सत्यमेव जयते

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

सं. उक्षेविस/ वाणिज्यिक/ 209/ आर पी सी (56वीं)/2022/ 6516-6563 दिनाँक: 27.07.2022

सेवा में / To,

उ.क्षे.वि.स. के सभी सदस्य (संलग्न सूचीनुसार)
Members of NRPC (As per List)

विषय: उत्तर क्षेत्रीय विद्युत समिति की 56वीं बैठक की कार्यसूची ।
Subject: Agenda for 56th meeting of Northern Regional Power Committee-reg

महोदय / Sir,

उत्तर क्षेत्रीय विद्युत समिति की 56वीं बैठक दिनांक **29 जुलाई, 2022** को **1100** बजे विडियो कोंफ्रेंसिंग के माध्यम से आयोजित की जाएगी । बैठक की कार्यसूची संलग्न है। बैठक का लिंक एंव पासवर्ड नियत समय पर ईमेल द्वारा उपलब्ध करा दिया जायेगा ।

The 56th meeting of Northern Regional Power Committee (NRPC) will be held at **1100 Hrs** on **29th July, 2022** via video conferencing. Agenda for the same is attached. The link and password for joining the meeting shall be sent in due course of time to the respective email-IDs.

भवदीय
Yours faithfully,

Naresh

(नरेश भंडारी) 27/7/22
(Naresh Bhandari)
सदस्य सचिव
Member Secretary

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44. COO, Adani Power Rajasthan Ltd., Ahmedabad-380006 (Fax No- 07925557176)
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47. Director (Commercial & Operations), PTC India Ltd., New Delhi (Fax- 01141659144,41659145)
48. CEO, Nabha Power Limited, (Fax: 01762277251 / 01724646802)
49. Representative of Prayagraj Power Generation Co. Ltd.
50. Representative of Greenko Budhil Hydro Power Private Limited (Member IPP<1000 MW)
51. Representative of TPDDL (Delhi Private Discom)

Special Invitee:

i. Member Secretary, WRPC, Mumbai-400 093.
ii. Member Secretary, SRPC, Bangalore-560 009
iii. Member Secretary, ERPC, Kolkata-700 033.
iv. Member Secretary, NERPC, Shillong-793 003.

Contents

उत्तरी क्षेत्रीय विद्युत समिति की 56वीं बैठक
56th MEETING OF NORTHERN REGIONAL POWER COMMITTEE

Time & Date of NRPC meeting: 11:00 HRS; 29th July, 2022

Venue: Video Conferencing

AGENDA

A.1 Approval of MoM of 55th NRPC meeting

A.1.1 Minutes of 55th NRPC meeting has been issued on 25.07.2022. No comment has been received till the date.

Members may kindly approve.

A.2 Adequacy of Transmission Lines emanating from Bhakra Power House Complex post uprating of Bhakra Left Bank Power House - approval for replacement of ACSR conductor of five no. Bhakra-Ganguwal circuits with HTLS conductor (agenda by BBMB)

A.2.1 BBMB has proposed to replace the existing ACSR conductors with relevant HTLS conductors at all the five circuits emanating from Bhakra Complex to Ganguwal i.e., Bhakra-Ganguwal circuit No. 1 to 5, so as to get the constraints removed along with making it N-1 complaint.

A.2.2 The agenda was deliberated in 194th OCC meeting wherein forum desired that BBMB shall share with NRLDC the results of study they have got conducted from Himachal Pradesh for further examination.

A.2.3 BBMB vide letter dated 11.07.2022 (copy enclosed as **Annexure**-**A.I**) has communicated that the requisite data was submitted to NRLDC and NRLDC validated the load flow studies as carried out by HPPTCL.

A.2.4 The agenda was again discussed in 197th OCC held on 22.07.20222 and forum recommended the proposal for putting up before NRPC forum.

***Members may kindly approve*.**

A.3 Revised islanding schemes for RAPS A & B (agenda by RVPN)

A.3.1 RVPN vide letter dtd. 19.07.2022 has proposed that the existing islanding scheme for RAPS A & B was planned in 2013 and due to change in configuration of transmission lines and loads of the GSS, there is need to review and revise the islanding schemes at RAPS A & B. The proposed islanding scheme is attached as **Annexure-A.II**.

A.2.5 The scheme has been discussed in 197th OCC held on 22.07.2022 and forum recommended the proposal for putting up before NRPC forum.

***Members may kindly approve*.**

A.4 New islanding schemes in Rajasthan (agenda by RVPN)

A.4.1 RVPN vide letter dtd. 22.10.2021 & 11.05.2022 (attached as **Annexure**-**A.III**) has submitted proposal for islanding scheme as below:

i. Suratgarh STPS Islanding Scheme

ii. Jodhpur-Barmer-Rajwest LTPS Islanding Scheme

A.4.2 The scheme has been discussed and approved in 195th OCC meeting held on 24.05.2022.

A.4.3 The scheme is submitted for approval of NRPC forum.

A.5 Default in release of outstanding dues by THDCIL's Beneficiary (agenda by THDCIL)

A.5.1 As on 19.07.2022, an overdue amount including LPS of approx. Rs.364.58 Cr. is due for payment. THDC India Ltd has been vigorously pursuing with JKPCL (J&K DISCOM) for expeditious payment. Despite vigorous follow up, JKPCL (J&K DISCOM) has still to liquidate its old outstanding due. The details of the overdue amount on JKPCL (J&K DISCOM), as on 19.07.2022, is as under:

DISCOMs	Principal Outstanding (Rs. in Cr.)	Late Payment Surcharge (Rs. in Cr.)	Overdue amount including LPS (Rs. in Cr.)
1	2	3	4=2+3
PDD & JKPCL, J&K	353.94	10.64	364.58

A.5.2 Long pending dues are to be liquidated by the JKPCL (J&K DISCOM). The amount is quite substantial and crucial. Due to scarce availability of funds with us, we are compelled to avail borrowings to meet our day-to-day requirements. Thus, immediate payment is very much crucial for sustenance of THDCIL.

A.5.3 JKPCL (J&K DISCOM) is requested to liquidate its above overdue amount immediately.

***Members may kindly deliberate*.**

A.6 Request for opening of Letter of Credit (agenda by THDCIL)

A.6.1 Despite repeated request and reminders, J&K has not opened the Letter of Credit (LC) amounting to Rs14.45 Cr for Financial Year 2022-23 till date.

A.6.2 As per recently issued MoP, Govt. of India Electricity (Late payment surcharge) rules, 2022 on 3rd Jun'22, as per said regulation distribution licensee (DISCOMs) shall maintain unconditional, irrevocable and adequate payment security mechanism. Therefore, it is requested to J&K for year 2022-23 to open the LC of requisite amount or adequate advance payment is to be made available immediately.

Members may kindly deliberate.

A.7 Requesting generating companies to furnish Daily/Monthly Generation and Outages Data online at National Power Portal (agenda by OPM Division, CEA)

A.7.1 OPM Division vide letter dtd. 06.07.2022 has intimated that many generators have not switched over to online mode of submission of generation data leading to delay in preparation/issuance of related reports. List of such plants is enclosed as **Annexure-A.IV**.

***Members may kindly take a note*.**

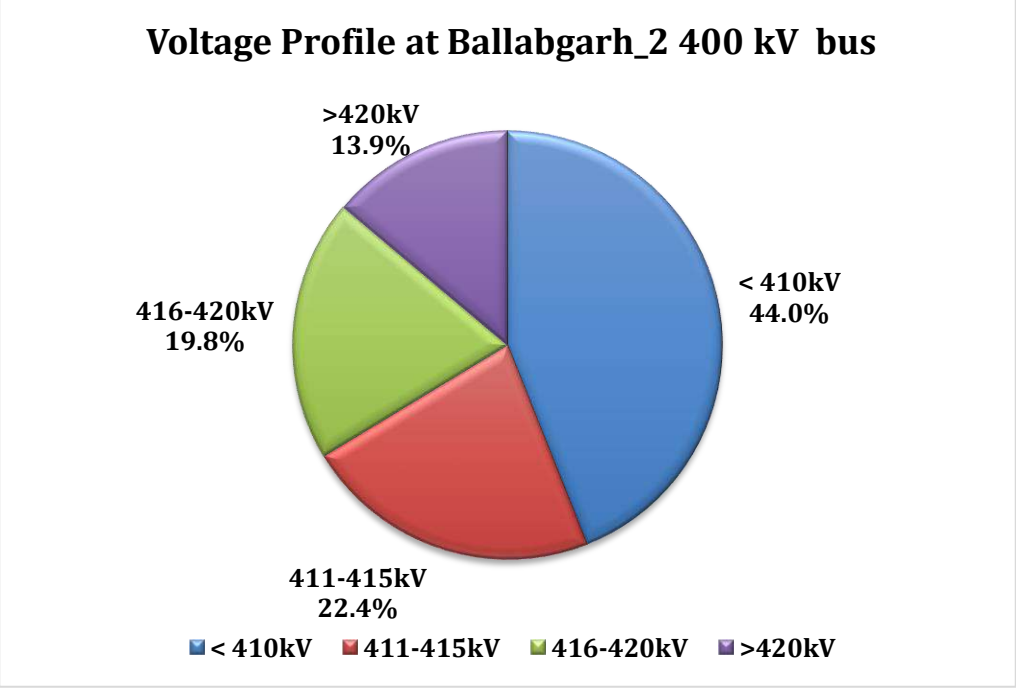
A.8 Replacement of 420kV 80 MVAR 3-Ph Bus Reactor at Ballabgarh (agenda by CTU)

A.8.1 It was deliberated in the 53rd NRPC meeting held on 29.04.2022, as POWERGRID agenda.

A.8.2 POWERGRID had approached CPRI to carry out Residual Life Assessment Studies for the 80 MVAR bus reactor at 400 kV Ballabgarh S/s. The bus reactor has completed 32 years of service and thus crossed its useful life of 25 years from commissioning. CPRI has recommended a replacement for the same.

A.8.3 NRPC decided that the matter may first be discussed in the Consultative Meeting of NR.

A.8.4 The matter has been discussed in 8th CMETS-NR held on 30.06.2022. It was deliberated that from study results it is observed that taking the 80 MVAr bus reactor into service results in a voltage drop of around 1 kV at Ballabgarh Bus. If the 80 MVAr bus reactor is replaced with 125 MVAr the resultant voltage drop is around 2 kV. Voltage profile of 400 kV Ballabgarh S/s for the last one year (June'21-June'22) is as under:



A.8.5 From above, it may be seen that 400kV Ballabgarh S/s voltage remained >415 kV for about 34% time. Considering above and the high voltage prevailing in NR grid, it is

recommended to replace 420 kV 80MVAr bus reactor at Ballabgarh with 420 kV 125 MVAr bus reactor.

A.8.6 CEA and POSOCO also recommended for replacement of 80MVAR (420kV) Bus Reactor at Ballabgarh S/s with 125 MVAR (420kV) Bus Reactor in view of prevailing high voltage issues in NR. POWERGRID also confirmed feasibility of replacement. In view of above, proposal for 125 MVAR (420kV) Bus Reactor was agreed.

A.8.7 The same is submitted for approval of NRPC forum.

***Members may kindly deliberate*.**

A.9 Implementation of "N -1" contingency at RE pooling substations in NR (agenda by CTU)

A.9.1 In 8th CMETS-NR held on 30.06.2022, it was deliberated that CEA transmission planning criteria, section 16.2 mentions that "The *'N-1' criteria may not be applied to the immediate connectivity of wind/solar farms with the ISTS/Intra-STS grid i.e., the line connecting the farm to the grid and the step-up transformers at the grid station."* The above criterion is also followed in planning of transmission system for integration of renewable energy zones in Rajasthan.

A.9.2 It was stated that POWERGRID vide letters dated 17th May 2022 & 19th May 2022 informed CTU that as per the current practice, N-1 criteria is not being implemented at planning stage of network with respect to step up transformers at RE pooling stations in Rajasthan (Bhadla-2, Fatehgarh-2 & Bikaner). Due to this, outage of any transformer in above stations will result into overloading of other transformers leading to cascaded tripping on overload/higher temperature and may adversely impact both RE generation as well as health of the transformers. In view of the above, POWERGRID requested CTU to implement additional 400/220kV ICTs at RE pooling stations to meet the N-1 criteria for smooth evacuation of power. POWERGRID also recommended that, N-1 criteria may be taken into consideration during planning stage for upcoming RE pooling stations.

A.9.3 Subsequently, in 54th NRPC meeting held on 31.05.2022, the events of overloading of ICTs and cascaded tripping of generations at Bhadla in early stage of substation was discussed. POSOCO informed that in Fatehgarh-II PS also face similar loading levels are observed on 5 nos. 500 MVA ICTs. POSOCO also stated that the overloading of transformers, variations in their loading throughout the day and heating/cooling cycle do affect the life of the transformer in the long run.

A.9.4 POSOCO suggested that high RE capacity substations must have N-1 compliance at 400/220 kV level i.e., Fatehgarh-II (both sections)/Fatehgarh-III PS, Bhadla-II PS etc. for which revised transmission planning criteria must have suitable provisions. In addition, bus sectionalization at pooling station should have arrangements such that sharing on ICTs loading on each bus remain commensurate with underlying RE connected generation and ICTs on each bus should be N-1 compliant.

A.9.5 In 54th NRPC meeting held on 31.05.2022, it was agreed that CTU may explore possibility of ensuring N-1 compliance at 400/220kV RE pooling stations with higher RE capacity on case-to-case basis.

A.9.6 Accordingly, requirement of 400/220kV ICTs at each section of Bhadla-2, Fatehgarh-2 & Bikaner PS to meet the N-1 compliance were deliberated as under:

Sl. No.	Substation (Section)	Transformation Capacity (MVA)	Stage-II Connectivity at 220 kV level (MW)	RE Capacity Commissioned (MW)	LTA Granted (MW)	Remarks
1	Fatehgarh-2 (Section 1) 6th ICT of 500MVA	5x500	2490	1990	2490	It was stated that balance 500MW capacity is expected to be commissioned in next 1-2 months. Accordingly, 400/220kV, 1x500MVA (6th) ICT in Section-1 was agreed to be taken up on urgent basis to meet 'N-1' criteria
2	Fatehgarh-2 (Section 1A) 6th ICT of 500MVA	4x500	2470	NIL	1820	It was deliberated that Augmentation with 400/220kV, 1x500MVA Transformer (10th) at Fatehgarh-2 PS (5th ICT at Section-1A) was allocated to POWERGRID vide MoP OM dated 01.12.21 with implementation timeframe of 15 months from MOP OM or condition of evacuation requirement 4490 MW at 220 level of Fatehgarh-2 whichever is later At Present LTA of 4610MW is granted/agreed for grant at Fatehgarh-2 PS (1820MW at Section 1A). With this the total evacuation requirement at 220 level of Fatehgarh-2 will be 4610 MW(>4490 MW). Accordingly, the 5th ICT at Fatehgarh-2 Section-1A is being taken

Sl. No.	Substation (Section)	Transformation Capacity (MVA)	Stage-II Connectivity at 220 kV level (MW)	RE Capacity Commissioned (MW)	LTA Granted (MW)	Remarks
						up along with LTA of Eden Bercy. Further,1x500MVA 6th ICT at Section-1A at Fatehgarh-2 PS is to be taken up to meet "N-1" criteria in corresponding RE generation schedule with LTA beyond 2000 MW (at 220kV level) at Section-1A as well as well as for evacuation requirement beyond 2000MW in section-1A (with M/s Eden Renewable Bercy evacuation requirement is 2120MW at 220kV level) Schedule of above ICT is to be matched with LTA grant schedule of M/s Eden Bercy (Mar'24)
3	Bikaner PS 1x500MVA (3rd) & 1x500MVA (4th)	2x500	1110	204	935	It was stated that Cumulative RE generation of more than 800 MW will be commissioned in next 3-4 months in Bikaner PS 220 KV level. Therefore, 400/220kV, 1x500MVA (3rd) ICT may to be taken up on urgent basis to meet 'N-1' criteria. The ICT will also facilitate evacuation requirement beyond 1000MW at 220kV level of Bikaner PS. Further,400/220kV, 1x500MVA (4th) ICT was agreed for LTA beyond 1000 MW at Bikaner (220kV level)

Sl. No.	Substation (Section)	Transformation Capacity (MVA)	Stage-II Connectivity at 220 kV level (MW)	RE Capacity Commissioned (MW)	LTA Granted (MW)	Remarks
4	Bhadla-2 (Section 1) 6th ICT of 500MVA	5x500	2375	600	2075	For LTA quantum of 2075 MW, 5x500 MVA ICT is under establishment at Bhadla-2 Section 1. POSOCO suggested that ICT may be taken up with the additional LTA beyond 2075 MW to meet 'N-1' criteria. Accordingly, it was decided that 400/220kV, 1x500MVA (6th) ICT is to be taken up with the additional LTA beyond 2075 MW
5	Bhadla-2 (Section 1A) 4th ICT of 500MVA	3x500	1520	NIL	420	3x500 MVA ICT is under establishment at Bhadla-2 Section 1A. LTA quantum at above 220kv section is 420 MW. 400/220kV, 1x500MVA (4th) ICT may to be taken up for implementation with LTA beyond 1000 MW (220kV level) to meet 'N-1' criteria.

A.9.7 It was noted that in the Draft CEA Transmission planning criteria-2022, it is mentioned that "N-1 reliability criteria may be considered for ICTs at the ISTS /STU pooling stations for renewable energy-based generation of more than 1000 MW after considering the capacity factor of renewable generating stations.

A.9.8 It was stated that, all the above substations are closed for grant of Stage-II connectivity on new bays. Therefore, with implementation of additional ICTs at each 400/220 kV section as mentioned in the above table, the N-1 compliance of above RE pooling stations can be achieved. POWERGRID vide mail dated 26.05.2022 confirmed the availability of space at these substations for implementation of additional ICTs at each 400/220 kV sections of Fatehgarh-2, Bhadla-2 & Bikaner PS along with Cable/GIS duct connection requirement.

A.9.9 Considering the security and reliability of the system, it was agreed to implement additional ICTs in each 400/220 kV sections of the RE pooling stations in order to meet the N-1 criteria as well as to meet the evacuation requirement. Scheme was agreed to be implemented in phases as under:

A) ICTs agreed to be taken up for implementation as system strengthening scheme on urgent basis

1. Augmentation with 400/220kV, 1x500MVA Transformer at Fatehgarh-2 PS (6th ICT at Section-1 with cable/GIS duct connection at 220kV side)
2. Augmentation with 400/220kV, 1x500MVA Transformer at Bikaner PS (3rd ICT)

B) ICTs agreed to be taken up for implementation on receipt of commensurate LTA quantum at RE pooling stations as shown below

1. Augmentation with 400/220kV, 1x500MVA Transformer at Bhadla-2 PS (4th ICT at Section-1A)

   Implementation Timeframe: *15 months from the date of allocation of project or evacuation requirement beyond 1000 MW at 220kV level of Bhadla-2(Section-1A) whichever is later.*

2. Augmentation with 400/220 kV 1x500 MVA (6th) ICT at Fatehgarh-2 PS (In Section-1A with cable/GIS duct connection at 220kV side)

   Implementation Timeframe: *15 months from the date of allocation of project or evacuation requirement beyond 2000 MW at 220kV level of Fatehgarh-2(Section-1A) or LTA grant schedule of M/s Eden RE Bercy (Mar'24) whichever is later.*

3. Augmentation with 400/220 kV 1x500 MVA(4th) ICT at Bikaner PS

   Implementation Timeframe: *15 months from the date of allocation of project or evacuation requirement beyond 1000 MW at 220kV level of Bikaner PS whichever is later.*

4. Augmentation with 400/220kV, 1x500MVA (6th) ICT at Bhadla-2 PS (In Section-1 with cable/GIS duct connection at 220kV side)

   Implementation Timeframe *15 months from the date of allocation of project or evacuation requirement beyond 1000 MW at 220kV level of Bikaner PS whichever is later.*

A.9.10 For optimal utilization of ICTs, it is recommended that Schedule for Part-B for S. No. 1,3, and 4 ICTs to be matched with RE generation schedule.

***Members may kindly deliberate*.**

A.10 Transmission system for evacuation of power from Rajasthan REZ Ph-IV (Part-1) (Bikaner Complex: 7.7GW) (agenda by CTU)

A.10.1 CTU has submitted following proposal (attached as **Annexure-A.V**):

Sl. No.	Items	Details
1.	**Name of Scheme**	Transmission system for evacuation of power from Rajasthan REZ Ph-IV (Part-1) (Bikaner Complex: 7.7GW)

Sl. No.	Items	Details
2.	**Scope of the scheme**	Transmission system for evacuation of power from Rajasthan REZ Ph-IV (Part-1) **(Bikaner Complex: 7.7GW)** **(Bikaner-II: 3.7GW (Solar) + Bikaner-III: 4GW (7GW Solar+3GW BESS)** • Establishment of 6x1500 MVA, 765/400kV & 5x500 MVA^ 400/220kV Bikaner-III Pooling Station along with 2x330 MVAr (765kV) Bus Reactor & 2x125 MVAr (420kV) Bus Reactor at a suitable location near Bikaner **Future provisions at Bikaner-III PS*:** **Space for** ➢ 765/400kV ICT along with bays- 1 no. ➢ 765 kV line bays along with switchable line reactors – 4 nos. ➢ 765kV Bus Reactor along with bay: 1 no. ➢ 400 kV line bays along with switchable line reactor –4 nos. ➢ 400 kV line bays–4 nos. ➢ 400/220kV ICT along with bays -5 nos. ➢ 400 kV Bus Reactor along with bay: 1 no. ➢ 400kV Sectionalization bay: 2 sets ➢ 220 kV line bays for connectivity of RE Applications - 6 nos.* ➢ 220kV Sectionalization bay: 3 sets ➢ STATCOM (2x±300MVAr) along with MSC (4x125 MVAr) & MSR (2x125 MVAr) • Augmentation with 400/220 kV, 5x500 MVA^ ICT at Bikaner-II PS • Augmentation with 765/400 kV, 1x1500MVA ICT (4th) at Bikaner (PG) • LILO of both ckts of 400kV Bikaner (PG)-Bikaner-II D/c line at Bikaner-III PS (~20 km) • Bikaner-II PS – Bikaner-III PS 400 kV D/c line (Quad) (~30 km) • Establishment of 765/400 kV, 4x1500 MVA Neemrana-II S/s along with 2x330 MVAr (765kV) Bus Reactor & 2x125 MVAr (420kV) Bus Reactor at a suitable location near Neemrana **Future provisions at Neemrana-II S/s:** **Space for** ➢ 765/400kV ICT along with bays- 2 no. ➢ 765 kV line bays along with switchable line reactors – 6 no. ➢ 765kV Bus Reactor along with bay: 1 no. ➢ 400 kV line bays along with switchable line reactor –6 no. ➢ 400 kV Bus Reactor along with bays: 1 no. ➢ 400kV Sectionalization bay: 2 sets

Sl. No.	Items	Details
		• Bikaner-III – Neemrana-II 765 kV 2xD/c line (~350 km) along with 330 MVAr switchable line reactor for each circuit at each end • Neemrana-II- Bareilly(PG) 765 kV D/c line (~350 km) along with 330 MVAr switchable line reactor for each circuit at each end • Neemrana-II -Kotputli 400 kV D/c line (Quad)(~70 km) • Augmentation by 400/220 kV, 1x500 MVA (3rd) ICT at Kotputli (PG) • LILO of both ckts of Sohna Road(GPTL)-Gurgaon(PG) D/c line at Neemrana-II S/s (~85 km) • 220 kV line bays at Bikaner-III PS for RE Connectivity (6 nos)* ***^incl 1x500MVA ICT to fulfill 'N-1' requirement*** **** Recently, 220kV bays (4 nos) at Bikaner-III PS agreed in CMETS-NR meetings commensurate to Stage-II connectivity applications granted. In view of that 220 kV line bays at Bikaner-III PS for RE Connectivity (6 nos.) is taken up in addition to the scope agreed in 8th CMETS-NR meeting. The corresponding no. of 220 kV bays reduced from Future scope of Bikaner-III PS.***
3.	**Depiction of the scheme on Transmission Grid Map**	Attached at Exhibit-I of Annexure-A.V.
4.	**Upstream/downstream system associated with the scheme**	Connectivity of Under implementation 400/220kV Bikaner-II S/s includes 400kV D/c interconnection with Khetri (2xD/c) and Bikaner (PG). 765/400/220kV existing Bikaner (PG) S/s is interconnected to 765/400kV Khetri , 765/400/220kV Bhadla (PG) and 765/400kV Moga S/s through 765kV D/c lines. 765/400kV existing Bareilly(PG) S/s is interconnected to 765/400kV Lucknow S/s through 765kV D/c line and 400kV Bareilly (PG) and Kashipur S/s through 400kV D/c lines.
5.	**Objective / Justification**	1. MNRE vide letter No. 367-13/1/2021-GEC dated 15.02.2022 addressed to Joint Secretary (Trans), MoP, had forwarded the Renewable Energy Zones (REZs) identified by MNRE/SECI with a total capacity of 181.5 GW for likely benefits by the year 2030. Transmission plan was to be prepared for the identified RE zones. These REZ's are located in eight states, out of which 75 GW REZs includes state of Rajasthan comprising of 15 GW Wind and 60 GW Solar potential.

<table>
<tr><th>Sl. No.</th><th>Items</th><th>Details</th></tr>
<tr><td></td><td></td><td>
2. Accordingly, a Comprehensive transmission scheme was evolved for evacuation of 75GW RE from Rajasthan. Out of above comprehensive scheme, transmission scheme is evolved for about 8GW (Solar) in Bikaner complex with potential (14GW along with 6GW BESS) as below:

Bikaner-II: 4 GW(7GW Solar+ 3 GW BESS)
Bikaner-III:4 GW(7GW Solar+ 3 GW BESS)

3. At Bikaner-II PS, St-II Connectivity for 5.575 GW RE is already granted against the potential of 1.9 GW (revised from 2.9GW) identified under Ph-II), therefore, evacuation for additional 3.7 GW capacity is required from Bikaner-II PS.

4. For additional solar potential of 7GW with 3GW BESS at Bikaner-III, evacuation system (4 GW) shall also be required. Therefore, total evacuation system requirement for 7.7GW (3.7+4 GW) shall be required from Bikaner Complex (Bikaner-II & III).
<table>
<tr><th>S.No</th><th>Pooling Station</th><th colspan="2">Total RE potential (GW)</th><th>Net RE generation</th></tr>
<tr><td></td><td></td><td>Solar</td><td>BESS</td><td></td></tr>
<tr><td>1</td><td>Bikaner-II</td><td>3.7*</td><td>-</td><td>3.7</td></tr>
<tr><td>2</td><td>Bikaner-III</td><td>7</td><td>3</td><td>4</td></tr>
<tr><td></td><td></td><td>10.7</td><td>3</td><td>7.7</td></tr>
</table>
*1.9GW Solar potential is already considered in Ph-II at Bikaner-II. Total potential considered at Bikaner-II: 5.6GW (1.9+3.7)

5. Evacuation system planned earlier in Ph-I, II, III from Bikaner complex was adequate for evacuation of about 4.8 GW RE potential from Bikaner complex. however, recently due to restrictions in GIB area, CTU has received more no. of connectivity applications in Bikaner complex. Stage-II connectivity received at Bikaner (PG) & Bikaner-II PS has already exceeded the envisaged potential in Bikaner complex as part of Ph-I (2.9 GW) and Ph-II (1.9 GW) potential.

6. Upon grant of about 5.575 GW St-II Connectivity, in the 5th & 6th CMETS in NR, no further grant for St-II connectivity at 400/220kV Bikaner-II was decided. However, to effect LTA of entire Stage-II grant at Bikaner-II, additional corridors shall need to be planned from Bikaner-II PS. Further, as Bikaner PS and Bikaner-II PS are interconnected, power flow
</td></tr>
</table>

Sl. No.	Items	Details
		on interconnection is influenced by RE generation dispatched at each Pooling station. Considering space limitation of 400kV bays for additional corridors as well as 765/400kV ICTs at Bikaner PS, there is limitation on evacuation of power from Bikaner PS. 7. The agenda for evacuation of power from Bikaner-II & Bikaner-III PS along with studies was discussed in 8th CMETS-NR meeting wherein observations on agenda/studies by Stakeholder incl. HVPN and POSOCO were deliberated. HVPN vide letter 28.06.22 and POSOCO mail dated 01.07.22 also sent their observations on agenda/studies. 8. Based on observations from Stakeholders, revised study files shared to all constituents on 01.07.22. Subsequently, HVPN vide letter 05.07.22 concurred with the proposal 9. Based on POSOCO input, CTU also carried out P-V and Q-V stability analysis in line with the discussion held in meeting and enclosed as part of minutes of 8th CMETS-NR meeting 10. Considering grant of connectivity to new RE generators in Bikaner complex (incl. Bikaner-III) as well as for evacuation of power beyond Bikaner complex (Bikaner/Bikaner-II/Bikaner-III PS), transmission scheme was agreed for evacuation of power from Rajasthan REZ Ph-IV (Part-1) [**Bikaner complex :7.7GW**] in the 8th CMETS-NR meeting with scope at S. No. 2
6.	**Estimated Cost**	**Total: Rs 13000 Cr.**
7.	**Need of phasing, if any**	Not Applicable
8.	**Implementation timeframe**	18 months from allocation of project
9.	**System Study for evolution of the proposal**	Studies discussed and agreed in following meeting: • 8th CMETS-NR meeting held on 30.06.2022 (Minutes of meeting enclosed in Annexure-I of Annexure-A.V.) • Study assumptions are enclosed in Annexure-II of Annexure-A.V. • Load flow results is attached at Exhibit-II of Annexure-A.V.

***Members may kindly deliberate*.**

A.11 Downstream network by State utilities form ISTS Station (agenda by UPPTCL)

A.11.1 UP has submitted that in past few years of OCC Meetings, there is a standard agenda to review the progress of downstream network to be constructed by State utilities for ISTS Station, wherein it is desired from state utilities to provide the updated status of downstream network.

A.11.2 It is pertinent to mention that UP-STU, as well as other state utilities has informed to the forum that for some ISTS stations they have no plan for connecting the unutilized bays and neither is it required by them.

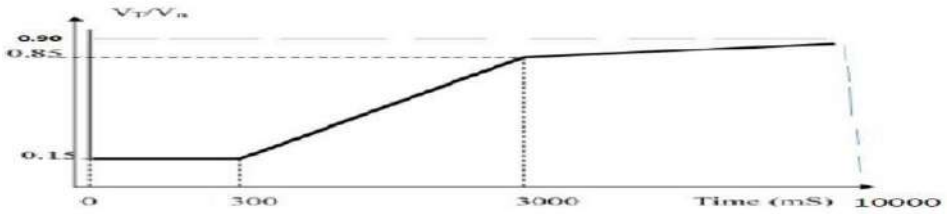
A.11.3 CTU on the other hand has also informed to the forum that there is standard practice for minimum number of bays, these bays at the particular substation are constructed on the normative basis, in accordance with the number of ICTs installed. It is also a known fact that substation has to meet N-1 criterion for ICTs, hence this additional ICT also comes with additional number of bays which is not required by state utilities to meet the load requirement.

A.11.4 It is proposed that review of unutilized bays from state utilities should be done on the basis of commitment made by the state utilities.

***Members may kindly deliberate*.**

A.12 HVRT/LVRT non-compliance at RE stations (agenda by NRLDC)

A.12.1 As per CEA Technical Standards for connectivity to Grid, 2019, the RE generating stations connected to the grid, shall remain connected to the grid when voltage at the interconnection point on any or all phases dips up to the level depicted by the thick lines in the following curve, namely: —



VT : Actual Voltage; Vn: Nominal Voltage

Provided that during the voltage dip, the supply of reactive power has first priority, while the supply of active power has second priority and the active power preferably be maintained during voltage drops, provided, a reduction in active power within the plant's design specifications is acceptable and active power be restored to at least 90% of the pre-fault level within 1 sec of restoration of voltage.

A.12.2 The generating station connected to the grid, shall remain connected to the grid when voltage at the interconnection point, on any or all phases (symmetrical or asymmetrical overvoltage conditions) rises above the specified values given below for specified time:

Over voltage (pu)	Minimum time to remain connected (Seconds)
1.30 < V	0 Sec (Instantaneous trip)
1.30 ≥ V > 1.20	0.2 Sec
1.20 ≥ V >1.10	2 Sec
V ≤ 1.10	Continuous

A.12.3 Issue of LVRT/HVRT non-compliance of RE generators have been raised many number of times. From number of events during recent past it is observed that RE

generators drops their active power during occurrence of any through fault and don't revive back to its antecedent value in defined time. In view of the same, detailed analysis of behavior of RE generators during grid disturbance which occurred on 09th July, 2022 is attached as **Annexure-B.I.**

A.12.4 On 09.07.2022 at 13:42 hrs multiple element tripping happened in Rajasthan solar complex and drop in solar generation of approx. 3485 MW also took place. From the available data at NRLDC, it can be observed that almost all the RE stations dropped their active power during through fault and revived back with delay. Hence, RE generators seem to be LVRT/ HVRT non-compliant. The issue was communicated to ISTS RE generators vide NRLDC letters dated 18.07.2022.

A.12.5 Sudden drop in this large quantum of RE generations leads to significant drop in frequency and rise in voltages across the grid. Non-compliance of LVRT/ HVRT of RE generators hampers the security and reliability of grid. Hence, corrective actions need to be taken to ensure LVRT/HVRT compliance of RE generators on priority.

***Members may kindly deliberate*.**

*****

Annexure A.I

निदेशक / विद्युत विनियम
भाखड़ा ब्यास प्रबन्ध बोर्ड
Director / Power Regulation
Bhakra Beas Management Board
SLDC Complex, Industrial Area, Phase – I
Chandigarh - 160002. Tel.: 0172-2652820 (Tel. FAX)
E-mail: dirpr@bbmb.nic.in

Bhakra Beas
Nation's Pride

प्रेषित

Email copy

अधीक्षण अभियन्ता/ ऑपरेशन सर्कल
एनआरपीसी नई दिल्ली। (ईमेल: seo-nrpc@nic.in)

क्रमांक सं 1768-72 **/पीसीटी -82** **दिनांक** 11-7-22

विषय: **Inclusion of agenda BBMB for discussion in 197th OCC meeting of NRPC.**

In reference of above please find herewith attached **"Agenda note regarding approval for replacement of ACSR conductor of five no. Bhakra-Ganguwal circuits with HTLS Conductor"** with a request that the same may please be included in the agenda(s) for discussion in 197th OCC meeting.

यह आपको सूचनार्थ एवं अग्रिम कार्यवाही हेतु प्रेषित है जी ।

संलगन: उपरोक्तनुसार

निदेशक/विद्युत विनियम
बीबीएमबी, चण्डीगढ़ ।

प्रतिलिपि:

1. प्रमुख अभियन्ता/ प्रणाली परिचालन, बीबीएमबी, चण्डीगढ़।
2. मुख्य अभियन्ता/ पारेषण प्रणाली, बीबीएमबी, चण्डीगढ़ ।
3. निदेशक/ यो.एवं रु. (पारे. प्र.), बीबीएमबी, चण्डीगढ़ को उनके कार्यालय पत्र क्रमांक सं: 2422-24/ पीएनटी-449 भाग 2 दिनांक 01-07-2022 के संधर्भ में एनआरपीसी की 197वीं ओसीसी बैठक में उपरोक्त चर्चा में संबधित अधिकारी द्वारा भाग लेने हेतु। जिसका कार्यक्रम सूचित कर दिया जाएगा जी।
4. मास्टर फाईल कार्या: निदेशक/विद्युत विनियम, बीबीएमबी, चण्डीगढ़ ।

Agenda Note for OCC meeting regarding approval for replacement of ACSR conductor of five no. Bhakra – Ganguwal circuits with HTLS conductor

Subject: Adequacy of Transmission Lines emanating from Bhakra Power House Complex post uprating of Bhakra Left Bank Power House - approval for replacement of ACSR conductor of five no. Bhakra – Ganguwal circuits with HTLS conductor

1. The above said agenda was discussed in the meeting of NRPC held on 20.4.2022 as Item no. 14 wherein BBMB presented its case detailing about the generation capacity of Bhakra Complex and the limitations brought out in the load flow studies done by HPPTCL in the evacuation network of the Bhakra Complex. Due to this, BBMB highlighted the need for requirement of comprehensive study for adequacy of transmission lines from Bhakra Power House Complex and requested that load flow study may please be carried out by NRLDC to identify possible constraints for evacuation of power of Bhakra Left Bank and Bhakra Right Bank Power House after considering their uprating and load changes. In the meeting, NRLDC requested BBMB to share the results of load flow study done by HPPTCL.

2. Accordingly, the requisite data was submitted to NRLDC and NRLDC validated the load flow studies as carried out by HPPTCL. In the mail dated 10.05.2022 NRLDC has observed : *"The generation of Bhakra left is being evacuated from three 220 KV circuits to Ganguwal. Power flow on these circuits doesn't seem to be N-1 compliant while high generation at Bhakra Left (installed capacity = 519 MW). The sensitivity studies also suggest that the flows on 220 kV Bhakra Right Jamalpur and Bhakra Right-Ganguwal circuits are not N-1 compliant at the time of high generation at Bhakra Right (installed capacity = 911 MW) considering the ampacity of the installed conductors. Therefore, suitable conductor type may be selected to cater these evacuations with desired N-1 compliance."*

3. The details of the conductors of all the five circuits of Bhakra Complex to Ganguwal are as below :

Circuit	Name of the Conductor	Strands	Diameter (mm)
Bhakra-Ganguwal Circuit 1 & 2	ACSR Goat	30/3.71 7/3.71	25.97
Bhakra-Ganguwal Circuit 3, 4 & 5	ACSR Zebra	54/3.18 7/3.18	28.62

4. The results of the load flow studies has brought out that the over loading with N-1 contingency in case of Bhakra-Ganguwal circuit 1&2 is 70.5%, Bhakra-Ganguwal circuit 3 is 40.5% and Bhakra-Ganguwal circuit 4&5 is 42%.

5. In view of the above result of the load flow study, BBMB proposes to replace the existing ACSR conductors with relevant HTLS conductors at all the five circuits emanating from Bhakra Complex to Ganguwal i.e. Bhakra-Ganguwal circuit No. 1 to 5, so as to get the constraints removed along with making it N-1 complaint. Further the case for re- conductoring of 220 kV Bhakra Right - Jamalpur double circuit is also under process.

The proposal at sr. no. 5 above may be got approved in the next OCC meeting.

सुरजीत सिंह 11/7/2022

निदेशक/योजना एवं रूपांकन (टी एस),

बी बी एम बी, चण्डीगढ़।

Annexure A.II

RAJASTHAN RAJYA VIDYUT PRASARAN NIGAM LIMITED.

[Corporate Identity Number (CIN):U40109RJ2000SGC016485]

(Regd. Office: Vidyut Bhawan, Jan Path, Jyoti Nagar, Jaipur - 302 005)

OFFICE OF THE SUPERINTENDING ENGINEER (PROJECT & PLANNING)

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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

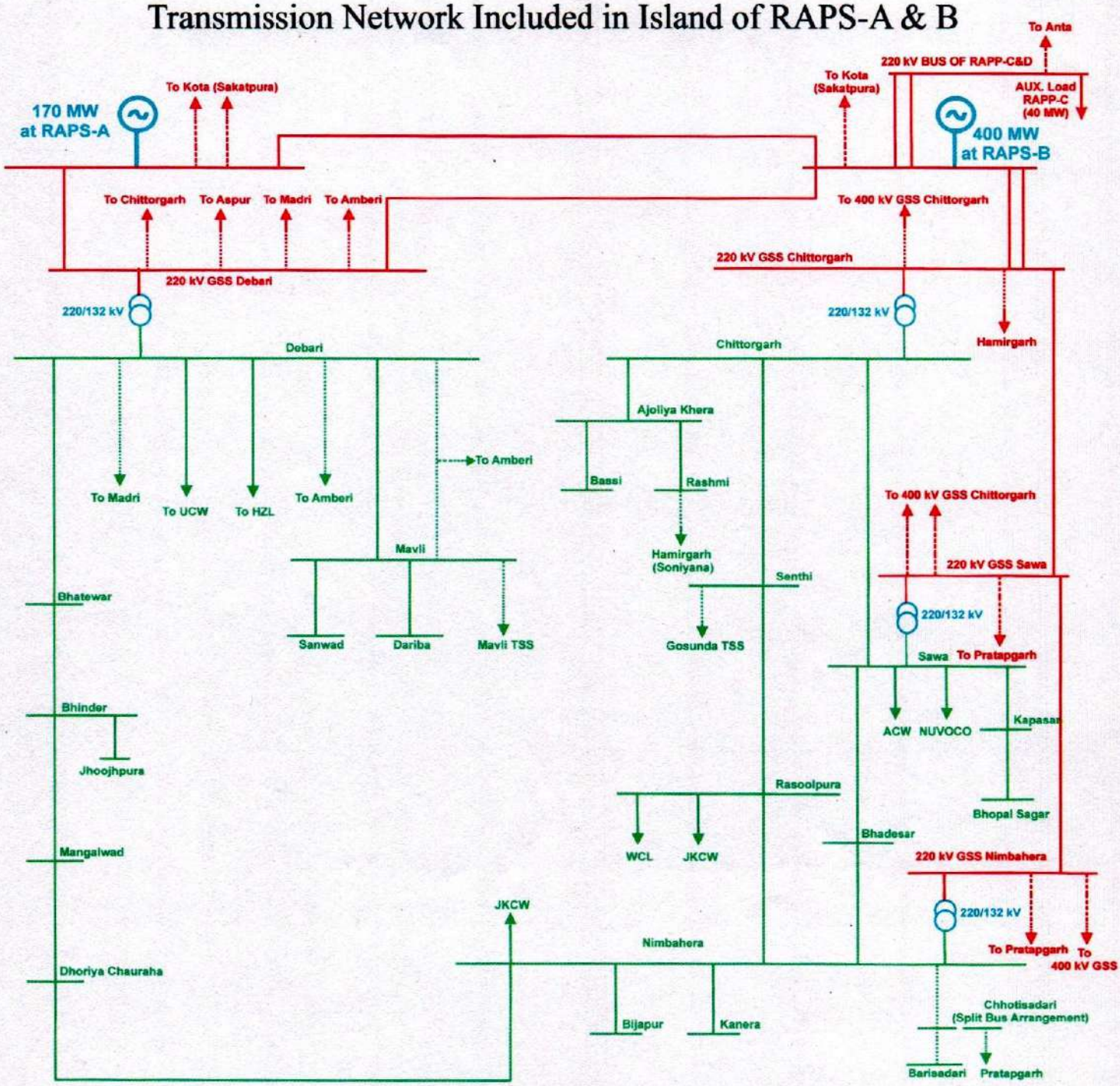
S. No.	Name of GSS	Maximum Load (MW)	Average Load (MW)
A	**Gourp-A for 370 MW**		
A.1	**Load at 220 kV GSS Debari**		
1	220 KV GSS Debari	26	16
2	132 KV GSS Mavli	26.28	12
3	132 KV GSS Sanwad	21.85	13
4	132 KV GSS Dariba	24.43	15
5	132 KV Hindustan Zinc Limited (Industry)	41	24.7
6	132 KV GSS Bhatewar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

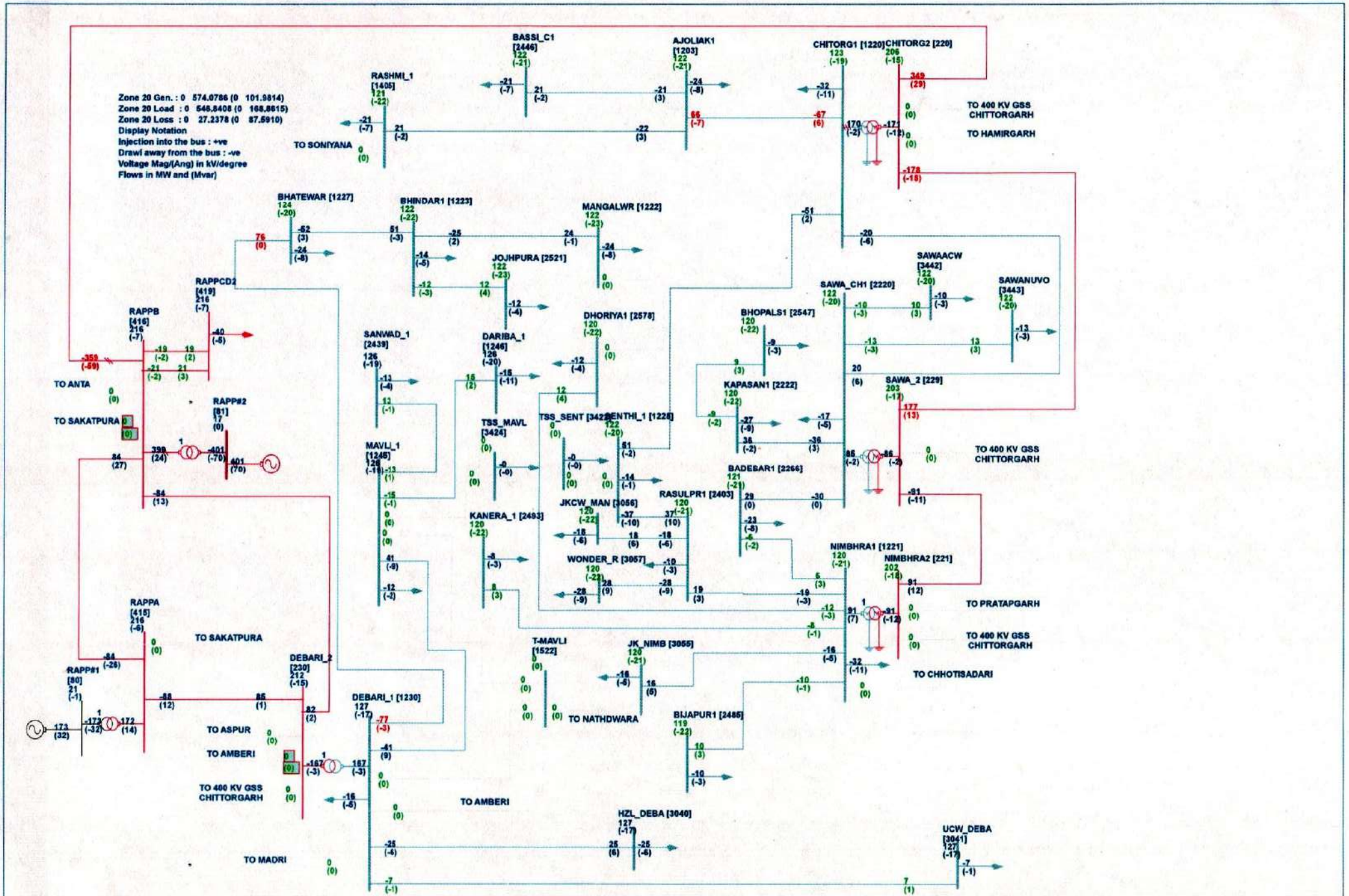
2.0 EFFECT ON STATION:

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]
RAPPCD2 [419]
RAPPB [416]
DHORIYA1 [2578]
BHOPALS1 [2547]
SANWAD_1 [2439]
DARIBA_1 [1246]
KAPASAN1 [2222]
SAWA_2 [229]
TO ANTA
TO SAKATPURA
RAPP#2 [81]
TSS_MAVL [3424]
TSS_SENT [3423]
BENTHI_1 [1226]
MAVLI_1 [1245]
BADESAR1 [2266]
RASULPR1 [2403]
JKCW_MAN [3056]
KANERA_1 [2493]
WONDER_R [3057]
NIMBHRA1 [1221]
NIMBHRA2 [221]
TO PRATAPGARH
TO 400 KV GSS CHITTORGARH
RAPPA [415]
TO SAKATPURA
T-MAVLI [1522]
JK_NIMB [3055]
TO CHHOTISADARI
RAPP#1 [80]
DEBARI_2 [230]
DEBARI_1 [1230]
BIJAPUR1 [2486]
TO ASPUR
TO AMBERI
TO 400 KV GSS CHITTORGARH
TO NATHDWARA
TO AMBERI
HZL_DEBA [3040]
UCW_DEBA [3041]
TO MADRI

Annexure A.III

RAJASTHAN RAJYA VIDYUT PRASARAN NIGAM LIMITED.
[Corporate Identity Number (CIN):U40109RJ2000SGC016485]
(Regd. Office: Vidyut Bhawan, Jan Path, Jyoti Nagar, Jaipur - 302 005)
OFFICE OF THE SUPERINTENDING ENGINEER (PROJECT & PLANNING)
Ph: +91-141-2740623,Fax:+91-141-2740794;
e-mail: se.pp@rvpn.co.in, website:www.rvpn.co.in
RVPN An ISO 9001:2000 Certified Company

No. RVPN/SE(P&P)/XEN-2(P&P)/ F. /D 342 Jaipur, Dt. 11/5/22

The General Manager, NRLDC,(POSOCO),
18-A Shaheed Jeet Singh Marg,
Katwaria Sarai,
New Delhi-110016

Sub: Islanding Schemes for the Suratgarh Supercritical Thermal Power Plant and Rajwest LTPS.

