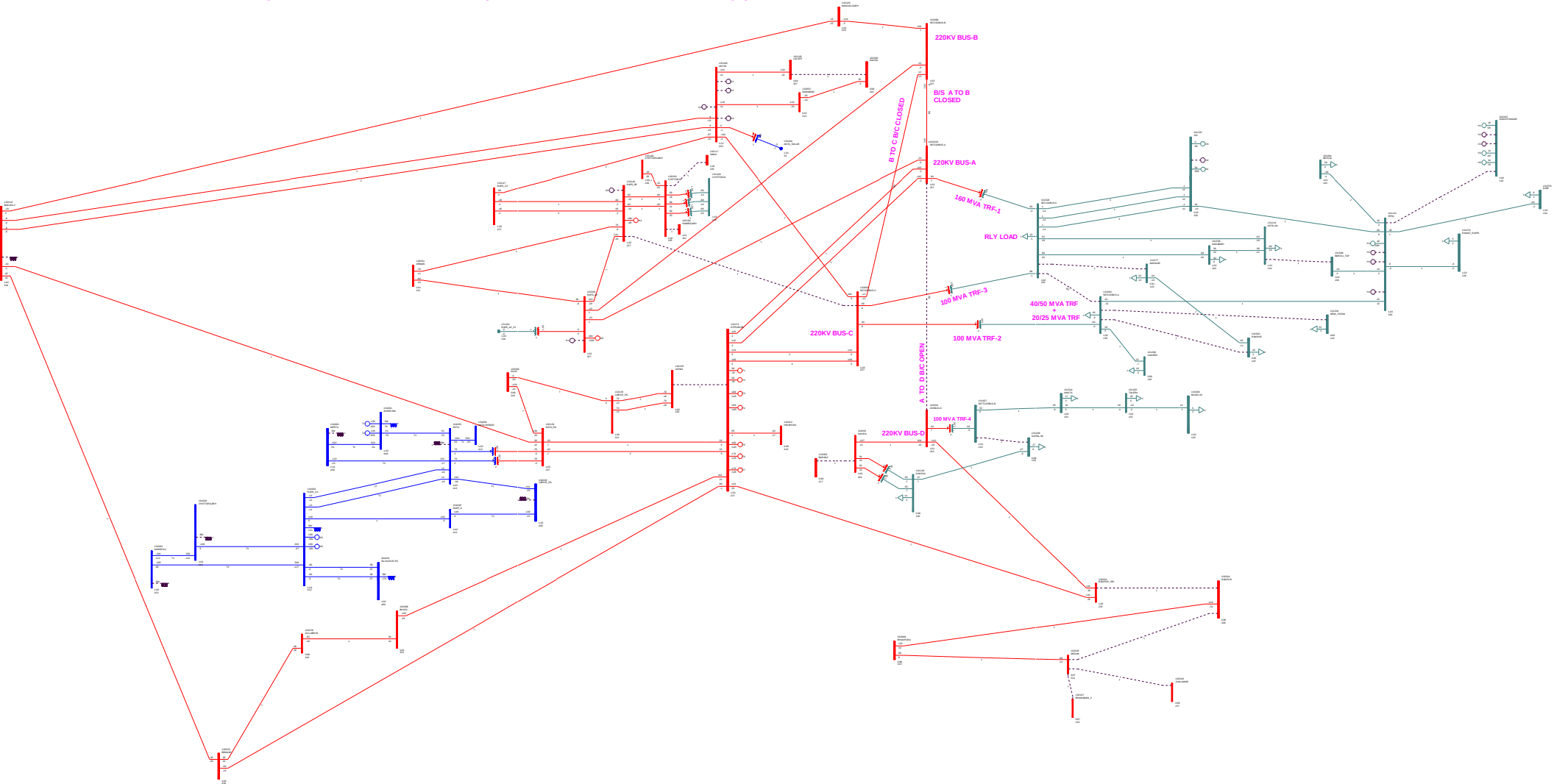
CASE-1L (CONTINGENCY-12 IN CASE-1) : OUTAGE OF 220 KV S/C RAPP(B)-DEBARI LINE

EXHIBIT-1L



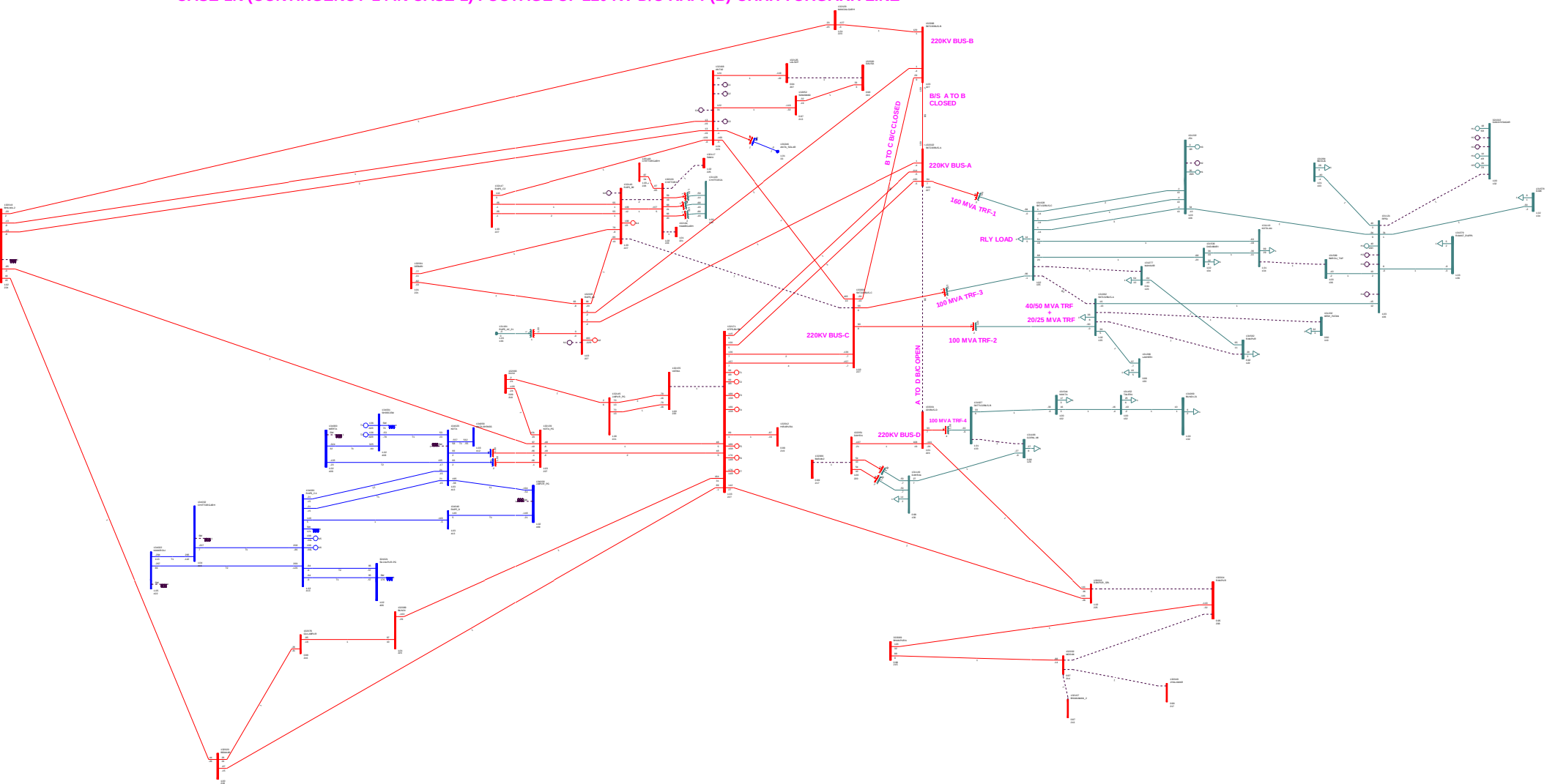
