



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 (60वीं)/2022/12003-12050

दिनांक: 8 December 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 60<sup>वीं</sup> बैठक का कार्यवृत्त ।**

**Subject: 60<sup>th</sup> meeting of Northern Regional Power Committee – MoM**

महोदय / Sir,

उत्तर क्षेत्रीय विद्युत समिति की 60<sup>वीं</sup> बैठक दिनांक 30 नवंबर 2022 को 1100 बजे विडियो कॉन्फ्रेंसिंग के माध्यम से आयोजित की गयी थी। बैठक का कार्यवृत्त संलग्न है। यह उ.क्षे.वि.स. की वेबसाइट (<http://164.100.60.165/>) पर भी उपलब्ध है।

The 60<sup>th</sup> meeting of Northern Regional Power Committee (NRPC) was held at 1100 Hrs on 30 November 2022 via video conferencing. MoM of the same is attached herewith. The same is also available on NRPC Sectt. website (<http://164.100.60.165/>).

भवदीय

Yours faithfully,

(नरेश भंडारी) 08/12/22

(Naresh Bhandari)

सदस्य सचिव

Member Secretary

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**उत्तरी क्षेत्रीय विद्युत समिति की 60<sup>वीं</sup> बैठक**

**60<sup>th</sup> MEETING OF NORTHERN REGIONAL POWER COMMITTEE**

**Time & Date of NRPC meeting: 11:00 HRS; 30 November 2022**

**Venue: Video Conferencing**

**Minutes of the Meeting**

Shri Naresh Bhandari, Member Secretary, NRPC welcomed all the delegates to the 60<sup>th</sup> NRPC meeting. He requested Chairperson, TCC to address the gathering with his opening remarks as well as chair the meeting due to unavailability of Chairperson, NRPC.

Sh. Mukesh Kumar, Dir (Opr), DTL and Chairperson, TCC welcomed all the delegates joined virtually in 60<sup>th</sup> NRPC meeting. He stated that issues such as reactive power compensation, high voltage need to be tackled for safe, and reliable operation of Northern Grid in this winter season. He stated that DTL will be commissioning 2x50 MVAR reactors at Harsh Vihar and 1x50 MVAR reactor at Peeragarhi. He requested all utilities to take necessary action to minimize tripping due to fog, smog and high voltages during winter season. He congratulated Grid controller of India (erstwhile POSOCO) for changing their name which signifies important role in operation as well grid control. He requested all members to have fruitful and detailed deliberation on the agenda in the meeting.

MS, NRPC also congratulated Grid Controller of India (erstwhile POSOCO) for changing their name and stated that changed name rightly expresses works being carried out by Grid operators. He stated that maximum number of shutdowns have been granted in month of November so that utilities can prepare for peak winter season. He requested utilities to plan shutdowns in remaining lean period. He stated that issues such as reactive power compensation, high voltages need to be tackled for safe, reliable operation of Northern Grid in this winter season. He informed about there is very crucial agenda for information of members regarding approved Scheme for National level optimization of surplus generation capacity and development of online portal at national level.

CGM(IC), NRLDC stated that safe and reliable operation of Grid is mandate for us and changed name (Grid Controller of India) clearly highlights the same. He stated that due to changing technology and integration of RE, controlling grid is a challenging task. He stated that they are thankful for co-ordination of all the utilities and requested that same is expected in future also.

## **A.1 Approval of MoM of 59<sup>th</sup> NRPC meeting**

A.1.1 EE (P&SS), NRPC apprised that minutes of 59<sup>th</sup> NRPC meeting (held on 31.10.2022) has been issued vide letter dtd. 11.11.2022 and addendum was issued vide letter dtd. 25.11.2022. No comment has been received till the date.

A.1.2 Hence, forum approved the minutes (along with addendum) of 59<sup>th</sup> NRPC meeting as issued.

A.1.3 Further, he stated that minutes of 58<sup>th</sup> NRPC meeting (held on 30.09.2022), was approved in 59<sup>th</sup> NRPC meeting (held on 31.10.2022), however CTUIL has submitted vide mail dtd. 25.11.2022 that point A.4.9 of minutes of 58<sup>th</sup> NRPC meeting may be made more clear and comprehensive in line with discussion held in the meeting.

A.1.4 In view of above, forum approved the minutes of 58<sup>th</sup> NRPC meeting with amendment of point A.4.9 as below:

Quote

*A.4.9 “Forum agreed unanimously that UP share from UCH-II may be exempted from ISTS charges. However, ISTS charges may be applicable in respect of UCH – III. CTU may revise/issue bill accordingly”*

Unquote

## **A.2 Scheme for National level optimization of surplus generation capacity and development of online portal at national level (agenda by NRPC Sectt. for information)**

A.2.1 EE (P&SS), NRPC informed members that MoP vide letter dtd. 19.11.2022 has intimated that Hon’ble Minister of Power and NRE has approved the scheme (Annexure-I) for National Level Optimization of Surplus Generation Capacity. The draft of the above scheme was also circulated by CEA on 13.09.2022 and was discussed with all stakeholders across country on 22.09.2022 in meeting chaired by Chairperson, CEA. He briefed major benefits and timelines of the scheme.

A.2.2 He mentioned that CEA has constituted a committee for development of online portal for the scheme at national level. The members of the committee are:

- i. Member Secretary, NRPC – Chairperson
- ii. Representative from NTPC- Member
- iii. Representative from NLDC/POSOCO- Member
- iv. Representative from GM Division, CEA - Member
- v. Chief Engineer, NPC Division, CEA – Member Convener

A.2.3 MS, NRPC highlighted salient features of the scheme and stated that timeline of project is January, 2023. He mentioned that portal will be developed by NTPC and NLDC has been requested to submit timeline of scheduling incorporating this scheme. He highlighted that scheme has been already deliberated at length and portal by NTPC will be integrated with WBES software of GRID-INDIA.

A.2.4 Members noted the scheme.

### **A.3 Proposed new Islanding Schemes in Rajasthan, Punjab and Himachal Pradesh (agenda by NRPC Sectt.)**

A.3.1 EE (P&SS), NRPC apprised that new islanding schemes of Rajasthan, Punjab and Himachal Pradesh are being discussed regularly in OCC meetings. Further, a separate meeting was also held on 04.11.2022 through VC to discuss and finalize these islanding schemes proposals. Thereafter, HP, Rajasthan and Punjab submitted revised islanding schemes. The same were deliberated in 201<sup>st</sup> OCC meeting (held on 15.11.2022) wherein OCC recommended these islanding schemes (Annexure-II) for discussion and approval in NRPC.

A.3.2 He further briefed below islanding schemes:

- a) Rajasthan (vide letter dated 09.11.2022):
  - i. Suratgarh STPS Islanding Scheme
  - ii. Jodhpur-Barmer-Rajwest LTPS Islanding Scheme
- b) Himachal Pradesh (vide letter dated 11.11.2022):
  - i. Shimal Solan Islanding schemes
  - ii. Kullu Mandi and Manali Islanding Scheme
- c) Punjab (vide email dated 15.11.2022):
  - i. NPL Rajpura Islanding scheme
  - ii. Ranjit Sagar Dam Islanding scheme

A.3.3 Rajasthan informed that SCADA display for their both islanding schemes have been created which will be shared with NRPC/NRLDC.

A.3.4 Himachal Pradesh representative highlighted that under frequency tripping of Malana – I HEP is currently set at 48.0 Hz. Since, islanding frequency is 47.9 Hz, Malana-I under frequency tripping setting may be changed.

A.3.5 After deliberation, Himachal Pradesh (HP) was advised that under frequency tripping setting of Malana-I may be set below islanding frequency i.e. 47.9 Hz in line with setting of other HEPs in consultation with OEM of Malana-I and with intimation to NRPC.

A.3.6 NRPC approved above 6 islanding schemes (Annexure-II) for implementation.

A.3.7 Rajasthan, Punjab and Himachal Pradesh were requested to proceed further for implementation of approved scheme.

**A.4 Issuance of Regional Transmission Deviation Account (RTDA) by NRPC (Table agenda by NRPC)**

- A.4.1 Ex. Engineer (C), NRPC apprised forum that CERC vide letter dated 16.11.2022 (copy enclosed at Annexure - III) raised the concern that RTDA for the month of April, 2018 and onwards are not available on NRPC website.
- A.4.2 He informed the forum that Regional Transmission Deviation Account (RTDA) for the months from April, 2018 and March, 2019 were issued by NRPC secretariat vide letter no. NRPC/Comml/202/RTA/2020/396-435 dated 10.01.2020. Subsequently, Amendment-I to RTDA for the months from April, 2018 and March, 2019 were issued by NRPC secretariat vide letter no. NRPC/Comml/202/RTA/2020/2654-93 dated 11.03.2020 and made available on NRPC website ([http://164.100.60.165/archives/2018-19/RTA/Rta0418-0319\\_R1.pdf](http://164.100.60.165/archives/2018-19/RTA/Rta0418-0319_R1.pdf)).
- A.4.3 MS, NRPC apprised that NRPC sectt. is not only grappling with crunch of officers but also with frequent transfers of officers dealing with issuance of various energy accounts of NR including RTDA. Certainly, there has been a delay in issuance of RTDA. NRPC sectt. is working on this and pending RTDA will be issued shortly.

**A.5 SPS at RVPNL 400kV GSS Bhadla and Bikaner S/s (Table agenda by RVPNL)**

- A.5.1 RVPNL briefed about the SPS at 400 kV Bhadla GSS and 400 kV Bikaner GSS and stated that these SPS scheme were deliberated in the meeting held on 25.11.2022 wherein few suggestions were given. Based on discussion, the revised SPS (enclosed as Annexure – IV) at 400 kV Bhadla GSS and 400 kV Bikaner GSS has been put up for approval of NRPC.
- A.5.2 He briefed the above two SPS scheme to the forum.
- A.5.3 For 400 kV GSS Bhadla, CGM, NRLDC highlighted that grading of ICT loading may be done in place of 100 % loading. RVPNL agreed for the same.
- A.5.4 Forum approved SPS at 400 kV Bhadla GSS and 400 kV Bikaner GSS.

**A.6 Proposal for additional 220 kV interconnections at POWERGRID 400 kV Jaipur (south) GSS (Table agenda by RVPNL)**

- A.6.1 RVPNL representative informed that 400/220 kV GSS at Jaipur (South) with 2x500 MVA transformer was approved in 26th meeting of the standing committee on 13.10.2008. PGCIL had constructed 08 Nos. 220 kV bays for RVPNL as per the norms approved in 23rd Standing committee meeting out of which 06 Nos. 220 kV Bays have been already utilized.

- A.6.2 He stated additional interconnections at PGCIL's 400 kV Jaipur (south) GSS with 38 km LILO of 220 kV S/C Dausa-Swaimadhapur line at PGCIL's 400 kV Jaipur (South) GSS is proposed (Enclosed as Annexure – V).
- A.6.3 He informed that CEA vide letter dated 16.11.2022 has commented that above proposal is generally in order, however, as the above proposal involves interconnections with an existing ISTS element, therefore, the proposal needs to be deliberated with CTUIL and POSOCO.
- A.6.4 CTUIL highlighted that proposal may not give relief to Bassi line loading, however it seems to be in order. RVPNL was also advised to take necessary action to plan load segregation for relief at Bassi. RVPNL agreed for the same.
- A.6.5 CTUIL mentioned that RVPNL may proceed for LILO along with OPGW as there is fibre on original line. POWERGRID stated that installation of OPGW on LILO section may improve reliability.
- A.6.6 RVPNL stated that OPGW on LILO may be required when there is no other path available for sake of redundancy in OPGW. Otherwise, project cost will increase un-necessarily.
- A.6.7 MS, NRPC advised that OPGW related issue may be deliberated in TeST sub-committee. However, LILO proposal may be approved.
- A.6.8 Forum approved proposal of RVPNL for additional 220 kV interconnections at POWERGRID 400 kV Jaipur (south) GSS with 38 km LILO of 220 kV S/C Dausa-Swaimadhapur line at PGCIL's 400 kV Jaipur (South) GSS. Forum decided that OPGW matter may be taken separately in TeST Sub-Committee.

## **A.7 Ensuring reliability and security of Rajasthan grid (Agenda by NRLDC)**

- A.7.1 NRLDC representative stated that following issues were deliberated in 59th NRPC meeting (held on 31.10.2022) wherein RVPNL was asked to submit pointwise reply on following issues:
- Action plan to meet the 16000-17000MW peak demand during winter.
  - Establishing additional connectivity of 400 kV Alwar from Bhiwadi / Bassi / Phagi. Gas generation at Dholpur may also help till connectivity established.
  - Minimising planned/ forced outage of intrastate thermal generating units.
  - Operating intrastate RE generators in voltage control mode.
  - Load MVAR drawl management including identification of nodes at 220kV and 132kV level which are drawing huge MVAR from the grid.
  - Expediting upgradation of 400kV Jodhpur (Kankani) to 765kV along with associated 765kV lines.
  - Additional reactive power support devices for maintaining grid voltages within IEGC prescribed limits.

A.7.2 NRLDC representative stated that above issues are still pending and presented various plots related to these agenda points which is attached as Annexure-VI. NRLDC representative stated that following 400/220kV ICTs are N-1 non-compliant in real-time in Rajasthan control area.

<b>400/220 kV Sub-Station Name</b>	<b>Transformation Capacity (MVA)/ No. of ICTs</b>	<b>N-1 Loading limit (MW)</b>	<b>Loading (MW) observed during Nov'22</b>	<b>SPS status</b>
<b>Chittorgarh</b>	2*315	410	<b>550-600</b>	implemented
<b>Merta</b>	2*315	420	450-530	implemented
<b>Bikaner</b>	2*315	440	450-550	Not implemented
<b>Ajmer</b>	2*315	460	<b>550-600</b>	implemented
<b>Jodhpur</b>	2*315	440	400-450	implemented
<b>Hindaun</b>	2*315	390	400-480	Not implemented
<b>Bhilwara</b>	315 + 500	490	500-550	Not implemented

A.7.3 NRLDC stated that loading of 400/220kV ICTs may be kept below their N-1 contingency limits by RVPN and at places where SPS is installed, loading needs to be such that SPS relief is able to manage loading within safe limits in case of N-1 contingency. Relevant plots as presented in the meeting are attached as Annexure-VI.

A.7.4 It was also highlighted that for Nov'2022 power factor at some of the 400/220kV intrastate stations are very poor (below 0.9) as shown below:

<b>Sub-Station Name</b>	<b>Average MW drawl during poor pf</b>	<b>Average MVAR drawl during poor pf</b>	<b>Average Power factor</b>
400/220kV Merta	210	105	0.89
400/220kV Bhinmal	160	100	0.85
400/220kV Alwar	200	120	0.86
400/220kV Bikaner	260	180	0.82

A.7.5 Relevant plots of poor power factor for November 2022 as presented in the meeting are attached as Annexure-VI.

A.7.6 CTU representative stated that connectivity of 400kV Alwar is pending since long and 400kV connectivity may be prioritised and OPGW link may also be provided in the proposal.

A.7.7 RVPN representative informed that:



- Reactive compensation in the form of STATCOMs in state transmission network have been proposed to CEA.
- Proposal for addition of capacitors is also being taken up with NRPC-Sectt.
- Issue of low and high voltage still persist especially in Western Rajasthan and would be only relieved after commissioning of new reactive resources. However, till the commissioning of these resources, manual actions would be taken at SLDC as well as DISCOM level.
- 765kV connectivity would be proposed in Alwar area as there are only two bays available at Alwar S/s,
- As suggested by CTUIL, 400kV Connectivity of Alwar would be proposed first thereafter upgradation to 765kV would be taken up.

A.7.8 RVPN agreed to submit pointwise reply to the issues highlighted by NRLDC in 59<sup>th</sup> as well as 60<sup>th</sup> NRPC meeting.

#### **A.8 Action points for winter preparedness 2022-23 (Agenda by NRLDC)**

A.8.1 NRLDC representative stated that issue of high voltages was discussed in 199<sup>th</sup>, 200<sup>th</sup> and 201<sup>st</sup> OCC meetings, wherein utilities were asked to take necessary actions which would help in ensuring safe and secure operation of grid and managing high voltages in the grid.

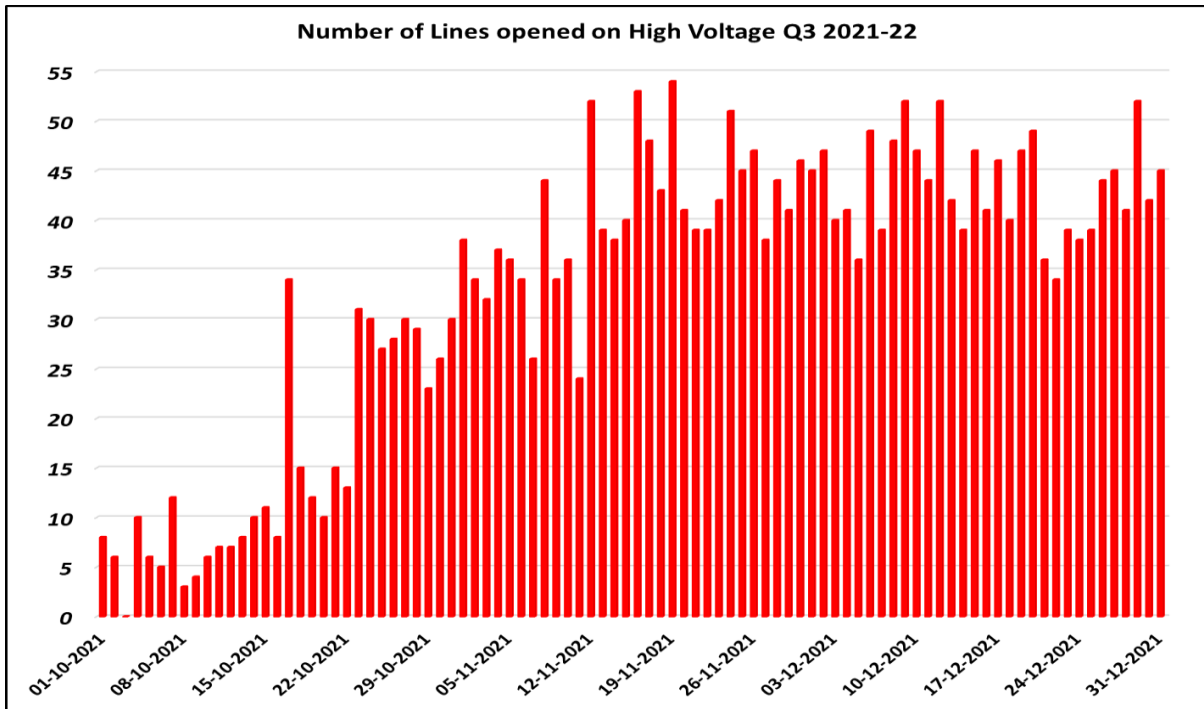
A.8.2 Further, analysis of data for Q3, Q4 2021-22 has been carried out and it can be seen that there are several 400kV nodes in Northern region especially in Punjab, Haryana, Delhi which experience very high voltages even after taking necessary actions at regional level including opening of lightly loaded EHV lines in real-time operation. Few of these nodes are listed below:

S. No.	Name of station	% of time voltage >420kV					
		Oct'21	Nov'21	Dec'21	Jan'22	Feb'22	Mar'22
1	Dhuri	30	42	40	64	45	24
2	Makhu	52	60	49	66	58	41
3	Nakodar	52	55	46	61	52	39
4	Rajpura	56	47	47	60	40	28
5	Mahendragarh	62	62	56	66	70	63
6	Kabulpur	18	48	40	49	41	38
7	Harshvihar	42	61	54	58	47	38
8	Mundka	17	23	16	25	21	13

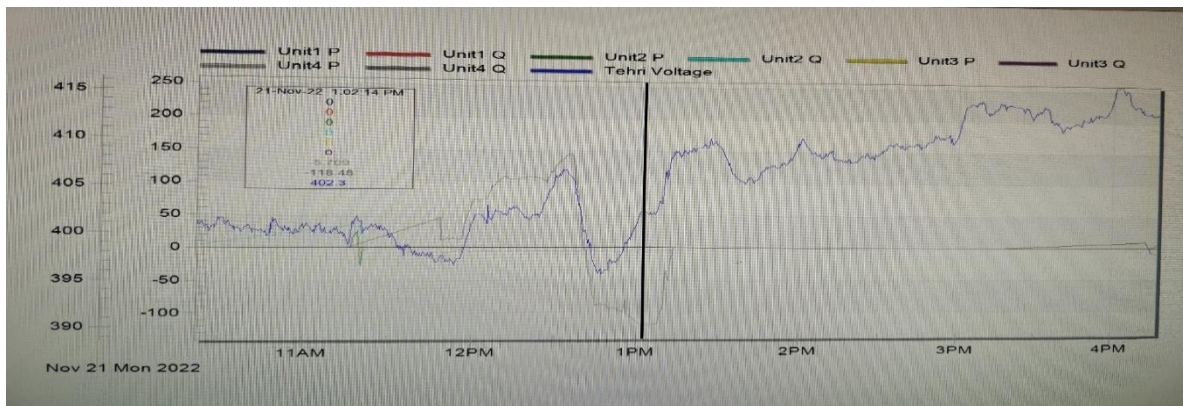
9	Karcham Wangtoo	7	42	48	69	67	47
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*Note: The above list includes only few nodes facing high voltage issues. There are other numerous nodes at which high voltage issues are being observed. Details of such nodes is part of quarterly operational feedback of POSOCO available @ [https://posoco.in/download/nldc-operational-feedback\\_jan\\_2022/?wpdmdl=42840](https://posoco.in/download/nldc-operational-feedback_jan_2022/?wpdmdl=42840), [https://posoco.in/download/nldc-operational-feedback\\_apr\\_2022\\_final/?wpdmdl=44720](https://posoco.in/download/nldc-operational-feedback_apr_2022_final/?wpdmdl=44720)*

- A.8.3 In 200th OCC meeting, all states were requested to prepare and share high voltage management plan for winter months with NRPC/ NRLDC. MS NRPC had also stated that such plan developed by states should be readily available with NRLDC as well as SLDC control room officials so that effective voltage control is possible during winter months and real-time operator at SLDC as well as RLDC end are aware of the actions to be taken.
- A.8.4 It was also highlighted that the same issue was also requested vide letter no. NRLDC/TS-65/ 1324 dated 14.11.2022.
- A.8.5 In 60 NRPC meeting, NRLDC representative stated that actions to be taken at regional level are available in Operating Procedure document of Northern region under Chapter-6. Document is available @ <https://nrlc.in/download/final-operating-procedure-for-northern-region-2022-23/?wpdmdl=10826>.
- A.8.6 In real-time operations, bus reactors are first taken in service when voltage crosses 410kV and is expected to further increase based on past experience. If the voltage is still increasing, say 415-420kV, RLDC operator has identified set of lines which remain lightly loaded and generate huge charging MVAR. The nodes for which voltage is further expected to rise, such lightly loaded lines are opened after duly considering any reliability issues. On daily basis, around 40-50 nos. (this increases to 55-60 nos. in Q4) 400kV & above voltage level lines are being opened to manage high voltage issues in the regional grid during winter months. Reactive power document has compiled list of lines along with charging MVAR, line end compensation details, and net MVAR relief expected if such line opened for high voltage control. Such list along with experience of control room officers proves useful for quick actions when opening lines on high voltage. Last year also number of lines were opened during winter months. As sample 400kV & above voltage level lines opened during Q3 2021-22 are shown below:



- A.8.7 It was mentioned that testing of synchronous condenser mode of Tehri units were carried out in November 2022. One unit (250MW) was able to absorb 120MVAR at the time of testing. Relevant plot as presented in the meeting is shown below:



- A.8.8 It was mentioned that tap change at 400/220kV substations was discussed in 201st OCC meeting and would be carried out shortly by NRLDC. States were also asked to carry out similar exercise at their level.

- A.8.9 SCADA snapshots of some of the 400/220kV stations such as Maharaniabagh, Dhanonda, Mandola, Sohna Road, Patran, Makhu for 03:00hrs were presented in the meeting (Annexure-VII). It was mentioned that there are several 400/220kV nodes where MVAR flow is from 220kV side to 400kV side and samples are being shown in the meeting. MVAR injection from 220kV to 400kV side as presented in the meeting were at Maharaniabagh (230MVAR), Dhanonda (130MVAR), Mandola (120MVAR), Sohna Road (90MVAR), Patran (80MVAR), Makhu (70MVAR). All utilities were asked to take necessary actions to minimize MVAR injection from 220kV side to 400kV side.

A.8.10 It was also mentioned that states are paying reactive energy charges for MVAR injection from low voltage side to high voltage side. Some of such nodes identified for 7-13 November 2022 as presented in the meeting are shown below:

State	Name of Drawl Point
Delhi	Bamnauli, Bawana, Dadri, Maharani Bagh, Mandola, Tughlakabad, Mundka
Haryana	Sohna, Abdullapur, Dhanoda, Gurgaon, Hisar, Jhajjar, Jind, Manesar
Punjab	Amritsar, Moga, Patran, Ludhiana
Others	Gumma, Karcham, Lucknow(PG), Kanpur(PG), Shahjahapur

A.8.11 It was mentioned that some of the reactors are under long outage. The matter is being also discussed in OCC meetings however still number of reactors are under forced outage even in the high voltage season. Some of such reactors are shown below:

- 50 MVAR BUS REACTOR NO 1 AT 400KV PANKI(UP)
- 125 MVAR Bus Reactor No 1 at 400KV Chamera\_1(NH)
- 50 MVAR Non-Switchable LR on Agra-Unnao (UP) Ckt-1 @Agra(UP)
- 50 MVAR Bus Reactor No 1 at 400KV Moradabad(UP)

A.8.12 In view of above and anticipated high voltage scenario during winter months, actions at lower voltage level also become critical for managing high voltage at regional grid level. Therefore, it was requested that all preparations for winter 2022-23 are reviewed at utility end and action plan, inclusive of at least following points be submitted to NRLDC/NRPC at the earliest:

- a. Actions taken/ to be taken at utility level for High Voltage management including analysis of nodes injecting MVAR from low voltage level to high voltage level.
- b. Ensuring healthiness of Reactive power resources such as reactors, SVCs, STATCOMs etc. (NRLDC reactive power document available @ <https://nrldc.in/download/nr-reactive-power-management-2022/?wpdmdl=9908> may also be referred)
- c. Reactive Power absorption utilizing full capability of on-bar generating units to control voltages
- d. Running units in synchronous condenser mode wherever applicable for voltage control.
- e. Maintaining availability of lines/avoiding tripping during fog by pre-action of insulator replacement/insulator cleaning etc.

- f. Ready list of EHV lines to be opened for high voltage management, including any prioritization.
- g. Confirmation that Over Voltage settings of lines and over flux settings of transformers are as approved by NRPC.
- h. Ensuring switching off capacitors and switching on reactors.

- A.8.13 Punjab SLDC representative stated that more than 50nos. 220kV lines have been opened for high voltage control this winter and reactive power performance of thermal generators are being monitored and necessary instructions are being issued. Ranjit Sagar Dam units are being used as synchronous condenser from this year onwards. New 1x125 MVAR at 400 kV & 1x25 MVAR at 220 kV at Dhuri and 1x25 MVAR at 220 kV at Nakodar are likely to be charged in 2-3 months. They assured to share all the details through mail/letter.
- A.8.14 Haryana SLDC representative stated that internal generation is expected to be slightly higher this year and therefore it is expected to be more MVAR absorption from thermal generators in Haryana state control area which would help in high voltage management.
- A.8.15 CGM(I/C) NRLDC stated that as discussed earlier also, proposed works for insulator washing and replacement work should be carried out by next two weeks as the period of fog would start thereafter.
- A.8.16 All states agreed to submit the plan to NRPC/ NRLDC by first week of December 2022.

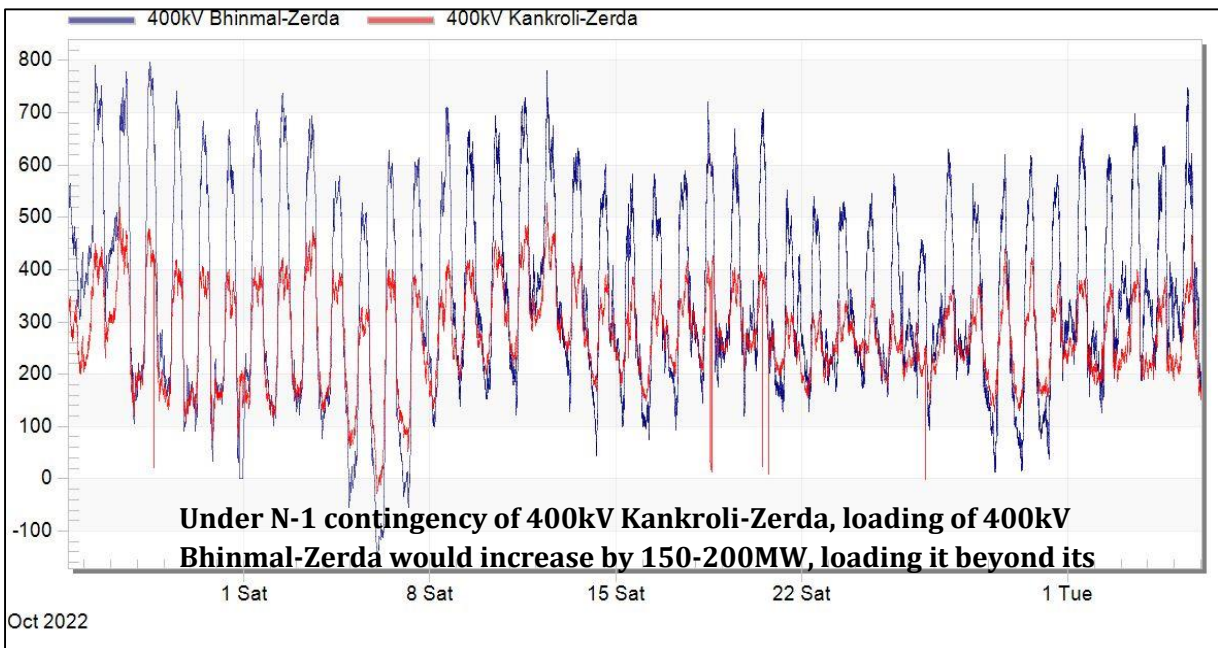
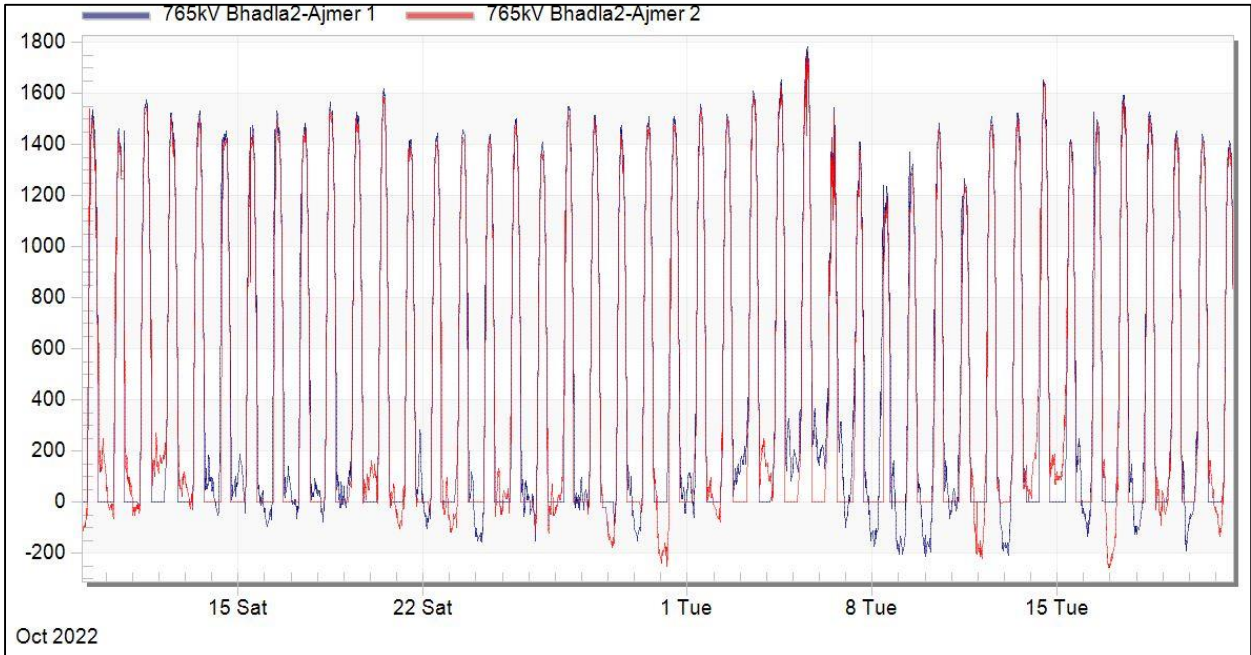
#### **A.9 Power evacuation issues from ISTS-RE complex in Western Rajasthan (Agenda by NRLDC)**

- A.9.1 NRLDC representative stated that as per planning for evacuation of RE power from ISTS connected renewable generation stations in Rajasthan two phases of transmission system have been planned i.e. Ph-I (8.9GW) and Ph-II (8.1GW). Transmission schemes for Phase-I and phase-II were agreed as detailed below:

<b>Scheme</b>	<b>NRSCT/ NRSCM</b>	<b>NCT</b>	<b>Status</b>
Phase-I	2 NRSCT on 13.11.2018	2 NCT on 04.12.2018	The Phase-I transmission system has mostly been commissioned except 5th and 6th ICTs of 400/220kV, 500MVA at Bhadla-II(PG)
Phase-II	5 NRSCT on 13.09.2019	6 NCT held on 30.09.2019	Yet to be commissioned.

- A.9.2 He that Transmission element part of Phase-II transmission schemes are yet to be commissioned, whereas RE generation is getting commissioned at rapid pace. Apart

from N-1 noncompliance of 400 kV Bikaner (PG)-Bikaner (RJ Line) and N-1 noncompliance of 765/400 kV ICTs at Bikaner (PG), high loading of 765kV Bhadla2-Ajmer line and 400kV Bhinmal-Zerda, 400kV Kankroli-Zerda is also being observed in real-time as shown below.



A.9.3 Under N-1 contingency of 765kV Bhadla-Ajmer line, the loading on other ckt is expected to increase by ~40% (nearly 600-700MW) and voltage may fall by 10-12kV at 765kV Bhadla2. Further, loading of 400kV Bikaner(PG)-Bikaner(RJ) is expected to increase by 11% i.e. if 765kV Bhadla2-Ajmer each ckt is loaded upto 1600MW and one line trips, then loading of already highly loaded 400kV Bikaner(PG)-Bikaner(RJ) would increase by 11% (180MW).

A.9.4 It is necessary that the transmission system for RE evacuation is commissioned in matching timeline with expected new RE generation so that there is no issue in safe

evacuation of RE power in future. More RE generation is expected to be commissioned in the complex including RE generation at Bhadla-2, therefore commissioning of following transmission elements under phase-II transmission scheme becomes very important with increasing generation in the complex (mentioned along with latest commissioning date status as intimated by CTU):

- Bhadla II - Sikar II 765 kV D/C line (27.08.2023)
- Sikar II - Neemrana 400kV D/c line (Twin HTLS) (27.08.2023)
- Establishment of 765/400kV, 2x1500 MVA S/s at suitable location near Sikar (Sikar-II Substation) with 1x125 MVAr & 2x330 MVAr bus reactor and 2x330 MVAr line Reactor at Sikar –II (27.08.2023)
- Sikar II- Aligarh 765kV D/C Line (28.08.2023)
- Bikaner-II PS – Khetri 400kV 2xD/c line (Twin HTLS line on M/c tower) (31.03.2023)
- Establishment of 400kV Bikaner-II PS with 2x125 MVAr bus reactor (31.03.2023)
- Removal of LILO of one circuit of Bhadla-Bikaner (RVPN) 400kV D/c(Quad) line at Bikaner(PG). Extension of above LILO section from Bikaner (PG) up to Bikaner-II PS to form Bikaner-II PS – Bikaner (PG) 400kV D/c(Quad) line (31.03.2023)
- ±2x300MVAr STATCOM at Fatehgarh-II substation with 4x125MVAr MSC,2x125MVAr MSR (28.02.2023)
- ±2x300 MVAr STATCOM at Bhadla–II substation with 4x125 MVAr MSC, 2x125 MVAr MSR (31.01.2023)

A.9.5 In addition to above, to control loading of 400kV Bhinmal-Zerda and 400kV Kankroli-Zerda, HVDC Mundra-Mahendragarh is being operated with power reversal i.e. power flow from Mahendragarh towards Mundra (500-700MW). Further, to relieve loading of 400kV Bhinmal-Zerda and 400kV Kankroli-Zerda, following needs to be expedited:

- Bypassing of 400 kV Kankroli - Bhinmal-Zerda line at Bhinmal to form 400 kV Kankroli – Zerda (direct) line #
- Reconductoring of 400 kV Jodhpur (Surpura)(RVPN) – Kankroli S/c (twin moose) line with twin HTLS conductor\*-188 km

# with necessary arrangement for bypassing Kankroli- Zerda line at Bhinmal with suitable switching equipment inside the Bhinmal substation.

\* with minimum capacity of 1940 MVA/ckt at nominal voltage; Upgradation of existing 400kV bay equipments each at Jodhpur (Surpura)(RVPN) and Kankroli S/s (3150 A).

A.9.6 POWERGRID representative stated that commissioning of STATCOMs at Fatehgarh-II and Bhadla-II would take one month more from the latest dates i.e. new anticipated commissioning dates would be 31.03.2023 and 28.02.2023 respectively.

A.9.7 All concerned agreed to take actions to commission the transmission elements as discussed in the agenda at the earliest.