Ref: i. No. NRPC/Operation/209/TCC(46th)/2021/5730-76 dated 25.06.2021.
ii. This office letter no. 1362 dated 22.10.2021

Dear Sir,

This is in continuation to this office letter no. 1362 dated 22.10.2021 vide which Islanding Schemes for the Suratgarh Supercritical Thermal Power Plant and Rajwest LTPS in Rajasthan state for consideration and approval.

Further, as per discussions held in OCC meetings joint simulation studies have been carried out in PSSE for Rajwest LTPS on 21.4.2022 & 22.4.2022 at New Delhi by POSOCO & RVPN. Further as per discussions and PSSE file provided by POSOCO, STPS Islanding scheme have been simulated by RVPN. Simulated PSSE file has been mailed to POSOCO on 9.5.2022 alongwith following informations:-

i. Annexure-1 : Buswise MW & MVAR Load on GSS considered in Islanding Scheme for Rajwest LTPS
ii. Annexure-2 : List of buses in Island Scheme Of Rajwest LTPS
iii. Annexure-3: Buswise MW & MVAR Load on GSS considered in Islanding Scheme for STPS
iv. Annexure-4 : list of buses in island scheme of STPS

It is requested to please examine the proposed islanding schemes of Rajwest LTPS & STPS and send your approval at the earliest.

Encl: as above

Your's faithfully,

(K. K. Meena)
Chief Engineer (PP&D)

Copy to the following for information and necessary action please:-

1. **Member Secretary** , Northern Regional Power Committee, 18-A, Shaheed Jeet Singh Marg, Katwaria Sarai, New Delhi-110016
2. The Chief Engineer (LD/MPT&S), RVPN, Heerapura/Jaipur
3. The Chief Engineer, Suratgarth Supercritical Thermal Power Station,RVUN, Suratgarh, 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.
6. The Plant Head, JSW Energy (Barmer) Ltd. (Formerly Rajwest LTPS), Barmer, Rajwest (E-mail: operationsupport.rwpl@jsw.in)

Encl: as above

Chief Engineer (PP&D)

OC

Annexure-1

Load on GSS considered in Islanding Scheme for Rajwest LTPS

S. No.	Name of GSS	Simultaneous Load	
		MW	MVAR
A	**Load in Barmer**		
1	132 kV GSS Gadra Road	19.00	4.00
2	132 kV GSS Barmer	35.00	2.00
3	400 kV GSS Barmer	2.00	1.00
4	132 kV GSS Mahloo	18.00	3.00
5	MPTS(Keyan Energy)	5.00	2.00
5	**Load at Barmer**	**79.00**	**12.00**
6	220 kV GSS Dhaurimanna	43.00	3.00
7	132 kV GSS Ranasar	18.00	4.00
8	132 kV GSS Ramji ki Gol	12.00	6.00
9	132 kV GSS Gudamalani	22.00	3.00
10	132 kV GSS Sawa	27.00	5.00
11	132 kV GSS Chouhtan	12.00	6.00
12	**Load at Dhaurimanna**	**134.00**	**27.00**
13	220 kV GSS Balotra	37.00	6.00
14	132 kV GSS Sindhari	15.00	3.00
15	132 kV GSS Samdari	13.00	0.00
16	132 kV GSS Siwana	17.00	5.00
	Load at Balotra	**82.00**	**14.00**
	Total load in Barmer	**295.00**	**53.00**
B	**Load in Jodhpur**		
1	220 kV GSS Boranada	35.00	1.00
2	220 kV GSS Jodhpur	57.00	9.00
3	220 kV GSS Barli	12.00	4.00
4	220 kV GSS Jhalamand	1.00	0.00
5	132 kV GSS NPH (Jodhpur)	73.00	0.00
6	132 kV GSS MBM Engineering College	19.00	5.00
7	132 kV GSS OPH (Jodhpur)	29.00	9.00
8	132 kV GSS Banar	52.00	4.00
9	132 kV GSS Kuri Bhagtasani	23.00	6.00
10	132 kV GSS Mandore	12.00	0.00
11	132 kV GSS Pratapnagar (Jodhpur)	32.00	5.00
12	132 kV GSS Chopasani Housing Board	45.00	0.00
13	132 kV GSS PS8	1.00	0.00
14	132 kV GSS Soorsagar	29.00	2.00
	Total load in Barmer	**420.00**	**45.00**
	Total load in Barmer & Jodhpur	**715.00**	**98.00**

Annexure-2

LIST OF BUSES IN ISLAND SCHEME OF RAJWEST LTPS

S. No.	Name of bus	Bus Voltage (kV)	Bus number	Remarks
1	RAJWEST	400	134009	6x135 MW Gen. units connected. **Out of which 4x135 MW units ON.**
2	RAJWEST	220	132077	2x135 MW Generators units connected which are units ON.
3	**BARMER-4**	**400**	**134002**	
4	**BARMER**	**220**	**132017**	
5	BARME-21	132	131124	
6	BARMER1	132	131037	
7	GADRAROA	132	131179	
8	MEHLOO	132	131302	
9	**DHAURIMA**	**220**	**132043**	
10	DHAURIMA	132	131142	
11	RANASAR1	132	131373	
12	SAWA_DHORIMA	132	131410	
13	CHOHTAN	132	131588	
14	RAM JI K GOL	132	131583	
15	GUDAMALN	132	131192	
16	**BALOTRA**	**220**	**132031**	
17	BALOTRA1	132	131132	
18	SAMDARI1	132	131395	
19	SINDRA1	132	131426	
20	SIWANA	132	131431	
21	**BORANADA**	**220**	**132074**	
22	BORNDA	132	131174	
23	**JODHPU-4**	**400**	**134015**	
24	**JODHPU-4**	**220**	**132098**	
25	JODHP-41	132	131220	
26	SURPURA1	132	131448	
27	KURI	132	131265	
28	BANAR1	132	131031	
29	**BARLI_2**	**220**	**132083**	
30	BARLI-21	132	131036	
31	PSNO8	132	131332	
32	SOORSAGA	132	131434	
33	CHOPASAN	132	131080	
34	PRATA-JO	132	131354	
35	**JALAMAND**	**220**	**132097**	
36	JALAMAND	132	131209	
37	**KANKANI**	**400**	**134039**	
38	**KANKANI_JODH**	**220**	**132170**	
39	**JODHPU-2**	**220**	**132033**	
40	JODHP-21	132	131131	
41	**NPH_JODHPUR**	**220**	**132180**	
42	NPH-JODH	132	131328	
43	ENGGCOLL	132	131171	
44	OPH-JODH	132	131330	
45	**MPT**	**220**	**132112**	

Annexure-3

Load on GSS considered in Islanding Scheme for STPS

S. No.	Name of GSS	Simultaneous Load	
		MW	MVAR
1	132 KV GSS Hanumangarh	50	19
2	132 KV GSS Goluwala	9	4
3	132 KV GSS Amarpura Thedi	28	15
4	132 KV GSS Fatehgarh	11	3
5	132 KV GSS, Rawatsar	10	6
6	132 KV GSS Tibbi	11	5
7	132 KV GSS Sangaria	22	10
8	132 KV GSS Nohar	19	6
9	220 KV GSS Bhadra	6	0
10	132 KV GSS Bhadra	20	6
11	132 kV GSS Sadulpur (Rajgarh)	20	9
12	132 kV GSS Taranagar	8	3
13	220 KV GSS Udyogvihar (Sri Ganganagar)	20	7
14	132 KV GSS, Sri Ganganagar	42	13
15	132 KV GSS, Sadulshahar	13	2
16	220 KV GSS Padampur	16	10
17	132 KV GSS Raisinghnagar	13	4
18	132 KV GSS Srikaranpur	9	2
19	132 KV GSS Kaminpura	7	2
20	132 KV GSS Tatarsar	4	2
21	220 KV GSS Suratgarh	28	4
22	132 KV GSS Rajiasar	16	4
23	132 KV GSS Pallu	7	3
24	132 KV GSS Jokhasar	6	2
25	132 KV GSS, Srivijaynagar	12	4
26	132 KV GSS, Anoopgarh	12	2
27	132 KV GSS Ghamurwali	7	3
28	132 KV GSS Pilibanga	28	11
29	220 kV GSS Ratangarh	31	10
30	132 kV GSS Ratangarh		
31	132 kV GSS Sardarsahar	27	9
32	132 kV GSS Momasar	49	13
33	132 kV GSS Bhanipura	19	9
34	132 kV GSS Patlisar	20	10
35	220 KV GSS, Rawatsar	7	3
	Total load	**607.00**	**215.00**

Annexure-4

LIST OF BUSES IN ISLAND SCHEME OF STPS

S. No.	Name of bus	Bus Voltage (kV)	Bus number	Remarks
1	SURATG-4	400	134018	4x250 MW Gen. units connected.. Which are kept off because same would be tripped under Island formation condition
2	SURATH-2	220	132057	2x250 MW Gen. units connected.. Which are kept off because same would be tripped under Island formation condition
3	SURATGARH_SC	400	134038	2x660 MW Gen. units connected.. Out of which one unit is kept off because same would be tripped under Island formation condition
4	HANUMANG	220	132059	
5	HANUMANG	132	131158	
6	AMRAPURA	132	131006	
7	GULUWALA	132	131194	
8	FATEHGARH	132	131575	
9	RAWATSAR	132	131380	
10	TIBBI	132	131595	
11	SANGRIA	132	131399	
12	NOHAR	132	131326	
13	RAWATSAR	220	132101	
14	RAWATSAR21	132	131597	
15	BHADRA	220	132085	
16	BADRA-21	132	131020	
17	BHADRA	132	131048	
18	SADULPUR_RAJ	132	131367	
19	TARANAGA	132	131453	
20	UDYOGVIH	220	132058	
21	UDYOGVIH	132	131147	
22	SRIGANGA	132	131438	
23	SADULSHA	132	131390	
24	PADAMPUR	220	132111	
25	PADAMPUR	132	131333	
26	RAISINGH	132	131365	
27	SRIKARNP	132	131439	
28	KAMINPUR	132	131230	
29	TATARSAR	132	131455	
30	SURATGAR	220	132119	
31	SURATCAR	132	131156	
32	RAJIASR	132	131369	
33	PALLU	132	131585	
34	JHOKHASA	132	131216	
35	SRIVIJAY	132	131442	
36	ANUPGARH	132	131011	
37	GHAMURWALI	132	131569	
38	PILIBANG	132	131345	
39	RATANGAR	220	132115	
40	RATANGARH	132	131107	
41	SARDARSH	132	131406	
42	MOMASAR1	132	131309	
43	BHANIPURA	132	131521	
44	PATLISAR	132	131342	
45	HALASAR	220	132186	
46	HALASAR	132	131577	
47	RATANGAR	400	134004	
48	RATANGARH42	220	132009	

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 1362 Jaipur, Dt 22/10/2021

Member Secretary
Northern Regional Power Committee,
18-A, Shaheed Jeet Singh Marg, Katwaria Sarai,
New Delhi-110016

Sub: Islanding Schemes for the Suratgarh Supercritical Thermal Power Plant and Rajwest LTPS.

Ref: No. NRPC/Operation/209/TCC(46th)/2021/5730-76 dated 25.06.2021.

Dear Sir,

In reference to the above referred MOM of Special TCC meeting held through video conferencing on 15.06.2021, kindly find enclosed herewith the Islanding Schemes for the Suratgarh Supercritical Thermal Power Plant and Rajwest LTPS in Rajasthan state for consideration and approval.

Encl: as above

Your's faithfully,

(K.K. Meena) 22/10

Additional Chief Engineer (PP&D)

Copy to the following for information and necessary action please:-

1. The Chief Engineer (LD/MPT&S), RVPN, Heerapura/Jaipur
2. The Chief Engineer, Suratgarth Supercritical Thermal Power Station,RVUN, Suratgarh, Rajasthan.
3. The Superintending Engineer (Communication-Corporate Office/Automation) , RVPN, Heerapura/Jaipur.
4. The Superintenting Engineer (Opration), Northern Regional Power Committee, 18-A, Shaheed Jeet Singh Marg, Katwaria Sarai, New Delhi-110016.
5. The Plant Head, JSW Energy (Barmer) Ltd. (Formerly Rajwest LTPS), Barmer, Rajwest (E-mail: operationsupport.rwpl@jsw.in)

Encl: as above

Additional Chief Engineer (PP&D)

PROPOSED ISLANDING SCHEME FOR SURATGARH SUPERCRITICAL POWER PLANT

A. Generation Details

1. The installed capacity (IC) of generators at Suratgarh Super-critical TPS is 2x660 MW (Units 7&8)i.e. 1320 MW. Each unit gives a net dispatch of **617 MW (Installed Capacity-Auxiliary consumption).**
2. Islanding scheme is designed considering only one unit of 660 MW (Unit #7) and the available generation would be 617 MW.

B. Transmission System at Suratgarh Super Critical TPS (2x660 MW) &Suratgarh TPS (6x250 MW)

I:-Suratgarh SCTPS has following 400 kV System

- 400 kV D/C Suratgarh SCTPS-Suratgarh TPS line (2 km)
- 400 kV D/C Suratgarh SCTPS-Bikaner Line (170 km)

II:-SuratgarhTPS has following 400 kV & 220 kV System

- 400 kV 2xS/C STPS-Ratangarh line (144 km)
- 400 kV S/C STPS-Bikaner line (170 km)
- 2x315 MVA, 400/220 kV ICT at STPS
- 220 kV S/C STPS-Rawatsar line (66.16 km)
- 220 kV S/C STPS-Halasar line (97.4 km)
- 220 kV D/C STPS-Suratgarh (220 kV GSS) line (25km)
- 220 kV S/C STPS-Bhadra line (115.62 km)
- 220 kV S/C STPS-Udyogvihar line (97km)

C. Load Details

The identified load around Suratgarh SCTPS is 600 MW which is placed at **Annexure-A** and detailed below:-

- 220 kV GSS Suratgarh (**190 MW**)
- 220 kV GSS Rawatsar(**68 MW**)
- 220 kV GSS Bhadra(**92 MW**)
- 220 kV GSS Padampur(**57 MW**)
- 220 kV GSS Hanumangarh(**77 MW**)
- 220 kV GSS Udyogvihar(**123 MW**)

Seasonal variations of load are high in the region. In the summer season (April-August),the maximum load of approximately 725 MW is observed in the region due to high agriculture load and minimum load is observed in the winter season (December-January) which is approximately 300 MW. Hence, islanding scheme is designed to have some of the

transmission lines in both operative/blocked mode so that SLDC, Rajasthan can monitor and decide upon mode of the lines so as to match the load with generation in the island.

The critical loads viz. defence, Railways, IGNP & PHED of **52.40 MW**are being fed from the following GSS which would be included in the island:-

- 132 kV GSS Sadulpur (Rajgarh) (**7.98 MW**)
- 220 KV GSS Udyogvihar (Sri Ganganagar) (**4 MW**)
- 132 KV GSS Sri Ganganagar (**3.5 MW**)
- 220 KV GSS Padampur (**0.4 MW**)
- 132 KV GSS Raisinghnagar (**1 MW**)
- 132 KV GSS Srikaranpur(**0.4 MW**)
- 132 KV GSS Kaminpura(**0.4 MW**)
- 220 KV GSS Suratgarh(**9.6 MW**)
- 132 KV GSS Rajiasar(**11 MW**)
- 132 KV GSS Pallu(**0.3 MW**)
- 132 KV GSS Jokhasar(**13.82 MW**)

D. Proposed Islanding Scheme

1. All generating units at SuratgarthTPS and SuratgarthSCTPS except unit #7 of rated capacity 660 MW are to be tripped at 48.0 Hz.
2. No RE Power Projects have been considered in the island. All RE generators are to be tripped at 48.0 Hz.
3. All dedicated feeders for critical loads viz. Defence, DRDO, railway etc. are to be kept in blocked mode even if these are open access consumers. Dedicated feeders for rest of open access consumers are to be kept operative at frequency of 48.0 Hz.
4. Islanding shall take place at 48.0 Hz with a time delay of 100 ms.
5. Blocked and operative status of all transmission lines of 400 kV, 220 kV and 132 kV voltage levels considered for the islanding are 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.
6. A single line diagram of 400 kV network, 220 kV & 132 kV network is at **Annexure-C.**

E. 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 610 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 = 617.1 MW

Load = 600.3 MW

Losses = 16.8 MW

It is observed that loading on all the lines and transformers included in the island of Suratgarh SCTPS is normal and overloading is not observed.

F. Results of Transient Stability Studies

Transient stability study is carried for the network included in the island of Supercritical Suratgarh thermal power station by opening all the lines which are kept in the operative state at time=1 second after the start of simulation. Various plots are discussed below:-

1. Active Power Curve

Plots of the mechanical power input to the 1x660 MW generator at Suratgarh SCTPS and electrical power generated by this generator are illustrated in Fig. 1. It is observed that variation in the input mechanical power is minimum and limited to 5 MW. Further, the generated active power varies between 556 MW to 675 MW against the rated value of 617 MW (Excluding the auxiliary power). Variations in the generated active power aresettling after a time period of 20seconds and island becomes stable.

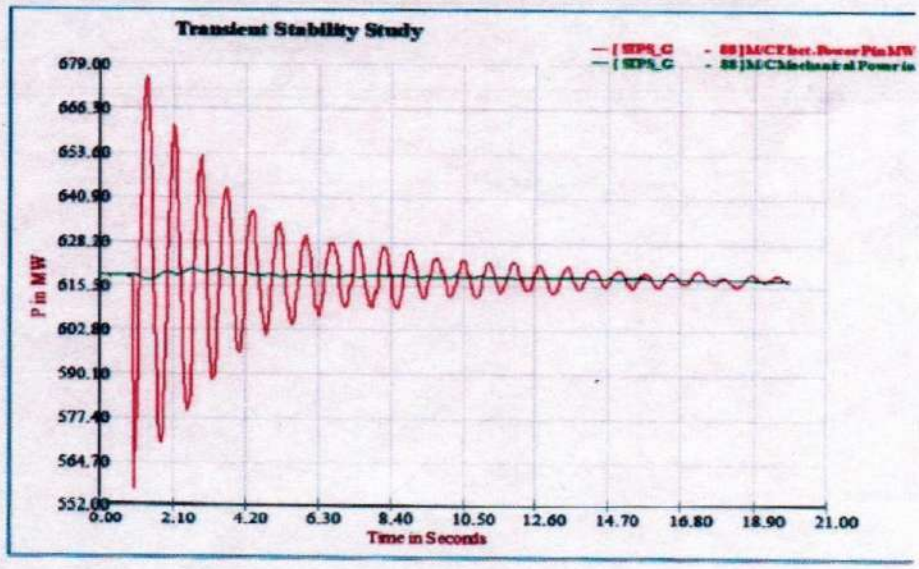


Fig. 1 Active power curve of SC-STPS generator

2. Reactive Power Curve

Reactive power plot of 1x660 MW generator at SC-STPS is described in Fig. 2. Before the initiation of islanding event the reactive power exchanged between the generator and grid was -110 MVAR which settles to a value of -15 MVAR after a time period of 6seconds. However, maximum deviations are up to +5.0 MVAR. This indicates that reactive power settles downand island becomes stable.

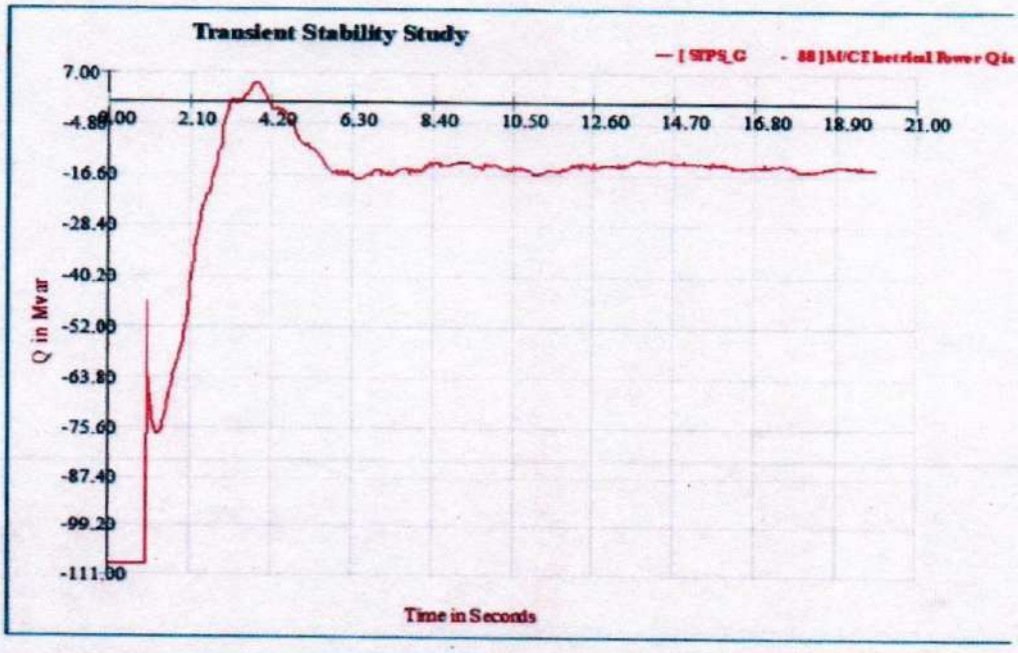


Fig. 2 Reactive Power variations during islanding condition

3. Load Angle Curve

The load angle curve of the 1x660 MW generator at SC-STPS is illustrated in Fig. 3. Load angle increases from 7° to new value after the island formation. The transients associated with the load angle curve settles down after a time period of 10seconds. Hence, network included in the island of SC-STPS will operate at a new load angle in stable state.

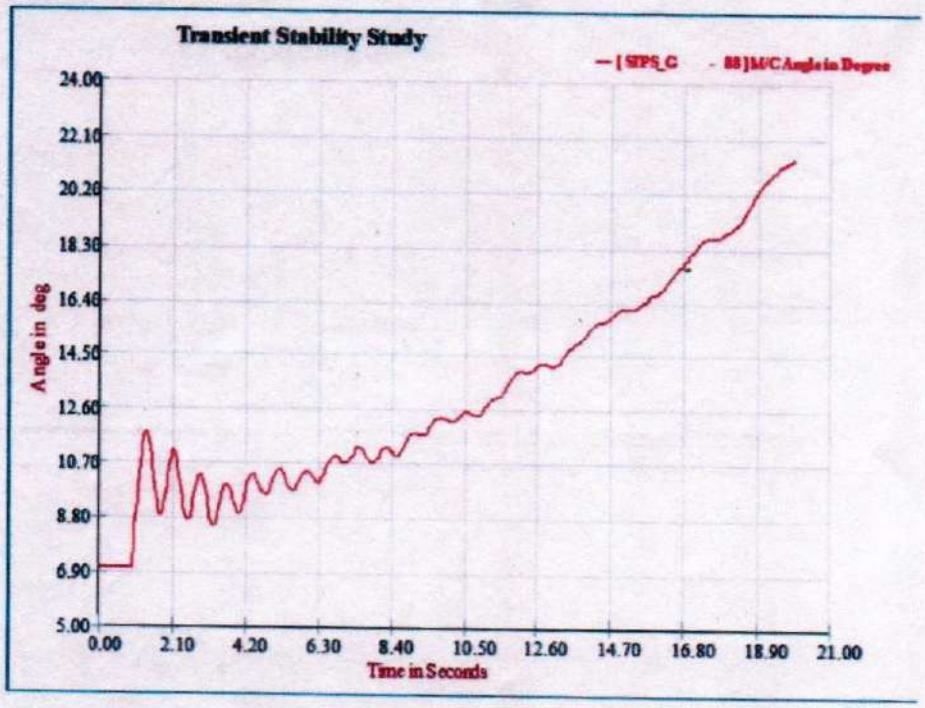


Fig. 3 Load angle curve

4. Frequency Plot

Plot of grid frequency is illustrated in Fig. 4. It is observed that grid frequency varies between 49.50HZ to 50.5 HZ after the formation of island and finally again settles to the value of 50 HZ in a time period of 10seconds which indicates that the island will operate in the stable state.

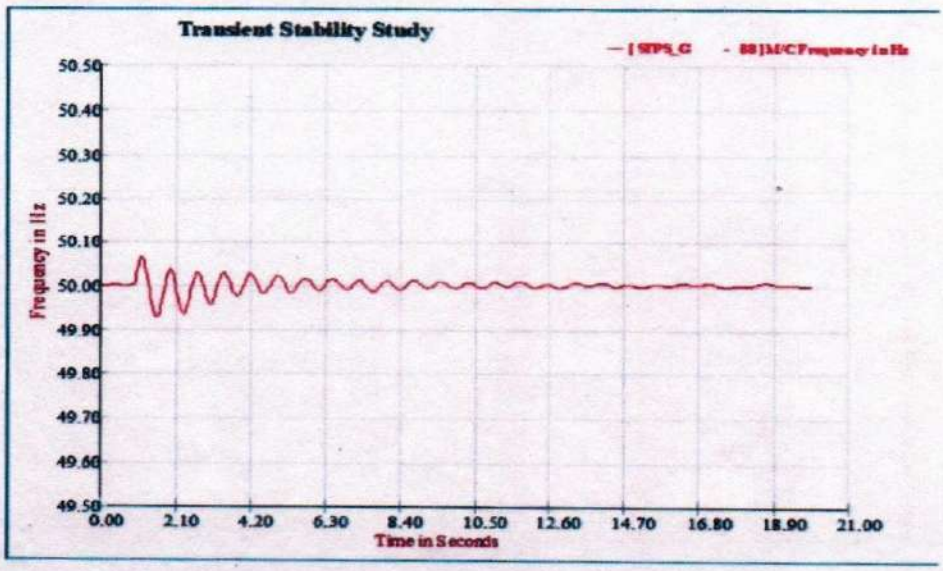


Fig. 4 Variation of frequency during islanding condition

5. Variation of Voltage

Plot of grid voltage at the SC-STPS bus is illustrated in Fig. 5. It is observed that grid voltage 0.97 pu to 1.012 pu and finally again settles at 1.05pu after a time period of 20seconds. This indicates that the island will operate in the stable state.

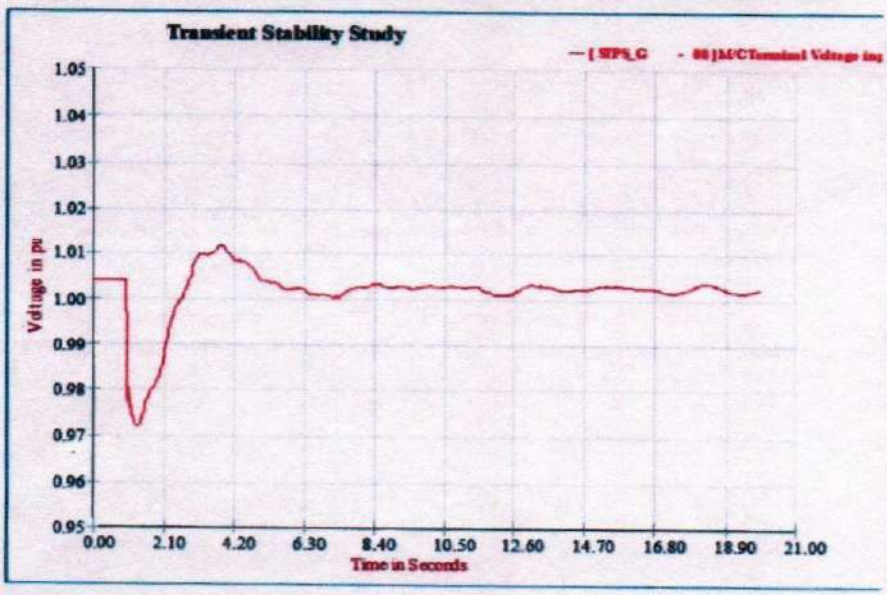


Fig. 5 Voltage variations during islanding condition

G. Conclusion

Proposed islanding is designed after detailed discussion with the field officers and officers from the MPT&S, Communications, Automations and LD. Based on the feedback/inputs of Officers and results of load flow studies & Transient stability 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 Suratgarh SC-STPS.
- 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.
- Results of transient stability study indicate that network included in the island of Suratgarh SC-STPS becomes stable after incidence of islanding event in respect of voltage variations, frequency variations, load angle variations, active power variations and reactive power variations.
- Proposed islanding scheme can be practically implemented on the transmission network of RVPN considering 1x660 MW machine at Suratgarh SC-STPS. 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.

Annexure-A

Load on GSS considered in Islanding Scheme for STPS

S. No.	Name of GSS	Maximum Load (MW)	Average Load (MW)	Minimum Load (MW)	Essential Loads
1	132 KV GSS Hanumangarh	85	50	21	NIL
2	132 KV GSS Goluwala	22.9	9	4.2	NIL
3	132 KV GSS Amarpura Thedi	52.42	28	9	NIL
4	132 KV GSS Fatehgarh	20.36	11	4.8	NIL
5	132 KV GSS, Rawatsar	30.21	10	7.8	NIL
6	132 KV GSS Tibbi	21.12	11	2	NIL
7	132 KV GSS Sangaria	45.17	22	0.22	NIL
8	132 KV GSS Nohar	49.48	19	29.04	NIL
9	220 KV GSS Bhadra	17.1	6	9	NIL
10	132 KV GSS Bhadra	42	20	14	NIL
11	132 kV GSS Sadulpur (Rajgarh)	49.36	20	9.5	7.98 (PHED)
12	132 kV GSS Taranagar	28.11	8	3.2	NIL
13	220 KV GSS Udyogvihar (Sri Ganganagar)	40	20	12	4 (Defence)
14	132 KV GSS, Sri Ganganagar	89	42	11	3.5 (Defence)
15	132 KV GSS, Sadulshahar	18.11	13	4	NIL
16	220 KV GSS Padampur	30	16	4	0.4 (Defence)
17	132 KV GSS Raisinghnagar	31.36	13	3	1 (Defence)
18	132 KV GSS Srikaranpur	20	9	5	0.4 (Defence)
19	132 KV GSS Kaminpura	15.73	7	3.5	0.4 (Defence)
20	132 KV GSS Tatarsar	4.76	4	1	NIL
21	220 KV GSS Suratgarh	55	28	15	9.6 (Airforce/Defence)
22	132 KV GSS Rajiasar	36.61	16	26.35	11 (IGNP)
23	132 KV GSS Pallu	22.39	7	8	0.3
24	132 KV GSS Jokhasar	13.54	6	6.5	13.82 (IGNP)
25	132 KV GSS, Srivijaynagar	31.84	12	16.7	NIL
26	132 KV GSS, Anoopgarh	29.5	12	14.996	NIL
27	132 KV GSS Ghamurwali	17.29	7	1	NIL
28	132 KV GSS Pilibanga	75.34	28	20	NIL
29	220 kV GSS Ratangarh	26	17	7	NIL
30	132 kV GSS Ratangarh	26.23	14	1.997	NIL
31	132 kV GSS Sardarsahar	67	27	35	NIL
32	132 kV GSS Momasar	62.91	49	0.9	8.0(PHED)
33	132 kV GSS Bhanipura	45.1	19	10	NIL
34	132 kV GSS Patlisar	50.3	20	11	NIL
	Total load	**1271.24**	**600.00**	**331.70**	

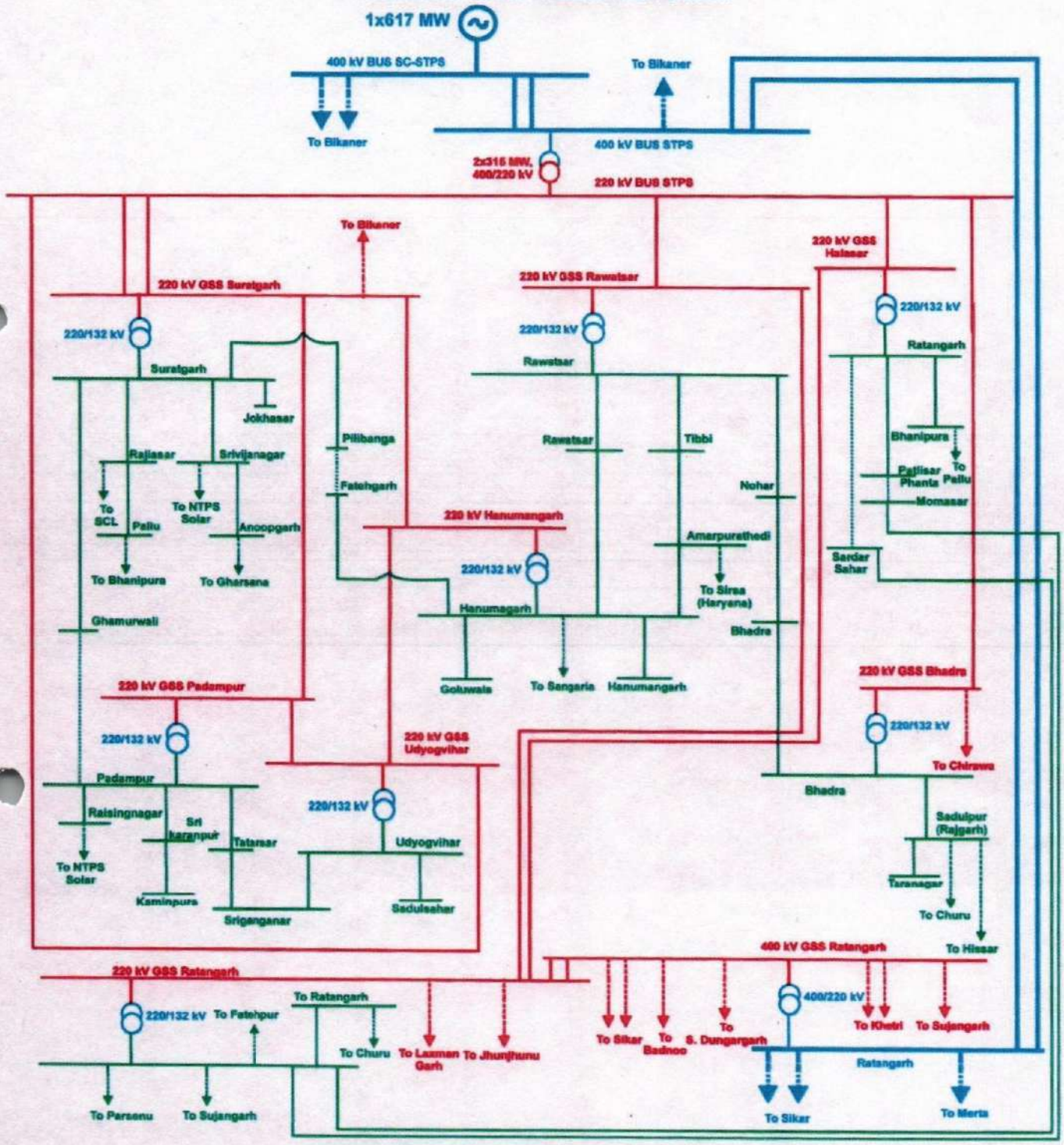
Annexure-B

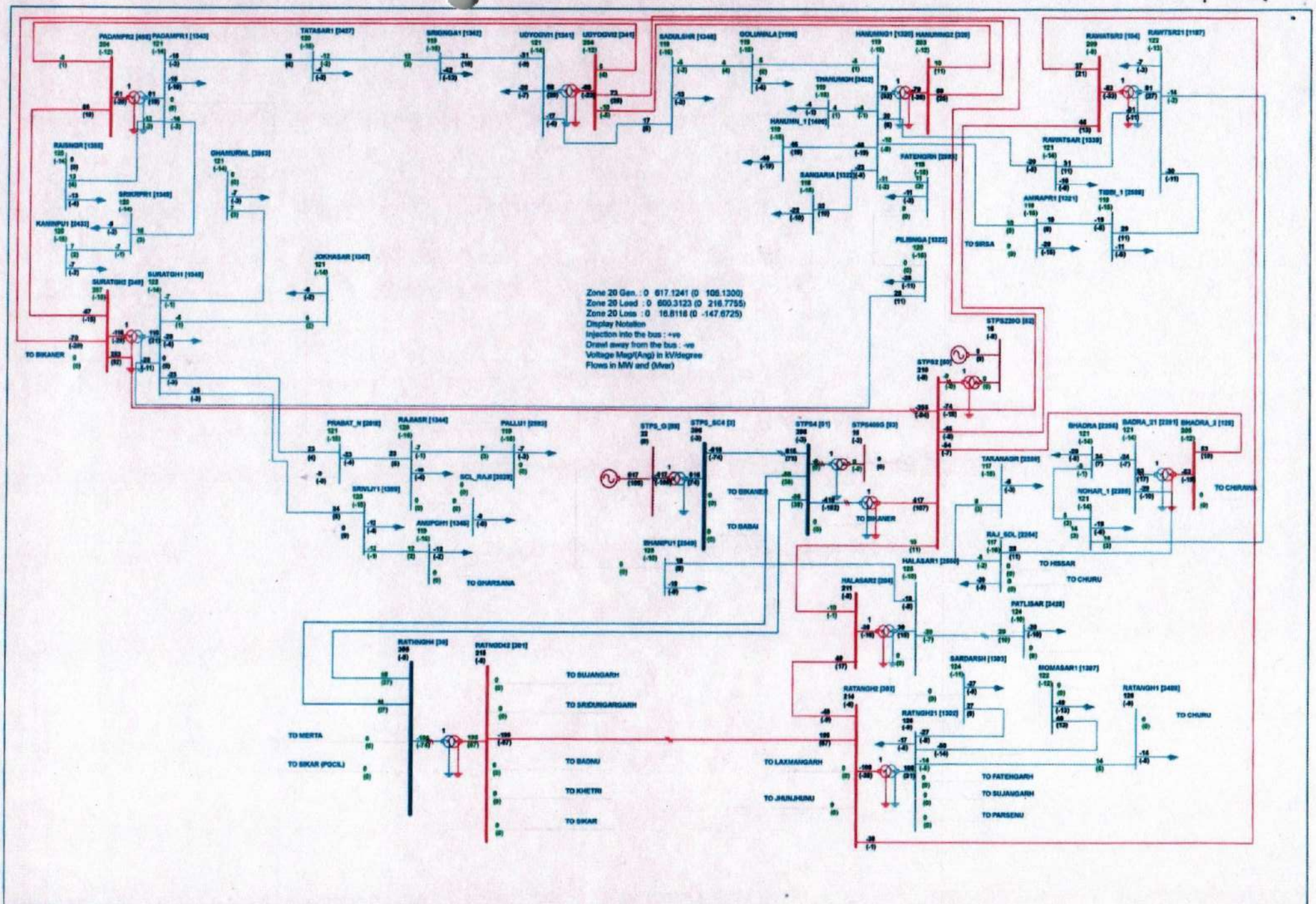
	Transmission Lines and Status of Under Frequency Relays for Sc-STPS Island	
S. No.	**Name of Line**	**Status**
1	400 kV S/C Suratgarh TPS-Bikaner Line	Operative
2	400 kV D/C Suratgarh SCTPS-Bikaner Line	Operative
3	400 kV D/C SCSTPS-STPS interconnector line	Blocked
4	400 kV D/C Suratgarh TPS-Ratangarh Line	Blocked
5	400 kV S/C Ratangarh-Merta Line	Operative
6	400 kV S/C Ratangarh-Sikar (PG) Line (Line owned by PGCIL)	Operative
7	220 kV S/C STPS-Halsar Line	Blocked
8	220 kV S/C Halsar-Ratangarh Line	Blocked
9	220 kV S/C STPS-Rawatsar Line	Blocked
10	220 kV S/C Rawatsar-Ratangarh Line	Blocked
11	220 kV S/C STPS-Bhadra Line	Blocked
12	220 kV S/C Bhadra-Chirawa Line	Operative
13	220 kV D/C STPS-Suratgarh Line	Blocked
14	220 kV S/C STPS-Udyogvihar Line	Blocked
15	220 kV S/C Suratgarh-Bikaner Line	Operative
16	220 kV S/C Suratgarh-Padampur Line	Blocked
17	220 kV S/C Suratgarh-Hanumangarh Line	Blocked
18	220 kV S/C Hanumangarh-Udyogvihar Line	Blocked
19	220 kV S/C Udyogvihar-Padampur Line	Blocked
20	220 kV D/C Ratangarh (400 kV GSS)-Ratangarh (220 kV GSS) Line	Blocked
21	220 kV D/C Ratangarh (400 kV GSS)-Sikar (PG) Line (RVPN line)	Operative
22	220 kV S/C Ratangarh (400 kV GSS)-Sujangarh Line	Operative
23	220 kV S/C Ratangarh (400 kV GSS)-Sridungargarh Line	Operative
24	220 kV S/C Ratangarh (400 kV GSS)-Badnoo Line	Operative
25	220 kV D/C Ratangarh (400 kV GSS)-Khetri Line	Operative
26	220 kV S/C Ratangarh (220 kV GSS)-Jhunjhunu Line	Operative
27	220 kV S/C Ratangarh (220 kV GSS)-Laxmangarh Line	Operative
28	132 kV S/C Suratgarh-Srivijaynagar Line	Blocked
29	132 kV S/C Srivijaynagar-Anoopgarh Line	Blocked
30	132 kV S/C Anoopgarh-Gharsana Line	Operative
33	132 kV S/C Suratgarh-Rajiasar Line	Blocked
34	132 kV S/C Rajiasar-Pallu Line	Blocked
35	132 kV S/C Pallu-Bhanipura Line	Operative
37	132 kV S/C Suratgarh-Jokhasar Line	Blocked
38	132 kV S/C Suratgarh-Ghamurwali Line	Blocked
39	132 kV S/C Ghamurwali-Padampur Line	Blocked/Operative
40	132 kV S/C Suratgarh-Pilibanga Line	Blocked
41	132 kV S/C Pilibanga-Fatehgarh Line	Blocked/Operative
42	132 kV S/C Fatehgarh-Hanumangarh Line	Blocked
43	132 kV S/C Hanumangarh-Goluwala Line	Blocked
44	132 kV S/C Hanumangarh-Sangaria Line	Blocked
45	132 kV S/C Hanumangarh-Amarpura Theri Line	Blocked
46	132 kV S/C Amarpura Their-Tibbi Line	Blocked

47	132 kV S/C Amarpura Their-Sirsa (Haryana) Line	Operative
48	132 kV S/C Hanumangarh (220 kV GSS)-Hanumangarh (132 kV GSS) Line	Blocked
49	132 kV S/C Hanumangarh-Rawatsar (132 kV GSS) Line	Blocked
50	132 kV S/C Udyogvihar-Sadulsahar Line	Blocked
51	132 kV S/C Udyogvihar-Sri-ganganar Line	Blocked
52	132 kV S/C Sri-ganganar-Tatarsar Line	Blocked/Operative
53	132 kV S/C Tatarsar-Padampur Line	Blocked
54	132 kV S/C Padampur-Raisingnagar Line	Blocked
55	132 kV S/C Padampur-Srikaranpur Line	Blocked
56	132 kV S/C Srikaranpur-Kaminpura Line	Blocked
57	132 kV S/C Rawatsar (220 kV GSS)-Rawatsar (132 kV GSS) line	Blocked
58	132 kV S/C Rawatsar (220 kV GSS)-Tibbi line	Blocked
59	132 kV S/C Rawatsar (220 kV GSS)-Nohar line	Blocked
60	132 kV S/C Nohar-Bhadra (132 kV GSS) line	Blocked
61	132 kV S/C Bhadra-Bhadra (220 kV GSS) line	Blocked
62	132 kV S/C Bhadra (220 kV GSS)-Sadulpur (Rajgarh) line	Blocked
63	132 kV S/C Sadulpur (Rajgarh)-Taranagar line	Blocked
64	132 kV S/C Sadulpur (Rajgarh)-Hissar (Haryana) line	Operative
65	132 kV S/C Sadulpur (Rajgarh)-Churu line	Operative
66	132 kV S/C NTPS Solar-Srivijaynagar	Operative
67	132 kV S/C NTPS Solar-Raisinghnagar	Operative
68	132 kV S/C Ratangarh (220 kV GSS)-Ratangarh (132 kV GSS) line	Blocked
69	132 kV S/C Ratangarh (132 kV GSS)-Sujangarh line	Operative
70	132 kV S/C Ratangarh (132 kV GSS)-Fatehpur line	Operative
71	132 kV S/C Ratangarh (132 kV GSS)-Parsenu line	Operative
72	132 kV D/C Patalisar Fanta-Halasar line	Blocked
73	132 kV S/C Sardarsahar-Halasar line	Operative
74	132 kV S/C Ratangarh (220 kV GSS)-Momasar line	Blocked
75	132 kV S/C Ratangarh (220 kV GSS)-Sardarsahar line	Blocked
76	132 kV S/C Halasar-Bhanipura line	Blocked
77	132 kV S/C Ratangarh (132 kV GSS)-Churu line	Operative
78	132 kV S/C Momasar-Patalisar Fanta line	Operative
Additional Lines to Install Under Frequency Relays		
79	132 kV S/C Churu-Bissau line	Blocked/Operative
80	132 kV S/C Gharsana-Khajuwala Line	Blocked/Operative

ANNEXURE-C

Transmission Network Included in STPS Island





PROPOSED CASE: TRANSMISSION NETWORK INCLUDED IN ISLAND OF SUPERCRITICAL THERMAL POWER STATION

EXHIBIT-1

204

PROPOSED ISLANDING SCHEME FOR RAJWEST (JSW) POWER PLANT

A Generation Details

1. The installed capacity of generators at Rajwest LTPS is 8x135 MW i.e. 1080 MW. Each unit gives a net dispatch of 120 MW. Under various scenarios, only 5-6 units are generating at Rajwest LTPS.
2. Islanding scheme is designed for Generation-720 MW and following units of Rajwest Power Plant are considered
   - 2 units at 220 kV voltage level= 2x120 MW=240 MW
   - 4 units at 400 kV voltage level= 4x120 MW=480 MW

   OR
   - 1 unit at 220 kV voltage level= 1x120 MW=120 MW
   - 5 units at 400 kV voltage level= 5x120 MW=600 MW
3. All other units are to be tripped at 48.20 Hz.
4. No RE Power Projects have been considered in the island. All RE generators are to be tripped at 48.2 Hz.