CASE-1M (CONTINGENCY-13 IN CASE-1) : OUTAGE OF 220 KV S/C RAPP(B)-SAKATPURA LINE

EXHIBIT-1M



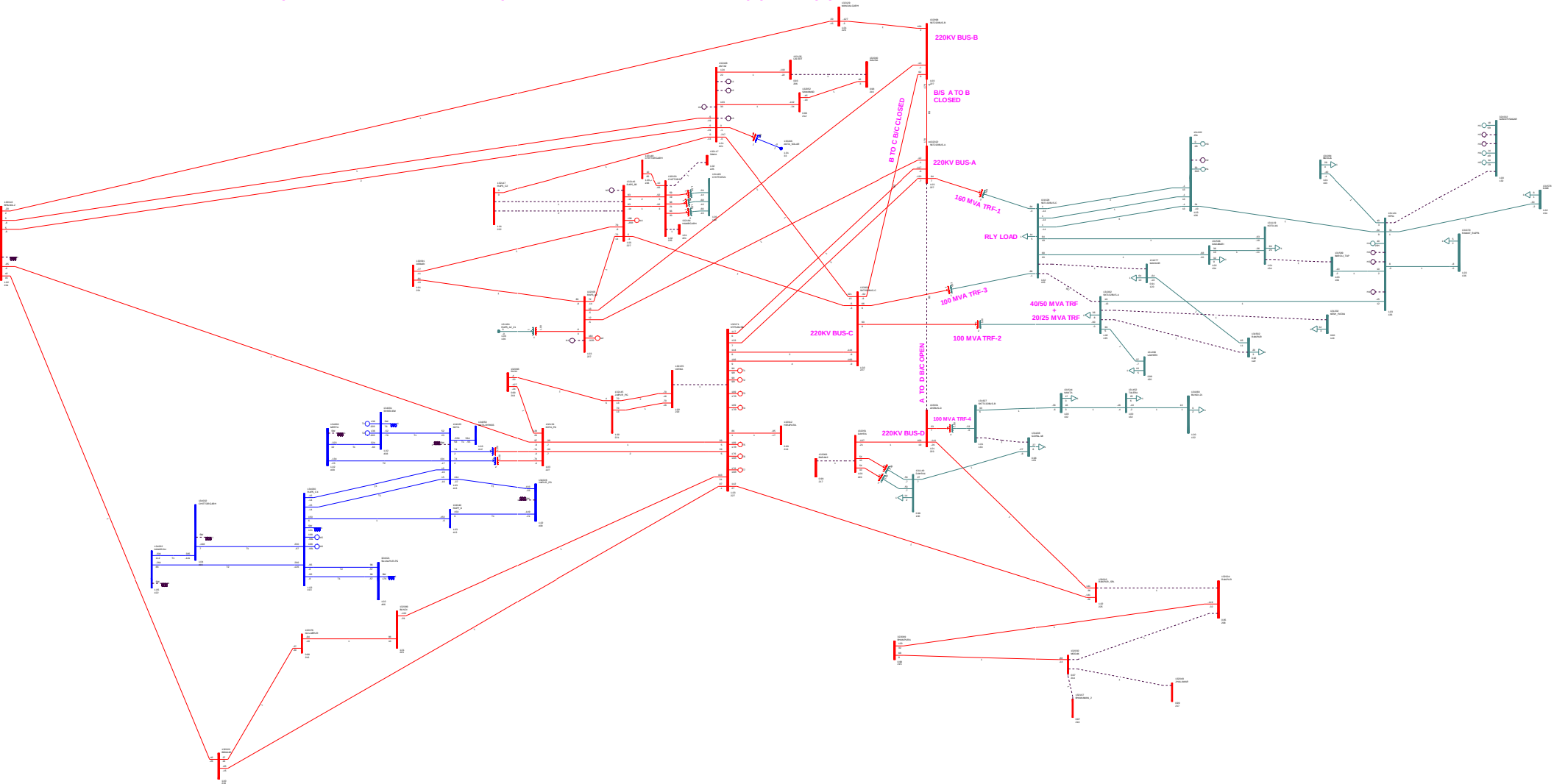
CASE-1N (CONTINGENCY-14 IN CASE-1) : OUTAGE OF 220 KV D/C RAPP(B)-CHHITTORGARH LINE