**A.10 Increasing involvement of SLDC officers of J&K and Chandigarh in system studies (Agenda by NRLDC)**

A.10.1 NRLDC representative stated that they have been carrying out several workshops for capacity building with SLDCs. In this series, workshops and one to one discussions were organized by NRLDC in 2021-22 in online mode for imparting training to SLDC officers in PSSe (software used for steady-state as well as dynamic studies) and PSCAD (software used for Electromagnetic transient studies):

- Workshop on transfer capability studies and PSSe (14.03.2022)
- Workshop on Basic studies on PSCAD and MATLAB (16.11.2022 & 17.11.2022)

A.10.2 It is to be noted that performance of SLDC in performing simulation studies has improved significantly over last one-two years with all states performing and sharing their ATC/TTC assessments with NRLDC except U/Ts of J&K, Ladakh and Chandigarh. NRLDC has been requesting these SLDCs to carry out simulation studies and also proposed to provide separate training sessions to these U/T officers.

A.10.3 In the training session on PSCAD & MATLAB held on 16.11.2022 & 17.11.2022, 8-10 officers from J&K participated.

A.10.4 In 60 NRPC meeting, SLDCs of UT J&K/Ladakh and Chandigarh were once again requested to start system studies related activities for reliable and secure grid operation. It was also proposed that sufficient manpower may be deployed for this work which can meet online on quarterly basis or as and when required for further discussion and knowledge sharing.

A.10.5 Chief Engineer, JKPCCL stated that they would be sharing their assessments with NRLDC/ NRPC in 15 days. NRLDC representative stated that they are ready to extend any support required by J&K and requested J&K to submit their assessments before next OCC meeting.

**A.11 Procedure for “Allocation of Transmission Corridor for Scheduling of General Network Access (GNA) and Temporary General Network Access (T-GNA) Transactions” (Agenda by NRLDC)**



- A.11.1 NRLDC representative apprised that Central Electricity Regulatory Commission has notified the Connectivity and General Network Access to the inter-State Transmission System Regulations, 2022 on 7th June 2022. In accordance with the regulations, draft procedure for “Allocation of Transmission Corridor for Scheduling of General Network Access (GNA) and Temporary General Network Access (T-GNA) Transactions” has been prepared and uploaded on POSOCO (Grid-India) website. It can be directly accessed @<https://posoco.in/download/public-consultation-draft-procedure-on-allocation-of-transmission-corridor-for-scheduling-of-gna-and-t-gna-transactions/?wpmmdl=48674>
- A.11.2 He presented few highlights of the procedure to the forum. It was also discussed that Online Workshop on the topic has been scheduled by Grid-India on 1st December 2022.
- A.11.3 Suggestions/ feedback on this draft procedure are invited and may be submitted to NRLDC/ NLDC by 9th December 2022.
- A.11.4 Members agreed to participate in online workshop and share their comments to NRLDC/ NLDC.

*Meeting ended with vote of thanks to the chair.*

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**F. No. 23/01/2022-RCM  
Government of India  
Ministry of Power**

2nd Floor, F Wing, Nirman Bhawan  
New Delhi 19th November, 2022

To

**The Chairperson, CEA**

**Subject: Scheme for National level optimization of surplus generation capacity in the country and Development of online Portal for the same-reg.**

Sir,

I am directed to refer to CEA letter dated 31.10.2022 on the subject noted above and to convey approval for issue of the revised Scheme **as per Annexure.**

2. This issues with the approval of Hon'ble Minister of Power & NRE.

Yours faithfully



(Nishat Kumar)

Under Secretary to the Government of India

Tel: 011-23062451

e-mail: nishat.kumar@nic.in

Copy for information to:

1. PS to Hon'ble Minister of Power & NRE
2. APS to Hon'ble Minister of State for Power
3. Sr. PPS to Secretary, Ministry of power
4. PPS to JS (R&R)/PSO to CE (R&R)/ PPS to Director (RCM), MoP.

Central Electricity Authority

**Scheme for National Level Optimization of surplus Generation Capacity**

A. **Background**

1. The generation capacity in the country may be categorized as under:
  - i. State owned generating capacity
  - ii. Central Generating Stations
  - iii. Private Sector: IPPs
  - iv. Captive generating Stations
2. Because of the present system of one to one PPA, the generating capacities are not being optimally utilized. Every year difficulties are observed in meeting the demand and some states do resort to power cuts. Especially during the April, May, September and October months the crisis is observed. The capacity is available in the country but due to one to one agreement constraint, even when the generating capacity is idle it cannot be utilized by the entity which needs power. There are States which do have surplus power and continue to bear the fixed charge burden without using it. This leads to high cost of power to the consumers.
3. The Distribution licensees tie up power from above generating sources mainly under following routes:
  - i. At regulated tariff determined by the Appropriate Commission under section 62 of the Electricity Act 2003.
  - ii. At bid tariff adopted by the Appropriate Commission under section 63 of the EA 2003.
  - iii. Banking of Power

**State owned Generating Capacity**

4. State owned generating companies supply power to Distribution companies of the same State and also supply seasonal surpluses to some other states under banking arrangements among such distribution companies.

**Central Generating Stations**

5. Central Generating companies supply power to the States under the allocation made by the Central Government. Some power which has been surrendered by the States have been reallocated to the other needy States. Some States have exited from the PPA after completion of 25 years, and such power is available for merchant sale as well.

6. The allocation of power is generally done to the states within the regions. There are five regions in the country i.e. Eastern, Western, Southern, Northern and North Eastern regions. Accordingly, the scheduling is also done among the beneficiaries of the region or the Power Purchase Agreement (PPA) holders from such power plant. In case there is un-requisitioned power within the region, it is available to only the original beneficiary of that power plant which means such power remains concentrated in the respective region only. There are following concerns:
  - i. Generally, there are similar demand pattern in the region and hence if demand is low, then some of the generating stations in the merit order dispatch has surplus capacity as they are not scheduled. As a result, most of the time, due to overall requisition being less than technical minimum (TM), the plant(s) do not generate and go under Reserve Shut Down (RSD). There are two consequences of this:
    - a. The plant is out of bar and is not available in the grid. Hence they cannot serve the grid under any contingencies or be used for Ancillary Services (Reserves).
    - b. Even the states who has power allocation and need power from such plant are deprived of the generation, as due to not attaining the TM, the plant is not generating and remains under reserve shutdown.
  - ii. The demand in some other region may be high or the states who do not have allocation from such power plants may be needing the power due to increased demand. Eg. Peak in Northern region is during summer whereas Peak in Southern region is during winter. Similarly, there is diversity in the time at which the peak occurs in the States.
7. At present, to facilitate use of surplus power by the constituents of the region, a portal is operational in Western Region (WR) and Eastern Region (ER). In order to have national level optimization, it is being proposed to have a national level mechanism and portal so that any state / Discom can use the surplus power from central generating stations of any region.

#### **Private Sector: IPPs**

8. Besides PPA holders, they may sell their surplus power in the power exchanges or sell in Term Ahead Market (TAM) or Day Ahead Market (DAM) or Real Time Market (RTM) or through DEEP e-portal.

#### **Captive Generating Stations**

9. They can sell their surplus power after meeting their own requirement.

### **B. The Scheme**

1.1 In the proposed scheme, a National portal would be created where temporary allocation of power from surplus (Seller) entity to deficit (buyer) entity would be made online amongst constituents in the country. In the proposed scheme none of the existing arrangements shall be disturbed, rather an additional avenue shall be provided to stakeholders for optimal use of surplus power. The proposed scheme envisages paperless working; and is subject to willingness of seller and buyer, confirmation of transmission corridor by NLDC and payment security by the seller before scheduling of such power. The Scheme shall be implemented with details as under:

- i. For surplus power with Central Generating Station (CGS):
  - a. Flexibility to use surplus power on day ahead basis (D-1) by all constituents in the country and;
  - b. Use of longer duration for surplus power
- ii. For surplus power with Inter- State Generating Stations (ISGS) (excluding CGS)
- iii. For surplus power with the States/ Distribution companies (whether State owned or Private)
- iv. For surplus power with IPPs and Captive Generating Stations

1.2 The power shall be bought / sold at the tariff as determined by the Appropriate Commission.

1.3 The transmission charges shall also be paid as applicable to the concerned transmission service providers (CTU or STU or as the case may be).

1.4 Payment security mechanism shall be maintained as per the mutually agreed terms and the same would be confirmed by the seller and the buyer on the portal. POSOCO to verify before actual despatch of power.

## **2.1 Standard operating Procedure (SOP) for flexibility to use the surplus power of CGS by all the States / Discoms irrespective of the original beneficiary of the region**

### **Temporary Allocation on Day Ahead (D-1) basis**

2.1.1 The original beneficiary of CGS shall submit through web-based National portal the surrendered quantum (MW), duration (block-wise). The tariff (as determined by the Appropriate Commission) shall be updated in advance at the portal by the concerned CGS. However, the tariff will be subject to any changes made by the Appropriate Commission.

2.1.2 The willing new beneficiary shall submit its requisition online for availing the surplus power through web-based National portal. The quantum and time period

shall be specified along with acceptance to pay the tariff as determined by the Appropriate Commission. The requisitions can be beyond MoP allocation.

2.1.3 CGS shall be permitted to revise its schedule for surplus power from its original beneficiary to any other beneficiary. The new beneficiary shall be liable to pay both variable charge (VC) and fixed cost (FC) for full requisition and original beneficiary shall have no right to recall as entire FC liability is shifted to the new beneficiary because power being temporarily reallocated to him. The financial liability of new beneficiary shall be limited to quantum of temporarily allocated power.

2.1.4 The payment shall be secured through suitable payment security mechanism e.g. letter of credit (LC) or advance payment or any other mutually agreed payment security mechanism.

2.1.5 Consent and details of surrender and requisition of surplus power of the original beneficiary and the new beneficiary respectively shall be confirmed by CGS w.r.t. to availability of units during period of requisition on the portal for further processing to the National Power Committee (NPC)/CEA.

2.1.6 NPC/CEA shall allocate surplus power on portal to willing new beneficiaries based on following criteria, and communicate to NLDC.

- i. First preference shall be given to co-beneficiaries of the CGS.
- ii. In case multiple beneficiaries seek to avail surplus power from a CGS, the surplus power allocation will be on first come first serve basis.
- iii. In case, multiple beneficiaries request simultaneously (in the same time block) and the sum of their requisitioned power exceeds the available surplus power, then the surplus shall be apportioned & scheduled pro-rata in the ratio of the respective requisitions (in MW) made by the buyers.

2.1.7 NLDC shall check availability of margins in the transmission network and seek confirmation of payment security from the CGS on the portal for the allocated capacity.

2.1.8 Based on CGS confirmation of payment security, NLDC shall finalise on the portal the allocation of surplus power and communicate to the CGS, concerned beneficiaries, respective RLDCs/RPCs and NPC/CEA.

2.1.9 The concerned RLDC shall schedule the surplus power as per the requisition within the time blocks stipulated in IEGC.

2.1.10 The portal would be linked to Web based energy schedule (WBES) software of NLDC/ RLDCs through Application program Interface (API) for outputs/inputs.

2.1.11 Payment settlement will be as per the REAs (Regional Energy Accounts) prepared by the concerned RPC. This will be binding on all the buyers of power from CGS.

2.1.12 For smooth implementation, NLDC shall bring out a detailed timelines.

**Temporary Allocation of Power for longer duration (more than one day- eg week, fortnight, month, quarter or any period mutually convenient to seller and buyer)**

2.1.13 For temporary allocation of power for longer duration i.e. more than one day, the original beneficiary may also provide standing consent to the CGS specifying quantum and time period. The duration could be for a week, fortnight, month, quarter, annual or any duration assessed by the seller or buyer. For allocation of power, similar procedure as given in para 2.1.1 to 2.1.11 above shall be adopted except in case desired duration exceeds STOA duration limit then CTU shall confirm availability of transmission network by following extant regulations.

2.1.14 To revive coal based units under Reserve Shut Down (RSD), maximum of around 36 hrs are required for cold start. CGS/Seller shall always keep updated status of generating units under reserve shutdown and planned shutdown at the portal so that buyers may submit their requisition accordingly.

**2.2 Standard operating Procedure (SOP) for flexibility to use the surplus power of ISGS (other than CGS) by all the States / Discoms irrespective of the original beneficiaries of the region**

2.2.1 Similar procedure as stated above i.e. clause 2.1.1 to 2.1.4 and 2.1.7 to 2.1.14 shall be adopted for ISGS as well.

2.2.2 Consent and details of surrender and requisition of surplus power of the original beneficiary and the new beneficiary respectively shall be confirmed by ISGS (other than CGS) w.r.t. to availability of units during period of requisition on the portal for further processing to the National Load Despatch Centre or Regional Load Despatch Centre, as the case may be.

**2.3 Standard operating Procedure (SOP) for flexibility to use the Surplus power with the States / Distribution companies (whether State owned or Private) by the other States / Discoms**

2.3.1 At present some of the distribution companies are giving the surplus power to some other states through banking process and take back the power when they need it as per the mutual agreement.

2.3.2 It is also observed that due to the diverse nature of demand in different states at different time, there is a possibility of optimum utilization of resources.

2.3.3 Many times it is seen that the States which are surplus during some period of time are keeping their own generating stations under reserve Shutdown. But there are other states which are facing crisis. However, in the absence of any mechanism, the resources even though available in the country but is not used to meet the overall demand in the country and there are load shedding. As per proposed scheme, states can temporarily transact. As a result, the State generating companies can also improve their plant load Factor and the effective overall per unit cost of generation of such generating companies can also be reduced.

2.3.4 In regard to option of the states selling surplus power in the power exchanges, it is experienced that the states prefer to keep their units under reserve shutdown. Further, the state owned generating companies do not take risk of selling their power in the power exchanges mainly due to uncertainty of the Market clearing price.

2.3.5 Thus, if the tariff is assured by some other states, the generating stations will come on bar and generate power. This will also reduce the burden of fixed cost to the Discoms and the retail tariff will also reduce, thereby benefitting the consumers. The buying State / discoms shall also bear the transmission charges as applicable.

2.3.6 Willing States/Discoms may use National Portal to sell/buy surplus power subject to payment confirmation by seller and transmission availability by NLDC. Accordingly, the procedure similar to ISGS may be adopted for States/Discoms.

2.3.7 The concerned SLDC (State Load Despatch Centre) shall accordingly coordinate with the RLDC/ NLDC if the buyer is from other than the same State.

## **2.4 Standard operating Procedure (SOP) for flexibility to use the Surplus power with the IPP and CPP**

2.4.1 Based on mutually agreed terms, willing IPPs/CPPs may use the National Portal to sell their surplus power subject to confirmation of transmission availability by NLDC.

2.4.2 The portal will also have similar features to facilitate the use of surplus power with the IPPs and CPP.

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## **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 generating units at Rajwest LTPS are to be tripped at 48.0 Hz.
4. No RE Power Projects have been considered in the island. Presently, there are no RE generators in the island. However, all future RE generators are to be tripped at 48.0 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 701.5 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

The identified load considering 90% of total load is **629 MW** which is placed at **Annexure-A1**. General condition of islanding is considered for the total system of 629MW which is 90% (approx.) of the maximum capacity of generation unit considered for island.

#### **D Proposed Islanding Scheme**

1. No RE Power Projects have been considered in the island. Presently, there are no RE generators in the island. However, all future RE generators are to be tripped at 48.0 Hz. **List of feeders is attached at Annexure-F.**
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 48.0 Hz (Note: to be monitored by SE (SO&LD)). **List of feeders is attached at Annexure-F.**
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 47.90 Hz instantaneous. 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. Islanding shall take place at 47.90 Hz instantaneous i.e. all identified feeders to form island will be tripped at this frequency.
5. 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.
6. 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 region are 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 included in **Annexure-A**. 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

Similarly, the results of load flow study indicate the following load-generation balance for system load of 629 MW (90% of the generation units):-

Generation	=	720 MW
Load	=	629.1800 MW
Losses	=	18.8403 MW

A snapshot of the load flow results for load of 629MW is placed at Exhibit-2. 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.

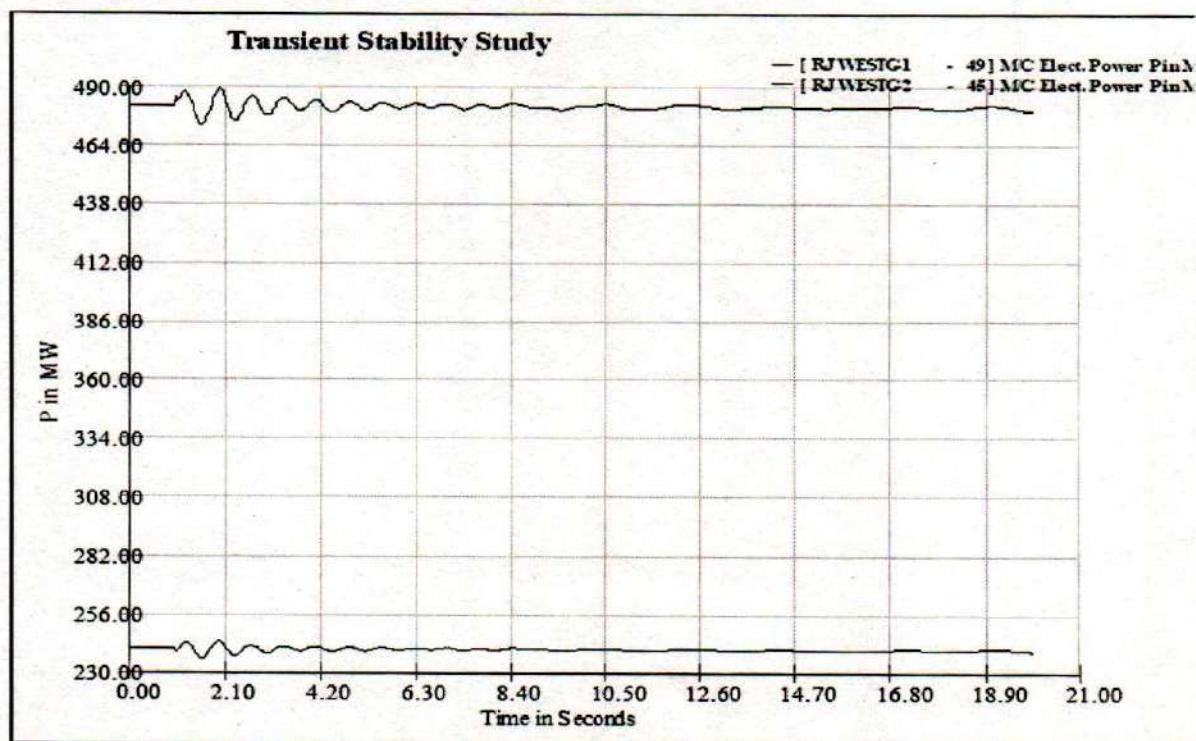


Fig. 1 Active power curve of Rajwest LTPS generators

## 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.

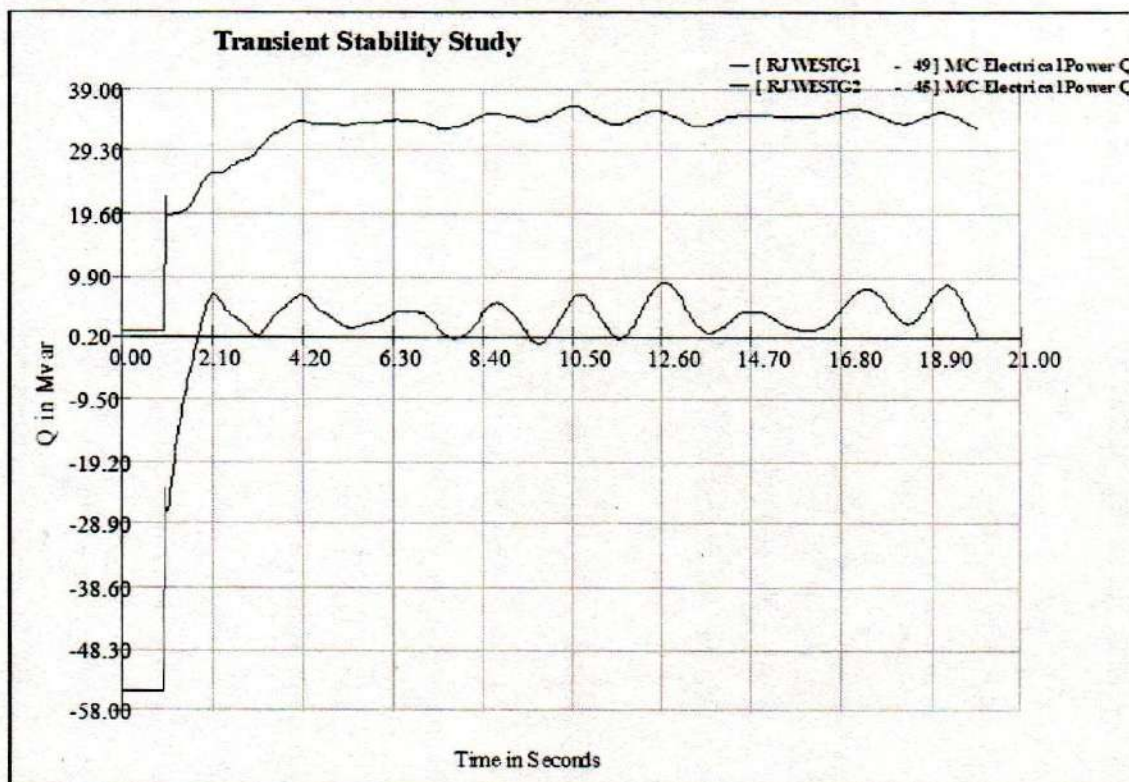


Fig. 2 Reactive Power variations during islanding condition

## 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  $24.5^\circ$  to  $22^\circ$  and finally settles at  $41.5^\circ$  in 18.5 seconds. Further, load angle for generator connected to 400 kV voltage bus (4x135 MW) first decreases from  $23^\circ$  to  $21.5^\circ$  and finally settles at  $40^\circ$  in 18.5 seconds. Hence, network included in the island of Rajwest LTPS will operate at a new load angle in stable state.

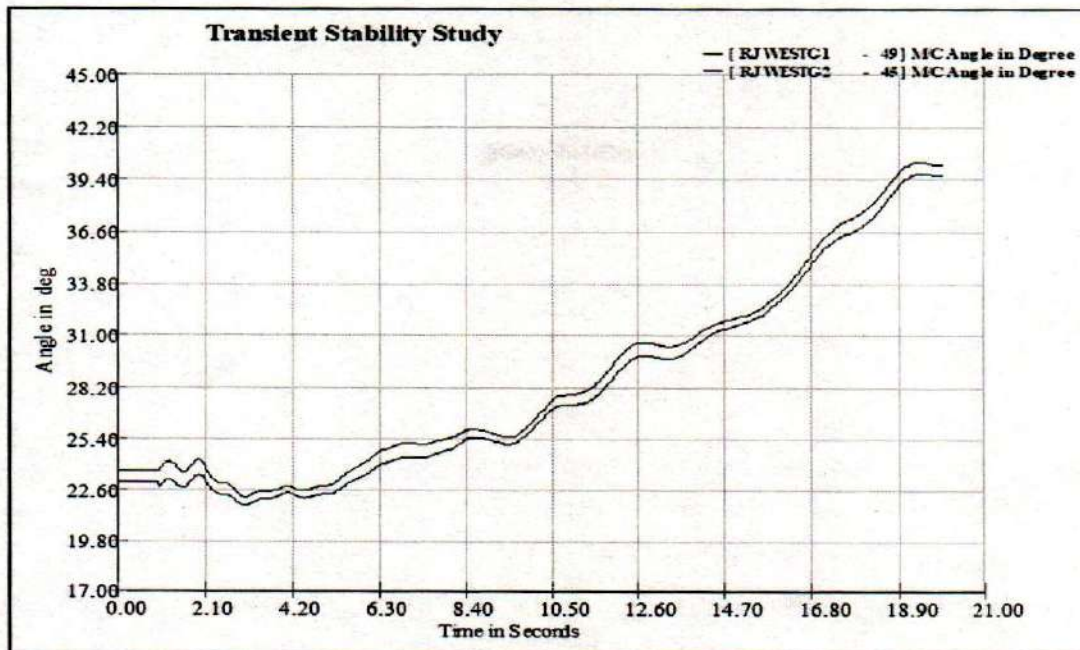


Fig. 3 Load angle curve

#### 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.

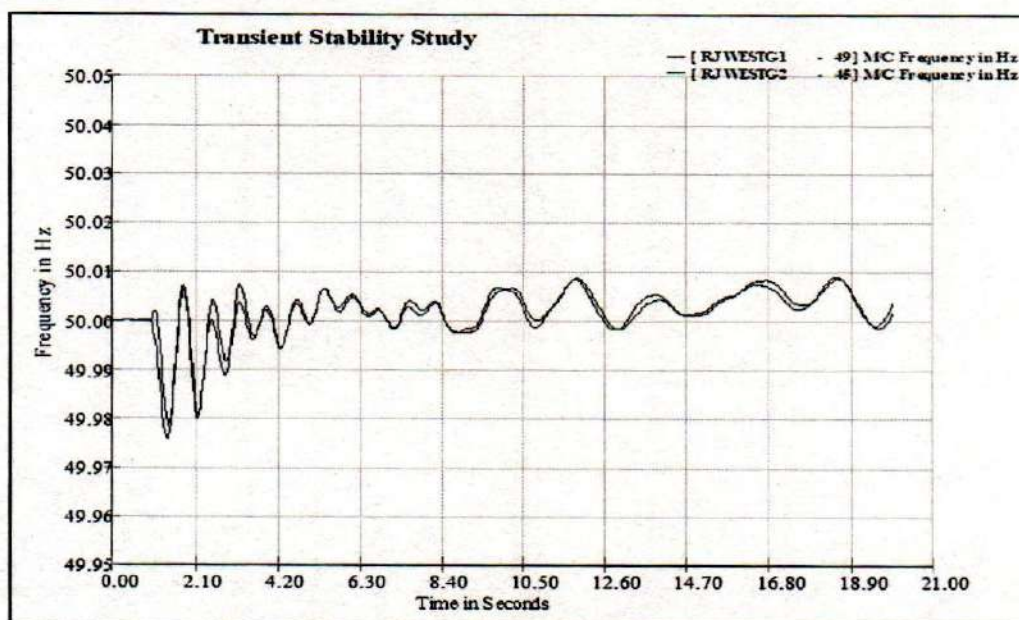


Fig. 4 Variation of frequency during islanding condition

#### 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 0.975 pu 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.

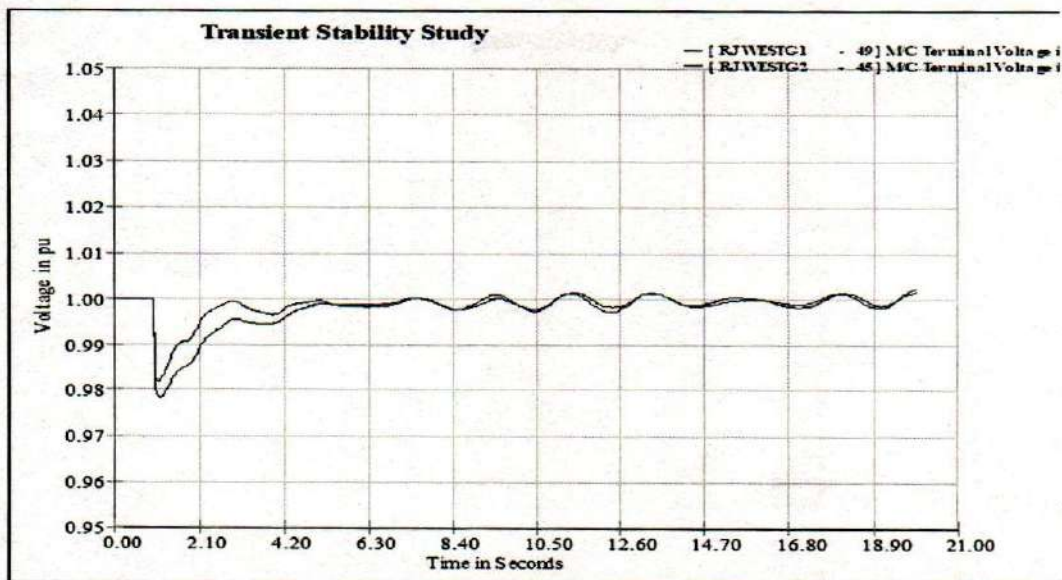


Fig. 5 Voltage variations during islanding condition

#### 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
<b>A</b>	<b>Load in Barmer</b>				
1	400 kV GSS Barmer	11.54	5.00	4.00	Defence
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	
	<b>Load at Barmer</b>	<b>120.48</b>	<b>77.00</b>	<b>27.26</b>	
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	
	<b>Load at Dhaurimanna</b>	<b>186.02</b>	<b>134.00</b>	<b>32.34</b>	
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	
	<b>Load at Balotra</b>	<b>128.76</b>	<b>82.00</b>	<b>7.28</b>	
	<b>Total load in Barmer</b>	<b>435.26</b>	<b>293.00</b>	<b>66.884</b>	
<b>B</b>	<b>Load in Jodhpur</b>				
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 PS8	4.50	1.00	0.02	
14	132 kV GSS Soorsagar	35.42	29.00	1.33	Defence
	<b>Total load in Barmer</b>	<b>560.81</b>	<b>408.00</b>	<b>86.41</b>	
	<b>Total load in Barmer &amp; Jodhpur</b>	<b>996.07</b>	<b>701.00</b>	<b>153.29</b>	

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
<b>A</b>	<b>Load in Barmer</b>				
1	400 kV GSS Barmer	11.54	5.00	4.00	Defence
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	
	<b>Load at Barmer</b>	<b>120.48</b>	<b>77.00</b>	<b>27.26</b>	
5	220 kV GSS Dhaurimanna	59.64	43.00	0.47	Defence
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
	<b>Load at Dhaurimanna</b>	<b>102.49</b>	<b>77.00</b>	<b>23.16</b>	
11	220 kV GSS Balotra	64.84	37.00	0.7	
13	132 kV GSS Samdari	16.97	13.00	0.23	
14	132 kV GSS Siwana	24.66	17.00	2.25	
	<b>Load at Balotra</b>	<b>106.47</b>	<b>67.00</b>	<b>3.18</b>	
	<b>Total load in Barmer (A)</b>	<b>329.44</b>	<b>221.00</b>	<b>57.704</b>	
<b>B</b>	<b>Load in Jodhpur</b>				
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 PS8	4.50	1.00	0.02	
14	132 kV GSS Soorsagar	35.42	29.00	1.33	Defence
	<b>Total load in Barmer (B)</b>	<b>560.81</b>	<b>408.00</b>	<b>86.41</b>	
	<b>Total load in Barmer &amp; Jodhpur (A+B)</b>	<b>890.25</b>	<b>629.00</b>	<b>144.11</b>	
<b>C</b>	<b>Additional Load</b>				
6	132 kV GSS Ranasar	22.13	18.00	0.68	
9	132 kV GSS Sawa	42.34	27.00	8.5	
10	132 kV GSS Chouhtan	19.06	12.00	3.9	
12	132 kV GSS Sindhari	22.29	15.00	4.1	
	<b>Total additional Load (C.)</b>	<b>105.82</b>	<b>72.00</b>	<b>17.18</b>	
	<b>Total Load (A+B+C)</b>	<b>996.07</b>	<b>701.00</b>	<b>161.29</b>	

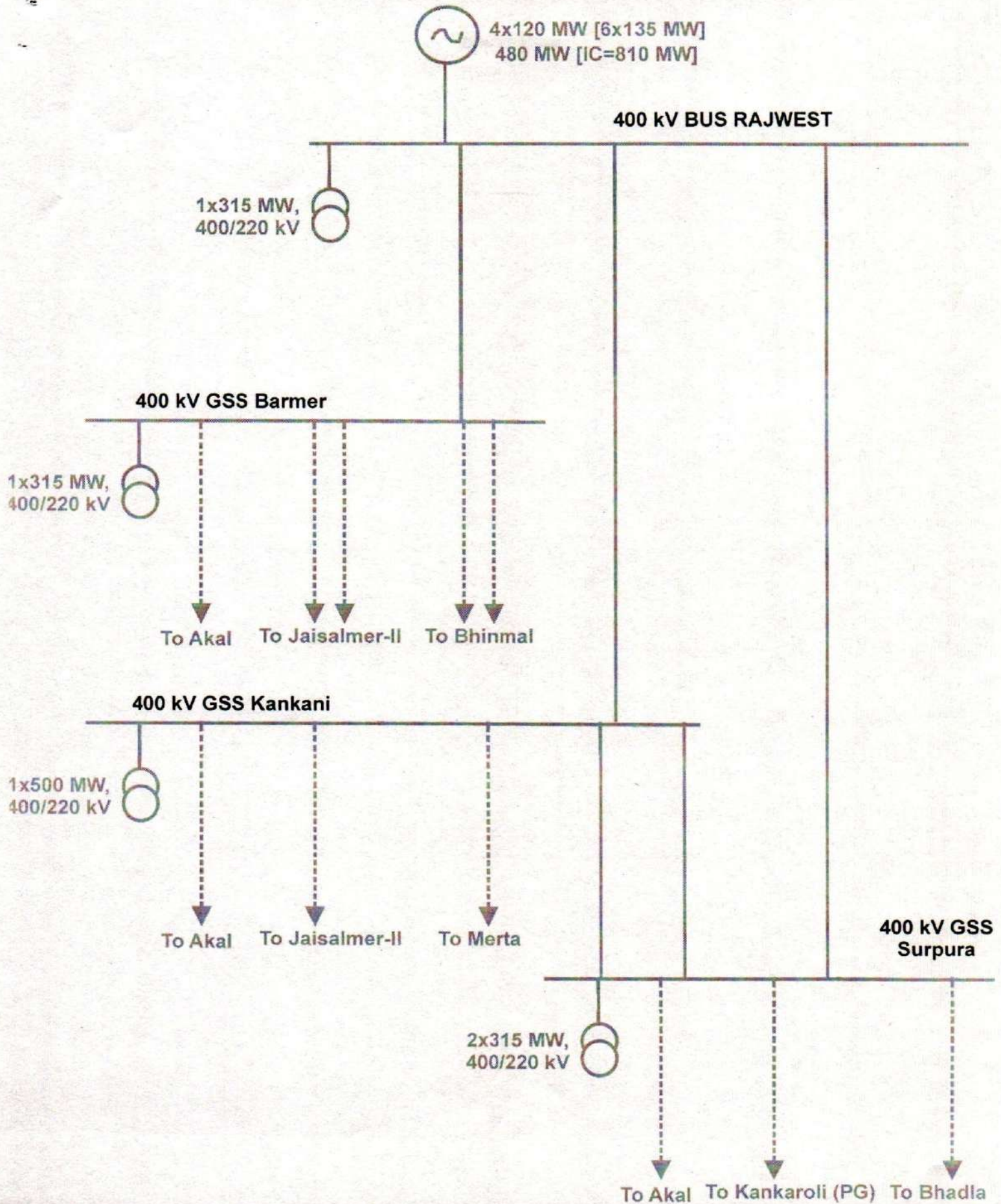


**Annexure-B**

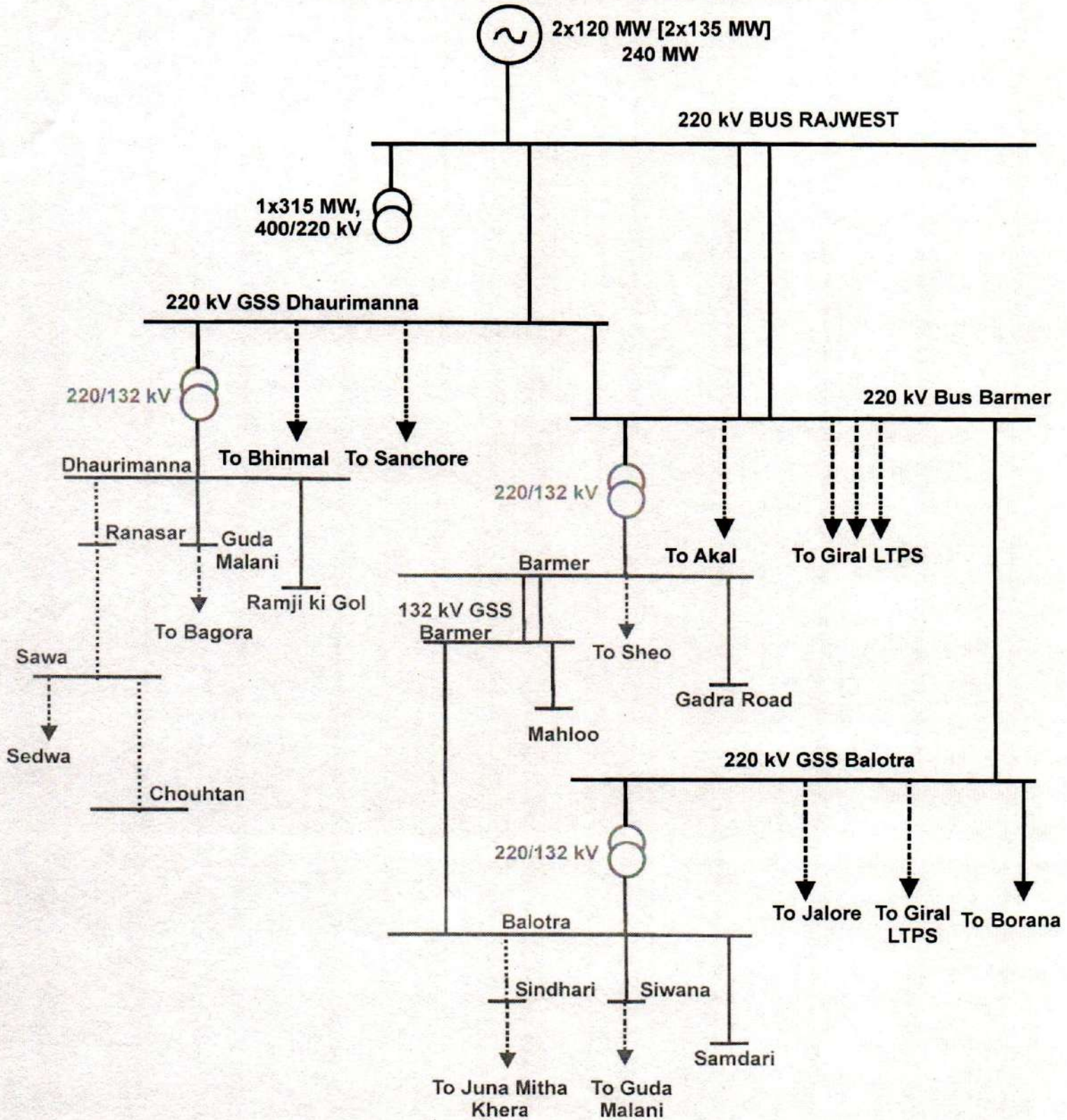
<b>Transmission Lines and Status of Under Frequency Relays for Rajwest Islanding Scheme</b>		
<b>S. No.</b>	<b>Name of Line</b>	<b>Status</b>
1	400 kV S/C Rajwest-Barmer line	Blocked
2	400 kV S/C Rajwest-Jodhour (Surpura) line	Blocked
3	400 kV S/C Rajwest-Kanknai (Jodpur) line	Blocked
4	220 kV D/C Rajwest-Barmer 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 (Akai) 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 (Akai) 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	Operative
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 Gudamalani-Bagora line	Operative
27	220 kV S/C Balotra-Jalore line	Operative
28	220 kV S/C Balotra-Boranada line	Blocked
29	132 kV S/C Balotra-Samdari line	Blocked
30	132 kV S/C Balotra-Siwana line	Blocked
31	132 kV S/C Balotra-Sindhari line	Blocked
32	132 kV S/C Siwana-Mandawala line	Operative
33	132 kV S/C Sindhari-Juna Mitha Khera line	Operative
34	400 kV S/C Jodhpur (Surpura)-Bhadla line	Operative
35	400 kV S/C Jodhpur (Surpura)-Akai line	Operative
36	400 kV S/C Jodhpur (Surpura)-Kankroli line	Operative
37	400 kV S/C Jodhpur (Surpura)-Kankani line Ckt-I	Blocked
38	400 kV S/C Jodhpur (Surpura)-Kankani line Ckt-II	Blocked
39	220 kV D/C Jodhpur (Surpura)-Bhawad line	Operative
40	220 kV 2xS/C Jodhpur (Surpura)-Tinwari line	Operative
41	220 kV S/C Jodhpur (Surpura)-Bilara line	Operative
42	220 kV S/C Jodhpur (Surpura)-Barli line	Blocked