B Power System at Rajwest LTPS

Rajwest LTPS has following 400 kV and 220 kV system

- 400 kV S/C Rajwest-Barmer Line
- 400 kV S/C Rajwest-Jodhpur (Surpura) Line
- 400 kV S/C Rajwest-Kankani (Jodhpur) Line
- 220 kV D/C Rajwest-Barmer Line
- 220 kV S/C Rajwest-Dhorimanna Line

C Load Details

Identified load around Rajwest LTPS is 701 MW which includes loads of Barmer (293 MW) and Jodhpur (408 MW). GSS wise load details for 7015 MW is placed at **Annexure-A.** The critical loads viz. defence, Railways, Refinery & PHED is being fed from the following GSS:-

- 400 kV GSS Barmer
- 132 kV GSS Gadra Road
- 132 kV GSS Barmer
- 220 kV GSS Dhaurimanna
- 132 kV GSS Gudamalani
- 132 kV GSS NPH (Jodhpur)
- 132 kV GSS MBM Engineering College
- 132 kV GSS OPH (Jodhpur)
- 132 kV GSS Banar

- 132 kV GSS Mandore
- 132 kV GSS Chopasani Housing Board
- 132 kV GSS Soorsagar

D Proposed Islanding Scheme

1. Islanding shall take place at 48.0 Hz with a time delay of 100 ms.
2. All dedicated feeders for critical loads viz. Defence, DRDO, refinery, railway etc. are to be kept in blocked mode even if these are open access consumers. Dedicated feeders for rest of open access consumers are to be kept operative at frequency of 48.1 Hz (Note: to be monitored by SE (SO&LD).
3. Transmission lines of 400 kV, 220 kV and 132 kV voltage levels considered for the islanding are attached at **Annexure-B.** The settings of under frequency relays in the Island are to be kept as indicated in the **Annexure-B.** All under frequency relays settings are to be considered as 48.0 Hz with a time delay of 100 ms.During the condition of light loads, the load-generation balance is to be maintained by changing the blocked/operative status of the additional lines identified to include additional GSS in the island **(Annexure-B).**
4. 80 MVAR, 400 kV bus reactor at 400 kV GSS Kankani, and 125 MVAR, 400 kV bus reactor at 400 kV GSS Barmer are to be equipped with the UFR relays in order to maintain the voltages within permissible limits
5. To indicate the blocked/operative mode of transmission lines, SLD for 400 kV network, 220 kV & 132 kV network of Barmer region and 220 kV & 132 kV network of Jodhpur regionare placed at **Annexure-C, D and E** respectively.

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, D and E**for a total load of 701 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	=	720 MW
Load	=	701 MW
Losses	=	19 MW

It is observed that loading on all the lines and transformers included in the island of Rajwest LTPS is normal and overloading is not observed.

G. Results of Transient Stability Studies

Transient stability study is carried for the network included in the island of Rajwest LTPS by opening all the lines which are kept in the operative state at time=1 second after the start of simulation. Various plots are discussed below:-

1. Active Power Curve

Plots of the electrical power generated by the generators (4x135 MW +2x135 MW) at Rajwest LTPS are illustrated in Fig. 1. It is observed that the generated active power varies between 480 MW to 475 MW (Excluding the auxiliary power) for the generator connected on the 400 kV voltage level (4x135 MW). Further, it is also observed that the generated active power varies between 234MW to 246 MW (Excluding the auxiliary power) for the generator connected on the 220 kV voltage level (2x135 MW). Variations in the generated active power are settling after a time period of 10 seconds and island becomes stable.

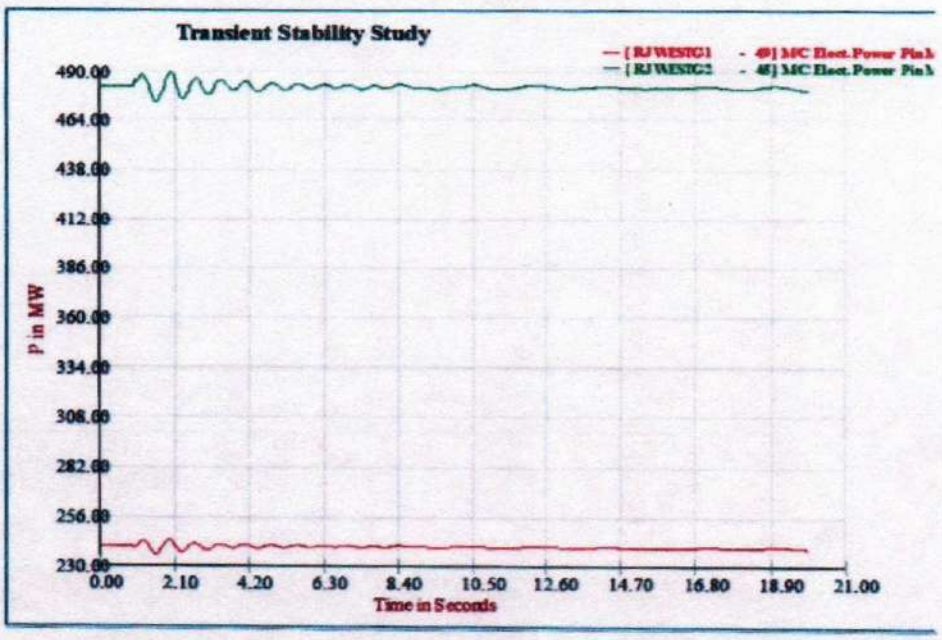


Fig. 1 Active power curve of Rajwest LTPS generators

2. Reactive Power Curve

Plots of the reactive power generated by the generators (4x135 MW +2x135 MW) at Rajwest LTPS are illustrated in Fig. 2. It is observed that the reactive power exchanged between generator connected on the 400 kV voltage level (4x135 MW) and grid varies from -55 MVAR and settles to a value of +5 MVAR after a time period of 5 seconds.Similarly, the reactive power exchange between the generator connected on the 220 kV voltage level (2x135 MW) and grid varies from +0.25 MVAR and settles to a value of +35 MVAR after a time period of 5 seconds. This indicates that reactive power settles down after 5 seconds and island becomes stable.

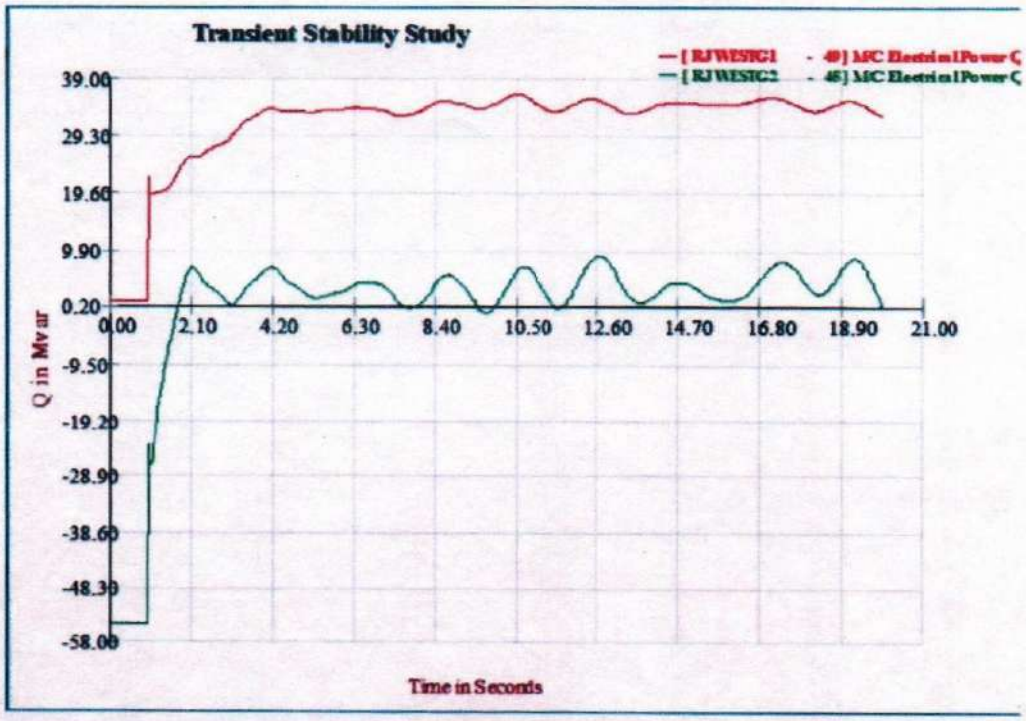


Fig. 2 Reactive Power variations during islanding condition

3. Load Angle Curve

The load angle curves of the generators (4x135 MW +2x135 MW) at Rajwest LTPS are illustrated in Fig. 3. Load angle for generator connected to 220 kV voltage bus (2x135 MW) first decreases from 24.5° to 22° and finally settles at 41.5° in 18.5 seconds. Further, load angle for generator connected to 400 kV voltage bus (4x135 MW) first decreases from 23° to 21.5° and finally settles at 40° in 18.5 seconds. Hence, network included in the island of Rajwest LTPS will operate at a new load angle in stable state.

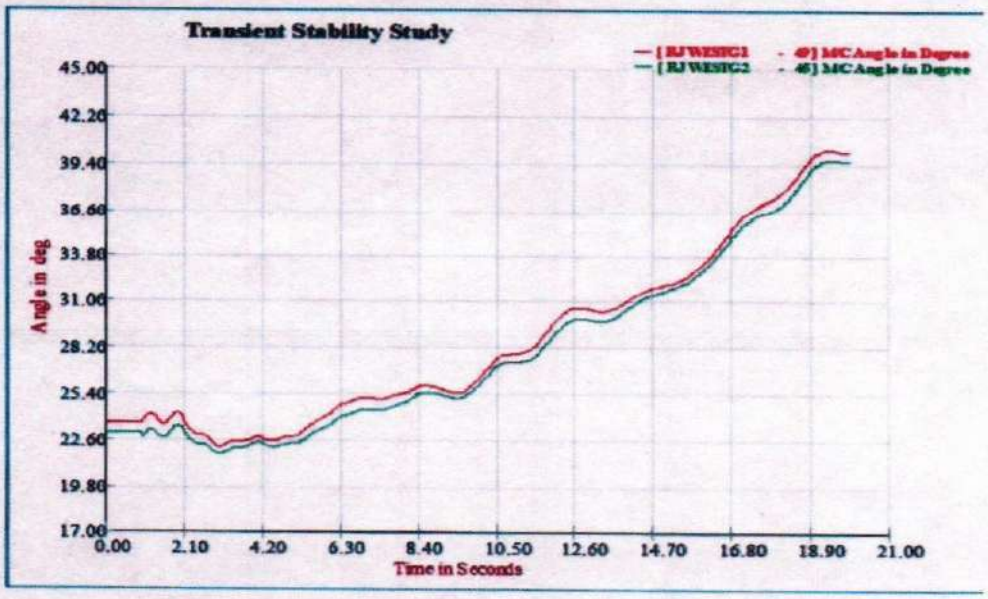


Fig. 3 Load angle curve

4. Frequency Plot

Plot of grid frequency is illustrated in Fig. 4. It is observed that grid frequency varies between 49.97 HZ to 50.01 HZ after the formation of island and finally again settles to the value of 50 HZ in a time period of 20 seconds for both the generators connected to 400 kV voltage bus and 220 kV voltage bus (4x135 MW +2x135 MW) which indicates that the island will operate in the stable state.

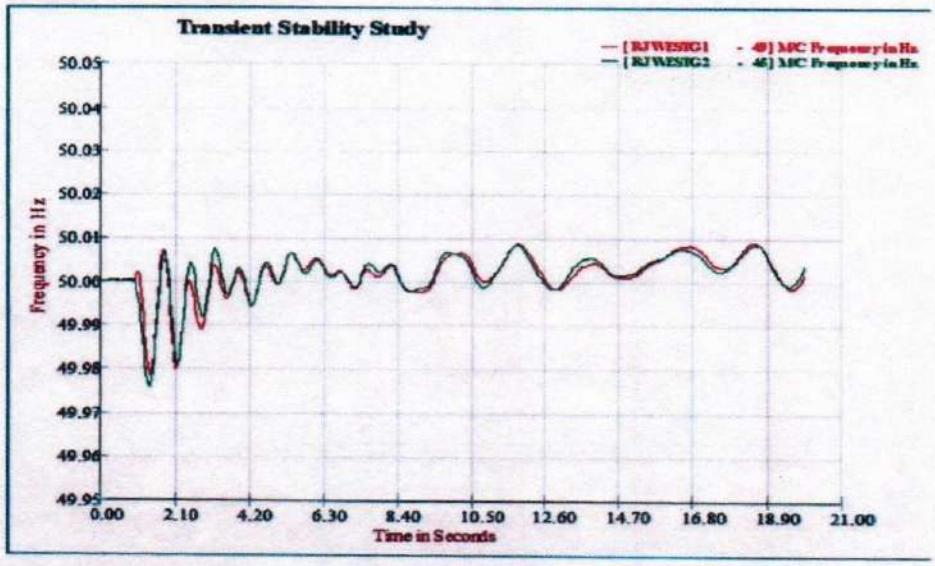


Fig. 4 Variation of frequency during islanding condition

5. Variation of Voltage

Plot of grid voltage at the Rajwest LTPS at the terminals of both generators connected to 400 kV voltage bus and 220 kV voltage bus (4x135 MW +2x135 MW) is illustrated in Fig. 5. It is observed that grid voltage first dips to 0.975pu and finally again settles at 1.0pu after a time period of 20 seconds. This indicates that the island will operate in the stable state.

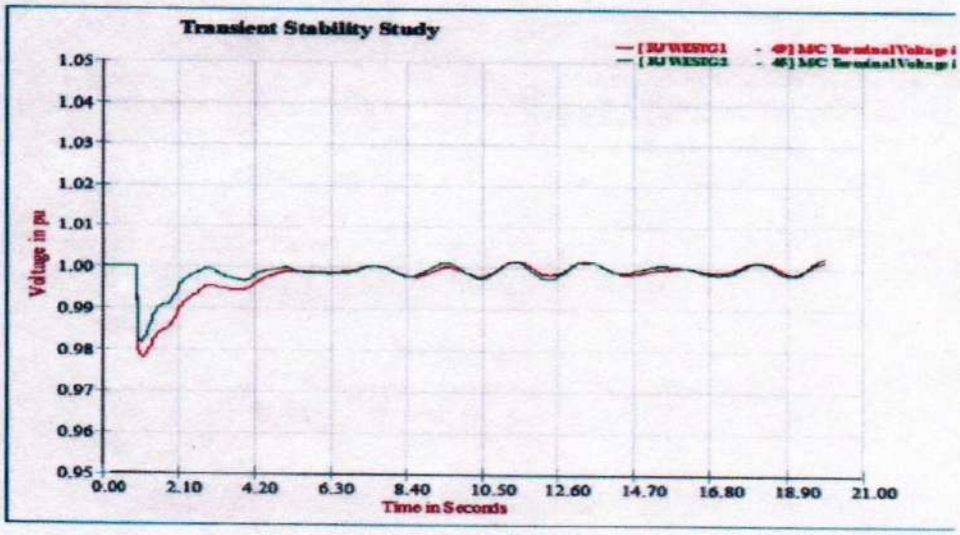


Fig. 5 Voltage variations during islanding condition

H. Conclusion

Proposed islanding is designed after detailed discussion with the field officers and officers from the MPT&S, Communications, Automations and LD. Based on the feedback/inputs of Officers and results of load flow studies & Transient stability 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 Rajwest LTPS.
- 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.
- Results of transient stability study indicate that network included in the island of Rajwest LTPS becomes stable after incidence of islanding event in respect of voltage variations, frequency variations, load angle variations, active power variations and reactive power variations.
- Proposed islanding scheme can be practically implemented on the transmission network of RVPN considering 4x135 MW machines at Rajwest LTPS connected to 400 kV voltage bus and 2x135 MW machines at Rajwest LTPS connected to 220 kV voltage bus. 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.

Annexure-A

Load on GSS considered in Islanding Scheme for Rajwest TPS

S. No.	Name of GSS	Maximum Load (MW)	Simultaneous Load (MW)	Minimum Load (MW)	Essential Loads
A	**Load in Barmer**				
1	400 kV GSS Barmer	11.54	5.00	4.00	Defennce
2	132 kV GSS Gadra Road	30.32	19.00	0.474	Defence
3	132 kV GSS Barmer	44.44	35.00	12.88	Defence
4	132 kV GSS Mahloo	34.18	18.00	9.91	
	Load at Barmer	**120.48**	**77.00**	**27.26**	
5	220 kV GSS Dhaurimanna	59.64	43.00	0.47	Defence
6	132 kV GSS Ranasar	22.13	18.00	0.68	
7	132 kV GSS Ramji ki Gol	19.82	12.00	8.06	
8	132 kV GSS Gudamalani	23.03	22.00	10.73	RGD
9	132 kV GSS Sawa	42.34	27.00	8.5	
10	132 kV GSS Chouhtan	19.06	12.00	3.9	
	Load at Dhaurimanna	**186.02**	**134.00**	**32.34**	
11	220 kV GSS Balotra	64.84	37.00	0.7	
12	132 kV GSS Sindhari	22.29	15.00	4.1	
13	132 kV GSS Samdari	16.97	13.00	0.23	
14	132 kV GSS Siwana	24.66	17.00	2.25	
	Load at Balotra	**128.76**	**82.00**	**7.28**	
	Total load in Barmer	**435.26**	**293.00**	**66.884**	
B	**Load in Jodhpur**				
1	220 kV GSS Boranada	52.00	35.00	0.98	
2	220 kV GSS Jodhpur	65.00	57.00	1.00	
3	220 kV GSS Barli	24.00	0.00	0.94	
4	220 kV GSS Jhalamand	13.17	1.00	0.22	
5	132 kV GSS NPH (Jodhpur)	64.00	73.00	15.00	Air Force, AIIMS, MGH, MDMH
6	132 kV GSS MBM Engineering College	19.58	19.00	1.89	DRDO. Airport
7	132 kV GSS OPH (Jodhpur)	43.00	29.00	2.00	Railway through DISCOM's 33/11 kV GSS
8	132 kV GSS Banar	72.00	52.00	44.00	Defence
9	132 kV GSS Kuri Bhagtasani	30.86	23.00	1.60	
10	132 kV GSS Mandore	32.00	12.00	8.00	Defence, DRDO
11	132 kV GSS Pratapnagar (Jodhpur)	38.00	32.00	3.00	
12	132 kV GSS Chopasani Housing Board	67.28	45.00	6.43	MDM Hospital
13	132 kV GSS PSB	4.50	1.00	0.02	
14	132 kV GSS Soorsagar	35.42	29.00	1.33	Defence
	Total load in Barmer	**560.81**	**408.00**	**86.41**	
	Total load in Barmer & Jodhpur	**996.07**	**701.00**	**153.29**	

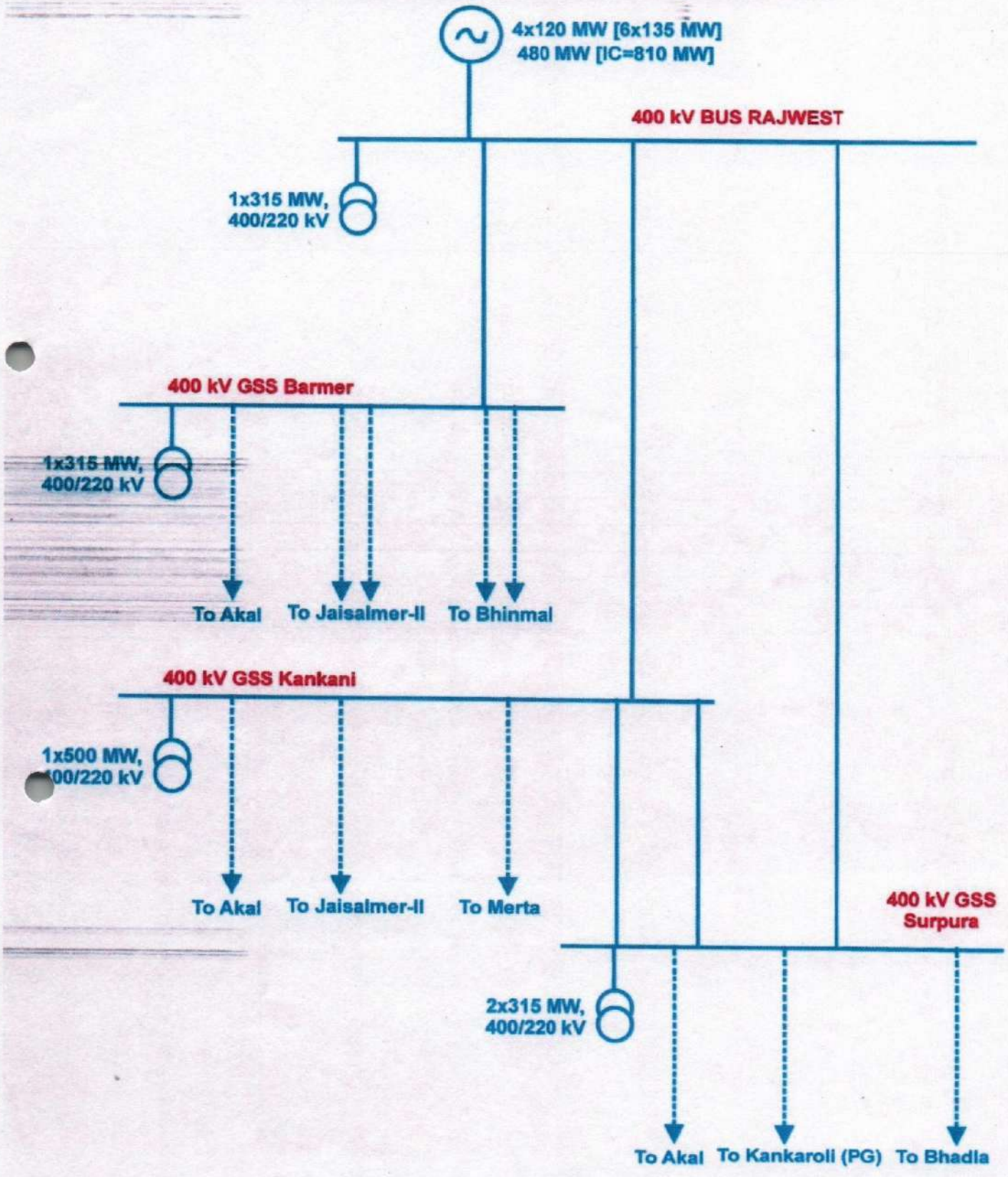
Annexure-B

	Transmission Lines and Status of Under Frequency Relays for Rajwest Islanding Scheme	
S. No.	**Name of Line**	**Status**
1	400 kV S/C Rajwest-Barmer line	Blocked
2	400 kV S/C Rajwest-Jodhour (Surpura) line	Blocked
3	400 kV S/C Rajwest-Kanknai (Jodpur) line	Blocked
4	220 kV D/C Rajwest-Barmer line	Blocked
5	220 kV S/C Rajwest-Dhaurimana line	Blocked
6	400 kV D/C Barmer-Jaisalmer-II line	Operative
7	400 kV S/C Barmer-Jaisalmer-I (Akal) line	Operative
8	400 kV D/C Barmer-Bhinmal line	Operative
9	220 kV S/C Barmer-Dhaurimana line	Blocked
10	220 kV D/C Barmer-Giral LTPS line	Operative
11	220 kV S/C Barmer-Giral LTPS line	Operative
12	220 kV S/C Barmer-Jaisalmer-I (Akal) line	Operative
13	220 kV S/C Barmer-Balotra line	Blocked
14	220 kV D/C Giral LTPS-Balotra line	Operative
15	132 kV S/C Barmer (400 kV GSS)-Gadra Road line	Blocked
16	132 kV S/C Barmer (400 kV GSS)-Barmer line Ckt-I	Blocked
17	132 kV S/C Barmer (400 kV GSS)-Barmer line Ckt-II	Blocked
18	132 kV S/C Barmer (400 kV GSS)-Sheo line	Operative
19	132 kV S/C Barmer(132 kV GSS)-Balotra line	Blocked
20	132 kV S/C Barmer(132 kV GSS)-Mahloo line	Blocked
21	220 kV S/C Dhaurimanna-Sanchore line	Blocked/Operative
22	220 kV S/C Dhaurimanna-Bhinmal line	Operative
23	132 kV S/C Dhaurimanna-Ranasar line	Blocked
24	132 kV S/C Dhaurimanna-Ramji ki Gol line	Blocked
25	132 kV S/C Dhaurimanna-Gudamalani line	Blocked
26	132 kV S/C Ranasar-Sawa line	Blocked
27	132 kV S/C Sawa-Sedwa line	Operative
28	132 kV S/C Sawa-Chouhtan line	Blocked
29	132 kV S/C Gudamalani-Bagora line	Operative
30	220 kV S/C Balotra-Jalore line	Operative
31	220 kV S/C Balotra-Boranada line	Blocked
32	132 kV S/C Balotra-Samdari line	Blocked
33	132 kV S/C Balotra-Siwana line	Blocked
34	132 kV S/C Balotra-Sindhari line	Blocked
35	132 kV S/C Siwana-Mandawala line	Operative
36	132 kV S/C Sindhari-Juna Mitha Khera line	Operative
37	400 kV S/C Jodhpur (Surpura)-Bhadla line	Operative
38	400 kV S/C Jodhpur (Surpura)-Akal line	Operative
39	400 kV S/C Jodhpur (Surpura)-Kankroli line	Operative
40	400 kV S/C Jodhpur (Surpura)-Kankani line Ckt-I	Blocked
41	400 kV S/C Jodhpur (Surpura)-Kankani line Ckt-I	Blocked
42	220 kV D/C Jodhpur (Surpura)-Bhawad line	Operative

43	220 kV 2xS/C Jodhpur (Surpura)-Tinwari line	Operative
44	220 kV S/C Jodhpur (Surpura)-Bilara line	Operative
45	220 kV S/C Jodhpur (Surpura)-Barli line	Blocked
46	132 kV S/C Madore (Surpura)-Banar line	Blocked
47	132 kV D/C Banar-OPH line	Blocked
48	132 kV S/C OPH-MBM Engineering college line	Opened
49	132 kV D/C MBM Engineering college-NPH line	Blocked
50	132 kV D/C NPH-Jodhpur (Basni) line	Blocked
51	132 kV S/C Jodhpur (Basni)-Kuri line	Blocked
52	132 kV S/C Kuri-Banar line	Blocked
53	132 kV S/C Mandore-Mathania line	Operative
54	220 kV S/C Jodhpur (Basni)-Barli line	Blocked
55	220 kV S/C Jodhpur (Basni)-Boranada line	Blocked
56	220 kV S/C Jodhpur (Basni)-Jhalamand line	Blocked
57	220 kV S/C Jodhpur (Basni)-Kankani line	Blocked
58	132 kV D/C Jodhpur (Basni)-CHB line	Blocked
59	132 kV S/C Jodhpur (Basni)-Bhawad line	Operative
60	132 kV S/C Jodhpur (Basni)-Jhalamand line	Blocked
61	132 kV S/C Jodhpur (Basni)-Boranada line	Blocked
62	132 kV S/C Boranada-Pali line	Operative
63	220 kV D/C Jhalamand-Kankani line	Blocked
64	132 kV S/C Jhalamand-Bilara line	Operative
65	220 kV D/C Barli-Kankani line	Blocked
66	132 kV S/C Barli-PS8 line	Blocked
67	132 kV D/C Barli-CHB line	Blocked
68	132 kV D/C CHB-Pratap Nagar line	Blocked
69	132 kV S/C Barli-Soorsagar line	Blocked
70	132 kV S/C Soorsagar-Tinwari line	Operative
71	132 kV S/C PS8-Tinwari line	Operative
72	400 kV S/C Kankani-Merta line	Operative
73	400 kV S/C Kankani- Akal line	Operative
74	400 kV S/C Kankani- Jaisalmer-II line	Operative
75	220 kV S/C Kankani- Pali line	Operative
76	132 kV Sawa-Sedwa line	Operative
77	132 kV Sawa-Chouhtan line	Blocked
Additional lines proposed for installation of UFRs for load management		
78	220 kV S/C Sanchore-Bhinmal (PG) line	Blocked/Operative
79	132 kV S/C Sedwa-Sata line	Blocked/Operative
80	132 kV S/C Sata-Galifa line	Blocked/Operative
81	132 kV S/C Sata-Sanchore line	Blocked/Operative
82	132 kV S/C Sanchore-Paladar line	Blocked/Operative
83	132 kV S/C Sanchore (220 kV GSS)-Sanchore (132 kV GSS) line	Blocked/Operative
84	132 kV S/C Sanchore (220 kV GSS)-Bhadroona line	Blocked/Operative
85	132 kV S/C Bhadroona-Bhinmal line	Operative
86	132 kV S/C Dhaurimanna-Bagora line	Blocked/Operative
87	132 kV S/C Bagora-Jeran line	Operative

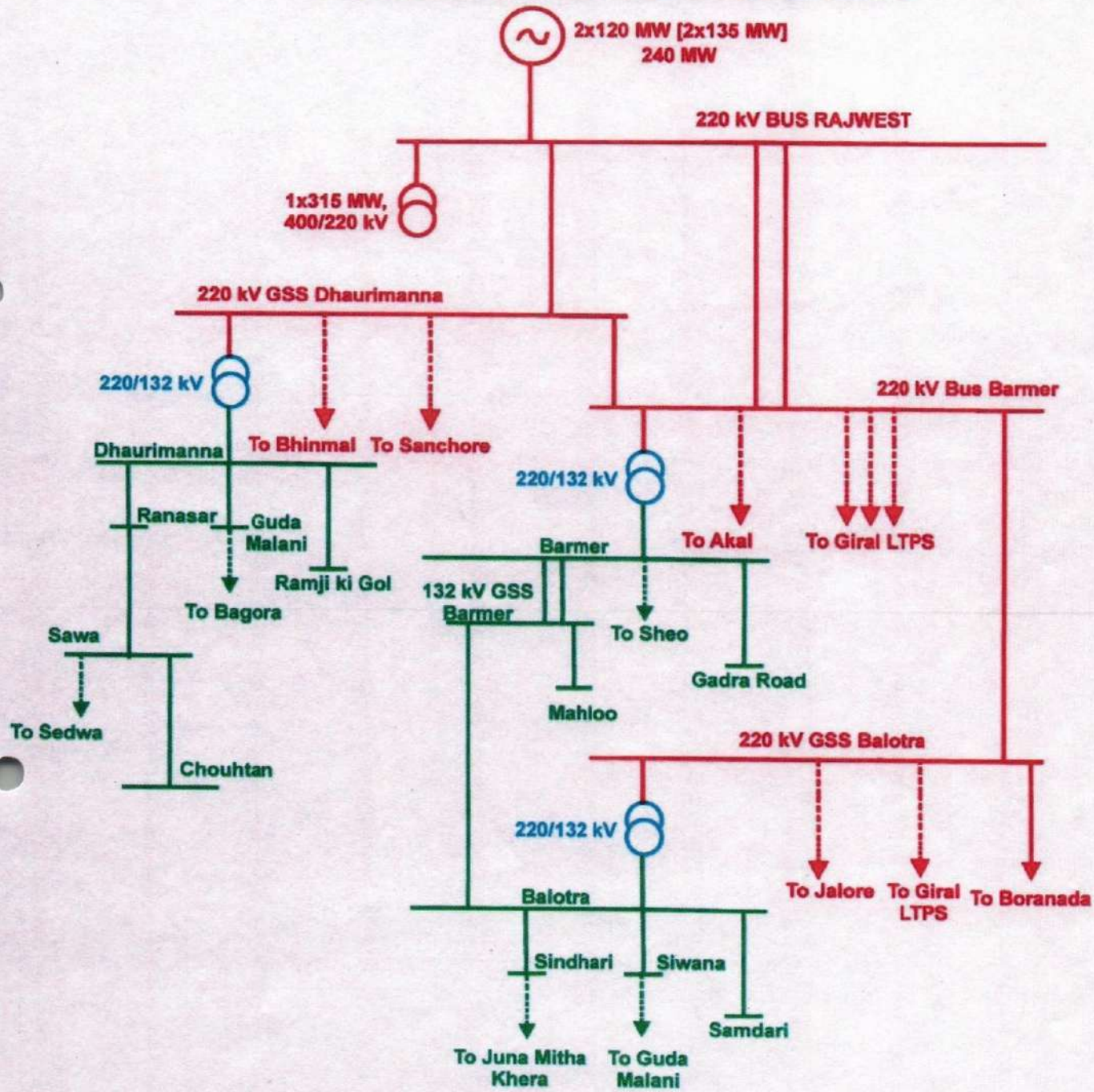
ANNEXURE -C

400 kV Network Included in Rajwest Island



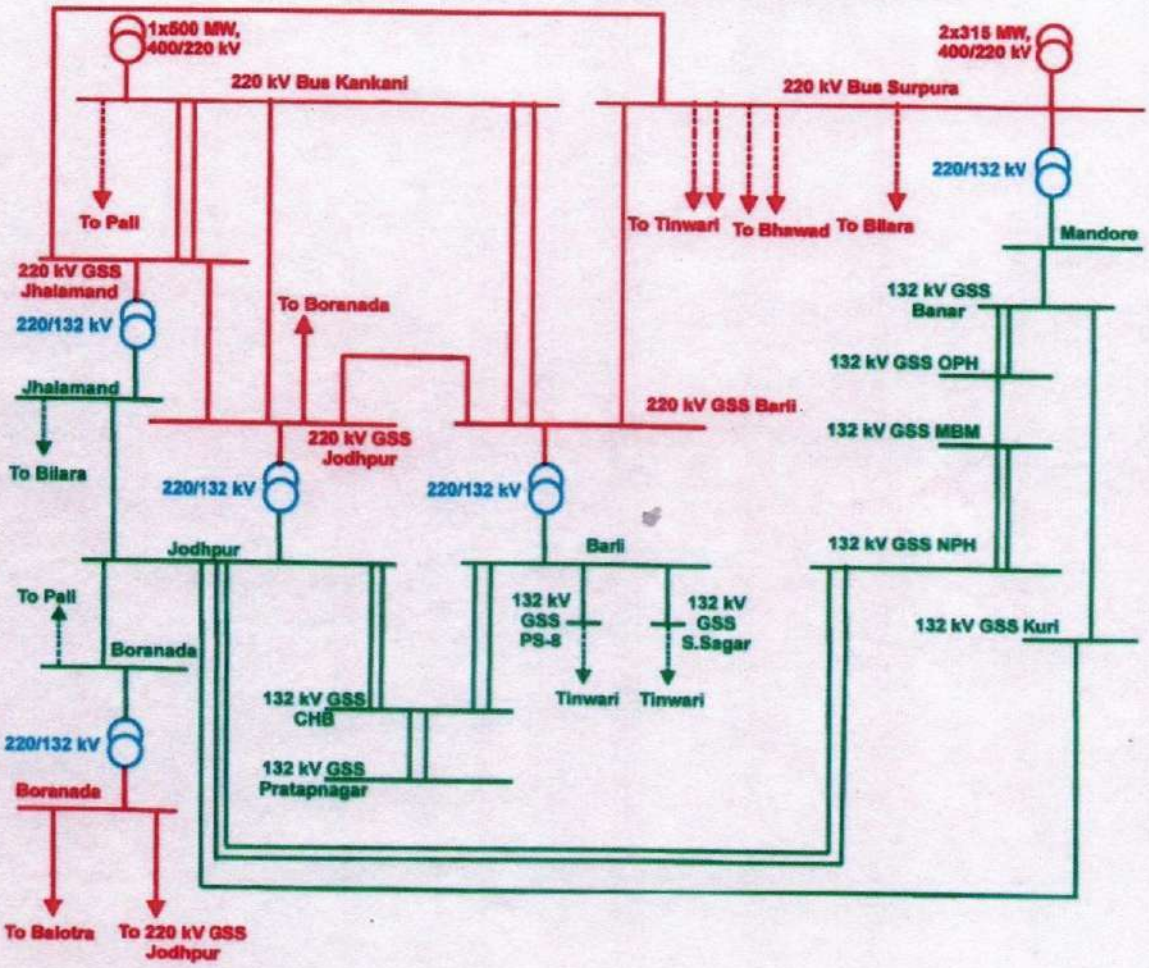
ANNEXURE-D

220 kV Network Included in Rajwest Island



ANNEXURE-E

220 kV Network Included in Rajwest Island (Jodhpur City)



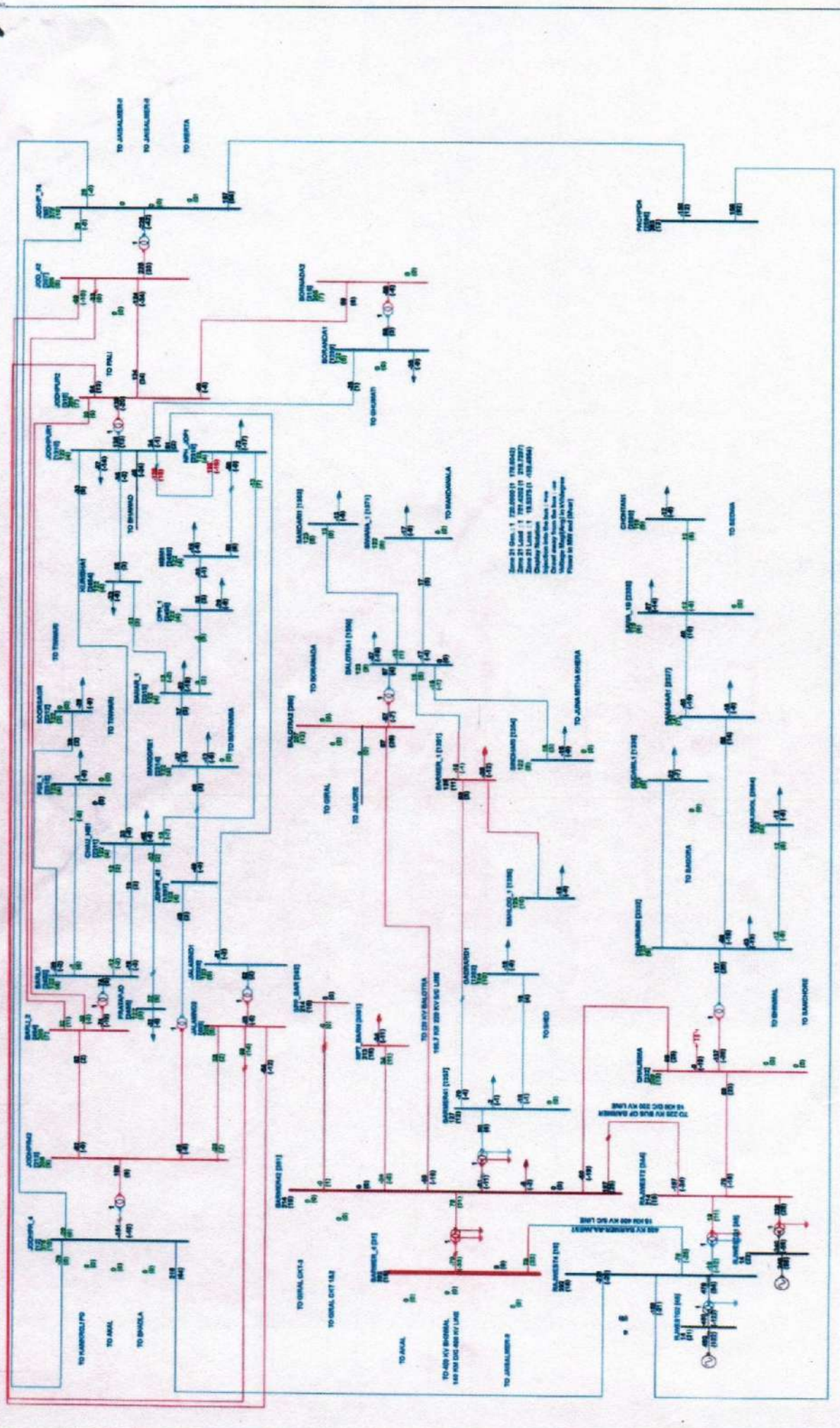


EXHIBIT I

PROPOSED CASE : TRANSMISSION NETWORK INCLUDED IN ISLAND OF RAJWEST THERMAL POWER STATION

Annexure A.IV

List of stations which are completely Offline on NPP portal in the month of June-2022

S.NO.	REGION	SECTOR	STATE	UTILITY	STN TYPE	FUEL	STATION
1	Eastern	CENTRAL SECTOR	Jharkhand	DVC	THERMAL	COAL	BOKARO TPS `A` EXP
2			West Bengal	DVC	THERMAL	COAL	DURGAPUR TPS
3		IPP SECTOR	Odisha	ICCL	THERMAL	COAL	ICCL IMP
4			Odisha	NALCO	THERMAL	COAL	NALCO IMP
5			Odisha	VEDANTA	THERMAL	COAL	VEDANTA TPP
6		STATE SECTOR	Jharkhand	JUUNL	HYDRO	HYDRO	SUBERNREKHA-I HPS
7			Jharkhand	JUUNL	HYDRO	HYDRO	SUBERNREKHA-II HPS
8			Odisha	APGENCO	HYDRO	HYDRO	MACHKUND HPS
9			Odisha	OHPC	HYDRO	HYDRO	BALIMELA HPS
10			Odisha	OHPC	HYDRO	HYDRO	CHIPLIMA HPS
11			Odisha	OHPC	HYDRO	HYDRO	HIRAKUD HPS
12			Odisha	OHPC	HYDRO	HYDRO	RENGALI HPS
13			Odisha	OHPC	HYDRO	HYDRO	UPPER INDRAVATI HPS
14			Odisha	OHPC	HYDRO	HYDRO	UPPER KOLAB HPS
15			West Bengal	WBSEDCL	HYDRO	HYDRO	PURULIA PSS HPS
16	North Eastern	STATE SECTOR	Tripura	TSECL	THERMAL	NATURAL	BARAMURA GT
17			Tripura	TSECL	THERMAL	NATURAL	ROKHIA GT
18	Northern	CENTRAL SECTOR	Himachal Pradesh	NTPC Ltd.	HYDRO	HYDRO	KOLDAM
19			Uttar Pradesh	MUNPL	THERMAL	COAL	MEJA STPP
20		IPP SECTOR	Uttarakhand	GIPL	THERMAL	NATURAL	GAMA CCPP
21		STATE SECTOR	Delhi	IPGCL	THERMAL	NATURAL	I.P.CCPP
22			Delhi	PPCL	THERMAL	NATURAL	PRAGATI CCGT-III
23			Jammu and Kashmir	JKSPDC	HYDRO	HYDRO	BAGLIHAR II HPS
24			Punjab	PSPCL	HYDRO	HYDRO	ANANDPUR SAHIB-I HPS
25			Punjab	PSPCL	HYDRO	HYDRO	ANANDPUR SAHIB-II HPS
26			Punjab	PSPCL	THERMAL	COAL	GH TPS (LEH.MOH.)
27			Rajasthan	RRVUNL	HYDRO	HYDRO	JAWAHAR SAGAR HPS
28			Rajasthan	RRVUNL	HYDRO	HYDRO	R P SAGAR HPS
29			Rajasthan	RRVUNL	THERMAL	LIGNITE	GIRAL TPS
30			Rajasthan	RRVUNL	THERMAL	NATURAL	DHOLPUR CCPP
31			Rajasthan	RRVUNL	THERMAL	NATURAL	RAMGARH CCPP
32			Uttar Pradesh	UPJVNL	HYDRO	HYDRO	KHARA HPS
33			Uttar Pradesh	UPJVNL	HYDRO	HYDRO	MATATILA HPS
34			Uttar Pradesh	UPRVUNL	THERMAL	COAL	PARICHHA TPS
35			Uttarakhand	UJVNL	HYDRO	HYDRO	CHILLA HPS
36			Uttarakhand	UJVNL	HYDRO	HYDRO	DHALIPUR HPS

37	Southern	IPP SECTOR	Andhra Pradesh	BSES AP	THERMAL	NATURAL	PEDDAPURAM CCPP
38			Andhra Pradesh	KONA	THERMAL	NATURAL	KONASEEMA CCPP
39			Andhra Pradesh	LVS POWER	THERMAL	DIESEL	LVS POWER DG
40			Andhra Pradesh	MEL	THERMAL	COAL	THAMMINAPATNAM TPS
41			Andhra Pradesh	SEPL	THERMAL	COAL	SIMHAPURI TPS
42			Kerala	BSES(C)	THERMAL	NAPTHA	COCHIN CCPP (Liq.)
43			Tamil Nadu	IBPIL	THERMAL	COAL	TUTICORIN (P) TPP
44			Tamil Nadu	MADURAI P	THERMAL	DIESEL	SAMAYANALLUR DG
45			Tamil Nadu	PENNA	THERMAL	NATURAL	VALANTARVY CCPP
46			Tamil Nadu	SAMALPATI	THERMAL	DIESEL	SAMALPATTI DG
47			Tamil Nadu	ST-CMSECP	THERMAL	LIGNITE	NEYVELI TPS(Z)
48		STATE SECTOR	Karnataka	KPCL	HYDRO	HYDRO	BHADRA HPS
49			Karnataka	KPCL	HYDRO	HYDRO	SIVASAMUNDRUM HPS
50			Kerala	KSEB	HYDRO	HYDRO	NARIAMANGLAM HPS
51			Kerala	KSEB	HYDRO	HYDRO	PALLIVASAL HPS
52			Kerala	KSEB	HYDRO	HYDRO	SENGULAM HPS
53			Kerala	KSEB	THERMAL	DIESEL	BRAMHAPURAM DG
54			Kerala	KSEB	THERMAL	DIESEL	KOZHIKODE DG
55			Puducherry	P&ED, Pudu.	THERMAL	NATURAL	KARAIKAL CCPP
56			Tamil Nadu	TANGEDCO	HYDRO	HYDRO	ALIYAR HPS
57			Tamil Nadu	TANGEDCO	HYDRO	HYDRO	KADAMPARI HPS
58			Tamil Nadu	TANGEDCO	HYDRO	HYDRO	KUNDAH-V HPS
59			Tamil Nadu	TANGEDCO	HYDRO	HYDRO	PARSON`S VALLEY HPS
60			Tamil Nadu	TANGEDCO	HYDRO	HYDRO	SARKARPATHY HPS
61			Tamil Nadu	TANGEDCO	HYDRO	HYDRO	SHOLAYAR HPS (TN)
62			Tamil Nadu	TANGEDCO	THERMAL	NAPTHA	BASIN BRIDGE GT (Liq.)
63	Western	IPP SECTOR	Gujarat	CLPINDIA	THERMAL	NATURAL	PEGUTHAN CCPP
64			Gujarat	EPGL	THERMAL	COAL	SALAYA TPP
65			Maharashtra	JSWEL	THERMAL	COAL	JSW RATNAGIRI TPP
66			Maharashtra	VIP	THERMAL	COAL	BUTIBORI TPP
67			Maharashtra	WPCL	THERMAL	COAL	WARDHA WARORA TPP
68		PVT SECTOR	Maharashtra	TATA MAH.	HYDRO	HYDRO	BHIRA HPS
69			Maharashtra	TATA MAH.	HYDRO	HYDRO	BHIVPURI HPS
70			Maharashtra	TATA MAH.	HYDRO	HYDRO	KHOPOLI HPS
71		STATE SECTOR	Gujarat	GPPCL	THERMAL	NATURAL	PIPAVAV CCPP
72			Gujarat	GSECL	THERMAL	NATURAL	UTRAN CCPP
73			Maharashtra	MAHAGENCO	THERMAL	COAL	KHAPARKHEDA TPS
74			Maharashtra	MAHAGENCO	THERMAL	COAL	KORADI TPS
75			Maharashtra	MAHAGENCO	THERMAL	COAL	PARLI TPS
76			Maharashtra	MAHAGENCO	THERMAL	NATURAL	URAN CCPP

Transmission system for evacuation of power from Rajasthan REZ Ph-IV (Part-1) (Bikaner Complex: 7.7GW)

S. No.	Items	Details
1.	**Name of Scheme**	Transmission system for evacuation of power from Rajasthan REZ Ph-IV (Part-1) (Bikaner Complex : 7.7GW)
2.	**Scope of the scheme**	Transmission system for evacuation of power from Rajasthan REZ Ph-IV (Part-1) **(Bikaner Complex: 7.7GW)** **(Bikaner-II : 3.7GW (Solar) + Bikaner-III : 4GW (7GW Solar+3GW BESS)** • Establishment of 6x1500 MVA, 765/400kV & 5x500 MVA^ 400/220kV Bikaner-III Pooling Station along with 2x330 MVAr (765kV) Bus Reactor & 2x125 MVAr (420kV) Bus Reactor at a suitable location near Bikaner **Future provisions at Bikaner-III PS*:** **Space for** ➢ 765/400kV ICT along with bays- 1 no. ➢ 765 kV line bays along with switchable line reactors – 4 nos. ➢ 765kV Bus Reactor along with bay: 1 no. ➢ 400 kV line bays along with switchable line reactor –4 nos. ➢ 400 kV line bays–4 nos. ➢ 400/220kV ICT along with bays -5 nos. ➢ 400 kV Bus Reactor along with bay: 1 no. ➢ 400kV Sectionalization bay: 2 sets ➢ 220 kV line bays for connectivity of RE Applications - 6 nos.* ➢ 220kV Sectionalization bay: 3 sets ➢ STATCOM (2x±300MVAr) along with MSC (4x125 MVAr) & MSR (2x125 MVAr) • Augmentation with 400/220 kV, 5x500 MVA^ ICT at Bikaner-II PS • Augmentation with 765/400 kV, 1x1500MVA ICT (4th) at Bikaner (PG) • LILO of both ckts of 400kV Bikaner (PG)-Bikaner-II D/c line at Bikaner-III PS (~20 km) • Bikaner-II PS – Bikaner-III PS 400 kV D/c line (Quad) (~30 km) • Establishment of 765/400 kV, 4x1500 MVA Neemrana-II S/s along with 2x330 MVAr (765kV)

S. No.	Items	Details
		Bus Reactor & 2x125 MVAr (420kV) Bus Reactor at a suitable location near Neemrana **<u>Future provisions at Neemrana-II S/s:</u>** **Space for** ➢ 765/400kV ICT along with bays- 2 no. ➢ 765 kV line bays along with switchable line reactors – 6 no. ➢ 765kV Bus Reactor along with bay: 1 no. ➢ 400 kV line bays along with switchable line reactor –6 no. ➢ 400 kV Bus Reactor along with bays: 1 no. ➢ 400kV Sectionalization bay: 2 sets • Bikaner-III – Neemrana-II 765 kV 2xD/c line (~350 km) along with 330 MVAr switchable line reactor for each circuit at each end • Neemrana-II- Bareilly(PG) 765 kV D/c line (~350 km) along with 330 MVAr switchable line reactor for each circuit at each end • Neemrana-II -Kotputli 400 kV D/c line (Quad)(~70 km) • Augmentation by 400/220 kV, 1x500 MVA (3rd) ICT at Kotputli (PG) • LILO of both ckts of Sohna Road(GPTL)-Gurgaon(PG) D/c line at Neemrana-II S/s (~85 km) • 220 kV line bays at Bikaner-III PS for RE Connectivity (6 nos)* ***^incl 1x500MVA ICT to fulfill 'N-1' requirement*** **** Recently, 220kV bays (4 nos) at Bikaner-III PS agreed in CMETS-NR meetings commensurate to Stage-II connectivity applications granted . In view of that 220 kV line bays at Bikaner-III PS for RE Connectivity (6 nos.) is taken up in addition to the scope agreed in 8th CMETS-NR meeting. The corresponding no. of 220 kV bays reduced from Future scope of Bikaner-III PS.***
3.	**Depiction of the scheme on Transmission Grid Map**	Attached at **Exhibit-I**
4.	**Upstream/downstream system associated with the scheme**	Connectivity of Under implementation 400/220kV Bikaner-II S/s includes 400kV D/c interconnection with Khetri (2xD/c) and Bikaner (PG). 765/400/220kV existing Bikaner (PG) S/s is interconnected to 765/400kV Khetri , 765/400/220kV Bhadla (PG) and 765/400kV Moga S/s through 765kV D/c lines.