EXHIBIT-1N

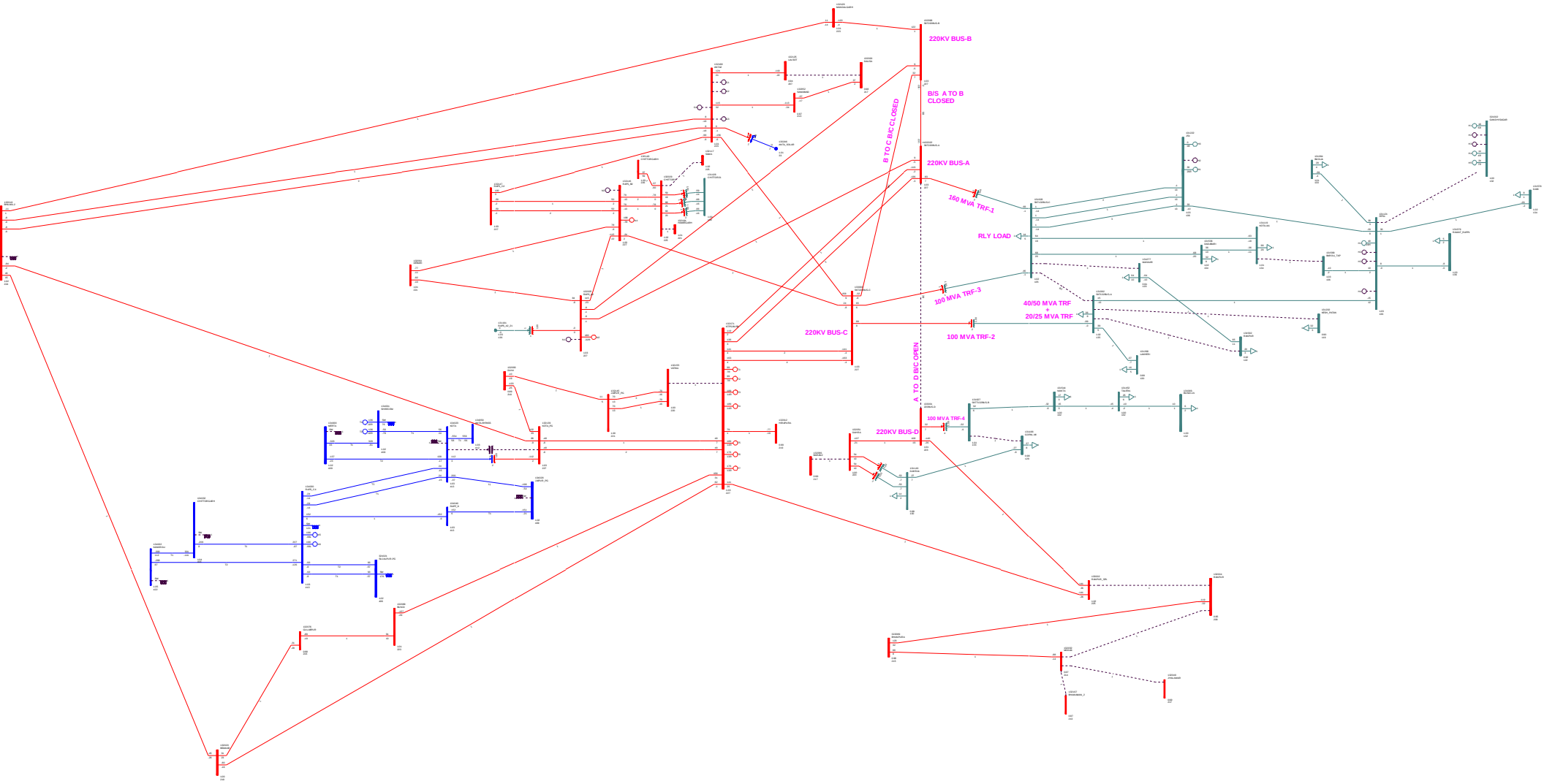


CASE-1O (CONTINGENCY-15 IN CASE-1) : OUTAGE OF 220 KV D/C RAPP(B)-RAPP(C) LINE

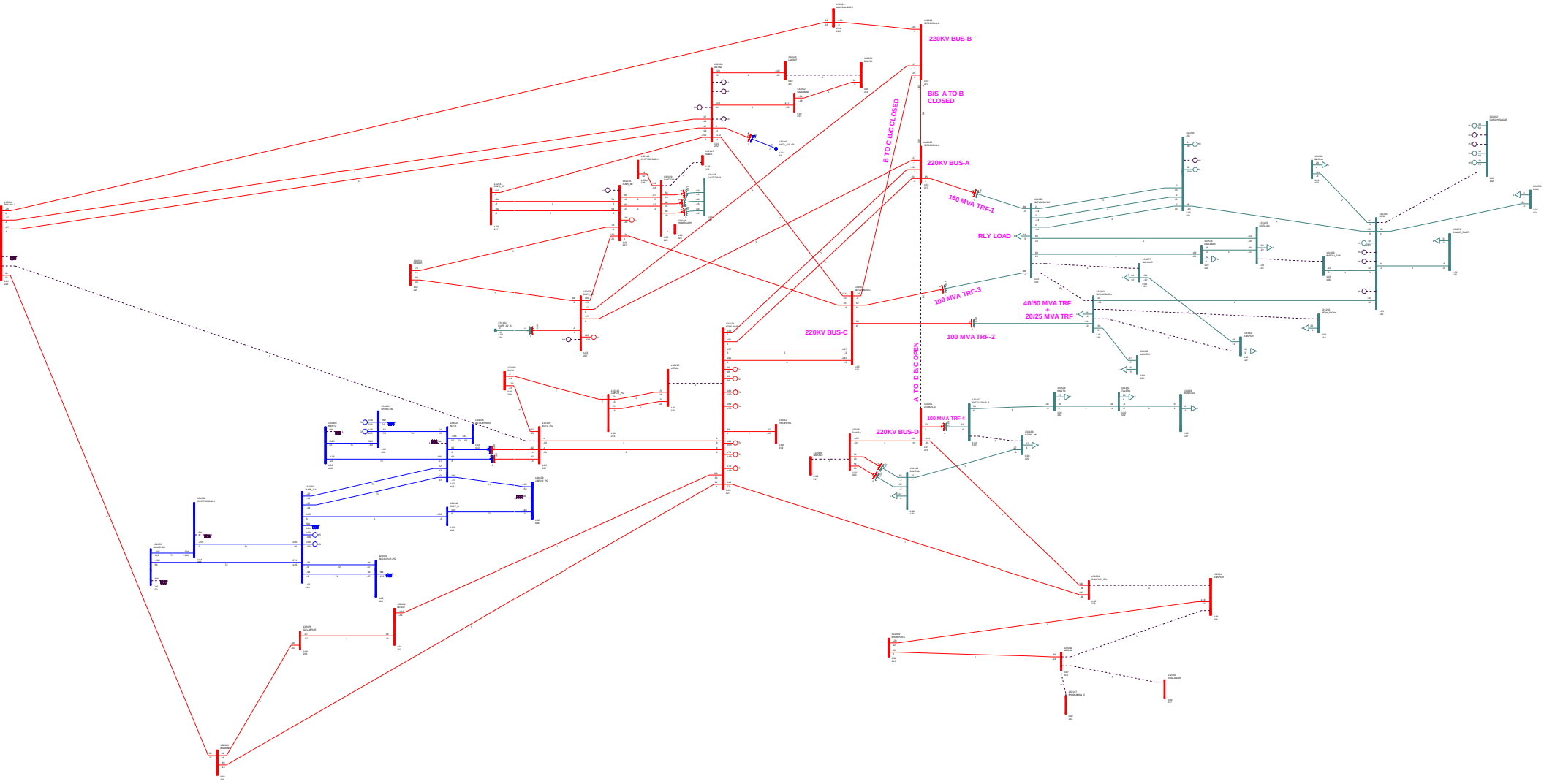