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

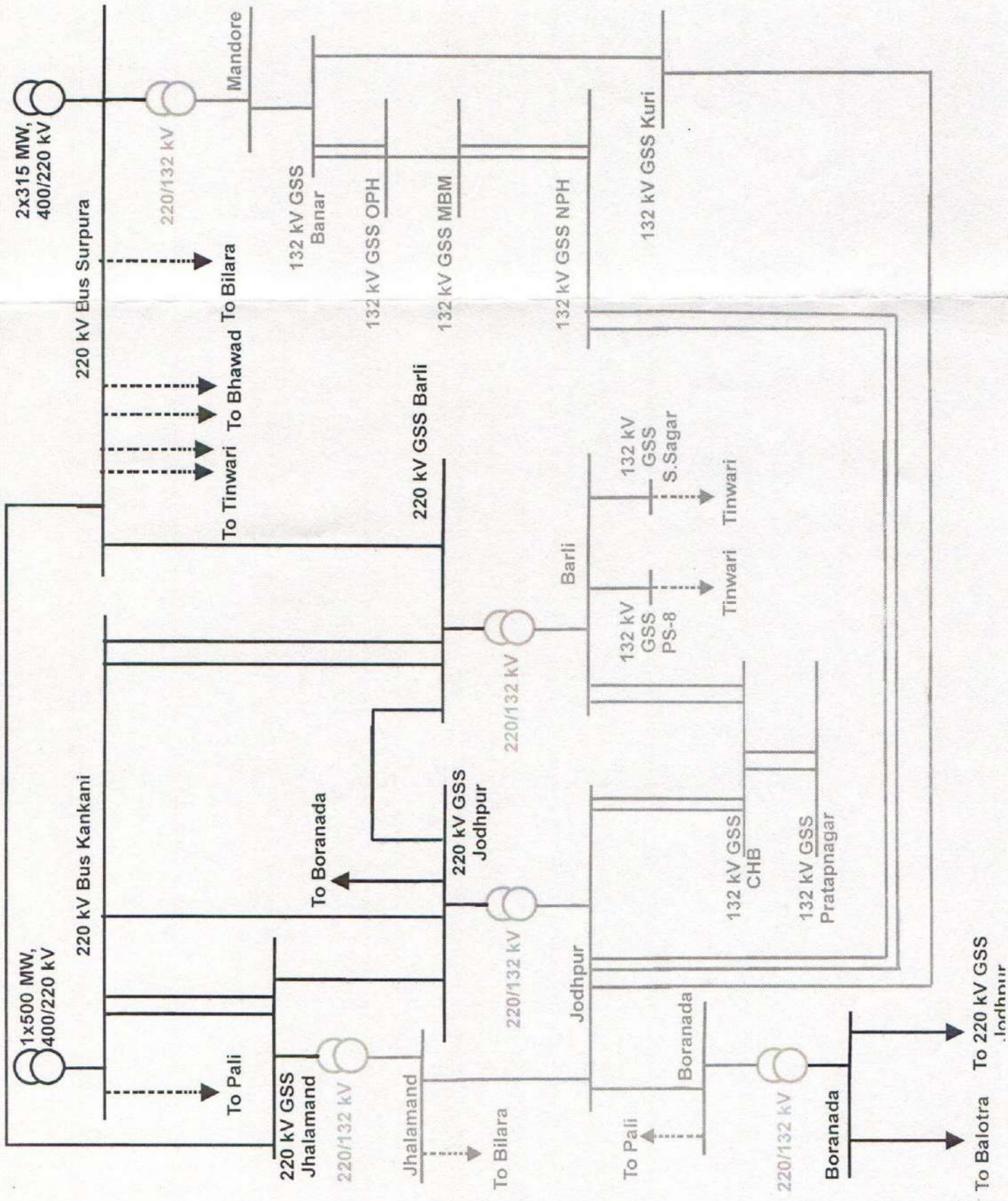
# 400 kV Network Included in Rajwest Island



## 220 kV Network Included in Rajwest Island



# 220 kV Network Included in Rajasthan Island (Jodhpur City)

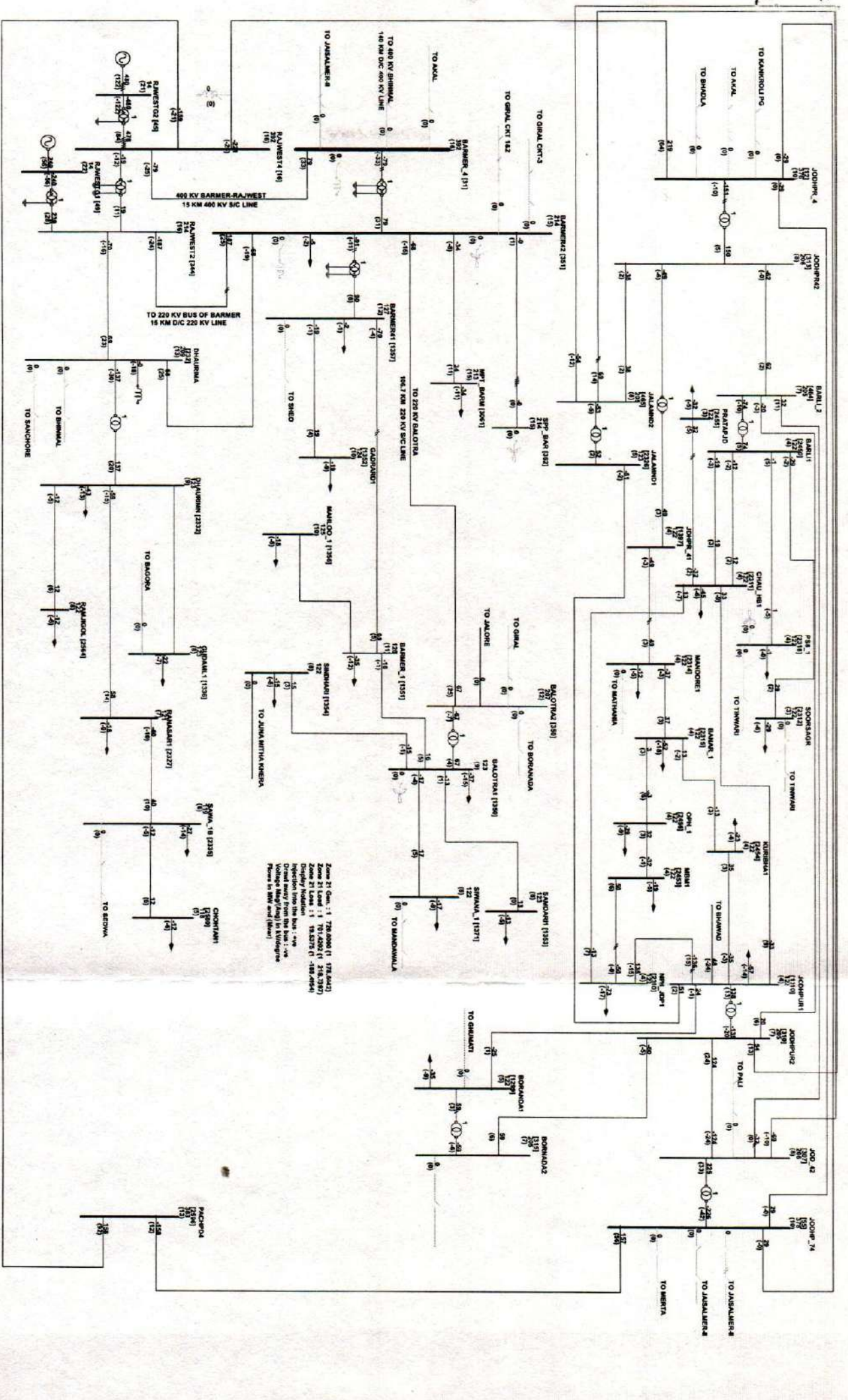


**List of Dedicated Feeders of Open Access Consumers/RE Generators to be tripped at 48.20HZ for STPS Island**

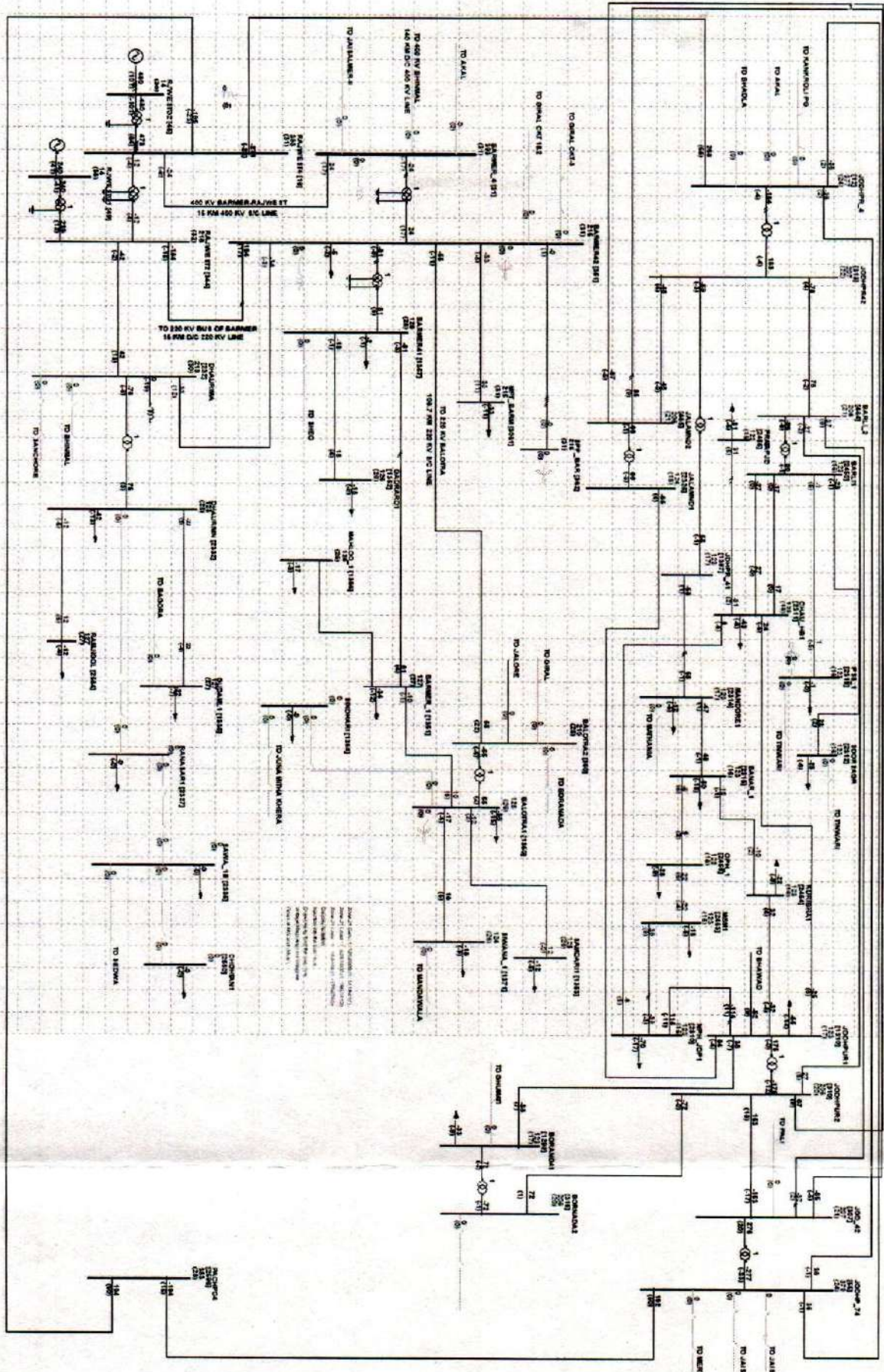
<b>S. No.</b>	<b>Name of GSS</b>	<b>Name of Feeder</b>	<b>Quantum of Load</b>
1	132 kV GSS Mandore	33KV O/G Jodhpur Alloy	Feeder DC since 12.07.2022
2	132 kV GSS PS8	132 KV O/G ENERCON	350 A, 70-72 MW

Note:

1. Dedicated feeders for open access consumers are to be kept operative at frequency of 48.0 Hz.
2. All RE feeders are to be tripped at 48.0 Hz.



Zone 21 Code : 1 78.4000 (1 78.4000)  
 Zone 21 Line : 1 78.4000 (1 218.2387)  
 Zone 21 Line : 1 78.5075 (1 -188.4864)  
 Display Notation  
 Injection into the bus : one  
 Voltage Magnifying in Underwire  
 Flows in MW and MVar





## **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:- Suratgarh TPS 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)

The identified load considering 90% of total load is 550MW which is placed at **Annexure-A1**. General condition of islanding is considered for the total system of 550MW which is 90% (approx.) of the maximum capacity of generation unit considered for island. In this case 27MW of load is considered at the 220 kV GSS Hanumangarh.

Further, 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 Srikanpur (**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 Suratgarth TPS and Suratgarth SCTPS 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. List of the identified feeders is placed at **Annexure-D**.
4. Islanding shall take place at 47.90 Hz instantaneous i.e. all identified feeders to form island will be tripped at this frequency.
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 600 MW and 550MW. Power flow plot of the network included in the island considering load of 600MW is placed at **Exhibit-1**. The results of load flow study indicate the following load-generation balance for system load of 600MW:-

Generation	=	617.1 MW
Load	=	600.3 MW
Losses	=	16.8 MW

Similarly, the results of load flow study indicate the following load-generation balance for system load of 550 MW (90% of the generation unit):-

Generation	=	567.6645 MW
Load	=	553.9511 MW
Losses	=	13.7134 MW

A snapshot of the load flow results for load of 550MW is placed at Exhibit-2. 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 are settling after a time period of 20 seconds and island becomes stable.

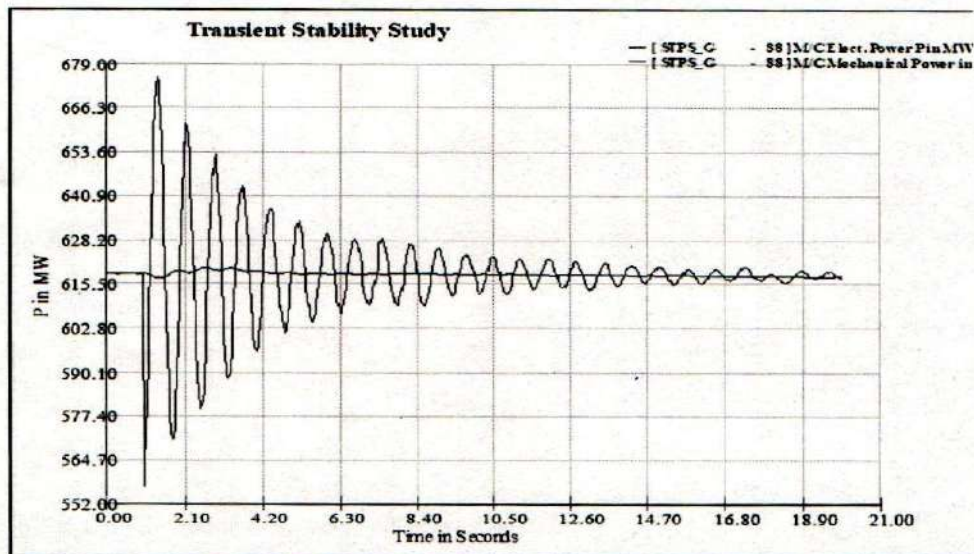


Fig. 1 Active power curve of SC-STPS generator

### 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 6 seconds. However, maximum deviations are up to +5.0 MVAR. This indicates that reactive power settles down and island becomes stable.

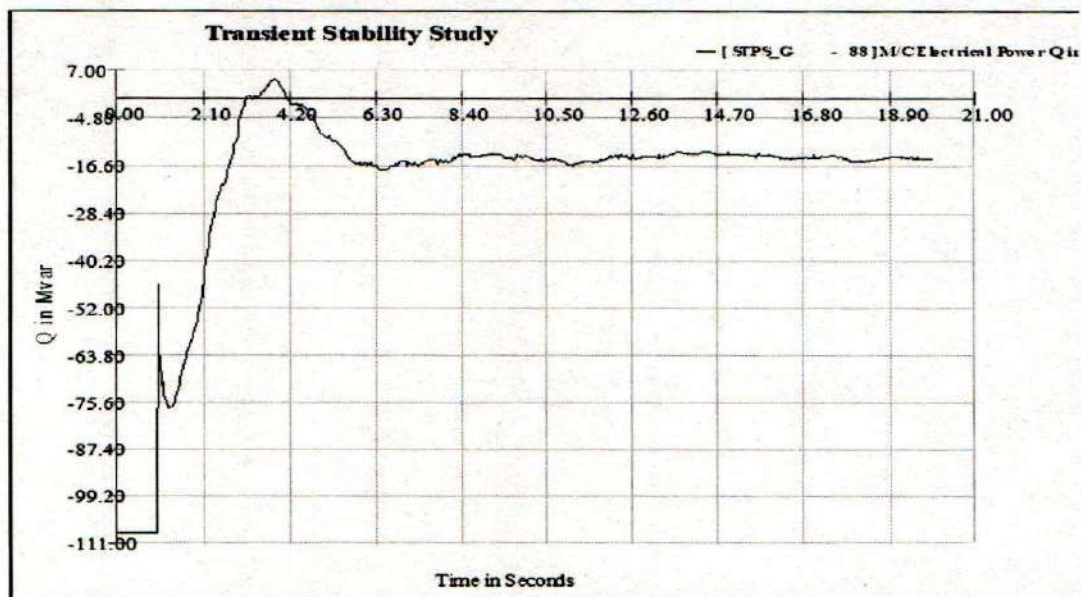


Fig. 2 Reactive Power variations during islanding condition

### 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  $7^\circ$  to new value after the island formation. The transients associated with the load angle curve settles down after a time period of 10

seconds. Hence, network included in the island of SC-STPS will operate at a new load angle in stable state.

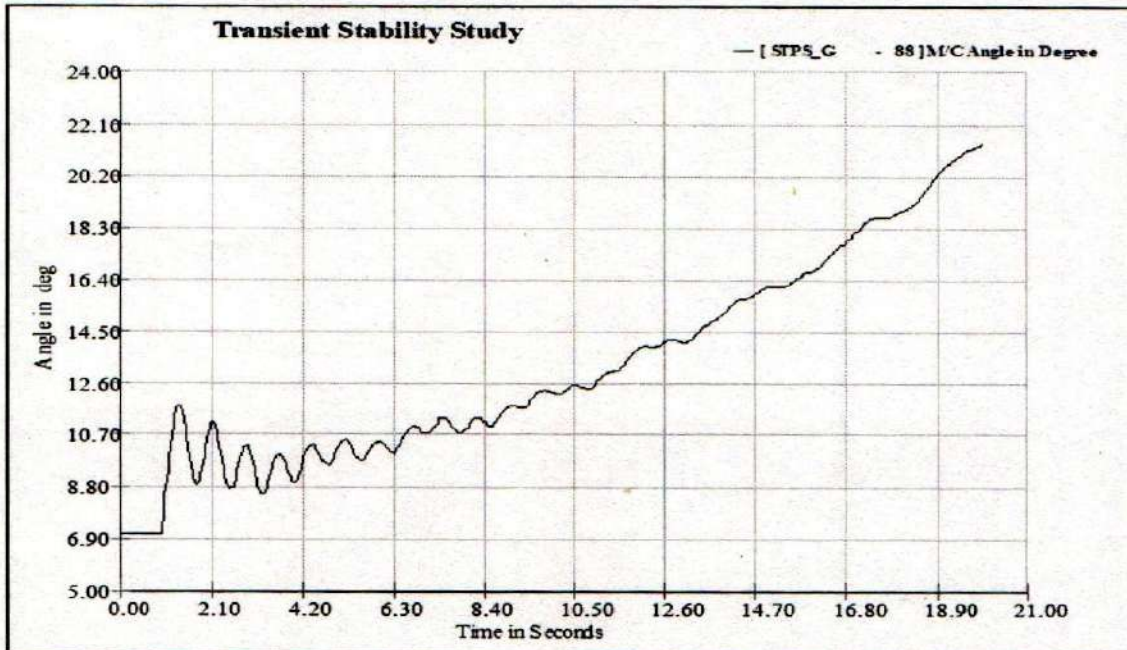


Fig. 3 Load angle curve

#### 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 10 seconds which indicates that the island will operate in the stable state.

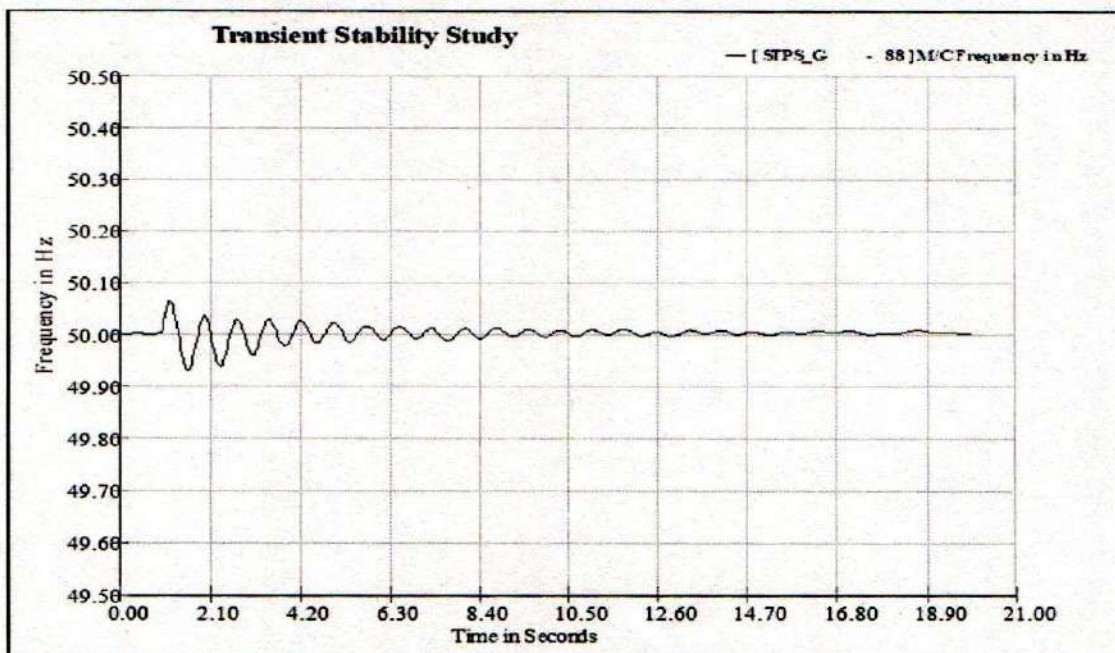


Fig. 4 Variation of frequency during islanding condition

## 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 20 seconds. This indicates that the island will operate in the stable state.

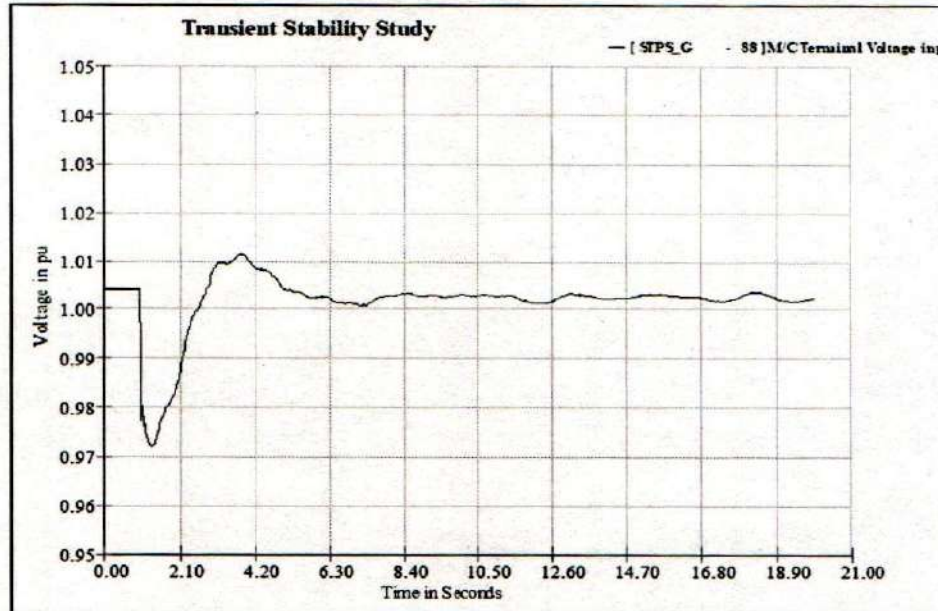


Fig. 5 Voltage variations during islanding condition

## 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
	<b>Total load (A)</b>	<b>1271.24</b>	<b>600.00</b>	<b>331.70</b>	
<b>Additional Load For SC-STPS Island</b>					
35	132 kv GSS Bissau	29.31	14	8	NIL
36	132 kv GSS Parsaneu	30.38	15	8.5	NIL
37	132 kv GSS Kitarar	43.6	21	12.8	NIL
38	132 kv GSS Fatehpur	42.4	20	11.9	NIL
39	132 kv GSS Antroli	33.34	17	9.11	NIL
	<b>Total Load (B)</b>	<b>179.03</b>	<b>87</b>	<b>50.31</b>	
	<b>Total Load (A+B)</b>	<b>1450.27</b>	<b>687.00</b>	<b>382.01</b>	



## Annexure-A1

## 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 Goluwala	22.9	9	4.2	NIL
2	132 KV GSS Amarpura Thedi	52.42	28	9	NIL
3	132 KV GSS Fatehgarh	20.36	11	4.8	NIL
4	132 KV GSS, Rawatsar	30.21	10	7.8	NIL
5	132 KV GSS Tibbi	21.12	11	2	NIL
6	132 KV GSS Sangaria	45.17	22	0.22	NIL
7	132 KV GSS Nohar	49.48	19	29.04	NIL
8	220 KV GSS Bhadra	17.1	6	9	NIL
9	132 KV GSS Bhadra	42	20	14	NIL
10	132 kv GSS Sadulpur (Rajgarh)	49.36	20	9.5	7.98 (PHED)
11	132 kv GSS Taranagar	28.11	8	3.2	NIL
12	220 KV GSS Udyogvihar (Sri Ganganagar)	40	20	12	4 (Defence)
13	132 KV GSS, Sri Ganganagar	89	42	11	3.5 (Defence)
14	132 KV GSS, Sadulshahar	18.11	13	4	NIL
15	220 KV GSS Padampur	30	16	4	0.4 (Defence)
16	132 KV GSS Raisinghnagar	31.36	13	3	1 (Defence)
17	132 KV GSS Srikaranpur	20	9	5	0.4 (Defence)
18	132 KV GSS Kaminpura	15.73	7	3.5	0.4 (Defence)
19	132 KV GSS Tatarsar	4.76	4	1	NIL
20	220 KV GSS Suratgarh	55	28	15	9.6 (Airforce/Defence)
21	132 KV GSS Rajjasar	36.61	16	26.35	11 (IGNP)
22	132 KV GSS Pallu	22.39	7	8	0.3
23	132 KV GSS Jokhasar	13.54	6	6.5	13.82 (IGNP)
24	132 KV GSS, Srivijaynagar	31.84	12	16.7	NIL
25	132 KV GSS, Anoopgarh	29.5	12	14.996	NIL
26	132 KV GSS Ghamurwali	17.29	7	1	NIL
27	132 KV GSS Pilibanga	75.34	28	20	NIL
28	220 kv GSS Ratangarh	26	17	7	NIL
29	132 kv GSS Ratangarh	26.23	14	1.997	NIL
30	132 kv GSS Sardarsahar	67	27	35	NIL
31	132 kv GSS Momasar	62.91	49	0.9	8.0(PHED)
32	132 kv GSS Bhanipura	45.1	19	10	NIL
33	132 kv GSS Patlisar	50.3	20	11	NIL
	<b>Total load (A)</b>	<b>1186.24</b>	<b>550.00</b>	<b>310.70</b>	
<b>Additional Load For SC-STPS Island</b>					
34	132 kv GSS Bissau	29.31	14	8	NIL
35	132 kv GSS Parsaneu	30.38	15	8.5	NIL
36	132 kv GSS Kitasar	43.6	21	12.8	NIL
37	132 kv GSS Fatehpur	42.4	20	11.9	NIL
38	132 kv GSS Antroli	33.34	17	9.11	NIL
39	132 KV GSS Hanumangarh	85	50	21	NIL
	<b>Total Load (B)</b>	<b>264.03</b>	<b>137</b>	<b>71.31</b>	
	<b>Total Load (A+B)</b>	<b>1450.27</b>	<b>687.00</b>	<b>382.01</b>	

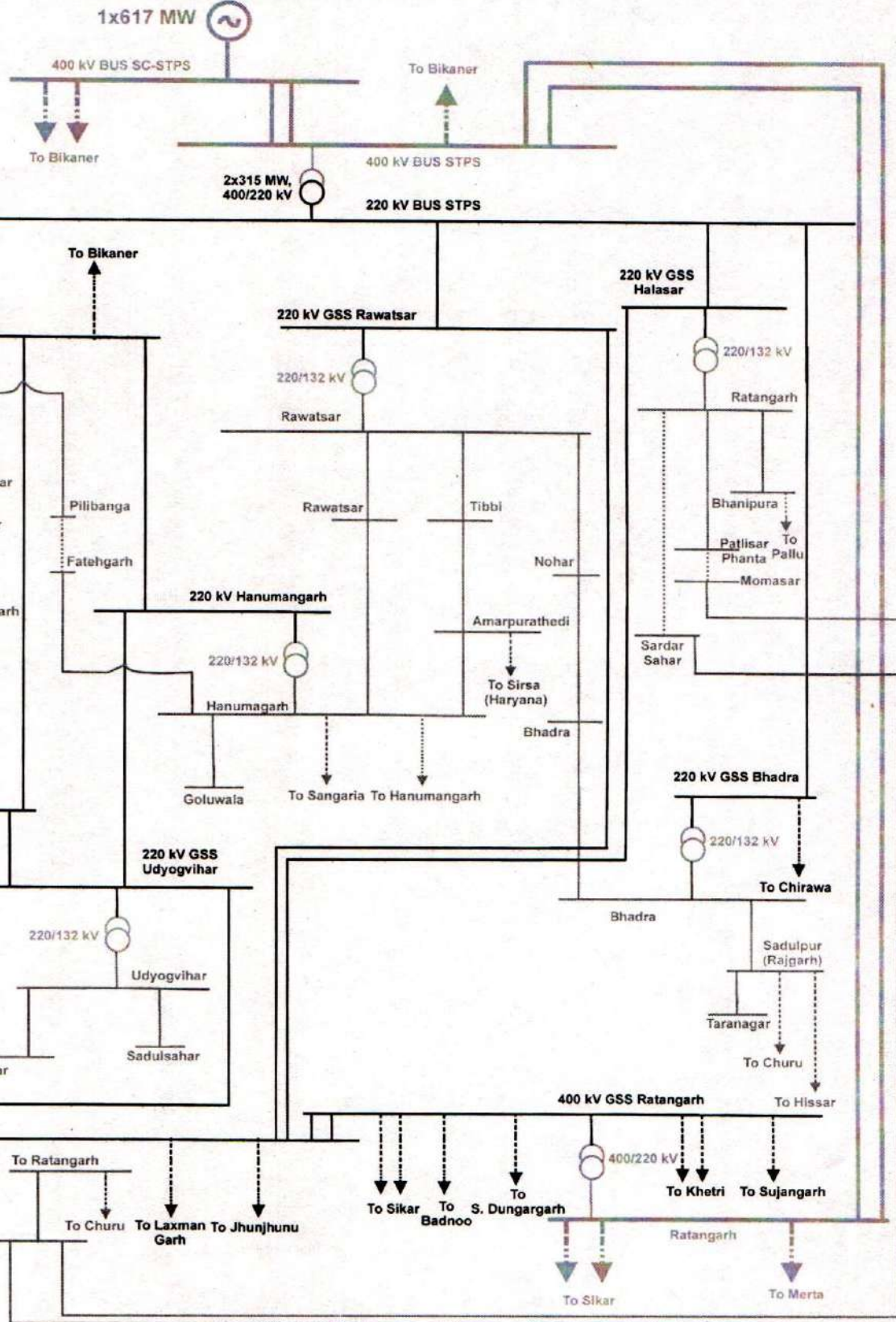
**Annexure-B**

<b>Transmission Lines and Status of Under Frequency Relays for Sc-STPS Island</b>		
<b>S. No.</b>	<b>Name of Line</b>	<b>Status</b>
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	Operative
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-Srikanpur Line	Blocked
56	132 kV S/C Srikanpur-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
<b>Additional Lines to Install Under Frequency Relays</b>		
79	132 kV S/C Churu-Bissau line	Blocked/Operative
80	132 kV S/C Gharsana-Khajuwala Line	Blocked/Operative
81	132 kV S/C Bissau-Jhunjhunu line	Blocked/Operative
82	132 kV S/C Parsaneu-Kitasar line	Blocked/Operative
83	132 kV S/C Kitasar-Sridungargarh line	Blocked/Operative
84	132 kV S/C Fatehpur-Antroli line	Blocked/Operative
85	132 kV S/C Antroli-Laxmangarh line	Blocked/Operative

Transmission Network Included in STPS Island

1x617 MW



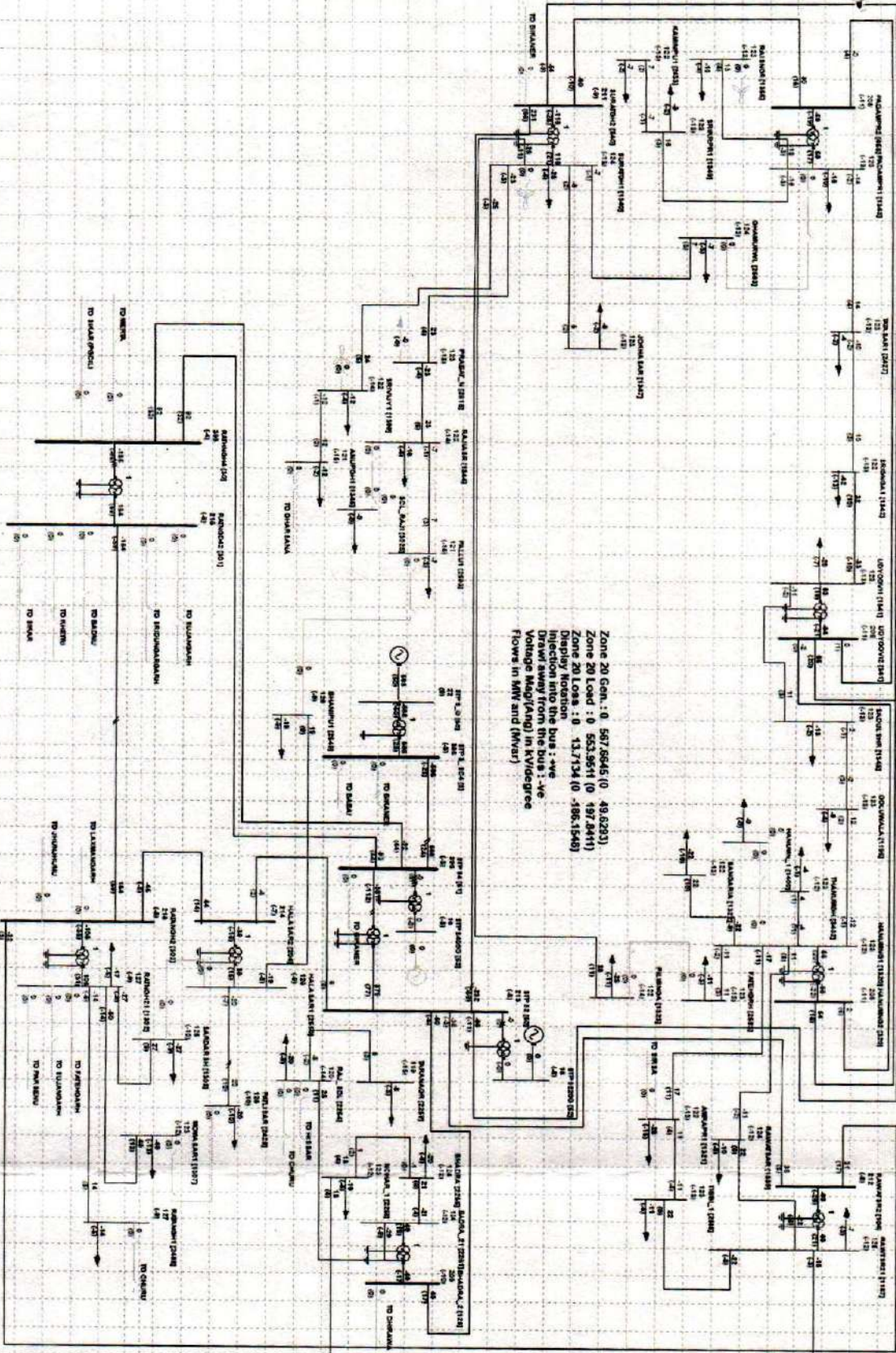
**ANNEXURE-D**

**List of Dedicated Feeders of Open Access Consumers/RE Generators to be tripped at 48.20HZ for STPS Island**

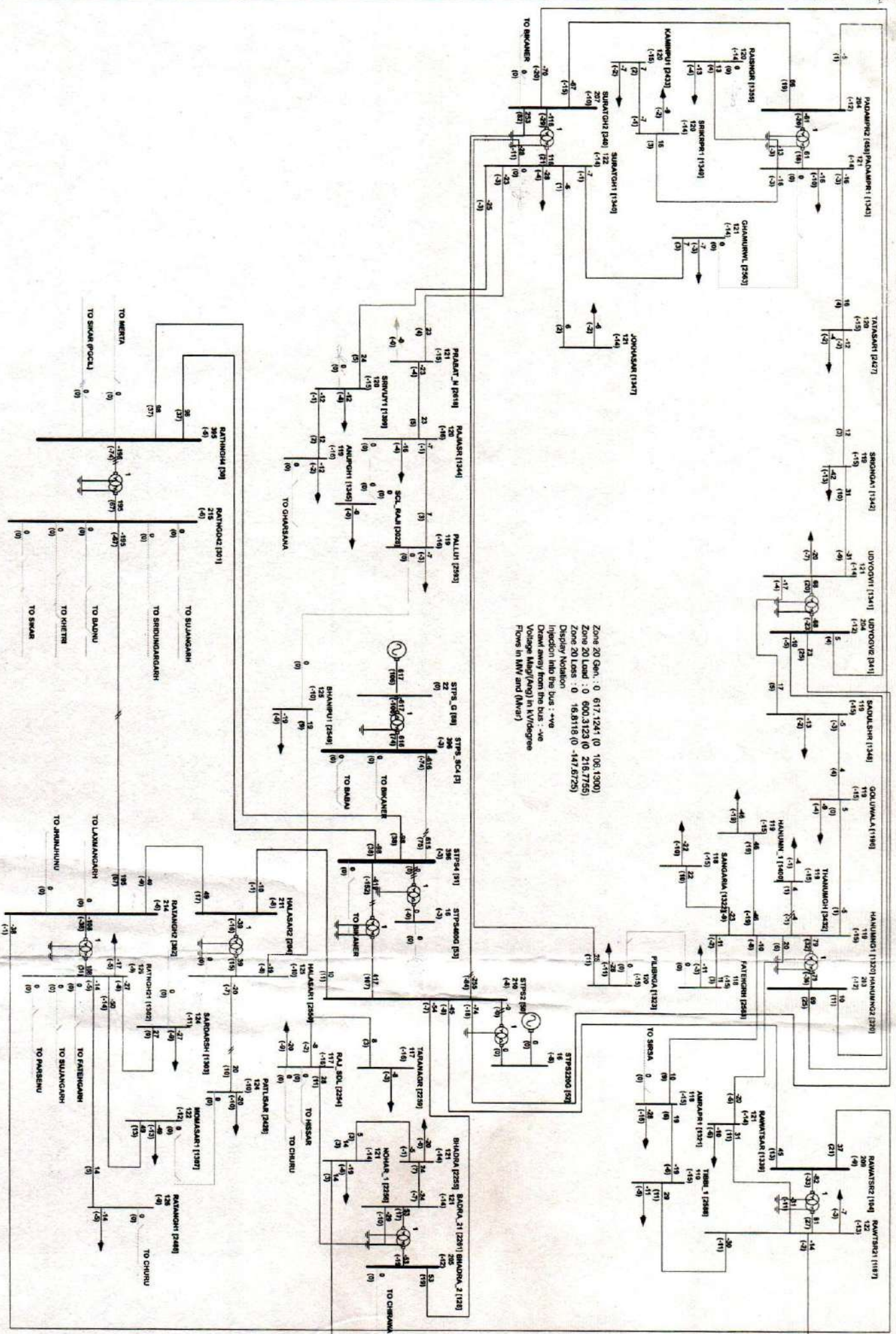
S. No.	Name of GSS	Name of Feeder	Quantum of Load	Remark
1	132 KV GSS Raisinghnagar	132 KV NTPC Jetsar	80 MW	RE Feeder
2	132KV GSS Sangaria	132KV Sanjog Biomass	10 MW	RE Feeder
3	132 KV GSS Srivijaynagar	132 KV NTPC Srivijaynagar-Jaitsar Solar Line	80 MW	RE Feeder
4	220 KV GSS Padampur	33 KV KPTL	7.8 MW	Open Access Consumer
5	132 KV GSS Kaminpura	33 KV Sugar Mill	4.95 MW	Open Access Consumer
6	132 KV GSS Rajiasar	132 KV Shree Cement Ltd.	21 MW	Open Access Consumer

**Note:**

1. Dedicated feeders for open access consumers are to be kept operative at frequency of 48.0 Hz.
2. All RE feeders are to be tripped at 48.0 Hz.