<table>
<tr><th>S. No.</th><th>Items</th><th>Details</th></tr>
<tr><td></td><td></td><td>765/400kV existing Bareilly(PG) S/s is interconnected to 765/400kV Lucknow S/s through 765kV D/c line and 400kV Bareilly (PG) and Kashipur S/s through 400kV D/c lines.</td></tr>
<tr><td>5.</td><td>Objective / Justification</td><td>
1. MNRE vide letter No. 367-13/1/2021-GEC dated 15.02.2022 addressed to Joint Secretary (Trans), MoP, had forwarded the Renewable Energy Zones (REZs) identified by MNRE/SECI with a total capacity of 181.5 GW for likely benefits by the year 2030. Transmission plan was to be prepared for the identified RE zones. These REZ's are located in eight states, out of which 75 GW REZs includes state of Rajasthan comprising of 15 GW Wind and 60 GW Solar potential.

2. Accordingly, a Comprehensive transmission scheme was evolved for evacuation of 75GW RE from Rajasthan. Out of above comprehensive scheme, transmission scheme is evolved for about 8GW (Solar) in Bikaner complex with potential (14GW along with 6GW BESS) as below:
• Bikaner-II: 4 GW(7GW Solar+ 3 GW BESS)
• Bikaner-III:4 GW(7GW Solar+ 3 GW BESS)

3. At Bikaner-II PS, St-II Connectivity for 5.575 GW RE is already granted against the potential of 1.9 GW (revised from 2.9GW) identified under Ph-II), therefore, evacuation for additional 3.7 GW capacity is required from Bikaner-II PS.

4. For additional solar potential of 7GW with 3GW BESS at Bikaner-III, evacuation system (4 GW) shall also be required. Therefore, total evacuation system requirement for 7.7GW (3.7+4 GW) shall be required from Bikaner Complex (Bikaner-II & III).
<table>
<tr><th>S.No</th><th>Pooling Station</th><th colspan="2">Total RE potential (GW)</th><th>Net RE generation</th></tr>
<tr><td></td><td></td><td>Solar</td><td>BESS</td><td></td></tr>
<tr><td>1</td><td>Bikaner-II</td><td>3.7*</td><td>-</td><td>3.7</td></tr>
<tr><td>2</td><td>Bikaner-III</td><td>7</td><td>3</td><td>4</td></tr>
<tr><td></td><td></td><td>10.7</td><td>3</td><td>7.7</td></tr>
</table>
*1.9GW Solar potential is already considered in Ph-II at Bikaner-II. Total potential considered at Bikaner-II : 5.6GW (1.9+3.7)

5. Evacuation system planned earlier in Ph-I, II, III from Bikaner complex was adequate for
</td></tr>
</table>

S. No.	Items	Details
		evacuation of about 4.8 GW RE potential from Bikaner complex. however, recently due to restrictions in GIB area, CTU has received more no. of connectivity applications in Bikaner complex. Stage-II connectivity received at Bikaner (PG) & Bikaner-II PS has already exceeded the envisaged potential in Bikaner complex as part of Ph-I (2.9 GW) and Ph-II (1.9 GW) potential. 6. Upon grant of about 5.575 GW St-II Connectivity, in the 5th & 6th CMETS in NR, no further grant for St-II connectivity at 400/220kV Bikaner-II was decided. However, to effect LTA of entire Stage-II grant at Bikaner-II, additional corridors shall need to be planned from Bikaner-II PS. Further, as Bikaner PS and Bikaner-II PS are interconnected, power flow on interconnection is influenced by RE generation dispatched at each Pooling station. Considering space limitation of 400kV bays for additional corridors as well as 765/400kV ICTs at Bikaner PS, there is limitation on evacuation of power from Bikaner PS. 7. The agenda for evacuation of power from Bikaner-II & Bikaner-III PS along with studies was discussed in 8th CMETS-NR meeting wherein observations on agenda/studies by Stakeholder incl. HVPN and POSOCO were deliberated. HVPN vide letter 28.06.22 and POSOCO mail dated 01.07.22 also sent their observations on agenda/studies. 8. Based on observations from Stakeholders, revised study files shared to all constituents on 01.07.22. Subsequently, HVPN vide letter 05.07.22 concurred with the proposal 9. Based on POSOCO input, CTU also carried out P-V and Q-V stability analysis in line with the discussion held in meeting and enclosed as part of minutes of 8th CMETS-NR meeting 10. Considering grant of connectivity to new RE generators in Bikaner complex (incl. Bikaner-III) as well as for evacuation of power beyond Bikaner complex (Bikaner/Bikaner-II/Bikaner-III PS), transmission scheme was agreed for evacuation of power from Rajasthan REZ Ph-IV

S. No.	Items	Details
		(Part-1) [**Bikaner complex :7.7GW**] in the 8th CMETS-NR meeting with scope at S. No. 2
6.	**Estimated Cost**	**Total: Rs 13000 Cr.**
7.	**Need of phasing, if any**	Not Applicable
8.	**Implementation timeframe**	18 months from allocation of project
9.	**System Study for evolution of the proposal**	Studies discussed and agreed in following meeting: • 8th CMETS-NR meeting held on 30.06.2022 (Minutes of meeting enclosed in **Annexure-I**) Study assumptions are enclosed in **Annexure-II** Load flow results is attached at **Exhibit-II**

Annexure-I

सेंट्रल ट्रांसमिशन यूटिलिटी ऑफ इंडिया लिमिटेड
(पावर ग्रिड कॉर्पोरेशन ऑफ इंडिया लिमिटेड के स्वामित्व में)
(भारत सरकार का उदयम)
CENTRAL TRANSMISSION UTILITY OF INDIA LTD.
(A wholly owned subsidiary of Power Grid Corporation of India Limited)
(A Government of India Enterprise)

Ref: CTU/N/00/CMETS/08 **Date:** 20-07-2022

As per distribution list

Subject: 8th Consultation Meeting for Evolving Transmission Schemes in Northern Region-Minutes of Meeting

Dear Sir/Ma'am,

Please find enclosed the minutes of the 8th Consultation Meeting for Evolving Transmission Schemes in Northern Region held on 30th June, 2022 through virtual mode. The minutes are also available at CTU website (www.ctuil.in)

Thanking you,

Yours faithfully,

20/07/22

(Kashish Bhambhani)
General Manager

Transmission Ltd. (PRTL). Land is already acquired by M/s PRTL as per the scope (present and future) mentioned in the RfP. Extension of Fatehgarh-III PS is approved as part of Phase-III System which is currently under bidding.

In order to optimize generation mix and also for better utilization of the transmission infrastructure, SECI has issued RfS for setting up of Pilot Project of 500 MW/1000MWh Standalone Battery Energy Storage Systems. In this regard, SECI vide email dated 14/10/21 & 16/12/21 to CTU, mentioned that as recommended by the steering committee appointed by GoI, land may be arranged at Fatehgarh-III PS for the first BESS project of 500MW/1000MWh capacity. SECI had further requested for draft lease agreement to be signed between owner of pooling station and BESS developers.

It was mentioned that any ISTS licensee who acquires the land to establish ISTS Substation as per the given scope of works (present+future), need to allow other TSP/RE generator for installation of connectivity bays, for which there is no requirement of leasing or subleasing of the land. CTU vide letter dated 20.06.2022 to SECI, clarified the same and in-principally informed about space allocation for BESS at Fatehgarh-III PS. CEA enquired on mode of interconnection of above BESS at Fatehgarh-3 PS. CTU clarified that BESS is proposed to be connected at 220kV level in above Substation

Based on above deliberations, proposal of providing 13 acres space of land for installation of 500 MW/1000MWh Standalone Battery Energy Storage Systems (BESS) at Fatehgarh-III PS for entire term of Battery Energy Storage Purchase Agreement was agreed.

4. Transmission system for evacuation of power from Rajasthan REZ Ph-IV (Part-1) (Bikaner Complex)

It was deliberated that Transmission system for evacuation of power from Rajasthan Solar energy zones was evolved in various phases i.e Phase-I (8.9 GW), Phase-II (8.1 GW) & Phase-III (20 GW). The Ph-I transmission scheme is already commissioned whereas Ph-II is under various stages of implementation. The phase-III scheme is under tendering stage

Further, MNRE vide letter No. 367-13/1/2021-GEC dated 15.02.2022 addressed to Joint Secretary (Trans), MoP, had forwarded the Renewable Energy Zones (REZs) identified by MNRE/SECI with a total capacity of 181.5 GW for likely benefits by the year 2030. Transmission plan has to be prepared for the identified RE zones. These REZ's are located in eight states, out of which 75 GW REZs includes state of Rajasthan comprising of 15 GW Wind and 60 GW Solar potential.

District-wise breakup of identified RE Zones (potential) in NR is given below (Table-1):

State	District	Potential (GW)		Evacuation capacity to be planned (GW)
		Wind	Solar	
Rajasthan (75 GW)	Sanchore, Sirohi, Jalor, Pali, Ajmer, Bikaner, Nagaur(non GIB Zone)		30	16
	Barmer, Jaisalmer, Jodhpur (GIB Zone)	15	30	32

Accordingly, a Comprehensive transmission scheme evolved for evacuation of 75GW RE from Rajasthan. Out of above comprehensive scheme, transmission scheme is evolved for about 8GW (Solar) in Bikaner complex (14 GW potential along with 6 GW BESS) in Rajasthan RE. At Bikaner-II PS, St-II Connectivity for 5.6 GW RE, against the potential of 1.9 GW (revised from 2.9GW identified under Ph-II), is already received. Accordingly, BESS may not be accounted for net dispatch at Bikaner-II PS while evolving the evacuation scheme and evacuation for additional 3.7 GW capacity is required from Bikaner-II PS. For 7GW additional solar potential at Bikaner-III along with 3GW BESS, evacuation system (4 GW) shall also be required.

Further details of St-II connectivity and LTA received in Bikaner complex is as under:

Pooling Station	**St-II Connectivity received (MW)**	**LTA received (MW)**	**Dispatch Considered in studies (MW)**
Bikaner	3750	3275**	3750
Bikaner-II	5575	1500**	5575
Bikaner-III	1060*	-	4000

St-II application of 300MW at Bikaner-III agreed for grant in present CMETS-NR meeting
****LTA application of 300MW at Bikaner and 1200MW at Bikaner-II agreed for grant in present CMETS-NR meeting***

It was deliberated that the evacuation system planned earlier in Ph-I, II, III from Bikaner complex was adequate for evacuation of about 4.8 GW RE potential from Bikaner complex. however, recently due to restrictions in GIB area, CTU has received more no. of connectivity applications in Bikaner complex. Stage-II connectivity received at Bikaner (PG) & Bikaner-II PS has already exceeded the envisaged potential in Bikaner complex as part of Ph-I (2.9 GW) and Ph-II (1.9 GW) potential.

Upon grant of about 5.575 GW St-II Connectivity, in the 5th & 6th Consultation Meeting for Evolving Transmission Schemes in Northern Region, no further grant for St-II connectivity at 400/220kV Bikaner-II was decided. However, to effect LTA of entire Stage-II grant at Bikaner-II, additional corridors shall need to be planned from Bikaner-II PS. Further, as Bikaner and Bikaner-II PS are interconnected, power flow on interconnection is influenced by RE generation dispatched at each Pooling station as cumulative St-II connectivity granted for about 10 GW (Incl. possible enhancement) on both the pooling stations. Considering space limitation of 400kV bays for additional corridors as well as 765/400kV ICTs at Bikaner PS, there is limitation on evacuation of power from Bikaner PS.

Accordingly, Studies were carried out for 2025-time frame for solar maximized scenario (afternoon peak) in June and February seasons and load flow results were circulated

HVPN vide letter 28.06.22 sent their observations on agenda/studies. HVPN stated that proposed scheme comprises LILO of both ckts of Sohna Road(GPTL)-Manesar(PG) D/c line at Neemrana-2 S/s and with above LILO, 400/220kV ICTs at Manesar S/s as well as downstream network of 400/220kV Sohna Road and Manesar become “n-1” non-compliant. CTU vide mail 29.06.22 also provided reply on HVPN observations. In the meeting CTU stated that to divert the loading from Manesar S/s, LILO of both ckts of Gurgaon(PG)-Sohna Road(GPTL) D/c line in place of LILO of both ckts of Sohna Road(GPTL)-Manesar(PG) D/c line at Neemrana S/s was studied and It was observed that with above proposed LILO, issue of “n-1” non-compliance at 400/220kV ICTs at Manesar is resolved. HVPN requested to provide revised study file to examine the proposal. Revised study files for February & June solar maximized scenario shared to all constituents on 01.07.22 for observations/concurrence on the scheme by 05.07.22

HVPN also stated that load of Haryana is taken lesser in study files. CTU stated that load is taken based on 19th EPS data as well as demand factors provided by POSOCO in various scenarios in earlier planning studies. Subsequently, HVPN vide letter 05.07.22 concurred the proposal of LILO of both ckts of Gurgaon (PG)-Sohna Road(GPTL) D/c line at Neemrana-2 S/s(85 km) in place of LILO of both ckts of Sohna Road(GPTL)-Manesar(PG) D/c line at Neemrana-2 S/s(70 km) as part of proposed transmission scheme.
PSTCL stated that 50MVAr line reactor at Ropar end of Koldam-Ropar line may be considered in studies. CTU replied that line reactor is switchable and it can be switched on/off as per requirement and there is no significant impact on inclusion of above line reactor in study results In the meeting, PSTCL stated that prima facie they agreed on the proposal, however they will examine the proposal and provide the comments if any. However, no comments from PSTCL is received.

CEA concurred the proposal and stated that proposed transmission scheme for evacuation of power from Bikaner complex is in line with Comprehensive transmission scheme evolved for evacuation of 75GW RE from Rajasthan.

In the meeting as well POSOCO mail dated 01.06.22, it was stated that stability studies may be carried out for 765kV highly loaded long transmission lines emanating from RE pockets in Rajasthan. In the mail, it was also stated that recently it has been observed, outage of lines in solar complexes is leading to oscillations in the grid, it is important that transient studies are also carried out at system planning to assess the transmission elements required so that minimal or no oscillations are observed in real-time. For outage of one ckt of such lines, there is possibility of line loading increasing more than 3500MW or angular difference> 30deg.

CTU stated that they are facing severe convergence issues with RE models while performing stability studies. CTU requested POSOCO to share dynamics file as well as latest conventional/RE models. Meanwhile CTU will carry out the P-V, Q-V analysis for such highly loaded 765kv lines and results will be depicted as part of minutes of above meeting. Accordingly, CTU carried out P-V and Q-V analysis of such candidate lines and it is observed that system is stable under various contingencies. Result of above analysis is enclosed in ***Exhibit-1.***

POSOCO also stated that RE generators are lumped and connected at 400/765kV level and are supporting the grid, however in real time, solar generators are drawing huge MVAR instead of supporting the grid.

CTU stated that planning studies are being carried out considering 0.98pf of all solar generators, however as per CEA technical standard 2013 “the generating station shall be capable of supplying dynamically varying reactive power support so as to maintain power factor within the limits of 0.95 lagging to 0.95 leading”. Therefore, margin is already kept for real time operation. However, in case of unity pf considered in planning studies, reactive power requirement (Injection in peak solar time/absorption in no solar hours) will be very high.

RVPN vide mail 06.07.22 informed that they do not foresee any drawl requirement from Neemrana-2 S/s in future, accordingly scope for provision of space for 400/220kV ICTs as well as 220kV bays at Neemrana-2 S/s need not to be kept.

Considering grant of connectivity to new RE generators in Bikaner complex (incl. Bikaner-III) as well as for evacuation of power beyond Bikaner complex (Bikaner/Bikaner-II/Bikaner-III PS), following transmission scheme was agreed for evacuation of power from Rajasthan REZ Ph-IV (Part-1) [Bikaner complex] in the meeting:

Proposed Transmission system for evacuation of power from Rajasthan REZ Ph-IV (Part-1)

Bikaner-II : 3.7GW (Solar) + Bikaner-III : 4GW (7GW Solar+3GW BESS)

- Establishment of 6x1500 MVA, 765/400 kV & 5x500 MVA^ 400/220 kV Bikaner-III Pooling Station along with 2x330 MVAr (765kV) Bus Reactor & 2x125 MVAr (420kV) Bus Reactor at a suitable location near Bikaner (Assuming 2 GW injection at 220 kV level and 2 GW injection at 400 kV level)
- Augmentation with 400/220 kV, 5x500 MVA^ ICT at Bikaner-II PS
- Augmentation with 765/400 kV, 1x1500MVA ICT (4th) at Bikaner (PG)
- LILO of both ckts of 400kV Bikaner (PG)-Bikaner-II D/c line at Bikaner-III PS (~20 km)
- Bikaner-II PS – Bikaner-III PS 400 kV D/c line (Quad) (~30 km)
- Establishment of 765/400 kV, 4x1500 MVA Neemrana-II S/s along with 2x330 MVAr (765kV) Bus Reactor & 2x125 MVAr (420kV) Bus Reactor at a suitable location near Neemrana
- Bikaner-III – Neemrana-II 765 kV 2xD/c line (~350 km) along with 330 MVAr switchable line reactor for each circuit at each end
- Neemrana-II- Bareilly(PG) 765 kV D/c line (~350 km) along with 330 MVAr switchable line reactor for each circuit at each end
- Neemrana-II -Kotputli 400 kV D/c line (Quad)(~70 km)
- Augmentation by 400/220 kV, 1x500 MVA (3rd) ICT at Kotputli (PG)
- LILO of both ckts of Sohna Road(GPTL)-Gurgaon(PG) D/c line at Neemrana-II S/s (~85 km)

^incl 1x500MVA ICT to fulfill 'N-1' requirement

Future provisions at Bikaner-III PS*:

Space for

- 765/400kV ICT along with bays- 1 no.
- 765 kV line bays along with switchable line reactors – 4 nos.
- 765kV Bus Reactor along with bay: 1 no.
- 400 kV line bays along with switchable line reactor –4 nos.
- 400 kV line bays–4 nos.
- 400/220kV ICT along with bays -5 nos.
- 400 kV Bus Reactor along with bay: 1 no.
- 400kV Sectionalization bay: 2 sets
- 220 kV line bays for connectivity of RE Applications -12 nos.
- 220kV Sectionalization bay: 3 sets
- STATCOM (2x±300MVAr) along with MSC (4x125 MVAr) & MSR (2x125 MVAr)

Future provisions at Neemrana-II S/s:

Space for

- 765/400kV ICT along with bays- 2

- 765 kV line bays along with switchable line reactors – 6
- 765kV Bus Reactor along with bay: 1 nos.
- 400 kV line bays along with switchable line reactor –6
- 400 kV Bus Reactor along with bays: 1 no.
- 400kV Sectionalization bay: 2 sets

Estimated Cost : Rs 12,000 Cr (Tentative)

However, out of above agreed scheme, 765/400kV ICT (4th) at Bikaner (PG) S/s and 400/220 kV, 5x500 MVA ICT at Bikaner-II PS may be taken up based on evacuation requirement beyond Bikaner/Bikaner-II PS.

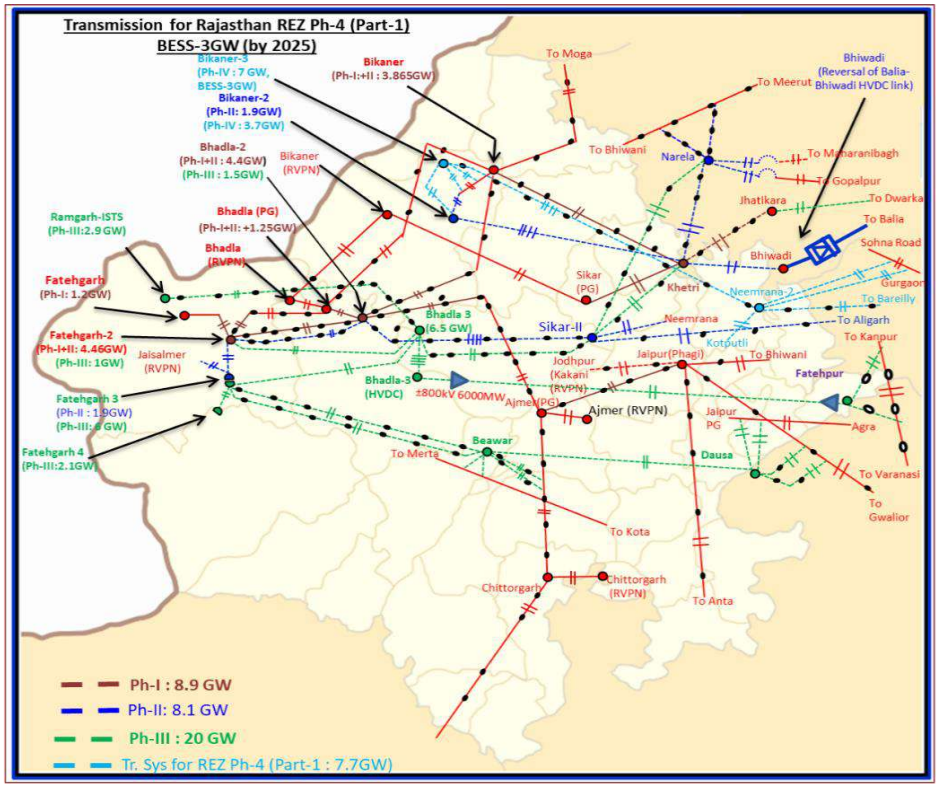
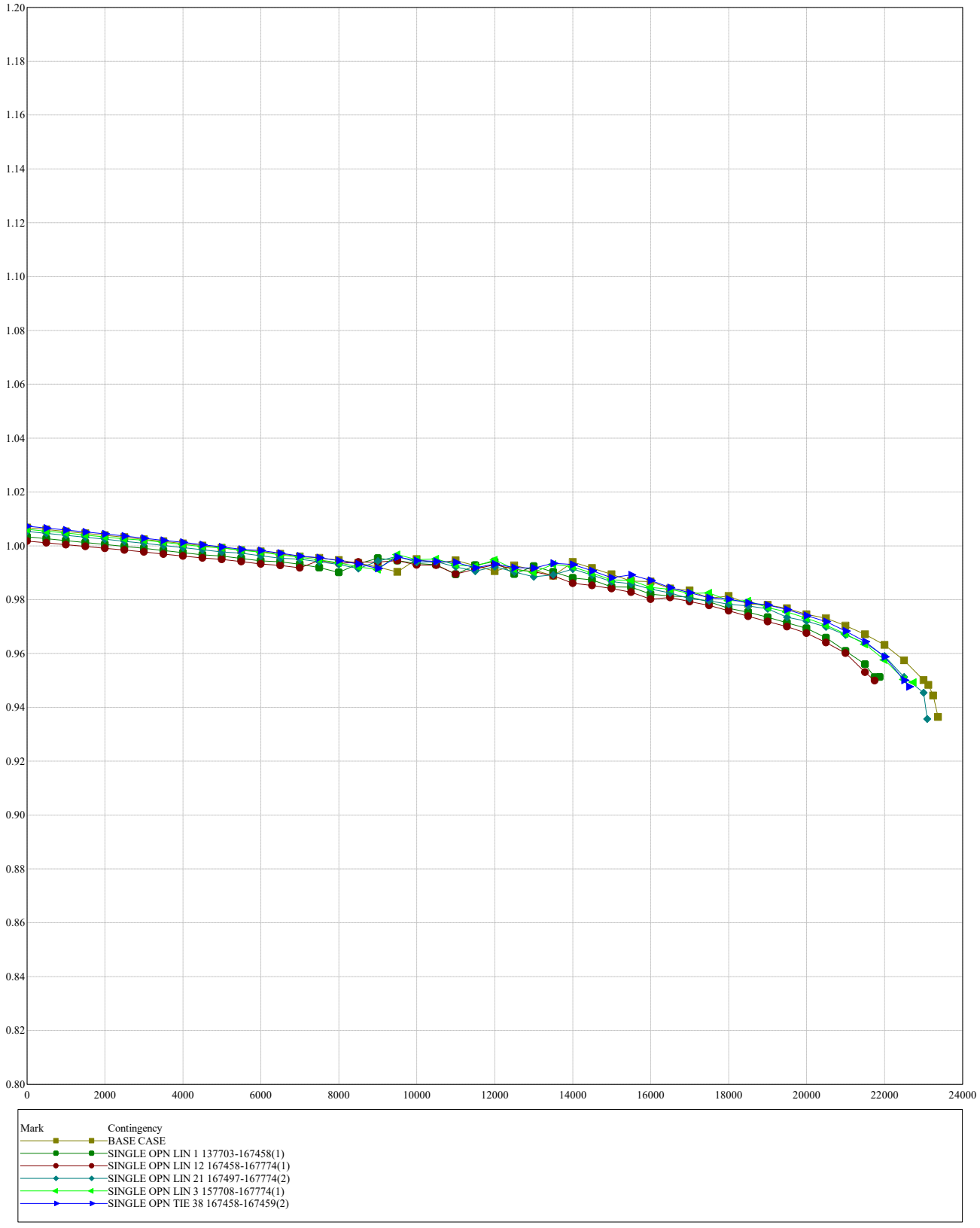


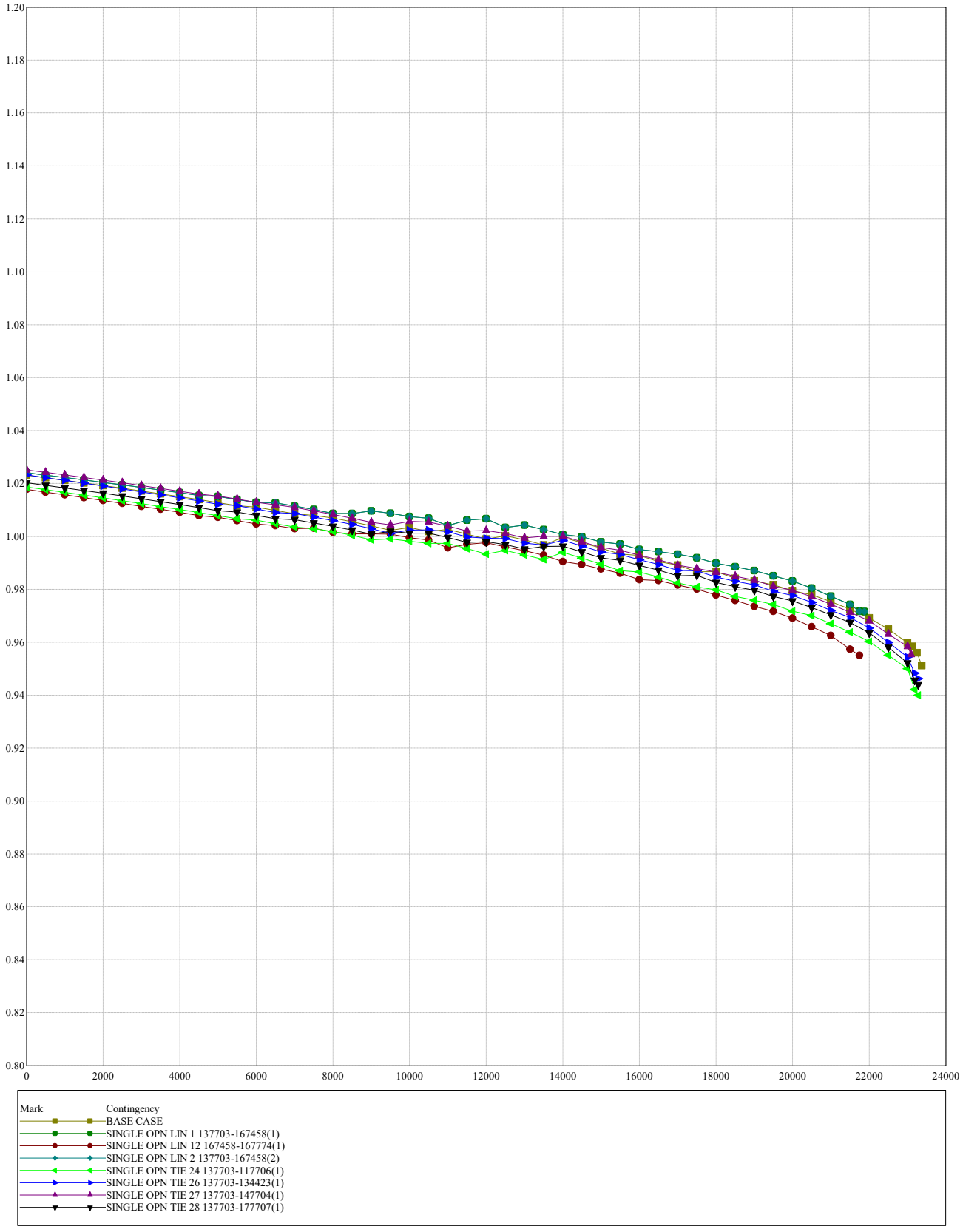
Fig 1: Transmission system for evacuation of power from Rajasthan REZ Ph-IV (Part-1) (Bikaner Complex)