EXHIBIT-1O



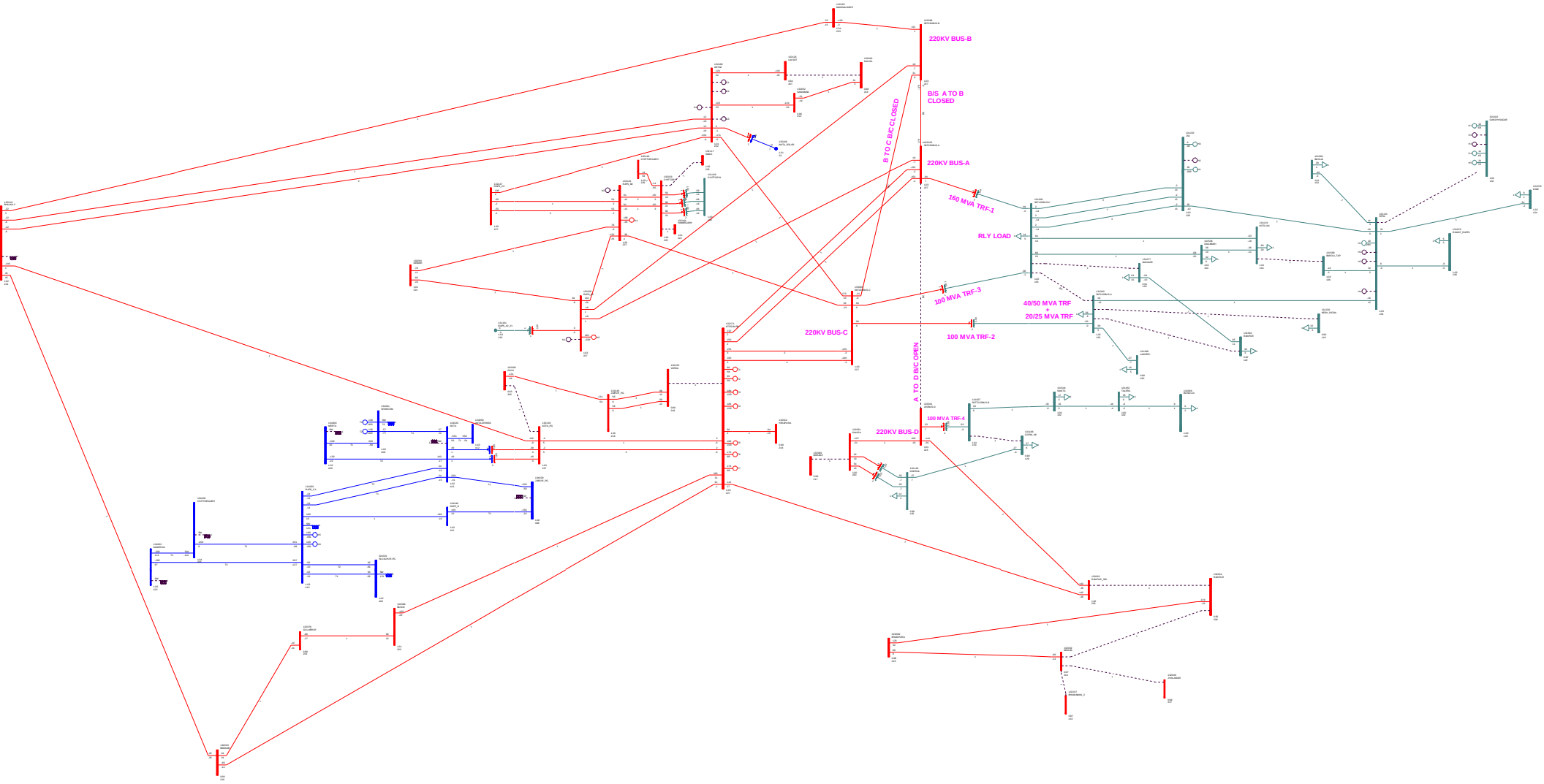
Contingency-16 (Case-1P, Exhibit-1P): Outage of one 315 MVA, 400/220 kV transformer at Kota(PG)