Zone 20 Gen: 0 567.8645 (0 48.6293)  
Zone 20 Load: 0 553.9611 (0 197.8411)  
Display Rotation  
Injection into the bus: +ve  
Draw away from the bus: -ve  
Voltage Mag(Ang) in KV(Degree  
Flows in MW and (MVar)





**HIMACHAL PRADESH STATE LOAD DESPATCH CENTRE**  
(AN APEX BODY)  
GOVERNMENT OF HIMACHAL PRADESH



No. HPSLDC/SLDC-75 (Vol.-II)/2022-23- 7481-86  
To

Dated: 11.11.2022

**The Superintending Engineer (Operation),  
Northern Regional Power Committee,  
18-A, Shaheed Jeet Marg, New Delhi – 110016.  
Email id: [seo-nrpc@nic.in](mailto:seo-nrpc@nic.in)**

**Subject: Proposed Islanding Scheme in respect of Himachal Pradesh.**

**Reference:** 1. This office letter No. HPSLDC/SLDC-75 (Vol.-II)/2022-23-7105-10 dated: 03.11.2022  
2. Meeting regarding Implementation of Islanding Scheme in NR-reg held on 04.11.2022.

Sir,


With reference to above, enclosed please find herewith the proposed revised islanding scheme of the following islands in respect of Himachal Pradesh i.e.

1. The Shimla Solan Islanding Scheme using Bhaba HEP and other IPPs injection at Kotla.
2. The Kullu Mandi and Manali Islanding Scheme using Malana – I HEP and other IPPs injection at Malana HEP.

This is for your kind information and necessary action please.


Yours sincerely,

DA: As Above

  
Chief Engineer,  
HP State Load Despatch Centre,  
Govt. of HP, Totu, Shimla-11(H.P.).

**Copy of the above is forwarded to the following for kind information and necessary action please:**

1. The Managing Director, H.P. State Electricity Board Ltd., Vidyut Bhawan, Shimla (H.P.) – 171004. Email: [mdhpseblshimla@gmail.com](mailto:mdhpseblshimla@gmail.com)
2. The Managing Director, H.P. Power Transmission Corporation Ltd., Himfed Building, Panjari, Shimla-171005. Email: [md.tcl@hpmail.in](mailto:md.tcl@hpmail.in)
3. The Chief Engineer (Sys. Op.), H.P. State Electricity Board Ltd., Vidyut Bhawan, Shimla (HP) – 171004. Email: [cesysophsebl@gmail.com](mailto:cesysophsebl@gmail.com)
4. The General Manager (Projects), H.P. Power Transmission Corporation Ltd., Himfed Building, Panjari, Shimla-171005. Email: [gmpjects.tcl@hpmail.in](mailto:gmpjects.tcl@hpmail.in)
5. The Chief Engineer (Gen.), H.P. State Electricity Board Ltd., Sundernagar, Mandi (HP) – 175019. Email id: [cegenhpsebl@gmail.com](mailto:cegenhpsebl@gmail.com)

  
Chief Engineer,  
HP State Load Despatch Centre,  
Govt. of HP, Totu, Shimla-11(H.P.).

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**PROPOSED SHIMLA SOLAN ISLANDING SCHEME USING BHABA HEP AND OTHER  
IPPs INJECTION AT KOTLA**

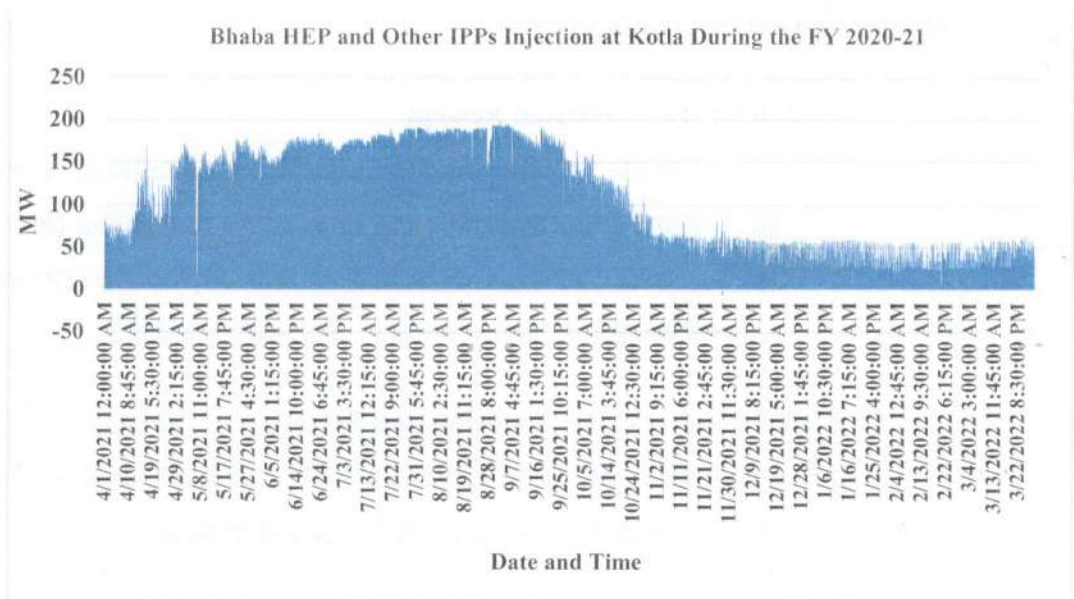
**A. GENERATION DETAILS: -**

- The Total Installed Capacity of Generators in Shimla Solan Islanding Scheme is 226.82 MW which consists of following Generators shown in Table A: -

**TABLE A**

Sr. No.	Name of the Generator	Installed Capacity (MW)
1.	Bhaba HEP	120.00
2.	Goodwill HEP	24.81
3.	Other IPPs Injection at Kotla	82.01 (Cumulative)
3.1	Ghanvi – I HEP	22.5
3.2	Ghanvi – II HEP	10
3.3	Nanti HEP	13.5
3.4	Surya Kanta HEP	14
3.5	Sumez HEP	14
3.6	Kurmi HEP	8.01
<b>Total</b>		<b>226.82</b>

- The Generation Profile of Shimla Solan Islanding Scheme for the FY 2020-21 and FY:2021-22 is shown below: -



**Figure 1: - The Generation Profile of Shimla Solan Island During the FY:2020-21**

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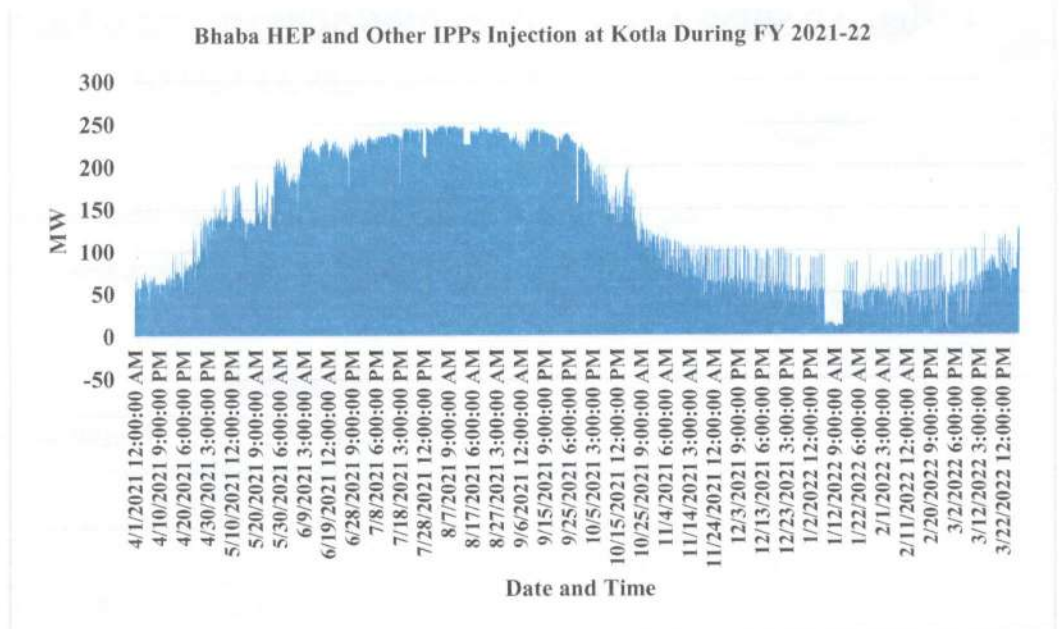


Figure-2: The Generation Profile of Shimla Solan Island for the FY: 2021-22

3. The Generation Scenario of the Shimla Solan Islanding Scheme during May – October (High Hydro Season) for the FY: 2020-21 and FY:2021-22 is as shown in Table B: -

**TABLE B**

FY	Generation Range (MW)	Average Generation (MW)
2020-21*	50-198	157
2021-22	50-248	198

\*Due to outage of 1 unit of Bhaba

## B. TRANSMISSION SYSTEM

### 1. 220 kV Transmission System

- i. 220 kV S/C Transmission Line Wangtoo to Bhaba (Proposed)
- ii. 220 kV S/C Transmission Line Bhaba to Kunihar (Proposed)
- iii. 220 kV S/C Transmission Line Jeori to Wangtoo (Proposed)
- iv. 220 kV S/C Transmission Line Jeori to Kunihar.

### 2. 220 kV & 132 kV Transmission System

- i. 160/200 MVA, 220/132 kV ICT-1 at Kunihar.
- ii. 160/200 MVA, 220/132 kV ICT-2 at Kunihar.

### 3. 132 kV Transmission System

- i. 132 kV D/C Transmission Line Kunihar to Solan.
- ii. 132 kV D/C Transmission Line Kunihar to Barotiwala

*[Handwritten signature]*

R.K.

- iii. 132 kV S/C Transmission Line Kunihar to Jutogh
- iv. 132 kV S/C Transmission Line Kunihar to Maliana
- v. 132 kV S/C Transmission Line Maliana to Jutogh

**4. 132 kV & 66 kV Transmission System**

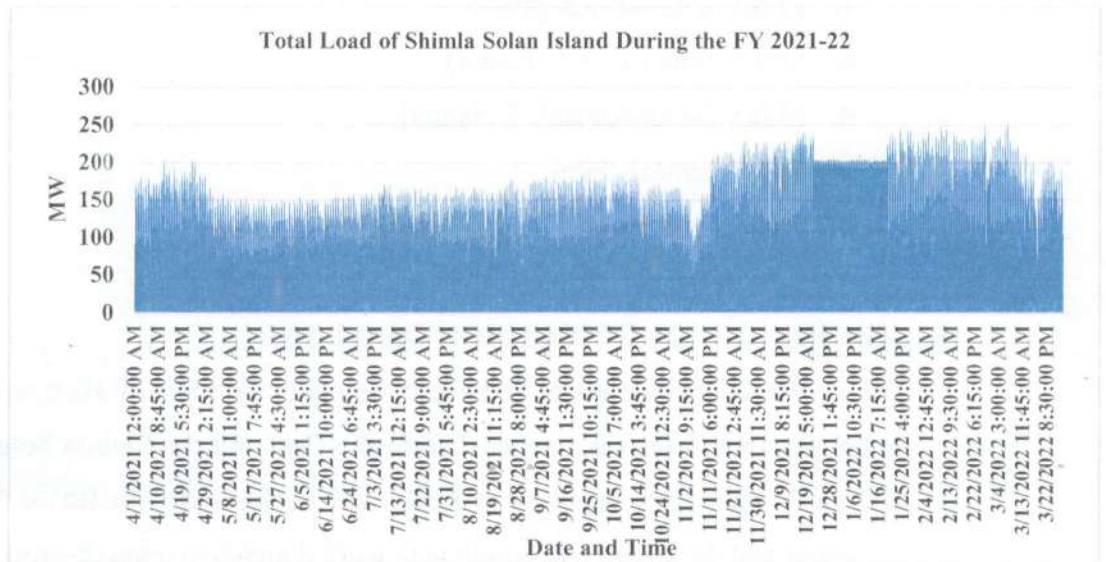
- i. 31.5 MVA, 132/66 kV ICT-1 at Jutogh
- ii. 31.5 MVA, 132/66 kV ICT-2 at Jutogh

**C. LOAD DETAILS**

1. The Load Areas identified in Shimla Solan Islanding Scheme are detailed as under: -

- i. Gumma
- ii. Mashorba
- iii. Jutogh
- iv. Maliana
- v. Kunihar
- vi. Solan
- vii. Barotiwala

2. The Load Profile of Shimla – Solan Islanding Scheme for the FY:2021-22 is shown below: -



**Figure-3: The Load Profile of Shimla Solan Island during the FY 2021-22**

4. The Load Scenario of the Shimla Solan Islanding Scheme during May – October (High Hydro Season) for the FY:2021-22 is as shown in Table C: -

*[Handwritten signature]*  
R.K.

**TABLE C**

Name of the Feeder	Load Range (MW)	Average Load (MW)
Kunihar	3-10	6
Solan	10-42	23
Barotiwala	36-98	51
Gumma	10-79	39
Mashobra		
Jutogh		
Maliana		
Losses~	15	15
<b>Total Load</b>	<b>74-244</b>	<b>134</b>

**D. FEEDERS TO BE DISCONNECTED FOR CREATION OF ISLAND**


1. 220kV Kotla-Wangtoo
2. 220kV Bhaba-Wangtoo
3. 220kV Kunihar- Baddi-1
4. 220kV Kunihar- Baddi-2
5. 132kV Kunihar-Darla
6. 132kV Kunihar-Kangoo-1
7. 132kV Kunihar-Kangoo-2
8. 132kV Solan-Giri-1 (Gaura)
9. 132kV Solan-Kalamb-2 (Jamta)
10. 66kV Gumma-Sainj
11. 66kV Kotla-Nogli

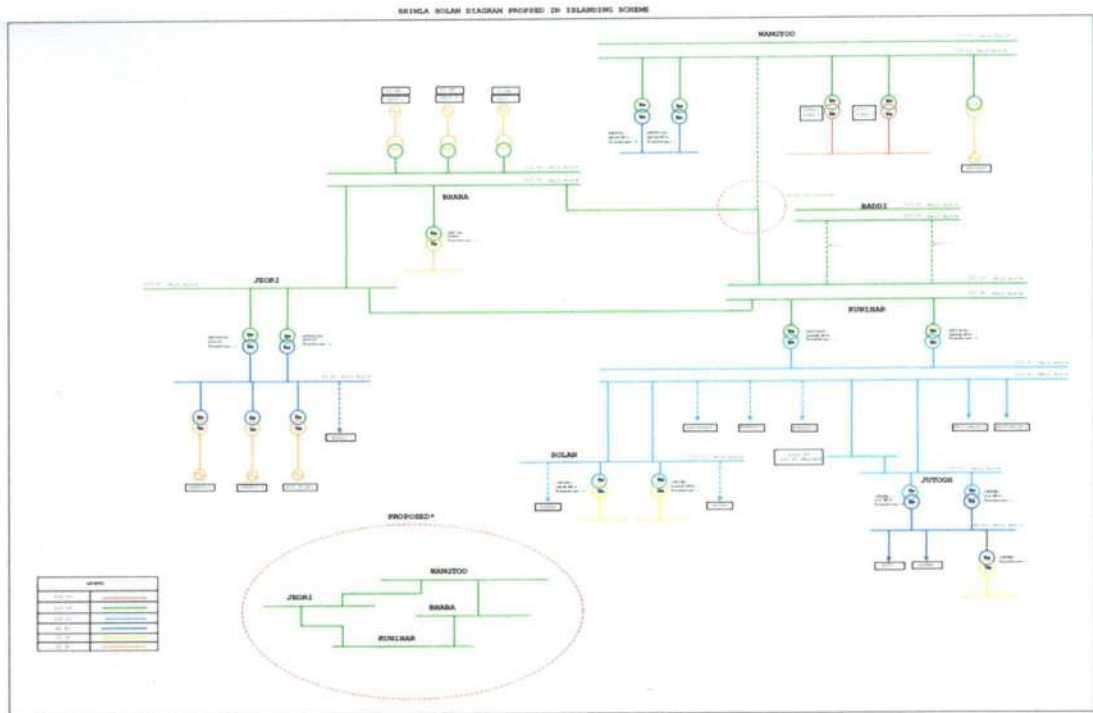
**E. MECHANISM OF FORMATION OF ISLAND**

During the severe Grid event, if the grid frequency falls to 47.9 Hz then the feeders mentioned in Sr. No. D will get disconnected from the Grid and the Shimla Solan Island using Bhaba HEP and other IPPs injection at Kotla will be formed with Bhaba HEP acting as a lead generator and the Island will continue to work depending upon the availability of water or the Grid restoration process initiated by NRLDC / NLDC at that time.

**F. SINGLE LINE DIAGRAM OF THE SHIMLA SOLAN ISLAND**

The Single Line Diagram of Shimla Solan Island is given below and attached as per 'Annexure - A'

Rtk. 



**Figure-4: Single Line Diagram of Shimla Solan Islanding Scheme**

## G. CONCLUSION

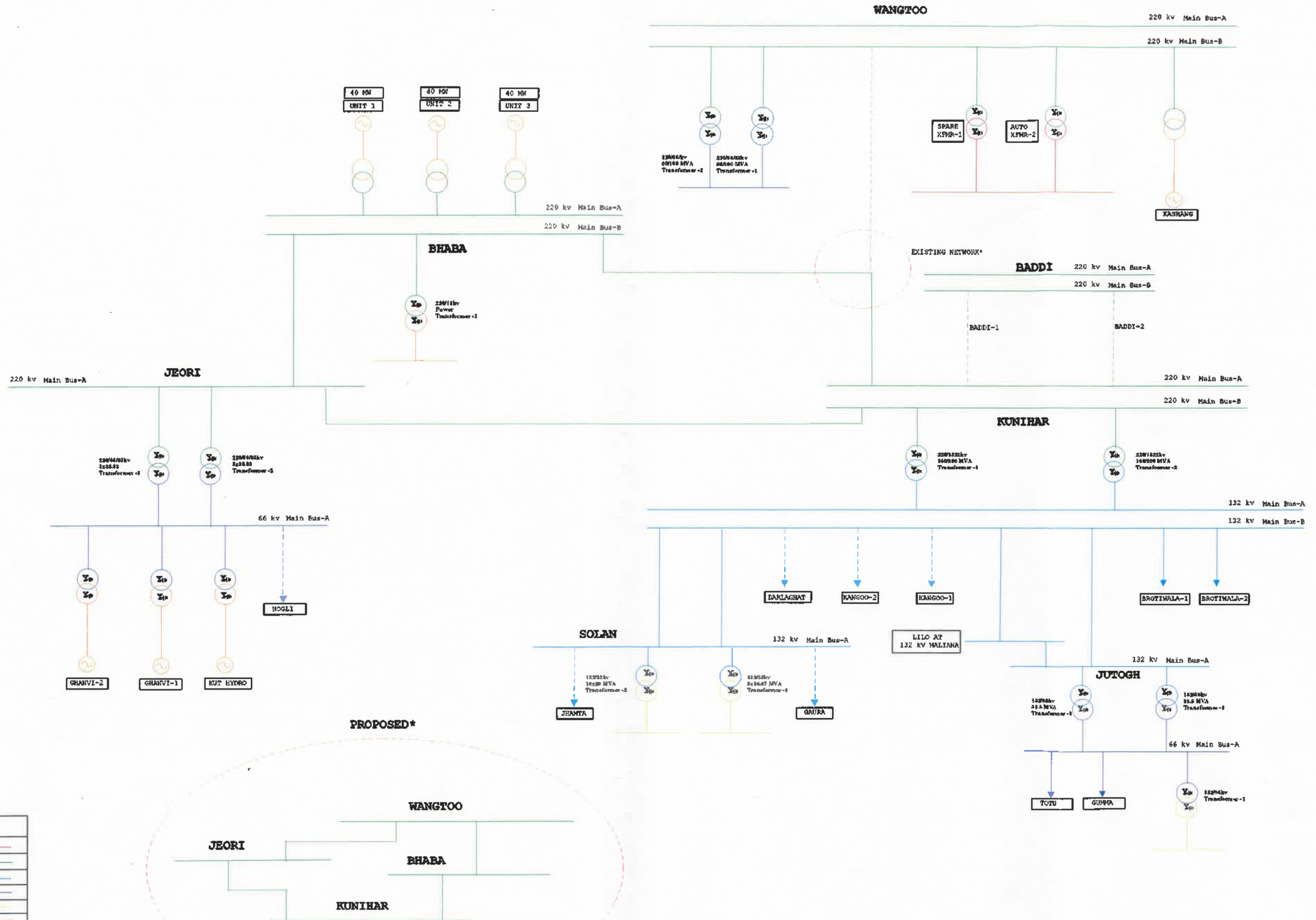
The above islanding scheme is valid only for May to October i.e. high hydro season for creation of island. Because in Himachal Pradesh all the hydro plants are Snow-fed Run-of-River Plants with or without Pondage. So, the Generation Scenario depends upon the availability of water and Temperature variation.

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R.K.

SHIMLA SOLAN DIAGRAM PROPSD IN ISLANDING SCHEME

'ANNEXURE-A'



LEGEND	
400 KV	—
220 KV	—
132 KV	—
66 KV	—
33 KV	—
11 KV	—

R.K. [Signature]

**PROPOSED KULLU MANDI & MANALI ISLANDING SCHEME USING MALANA HEP  
AND OTHER IPPs INJECTION AT MALANA HEP**

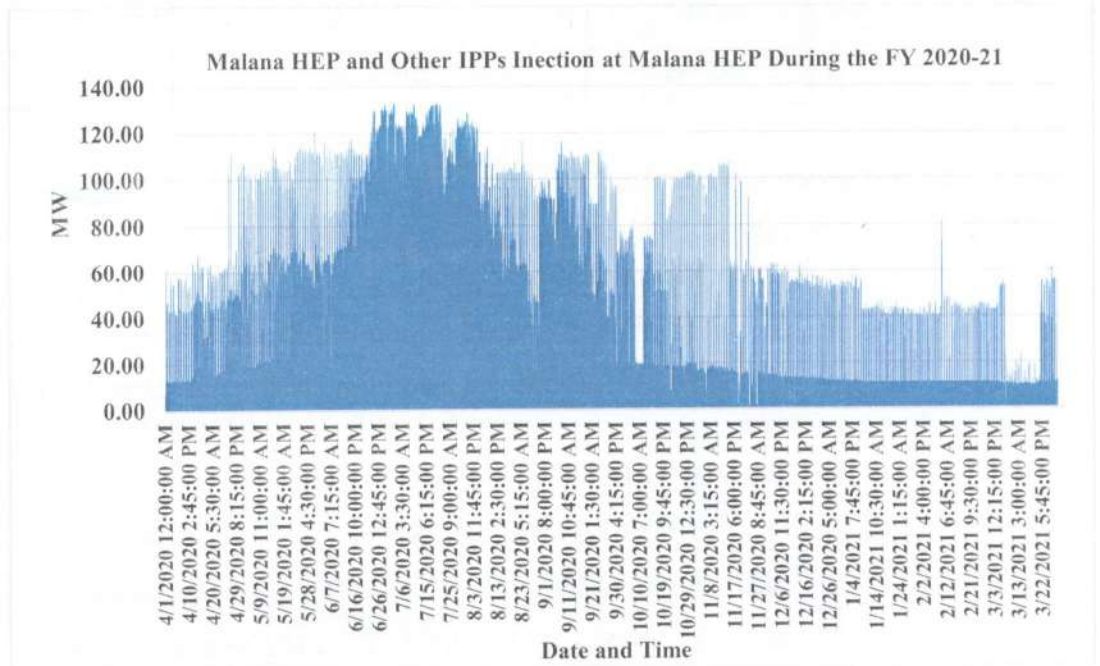
**A. GENERATION DETAILS: -**

- The Total Installed Capacity of Generators in Kullu Mandi & Manali Islanding Scheme is 111 MW which consists of following Generator shown in Table A: -

**TABLE A**

Sr. No.	Name of the Generator	Installed Capacity (MW)
1.	Malana I HEP	86
2.	Other IPPs Injection at Malana HEP	25 (Cumulative)
2.1	Toss HEP	10
2.2	Jirah HEP	4
2.3	Sandhya HEP	9
2.4	Chaski HEP	2
<b>Total</b>		<b>111</b>

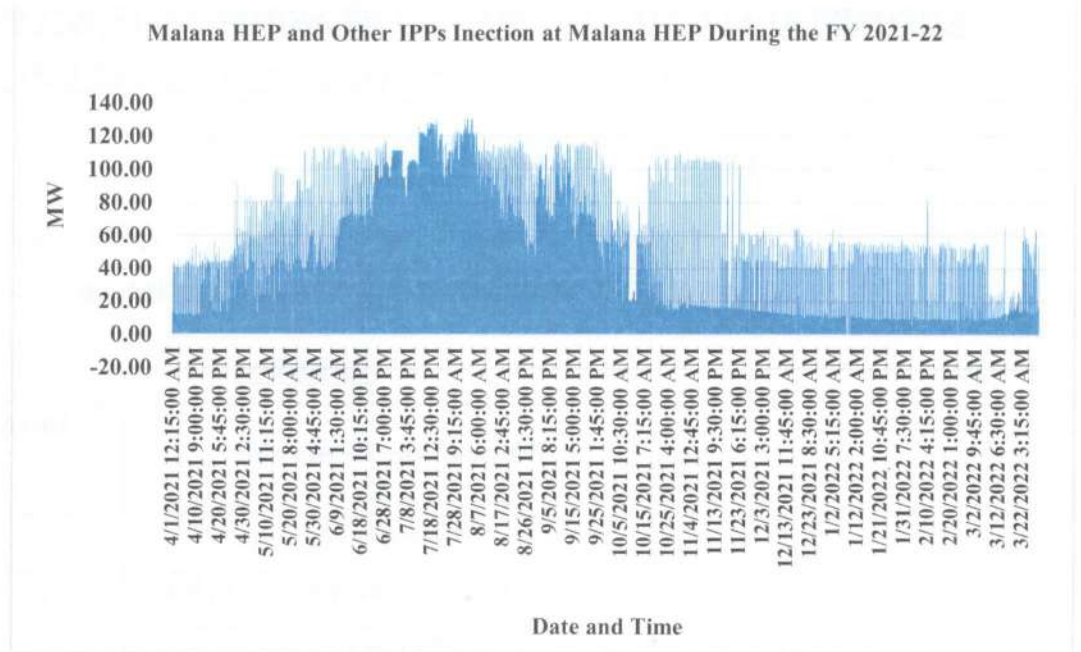
- The Generation Profile of Kullu Mandi & Manali Islanding Scheme for the FY 2020-21 and FY:2021-22 is shown below: -



**Figure 1: - The Generation Profile of Kullu Mandi and Manali Island During the FY:2020-21**

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R.K.



**Figure-2: The Generation Profile of Kullu Mandi and Manali Island for the FY: 2021-22**

3. The Generation Scenario of the Kullu Mandi and Manali Islanding Scheme during May – October (High Hydro Season) for the FY: 2020-21 and FY:2021-22 is as shown in Table B: -

**TABLE B**

FY	Generation Range (MW)	Average Generation (MW)
2020-21	30-132	78
2021-22	30-130	72

## B. TRANSMISSION SYSTEM

### 1. 132 kV Transmission System

- i. 132 kV S/C Transmission Line Bajura to Kangoo
- ii. 220 kV S/C Transmission Line Kangoo to Mandi (Bijni)

### 2. 132 kV & 33 kV Transmission System

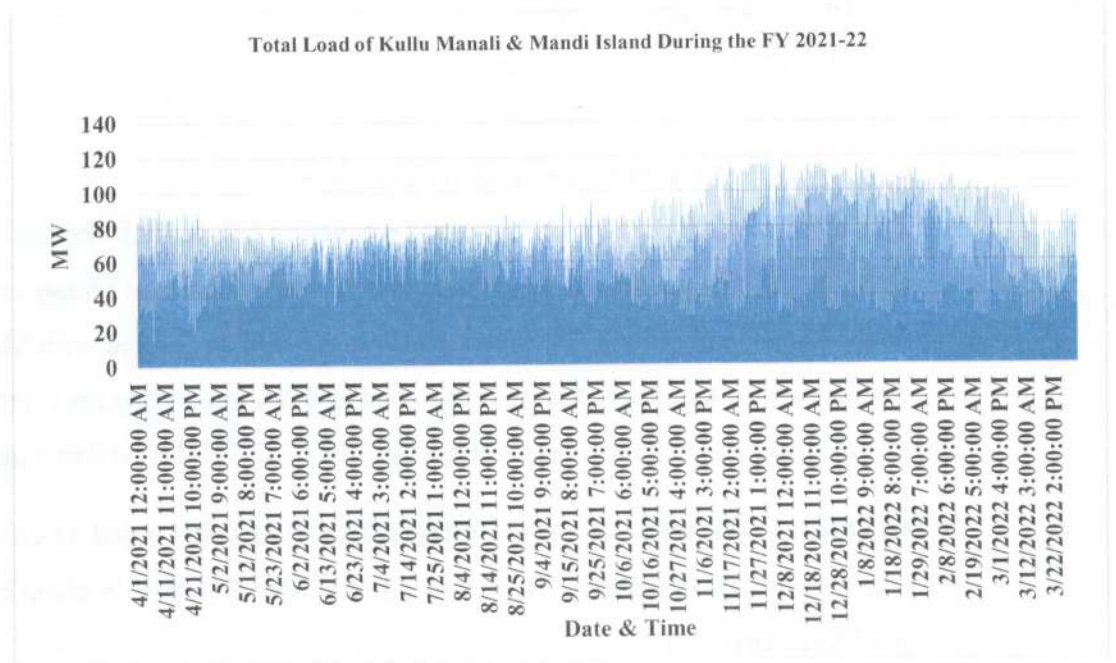
- i. 25/31.5 MVA, 132/33 kV ICT – 1 at Bajura
- ii. 25/31.5 MVA, 132/33 kV ICT – 2 at Bajura
- iii. 31.5 MVA, 132/33 kV ICT – 1 at Kangoo
- iv. 31.5 MVA, 132/33 kV ICT – 2 at Kangoo

*Handwritten signature and initials: R.K.*



### C. LOAD DETAILS

1. The Load Areas identified in Kullu Mandi and Manali Islanding Scheme are detailed as under: -
  - i. Kullu
  - ii. Mandi
  - iii. Manali
  - iv. Kangoo
2. The Load Profile of Kullu Mandi and Manali Islanding Scheme for the FY:2021-22 is shown below: -



**Figure-3: The Load Profile of Kullu Mandi and Manali Island during the FY 2021-22**

4. The Load Scenario of the Kullu Mandi and Manali Islanding Scheme during May – October (High Hydro Season) for the FY:2021-22 is as shown in Table C: -

**TABLE C**

Name of the Feeder	Load Range (MW)	Average Load (MW)
Mandi	10-45	21
Kangoo	16-50	33
Bajaura		
Losses~	6	6
<b>Total Load</b>	<b>32-101</b>	<b>60</b>

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R.K.

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#### D. FEEDERS TO BE DISCONNECTED FOR CREATION OF ISLAND

1. 220 kV Kangoo – Dehar - 1
2. 132 kV Kangoo – Dehar - 2
3. 220 kV Kangoo – Hamirpur – 1
4. 220 kV Kangoo – Hamirpur – 2 (Jahoo)
5. 132 kV Kunihar - Kangoo-1
6. 132 kV Kunihar - Kangoo-2
7. 132 kV Bajaura - Larji
8. 132 kV Kangoo – Larji – 1
9. 132 kV Kangoo – Larji – 2
10. 132 kV Larji – Pandoh
11. 132 kV Pandoh to Mandi

#### E. MECHANISM OF FORMATION OF ISLAND

During the severe Grid event, if the grid frequency falls to 47.9 Hz then the feeders mentioned in Sr. No. D will get disconnected from the Grid and the Kullu Mandi and Manali Island using Malana HEP and other IPPs injection at Malana will be formed with Malana HEP acting as a lead generator and the Island will continue to work depending upon the availability of water or the Grid restoration process initiated by NRLDC / NLDC at that time.