Exhibit-1A

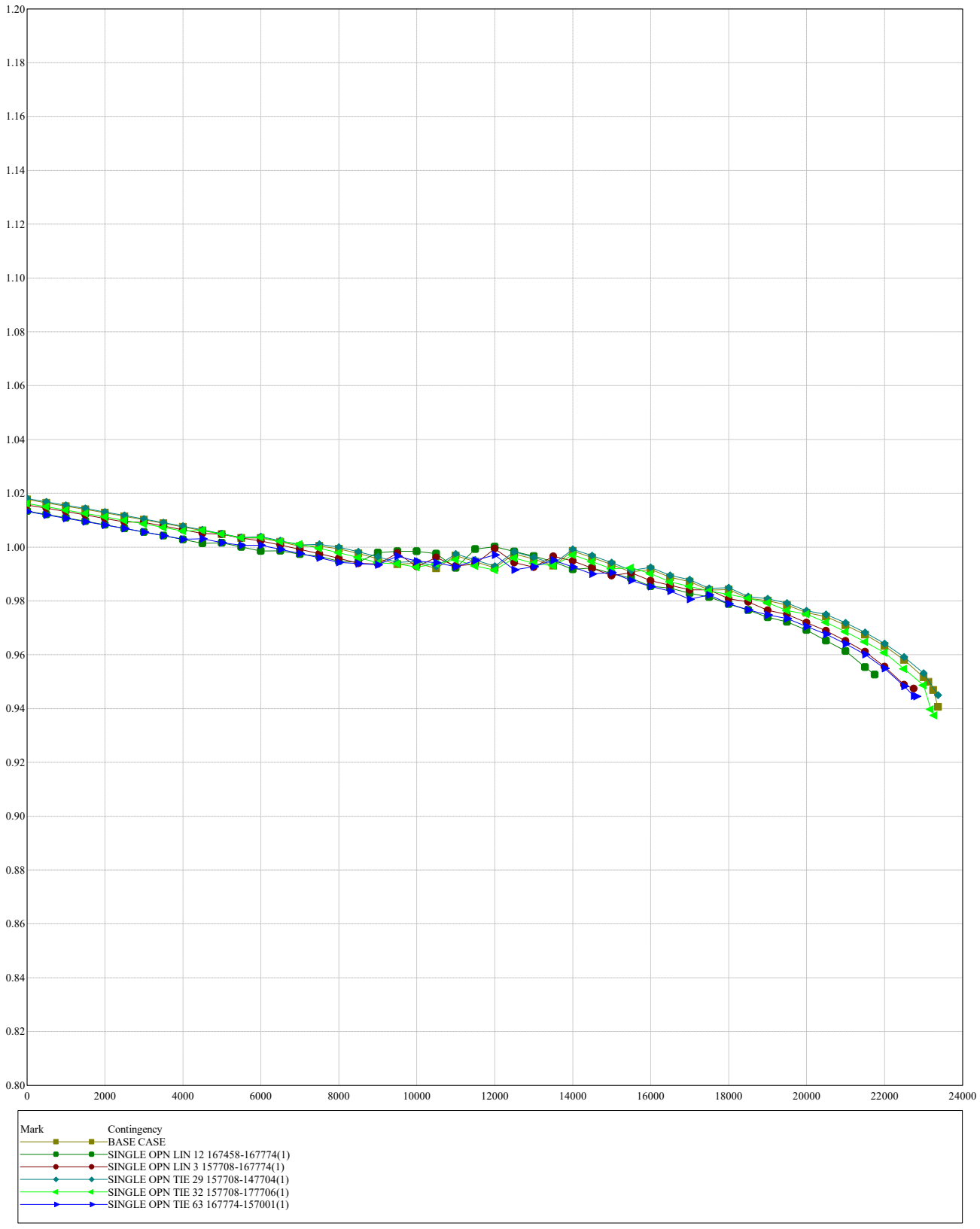
Bikaner PS PV Curve



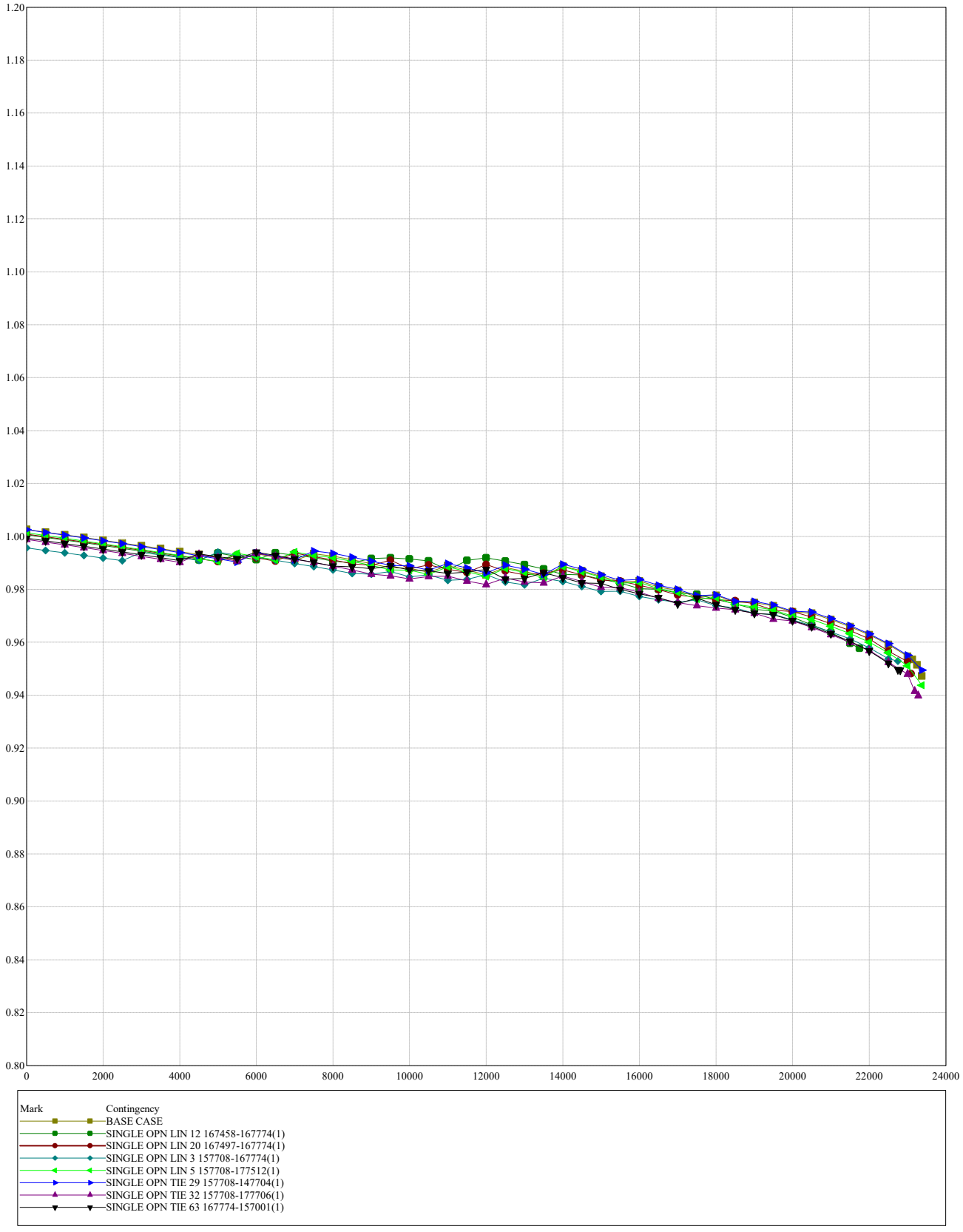
Moga PV Curve



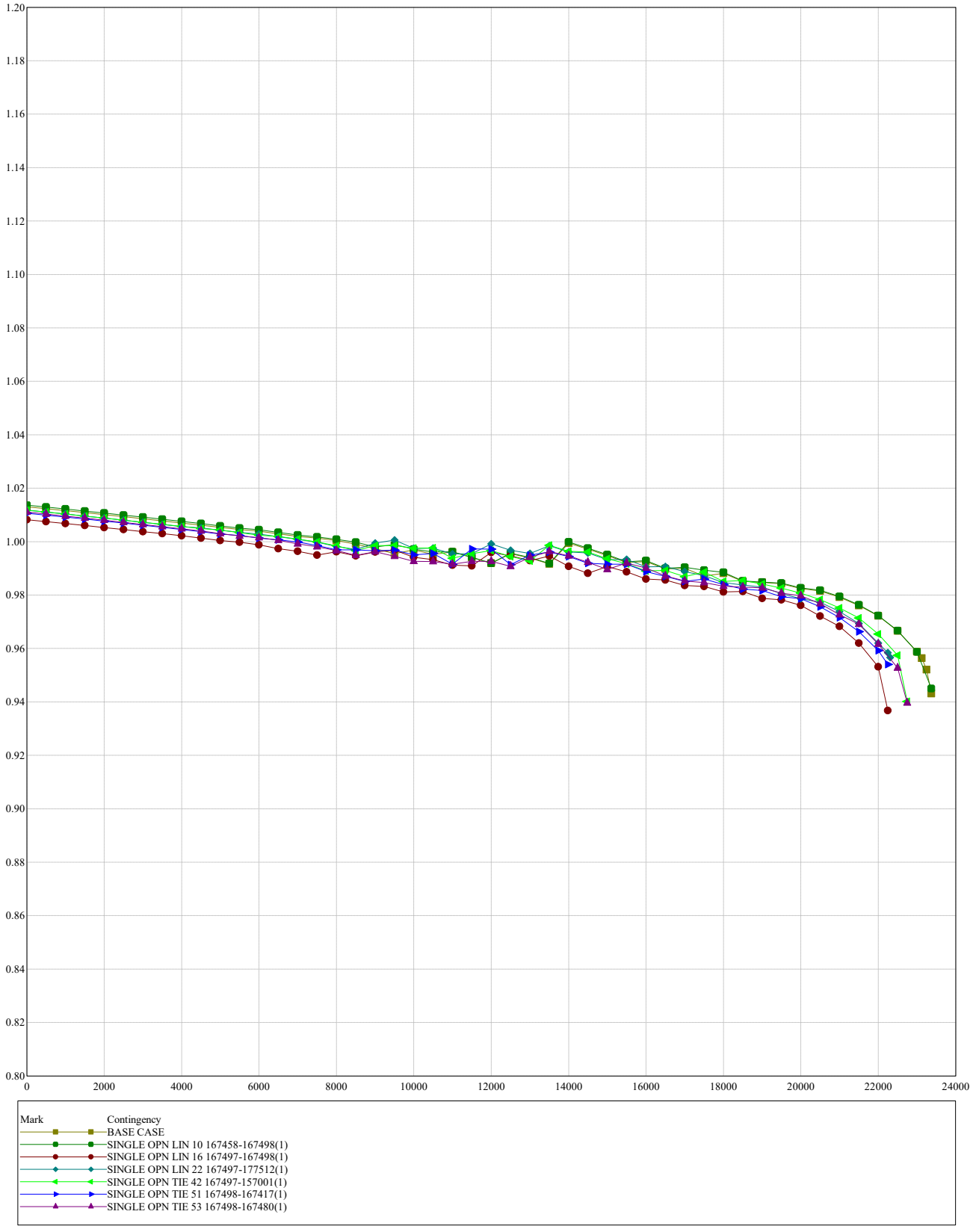
Khetri PV Curve



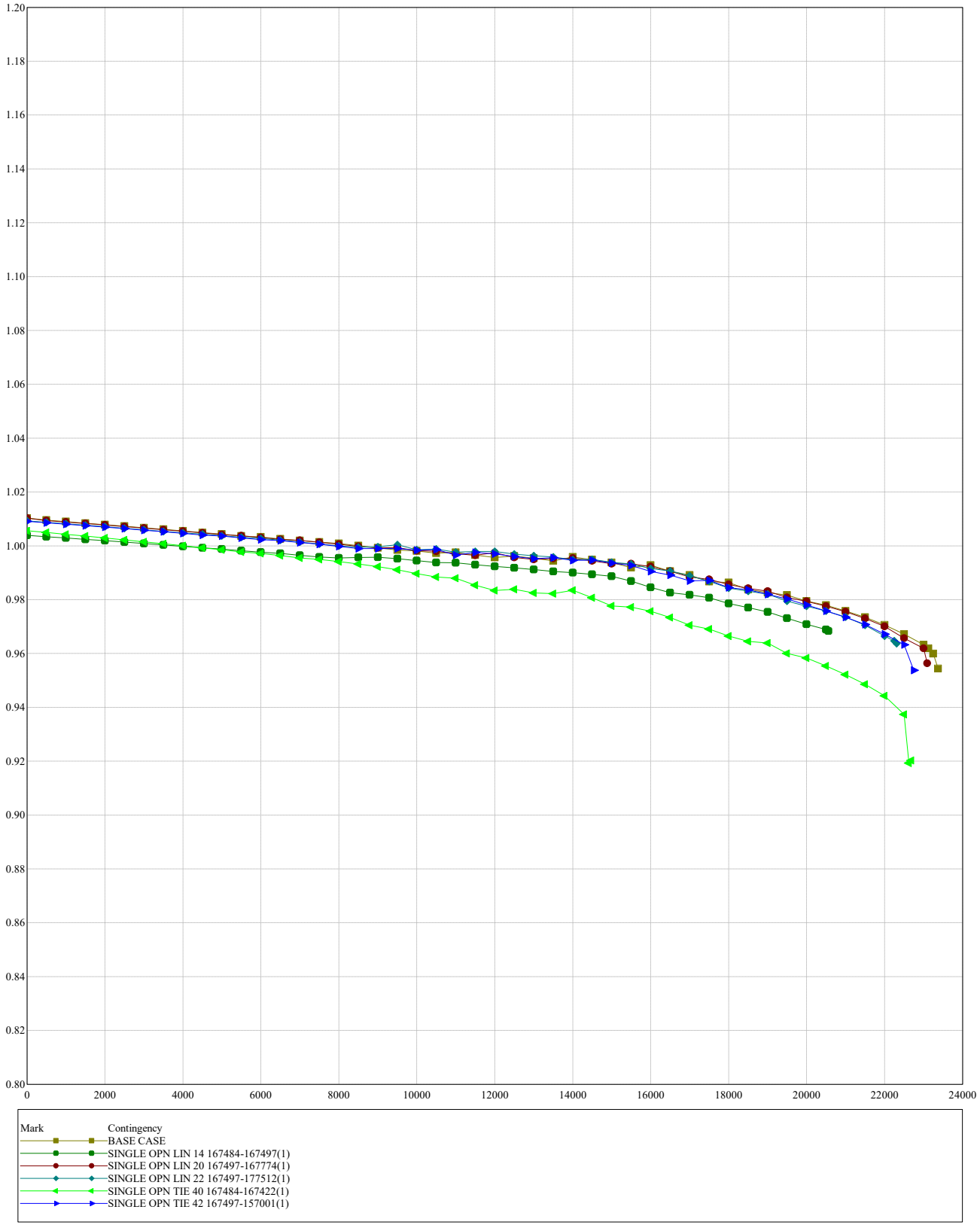
Jhatikara PV Curve



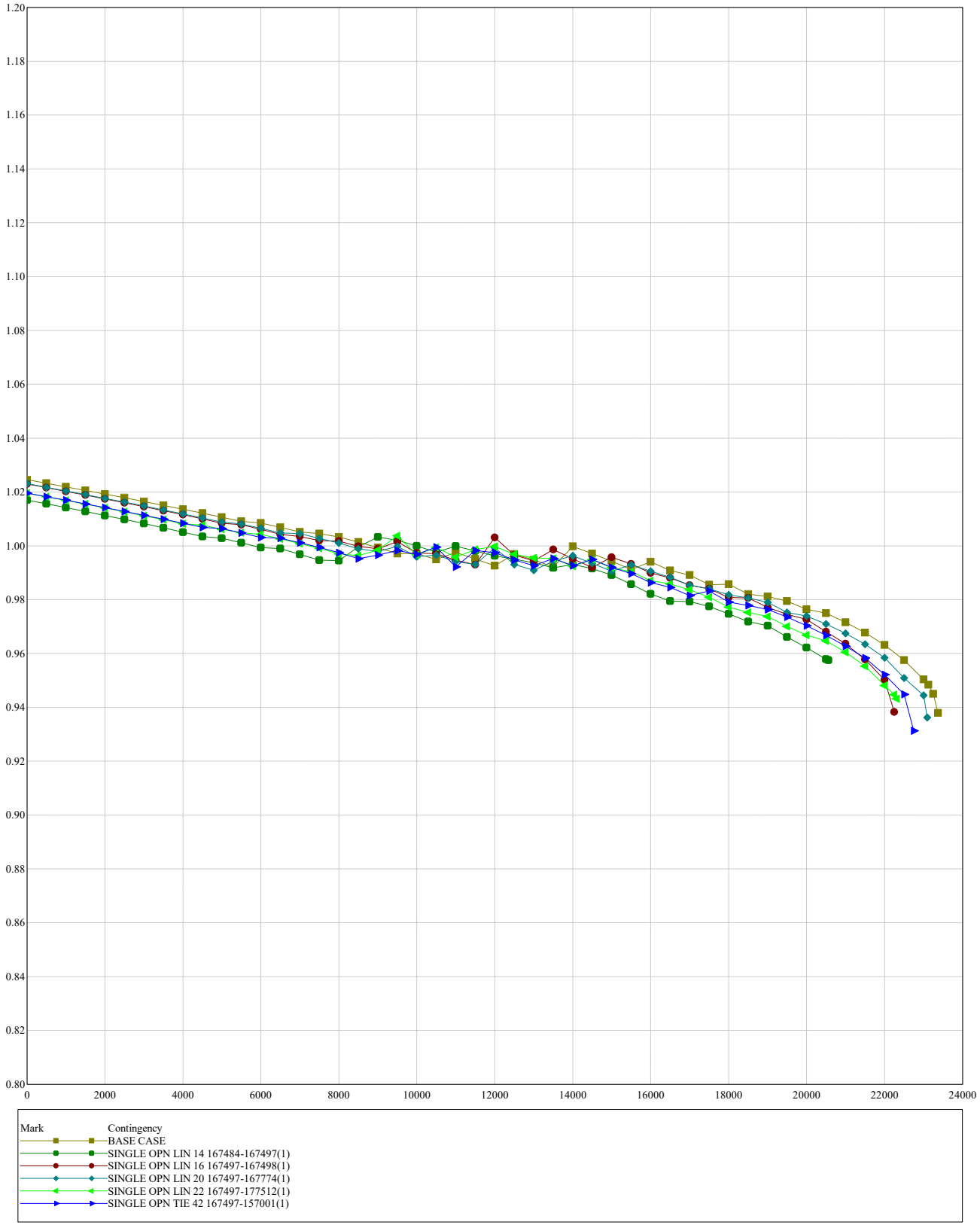
Bhadla-2 PV Curve



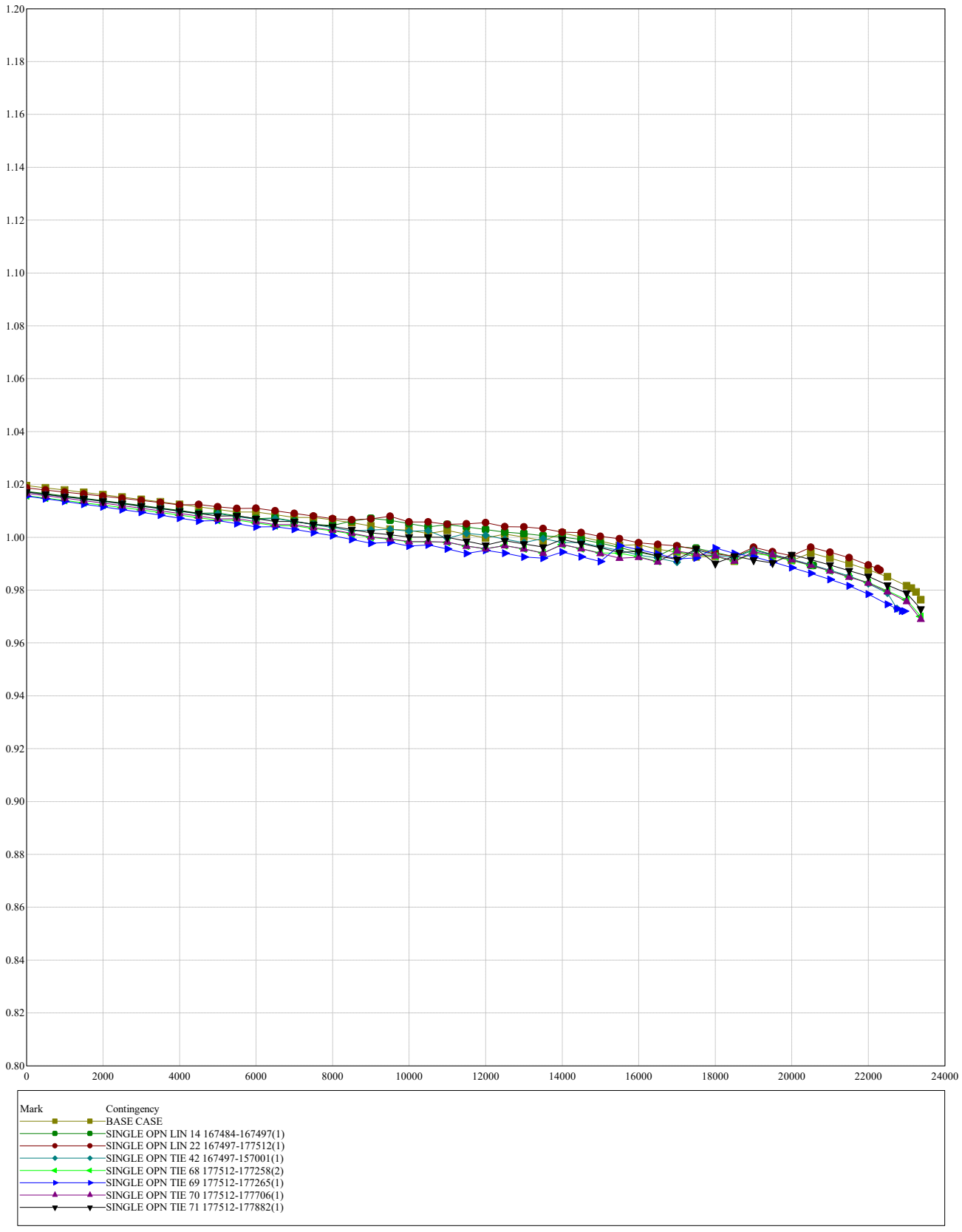
Bhadla-3 PV Curve



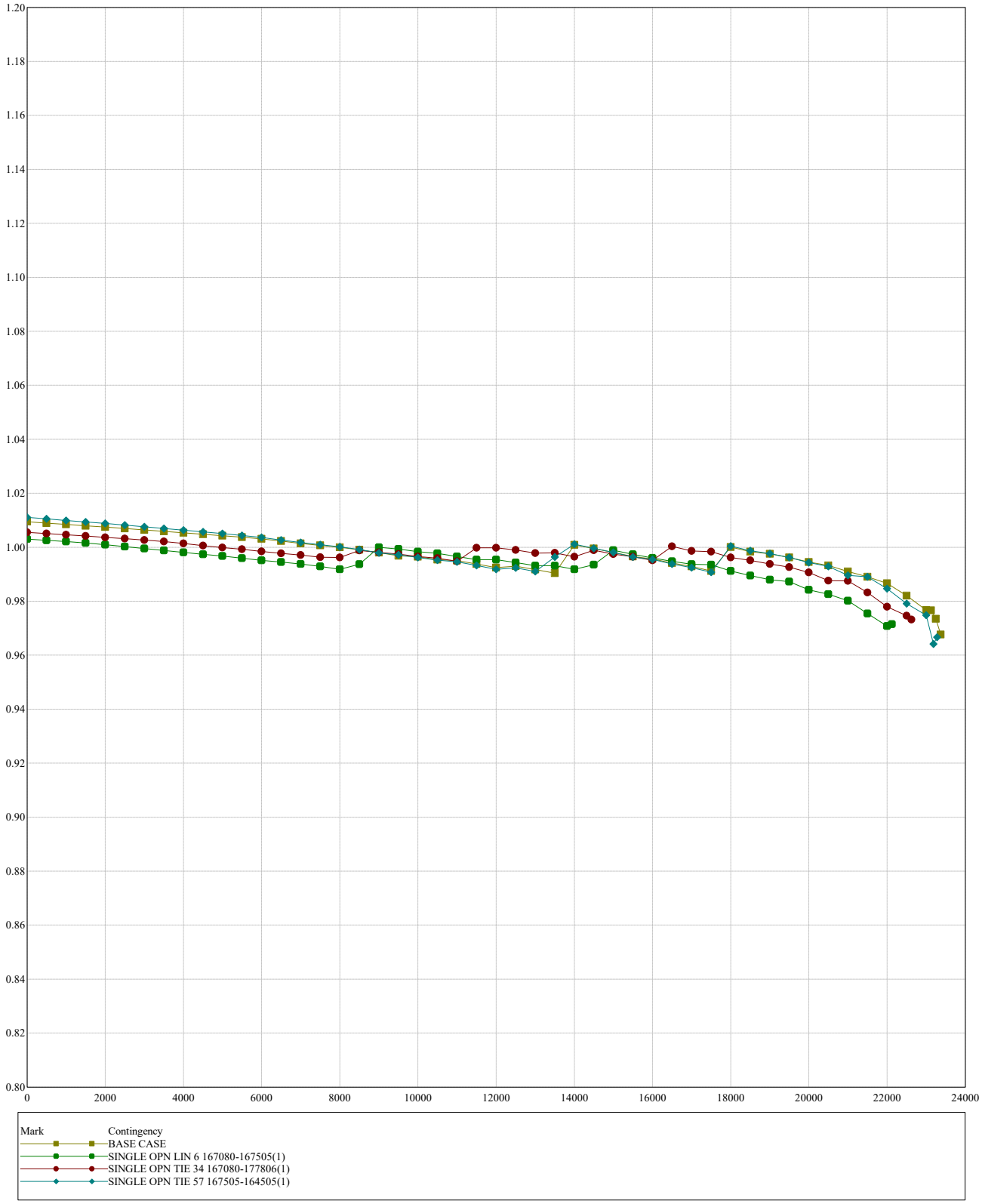
Sikar-2 PV Curve



Aligarh PV Curve



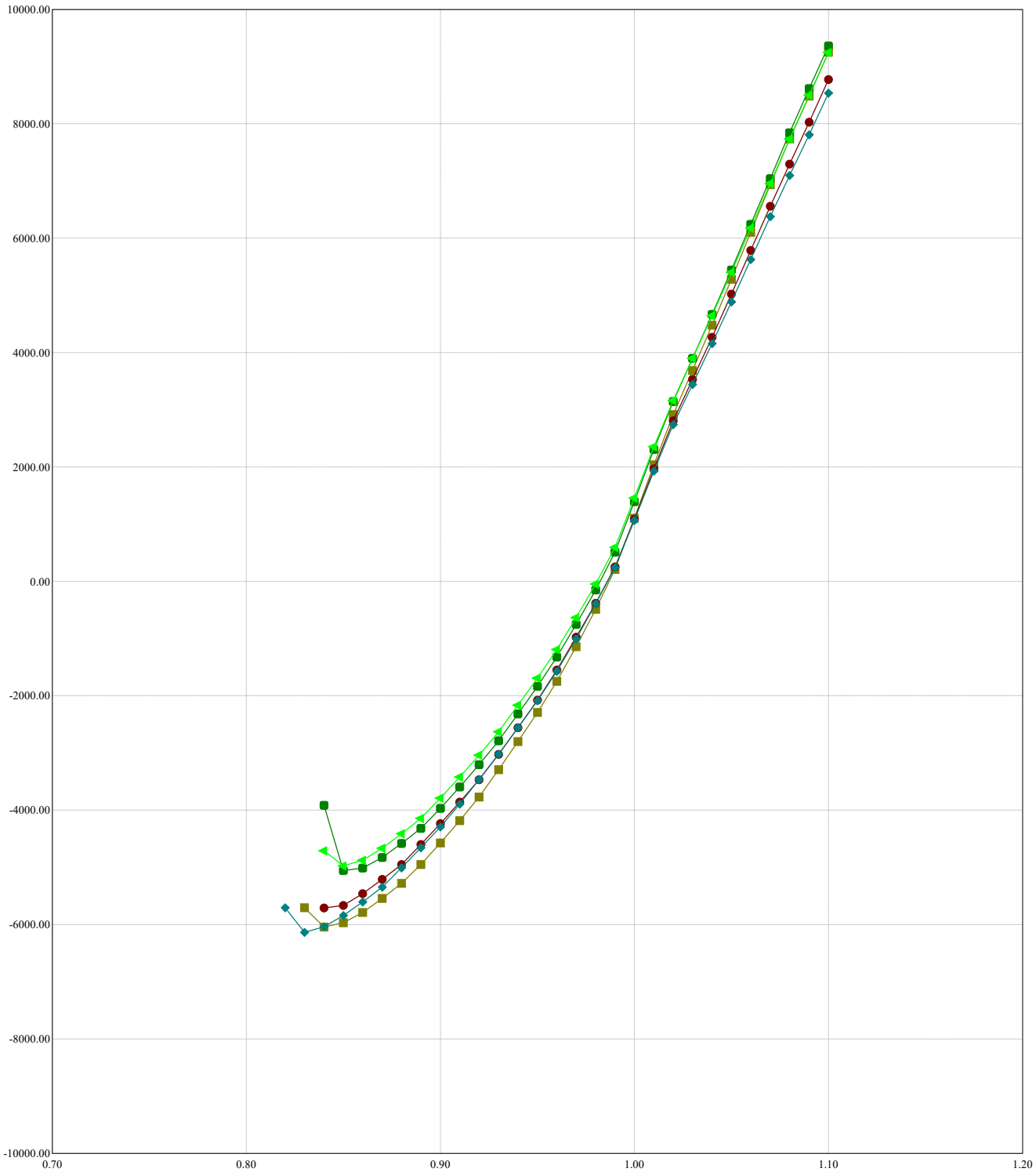
Bikaner-3 PV Curve



Bikaner PS QV Curve

Exhibit- 1B

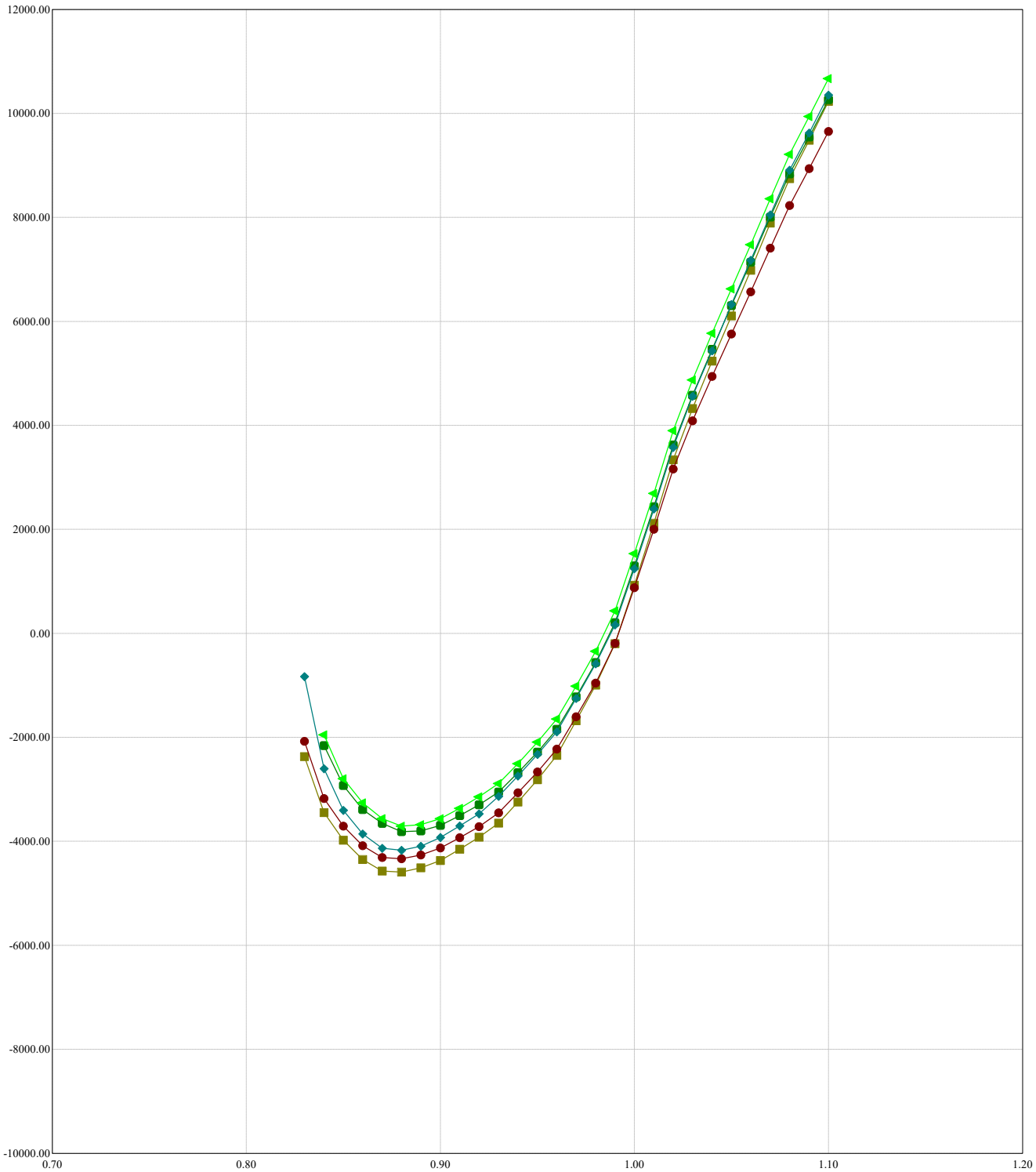
Study bus: 167458



Mark	Description	QMin
	BASE CASE	-6043.301
	OPEN LINE FROM BUS 167458 [BIKANER-NW 765.00] TO BUS 137703 [MOGA-PG 765.00] CKT 1	-5058.560
	OPEN LINE FROM BUS 167458 [BIKANER-NW 765.00] TO BUS 167459 [BHADLA PG 765.00] CKT 1	-5711.232
	OPEN LINE FROM BUS 167458 [BIKANER-NW 765.00] TO BUS 167498 [BHADLA-2 765.00] CKT 1	-6134.845
	OPEN LINE FROM BUS 167458 [BIKANER-NW 765.00] TO BUS 167774 [KHETRI 765.00] CKT 1	-4972.170

Bhadla-2 QV Curve

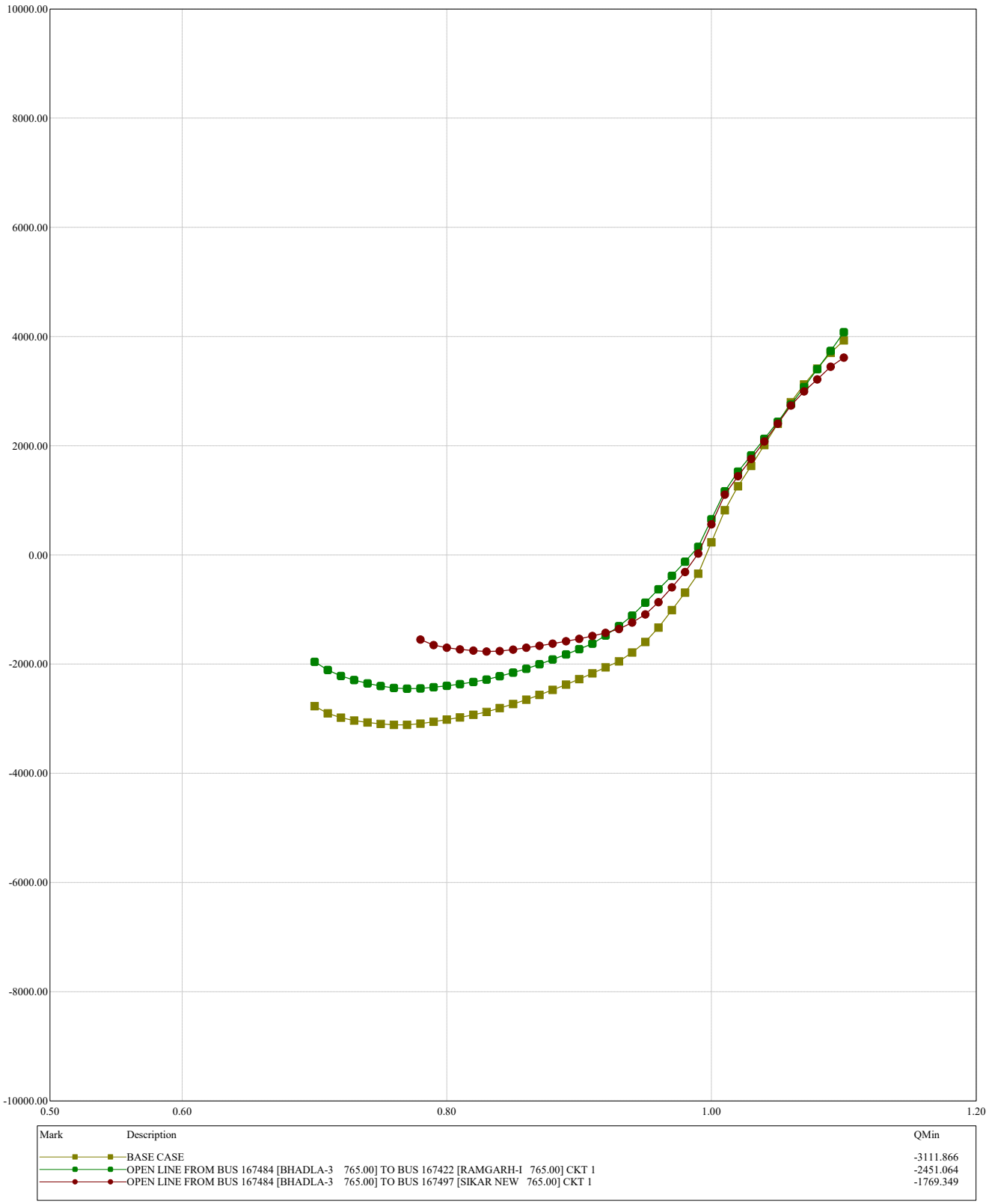
Study bus: 167498



Mark	Description	QMin
	BASE CASE	-4593.440
	OPEN LINE FROM BUS 167498 [BHADLA-2 765.00] TO BUS 167417 [AJMER-NW 765.00] CKT 1	-3815.384
	OPEN LINE FROM BUS 167498 [BHADLA-2 765.00] TO BUS 167458 [BIKANER-NW 765.00] CKT 1	-4333.717
	OPEN LINE FROM BUS 167498 [BHADLA-2 765.00] TO BUS 167480 [FATEH-2 765.00] CKT 1	-4173.942
	OPEN LINE FROM BUS 167498 [BHADLA-2 765.00] TO BUS 167497 [SIKAR NEW 765.00] CKT 1	-3709.853

Study bus: 167484

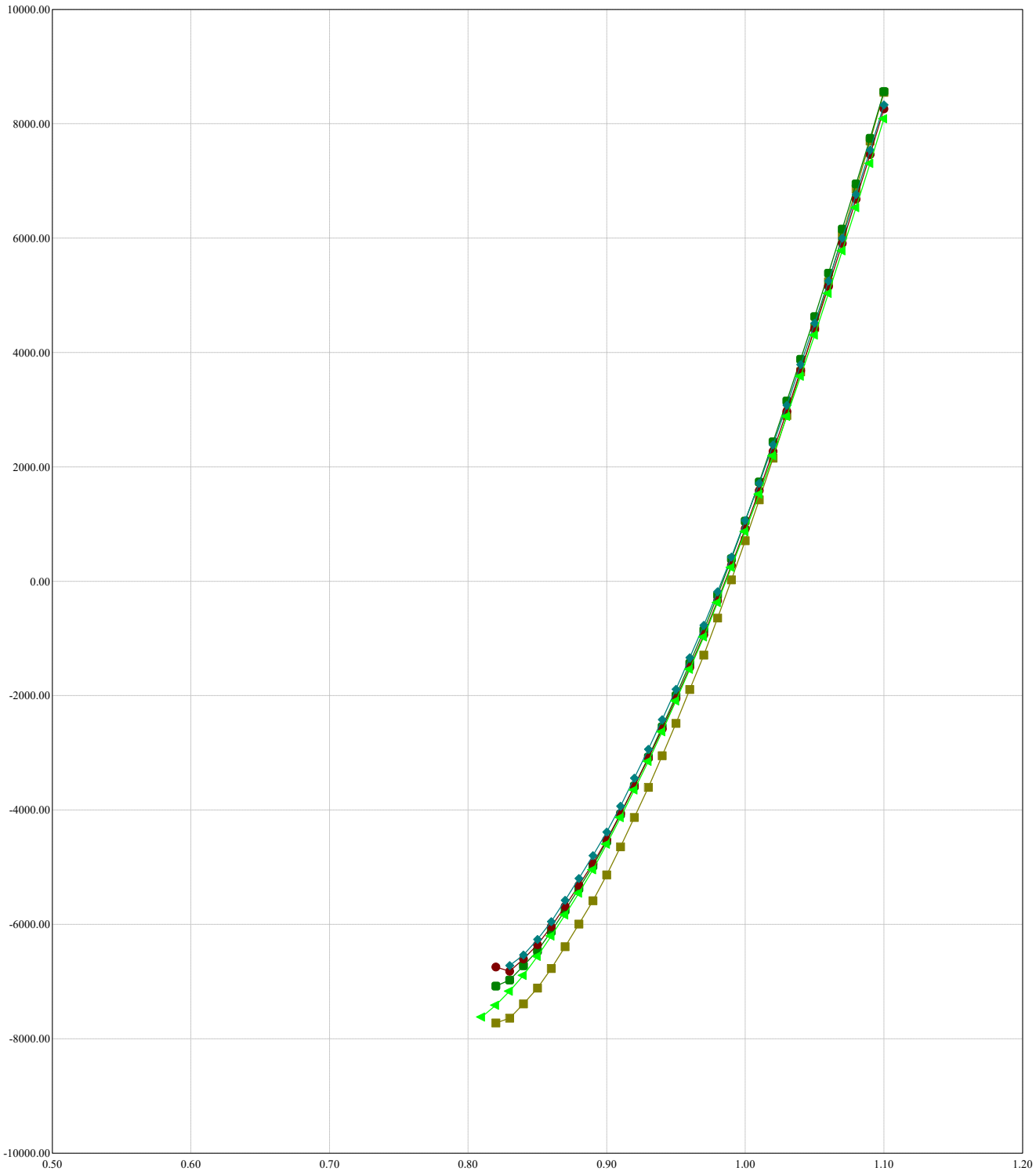
Bhadla-3 QV Curve



Mark	Description	QMin
	BASE CASE	-3111.866
	OPEN LINE FROM BUS 167484 [BHADLA-3 765.00] TO BUS 167422 [RAMGARH-I 765.00] CKT 1	-2451.064
	OPEN LINE FROM BUS 167484 [BHADLA-3 765.00] TO BUS 167497 [SIKAR NEW 765.00] CKT 1	-1769.349

Study bus: 167774

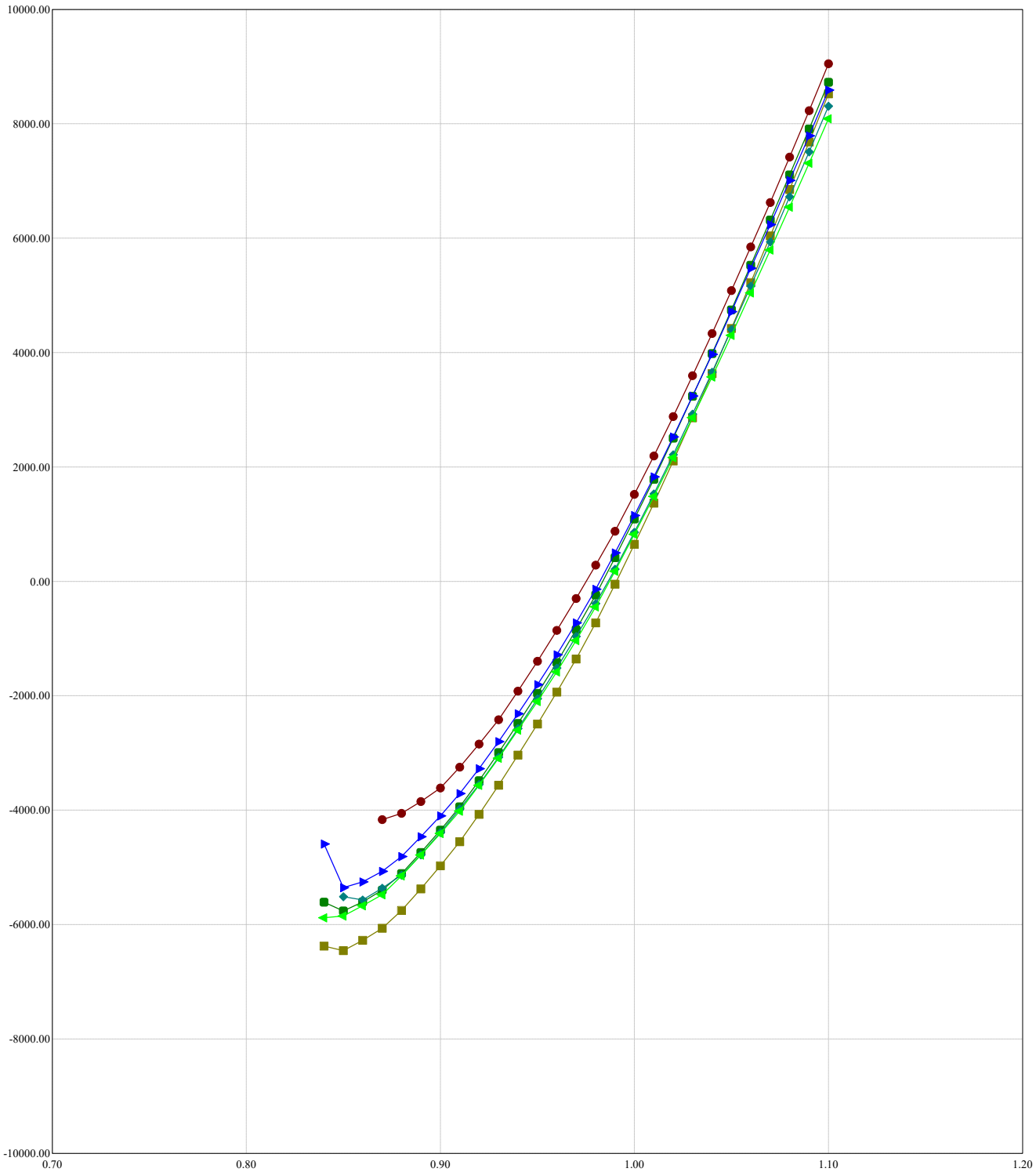
Khetri QV Curve



Mark	Description	QMin
	BASE CASE	-7724.448
	OPEN LINE FROM BUS 167774 [KHETRI 765.00] TO BUS 157001 [NARELA ISTS 765.00] CKT 1	-7080.165
	OPEN LINE FROM BUS 167774 [KHETRI 765.00] TO BUS 157708 [JHATI-PG 765.00] CKT 1	-6823.060
	OPEN LINE FROM BUS 167774 [KHETRI 765.00] TO BUS 167458 [BIKANER-NW 765.00] CKT 1	-6718.192
	OPEN LINE FROM BUS 167774 [KHETRI 765.00] TO BUS 167497 [SIKAR NEW 765.00] CKT 1	-7618.119

Sikar-2 QV Curve

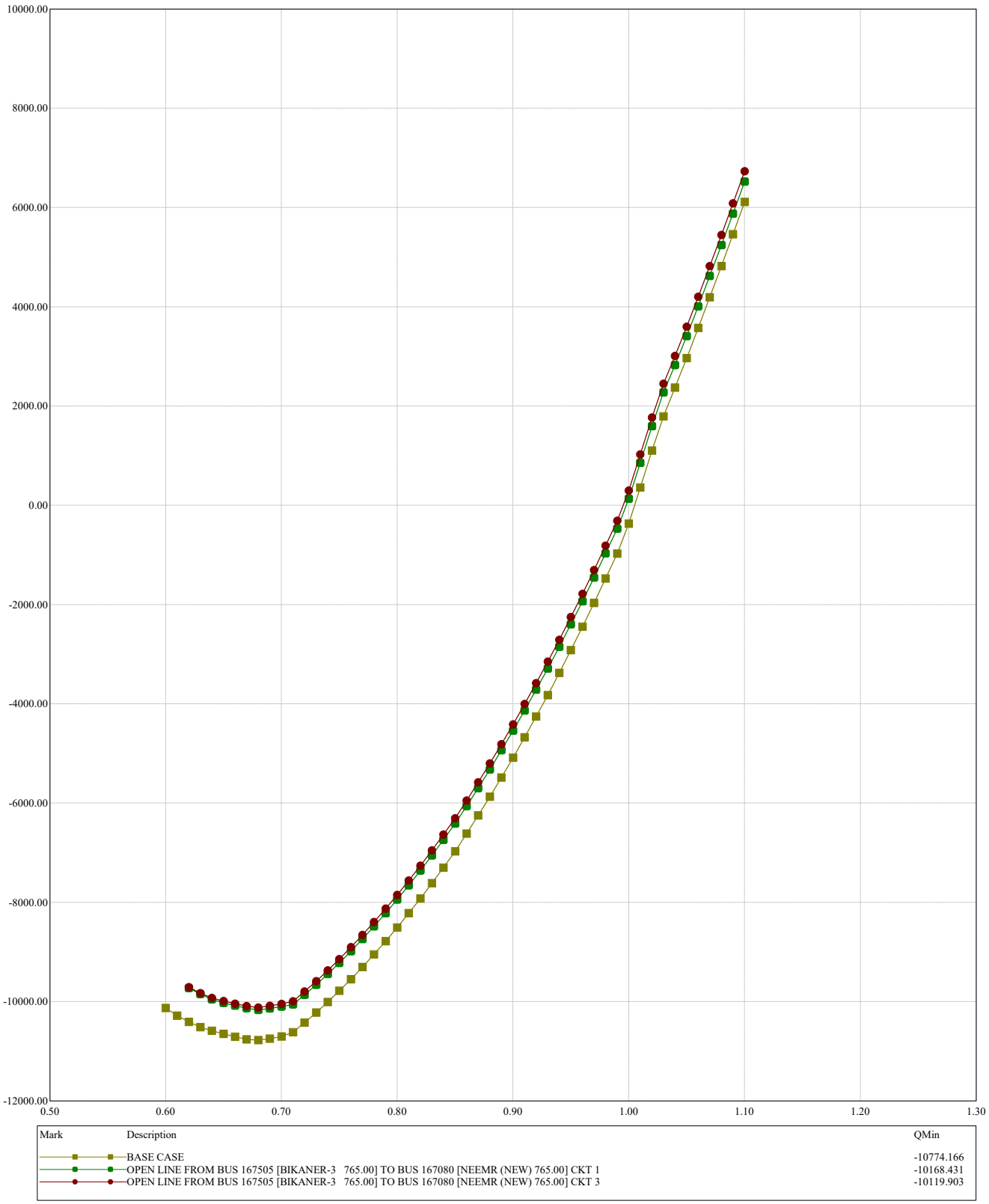
Study bus: 167497



Mark	Description	QMin
	BASE CASE	-6457.621
	OPEN LINE FROM BUS 167497 [SIKAR NEW 765.00] TO BUS 157001 [NARELA ISTS 765.00] CKT 1	-5762.925
	OPEN LINE FROM BUS 167497 [SIKAR NEW 765.00] TO BUS 167484 [BHADLA-3 765.00] CKT 1	-4166.806
	OPEN LINE FROM BUS 167497 [SIKAR NEW 765.00] TO BUS 167498 [BHADLA-2 765.00] CKT 1	-5568.792
	OPEN LINE FROM BUS 167497 [SIKAR NEW 765.00] TO BUS 167774 [KHETRI 765.00] CKT 1	-5882.892
	OPEN LINE FROM BUS 167497 [SIKAR NEW 765.00] TO BUS 177512 [ALIGARH 765.00] CKT 1	-5353.258

Bikaner-3 QV Curve

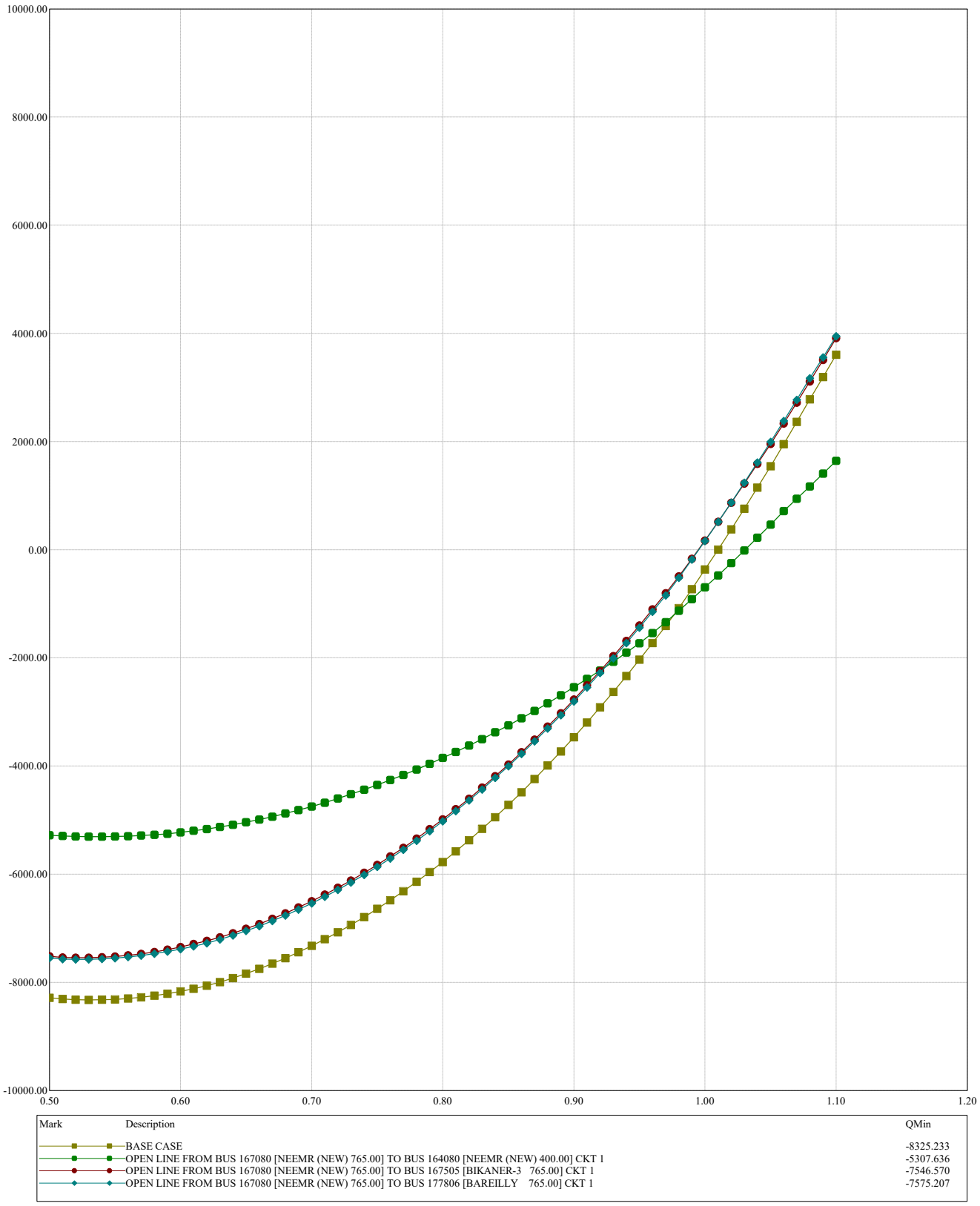
Study bus: 167505



Mark	Description	QMin
	BASE CASE	-10774.166
	OPEN LINE FROM BUS 167505 [BIKANER-3 765.00] TO BUS 167080 [NEEMR (NEW) 765.00] CKT 1	-10168.431
	OPEN LINE FROM BUS 167505 [BIKANER-3 765.00] TO BUS 167080 [NEEMR (NEW) 765.00] CKT 3	-10119.903

Neemrana-2 QV Curve

Study bus: 167080



Mark	Description	QMin
	BASE CASE	-8325.233
	OPEN LINE FROM BUS 167080 [NEEMR (NEW) 765.00] TO BUS 164080 [NEEMR (NEW) 400.00] CKT 1	-5307.636
	OPEN LINE FROM BUS 167080 [NEEMR (NEW) 765.00] TO BUS 167505 [BIKANER-3 765.00] CKT 1	-7546.570
	OPEN LINE FROM BUS 167080 [NEEMR (NEW) 765.00] TO BUS 177806 [BAREILLY 765.00] CKT 1	-7575.207

Annexure-II

Study Assumptions

1. Studies were carried out for 2025-time frame for solar maximized scenario (afternoon peak) in June and February seasons
2. For evacuation studies,100% Solar dispatch for ISTS solar generation and 80% for intra state solar is considered in Northern region. Solar generation in other regions is considered 90%.
3. Wind Generation of NR is considered as 50% whereas wind generation of other regions is considered 50-55% during solar maximized scenario of June season whereas low dispatch (up to 10%) of wind generation is considered in Feb season in all regions.
4. All India projected Peak Demand by 2025 is considered as per the 19th EPS of CEA as well as based on NR constituents inputs.
5. Hydro Generation of NR region is considered 60-70% and hydro generation of other regions is considered 30-40% in June season whereas in Feb season, hydro generation is considered as 30% in all regions
6. Central sector/IPP Thermal generation is taken based on merit order dispatch with 55% technical minimum. State sector units dispatched to variable dispatch (55-85%) in a way that maximum thermal units will be available for generation in evening peak.
7. In the studies, all India transmission network up to 220kV level has been simulated. It includes, existing as well as under construction transmission network