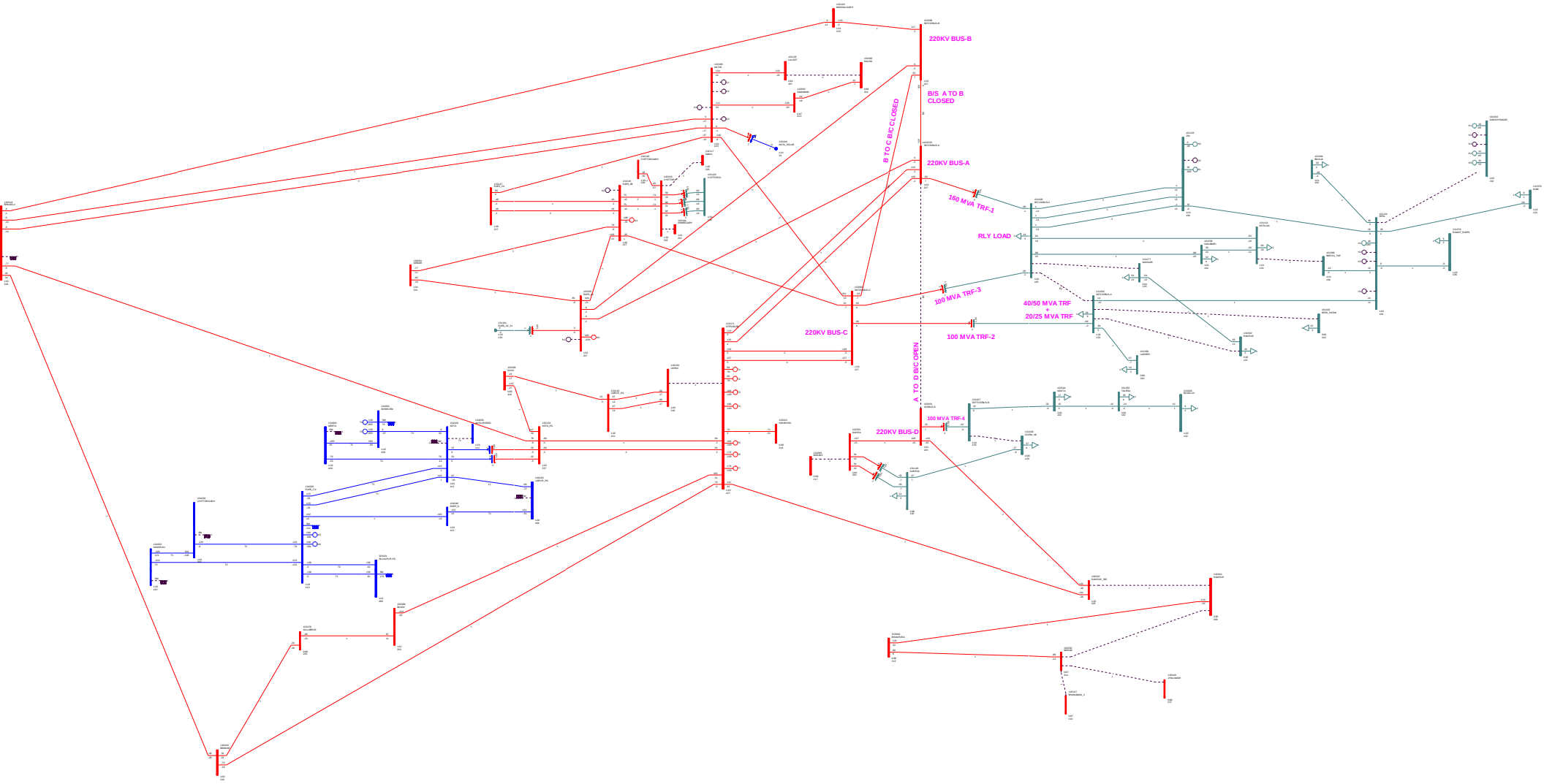
Contingency-17 (Case-1Q, Exhibit-1Q) : Outage of 220 kV S/C Kota(PG)-Bhilwara line