#### F. SINGLE LINE DIAGRAM OF THE KULLU MANDI AND MANALI ISLAND

The Single Line Diagram of Kullu Mandi and Manali Island is given below and attached as per 'Annexure – B'

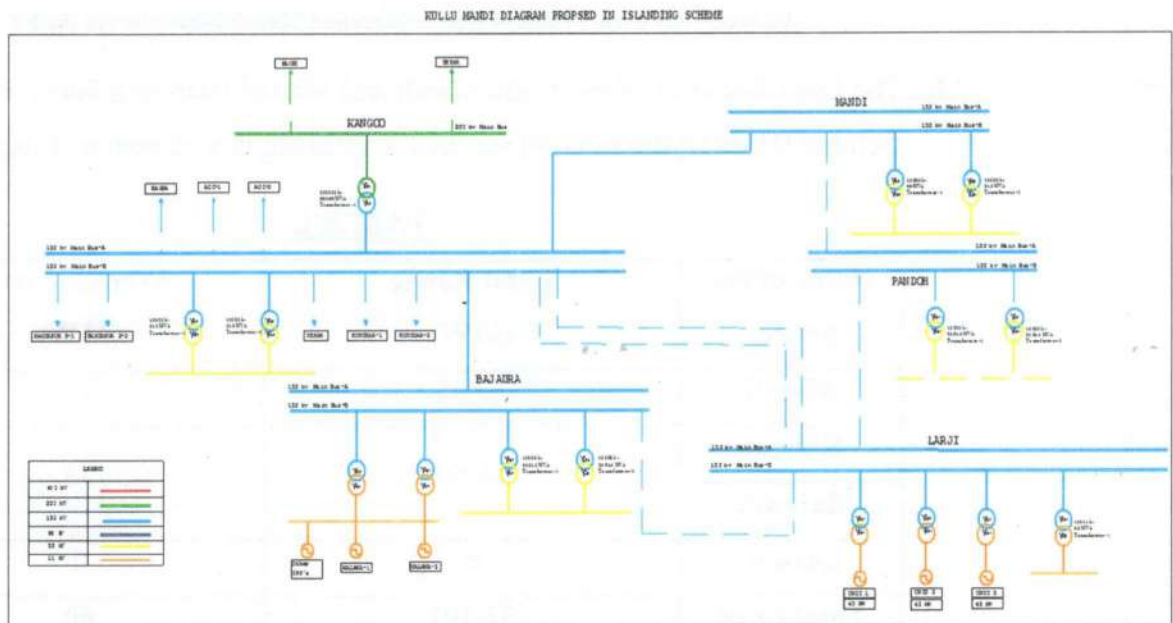


Figure-4: Single Line Diagram of Kullu Mandi and Manali Islanding Scheme

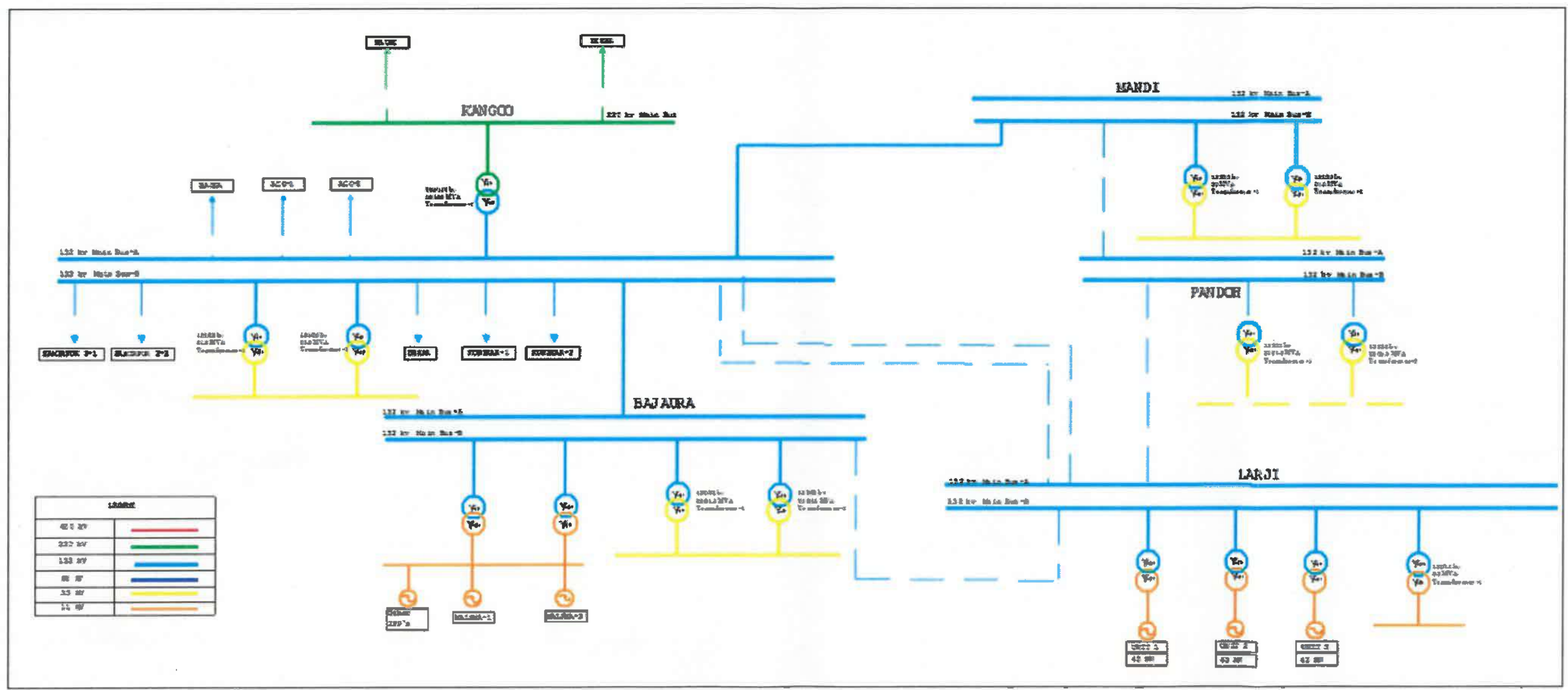
*[Handwritten signature]* R.K.

## **G. CONCLUSION**

The above islanding scheme is valid for the for May to October i.e. high hydro season for creation of island only. Because in Himachal Pradesh all the hydro plants are Snow-fed Run-of-River Plants with or without Pondage. So, the Generation Scenario depends upon the availability of water and Temperature variation.

RK 

KULLU MANDI DIAGRAM PROPOSED IN ISLANDING SCHEME



R.K.

## **CHAPTER-1.0**

1. Hon'ble Minister of State for Power and new & renewable energy chaired a meeting on 28-12-2020 to review islanding schemes in the country. During the meeting following action points, inter-alia, emerged:

i. Islanding schemes shall be designed for all major cities of the country. If there is a need to establish a power plant in /around such a city for the purpose, the proposal for the same may be submitted for consideration of the ministry. Possibility of installation of storage system at such location may also be explored.

ii. All the strategic and essential loads should be covered in the islanding scheme. For finalization of strategic loads, Ministry of Defence may also be consulted.

iii. Generating stations, which are spatially nearby the strategic and essential loads, shall be given priority in designing the islanding schemes.

iv. All concerned entities to ensure functionality of UFRs and df/dt relays at all point of time.

2. On 31.03.21, Secretary(Power), GOI chaired a meeting to review the actions taken on decisions of meeting dt. 28.12.2020. After detailed deliberations, following major decisions were taken in the meeting:

i. List of cities identified shall be divided in two categories. Category A shall contain list of those cities that are already having islanding schemes implemented for them, in one form or the other. Category B shall contain list of those cities where currently no islanding scheme is there.

ii. Clear action plan to be prepared by the end of April 2021 for category A cities and by the end of May- June 2021 for the category B cities. Action plan should, inter-alia, consist of generating station, transmission required for implementation islanding scheme, frequency setting, cyber security and other operational aspects.

3. In pursuance of the decisions taken in meeting dt.31-3-2021, NRPC secretariat requested all the SLDCs in NR , via e -mail dated 31-03-2021, to submit inputs regarding islanding schemes as per format attached as annexure-III.

4. Thereafter , special meeting was held on 1.04.2021 with all SLDCs of NR for review of islanding schemes. in the meeting it was discussed there are four implemented islanding schemes in NR via Delhi IS, NAPS is RAPS is and GHTPS is and the review of Unchahar IS needs review for complete implementation. further states were requested to propose new islanding schemes and submit data regarding category A and Category B cities at the earliest. However, GHTPS & GNDTP islanding schemes were dropped off due to shutdown of GNDTP station.

5. Next meeting was held on 07-04-21 with the officials of Punjab SLDC ,NPL-Rajpura , NRLDC for discussing islanding scheme for Rajpura and nearby critical loads , gist of discussions held in the meeting is as under.

i. Punjab shall identify the strategic and critical loads nearby to Rajpura power station : further if there is Generation surplus of Rajpura then inclusion of critical loads of Mohali shall also be considered and further inclusion of Chandigarh critical loads though 66KV may also be explored.

ii. An island consisting the loads of Jalandhar cantonment and Railway points of Jamsheer , Butari, Dasuya may be formed which are to be fed through BBMB.

iii. Pathankot cantonment may be fed from Ranjit Sagar Dam (RSD) and Rajpura island scheme may also be formed.

iv. Punjab SLDC should provide the requisite data and outline of the plan in the request of BBMB, RSD and NPL-Rajpura islanding schemes by 13.04.2021

6. Gist of Discussions held in meeting dt.07th April 2021 on likely islanding schemes for Punjab

1. A meeting was held on 07-04-2021 with officials of Punjab SLDC, NPL-Rajpura NRLDC and NRPC sectt. to discuss the likely islanding schemes for Rajpura and nearby critical loads and other possibilities in Punjab.
2. MS, NRPC stated that a review meeting on islanding scheme was held on 28-12-2020 under the chairmanship of Hon'ble MoS (P) (I/C). Further, as a follow up action of the aforesaid meeting, a review meeting was held on 31-03-2021 under the chairmanship of secretary (Power). in this meeting , it was decided that major cities having essential and strategic load which are required to be protected by islanding schemes should be identified immediately , and action plan on new and existing schemes shall be prepared. Subsequently , a meeting through video conferencing was taken by NRPC Sect. on 01.04.2021, wherein it was decided that the matter pertaining to Punjab needs to be discussed in separate meeting.
3. SE, NRPC while presenting the network diagram of NPL-Rajpura TSPL and nearby substations stated that Rajpura power station (2x700MW) connected to some nearby load centers such as Gobindgarh, Bahadurgarh, Mohali via Lalru, Patiala via Devigarh & Bahadugarh. He further presented the generation data of Rajpura station for the 2019-2020 wherein Rajpura station was found to be operational at 700-1400MW in the most of the time in the Year.
4. Representative of Punjab SLDC stated in the formation of island, industrial load of Gobindgarh, Lalru etc. may be considered which are fed through Rajpura station. he further stated that there is no direct 400 kV connectivity to Patiala & Mohali from Rajpura and study may be done to assess the feasibility of feeding long distance load in islanding scheme.

5. Representative of Punjab SLDC stated that earlier while discussing the islanding for Rajpura station, 75% generation was kept into consideration in the case of island formation and thus proportionate nearby load can be identified
6. Representative of NRLDC stated that in case of eventuality rather than 75% technical minimum of 55% as per extant regulations shall be considered.
7. Representative of NPL, Rajpura stated that presently in the situation of load through -off, 55% of MCR operation has not been designed.
8. Representative of NRLDC stated that NPL shall consider 55% and re-design the logics for the operation of the units at 55% of MCR in the case of sudden load through-off.
9. Representative of the NPL, Rajpura agreed for the same.
10. Representative of NRLDC stated that the first Punjab shall identify the strategic and critical loads nearby to Rajpura power station; further, if there is Generation surplus of Rajpura then inclusion of critical loads of Mohali shall be considered and further inclusion of Chandigarh critical loads though 66kV may also be explored.
11. Representative of Punjab stated that inclusion of Mohali and Chandigarh can only be established after stability study of the network.
12. MS, NRPC stated that Punjab have some defence establishments and some S/S are also feeding power to the railways. Punjab shall include these location in the islanding, if there is requirement of new transmission network then the same shall be communicated so that NRPC could take up the issue with CEA. He further stated that if there is Requirement of battery storage system then same shall also be intimated .



13. Representative of Punjab stated that an island consisting the loads of Jalandhar cantonment and railway points of Jansher, Butari, Dasuya may be formed which are to be fed through BBMB. He further stated that Pathankot cantonment may be fed from Ranjit Sagar Dam (RSD) and Rajpura island scheme may also be formed as per discussion in the meeting.
14. Member Secretary, NRPC stated that, in the meeting it has emerged that there is an urgent requirement of feeder wise load data and Generation data along with details of identified critical load; therefore Punjab SLDC should provide the requisite data and outline of the plan in the respect of BBMB, RSD and NPL, Rajpura islanding schemes by 13-04-2021. thereafter, a joints meeting with meeting with BBMB officials would be called on 16.04.2021 along with officials of Punjab and Haryana SLDCs for working out on BBMB based islands.

Based on the inputs provided by NRPC and deliberations amongst study group including representatives from two major thermal generating stations (NPL Rajpura & TSPL Talwandi Sabo), PSTCL has propped the three islanding scheme for Punjab control area i.e. NPL, TSPL & RSD. The proposal shall be submitted to the NRPC for approval before taking its implementation.

## **CHAPTER 2.0**

### **OVERVIEW OF PUNJAB POWER SYSTEM**

The Transmission functions in Punjab Power System are performed by Punjab State Transmission Corporation Ltd. (PSTCL) whereas Generation & Distribution functions are performed by Punjab State Power Corporation Ltd. (PSPCL). Punjab Power System is operative with a number of generating stations both Thermal and Hydel in the state sector owned by PSPCL & IPPs. (Total Installed Capacity within state = 8114 MW approximately). Beside this Punjab also draws its share from BBMB Hydro-Generating stations through BBMB Transmission network in Punjab. The Punjab network has also interface with 400 KV PGCIL network at Malerkotla, Moga, Patiala, Ludhiana, Jalandhar and Amritsar to draw Central sector share.

The transmission network of Punjab consists of 132 KV, 220 KV & 400 kV network spread all over the state. A major 400 kV network in Punjab is mainly for the evacuation of power from Thermal Power Stations in Private sector (IPPs) at Talwandi Sabo (TSPL) and Rajpura (NPL).

The Punjab has transformation capacity of 38167 MVA approx. as on 31-03-2021 and there is a plan to add further transformation capacity. The present transformation capacity of ICTs located in Power grid Grid Sub-stations in Punjab is also being augmented under Inter-state system strengthening scheme undertaken by Power grid. Corresponding to these transformation capacity additions, new transmission links are being added/planned by PSTCL at respective Grid sub stations.

## **CHAPTER 3.0**

### **GENERAL PHILOSOPHY ON FORMATION OF ISLANDS**

During Grid disturbance ,the control area shall endeavor to sustain through the under frequency relays (UFRs) and df/dt relays based load shedding scheme , already installed in the system, as a first line of defense. Only in case, this defense mechanism fails and frequency continues its fall to dangerously low levels, formation of islands shall be initiated as a last resort.

For success of islanding scheme, the load - generation balance in the islands shall be maintained. To achieve this, at least one of the generators within the island, shall operate with governor in frequency control mode.

Islanding scheme shall primarily be a three tier scheme. At frequency of 47.9 Hz, signal/command for formation of islands comprising of more than one generating station along with pre-identified load shall be initiated. However, if after the formation of island, frequency continues to fall further to say 47.7 Hz, these islands could be further broken into smaller islands or load shedding shall be initiated within the island.

Load generation balance in pre-identified island may change based on variation in seasonal demand, load growth and network changes, if any. Islanding scheme shall therefore require intermittent review and re-adjustments of loads to be cut-in/cut-off to match load - generation balance.

Efforts shall be made to cover major essential loads such as hospitals, Industries, Airport, Railways etc. in the proposed island. However, if it is not possible due to some reasons, efforts should be made to extend supply from these islands to identified essential loads on priority basis.

## **CHAPTER-4.0**

### **ISLANDING SCHEME FOR PUNJAB CONTROL AREA:**

#### **Objective:**

Formation of proposed island shall achieve the following objectives:-

- i) Prevention from total black out by avoiding effect of cascade tripping of the Power System.
- ii) Fast restoration of supply to the affected areas.
- iii) Supply to Important Loads/essential services i.e. Railways, Hospitals etc. shall be maintained or can be restored on priority

#### **Present Status:**

Presently there is no islanding scheme in operation in Punjab. However, UFRs, df/dt relays have been installed on selected feeders to get desired load relief under critical grid conditions to help grid security.

#### **Proposed Islands:**

As identified by the Islanding Scheme Group at NRPC in its meeting held on 15.06.2021 and further deliberations held by the study group in PSTCL including representatives from NPL Rajpura & TSPL

Talwandi Sabo, RSD the following islands have been identified to ensure better grid security by dividing the whole Punjab system Network into three islands :-

- i) NPL Rajpura with Gobindgarh area Industrial load, Mohali International Airport Load, Railways Load from Dera Bassi & Rajpura, PGI Chandigarh, Mohali & Chandigarh Capital area Load & Patiala Area Load.
- ii) RSD (Ranjit Sagar Dam) with Pathankot Air Base Station, Railway Load from Sarna & MES load from Mamoom.
- iii) TSPL Talwandi Sabo with Bathinda area Load(MES Army Cantt.), Bhisiana (Airport & Air Force Base) Load, AIMS from IGC Bathinda, Railways Load & HMEL Refinery Load.

However, there is some upgradation in the downstream network of TSPL Island. So, in first stage NPL Rajpura & RSD islanding scheme will be implemented.

#### **Methodology of Proposed Islanding Scheme:**

Broad methodology adopted for the proposed Islanding scheme is as under:-

- i) The scheme is primarily based on frequency measurement. This measurement will be done through digital frequency sensing relays (UFRs) to be installed at substations falling within island where

switching action is required.

ii) The proposed islanding scheme operations consists of three stages as under:-

- a) Stage I: When frequency dips to level of 47.9 Hz
- b) Stage II: When frequency further dips to level of 47.7 Hz
- c) Stage III: When frequency stays at 47.7 Hz\*

\* additional load shedding at an interval of 300 milli-seconds

iii) Disconnection of feeders will be triggered through UFRs proposed to be installed at Sub stations. Two independent relays, for sensing the frequency from each bus of sub station shall be provided at each of the sub station falling under the islanding zone, classified as under:

Relay on Bus-1 = M1, S1, R1 & P1

Relay on Bus-2 = M2, S2, R1 & P1

iv) Each 400 kV feeder will have dedicated set of relays (M1 and M2), & Each 220 kV feeder will have dedicated set of relays (S1 and S2) whereas in case of 132 kV & 66 kV feeders, one set of relay (R1 and R2) will control each 132 kV feeders & one set of relay(P1& P2) will control each 66 kV feeders .

(R1 & R2) & (P1 & P2) shall also control high frequency swings in the island by operating at 50.5 Hz & 51.0 Hz for auto reclosing the pre-identified feeders.

**The setting of relays shall be as under:-**

M1&S1	M2 & S2	47.9 Hz
R1 & P1	R2 & P2	47.7 Hz
R1	R2	50.5 Hz (for Auto reclosing of 132 kV Feeders)
P1	P2	51.0 Hz (for Auto reclosing of 66 kV Feeders)

- v) Initially main three islands of Punjab Network will be created during stage I of Islanding scheme (i.e. when frequency dips to level of 47.9 Hz ). The large island will further be divided into smaller island(s) during stage II of Islanding scheme (i.e. when frequency dips to level of 47.7 Hz ).
- vi) One generating station in each island will be operated in frequency control mode to control fluctuations in the frequency in that particular island.

## **MECHANISM FOR FORMATION AND MAINTAINING ISLANDS**

- i) As system frequency is sensed at 47.9 Hz, relays (M1 and M2, S1 & S2) will operate and trip the identified 400 kV & 220 kV feeders, thus forming a stage-I island.
- ii) The frequency of the island so formed shall be further maintained through both generator and load end. On generator end, one of the units shall be operated in frequency mode and on load side when the frequency drops to the level of 47.7 Hz (Stage-II), relays ( R1 & R2, P1 & P2) will operate to switch off the pre- identified 132kV & 66 kV feeders as per the detail provided in the schematic diagram. If the frequency of the system stays at 47.7 Hz (Stage III), relays (R1,R2 & P1, P2) installed at will operate to switch off the pre-identified 132/66 kV & 66/11 kV P . T / F feeders.

To take care of the power swings due to sudden load throw off during formation of island, relays (R1 and R2) & (P1 &P2) will operate at 50.50 Hz/ 51.00 Hz to auto reclose the pre-identified 132/66 kV & 66/11 kV P.T/Fs as per detail provided in the schematic diagrams.



## **CHAPTER-5.0**

### **DESCRIPTION OF PROPOSED ISLANDS:**

Detailed description of each island indicating load - generation balance and transmission elements to be opened to create these islands is discussed under:-

### **NPL RAJPURA ISLANDING SCHEME**

There are two Units (2x700 MW) at NPL Rajpura.

Auxillary Load of NPL Rajpura is 5% of 1400 MW i.e. 70 MW. Therefore, Total ex-bus generation equals to 1330 MW and corresponding average load considered for island is 1171 MW which is approximately 90% of generation considered in island i.e. 1330 MW.

Since the substations under NPL Rajpura Islanding Scheme feeds Industrial Loads so there is only 10-15% variation of Load during Paddy & Non-Paddy Season. So keeping in view of Average Loading of S/S , the details of load to be fed to achieve Load-Generation balance is as under:-

<b>Name of S/S</b>	<b>Average Load (MW)</b>	<b>Relief from UFR/df/dt (in MW)</b>	<b>Net Demand to be met</b>
220 kV S/S Rajpura	202 MW	63 MW	139 MW
220 kV S/S Ablowal	120 MW	16 MW	104 MW

220 kV S/S Banur	106 MW	34 MW	72 MW
220 kV S/S Dera Bassi	147 MW	65 MW	82 MW
220 kV S/S G-1	202 MW	126 MW	76 MW
220 kV S/S G-2	100 MW	0	100 MW
220 kV S/S Lalru	94 MW	0	94 MW
220 kV S/S Mohali I	218 MW	0	218 MW
220 kV S/S Mohali II	102 MW	0	102 MW
220 kV S/S Amloh	214 MW	30 MW	184 MW
<b>Total</b>			<b>1171 MW</b>

Detail of outgoing feeders/bays to be opened (in order to maintain the above anticipated islanding load of (1197 MW) during Stage-I (at 47.9 Hz) Island operations is as under:-

1. 400 kV NPL-Nakodar Ckt.I( will be opened at NPL Rajpura end)
2. 400 kV NPL-Nakodar Ckt.II( will be opened at NPL Rajpura end)
3. 400 kV Rajpura-Dhuri Ckt.I (will be opened at 400 kV Rajpura end)
4. 400 kV Rajpura-Dhuri ckt.II (will be opened at 400 kV Rajpura end)
5. 400 kV Rajpura-Dehar ckt.(will be opened at 400 kV Rajpura end)

6. 400 kV Rajpura-Bhiwani ckt.(will be opened at 400 kV Rajpura end)
7. 220 kV Ablowal-Faggan Majra ckt.I( will be opened at 220 kV Ablowal end)
8. 220 kV Ablowal-Faggan Majra ckt.II( will be opened at 220 kV Ablowal end)
9. 220 kV Ablowal-Rajla ckt.( will be opened at 220 kV Ablowal end)
10. 220 kV Ablowal-Passiana ckt.( will be opened at 220 kV Ablowal end)
11. 220 kV G1-RTP ckt.I(will be opened at 220 kV G-1 end)
12. 220 kV G1-RTP ckt.II(will be opened at 220 kV G-1 end)
13. 220 kV G1-RTP ckt.III(will be opened at 220 kV G-1 end)
14. 220 kV G1-Bassi Pathana ckt.(will be opened at 220 kV G-1 end)
15. 220 kV Amloh-Malerkotla ckt.(will be opened at 220 kV Amloh end)
16. 220 kV G1-Ikolaha ckt.(will be opened at 220 kV G-1 end)
17. 220 kV G1-G-3 ckt.(will be opened at 220 kV G-1 end)
18. 220 kV G-2-Bhari ckt.(will be opened at 220 kV G-2 end)
19. 220 kV G-2-Ganguwal ckt.(will be opened at 220 kV G-2 end)
20. 220 kV G-2-G-3 ckt.(will be opened at 220 kV G-2 end)
21. 220 kV Mohali 1-Nalagarh ckt. I. (will be opened at 220 kV Mohali 1 end)
22. 220 kV Mohali 1-Nalagarh ckt. II. (will be opened at 220 kV Mohali 1 end)
23. 220 kV Mohali 1-Kharar ckt. (will be opened at 220 kV Mohali 1 end)
24. 220 kV Mohali 1-Ganguwal ckt. (will be opened at 220 kV Mohali 1 end)
25. 220 kV Mohali 1-Majra ckt.(will be opened at 220 kV Mohali 1 end)
26. 220 kV Mohali 1-RTP ckt.(will be opened at 220 kV Mohali 1 end)
27. 220 kV Rajpura-Devigarh ckt.I(will be opened at 220 kV Rajpura end)
28. 220 kV Rajpura-Devigarh ckt.II(will be opened at 220 kV Rajpura end)

Detail of outgoing feeders/bays to be opened during Stage-II (at 47.7 Hz) Island operations is as under:-

I) At 220 kV Rajpura, relays(P1& P2) will operate to switch off of following 66 kV Feeders:-

i) 66 kV Nausherra

ii) 66 kV Dharamgarh

II) At 220 kV Banur, relay (P1) will operate to switch off of following 66 kV Feeders:-

i) 66 kV Rajpura

ii) 66 kV Chandiala

iii) 66 kV Mubarakpur

iv) 66kV Mohikalan

v) 66 kV Lalru

III) At 220 kV Dera Bassi, relays(P1& P2) will operate to switch off of following 66 kV Feeders:-

i) 66 kV Nahar

ii) 66 kV Winsor

IV) At 220 kV Gobindgarh G-1, relays(P1& P2) will operate to switch off of following 66 kV Feeders:-

i) 66 kV Chaur Wala I

ii) 66 kV Chaur Wala II

iii) 66 kV Talwara I

iv) 66 kV Talwara II

V) At 220 kV Lalru, relays(P1 & P2) will operate to switch off of following 66 kV Feeders:-

i) 66 kV Alamgir I

ii) 66 kV Alamgir II

iii) 66 kV Handesra I

iv) 66 kV Handesra II

VI) At 220 kV G-2, relay (P1) will operate to switch off of following 66 kV Feeders:-

i) 66 kV Badeenpur I

ii) 66 kV Badeenpur II

VII) At 220 kV Ablowal, relays(P1& P2) will operate to switch off of following 66 kV Feeders:-

i) 66 kV Baran

ii) 66kV Rakhra I

iii) 66 kV Rakhra II

iv) 66 kV Passiana

v) 66 kV Patiala I

vi) 66 kV Patiala II

vii) 66 kV Shakti Vihar

VIII) At 220 kV Amluh, relay (P1) will operate to switch off of following 66 kV Feeders:-

- i) 66 kV Raiwal
- ii) 66 kV Tanda/Badha

Detail of outgoing feeders/bays to be opened after delay of 300msec during Stage-III( if frequency continues to be at 47.7 Hz)Island operations is as under:-

I) At 220 kV Rajpura, relays(P1& P2) will operate to switch off of following 66 kV Feeders:-

- i) 12.5 MVA T/F T-2
- ii) 20 MVA T/F T-4

II) At 220 kV Banur, relay (P1) will operate to switch off of following 66 kV Feeders:-

- i) 20 MVA T/F T-1
- ii) 20 MVA T/F T-2

III) At 220 kV Dera Bassi, relays(P1& P2) will operate to switch off of following 66 kV Feeders:-

- i) 20 MVA T/F T-2
- ii) 20 MVA T/F T-4
- iii) 20 MVA T/F T-5

IV) At 220 kV Gobindgarh G-1, relays(P1& P2) will operate to switch off of following 66 kV

Feeders:-

i) 20 MVA T/F T-1

ii) 20 MVA T/F T-4

iii) 20 MVA T/F T-7

V) At 220 kV Lalru, relays(P1 & P2) will operate to switch off of following 66 kV Feeders:-

i) ) 20 MVA T/F T-3

ii) 20 MVA T/F T-4

iii) 20 MVA T/F T-5

VI) At 220 kV G-2, relay (P1) will operate to switch off of following 66 kV Feeders:-

i) 20 MVA T/F T-2

ii) 20 MVA T/F T-4

iii) 20 MVA T/F T-6

iv) 12.5 MVA T/F T-7

VII) At 220 kV Ablowal, relays(P1& P2) will operate to switch off of following 66 kV Feeders:-

i) 20 MVA T/F T-3

ii) 20 MVA T/F T-4

VIII) At 220 kV Mohali I, relays (P1 &P2) will operate to switch off of following 66 kV Feeders:-

i) 12.5 MVA T/F T-4

ii) 12.5 MVA T/F T-5

IX) At 220 kV Mohali II, relays (P1) will operate to switch off of following 66 kV Feeders:-

i) 20 MVA T/F T-2

ii) 20 MVA T/F T-4

X) At 220 kV Amluh, relays (P1) will operate to switch off of following 66 kV Feeders:-

i) 20 MVA T/F T-1

ii) 20 MVA T/F T-2

iii) 20 MVA T/F T-5

Details of sub stations wise load /feeders to be covered for load generation balance in the island & Feeders to be opened and re-closed at various sub-stations is Shown in SLDs of Sub-Stations under NPL Islanding Scheme:

1. NPL Rajpura :- The SLD of NPL Rajpura is attached at Annexure 1.
2. 400 kV S/S Rajpura:- The SLD of 400 kV S/S Rajpura is attached at Annexure 1(a).
3. 220 kV Rajpura:- The SLD of 220 kV S/S Rajpura is attached at Annexure 1(b).
- 4.220 kV Ablowal:- The SLD of 220 kV S/S Ablowal is attached at Annexure 1(c).



5. 220 kV S/S Banur:- The SLD of 220 kV Banur is attached at Annexure 1(d).
6. 220 kV Dera Bassi:- The SLD of 220 kV Dera Bassi is attached at Annexure 1(e).
7. 220 kV S/S G-1:- The SLD of 220 kV G-1 is attached at Annexure 1(f).
8. 220 kV S/S Lalru:- The SLD of 220 kV Lalru is attached at Annexure 1(g).
9. 220 kV S/S Mohali I:- The SLD of 220 kV Mohali I is attached at Annexure 1(h).
10. 220 kV S/S Mohali II:- The SLD of 220 kV Mohali II is attached at Annexure 1(i).
11. 220 kV S/S G-2:- The SLD of 220 kV G-2 is attached at Annexure 1(j).
12. 220 kV S/S Amloh:- The SLD of 220 kV Amloh is attached at Annexure 1(k).

## **RSD RANJIT SAGAR DAM ISLANDING SCHEME**

There are four Units (4x150 MW) at RSD Ranjit Sagar Dam.

Considering availability of 1 units and corresponding averageload for island scheme @ 90% of 150 MW comes to 135 MW.

### **DETAIL OF SUBSTATION WISE LOADS FALLING IN THE RSD RANJIT SAGAR DAM ISLAND**

<b>Name of S/S</b>	<b>Average Load (MW)</b>
220 kV S/S Sarna	28 MW
220 kV Dasuya	21 MW
132 kV S/S Pathankot	46 MW
132 kV S/S Mamoom	9 MW
132 kV Gurdaspur	37 MW
Total (RSD Ranjit Sagar Dam)	141 MW

Detail of outgoing feeders/bays to be opened (in order to maintain the above anticipated islanding load of 135 MW) during Stage-I(47.9 Hz) Island operations is as under:-

1. 220 kV RSD-Jammu ckt. I (will be opened at RSD end)

2. 220 kV RSD-Jammu ckt.II (will be opened at RSD end)
3. 220 kV RSD-Jasur ckt.(will be opened at RSD end).
4. 220 kV Sarna-Wadala Granthian ckt. I( will be opened at Sarna end)
5. 220 kV Sarna-Wadala Granthian ckt. II will be opened at Sarna end)
6. 220 kV Sarna-Wadala Granthian ckt. III( will be opened at Sarna end)
7. 220 kV Sarna-Tibber ckt.( will be opened at Sarna end)
8. 220 kV Sarna-Dasuya ckt. I( will be opened at Sarna end)
9. 220 kV Sarna-Dasuya ckt. II( will be opened at Sarna end)
10. 220 kV Sarna-Kishanpur ckt. I( will be opened at Sarna end)
11. 220 kV Sarna- Kishanpur ckt. II( will be opened at Sarna end)
12. 220 kV Sarna-Udhampur ckt. ( will be opened at Sarna end)
13. 220 kV Sarna-HiraNagar ckt. ( will be opened at Sarna end)
14. 100 MVA, 220/66 kV P.T/F T-1 & T-2 at Sarna
15. 132 kV Gurdaspur-Dhariwal ckt.I(will be opened at Gurdaspur end)
16. 132 kV Gurdaspur-Dhariwal ckt.II(will be opened at Gurdaspur end)
17. 132 kV Mamoom-Kangra ckt.(will be opened at Mamoom end)
18. 132 kV Kangra-Pathnakot ckt.I(will be opened at Pathankot end)
19. 132 kV Kangra-Pathnakot ckt.II(will be opened at Pathankot end)
20. 220 kV Dasuya-Kartarpur ckt. I(will be opened at Dasuya end)
21. 220 kV Dasuya-Kartarpur ckt. II(will be opened at Dasuya end)
22. 220 kV Dasuya-Pong ckt. III(will be opened at Dasuya end)
23. 220 kV Dasuya-Kartarpur ckt. I(will be opened at Dasuya end)
24. 220 kV Dasuya-Jalandhar ckt. I(will be opened at Dasuya end)
25. 220 kV Dasuya-Alawalpur ckt. I(will be opened at Dasuya end)
26. 100 MVA, 220/66 kV P.T/F T-1 at 220 kV S/S Dasuya
27. 100 MVA, 220/66 kV P.T/F T-2 at 220 kV S/S Dasuya

Detail of outgoing feeders/bays to be opened during Stage-II (at 47.7 Hz) Island operations is as under:-

I) At 132 kV Pathankot, relays(R1) will operate to switch off of following 132 kV Feeders:-

- i) 25 MVA, 132/66 kV P.T/F T-3
- ii) 16 MVA, 132/33 kV P.T/F T-4

II) At 132 kV Gurdaspur, relays(R1) will operate to switch off of following 132 kV Feeders:-

- i) 50 MVA, 132/66 kV P.T/F T-2.
- ii) 50 MVA, 132/66 kV P.T/F T-3.

Details of sub stations wise load /feeders to be covered for load generation balance in the island & Feeders to be opened and re-closed at various sub-stations is Shown in SLDs of Sub-Stations under RSD Islanding Schemes:

1. RSD :- The SLD of RSD is attached at Annexure 2.
2. 220 kV S/S Sarna:- The SLD of 220 kV S/S Sarna is attached at Annexure 2(a).
3. 132 kV S/S Pathankot:-The SLD of 132 kV S/S Pathankot is attached at Annexure 2(b).
4. 132 kV Mamoom:- The SLD of 132 kV S/S Mamoom is attached at Annexure 2(c).
5. 220 kV S/S Dasuya:- The SLD of 220 kV S/S Dasuya is attached at Annexure 2(d).
6. 132 kV S/S Gurdaspur:- The SLD of 132 kV S/S Gurdaspur is attached at Annexure 2(e).



## **CHAPTER-6**

### **6.0 MAJOR CHALLENGES AND WAY FORWARD**

The islanding scheme has been framed considering the current power scenario in paddy season. The system is heavily loaded and most vulnerable to instability and grid disturbance during this period of the year, as experienced in the past. To make the islanding scheme suitable for all possible power scenario throughout the year and changes in the network, this shall require a regular review and re-adjustments.

Maintaining the island will require continuous actions to regain and thereafter maintain load generation balance in the respective islands. Since frequency excursion in islands are expected to fast paced, these actions will permanently be ensure automatically through time delay feature.

Training and Mock Drills at SLDC and Generating Stations to familiarize for handling real time situation during grid disturbance.

Introducing time delay of 5 seconds in the frequency tripping of generating units included in the islands shall enhance success rate of islands.

During the islanded operation of system, Punjab SLDC at Ablowal, Patiala will be the nodal agency who will have the overall responsibility of co-ordination & operation of the islanded systems with various agencies like generating/ distribution licensees (IPPs), BBMB and POWERGRID etc. Punjab SLDC will follow instructions issued by NRLDC.



सत्यमेव जयते

# केन्द्रीय विद्युत विनियामक आयोग

## CENTRAL ELECTRICITY REGULATORY COMMISSION



*Harpreet Singh Pruthi*  
Secretary

Secy/2022-RTDA/CERC-

Dated the 16<sup>th</sup> November 2022

**Sub: - Issuance of Regional Transmission Deviation Accounts by the respective RPCs under CERC (Sharing of Inter-State Transmission Charges and Losses) Regulations, 2020**

Dear Sir,

Central Electricity Regulatory Commission (Sharing of Inter-State Transmission Charges and Losses) Regulations, 2020 requires RPC Secretariat to issue Regional Transmission Deviation Accounts (RTDA) within specified timeline under Regulation 14 quoted as follows:

*“14(3) Regional Transmission Accounts and Regional Transmission Deviation Accounts shall be issued by the Secretariat of respective Regional Power Committee to DICs, the Central Transmission Utility and inter-State transmission licensees and also be displayed on the website of respective Regional Power Committees.*

*14(5)(c) Secretariat of the respective Regional Power Committee shall issue Regional Transmission Accounts and Regional Transmission Deviation Accounts by the end of the month following the billing period.”*

It is noticed from RPC website and a few RPCs are not issuing RTDA regularly and the following has been observed:

- RTDA for the month of April, 2018 and onwards are not available on the NRPC website
- RTDA for the month of June, 2022 and onwards are not available on the ERPC website
- RTDA for the month of April, 2022 and onwards are not available on the NERPC website

CTU can raise the bills towards transmission deviation only once RTDA is issued by RPCs. The charges so collected are to be reimbursed back to DICS as per Regulations. Non issuance of RTDA is a violation of Regulations.

NRPC, ERPC and NERPC secretariat are directed to furnished the reasons for non-issuance of RTDA and the timeline by which the same shall be issued.