Exhibit-I

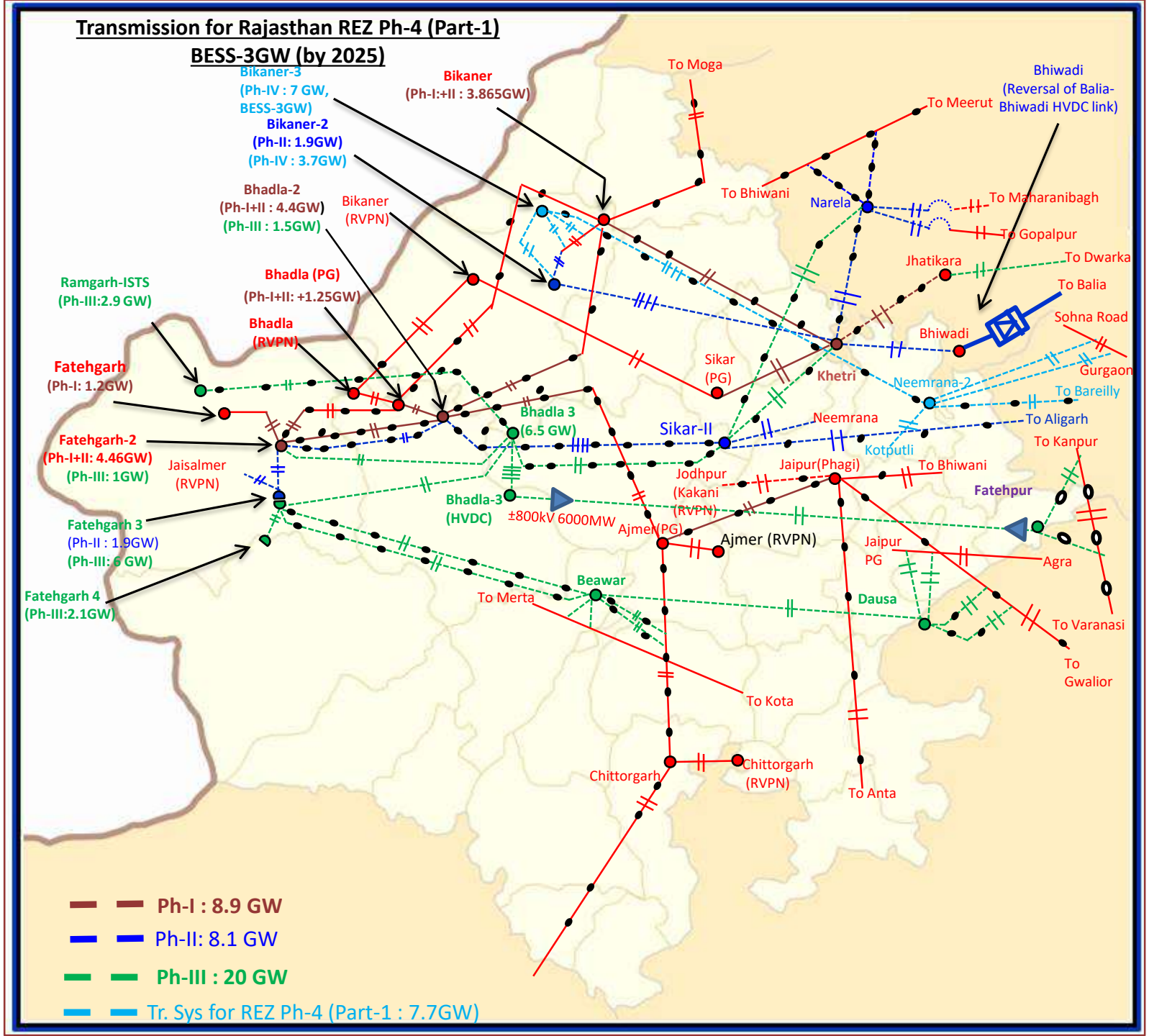
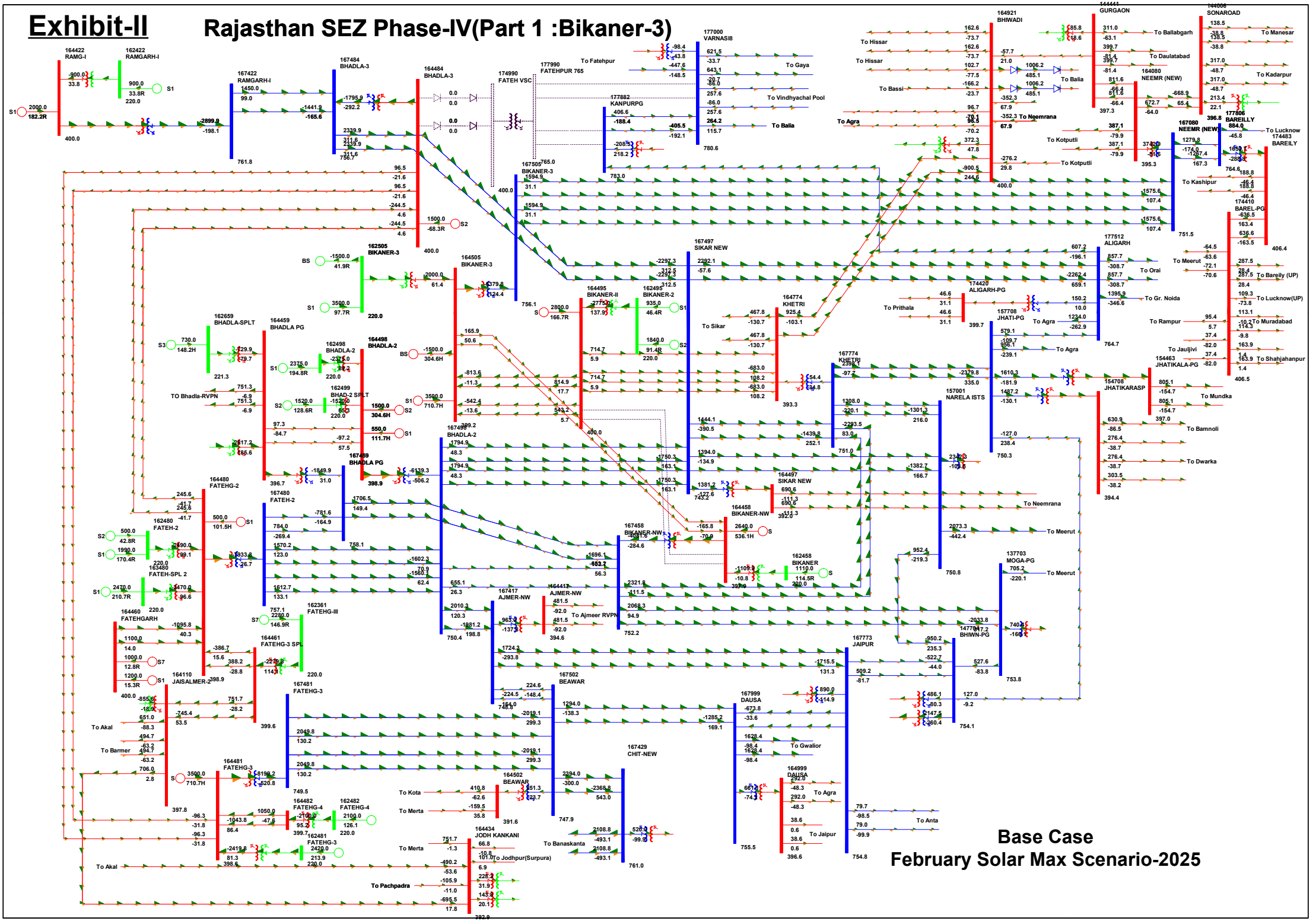
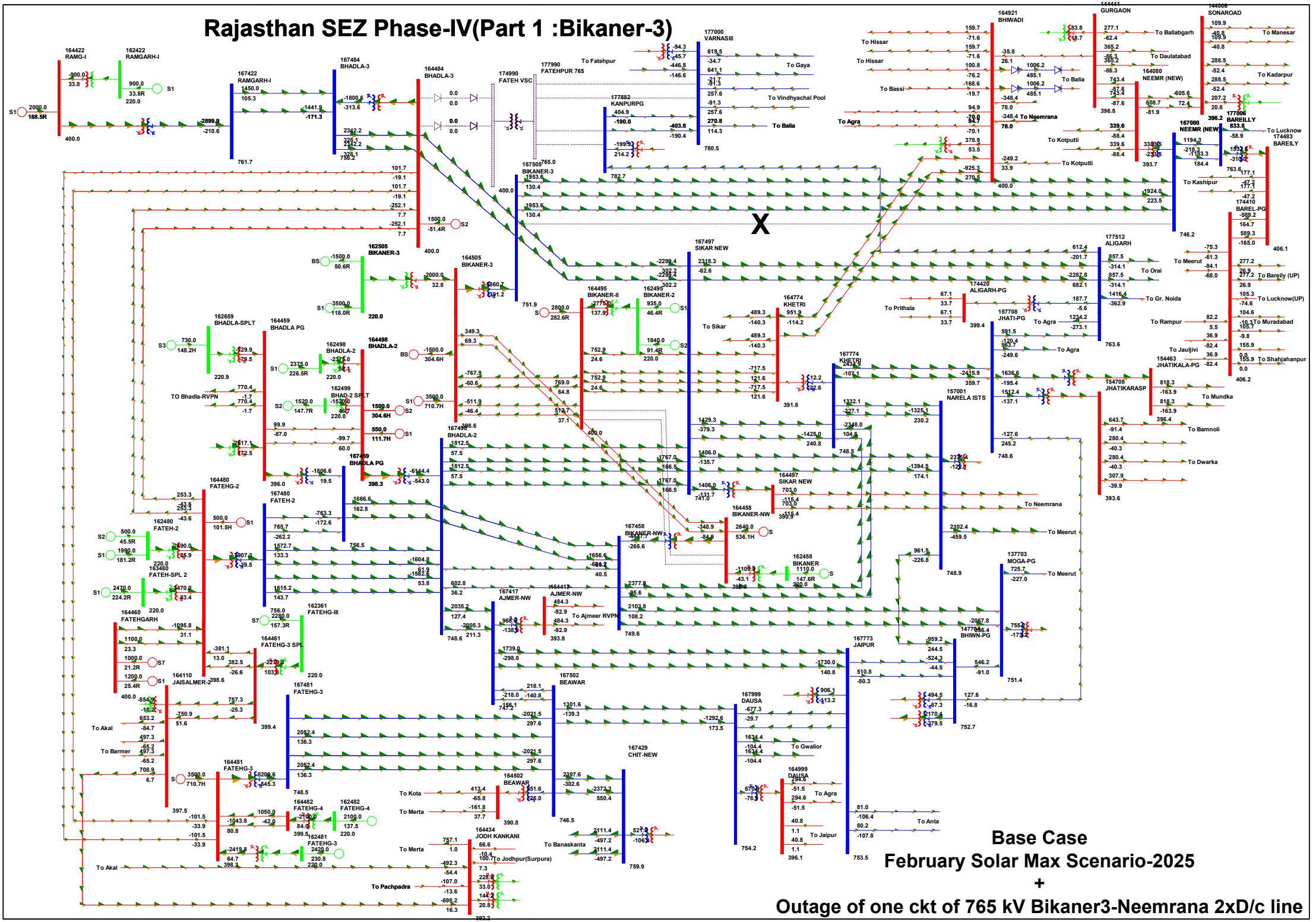

Transmission for Rajasthan REZ Ph-4 (Part-1)
BESS-3GW (by 2025)
Bikaner-3
(Ph-IV : 7 GW,
BESS-3GW)
Bikaner
(Ph-I:+II : 3.865GW)
Bikaner-2
(Ph-II: 1.9GW)
(Ph-IV : 3.7GW)
Bhadla-2
(Ph-I+II : 4.4GW)
(Ph-III : 1.5GW)
Bikaner
(RVPN)
Ramgarh-ISTS
(Ph-III:2.9 GW)
Bhadla (PG)
(Ph-I+II: +1.25GW)
Bhadla
(RVPN)
Fatehgarh
(Ph-I: 1.2GW)
Fatehgarh-2
(Ph-I+II: 4.46GW)
(Ph-III: 1GW)
Jaisalmer
(RVPN)
Fatehgarh 3
(Ph-II : 1.9GW)
(Ph-III: 6 GW)
Fatehgarh 4
(Ph-III:2.1GW)
Bhadla 3
(6.5 GW)
Bhadla-3
(HVDC)
±800kV 6000MW
To Moga
To Meerut
Bhiwadi
(Reversal of Balia-
Bhiwadi HVDC link)
To Bhiwani
Narela
To Maharanibagh
To Gopalpur
Jhatikara
To Dwarka
To Balia
Sohna Road
Bhiwadi
Gurgaon
Sikar
(PG)
Khetri
Neemrana-2
To Bareilly
Neemrana
To Aligarh
Sikar-II
Kotputli
To Kanpur
Jaipur(Phagi)
To Bhiwani
Jodhpur
(Kakani
(RVPN)
Fatehpur
Ajmer(PG)
Ajmer (RVPN)
Jaipur
PG
Agra
Beawar
To Merta
Dausa
To Varanasi
To
Gwalior
To Kota
Chittorgarh
Chittorgarh
(RVPN)
To Anta
Ph-I : 8.9 GW
Ph-II: 8.1 GW
Ph-III : 20 GW
Tr. Sys for REZ Ph-4 (Part-1 : 7.7GW)

Exhibit-II

Rajasthan SEZ Phase-IV(Part 1 :Bikaner-3)



Rajasthan SEZ Phase-IV(Part 1 :Bikaner-3)

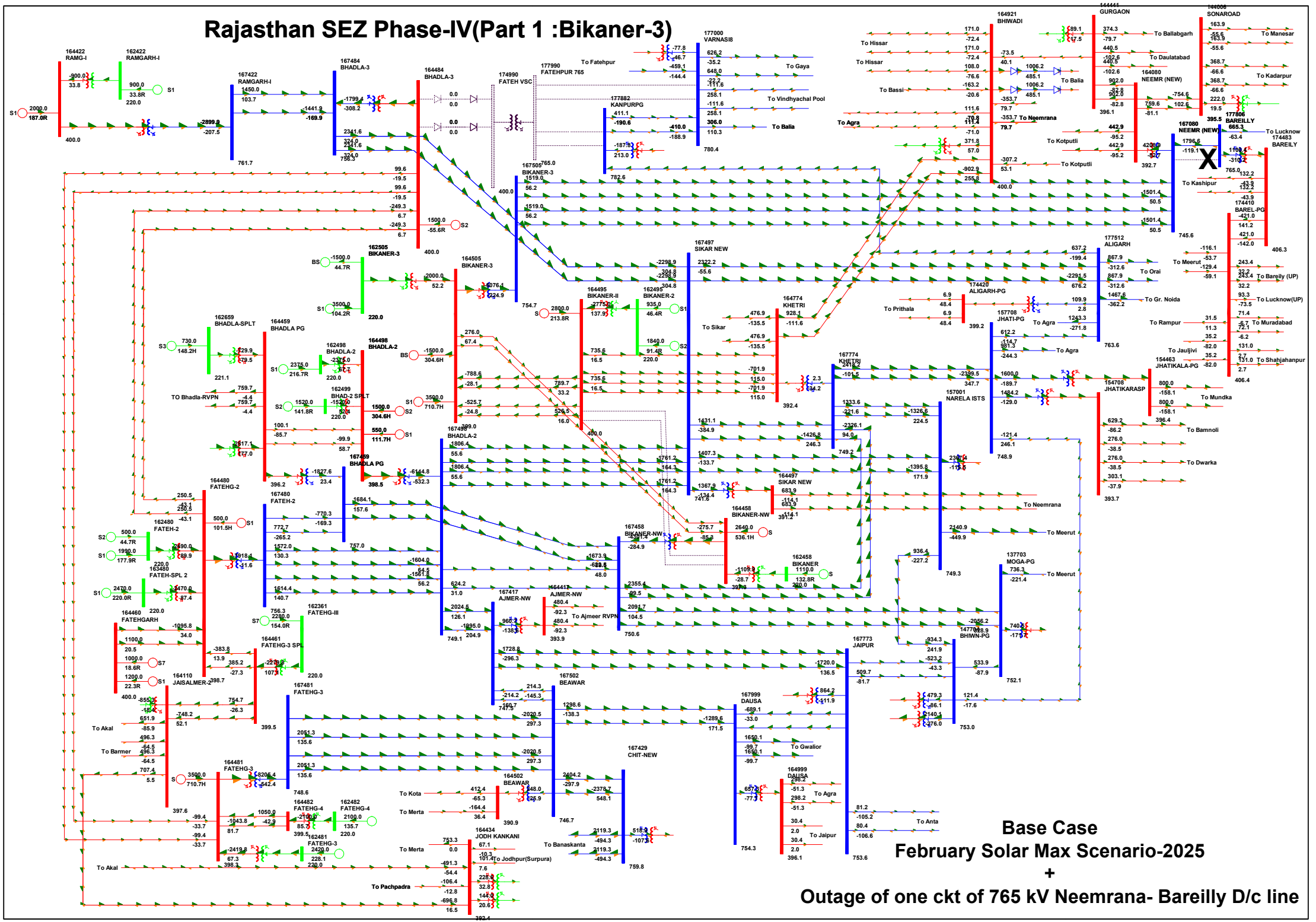


Base Case

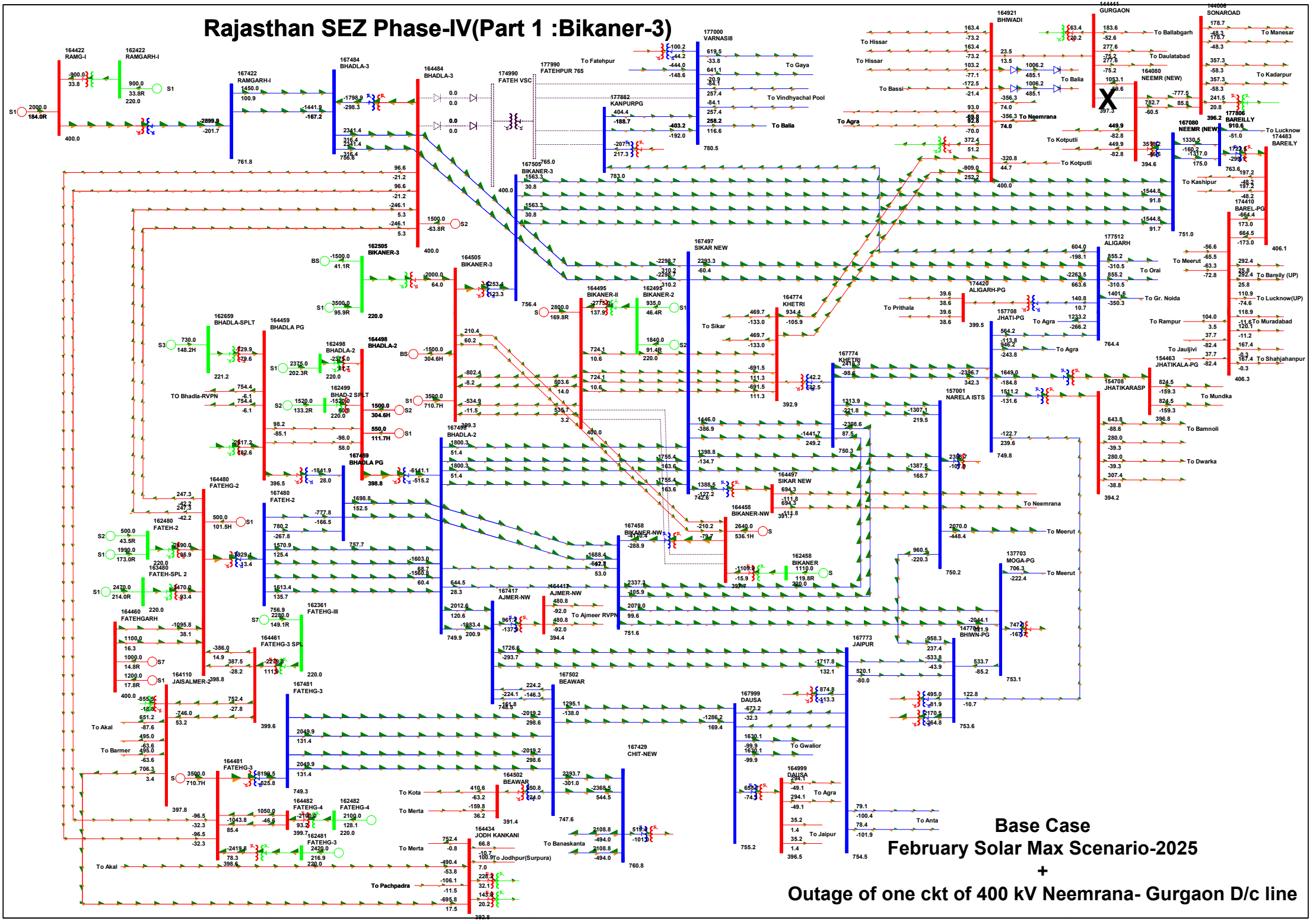
February Solar Max Scenario-2025

+

Outage of one ckt of 765 kV Bikaner3-Neemrana 2xD/c line


Rajasthan SEZ Phase-IV(Part 1 :Bikaner-3)
Base Case
February Solar Max Scenario-2025
+
Outage of one ckt of 765 kV Neemrana- Bareilly D/c line

Rajasthan SEZ Phase-IV(Part 1 :Bikaner-3)

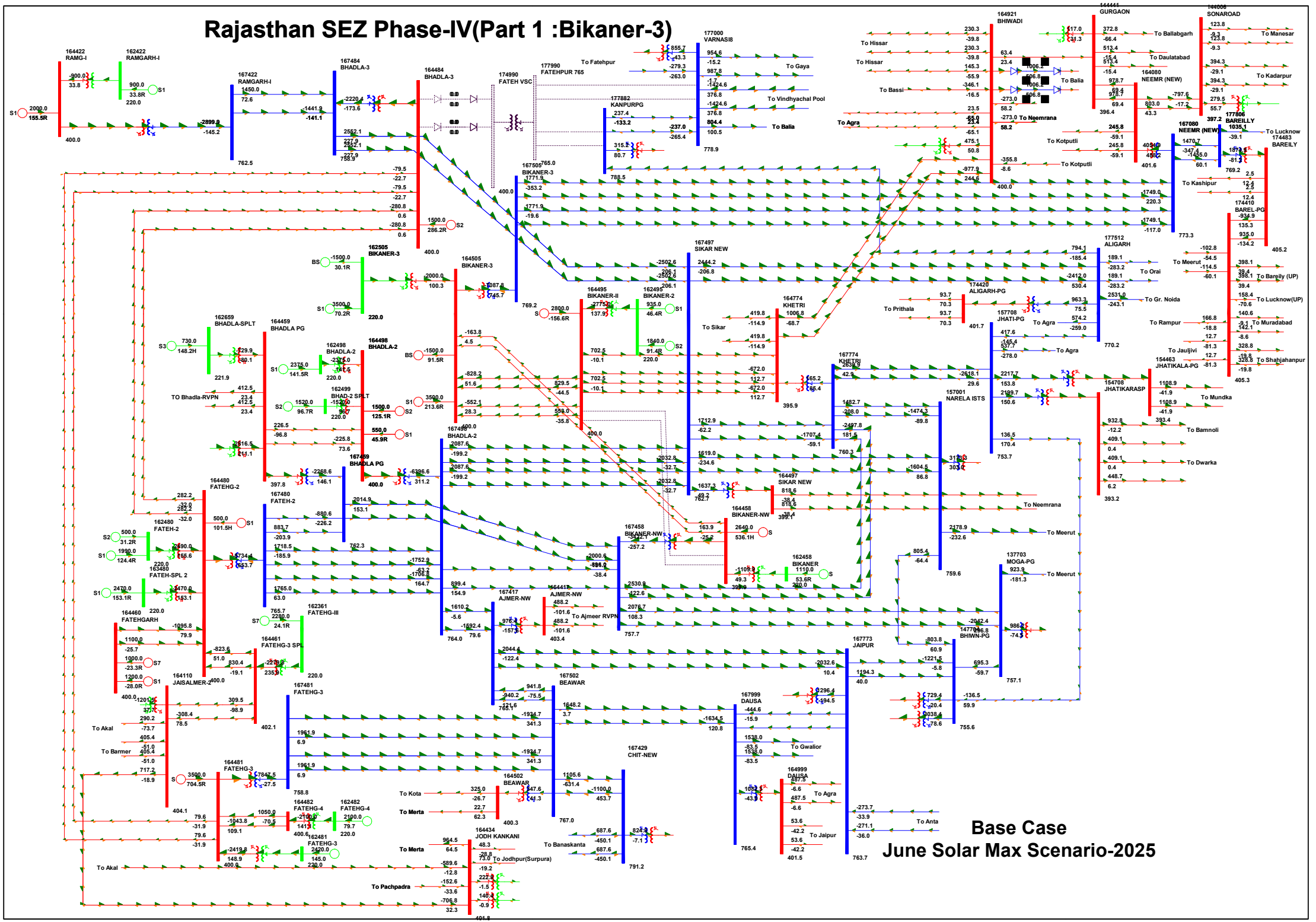


Base Case

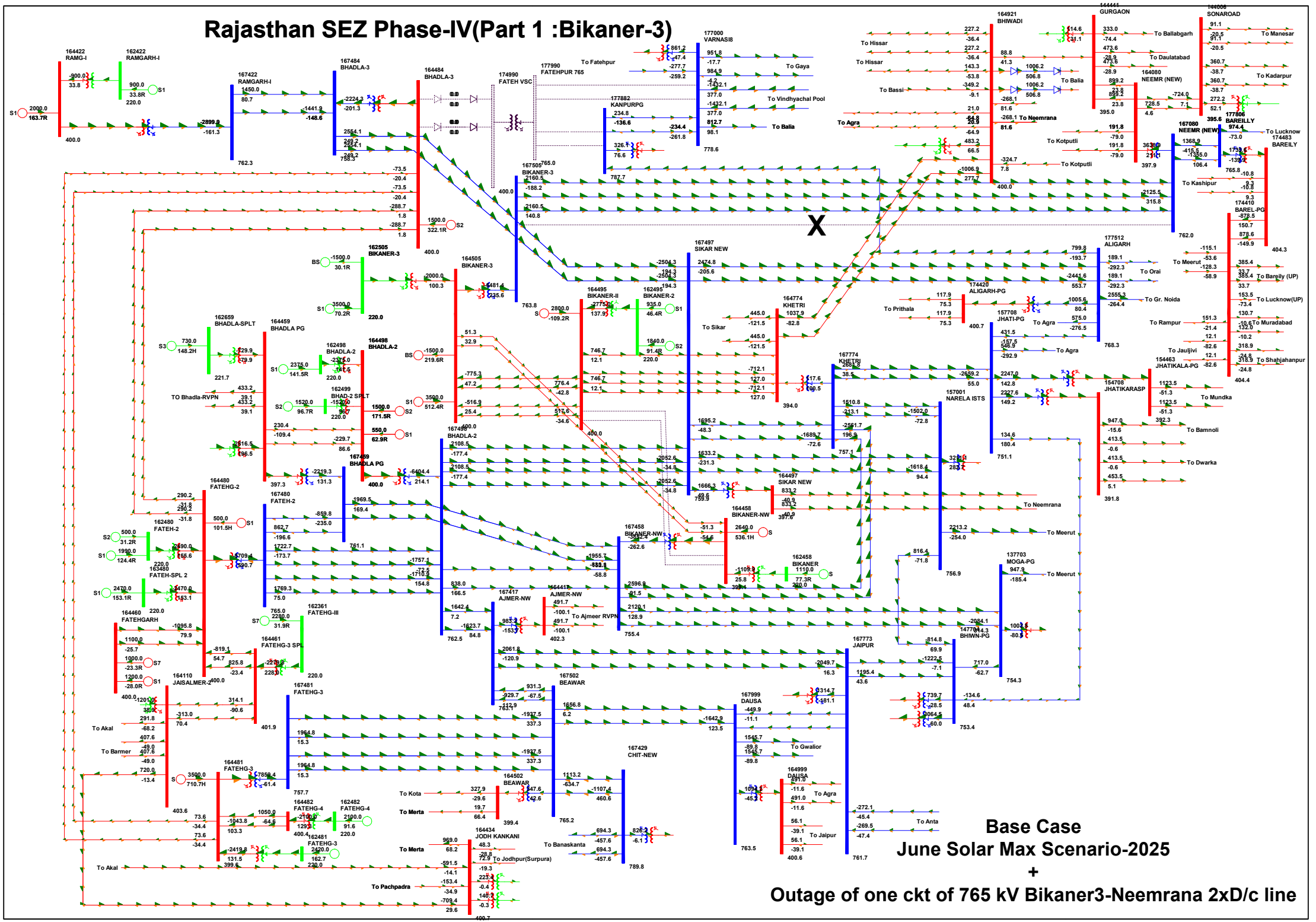
February Solar Max Scenario-2025

+

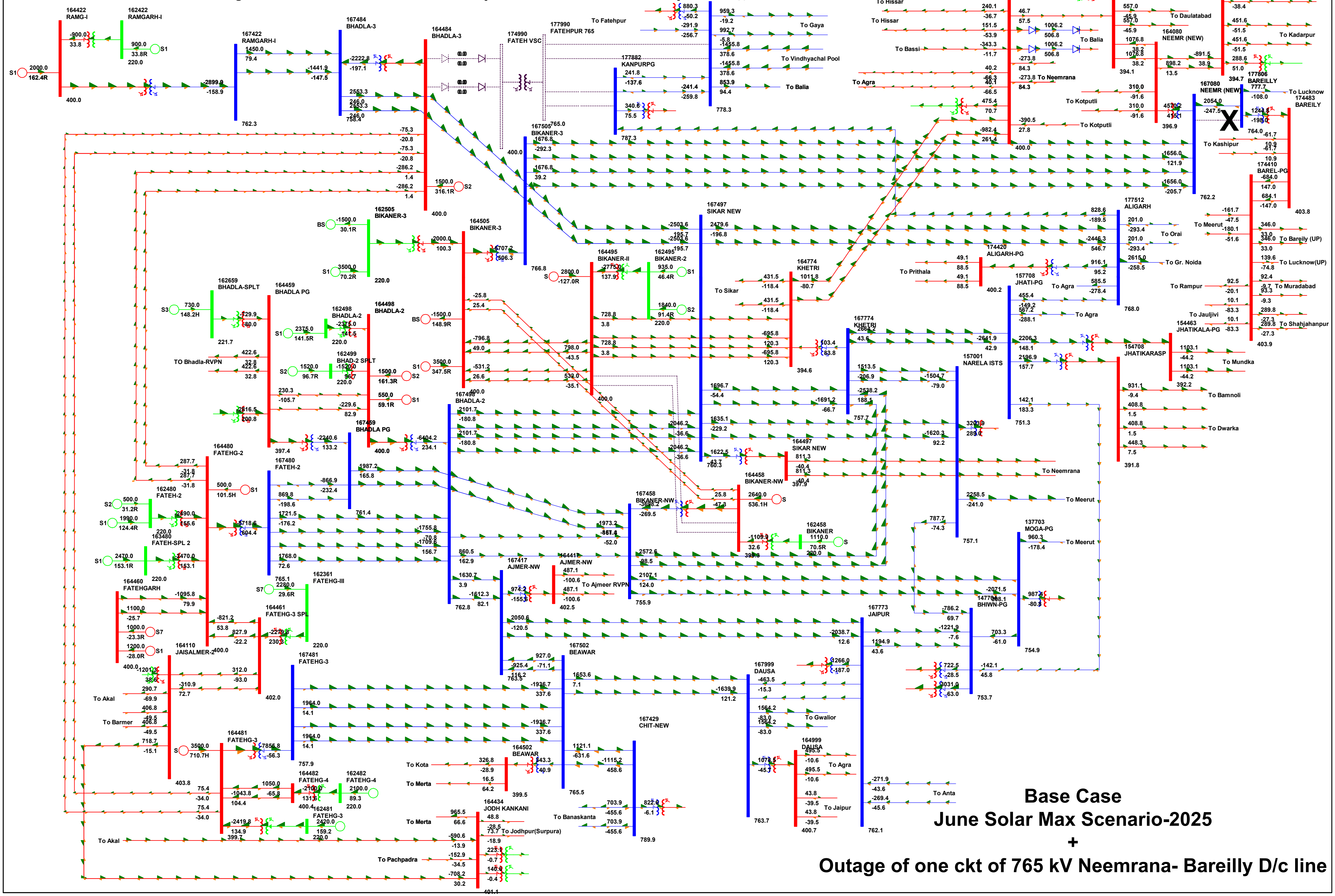
Outage of one ckt of 400 kV Neemrana- Gurgaon D/c line


Rajasthan SEZ Phase-IV(Part 1 :Bikaner-3)
Base Case
June Solar Max Scenario-2025
164422 RAMG-I
162422 RAMGARH-I
167422 RAMGARH-I
167484 BHADLA-3
164484 BHADLA-3
174990 FATEH VSC
177990 FATEHPUR 765
To Fatehpur
177882 KANPURPG
177000 VARNASI8
To Gaya
To Vindhyachal Pool
To Balia
167505 BIKANER-3
162505 BIKANER-3
164505 BIKANER-3
167497 SIKAR NEW
164495 BIKANER-II
162495 BIKANER-2
164774 KHETRI
To Sikar
To Prithala
174420 ALIGARH-PG
177512 ALIGARH
To Orai
To Gr. Noida
To Agra
157708 JHATI-PG
167774 KHETRI
157001 NARELA ISTS
154708 JHATIKARASP
154463 JHATIKALA-PG
To Rampur
To Jaujivi
To Meerut
To Bareily (UP)
To Lucknow(UP)
To Muradabad
To Shahjahanpur
To Mundka
To Bamnoli
To Dwarka
To Neemrana
To Kotputli
To Bassi
To Hissar
164921 BHIWADI
To Ballabgarh
To Daulatabad
To Balia
To Neemrana
144441 GURGAON
164080 NEEMR (NEW)
144006 SONAROAD
To Manesar
To Kadarpur
177806 BAREILLY
167080 NEEMR (NEW)
To Lucknow
174483 BAREILY
To Kashipur
174410 BAREL-PG
137703 MOGA-PG
To Meerut
167773 JAIPUR
14770 BHIWN-PG
To Jaipur
To Anta
To Gwalior
167999 DAUSA
164999 DAUSA
To Agra
167502 BEAWAR
164502 BEAWAR
167429 CHIT-NEW
To Banaskanta
To Kota
To Merta
164434 JODH KANKANI
To Jodhpur(Surpura)
To Pachpadra
To Akal
To Barmer
164480 FATEHG-2
167480 FATEH-2
162480 FATEH-2
163480 FATEH-SPL 2
164460 FATEHGARH
162361 FATEHG-III
164461 FATEHG-3 SPL
167481 FATEHG-3
164481 FATEHG-3
162481 FATEHG-3
164482 FATEHG-4
162482 FATEHG-4
164110 JAISALMER-2
162659 BHADLA-SPLT
164459 BHADLA PG
162498 BHADLA-2
164498 BHADLA-2
162499 BHAD-2 SPLT
167459 BHADLA PG
167499 BHADLA-2
TO Bhadla-RVPN
164458 BIKANER-NW
167458 BIKANER-NW
162458 BIKANER 1110.0
164497 SIKAR NEW
164417 AJMER-NW
164417 AJMER-NW
To Ajmeer RVPN
BS
S1
S2
S3
S7

Rajasthan SEZ Phase-IV(Part 1 :Bikaner-3)



Rajasthan SEZ Phase-IV(Part 1 :Bikaner-3)



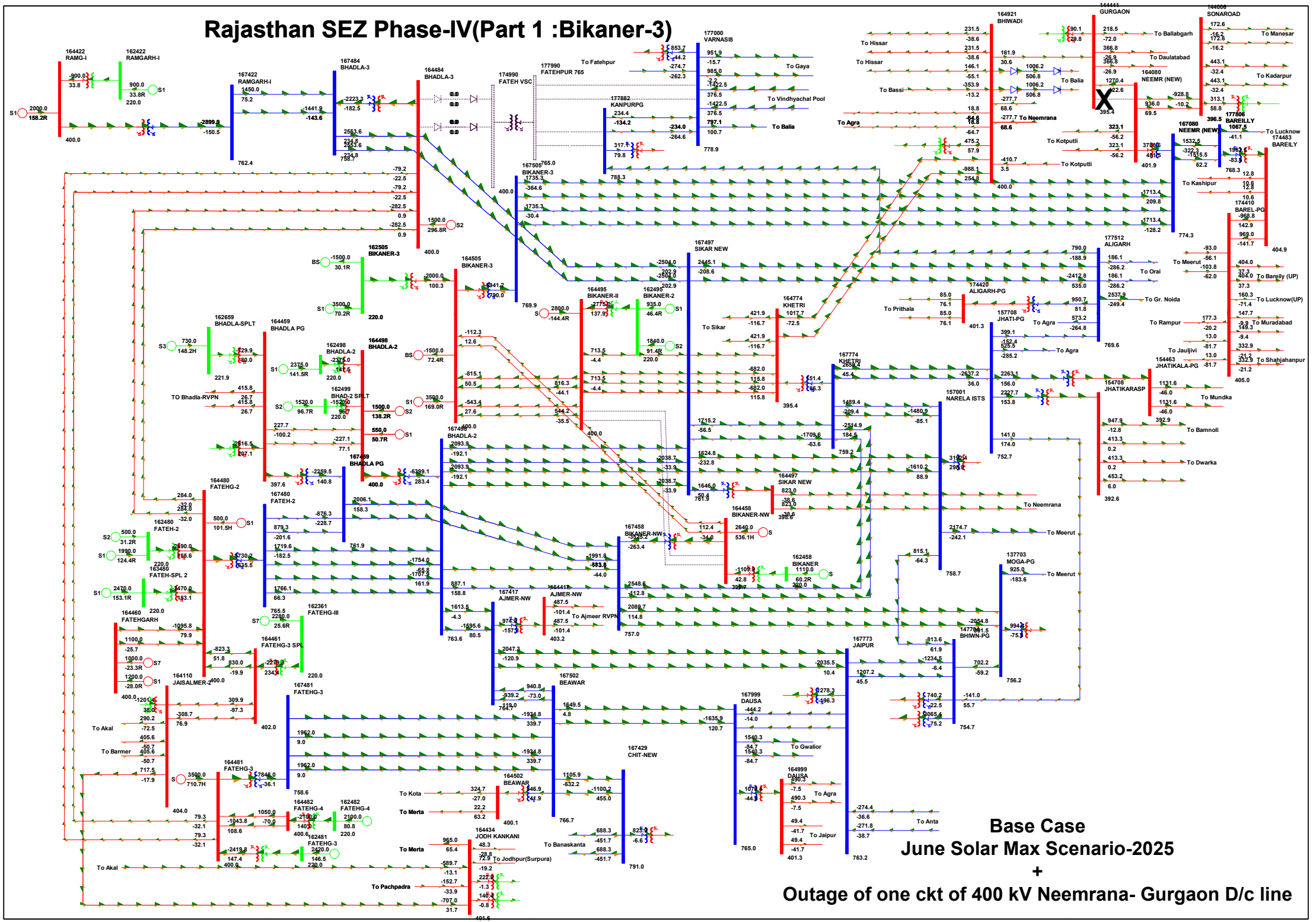
Base Case

June Solar Max Scenario-2025

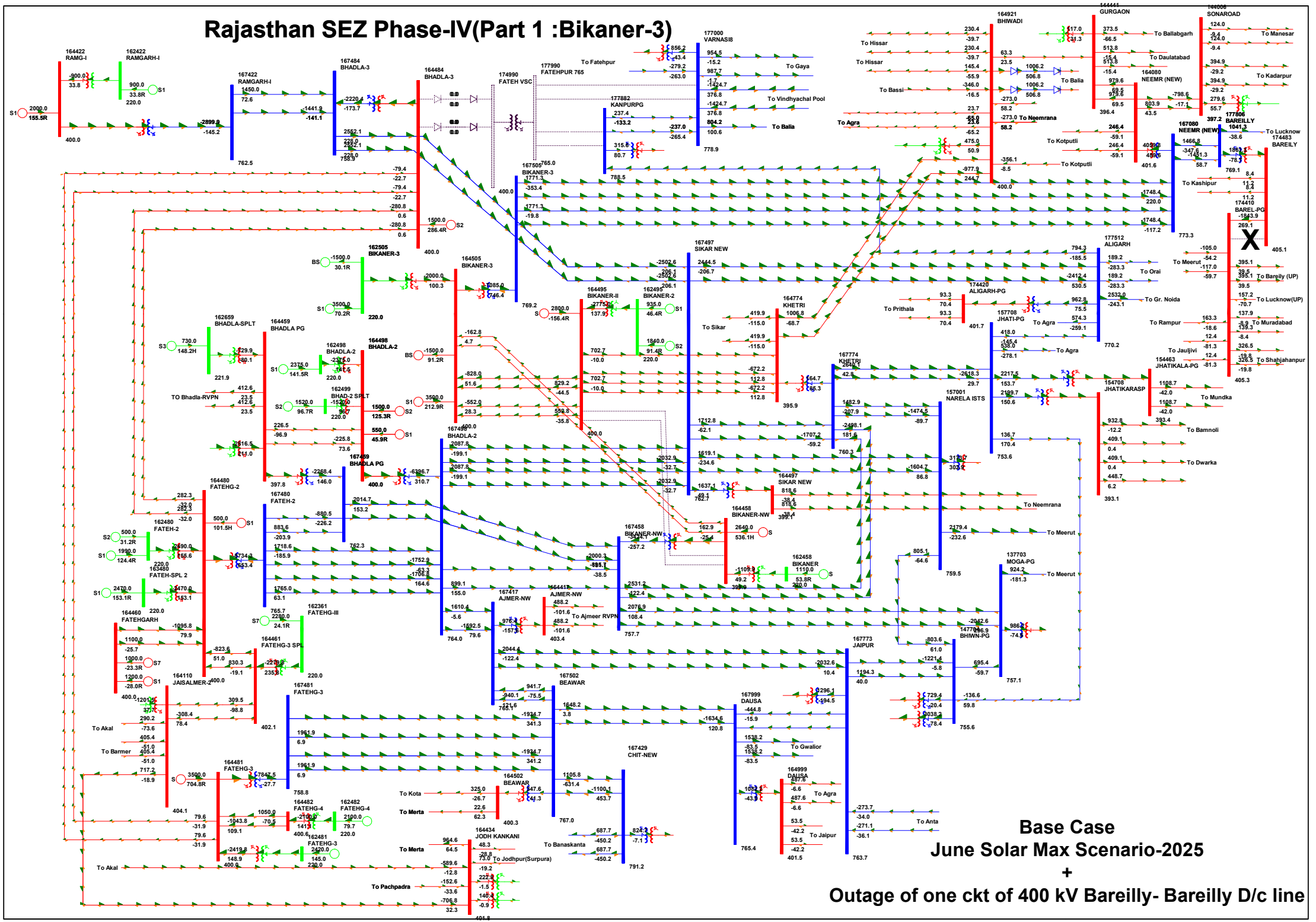
+

Outage of one ckt of 765 kV Neemrana- Bareilly D/c line

Rajasthan SEZ Phase-IV(Part 1 :Bikaner-3)



Rajasthan SEZ Phase-IV(Part 1 :Bikaner-3)



Base Case

June Solar Max Scenario-2025

+

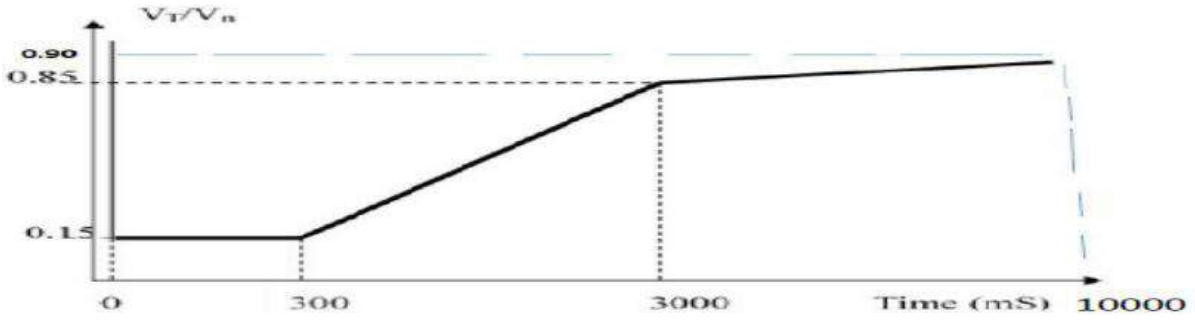
Outage of one ckt of 400 kV Bareilly- Bareilly D/c line

Solar Generation loss event on 09.07.2022
Assessment of LVRT & HVRT Performance of RE Generators

On 09.07.2022 at 13:42 hrs multiple element tripping happened in Rajasthan solar complex and drop in solar generation of approx. 3485MW also took place. The sequence of events was as below:

- At 13:42hrs, 400 KV Bikaner(PG)-Bikaner(RS) (PG) Ckt-1 tripped on R-Y phase to phase fault. As per DR received from Bikaner(PG) end, fault current was ~12kA. As per PMU at Fatehgarh2(PG), R-Y phase to phase fault which cleared within 80ms is observed.
- At the same time, 400 KV Avaada Pooling SL_BKN_PG (AEPL)-Bikaner(PG) (AEPL) Ckt-1 (carrying 727MW) also tripped on maloperation of SOTF protection. With the tripping of line, solar generation of approx. 727MW at Avaada also tripped due to loss of evacuation path.
- During same time, drop in solar generation is observed at many other RE stations connected at different RE pooling stations. Drop in total solar generation was approx. 3485MW (including Avaada solar generation).
- Within around 03 mins approx. 2300MW solar generation recovered.
- Further after 5secs of fault, over voltage occurred due to significant generation drop and 765 KV Bhadla_2 (PG)-Fatehgarh_II(PG) (PFTL) Ckt-1 tripped on over voltage protection operation at Bhadla2 end.