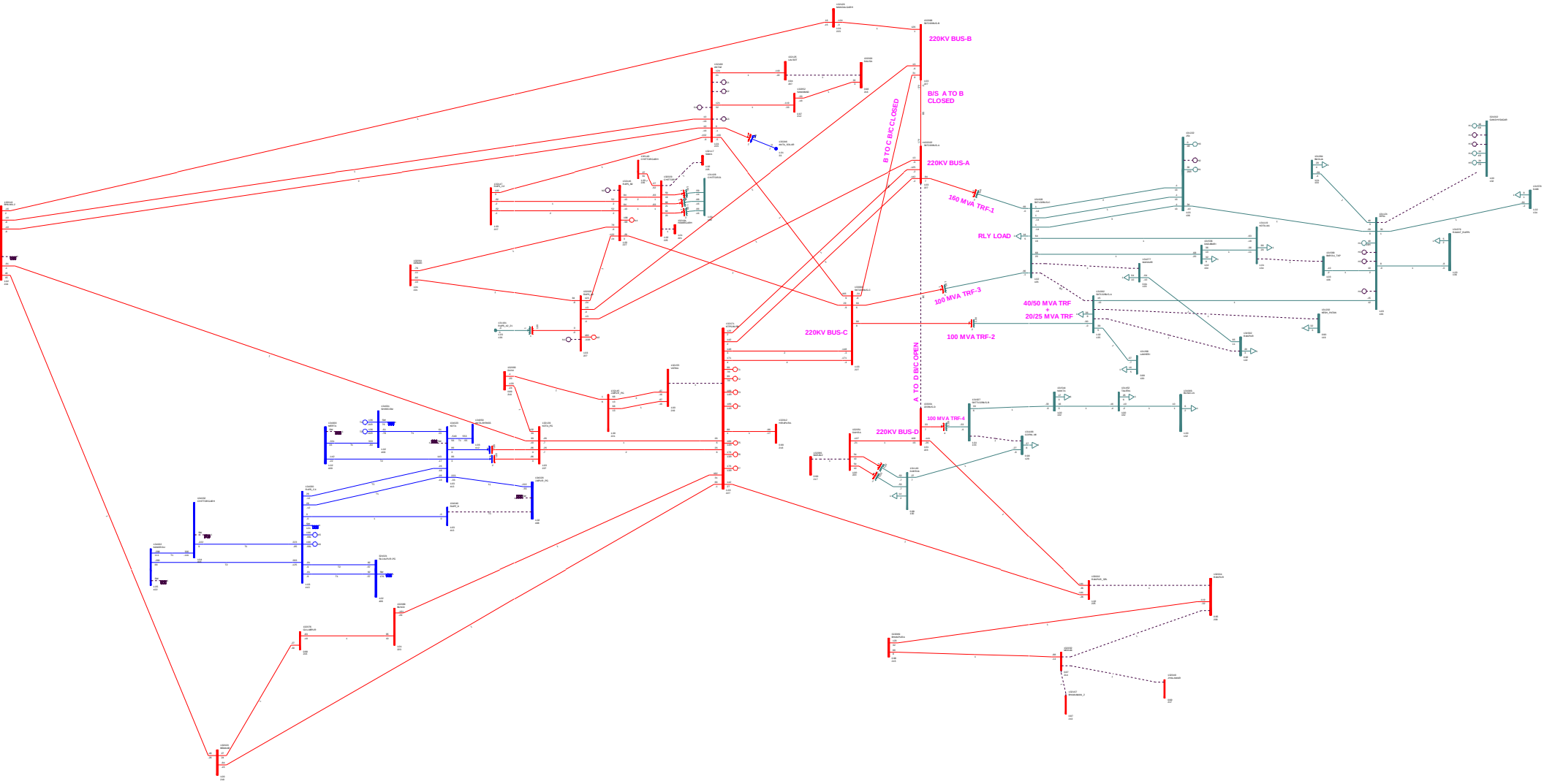
Contingency-18 (Case-1R, Exhibit-1R): Outage of 220 kV S/C Kota(PG)-Duni line