Yours faithfully,

(Harpreet Singh Pruthi)

Member Secretary,  
NRPC,  
18-A, Qutab Institutional Area,  
Katwaria Sarai,  
New Delhi - 110016

तीसरी मंजिल, चन्द्रलोक बिल्डिंग, 36, जनपथ, नई दिल्ली-110 001

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**RVPN**  
An ISO 9001:2000  
Certified Company

## 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)  
☎ +91-141-2740623, Fax: +91-141-2740794;  
e-mail: se.pp@rvpn.co.in; website: www.rvpn.co.in

No. RVPN/SE(P&P)/XEN-2(P&P)/AE-2/F. /D 1597 Jaipur, Dt. 28/11/22


To  
The General Manager (NRLDC)  
Power System Operation Corporation Ltd. (POSOCO)  
18-A, Shaheed Jeet Singh Sansanwal Marg, Katwaria Sarai  
New Delhi-110016.

**Sub:-** Updated SPS for 400/220 kV ICTs at RVPN's 400 KV GSS Bhadla and 400 kV GSS Bikaner.

**Ref:** 1. Discussions in the 201<sup>st</sup> OCC meeting.  
2. Discussion in the special meeting of NRPC held on dated 25.11.2022 regarding RVPN's SPP schemes for ICTs at 400 kV GSS Bhadla

On the above captioned subject, it is submitted that SPS for 3x500MVA, 400/220kV ICTs at 400 kV GSS Bhadla and 2x315 MVA, 400/220kV ICTs at 400 kV GSS Bikaner was discussed in the special meeting of NRPC held on dated 25.11.2022. In this meeting, RVPN was advised to submit the updated SPS schemes after incorporating the suggestions given in the meeting. The SPS for 3x500MVA, 400/220kV ICTs at 400 kV GSS Bhadla and 2x315 MVA, 400/220kV ICTs at 400 kV GSS Bikaner have been updated as suggested and attached with request to include in the next meeting of NRPC to be held on dated 30.11.2022 as Table agenda as decided in the special meeting of NRPC held on dated 25.11.2022.


**Encl:** As above

  
(S.C. Meena)  
Chief Engineer (PP&D)  
RVPNL, Jaipur.

Copy to the following for information and necessary action please-

1. The Member Secretary (NRPC), 18-A, Shaheed Jeet Singh Marg, Katwaria Sarai, New Delhi-110016 with request to include in proposed SPS for discussion in the the next meeting of NRPC to be held on dated 30.11.2022 as Table agenda as decided in the special meeting of NRPC held on dated 25.11.2022.
2. The Chief Engineer (LD/T&C/MPT&S), RVPN, Jaipur/Jodhpur/Jodhpur.
3. The Chief Engineer, Power System Planning & Appraisal-I Division, CEA, Sewa Bhawan, RK Puram-I, New Delhi-110066
4. The Superintending Engineer (Operation), NRPC, 18-A, Shaheed Jeet Singh Marg, Katwaria Sarai, New Delhi-110016.

**Encl:** As above

  
Chief Engineer (PP&D)  
RVPNL, Jaipur



## Proposed SPS for 3x500 MVA, 400/220 kV ICTs at 400 kV GSS Bhadla

### 1. Details of Installed ICTs and Transmission Lines

- There are 3x500MVA, 400/220 kV ICTs at 400 kV GSS Bhadla. Mainly these ICTs are used to stepped up the RE power to evacuate through 400 kV lines to Jodhpur, Merta and Bikaner. Load sharing on all the ICTs is almost equal and each ICT is loaded near to rated capacity of 500 MVA.
- Power map of transmission system at 400 kV GSS Bhadla is shown in Figure 1.

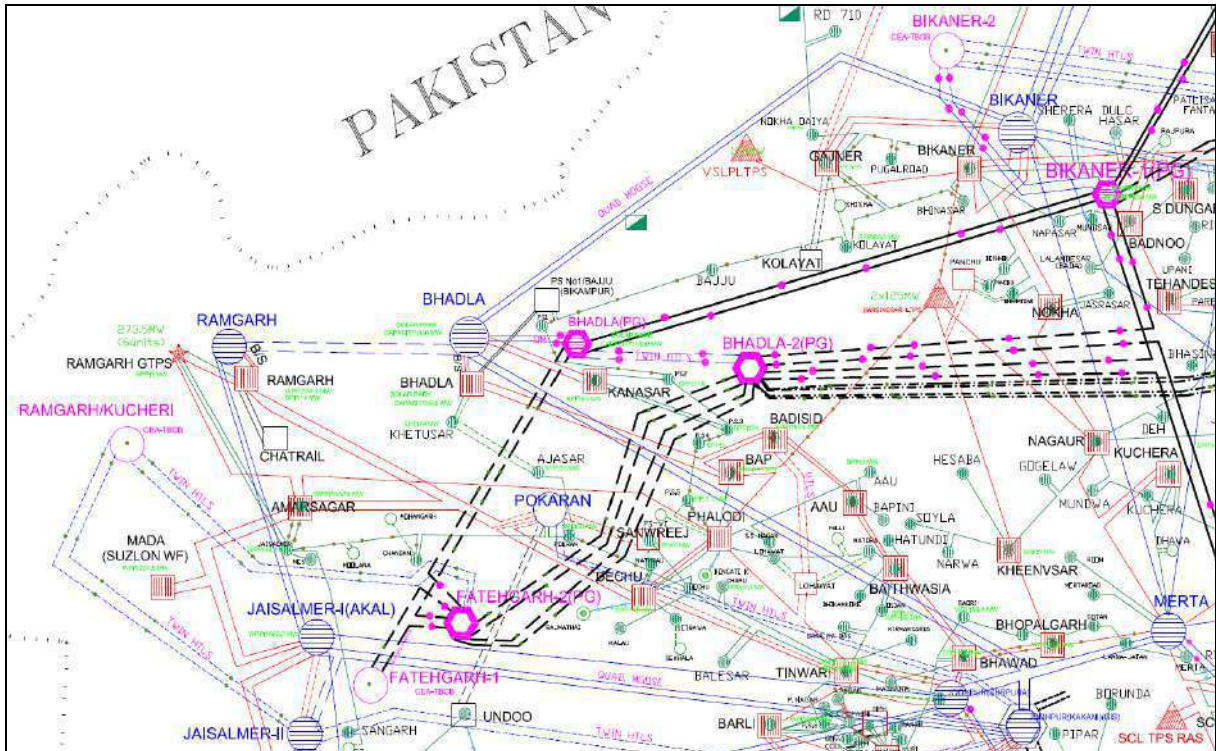


Fig. 1 Power map of Bhadla region

### 2. Load Details on ICTs and Transmission Lines Associated with 400 kV GSS Bhadla

- Peak Loads recorded on the 400/220 kV ICTs and 220 kV lines associated with 400 kV GSS Bhadla are detailed below in Table 1. RE power injected by the lines to 220 kV Bus of 400 kV GSS Bhadla is also mentioned in the Table 1.

Table 1: Load Details on ICTs and Transmission Lines Associated with 400 kV GSS Bhadla

S. No.	Name of 220 kV line/ILTs	Peak Load (MW)	RE Generation	SPS Groups
1	500 MVA, 400/220 kV ICT-I	494		
2	500 MVA, 400/220 kV ICT-II	490		
3	500 MVA, 400/220 kV ICT-III	491		
4	400 kV Bhadla-Bikaner Ckt-I Line	598		
5	400 kV Bhadla-Bikaner Ckt-II Line	710		

6	400 kV Bhadla-Ramgarh Ckt-I Line	520		
7	400 kV Bhadla-Ramgarh Ckt-II Line	520		
8	400 kV Bhadla-Merta Line	406		
9	400 kV Bhadla-Jodhpur (Surpura) Line	600		
10	400 kV Bhadla (RVPN)-Bhadla(PGCIL) Ckt-I Line	562		
11	400 kV Bhadla (RVPN)-Bhadla(PGCIL) Ckt-II Line	548		
12	220 kV Bhadla-Kanasar Ckt-I Line	134	190 MW	
13	220 kV Bhadla-Kanasar Ckt-II Line	134		
14	220 kV Bhadla-RSDCL-1 Ckt-I Line	153	340 MW	Group-1
15	220 kV Bhadla-RSDCL-1 Ckt-II Line	152		
16	220 kV Bhadla-RSDCL-2 Ckt-I Line	154	340 MW	Group-2
17	220 kV Bhadla-RSDCL-2 Ckt-II Line	156		
18	220 kV Bhadla-Adani REPRC Ckt-I Line	132	250 MW	Group-3
19	220 kV Bhadla- Adani REPRC Ckt-II Line	131		
20	220 kV Bus Sectionalizer-II to evacuate power of Saurya Urja-II (300 MW)	-	300 MW	Group-4

### 3. Proposed SPS for ICTs at 400 kV GSS Bhadla

- Tripping statistics for the 3x500MVA, 400/220kV at 400 kV GSS Bhadla for last one year is appended at Appendix-A.
- After detailed analysis of above loading conditions, RE power injection & grid interconnection issues, following lines are considered for tripping as soon as any one of the 3x500 MVA, 400/220 kV ICTs is tripped on fault/protection:-

#### 1. Group-1

- 220 kV Bhadla-RSDCL-1 Ckt-I Line
- 220 kV Bhadla-RSDCL-1 Ckt-II Line

#### 2. Group-2

- 220 kV Bhadla-RSDCL-2 Ckt-I Line
- 220 kV Bhadla-RSDCL-2 Ckt-II Line

#### 3. Group-2

- 220 kV Bhadla- Adani REPRC Ckt-I Line
- 220 kV Bhadla- Adani REPRC Ckt-II Line

#### 4. Group-2

- 220 kV Bus Sectionalizer-II used to evacuate 300 MW RE power of Saurya Urja-II

- Tripping commands for 220 kV lines and/or 220 kV Bus Sectionalizer-II are to be taken from overload relay/over current back up relay on 400 kV and/or 220 kV Side of ICTs considering 100% loading of the ICTs (500 MVA) with appropriate time delay (3 to 5

second) to avoid tripping during the through faults. Further, time grading of the backup elements may also be correlated for time delay of overloading.

- Schematic diagram for tripping of 220 kV lines included in SPS for 3x500 MVA, 400/220 kV ICTs at 400 kV GSS Bhadla is shown below in Figure 2.

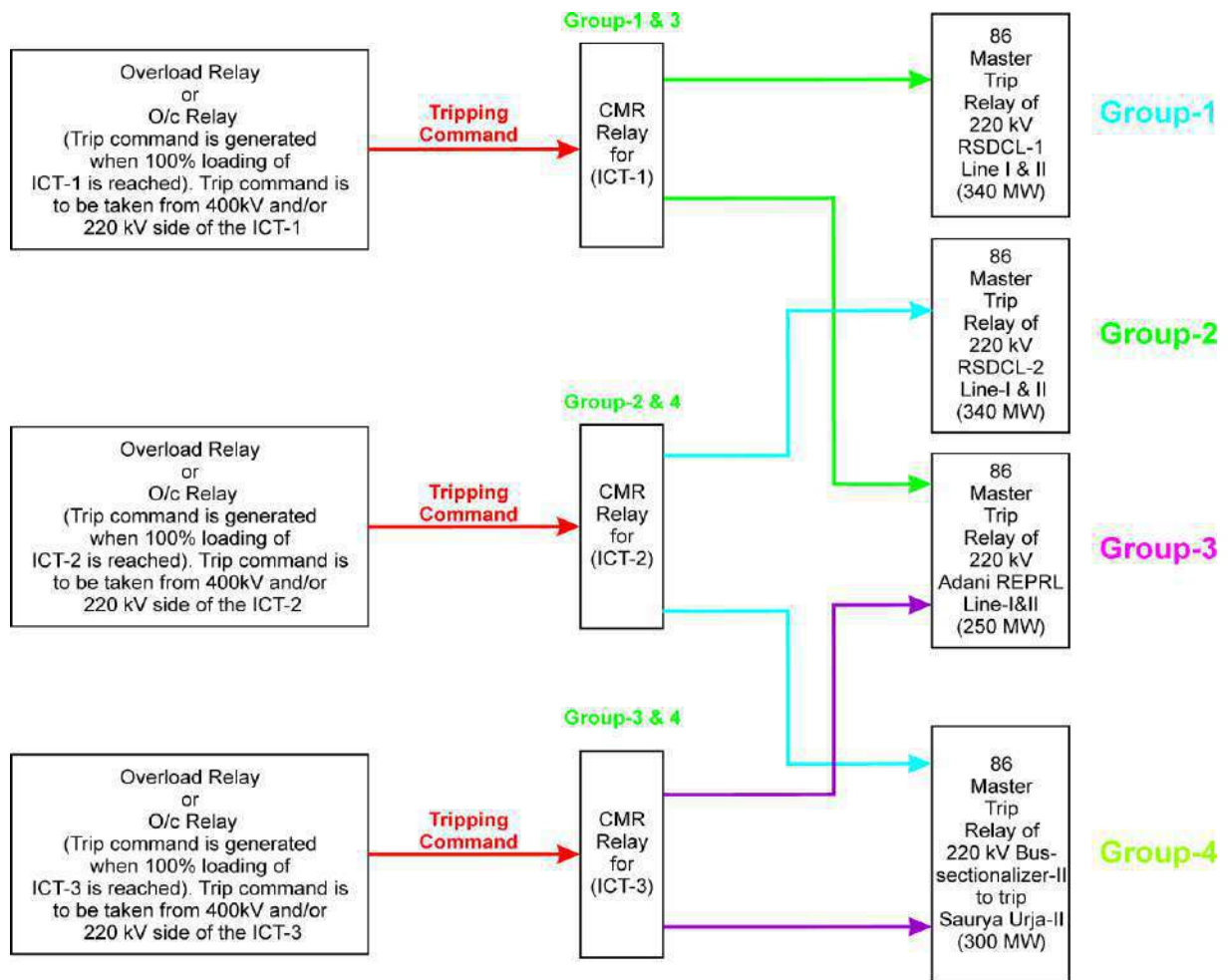


Fig. 2 Schematic diagram of proposed logics for SPS of 3x500 MVA, 400/220 kV ICTs at 400 kV GSS Bhadla

- To facilitate the RE generators for evacuation of RE powers of all generators in proportionate quantum, the tripped lines may be re-connected after curtailing the RE generation from all generators in such a quantum to maintain loadings on the healthy 400/220 kV ICTs within permissible limits.

#### 4. Validation of Proposed SPS for ICTs at 400 kV GSS Bhadla Using Load Flow Studies

- Load flow study is carried out for the condition corresponding to FY 2022-2023 for total system load of 16012 MW (recorded on 28.06.2022) considering the RE generation mentioned in the Table 2 at injection point with the RVPN network. The voltage level and injection point for RE generators are also mentioned in the Table 2.

Table 2 Details of RE Generators and Injection Point

S. No.	Name of RE Generator	Quantum of RE Power	Voltage Level of Grid Injection Point/Location	RE evacuation arrangement
1	RSDCL-1	340 MW	220 kV (400 kV GSS Bhadla)	220 kV D/C RSDCL-Bhadla line integrated to 220 kV bus of 400 kV GSS of Bhadla
2	RSDCL-2	340 MW	220 kV (400 kV GSS Bhadla)	220 kV D/C RSDCL-Bhadla line integrated to 220 kV bus of 400 kV GSS of Bhadla
3	Adani REPRL	250 MW	220 kV (400 kV GSS Bhadla)	220 kV D/C RSDCL-Bhadla line integrated to 220 kV bus of 400 kV GSS of Bhadla
4	Saurya Urja-II	300 MW	220 kV (400 kV GSS Bhadla)	220 kV D/C Saurya Urja-II-Bhadla line integrated to 220 kV bus of 400 kV GSS of Bhadla using bus coupler between the 220 kV GSS and 400 kV GSS
5	220 kV GSS Kanasar	190 MW	220 kV (400 kV GSS Bhadla)	220 kV D/C Kanasar-Bhadla line integrated to 220 kV bus of 400 kV GSS of Bhadla
6	Saurya Urja-I	200 MW	220 kV (220 kV GSS Bhadla)	220 kV D/C Saurya Urja-I-Bhadla line integrated to 220 kV bus of 220 kV GSS of Bhadla
7	Injection on 33 kV voltage level by 6 nos. generators	65 MW	33 kV (220 kV GSS Bhadla)	Power is injected on 33 kV voltage level in the yard of 220 kV GSS Bhadla
8	132 kV GSS Khetusar	70 MW	132 kV (220 kV GSS Bhadla)	Power is injected on 132 kV voltage level in the yard of 220 kV GSS Bhadla

- Load flow study is carried out for the following case studies:-

**Case-1:** Base Case: Power flow plot considering all the three ICTs is placed at Exhibit-1. Power flow plot with outage of one ICT is placed at Exhibit-1A.

**Case-2:** Outage of 500 MVA, 400/220 kV ICT-1 and tripping of following lines (Power flow plot is placed at Exhibit-2)

- 220 kV D/C Bhadla-RSDCL-1 line
- 220 kV D/C Bhadla-Adani REPRL line

**Case-3:** Outage of 500 MVA, 400/220 kV ICT-2 and tripping of following lines (Power flow plot is placed at Exhibit-3)

- 220 kV D/C Bhadla-RSDCL-2 line
- 220 kV Bus Coupler between 400 kV GSS Bhadla and 220 kV GSS Bhadla for outage of 300 MW generation of Saurya Urja-II

**Case-4:** Outage of 500 MVA, 400/220 kV ICT-3 and tripping of following lines (Power flow plot is placed at Exhibit-4)

- 220 kV D/C Bhadla-Adani REPR line
- 220 kV Bus Coupler between 400 kV GSS Bhadla and 220 kV GSS Bhadla for outage of 300 MW generation of Saurya Urja-II
- Power flow on the ICTs and transmission lines associated with the 220 kV and 400 kV transmission lines associated with 400 kV GSS Bhadla are Tabulated in Table 3:-

Table 3 Power Flow on the ICTs and Transformers

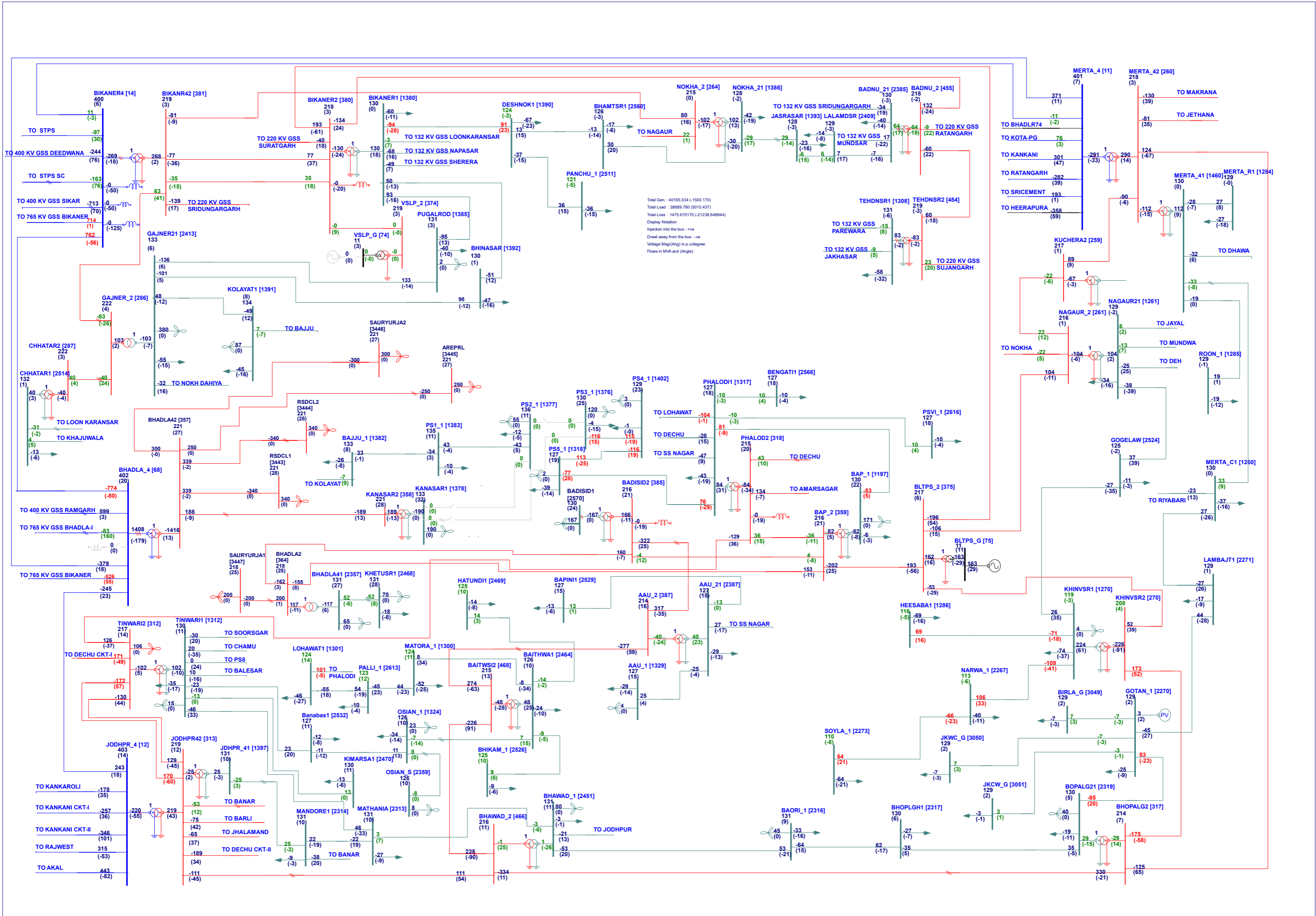
S. No.	Name of ICT/Line	Power Flow (MW)				
		Base Case (Case-1)		Case-2 (Exhibit-2)	Case-3 (Exhibit-3)	Case-4 (Exhibit-4)
		(Exhibit-1)	(Exhibit-1A)			
1	3x500 MVA, 400/220 kV ICTs	-1408	NA	NA	NA	NA
1	2x500 MVA, 400/220 kV ICTs	NA	<b>-1403</b>	-823	-774	-862
2	400 kV S/C Bhadla-Bikaner (RVPN) line	774	772	710	704	714
3	400 kV S/C Bhadla-Bikaner (PGCIL) line	526	525	476	471	479
4	400 kV S/C Bhadla-Jodhpur line	245	244	208	205	211
5	400 kV S/C Bhadla-Merta line	379	378	348	345	350
6	400 kV S/C Bhadla-Ramgarh line	-599	-598	-656	-661	-652
7	400 kV S/C Bhadla (RVPN)-Bhadla (PGCIL) line	83	82	-262	-291	-239
8	220 kV D/C Bhadla-RSDCL1 line	-339	-339	NIL	-339	-339
9	220 kV D/C Bhadla-RSDCL2 line	-339	-339	<b>-339</b>	NIL	-339
10	220 kV D/C Bhadla-Adani line	-250	-250	NIL	-250	NIL
11	220 kV D/C Bhadla-Saurya Urja-II line (Bus coupler)	-300	-300	-300	NIL	NIL
12	220 kV D/C Bhadla (220 kV GSS)-Saurya Urja-I line	-200	-200	-200	-200	-200
13	220 kV D/C Bhadla (220 kV GSS)-Bap line	155	155	155	155	155
14	220 kV D/C Bhadla (220 kV GSS)-Badisid line	162	162	162	162	162

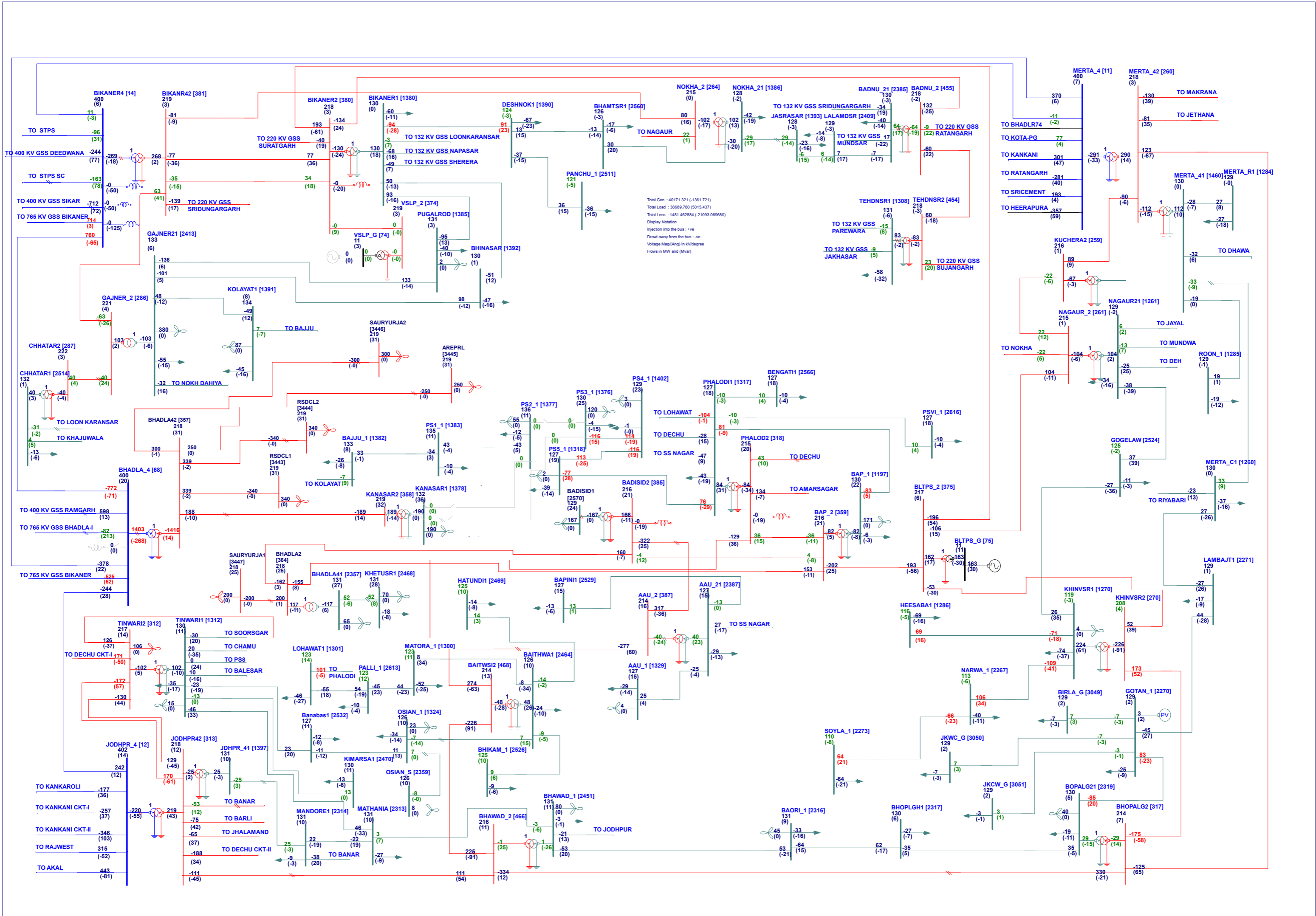
- Detailed analysis of the power flow on the transmission elements associated with the 400 kV GSS Bhadla and 220 kV GSS Bhadla mentioned in Table 3 indicates that loading on all the healthy ICTs is within permissible limits. However, with reduced RE generation loading on the healthy ICTs vary from 77.4% to 82.3%. These ICTs can be utilized up to full capacity by allowing the generation from the tripped RE generators on reduced capacity.

## 5. Conclusion

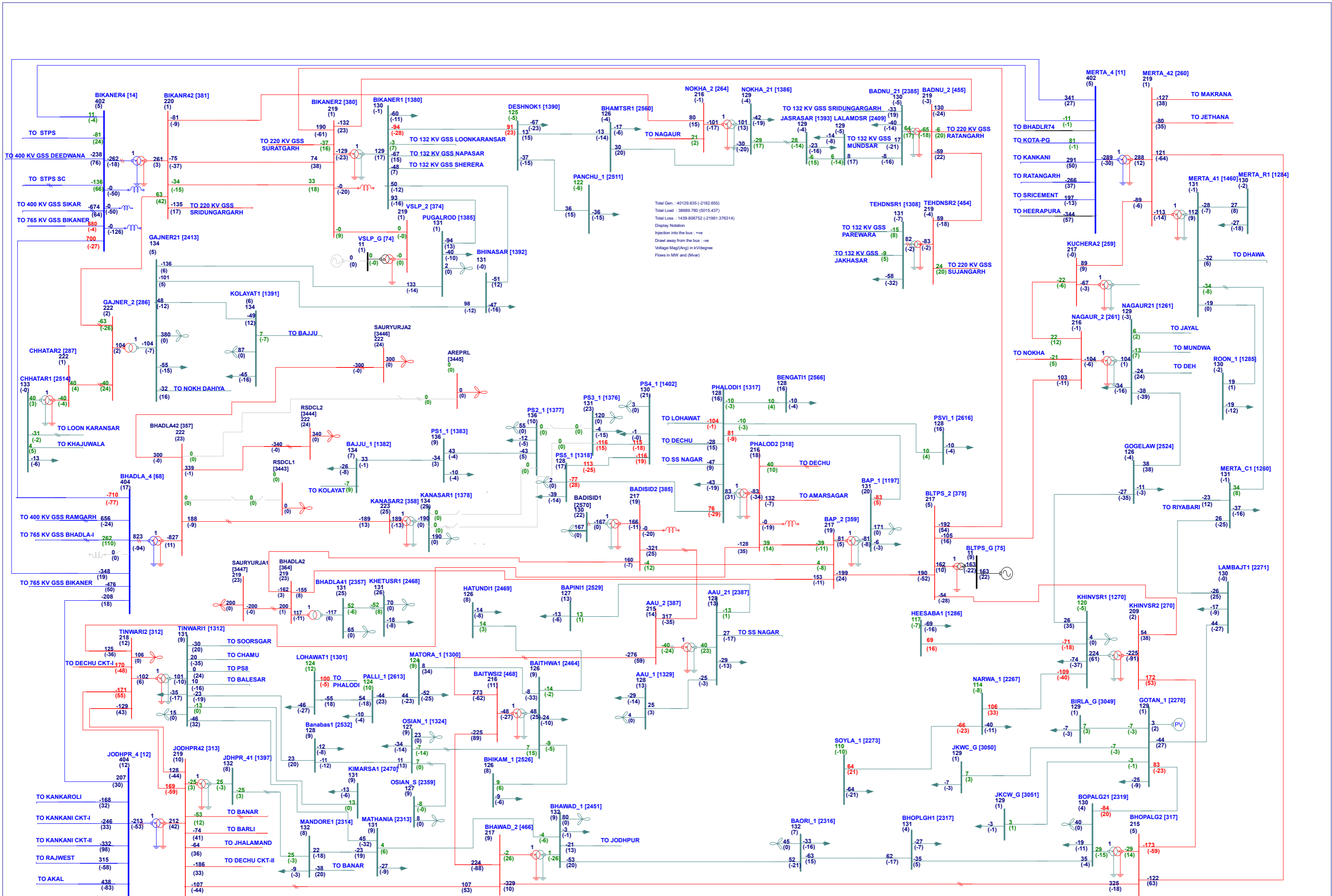
Based on the results of load flow study, SPS logics included in the section 3 and explained in Fig. 2 are found feasible.

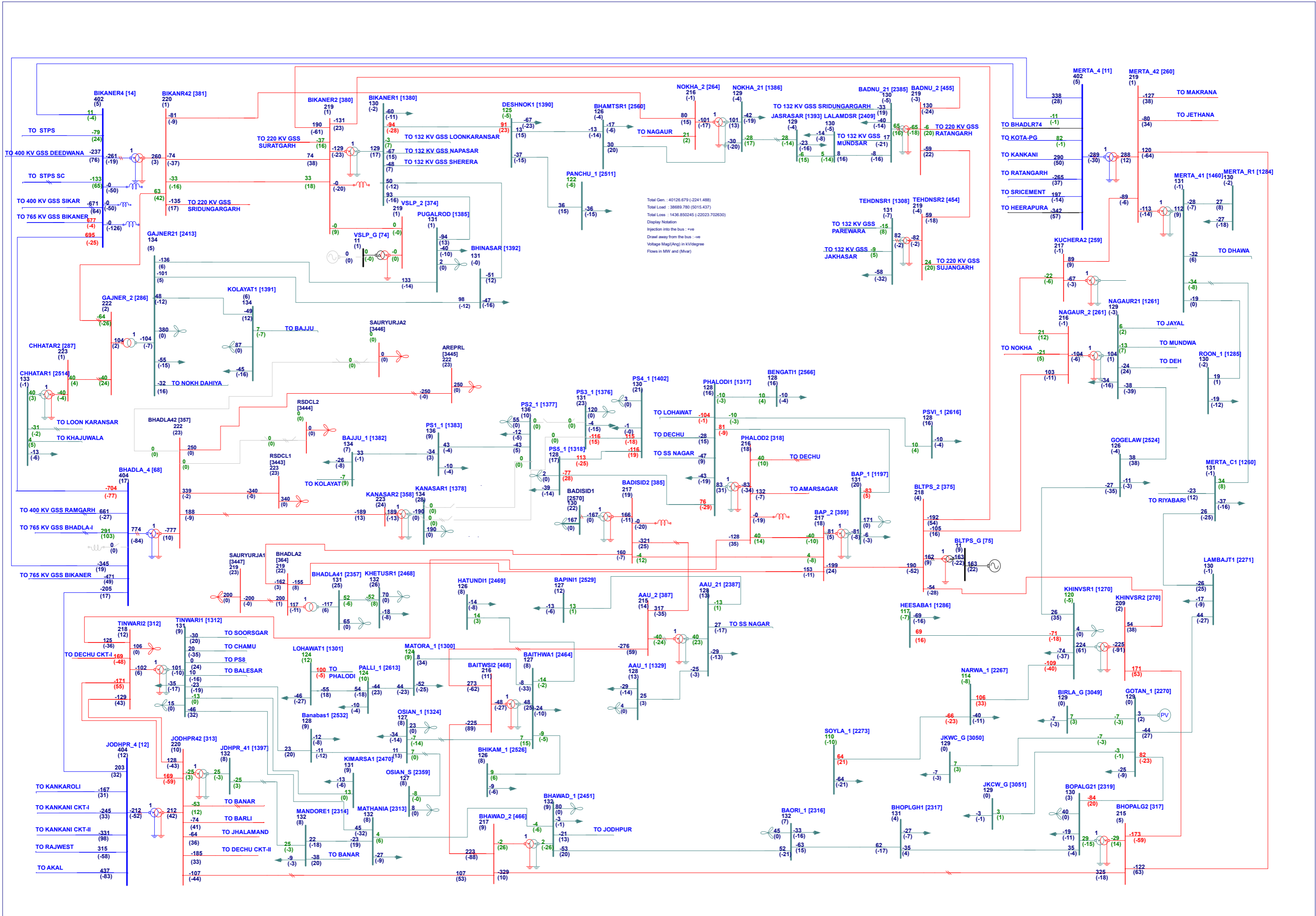
Appendix A																		
Function/Location Name	Trip Id	Trip/No Trip	Fault Type	Trip Date	Trip time	Trip Close Date	Trip Close Time	Time Difference	Alarm Indication	Relay Indication	Remote End Alarm Indication	Remote End Relay Indication	Tripping Code Description	Tripping Type Description	Remark	Trip Status	LINE ID DESCRIPTION	LINE ID
HV SIDE 400/220/33KV 500MVA ICT-II	1003505239	Trip	FAULT TRIP	15-08-2021	09:50:00	16-08-2021	10:01:00	00:11:00	Y Phase Differential protection	Differential Relay (87M-1) opt.			DIFFERENTIAL PROT TRIP	Transformer Prot'n Trip	Tripping occurred due to over loading & non availability of ICT-2	Closed		
HV SIDE 400/220/33KV 500MVA ICT-I	1003505176	Trip	FAULT TRIP	15-08-2021	10:06:00	15-08-2021	10:27:00	00:21:00	Over Load Relay (49) Opt.	Over Load Relay (49) Opt.			INVERSE OC TRIP	Transformer Prot'n Trip	over load tripping occurred due to non availability of ICT-2.	Closed		
HV SIDE 400/220/33KV 500MVA ICT-III	1003505184	Trip	FAULT TRIP	15-08-2021	10:06:00	15-08-2021	10:29:00	00:23:00	over load relay (49) opt.	over load relay (49) opt.			OSR TRIP / INVERSE OC TRIP	Transformer Prot'n Trip	over load tripping occurred due to non availability of ICT-2.	Closed		

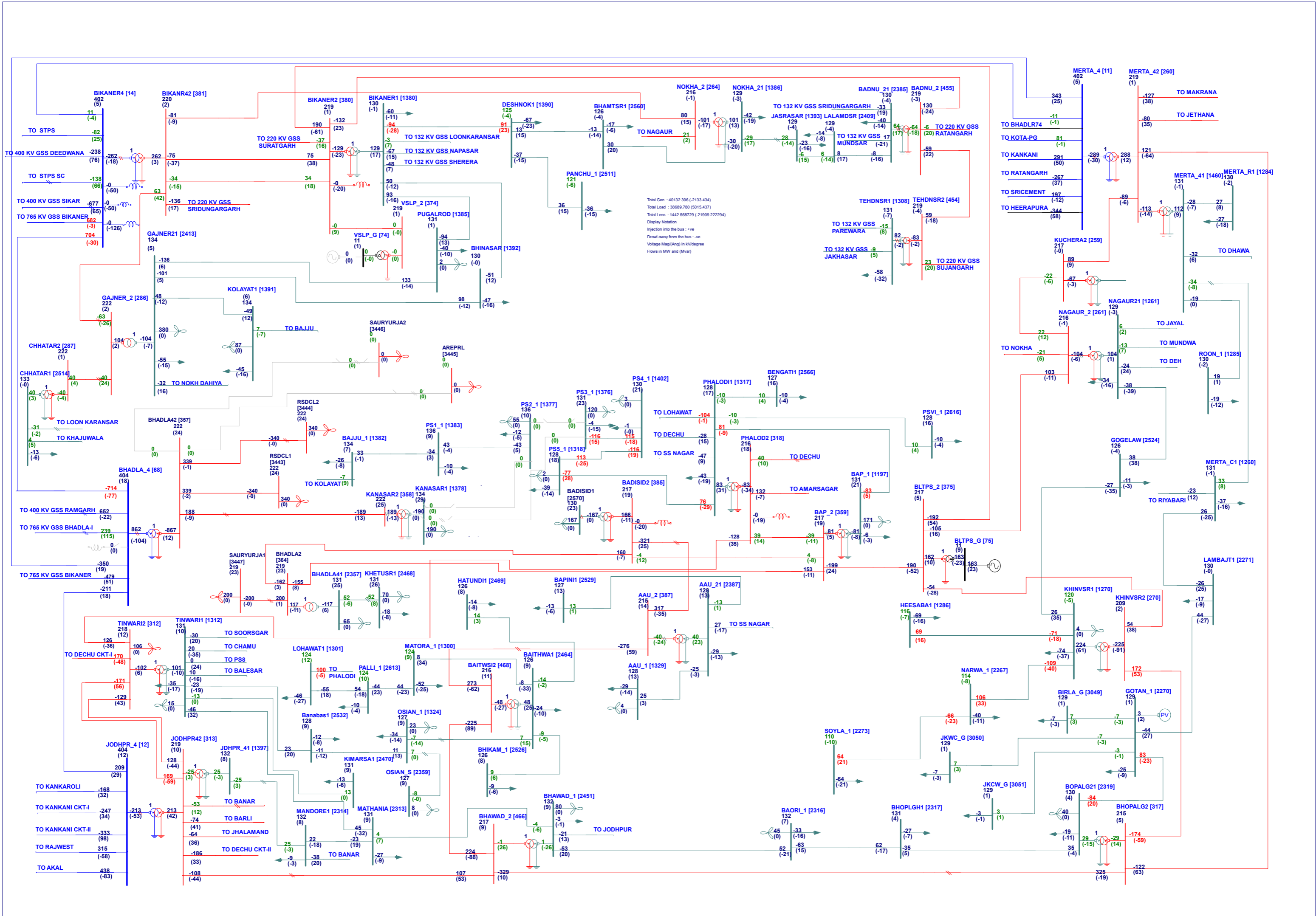












## Proposed SPS for 2x315 MVA, 400/220 kV ICTs at 400 kV GSS Bikaner

### 1. Details of Installed ICTs at 400 kV GSS Bikaner and Transmission Lines

- Percentage impedance of 315 MVA, 400/220 kV ICT-1 is HV-IV: 12.93%, HV-LV: 41.19%, IV-LV: 26.01%.
- Percentage impedance of 315 MVA, 400/220 kV ICT-2 is HV-IV: 12.94%, HV-LV: 40.72%, IV-LV: 26.43%.
- Power Map of Transmission System at 400kV GSS Bikaner is shown in Fig. 1.