As per CEA Technical Standards for connectivity to Grid 2019, *The RE generating stations connected to the grid, shall remain connected to the grid when voltage at the interconnection point on any or all phases dips up to the level depicted by the thick lines in the following curve, namely: —*
VT : Actual Voltage; Vn: Nominal Voltage—

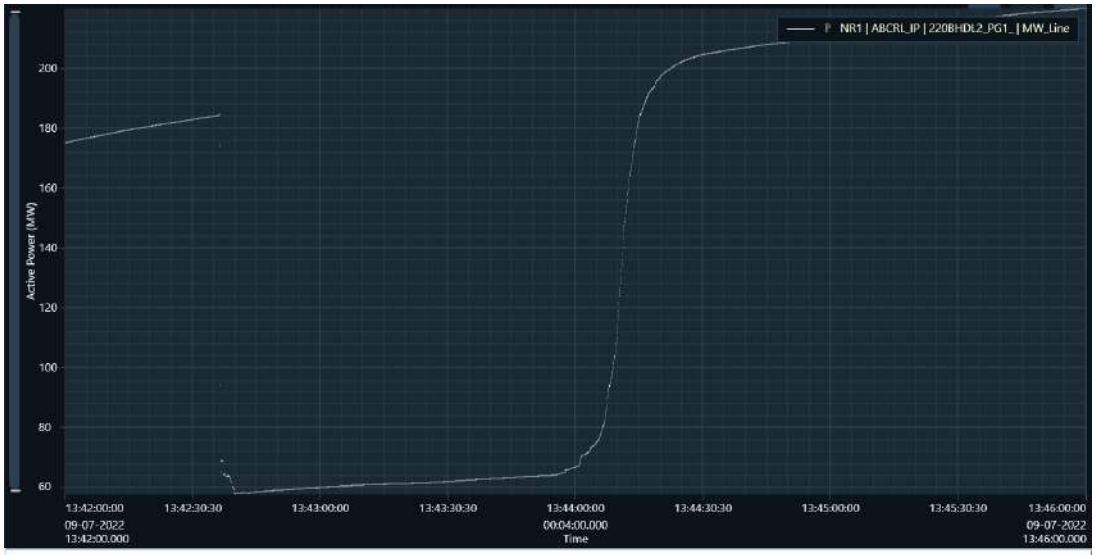


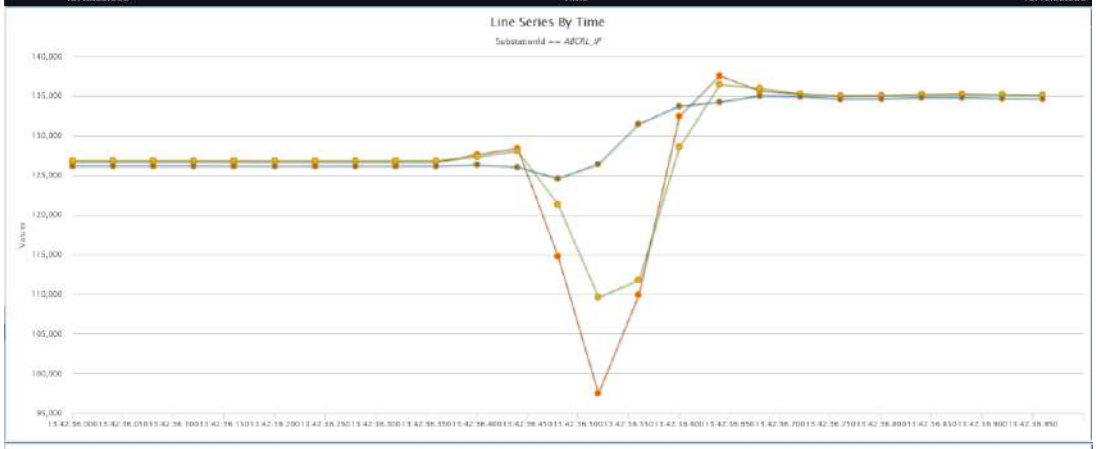
Provided that during the voltage dip, the supply of reactive power has first priority, while the supply of active power has second priority and the active power preferably be maintained during voltage drops, provided, a reduction in active power within the plant's design specifications is acceptable and active power be restored to at least 90% of the pre-fault level within 1 sec of restoration of voltage.
The generating station connected to the grid, shall remain connected to the grid when voltage at the interconnection point, on any or all phases (symmetrical or asymmetrical overvoltage conditions) rises above the specified values given below for specified time —

Over voltage (pu)	Minimum time to remain connected (Seconds)
1.30 < V	0 Sec (Instantaneous trip)
1.30 ≥ V > 1.20	0.2 Sec
1.20 ≥ V >1.10	2 Sec
V ≤ 1.10	Continuous

As fault in the system for subject event was cleared within 80 ms, therefore as is evident from curve and table above Generation drop is allowed only if voltage at the point of interconnection drops below 0.15 PU under LVRT and Generation drop is allowed only if voltage sustains above 1.1PU for 2 secs.

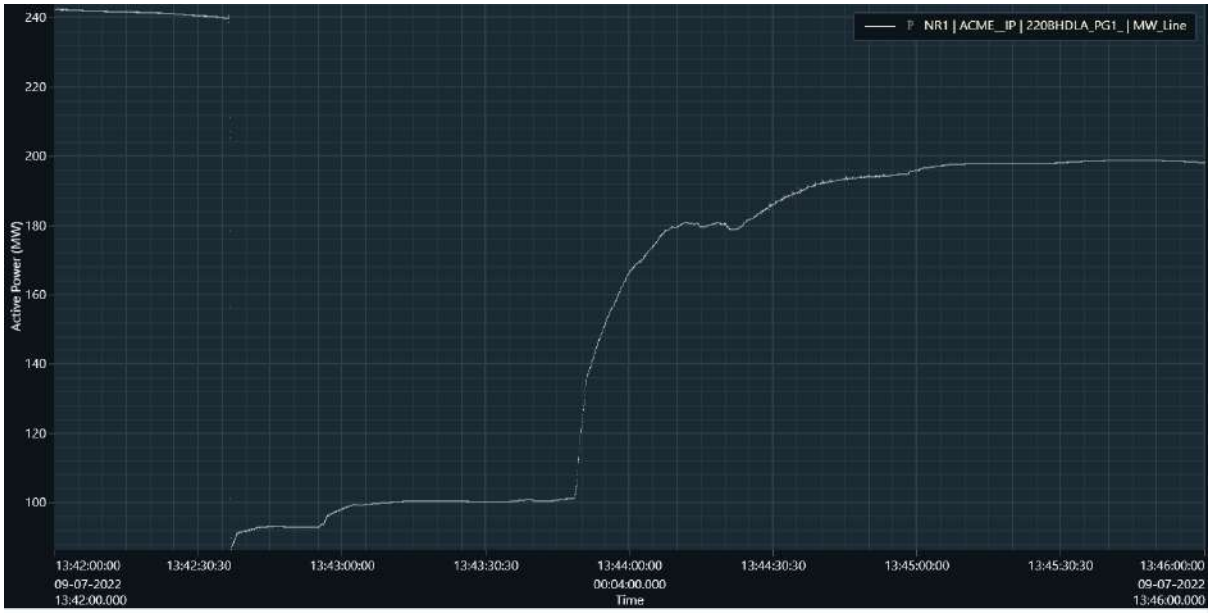
Input from PMUs installed at RE generator end were used for said analysis.
Accordingly Voltage at point of interconnection of all the RE generators and Active power being injected by each generator were analysed and followings were the observations:

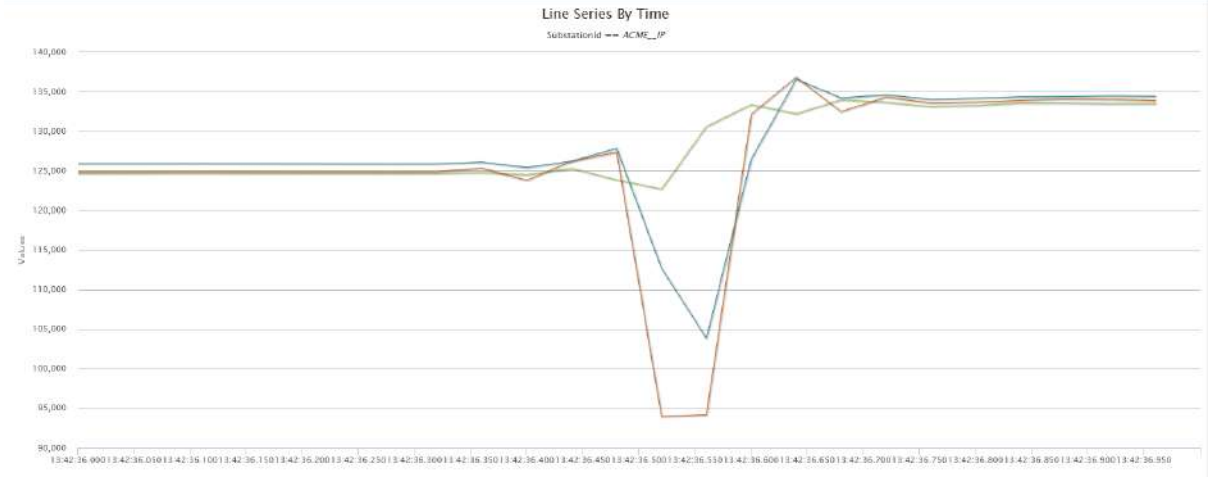




ABCRL:

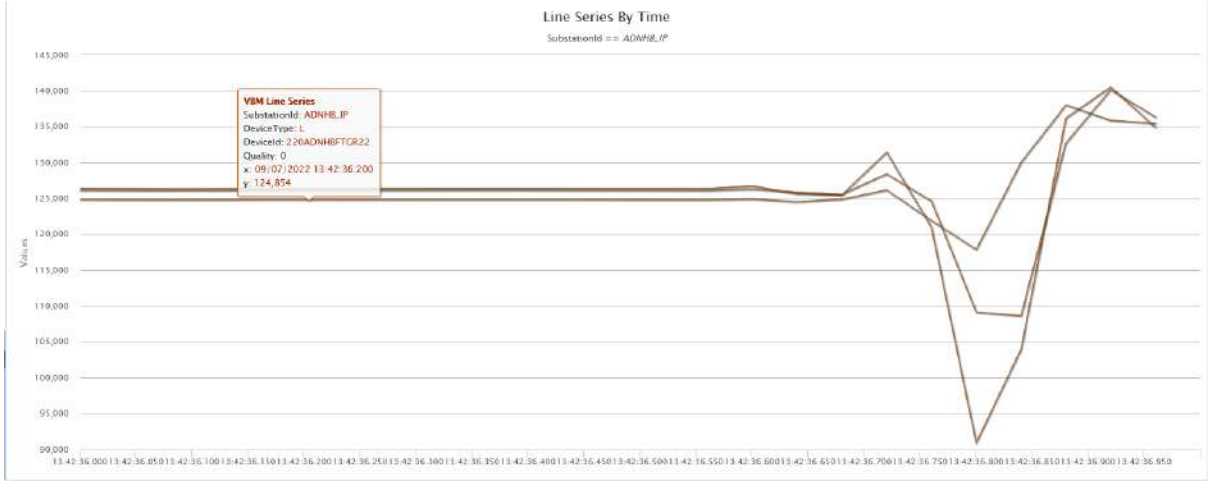
Voltage dipped to 0.76PU on lower side and 1.07PU on higher side. Generation dropped from 180 MW to 60 MW and came back after 2 mins. Generator is LVRT/HVRT non-compliant.

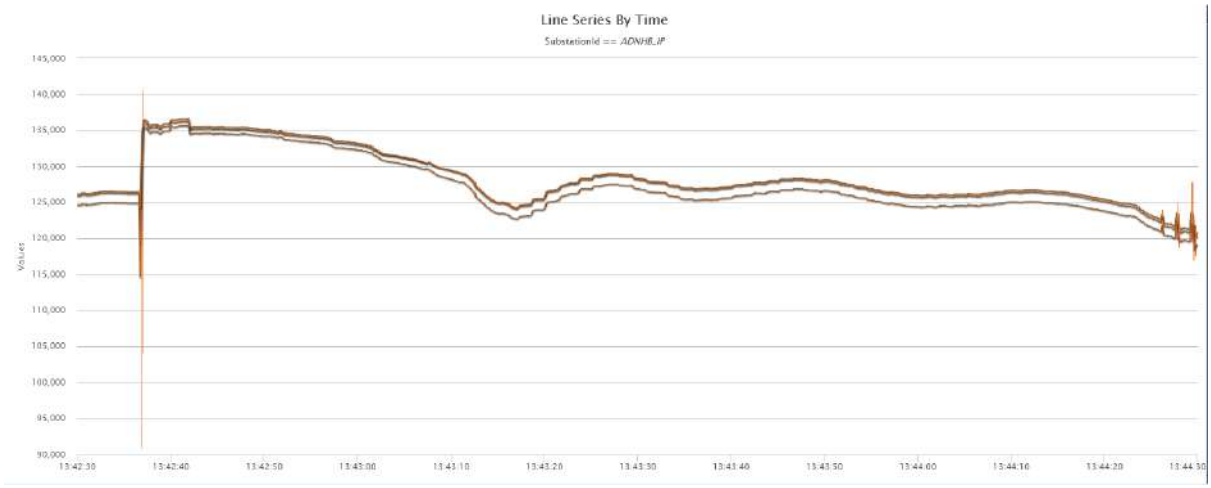




ACME:

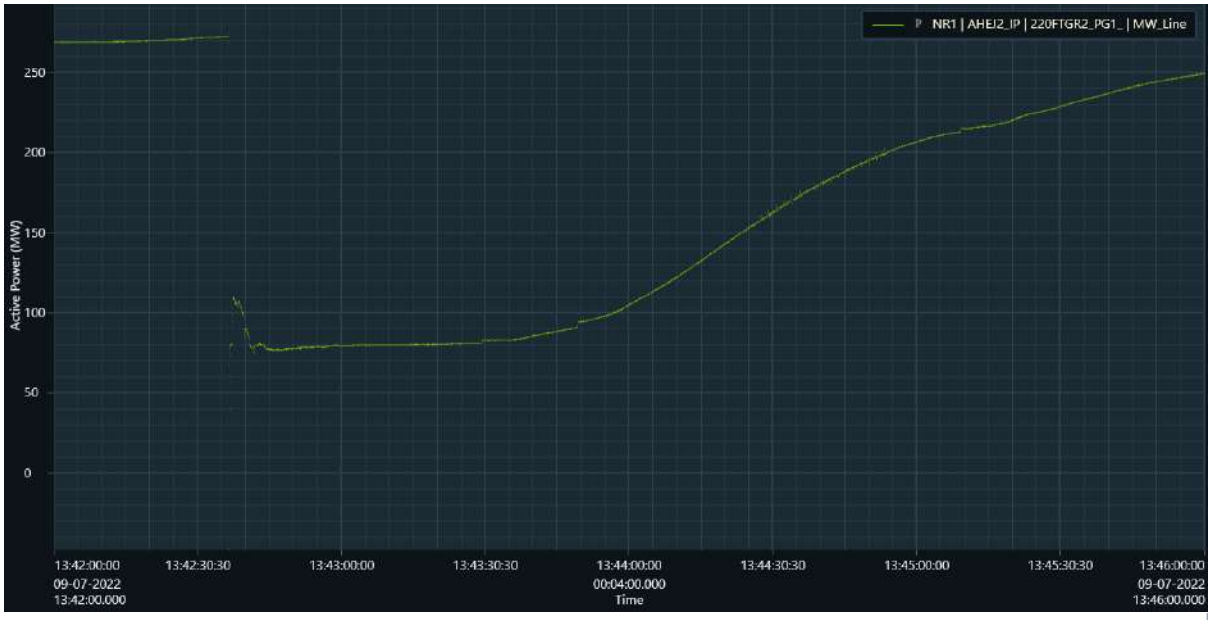
Voltage dipped to 0.74PU on lower side and 1.07PU on higher side. Generation dropped from 240 MW to 0 MW and came back after 2 mins. Generator is LVRT/HVRT non-compliant.

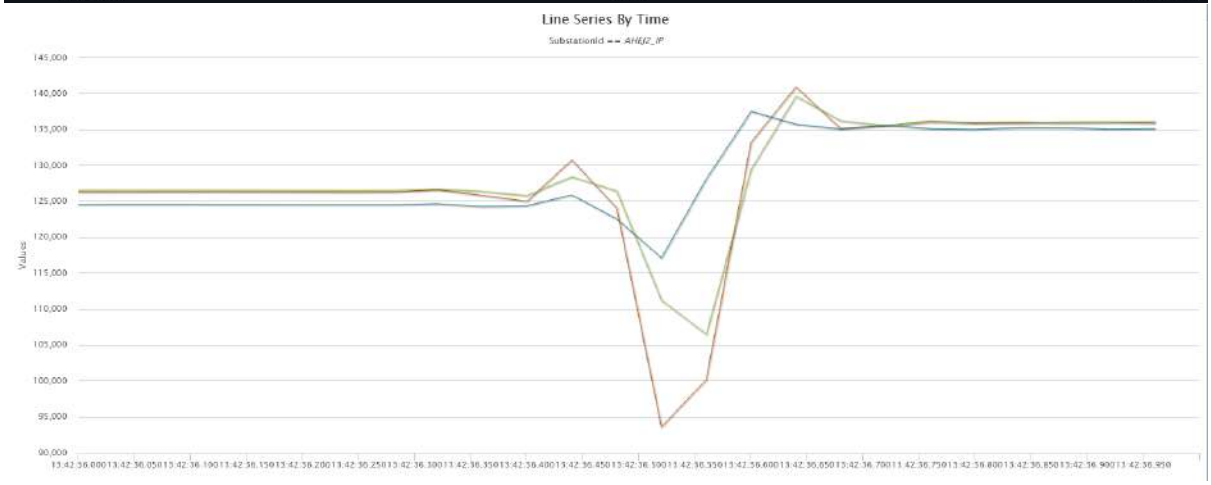


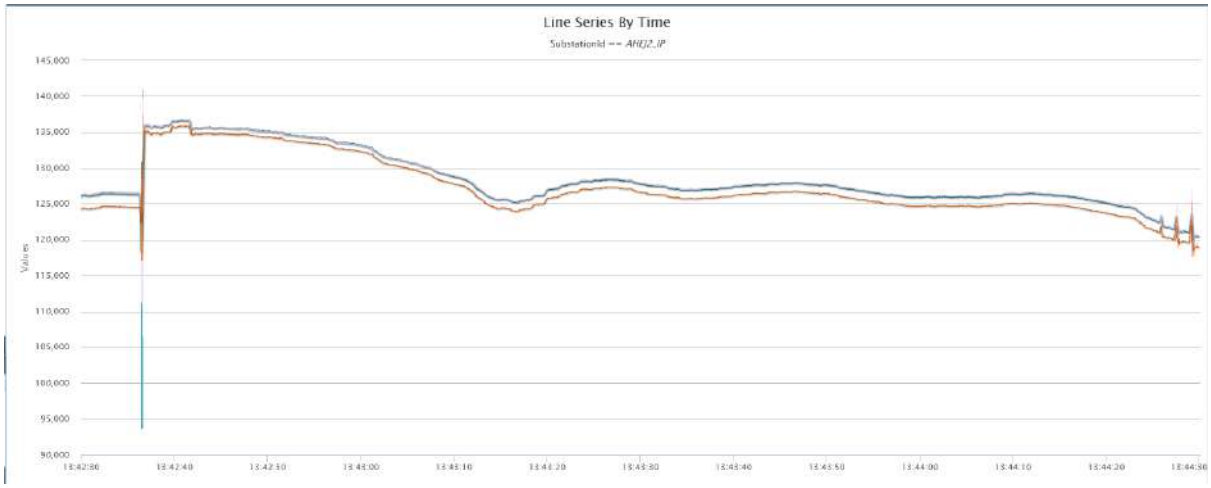


ADNHB:

Voltage dipped to 0.73PU on lower side and 1.10PU on higher side, sustained on higher side for less than 40 ms. Generation dropped from 180 MW to 60 MW and came back after 1 min. Generator is LVRT/HVRT non-compliant.

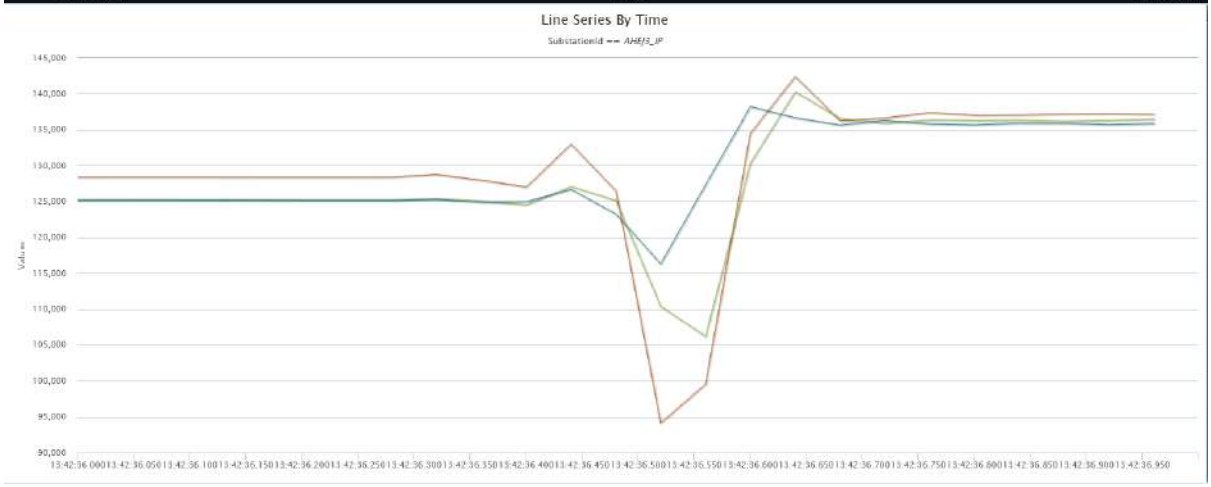






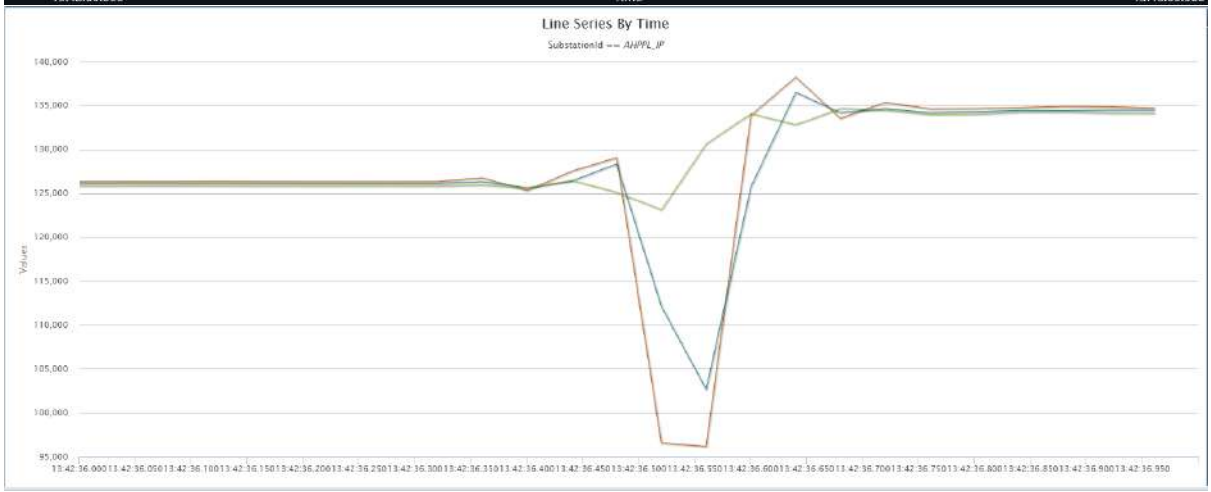
AHEJ2:

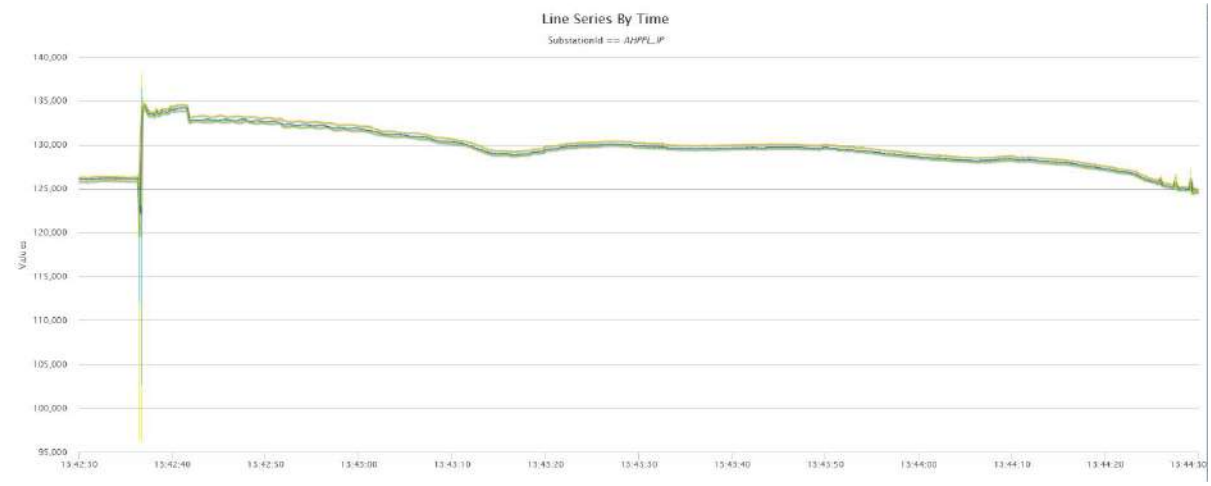
Voltage dipped to 0.74PU on lower side and 1.11PU on higher side, sustained on high level for less than 40 ms. Generation dropped from 265 MW to 70 MW and came back after 5 mins. Generator is LVRT/HVRT non-compliant.



AHEJ3:

Voltage dipped to 0.74PU on lower side and 1.11PU on higher side, sustained on high value for less than 40 ms. Generation dropped from 300 MW to 70 MW and came back after 4 mins. Generator is LVRT/HVRT non-compliant.



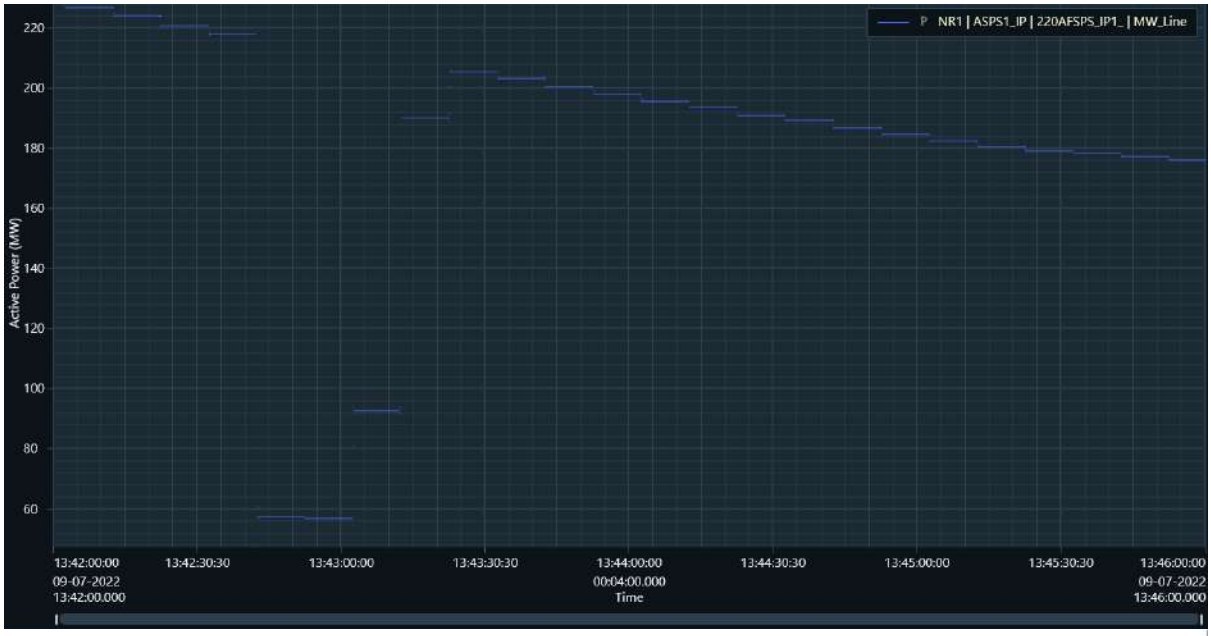


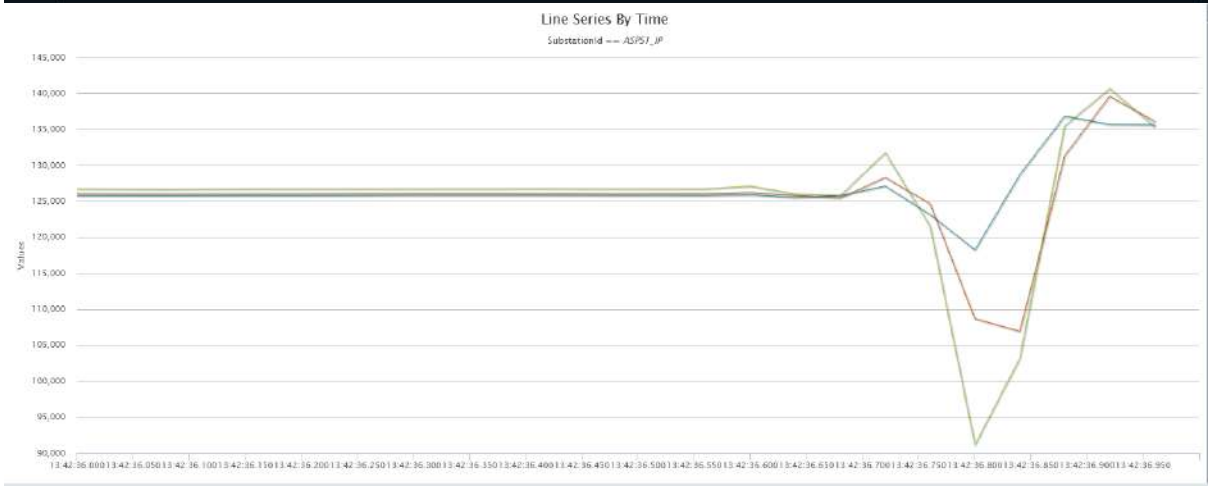
AHPPL:

Voltage dipped to 0.75PU on lower side and went to 1.08PU on higher side. Generation dropped from 156 MW to 140 MW and came back after 3 mins. Generator is LVRT/HVRT non-compliant.

APTFL:

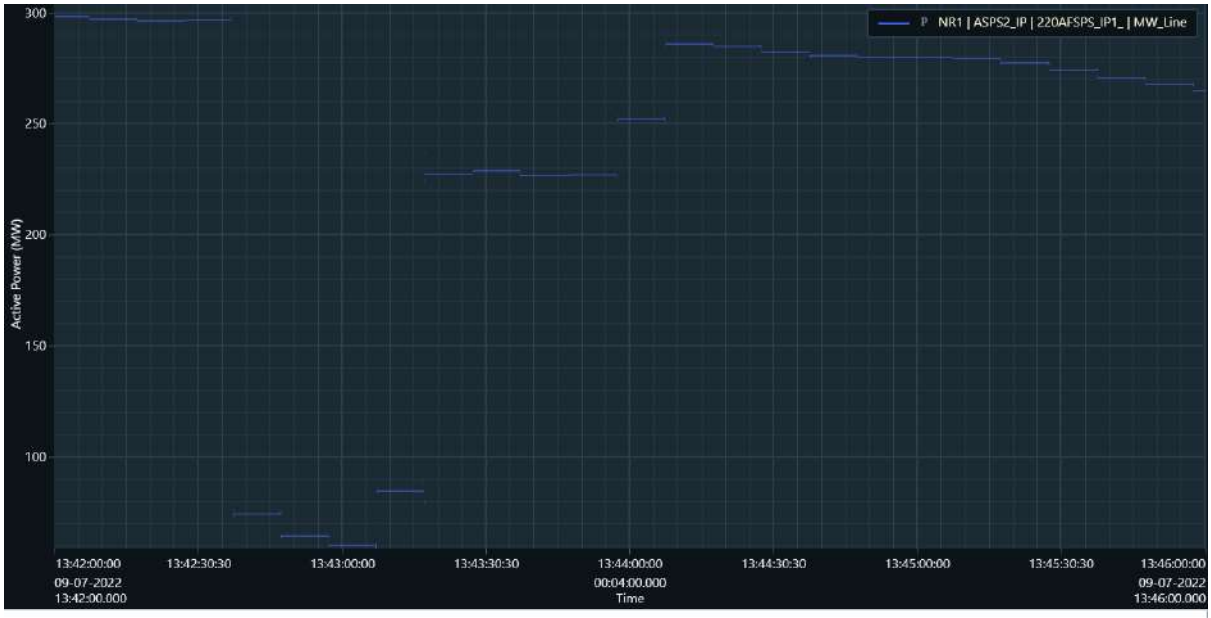
Voltage dipped to 0.78PU on lower side and 1.08PU on higher side. Generation dropped from 110 MW to 0 MW and came back after 3 mins. Generator is LVRT/HVRT non-compliant.

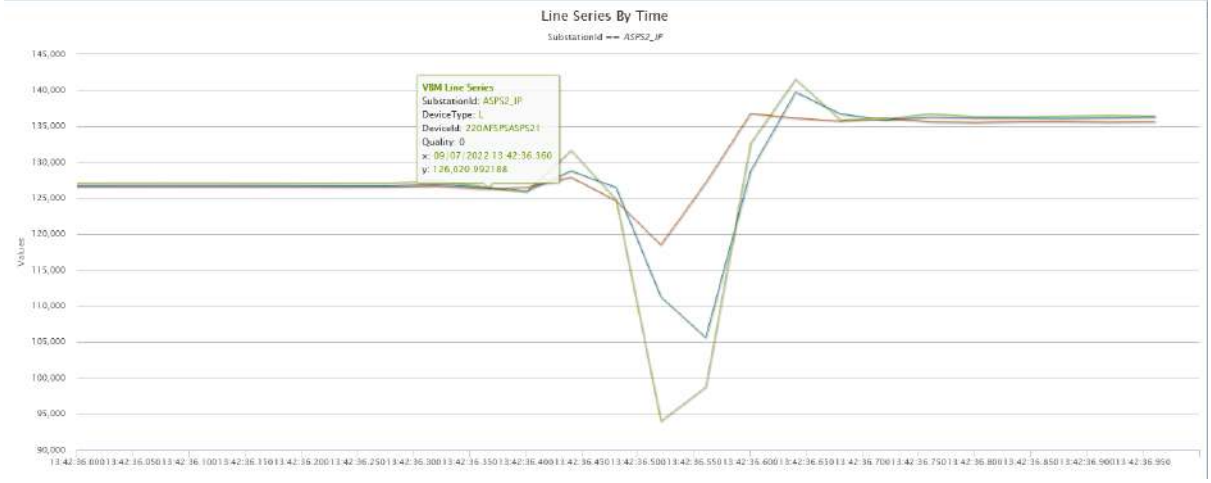




ASPS1:

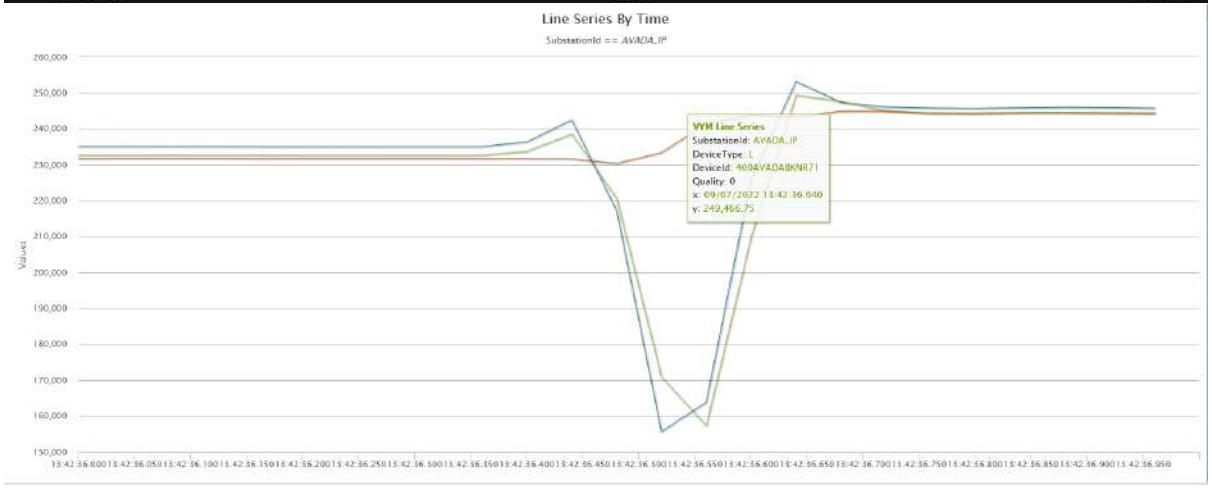
Voltage dipped to 0.70PU on lower side and 1.11 PU on higher side, sustained on higher side for less than 40 ms. Generation dropped from 220 MW to 60 MW and came back after 1 mins. Generator is LVRT/HVRT non-compliant.

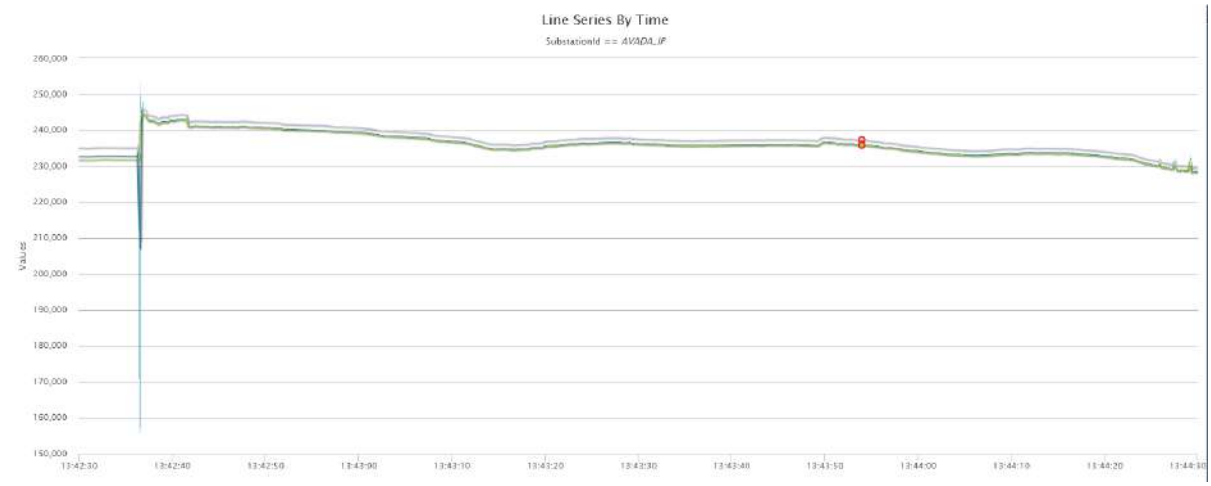




ASPS2:

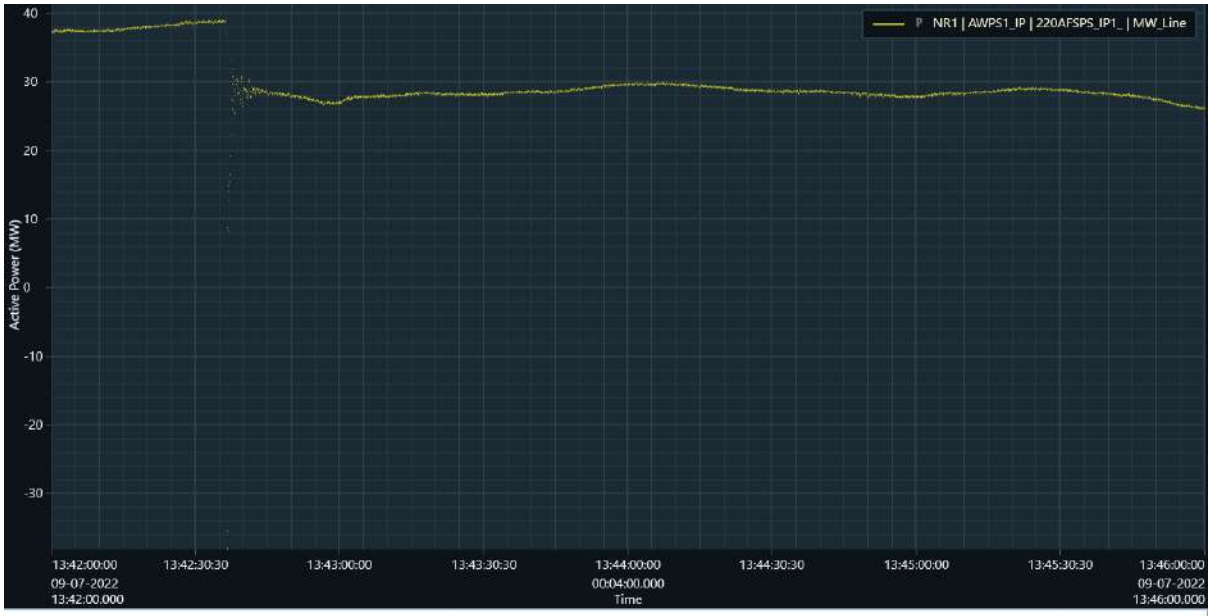
Voltage dipped to 0.74PU on lower side and 1.11PU on higher side, sustained on higher side for less than 40 ms. Generation dropped from 300 MW to 50 MW and came back after 1.5 mins. Generator is LVRT/HVRT non-compliant.

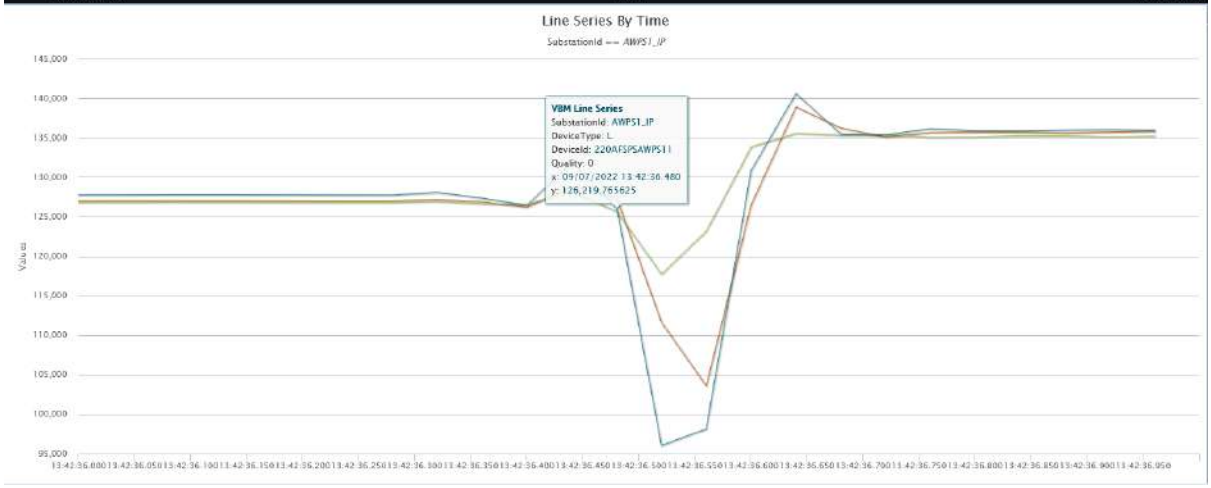




AVADA:

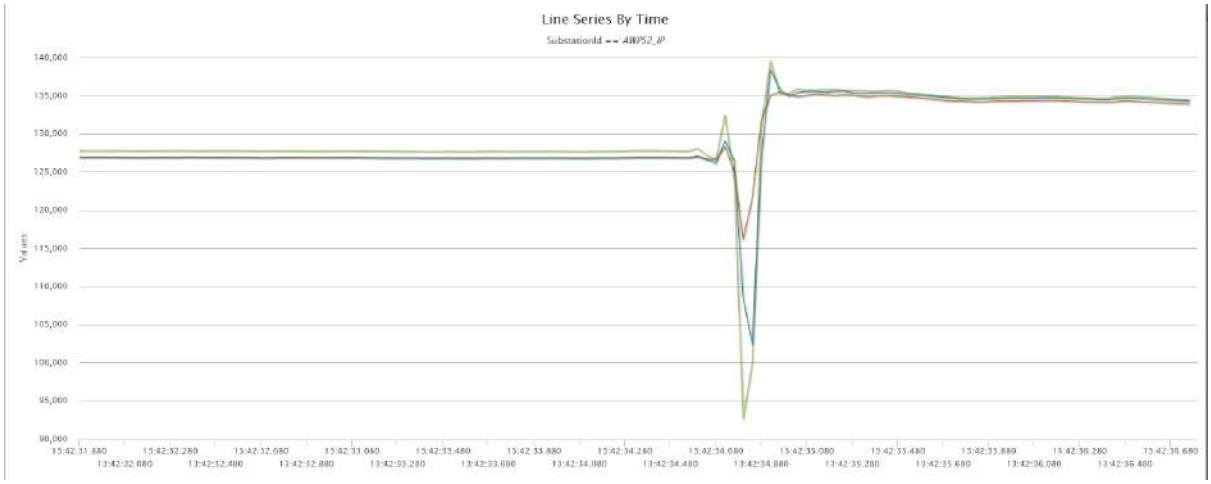
Generator got disconnected as 220 Line tripped on Protection Mal-operation.





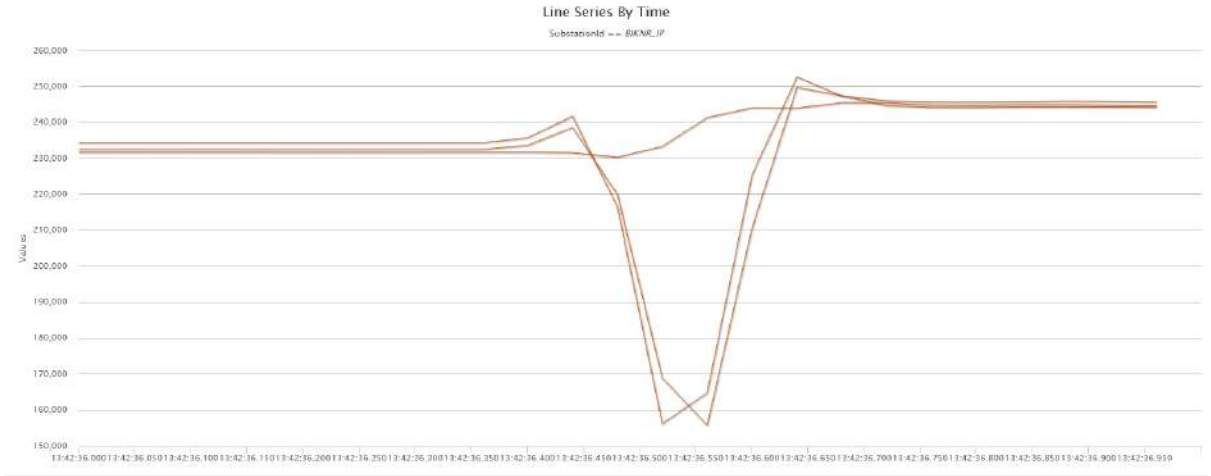
AWPS1:

Voltage dipped to 0.74PU on lower side and 1.10PU on higher side, sustained on higher side for less than 40 ms. Generation dropped from 40 MW to 30 MW and Didn't came back. Generator is LVRT/HVRT non-compliant.