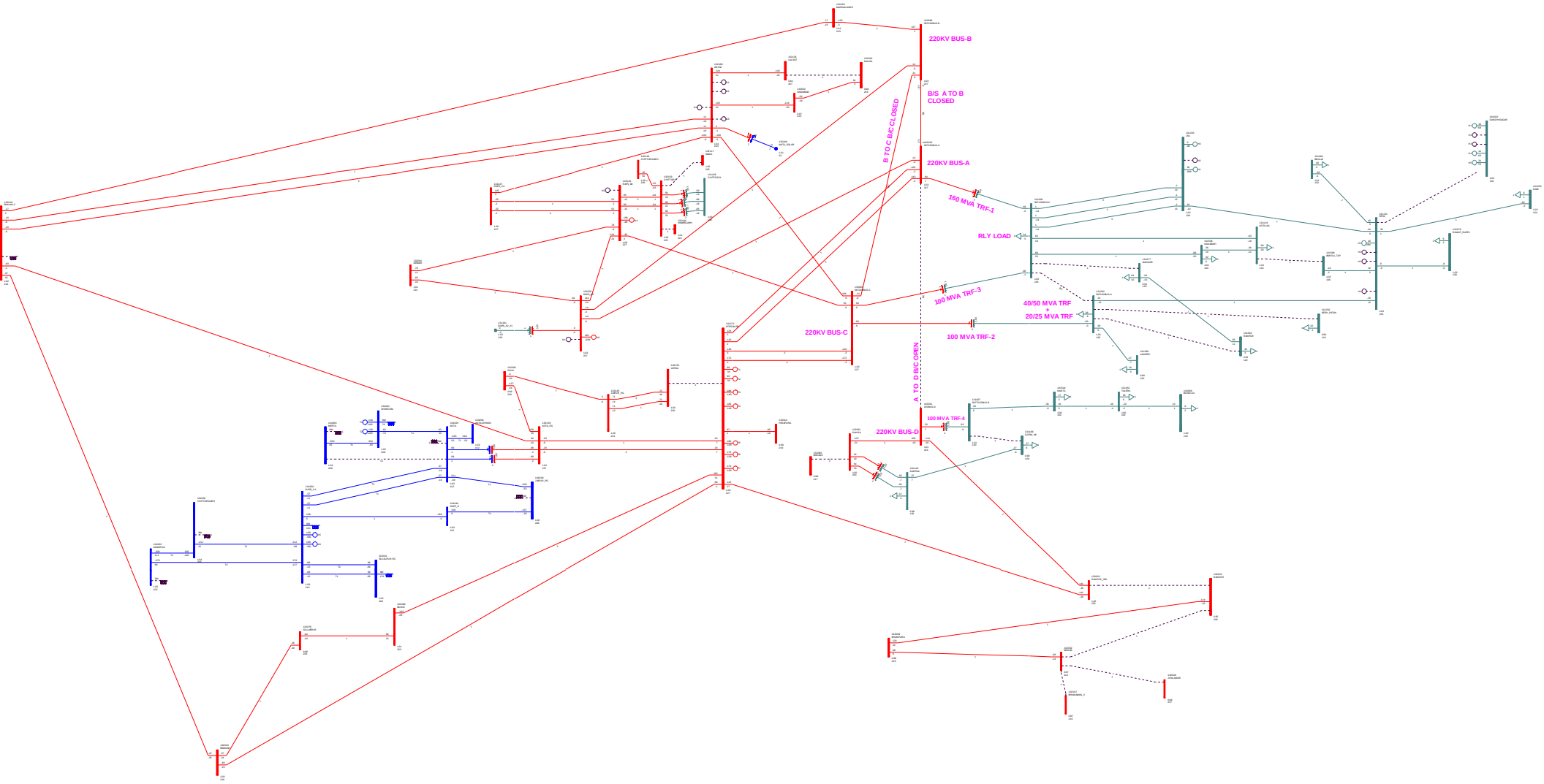
Contingency-19 (Case-1S, Exhibit-1S): Outage of 400 kV S/C Kota(PG)-Anta –Chhabra TPS line



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).