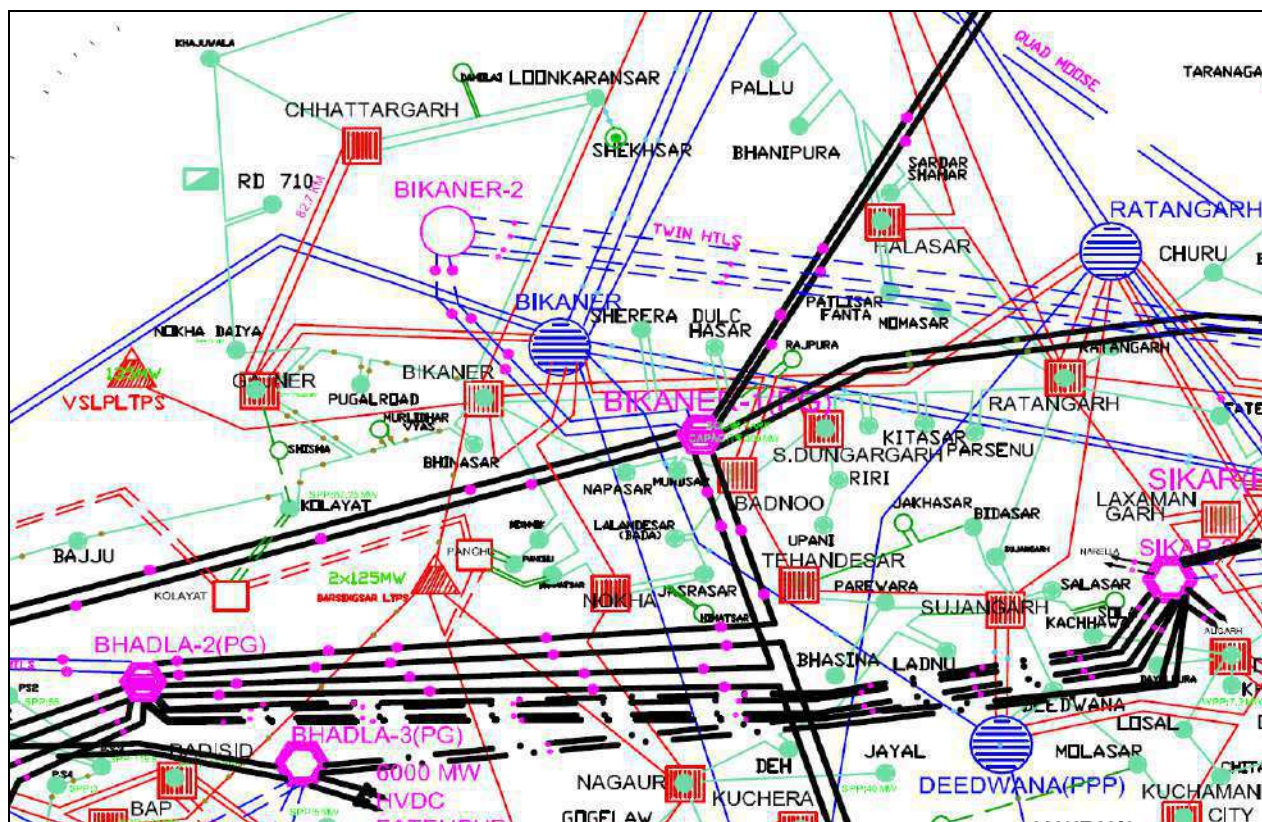


Fig. 1 Power map of Bikaner region

### 2. Load Details on ICTs and Transmission Lines Associated with 400 kV GSS Bikaner

- Peak load recorded on the 400/220 kV ICT's and 220 kV lines associated with 400 kV GSS Bikaner are detailed below in Table 1. Data and time of recorded peak load are include in Appendix-A.

Table 1: Load details of ICTs and Transmission line associated with 400 kV GSS, Bikaner

S. No.	Name of 220 kV line/ICTs	Peak Load (MVA)	Average Load (MVA)	Remark	SPS Group
1	315 MVA, 400/220 kV ICT-1	329	272	Peak load value has been recorded with restricted load due to load constraints.	
2	315 MVA, 400/220 kV ICT-2	333	278		
3	220 kV Bikaner	245	200	Tripping of these lines will	

	Interconnector-I				result in supply failure in Bikaner City. Hence, not considered in SPS.	
4	220 kV Bikaner Interconnector-II	185	114			
5	220 kV Bikaner-Nokha Line	256	198		Proposed for SPS	Group-1
6	220 kV Bikaner-Sri Dungargarh Line	210	163		Proposed for SPS	Group-2
7	220 kV Bikaner-Gajner Line-I	216	118		Generation lines. Power flows from Gajner to Bikaner in day hours	
8	220 kV Bikaner-Gajner Line-II	129	112			

### 3. Proposed SPS for ICTs at 400 kV GSS Bikaner

- No spare carrier protection channel is available on all 220 KV feeders emerging from 400KV GSS Bikaner to trip the transformers at the 220 kV GSS which are being fed from the 400 kV GSS Bikaner.
- After detailed analysis of above loading conditions & grid interconnection issues, following lines are considered for tripping as soon as any one of the 1x315 MVA, 400/220 kV ICTs at 400 kV GSS Bikaner is tripped on fault/protection:-
  - 220 kV Bikaner (400 kV GSS)-Nokha line
  - 220 kV Bikaner (400 kV GSS)-Sri Dungargarh line
- Tripping command for 220 kV lines are to be taken from overload relay/over current back up relay on 400 kV and/or 220 kV Side of ICTs considering 110% loading of the ICTs (315 MVA) with appropriate time delay (3 to 5 second) to avoid tripping during the through faults. Further, time grading of the backup elements may also be correlated for time delay of overloading.
- Schematic diagram for tripping of 220 kV lines included in SPS for 2x315 MVA, 400/220 kV ICTs at 400 kV GSS Bikaner is shown below:-

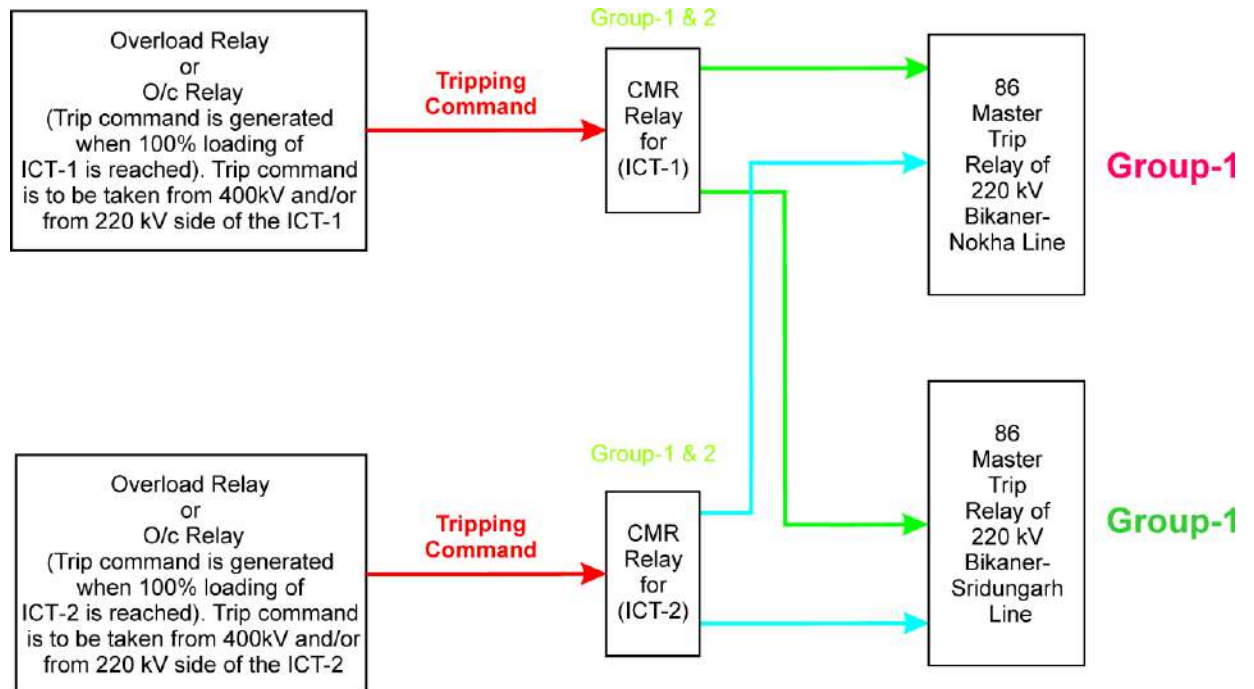


Fig. 2 Schematic diagram of proposed logics for SPS of 2x315 MVA, 400/220 kV ICTs at 400 kV GSS Bikaner

## Appendix-A

S. No.	Name of 220 kV line/ICTs	Peak Load (MVA)	Average Load (MVA)	Remark	SPS Group	Peak Load Date	Peak Load Time
1	315 MVA, 400/220 kV ICT-1	329	272	Peak load value has been recorded with restricted load due to load constraints.		03.06.2022	06:00 Hrs
2	315 MVA, 400/220 kV ICT-2	333	278			18.08.2021	05:00 Hrs
3	220 kV Bikaner Interconnector-I	245	200	Tripping of these lines will result in supply failure in Bikaner City. Hence, not considered in SPS.		08.09.2022	15:00 Hrs
4	220 kV Bikaner Interconnector-II	185	114			19.04.2022	08:00 Hrs
5	220 kV Bikaner-Nokha Line	256	198	Proposed for SPS	Group-1	08.09.2022	15:00 Hrs
6	220 kV Bikaner-Sri Dungargarh Line	210	163	Proposed for SPS	Group-2		
7	220 kV Bikaner-Gajner Line-I	216	118	Generation lines. Power flows from Gajner to Bikaner in day hours		30.08.2021	20:00 Hrs
8	220 kV Bikaner-Gajner Line-II	129	112			13.09.2022	22:00 Hrs



**RVPN**  
An ISO 9001:2000  
Certified Company

## 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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e-mail: [se.pp@rvpn.co.in](mailto:se.pp@rvpn.co.in); website: [www.rvpn.co.in](http://www.rvpn.co.in)

No. RVPN/SE(P&P)/XEN-2(P&P)/AE-2/ F. /D 1587 Jaipur, Dt. 2/11/22

### Member Secretary

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

Sub:- Proposal for additional 220 kV interconnections at PGCIL's 400 kV GSS Jaipur (south).

Ref: 1. RVPN letter no. RVPN/SE(P&P)/XEN-2(P&P)/AE-2/D. 1002 dated 18.08.2022

2. CEA letter dated 16.11.2022.

Dear Sir,

In reference to the above, it is submitted that RVPN had submitted a proposal for additional interconnections at PGCIL's 400 kV GSS Jaipur (south) to CEA for necessary approval vide letter dated 18.08.2022. CEA's observation was received vide above referred letter dated 16.11.2022 wherein CEA commented as "The proposal is generally in order. However, as the above proposal involves interconnections with an existing ISTS element, therefore, the proposal needs to be deliberated with CTUIL and POSOCO". Therefore, kindly find attached proposal for additional 220 kV interconnections at PGCIL's 400 kV GSS Jaipur (south) for inclusion in the agenda of next NRPC meeting for discussion.

Encl: as above

Your's faithfully,

(S. C. Meena)

Additional Chief Engineer (PP&D)

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

1. The CO(CTU), PGCIL, Saudamini, Plot No. 2, Sector-29, Near IFFCO Chowk, Gurgaon (Haryana)-122001.
2. The CGM, PGCIL, Saudamini, Plot No. 2, Sector-29, Near IFFCO Chowk, Gurgaon (Haryana)-122001.
3. The General Manager (NRLDC), Power System Operation Ltd. (POSOCO), 18-A, Shaheed Jeet Singh Sansanwal Marg, Katwaria Sarai, New Delhi-110016.
4. The Superintending 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)



## **Agenda for Discussion in NRPC Meeting**

**Agenda:** Proposal for additional 220 kV interconnections at PGCIL's 400 kV GSS Jaipur (south)

### **1. Objective**

To provide additional interconnections at PGCIL's 400/220 kV GSS Jaipur (South) to utilize 2 nos. 220 kV Bays at 400 kV GSS Jaipur (South) and improve reliability of power at 220 kV GSS Dausa and 220 kV GSS Sawaimadhopur.

### **2. Existing Scenario**

There are two Interstate 400/220 kV GSS at Bassi and Chaksu (Jaipur-South) and one RVPN's 400/220 kV GSS at Heerapura in and around the Jaipur City. These 400/220 GSS are prime sources of supply to the 220 kV and 132 kV GSS situated in and around the Jaipur City which feed domestic, industrial and agriculture load. A snapshot of the power map of the region is shown in Fig. 1.

At PGCIL's 400/220 kV GSS Jaipur (South), following 220 kV Transmission system is connected:

- 220 kV S/C Jaipur (South)-Chaksu line
- 220 kV S/C Jaipur (South)-Goner line
- 220 kV D/C Jaipur (South)-Vatika line
- 220 kV S/C Jaipur (South)-SEZ line
- 220 kV S/C Jaipur (South)-Duni line

Further, PGCIL's 400/220 kV GSS Bassi is also connected to the following RVPN's GSS:-

- 220 kV S/C Bassi (400 kV GSS)-IG Nagar line
- 220 kV S/C Bassi (400 kV GSS)-Kukas line
- 220 kV S/C Bassi (400 kV GSS)-Kunda Ki Dhani line
- 220 kV S/C Bassi (400 kV GSS)-Kukas line
- 220 kV S/C Bassi (400 kV GSS)-Bagru line
- 220 kV D/C Bassi (400 kV GSS)-Dausa line

RVPN's 400/220 kV GSS Heerapura is feeding following 220 kV GSS of RVPN

- 220 kV S/C Heerapura (400 kV GSS)-SEZ line
- 220 kV S/C Heerapura (400 kV GSS)-Sanganer line
- 220 kV S/C Heerapura (400 kV GSS)-KTPS line (connected to generation plant)
- 220 kV S/C Heerapura (400 kV GSS)-Phulera line
- 220 kV S/C Heerapura (400 kV GSS)-NPH (Jaipur) XLPE U/G Cable
- Connected to 220 kV GSS Heerapura through bus Sectionalizer

Details of transformation capacity and peak loads at various GSS in the region are provided in the Table 1.

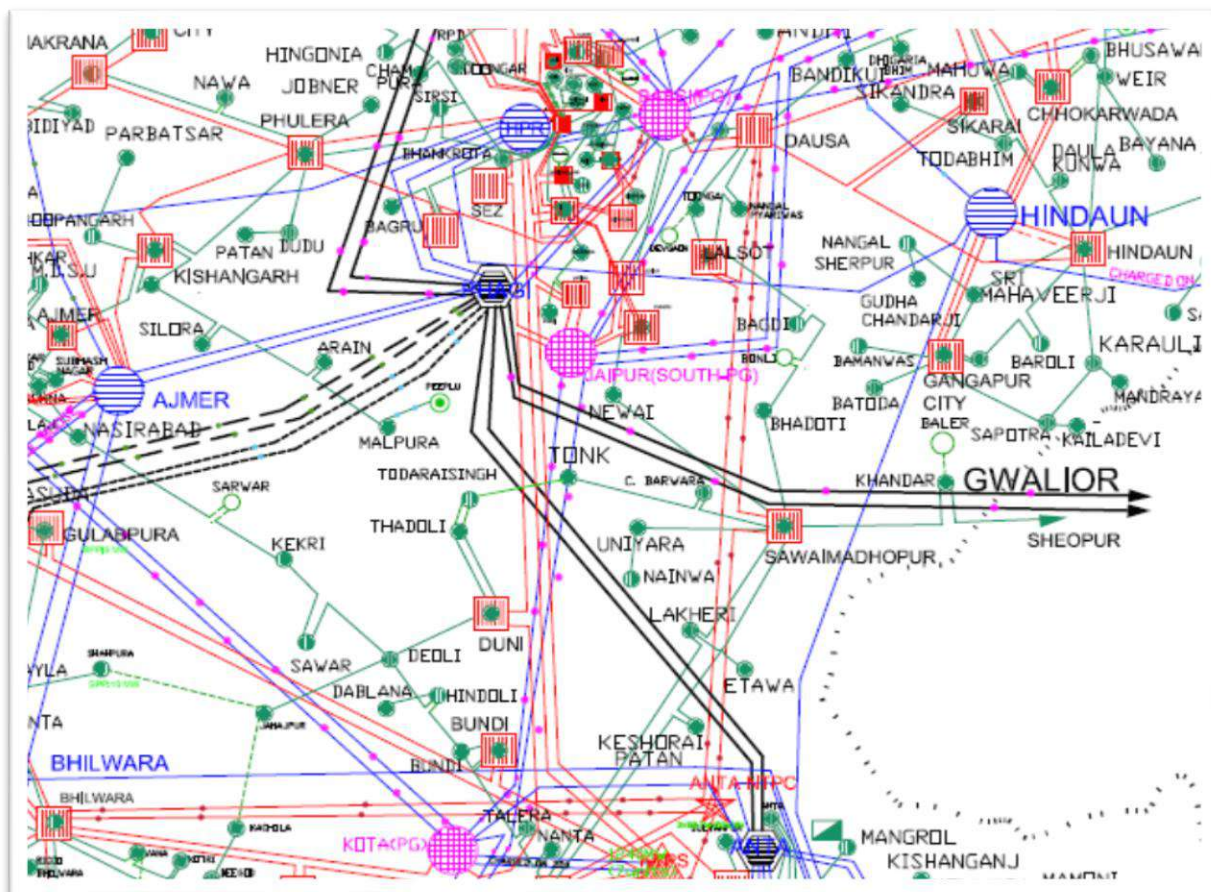


Fig. 1. Power map of Jaipur City and nearby Region

Table 1 Transformer Capacity and Recorded Peak loads at the GSS

S. No.	Name of GSS	Installed transformer Capacity	Recorded Peak load
1	220 kV GSS Lalsot	100 MVA, 220/132 kV Transformer-I	78.70 MW
		100 MVA, 132/33 kV Transformer-II	72.02 MW
		100 MVA, 132/33 kV Transformer	66 MW
2	220 kV GSS Chaksu	160 MVA, 220/132 kV Transformer	114 MW
		50 MVA, 132/33 kV Transformer	40 MW
3	220 kV GSS Dausa	160 MVA, 220/132 kV Transformer	71 MW
		100 MVA, 220/132 kV Transformer	70 MW
		87.5 MVA, 132/33 kV Transformer	70 MW
4	220 kV GSS Sawai Madhopur	160 MVA, 220/132 kV Transformer	144.5 MW
		100 MVA, 132/33 kV Transformer	74.56 MW
		87.5 MVA, 132/33 kV Transformer	65.84 MW

Peak load recorded on the 220 kV EHV transmission lines are tabulated in Table 2.

Table 2 Recorded Peak on the Transmission Lines and line Length

S. No.	Name of EHV line	Line length	Recorded Peak load
1	220 kV S/C Chaksu (220 kV GSS)-Chaksu (400 kV GSS) line	7.955 km	248 MW
2	220 kV S/C Chaksu (400 kV GSS)-Goner line	35.278 km	128.89 MW

3	220 kV S/C Chaksu (220 kV GSS)-Goner line	29.569 km	83 MW
4	220 kV S/C Chaksu (220 kV GSS)-Sanganer line	34.195 KM	122 MW
5	220 kV s/C Heerapura-KTPS line	184 km	123 MW
6	220 kV s/C Swaimadhampur-Dausa line	118.417 km	120.79 MW
7	220 kV s/C Bassi-Dausa line CKT-I	28 km	243 MW
	220 kV s/C Bassi-Dausa line CKT-II	28 KM	243 MW
8	220 kV S/C Dausa-Lalsot line	42.6 km	164 MW
9	220 kV S/C Lalsot-Anta line	193.3 km	156.92 MW
10	220 kV s/C Swaimadhampur-Anta line	118.417 km	164.54 MW

### 3. Status of Bays at PGCIL's 400 kV GSS Jaipur (South)

- A 400/220 kV GSS at Jaipur (South) with 2x500 MVA transformer was approved in 26<sup>th</sup> meeting of the standing committee on 13<sup>th</sup> October 2008.
- M/s PGCIL had constructed 08 Nos. 220 kV bays for RVPN as per the norms approved in 23<sup>rd</sup> Standing committee meeting.
- RVPN has already utilized 06 Nos. 220 kV Bays and 02 Nos. 220 kV bays are unutilized. For non-utilization of these 02 Nos. 220 kV bays, RVPN is paying 198.06 Lac per annum to M/s CTU.
- In 191<sup>st</sup> OCC Meeting, NRPC Secretariat representative apprised that a meeting was chaired by JS (OM & RR), MoP on 12.01.2022, wherein transmission constraints were discussed and concerned Utilities were requested to submit action plan to mitigate the constraint, hence, the interconnection is required to remove the Transmission Constraint. Since, there is urgency of above interconnection to utilise the 2 nos. of 220 kV terminal bays at PGCIL's 400/220 kV GSS Jaipur (South) and obviating the constraint discussed at the level of NRPC, it becomes essential to provide additional 220 kV interconnections at PGCIL's 400 kV GSS Jaipur (south).

### 4. Load Flow Studies

Load flow studies have been carried out for total system load of 15169 MW corresponding to FY 2022-23

#### 4.1 Base case

Existing transmission system without considering the proposed interconnections at PGCIL's 400 kV GSS Jaipur (South) is considered. Power flow plots of load flow study for Base Case with low wind and solar power generation (25%) are placed at **Exhibit-1**. Loading on the important elements in the region is tabulated in Table-3.

#### 4.2 Proposed Case

- 38 km LILO of 220 kV S/C Dausa-Swaimadhampur line at PGCIL's 400 kV GSS Jaipur (South).

Power flow plots of load flow study for proposed case with low (25 %) wind and solar power generation are placed at **Exhibit-3**. Loading on the important elements in the region is tabulated in Table-3.

#### 4.3 Power flows:-

The power flows as per results of load flow studies of related lines for base case and proposed case have been tabulated below:-

Table 3 Power Flow on the Transmission Elements

S. No.	Transmission lines/Transformers	Base Case (Exhibit-1) (MW)	Proposed Case (Exhibit-3) (MW)
<b>A</b>	<b>Transformers</b>		
1	1000 MVA, 400/220 kV Transformer at 400 kV GSS Jaipur (South)	297	312
2	160 MVA, 220/132 kV Transformer at 220 kV GSS Chaksu	75	71
3	200 MVA, 220/132 kV Transformer at 220 kV GSS Goner	105	102
4	260 MVA, 220/132 kV Transformer at 220 kV GSS Swaimadhampur	120	139
5	260 MVA, 220/132 kV Transformer at 220 kV GSS Dausa	125	125
<b>B</b>	<b>400 kV Transmission Lines</b>		
6	400 kV D/C Jaipur-Agra line	354	352
7	400 kV S/C Jaipur-RAPP C&D line	-553	-554
8	400 kV S/C Jaipur (PG)-Kota(PG) line	-578	-581
9	400 kV D/C Jaipur (PG)-Bassi (PG) line	480	471
<b>C</b>	<b>220 kV Transmission Lines</b>		
10	220 kV D/C Jaipur (PG)-Vatika line	77	68
11	220 kV S/C Jaipur (PG)-Chaksu(220 kV GSS) line	182	173
12	220 kV S/C Jaipur (PG)-Goner line	70	68
14	220 kV S/C Jaipur (PG)-Duni line	-92	-96
15	220 kV S/C Jaipur (PG)-SEZ line	59	55
16	220 kV D/C Bassi (PG)-Dausa line	269	261
17	220 kV S/C Dausa-Lalsot line	-44	-47
18	220 kV S/C Dausa-Swaimadhampur line	-78	-
19	220 kV S/C Lalsot-Anta line	-150	-152
20	220 kV S/C Swaimadhampur-Anta line	-200	-184
21	220 kV S/C Heerapura-KTPS line	-169	-170
<b>D</b>	<b>132 kV Transmission Lines</b>		
22	132 kV S/C Swaimadhampur-Uniyara line	66	66
23	132 kV S/C Uniyara-Nainwa line	45	45
24	132 kV S/C Swaimadhampur-C.Barwara line	17	20
25	132 kV S/C C.Barwara-Tonk line	-1	2
26	132 kV S/C Tonk-Todaraisingh line	-55	-52
27	132 kV S/C Thadoli-Todaraisingh line	68	65
28	132 kV S/C Duni-Thadoli line	80	77
29	132 kV S/C Swaimadhampur-Newai line	16	21
30	132 kV S/C Newai-Chaksu line	-29	-24
31	132 kV S/C Kishangarh (220 kV GSS)-Kishangarh (132 kV GSS) CKT-I	-69	-69
32	132 kV S/C Kishangarh (220 kV GSS)-Kishangarh (132 kV GSS) CKT-II	-24	-24
33	132 kV S/C Kishangarh (132 kV GSS)-Silora line	52	52
34	132 kV S/C Silora-Arain line	26	26
35	132 kV S/C Arain-Malpura line	20	20
36	132 kV S/C Malpura-Peeplu line	9	9
<b>E</b>	<b>Proposed System</b>		
37	160 MVA, 220/132 kV Transformer at 220 kV GSS Tonk	-	-
38	220 kV D/C Jaipur (South)-Chaksu line	-	-
39	220 kV D/C Jaipur (South)-Goner line	-	-
40	220 kV S/C Jaipur (South)-Dausa line	-	88
41	220 kV S/C Jaipur (South)-Swaimadhampur line	-	-44

42	220 kV S/C Jaipur (South)-Heerapura line	-	-
43	220 kV S/C Jaipur (South)-KTPS line	-	-
44	220 kV D/C Jaipur (South)-Tonk line	-	-
45	220 kV S/C KTPS-Tonk line	-	-
46	220 kV S/C Tonk-Heerapura line	-	-
47	132 kV S/C Tonk (220 kV GSS)-Chouth Ka Barwara line	-	-
48	132 kV S/C Tonk (220 kV GSS)-Tonk (220 kV GSS) line	-	-
49	132 kV D/C Tonk (220 kV GSS)-Uniyara line	-	-
50	132 kV S/C Todaraisingh-Malpura line	-	-
<b>F</b>	<b>Total System losses (MW)</b>	<b>1374.916</b>	<b>1372.544</b>
<b>G</b>	<b>Total saving in MW with respect to Base Case (MW)</b>	-	<b>2.366</b>
<b>H</b>	<b>Total saving in LU/ Annum wrt Base Case</b>	-	<b>89.537</b>

#### 4.4 Outcomes of Study

- In Proposed Case, total system losses have been reduced from **1374.916** MW to **1372.544** MW, thus saving of approximate **2.366** MW (**89.537** LUs/Annum) is envisaged in proposed case as compared to base case.
- Loading on the 220 kV S/C Swaimadhampur-Anta line is reduced by 16 MW in the proposed case.
- Loading on the 220 kV D/C Bassi (PG)-Dausa line is reduced by 8 MW in the proposed case.

#### 5 Conclusion

Based on the results of load flow study and technical feasibility received from the field, following transmission system is proposed for additional interconnections at PGCIL's 400 kV GSS Jaipur (south):-

- 38 km LILO of 220 kV S/C Dausa-Swaimadhampur line at PGCIL's 400 kV GSS Jaipur (South)

#### 6 Approval of WTD of RVPN

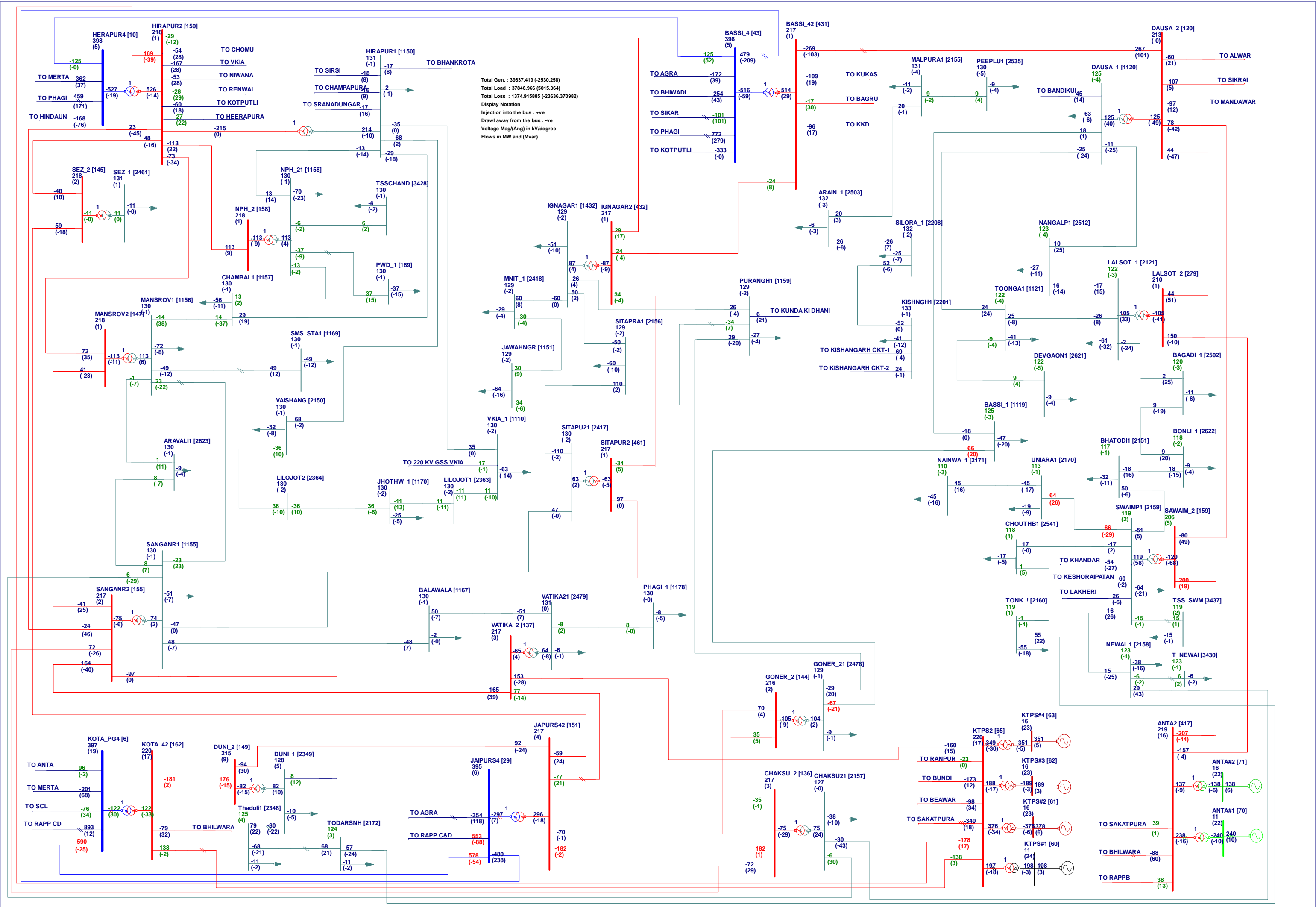
The proposed transmission system has been approved by WTD of RVPN on dated 21.07.2022 and accordingly administrative & financial sanction has been issued on dated 22.07.2022 at an estimated cost of Rs. 2832.59 lacs with IDC.

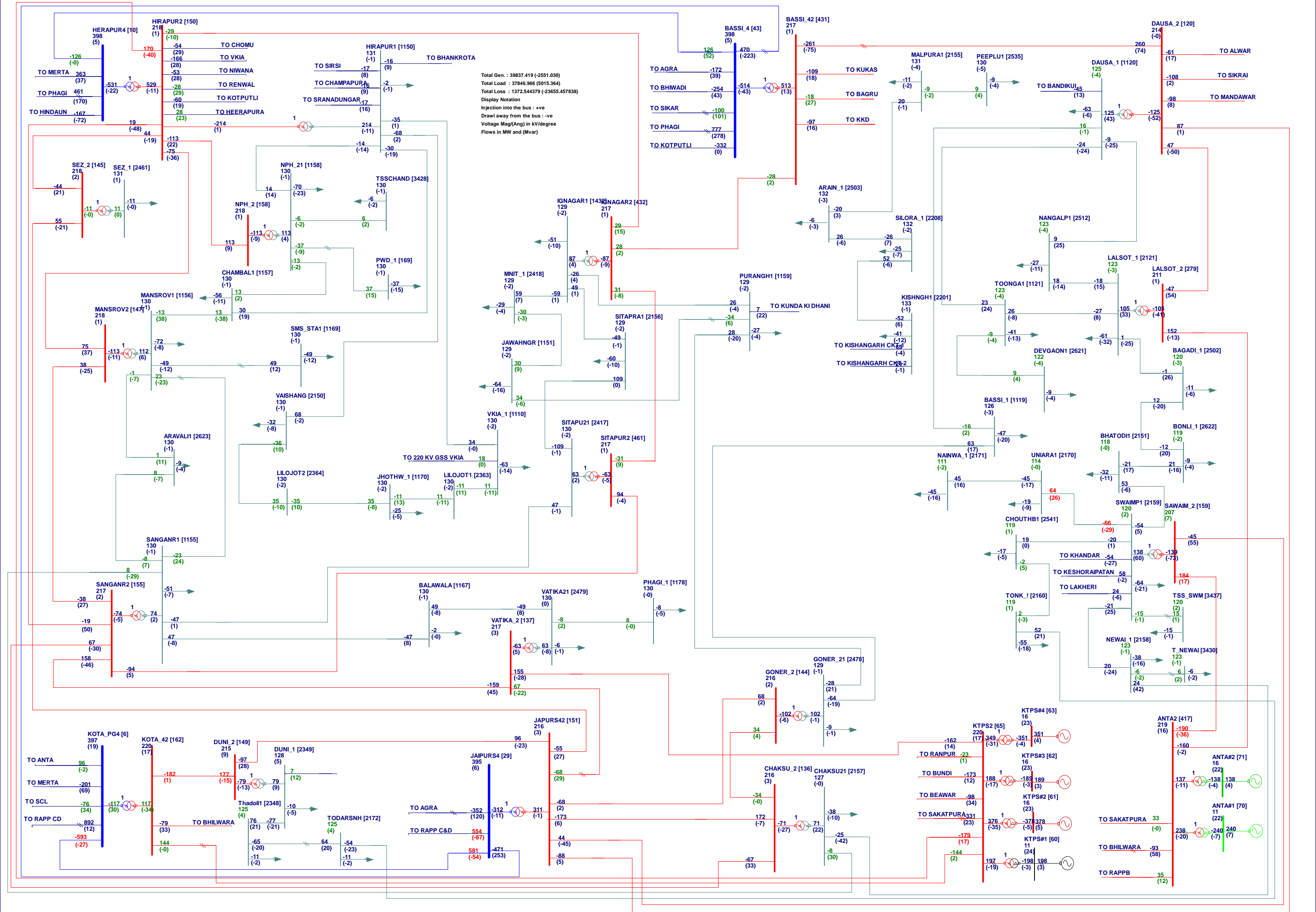
#### 7 Approval of CEA

The proposal for additional interconnections at PGCIL's 400 kV GSS Jaipur (south) was submitted to CEA for necessary approval vide RVPN's letter dated 18.08.2022. After detailed examination CEA commented on the proposal vide letter dated 16.11.2022 (Copy enclosed) which is detailed below:-

*"RVPN has intimated that M/s PGCIL has constructed 08 Nos. 220 kV Bays at Jaipur GSS for RVPN as per the norms approved in 23<sup>rd</sup> Standing Committee Meeting, out of which RVPN has already utilized 06Nos. 220 kV Bays. Remaining 02 Nos. 220 kV Bays would be utilized with the above proposal.*

*The above proposal is generally in order. However, as the above proposal involves interconnections with an existing ISTS element, therefore, the proposal needs to be deliberated with CTUIL and POSOCO."*







भारत सरकार

Government of India

विद्युत मंत्रालय

Ministry of Power

केन्द्रीय विद्युत प्राधिकरण

Central Electricity Authority

विद्युत प्रणाली योजना एवं मूल्यांकन-1 प्रभाग

Power System Planning &amp; Appraisal-I Division

सेवा में / To,

Chief Engineer (PP&D),  
RVPN, Vidyut Bhawan, Janpath,  
Jyoti Nagar,  
Jaipur- 302005

विषय /Subject: Intra State RE evacuation and system strengthening schemes proposed by  
RVPN

संदर्भ/ Reference:

- (i) RVPN letter no. RVPN/SE(P&P)/XEN-2(P&P)/AE-2/F/D 1002 dated 18.08.2022
- (ii) CEA email dated 09.09.2022, 19.09.2022 & 26.09.2022
- (iii) RVPN letter no. RVPN/SE(P&P)/XEN-2(P&P)/AE-2/F/D 1294 dated 29.09.2022

महोदय/ Sir,

RVPN vide letter under reference (i) dated 18.08.2022 has submitted proposal for Intra State RE evacuation and system strengthening schemes along with the load flow studies. CEA vide emails under reference (ii) has sought certain clarifications from RVPN which has been furnished by RVPN vide its letter dated 29.09.2022 under reference (iii). The proposal submitted by RVPN has been examined and CEA observations on the same are enclosed as Annexure I.