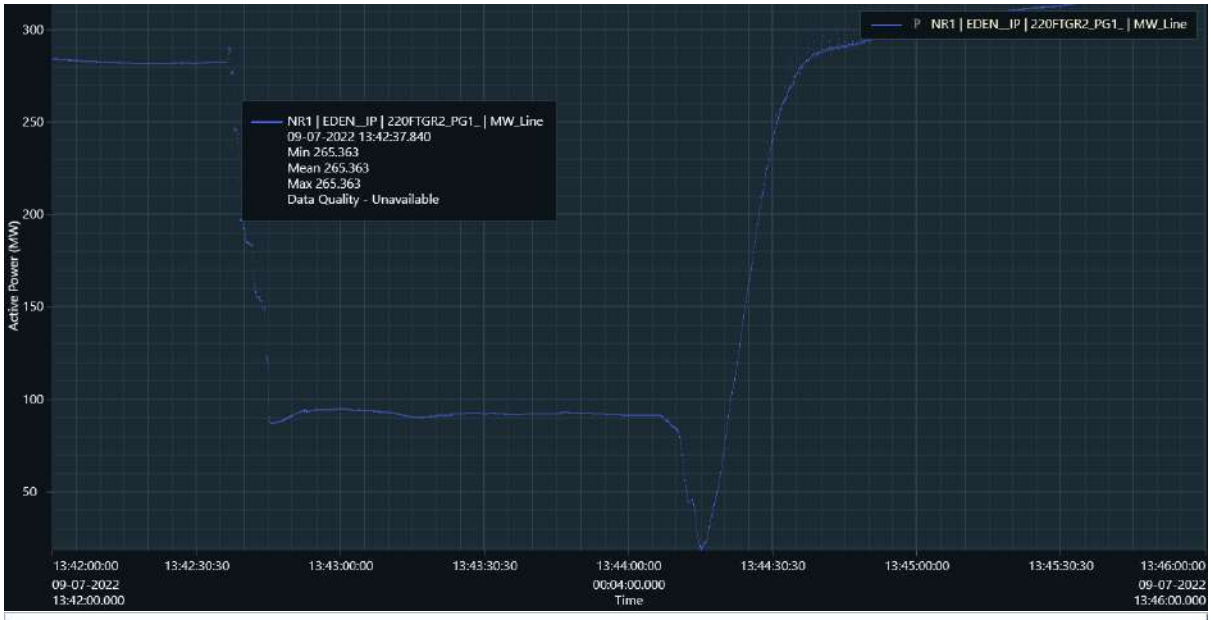
AWPS2:

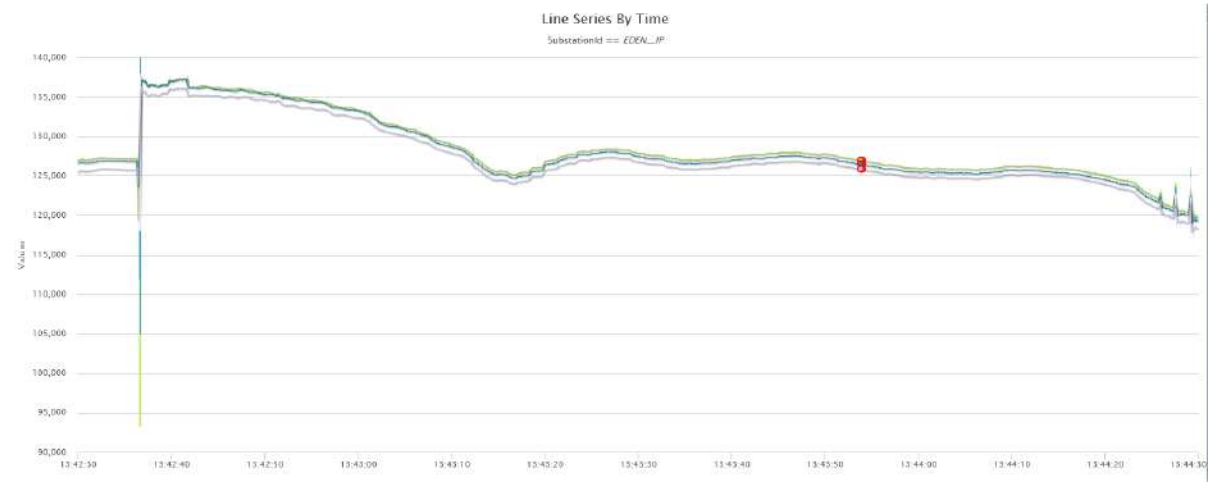
Voltage dipped to 0.74PU on lower side and 1.09PU on higher side. No drop in generation.
Generator is LVRT/HVRT compliant.



BIKNR:

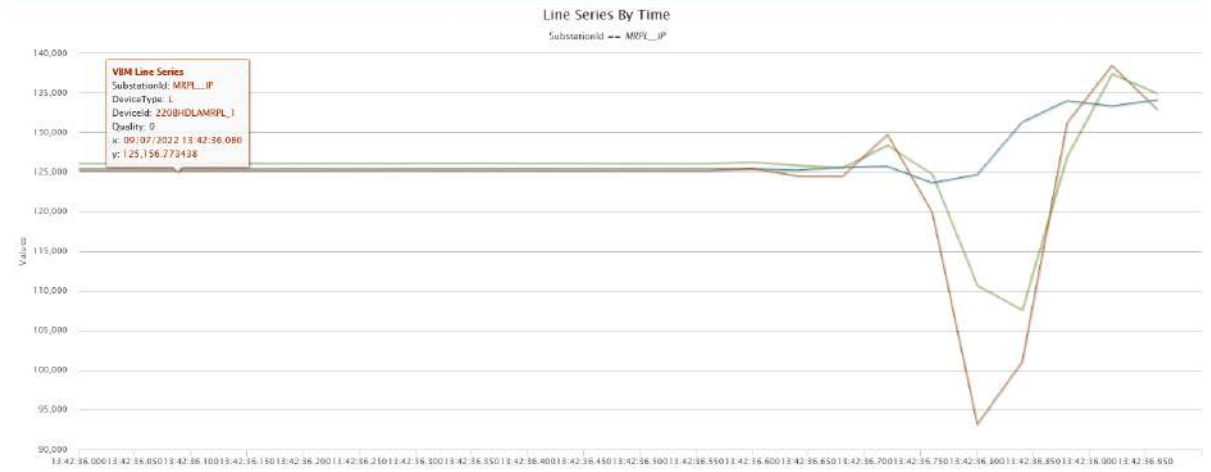
Voltage dipped to 0.62PU on lower side and 1.08PU on higher side. Generation dropped from 140 MW to 0 MW and came back after 3 mins. Generator is LVRT/HVRT non-compliant.

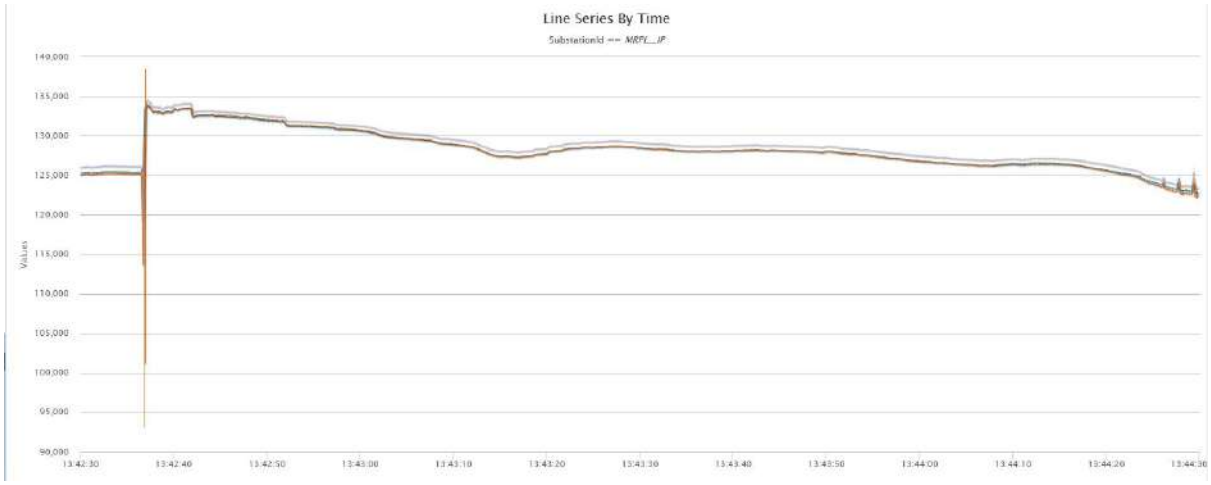




EDEN:

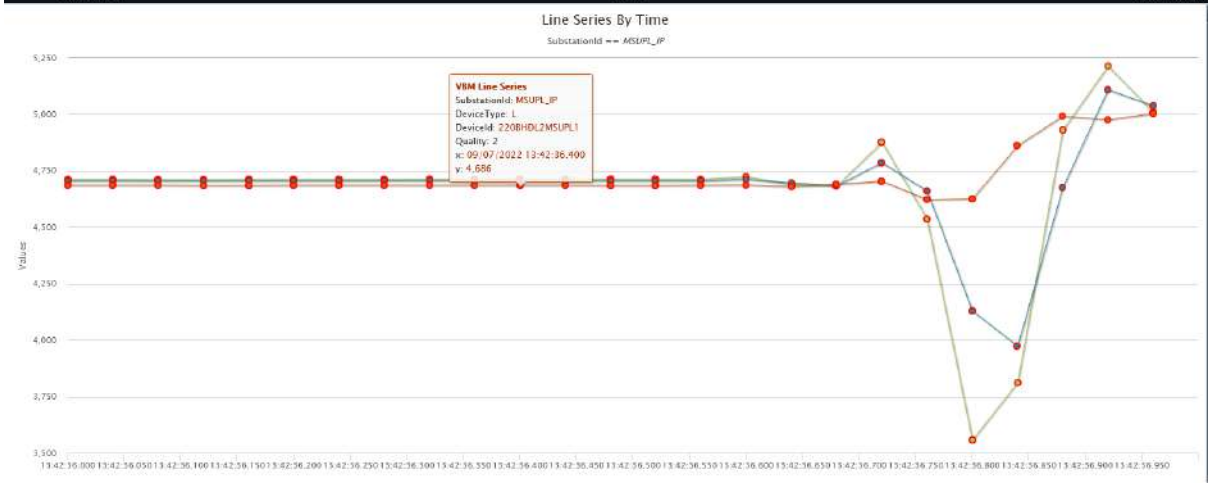
Voltage dipped to 0.73PU on lower side and 1.10PU on higher side, sustained on higher side for less than 40 ms. Generation dropped from 280 MW to 0 MW and came back after 2 mins. Generator is LVRT/HVRT non-compliant.





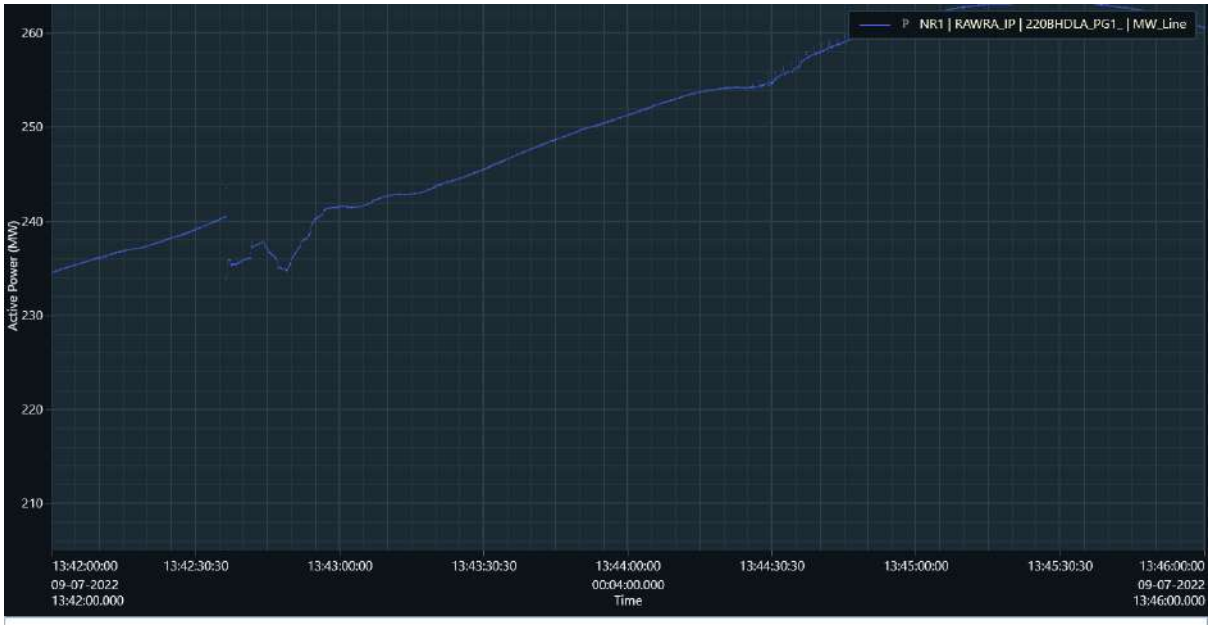
MRPL:

Voltage dipped to 0.76PU. Generation was already 0MW.



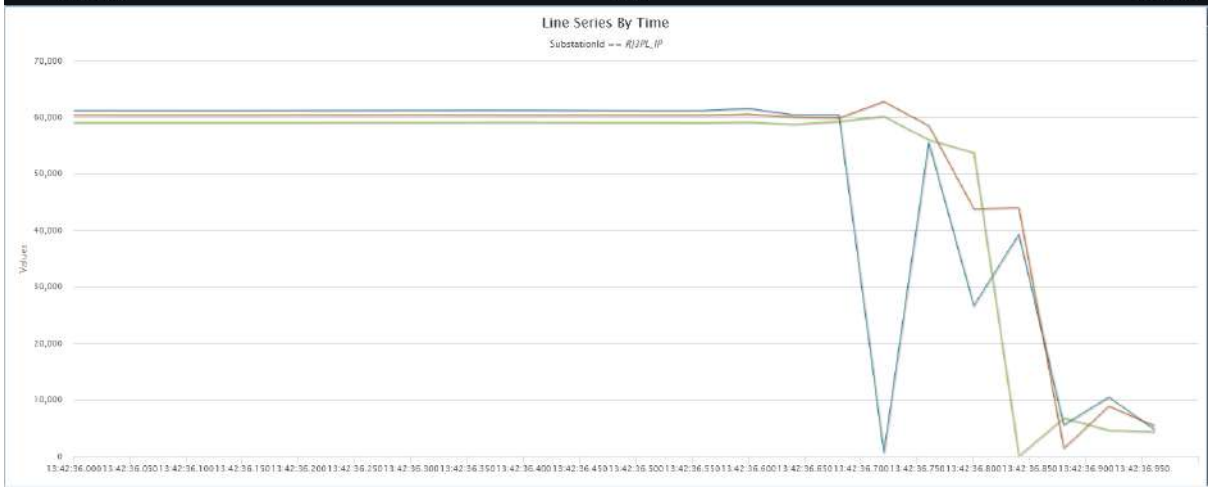
MSUPL:

Correct voltage phasor not being reported. Generation dropped from 220 MW to 0 MW and didn't come back. Generator is LVRT/HVRT non-compliant.



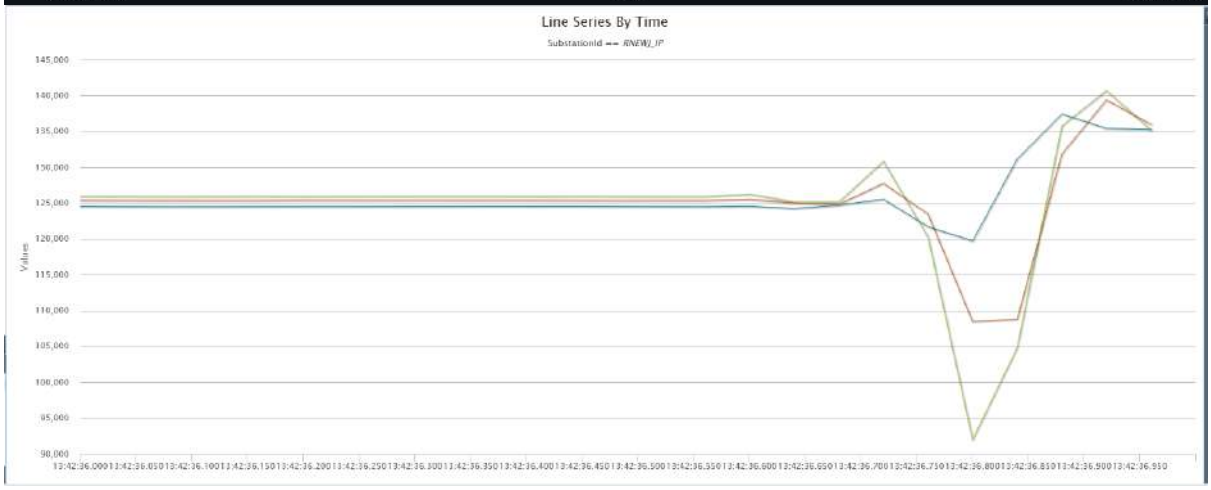
RAWRA:

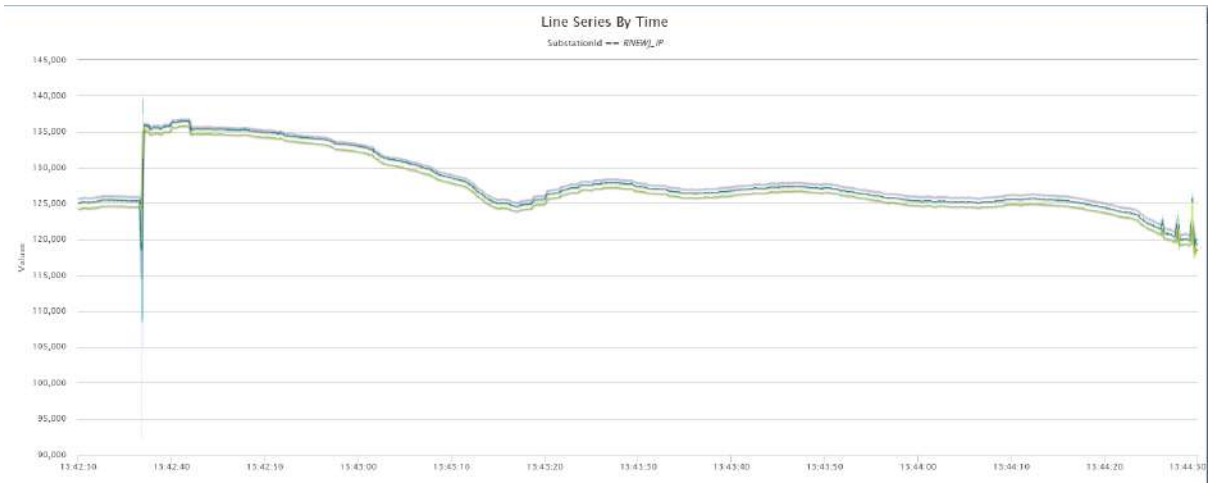
Voltage dipped to 0.76PU. Generation dropped from 240 MW to 235 MW momentarily. Generator is LVRT/HVRT non-compliant.



RJ3PL:

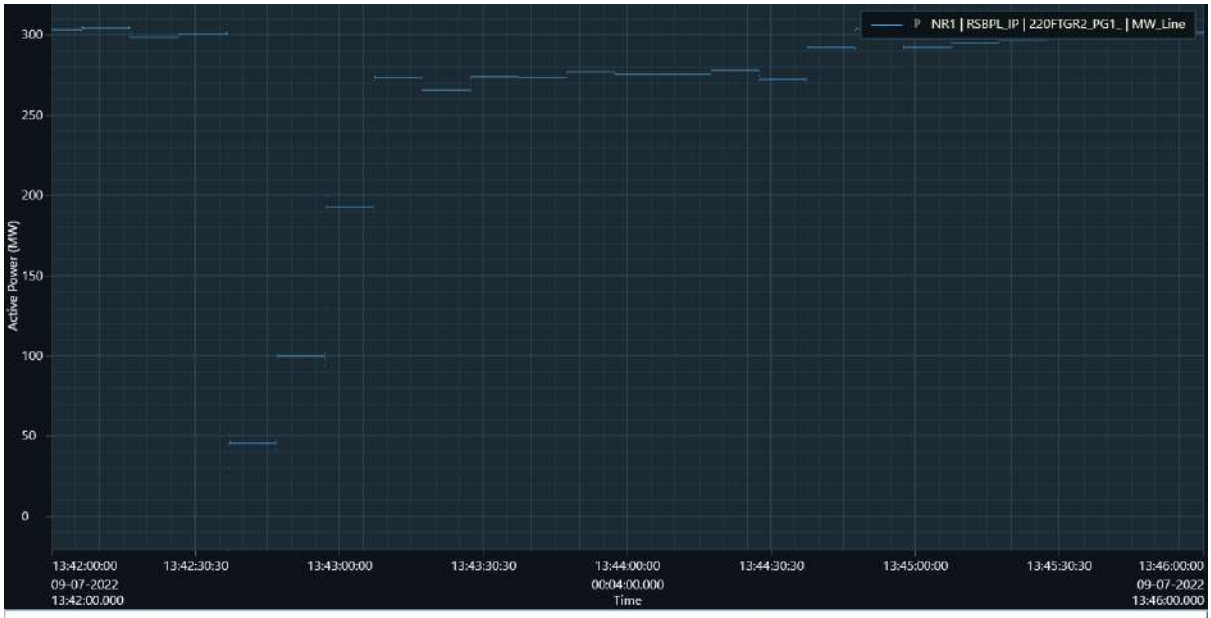
Correct voltage phasor not being reported. Generation dropped from 260 MW to 215 MW and came back after 2 mins. Generator is LVRT/HVRT non-compliant.

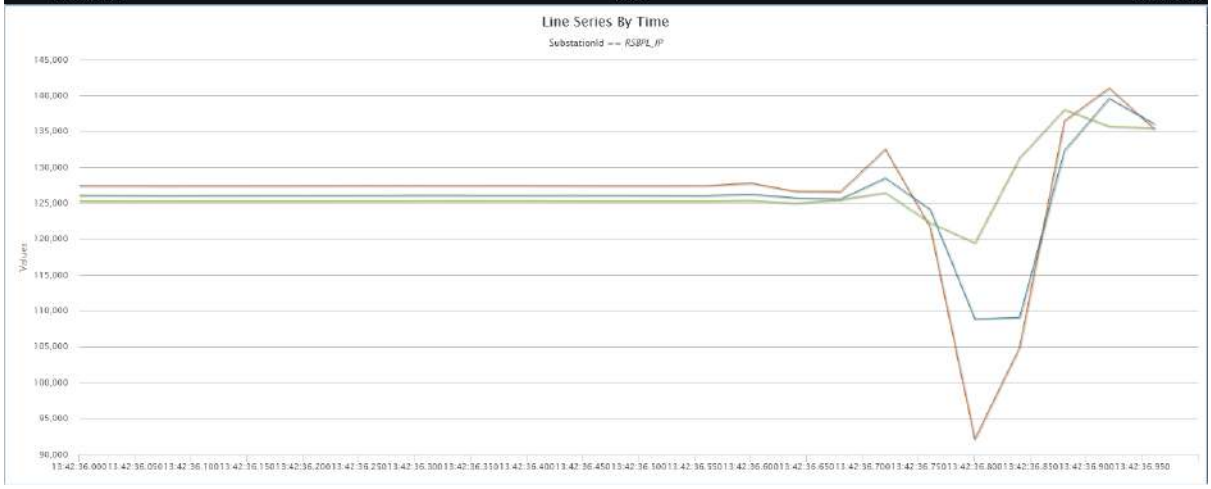




RNEWJ:

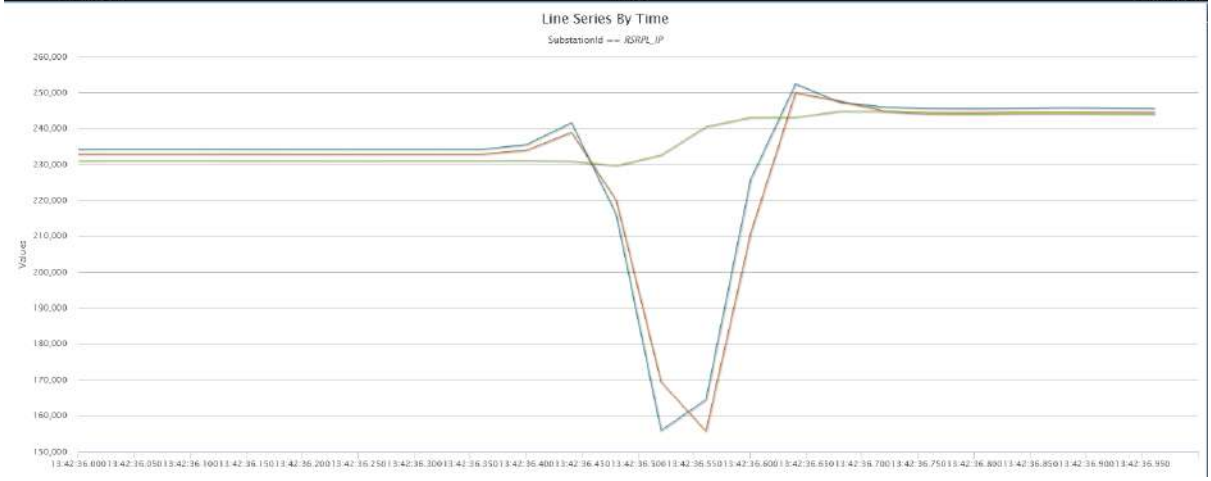
Voltage dipped to 0.76PU on lower side and 1.1PU on higher side, sustained on higher side for less than 40 ms. Generation dropped from 310 MW to 100 MW and came back after 3 mins. Generator is LVRT/HVRT non-compliant.

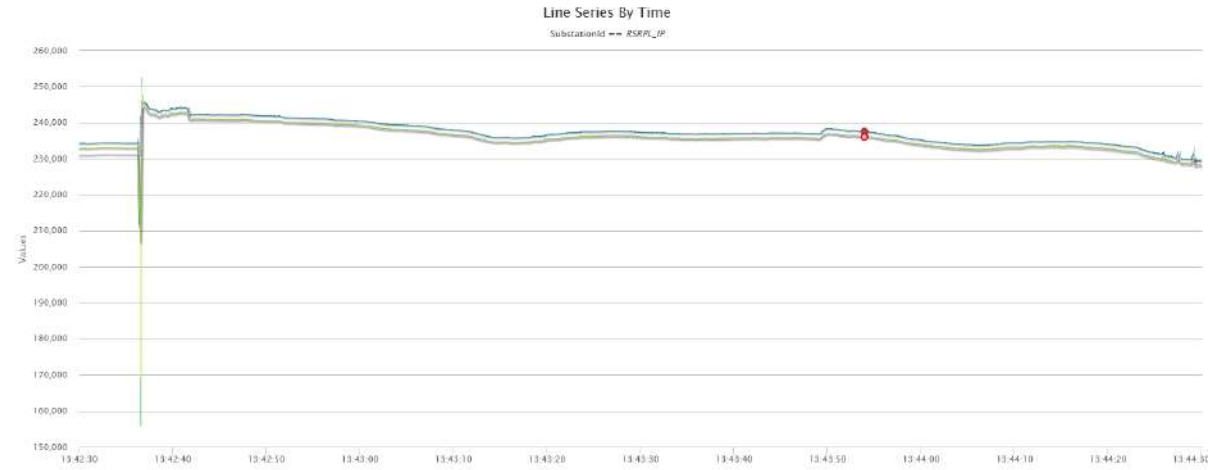




RSBPL:

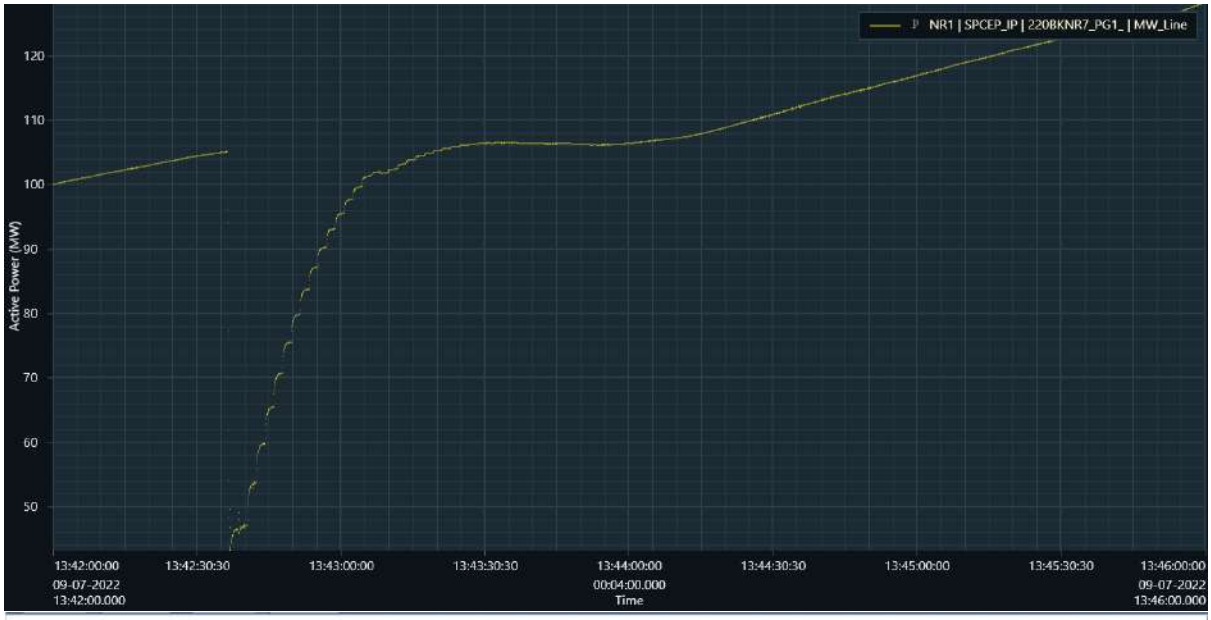
Voltage dipped to 0.75PU on lower side and 1.11 PU on higher side, sustained on higher side for less than 40 ms. Generation dropped from 300 MW to 50 MW and came back after 1 min. Generator is LVRT/HVRT non-compliant.





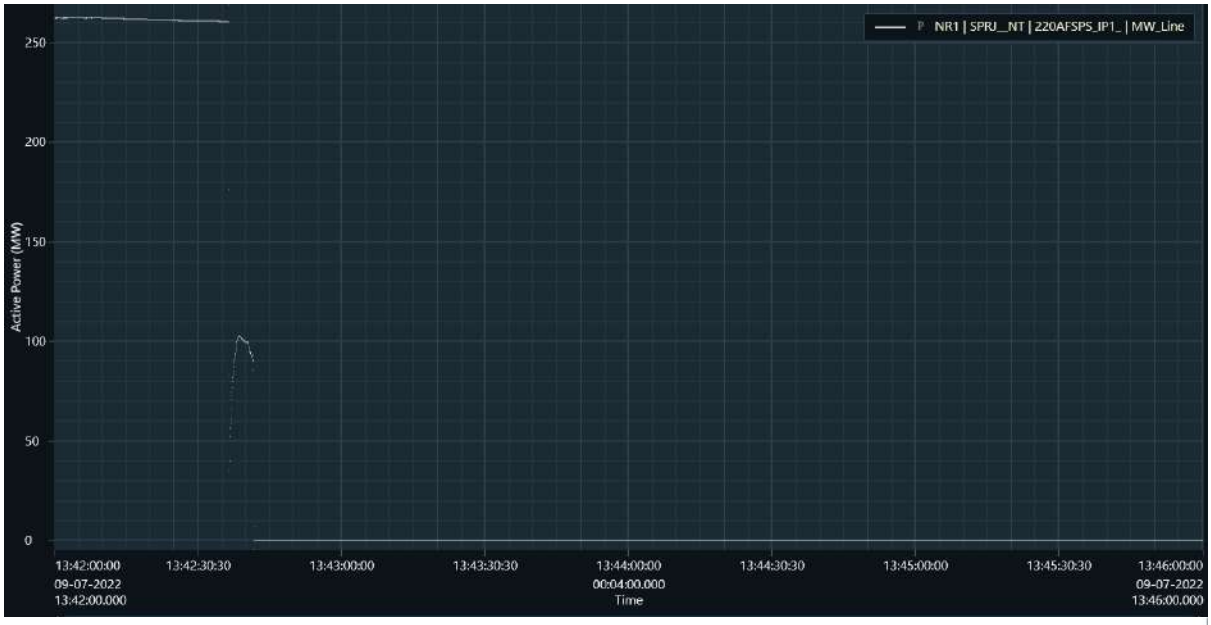
RSRPL:

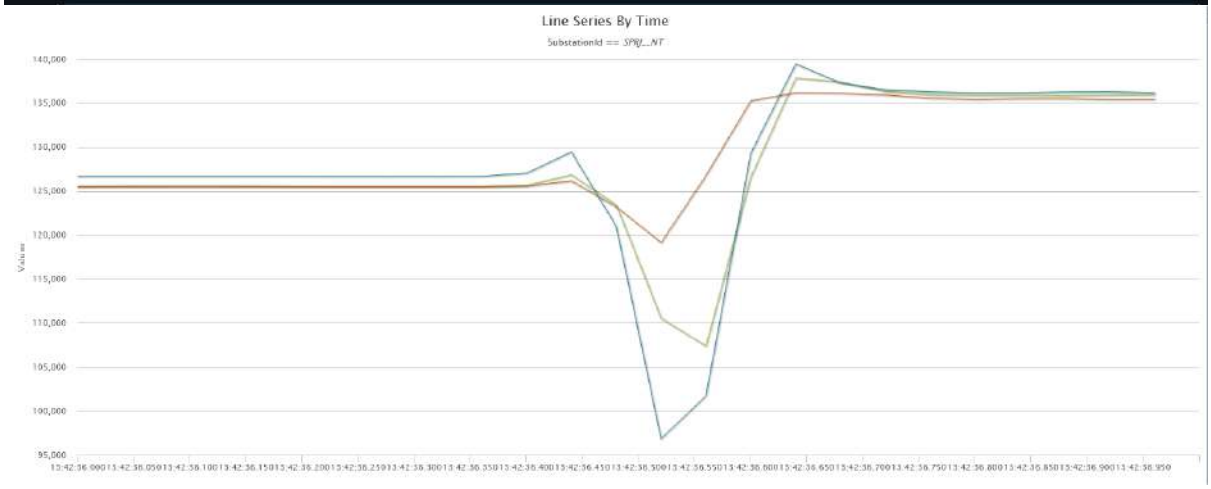
Voltage dipped to 0.66PU on lower side and 1.09PU on higher side. Generation dropped from 140 MW to 0 MW and came back after 2 mins. Generator is LVRT/HVRT non-compliant.

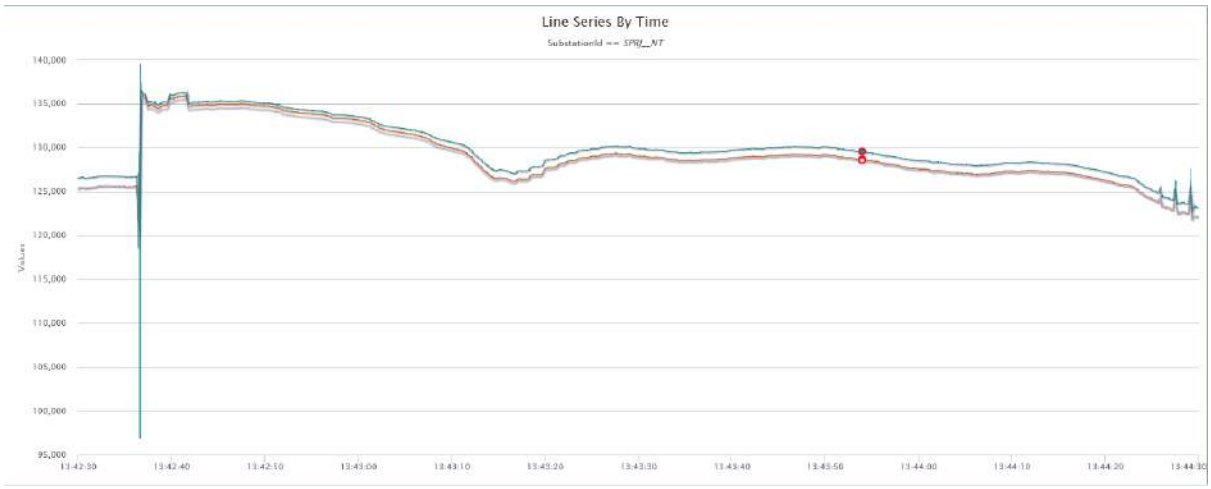


SPCEP:

Voltage dipped to 0.70PU on lower side and 1.09PU on higher side. Generation dropped from 102 MW to 0 MW and came back after 1 mins. Generator is LVRT/HVRT non-compliant.

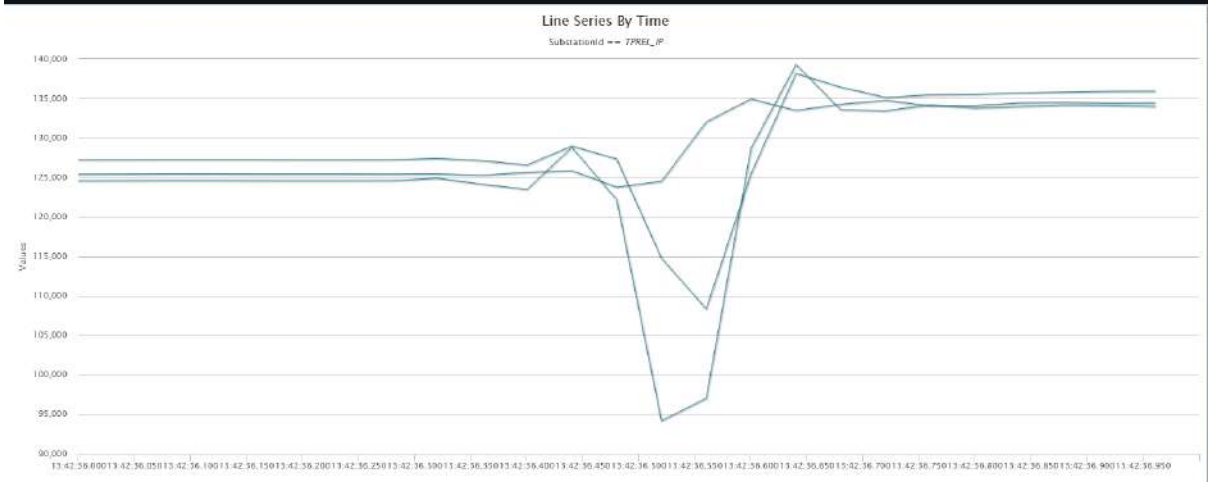


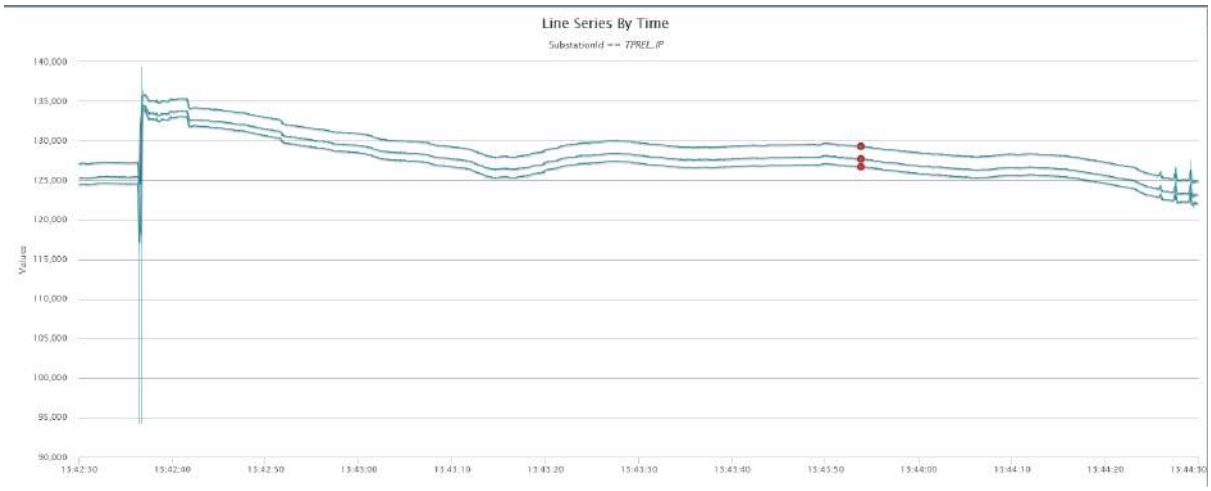




SPRJ:

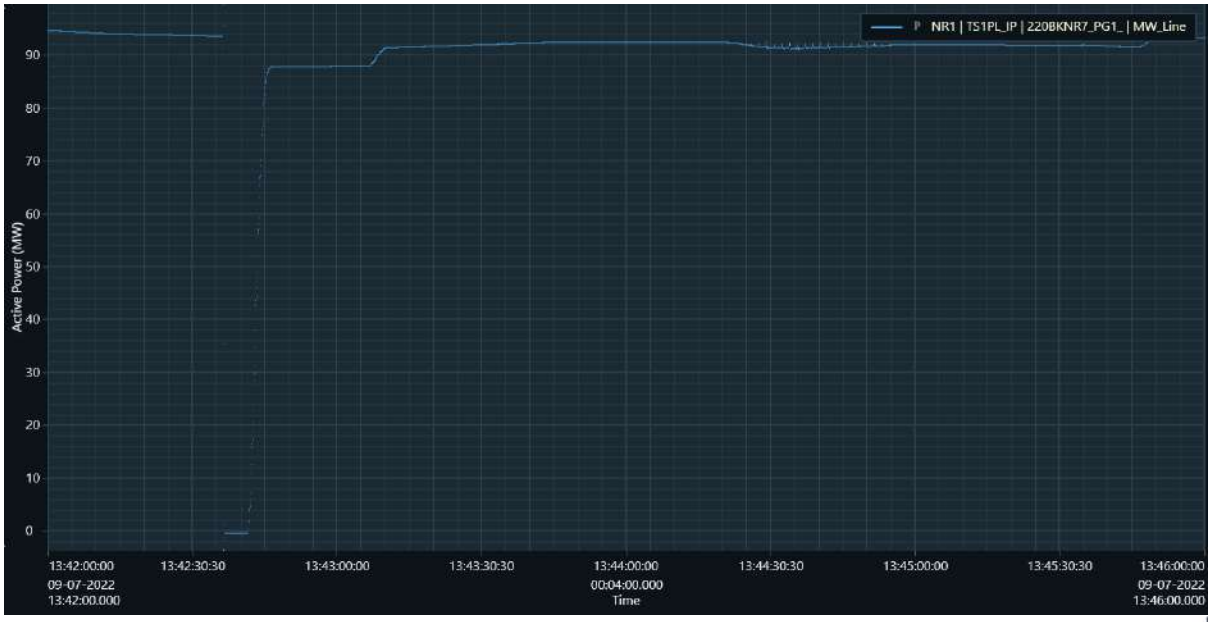
Voltage dipped to 0.76PU on lower side and 1.09PU on higher side. Generation dropped from 260 MW to 0 MW and didn't come back. Generator is LVRT/HVRT non-compliant.

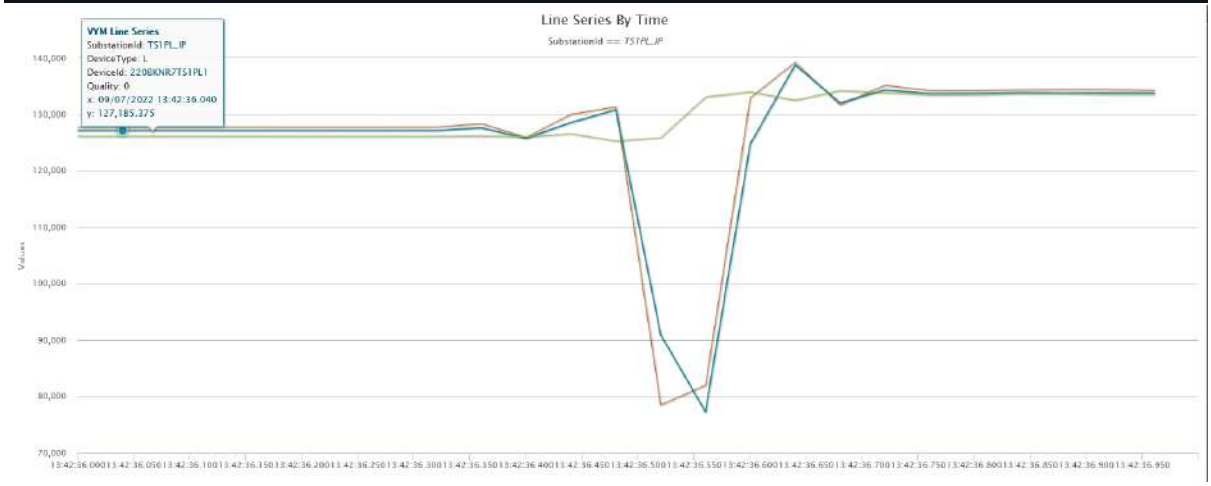




TPREL:

Voltage dipped to 0.74PU on lower side and 1.08 PU on higher side. Generation dropped from 260 MW to 225 MW and came back after 30 sec. Generator is LVRT/HVRT non-compliant.





TS1PL:

Voltage dipped to 0.62PU on lower side and 1.09PU on higher side. Generation dropped from 92 MW to 0 MW and came back after 5 sec. Generator is LVRT/HVRT non-compliant.