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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

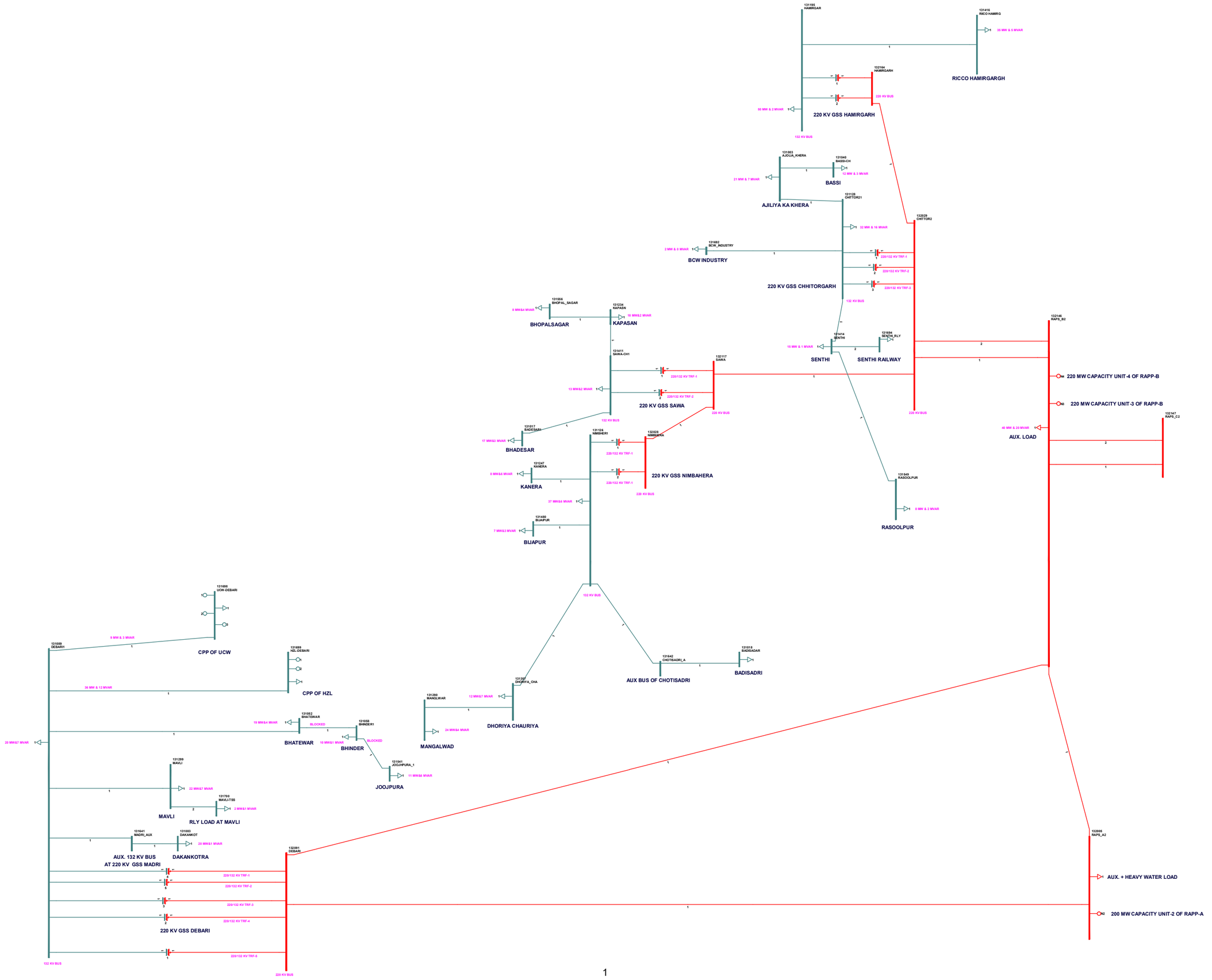
Transmission Lines and Status of Under Frequency Relays for RAPP-A&B Island

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

LEGEND

S.NO.	PARTICULARS	BLOCKED	OPERATIVE	OPERATIVE/ BLOCKED
1	132 KV LINE			
2	220 KV LINE			
4	132 KV G.S.S.			
5	220 KV G.S.S.			

BHILWARA
RICCO BHILWARA
M/s RSWML
M/s NITIN SPINNER
HAMIRGARH
RICCO GROWTH CENTER HAMIRGARH
M/s RSWML
SONIYANA
ASAHI GLASS
RASHMI
BASSI
AJOLIYA KA KHERA
HZL
CCW
BCW
CHITTORGARH
TO ANTA
TO SAKATPURA
RAPP-C
RAPP-B
2x220MW
RAPP-A
200MW
NATHDWARA
MAVLI TSS
CHHITORGARH
MAVLI
BHOPALSAGAR
KAPASAN
ACW
NUVACO
SAWA
GHATIWALI
SENTHI
GOSUNDA TSS
TO AMBERI
WCL
JKCW
RASOOLPUR
TO CHHITORGARH
BIJAIPUR
KANERA
JKCW
NIMBAHERA
DEBARI
M/S HZL
M/S UCW
BHATEWAR
BHINDER
BHADESAR
TO ASPUR
TO MADRI
JOOJHPURA
MANGALWAD
DHORIA CHAURAHA
TO PRATAPGARH
D.KOTDA (Via Aux. bus Madri)
BARISADARI (Via Aux bus. Chhotisadri)