भवदीय / Yours faithfully,

मंजरी  
16/11/2022  
(मंजरी चतुर्वेदी/Manjari Chaturvedi)  
(निदेशक/ Director)



I/24510/2022

Annexure ICEA observations on the Intra State RE evacuation and system strengthening schemes proposed by RVPN**A. Proposals submitted by RVPN for Renewable Energy Evacuation in Western Rajasthan:****(i) 765 kV GSS Jaisalmer (New Location)**

- a) Establishment of 3x1500 MVA, 765/400 kV substation at Jaisalmer (New Location), 330 MVAR 765 kV bus reactor
- b) 5 nos of 400 kV Feeder bays for RE developers
- c) 765 kV Jaisalmer- Kankani D/c line with Hexa Zebra/ AL59 (Zebra Equivalent) conductor, 2x330 MVAR, 765 kV switchable line reactor on Jaisalmer end and 2x330 MVAR, 765 kV switchable line reactor on Jodhpur (Kankani) end. (225 km)
- d) 400 kV D/c Twin HTLS line between 400 kV GSS Jaisalmer-II to 765 kV GSS Jaisalmer (instead of 400 kV D/c Jaisalmer-II- Kankani line (HTLS)) (70 km)
- e) LILO of 400 kV D/C Ramgarh - Akal line at 765 kV GSS Jaisalmer (25 km)

CEA observations on the scheme:

- a) Above transmission system has been proposed by RVPN for evacuation of RE power from Ramgarh, Akal and Jaisalmer region.
- b) Based on the load flow studies, above system proposed by RVPN is generally in order. However, as the total RE potential envisaged at proposed Jaisalmer substation by the year 2025 is 1700 MW, less no of 400 kV feeder bays may be required initially for RE generation developers rather than proposed 5 nos 400 kV feeder bays. Also, as per the general practice adopted in ISTS planning, the provision of 220kV switchyard along with 400/220kV ICTs is kept at new substations specially in RE zones as few RE generators may likely to be connected at 220 kV level. This would further reduce the no. of 400 kV feeder bays. It is suggested that RVPN may keep space for envisaged 400 kV feeder bays, 200 kV feeder bays and 400/220 kV ICTs. Implementation may be carried out as per connectivity applications received.
- c) As the proposed length of 765 kV Jaisalmer- Kankani D/c line is 225 km only, provision of 330 MVAR line reactors on both the circuits at both the ends may make the line over compensated. It is suggested the same may be analysed and rating of the reactor may be accordingly reviewed, if required.

**(ii) 765/400 kV GSS Jodhpur (Kankani):**

Modified transmission system at 765/400 kV GSS Jodhpur (Kankani) is as under:

- a) 2x1500 MVA, 765/400 kV GSS by upgrading 400 kV GSS at Kankani (Jodhpur) to 765 kV GSS, 1x 330 MVAR 765 kV Bus Reactor.
- b) 765 kV D/C Jodhpur-Phagi line (Hex Zebra/ AL59 (Zebra equivalent) Conductor) with 2x330 MVAR switchable line reactors at Jodhpur end and 2x240 MVAR switchable line reactors at Phagi end of the line. (300 km)

CEA observations on the scheme:

In the 1<sup>st</sup> Meeting of NRPC (TP), proposal of upgradation of 400 kV Kankani (Jodhpur) substation was approved with 3x1500 MVA, 765/400 kV ICTs for evacuation of RE power from Barmer and Jaisalmer. However, as per the load flow

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studies, with the creation of 765 kV Jaisalmer (New) substation, power flow from RE generators from Jaisalmer area to Kankani (Jodhpur) substation would reduce and there may not be requirement of 3<sup>rd</sup> 765 kV/400 kV ICT at Kankani (Jodhpur). In view of this, above modified scheme for 765/400 kV GSS Jodhpur (Kankani) proposed by RVPN is generally in order.

**(iii) 400 kV GSS Bhadla (New Location) (with provision to be upgraded to 765 kV GSS in future)**

- a) 400 kV Switching Station at Bhadla (new) (upgradable to 765 kV GSS) and 1x125 MVAR 420 kV Bus Reactor.
- b) 5 nos. 400 kV feeder bays for RE developers.
- c) LILO of 400 kV S/C Bhadla-Merta line at 400 kV GSS Bhadla (new) (6 km) with 1x50 MVAR, 420 kV switchable line reactor at Bhadla (New) end of the line for Merta line.
- d) LILO of 400 kV S/C Bhadla-Jodhpur (Surpura) line at 400 kV GSS Bhadla (new) with 1x50 MVAR, 420 kV switchable line reactor at Bhadla (New) end of the line for Jodhpur (Surpura) line. (6 km)
- e) 765 kV D/C Bhadla (New)-Bikaner (New) line (180 km) with Hexa Zebra Conductor (initially to be charged on 400 kV voltage) with 2x330 MVAR, 765 kV switchable line reactors at Bhadla end and 2x330 MVAR, 765 kV switchable line reactors at Bikaner end.

**(iv) 400 kV GSS Bikaner (New Location) (With the provision to be upgraded to 765 kV GSS in future)**

- a) 400 kV Switching Station at Bikaner (New) (upgradable to 765 kV GSS), 125 MVAR 400 kV bus reactor. 5 nos. of 400 kV feeder bays for RE developers.
- b) LILO of both circuits of 400 kV D/C Suratgarh SCTPS-Bikaner line at 400 kV GSS Bikaner (New) with 4x50 MVAR switchable line reactor at 400 kV GSS Bikaner (New) end of the line (48 km).

CEA observations for proposals at S.No. (iii) and (iv):

- a) RVPN has intimated that 2000 MW solar park is to be set up in Bikaner and the solar generation expected to be commissioned at Bhadla (New) substation is 1000 MW by the year 2025. As per the load flow studies, considering the envisaged quantum of RE generation at Bhadla (New) and Bikaner (New) substations, the system proposed by RVPN is not adequate and the constraints observed in the evacuation were communicated by CEA to RVPN vide email dated 09.09.2022 vide which CEA had suggested to plan more number of outlets from Bikaner (New) substation.

RVPN vide letter dated 29.09.2022 has intimated that in the present load flow studies, they have envisaged only 1110 MW solar generation at Bikaner (New) substation by the year 2025 and with further addition of solar generations in Bikaner, 765 kV Bhadla (New) - Bikaner (New) – Babai - Alwar corridor for evacuation of RE power would be planned.

As per the load flow studies, system proposed by RVPN is adequate for evacuation of 1000 MW solar generation at Bhadla (New) and 1110 MW solar generation at

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Bikaner (New) substation. However, with 1110 solar generation at Bikaner (New), Bikaner (New) - Suratgarh SCTPS 400 kV D/c line becomes critically loaded under N-1 contingency with outage of one circuit. Therefore, any further injection of solar generation at Bikaner (New) substation in addition to 1110 MW would require the planning of additional outlets from Bikaner (New) substation.

- b) As the RE potential envisaged at proposed Bhadla (New) and Bikaner (New) substations by the year 2025 is 1000 MW and 1110 MW respectively, less no. of 400 kV feeder bays may be needed for RE developers rather than proposed 5 nos 400 kV feeder bays each at proposed Bhadla (New) and Bikaner (New) substations. Also, RVPN may keep provision for 220 kV voltage level at both the proposed substations as few RE generators may get connected at 220 kV level. This would further reduce the no of 400 kV feeder bays. RVPN may keep space for envisaged feeder bays. Implementation may be carried out as per connectivity applications received.
- d) As the proposed length of 765 kV D/C Bhadla (New)-Bikaner (New) line (initially to be charged at 400 kV) is 180 km only, provision of 330 MVAR line reactors on both the circuits at both the ends may make the line over compensated. It is suggested the same may be analysed and rating of the reactor may be accordingly reviewed, if required.

**(v) Uprating of existing Transmission Lines using HTLS conductors**

Following transmission lines are required to be up-rated using the HTLS conductor:

S. No.	Associated transmission Lines	Line Length (km)	Circuit kms
<b>A</b>	<b>220 kV LINES</b>		
1	220 kV D/C Bhawad-Bhopalgarh Line	46.6	93.2
2	220 kV S/C Bhopalgarh- Merta(400 kV) Line	56.89	56.89
3	220 kV S/C Tinwari-Jodhpur(400 kV) Line (First Circuit)	38.21	38.21
4	220 kV S/C Tinwari-Jodhpur(400 kV) Line (Second Circuit)	28.947	28.947
5	220 kV S/C Bap-Barsinghsar LTPS Line	142.2	142.2
6	220KV S/C Barsinghsar-Bikaner line	36	36
7	220KV S/C Jodhpur(New)- Pali line	61.8	61.8
8	220KV S/C Jodhpur (Surpura)-Bilara line	81.18	81.18
	<b>Total (A)</b>	<b>491.827</b>	<b>538.427</b>
<b>B</b>	<b>132 kV LINES</b>		
1	132 kV S/C Phalodi(220 kV) -PS(5) Line	8	8
2	132 kV S/C PS(5) -PS(4) Line	22	22
3	132 kV S/C PS(4) -PS(3) Line	12	12
4	132 kV S/C PS(2) -PS(1) Line	12	12
5	132 kV S/C PS(1) -Bajju Line	58	58
6	132 kV S/C Bajju-Kolayat Line	45.845	45.845
7	132 kV S/C Gajner-Bhinasar Line	39.97	39.97
8	132 kV S/C Gajner-Pugal Road Line	21.815	21.815
9	132 kV S/C Pugal Road-Bikaner(220 kV) Line	19.25	19.25
10	132 kV S/C Kolayat - Gajner Line	21.815	21.815
11	132 kV S/C Pokran-Dechu(220 kV) Line	41.754	41.754
	<b>Total (B)</b>	<b>302.449</b>	<b>302.449</b>

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	<b>Total (A+B)</b>	<b>794.276</b>	<b>840.876</b>
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Observations of CEA on the scheme:

As per the load flow studies submitted by RVPN, proposal for reconductoring of above lines with HTLS conductor is generally in order. Also, above transmission lines have already been approved for uprating in the 1<sup>st</sup> Meeting of Northern Regional Power Committee (Transmission Planning) held on 24.01.2020..

**(vi) Dynamic Reactive Compensation**

- a)  $\pm 300$ MVAR, 400 kV STATCOM at 765 kV GSS Jaisalmer
- b)  $\pm 300$ MVAR, 400 kV STATCOM at 400 kV GSS Bhadla (Existing)
- c)  $\pm 100$ MVAR, 220 kV STATCOM at 220 kV GSS Phalodi
- d)  $\pm 100$ MVAR, 220 kV STATCOM at 220 kV GSS Tinwari

CEA Observations on the scheme:

RVPN has submitted that GSS located in Solar/Wind energy zones viz. GSS Bhadla, GSS Phalodi, GSS Dechu, and GSS Tinwari are recording both low voltages under high RE generation and also high voltages during low RE generation and these voltage variations have occurred a number of times during the day/night hours. Therefore, RVPN has proposed STATCOMs to curb the dynamic voltage variations.

RVPN is requested to furnish the recent voltage profile of the above mentioned existing substations at which Statcom has been proposed i.e. Bhadla, Phalodi and Tinwani substations for the day on which maximum voltage variation has been observed till date.

**(vii) 220 kV GSS Sawa (New Location)**

- a) 1x160 MVA, 220/132 kV Power Transformer and 1x20/25 MVA, 132/33 kV Power Transformer and 25 MVAR, 245 kV Bus Reactor at 220 kV GSS Sawa (Proposed).
- b) 100 km 220 kV D/C line from 400 kV GSS Barmer to 220 kV GSS Sawa (Proposed).
- c) 5 km LILO of existing 132 kV S/C Sawa (132 kV GSS)-Chouhtan line at 220 kV GSS Sawa (Proposed).
- d) 5 km LILO of existing 132 kV S/C Sawa (132 kV GSS)-Ranasar line at 220 kV GSS Sawa (Proposed).
- e) 50 km LILO of 220kV S/C Dhorimanna-Sanchore line at 220 kV GSS Sawa (Proposed).

**(viii) 220 kV GSS Panchu (New Location):-**

- a) 220 kV GSS at Panchu with 1x160 MVA, 220/132 kV and 1x20/25 MVA, 132/33 kV Power Transformers and 25 MVAR, 245 kV Bus Reactor.
- b) LILO of existing 220 kV S/C BLTPS-Khinvsar line at 220 kV GSS Panchu (Proposed). (3 km)

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- c) 132 kV D/C line from 220 kV GSS Panchu (Proposed) to 132 kV GSS Panchu (Existing). (0.6 km)
- d) 132 kV D/C Panchu (220 kV GSS)-Bhamatsar line (28 km)

**(ix) 220 kV GSS Lohawat (New Location):-**

- a) 220 kV GSS at Lohawat with 1x160 MVA, 220/132 kV and 1x40/50 MVA, 132/33 kV Power Transformers and 25 MVAR, 245 kV Bus Reactor.
- b) 70 km 220 kV D/C HTLS Transmission line from 220 kV GSS Badisid to 220 kV GSS Lohawat (Proposed).
- c) 10 km LILO of 220 kV Phalodi-Tinwari line at 220 kV GSS Lohawat (Proposed).
- d) 10 km 132 kV D/C line from 220 kV GSS Lohawat (Proposed) to 132 kV GSS Lohawat (Existing).
- e) 35 km 132 kV D/C line from 220 kV GSS Lohawat (Proposed) to 132 kV GSS Matora.

**(x) New EHV Lines/ Circuits**

- a) 220 kV S/C line from 220 kV GSS Dechu to 220 kV GSS Tinwari (72 km)
- b) stringing of second circuit of 132 kV S/C Bhadla-Khetusar line on D/C towers with construction of 01 nos. terminal bay Khetusar. (28 km)

**(xi) Transformer Augmentations**

- a) 1x500 MVA, 400/220 kV Bhadla
- b) 1x500 MVA, 400/220 kV Ramgarh
- c) 3x500 MVA, 400/220 kV Jaisalmer-II

**(xii) Static Reactive Compensation**

Following static reactors provided in table have been proposed reactive compensation for voltage regulation:-

Locations of Static Reactors

S. No.	Name of GSS	Capacity of Shunt Reactor in MVAR
1	765 kV GSS Anta	240
		125
2	400 kV GSS Heerapura	125
3	400 kV GSS Ajmer	125
4	400 kV GSS Bhilwara	125
5	400 kV GSS Babai	125
6	400 kV GSS Chhitorgarh	125
7	400 kV GSS Jodhpur(Existing)	125
8	400 kV GSS Barmer	125
	<b>Total (765 kV)</b>	<b>240 MVAR</b>
	<b>Total (400 kV)</b>	<b>8x125 MVAR</b>

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**(xiii) Power flow Control Device/ Solution**

Power flow control devices with degree of compensation for each device/solution equal to 45MVAR (at 245 kV) are proposed on the following transmission lines:

- a) 220 kV S/C Bhadla-Bap line
- b) 220 kV S/C Bhadla-Badisid line

**CEA observations on proposals at S.No. (vii), (viii), (ix), (x), (xi), (xii) and (xiii):**

Above schemes proposed by RVPN at Sl. No. (vii), (viii), (ix), (x), (xi), (xii) and (xiii) have already been approved in the 1<sup>st</sup> Meeting of Northern Regional Power Committee (Transmission Planning) held on 24.01.2020 and seems to be in order as per the revised studies also.

**(xiv) Transmission Schemes proposed for deletion:**

Following schemes approved in the 1<sup>st</sup> Meeting of Northern Regional Power Committee (Transmission Planning) held on 24.01.2020 have been proposed by RVPN to be deleted:

- a) 38 km 132 kV D/C Khetusar-Ajarar line
- b) 400 kV GSS Pokaran and Associated Transmission System
  - 400 kV GSS Pokaran with 2 X 500 MVA 400/220 kV Transformer, 2 x160 MVA 220/132 kV Transformer, 2 x 50 MVAR 400 kV Switchable Line Reactor, 1 x 125 MVAR 400 kV Bus Reactor and 1 x 25 MVAR 220 kV Bus Reactor.
  - 150 km 400 kV D/C Twin HTLS Line between proposed 400 kV GSS Pokaran and proposed 765/400 kV GSS Jodhpur
  - 25 km LILO of 220 kV S/C Ramgarh- Dechu Line at 400 kV GSS Pokaran
  - 25 km LILO of 220 kV S/C Amarsagar- Dechu Line at 400 kV GSS Pokaran
  - 30 km LILO of 132 kV S/C Chandan- Pokaran (132 kV GSS) Line at 400 kV GSS Pokaran
- c) 220 kV GSS Sanwreej and Associated Transmission System
  - 220 kV GSS with 1 x 160 MVA 220/132 kV Transformer at proposed 220 kV GSS Sanwreej, 25 MVAR 245 kV Reactor
  - 2 x 132 V Bay at 132 kV GSS Nathrau
  - 30 km 220 kV D/C 400 kV GSS Pokaran-220 kV GSS Sanwareej line
  - 38 km 132 kV D/C Sanwareej-Nathrau Line

**CEA observations:**

400 kV GSS Pokaran was planned for evacuation of RE Power in the region. However, since no RE connectivity has been received at 400 kV GSS Pokaran, RVPN has proposed to drop the proposal of Pokaran substation along with associated transmission lines. Also, Sanwareej substation was proposed to be radially connected to Pokaran GSS. Therefore, it is also proposed to be dropped.

The above proposal submitted by RVPN for deletion of schemes is generally in order.

**(xv) Dynamic Compensation proposal for deletion:**

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Following TCRs are recommended to be deleted as STATCOM have been considered for the dynamic compensation:-

**Table 25** Locations of Dynamic Reactors

S. No.	Name of 400 kV GSS	Capacity of TCR in MVAR
1	400KV GSS Merta	300
2	400KV GSS Bikaner	300
3	400KV GSS Bhadla	300
4	400KV GSS Jaisalmer-2	300
	<b>Total</b>	<b>1200 MVAR (4x300 MVAR )</b>

CEA observations:

As Statcoms have been proposed at various substations, above proposal submitted by RVPN for deletion of approved TCRs is generally in order.

**B. Creation of 400 kV GSS Pachpadra to meet the load demand of 350 MW of M/s HRRL for Refinery at Pachpadra**

- 2x500 MVA, 400/220 kV GSS at Pachpadra, District-Barmer, 1x125 MVAR, 420 kV Bus Reactor.
- 35 km LILO of 400 kV S/C Rajwest-LTPS line at 400 kV GSS Pachpadra (Proposed).
- 10 km LILO of 220 kV S/C Balotra-Boranada line at 400 kV GSS Pachpadra (Proposed).
- 3 km LILO of already constructed 220 kV S/C Balotra-HRRL line at 400 kV GSS Pachpadra (Proposed).
- 28 km 220 kV 2xS/C lines [on D/C towers] from proposed 400 kV GSS Pachpadra to M/s HRRL.

CEA observations on the scheme:

As the proposed transmission scheme would provide reliable power supply to M/s HRRL refinery, above proposal is generally in order and also as no other 400 kV substation exists in the nearby areas, the proposed 400 kV substation would act as a strong source for the connected 220 kV substations.

**C. Creation of 400 kV GSS at Udaipur (New Location), District-Udaipur and 220 kV GSS at Dungarpur, District-Dungarpur**

- 2x500 MVA, 400/220 kV Power Transformer, 125 MVAR 420 kV bus Reactor at proposed 400 kV GSS Udaipur(District-Udaipur).
- LILO of one circuit of 400 kV D/C Chittorgarh-Bhilwara line (Twin Moose) at 400 kV GSS Udaipur (Proposed) with 2x50 MVAR, 420 kV switchable line reactors on both circuits at Udaipur end (90km)
- LILO of 220 kV S/C Debari-Amberi line at 400 kV GSS Udaipur (Proposed). (2.5 km)
- LILO of 220 kV S/C Madri-Banswara line at 400 kV GSS Udaipur (Proposed). (11 km)

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- e) 1x160 MVA, 220/132 kV Power Transformer and 31.5 MVA 132/33 kV Power transformer at proposed 220 kV GSS Dungarpur (District-Dungarpur) at New Location.
- f) 220 kV D/C Udaipur (400 kV GSS)-Dungarpur line (102 km)
- g) LILO of one circuit of proposed 220 kV D/C Udaipur (400 kV GSS)-Dungarpur line at 220 kV GSS Aspur (15 km)
- h) LILO of 132 kV S/C Dungarpur (132 kV GSS)-Sagwara line at 220 kV GSS Dungarpur (Proposed) (14 km)
- i) 132 kV D/C line from 220 kV GSS Dungarpur to a diversion point for 132 kV GSS Bichhiwara and 132 kV GSS Semmalwara. Both circuits of this line will be extended to these GSSs using 132 kV S/C lines (14 km).
- j) 132 kV S/C line from diversion point to 132 kV GSS Bicchiwara line (26 km).
- k) 132 kV S/C line from diversion point to 132 kV GSS Seemalwara line (30 km).

CEA observations on the scheme:

Though as per the studies, no constraints are observed with LILO of one circuit of 400 kV D/C Chittorgarh-Bhilwara line (Twin Moose) at 400 kV GSS Udaipur (Proposed). However, considering the LILO length (i.e. 90 km), it is suggested that RVPN may explore the possibility of LILO of Kankroli- Chittorgarh 400 kV S/c line at Udaipur, instead of LILO of one circuit of Chittorgarh- Bhilwara 400 kV D/c line at proposed Udaipur substation. With this, the LILO length would be reduced and would also help in utilization of an existing ISTS transmission line. RVPN may carry out the load flow studies based on the feasibility for the same and may furnish its observations to CEA. Accordingly, the proposal would be discussed with CTUIL and POSOCO.

**D. Additional interconnections at PGCIL's 400 kV GSS Jaipur (south):**

- a) 38 km LILO of 220 kV S/C Dausa-Swaimadhpor line at PGCIL's 400 kV GSS Jaipur (South).

CEA observations on the scheme:

RVPN has intimated that M/s PGCIL has constructed 08 Nos. 220 kV bays at Jaipur GSS for RVPN as per the norms approved in 23<sup>rd</sup> Standing Committee Meeting, out of which RVPN has already utilized 06 Nos. 220 kV Bays. Remaining 02 Nos. 220 kV bays would be utilized with the above proposal.

The above proposal is generally in order. However, as the above proposal involves interconnection with an existing ISTS element, therefore, the proposal needs to be deliberated with CTUIL and POSOCO.

**E. Based on the analysis of recorded peak loads, RVPN has proposed following 400/220 kV ICT augmentations to make the existing 400/220kV ICTs N-1 compliant:-**

- a) 500 MVA, 400/220kV ICT (3<sup>rd</sup>) at 400 kV GSS Ajmer
- b) 500 MVA, 400/220kV ICT (3<sup>rd</sup>) at 400 kV GSS Jodhpur (Surpura)
- c) 500 MVA, 400/220kV ICT (3<sup>rd</sup>) at 400 kV GSS Merta
- d) 315 MVA, 400/220kV ICT (3<sup>rd</sup>) at 400 kV GSS Chittorgarh
- e) 315 MVA, 400/220kV ICT (3<sup>rd</sup>) at 400 kV GSS Babai
- f) 500 MVA, 400/220 kV ICT (3<sup>rd</sup>) at 400 kV GSS Bikaner



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g)500 MVA, 400/220 kV ICT (3<sup>rd</sup>) at 400 kV GSS Hindaun

CEA observations on the scheme:

As the recorded peak loading in ICTs is already high at the substations mentioned above, therefore, above proposal of ICT augmentation at various substations is generally in order. However, keeping in view the present ICT loading and future load growth, it is suggested that instead of 315 MVA ICTs, 500 MVA ICTs may be planned at Chittorgarh and Babai substations also as the cost difference between 500 MVA and 315 MVA ICT is marginal.

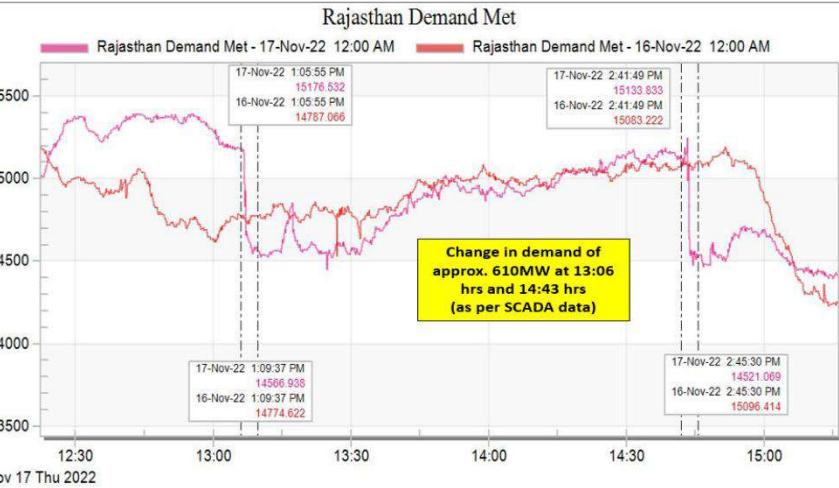
# N-1 violation of 400/220kV ICTs at RVPN S/s

Annexure - VI

400/220 kV Sub-Station Name	Transformation Capacity (MVA)/ No. of ICTs	N-1 Loading limit (MW)	Loading (MW) observed during Nov'22	Remarks	SPS status
<b>Chittorgarh</b>	2*315	410	<b>550-600</b>	315 MVA ICT to be installed at Chittorgarh (RS) is to be diverted from Kalisindh TPS. The likely timeline of completion is Nov'23	implemented
<b>Merta</b>	2*315	420	450-530	New 1*500MVA ICT is under implementation at 400/220kV Merta S/s by RVPNL. Tentative timeline for completion may be updated by RVPNL.	implemented
<b>Bikaner</b>	2*315	440	450-550	New 1*500MVA ICT is under implementation at 400/220kV Bikaner S/s by RVPNL. Tentative timeline for completion may be updated by RVPNL.	Not implemented
<b>Ajmer</b>	2*315	460	<b>550-600</b>	New 1*500MVA ICT is under implementation at 400/220kV Ajmer S/s by RVPNL. Tentative timeline for completion may be updated by RVPNL.	implemented
<b>Jodhpur</b>	2*315	440	400-450	New 1*500MVA ICT is under implementation at 400/220kV Jodhpur S/s by RVPNL. Tentative timeline for completion may be updated by RVPNL.	implemented
<b>Hindaun</b>	2*315	390	400-480	LILO of 400kV Agra-Sikar is pending at RVPNL end. Tentative timeline for completion and any ICT augmentation may be updated by RVPNL.	Not implemented
<b>Bhilwara</b>	315 + 500	490	500-550	RVPNL may provide update	Not implemented

# Prolonged issue at 400/220kV Hindaun and Alwar S/s

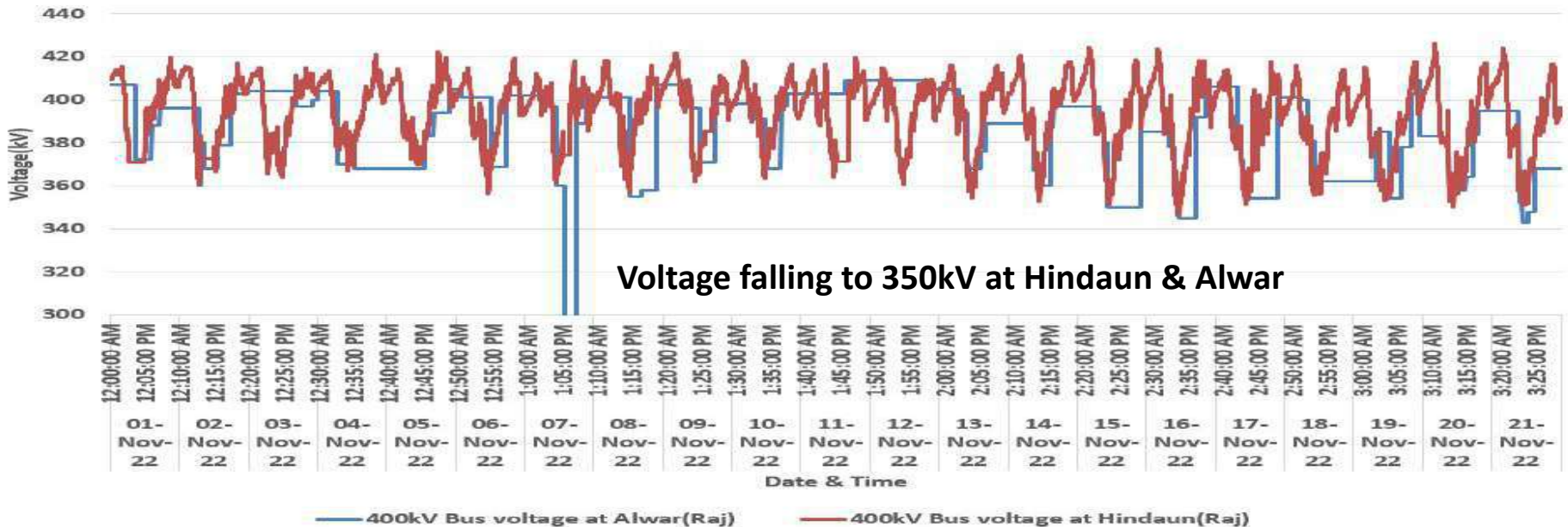
**Rajasthan demand during the event at 13:06hrs & 14:33hrs on 17<sup>th</sup> Nov 2022**



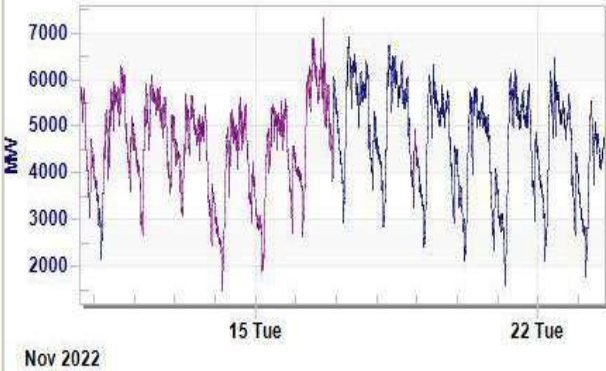
## Grid Disturbances during previous years:

- On 22nd December 2021 at 07:27 hrs:
  - Multiple elements tripping at 400/220kV Hindaun & Alwar (Raj)
  - Approx. load loss in Rajasthan control area: 600MW
- On 03rd November 2020 at 12:10 hrs:
  - Multiple elements tripping at 400/220kV Hindaun(Raj)
  - Approx. load loss in Rajasthan control area: 630MW

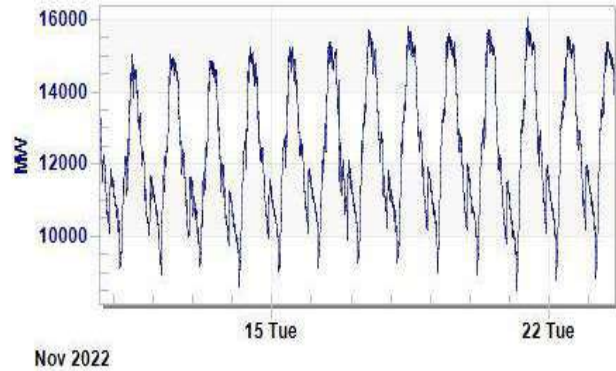
**400kV Bus voltage at 400/220kV Alwar & Hindaun(Rajasthan) during 01st-21st Nov 2022**



**Rajasthan import**

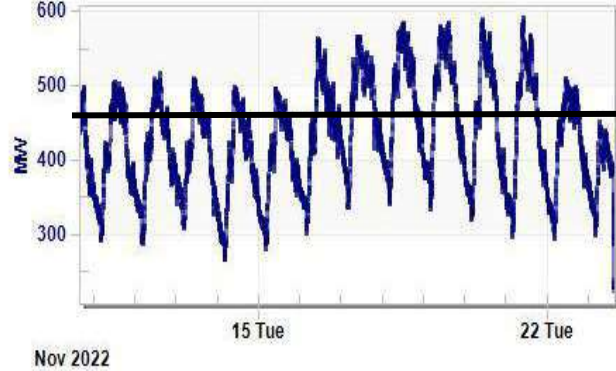


**Rajasthan Load**



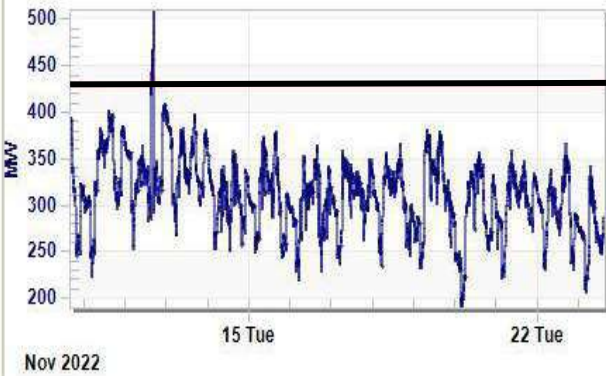
**Ajmer ICT loading**

**2\*315 MVA**



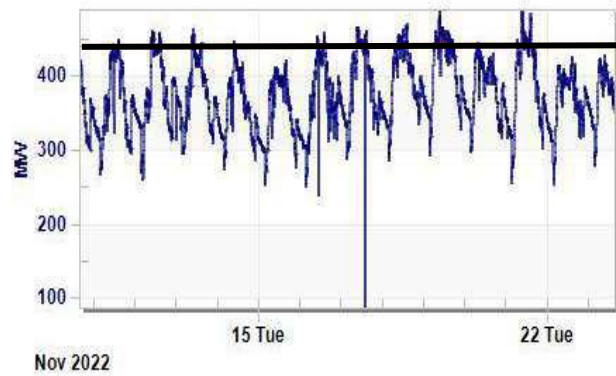
**Jodhpur ICT loading**

**2\*315 MVA**



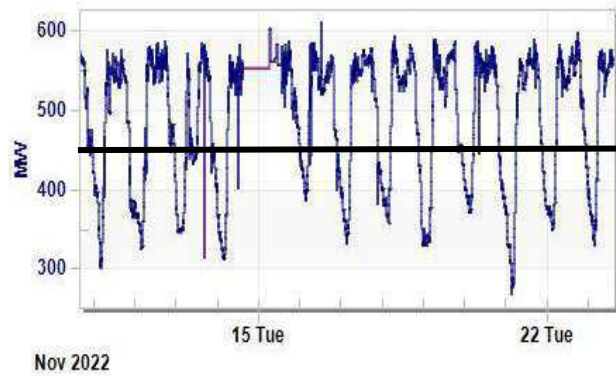
**Merta ICT loading**

**2\*315 MVA**



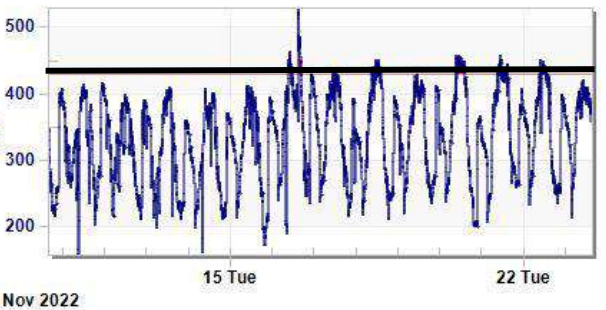
**Chittorgarh ICT loading**

**2\*315 MVA**



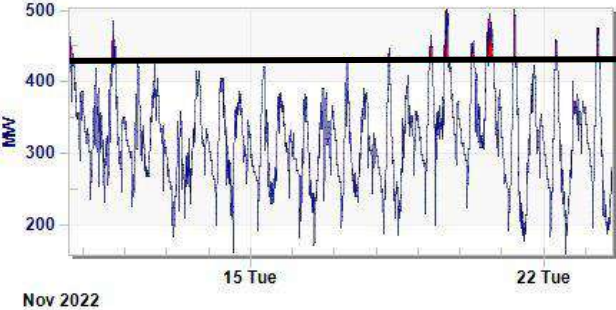
**Bhinmal ICT loading**

**2\*315 MVA**



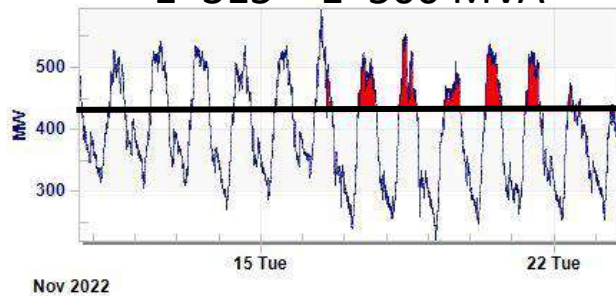
**Bikaner ICT loading**

**2\*315 MVA**

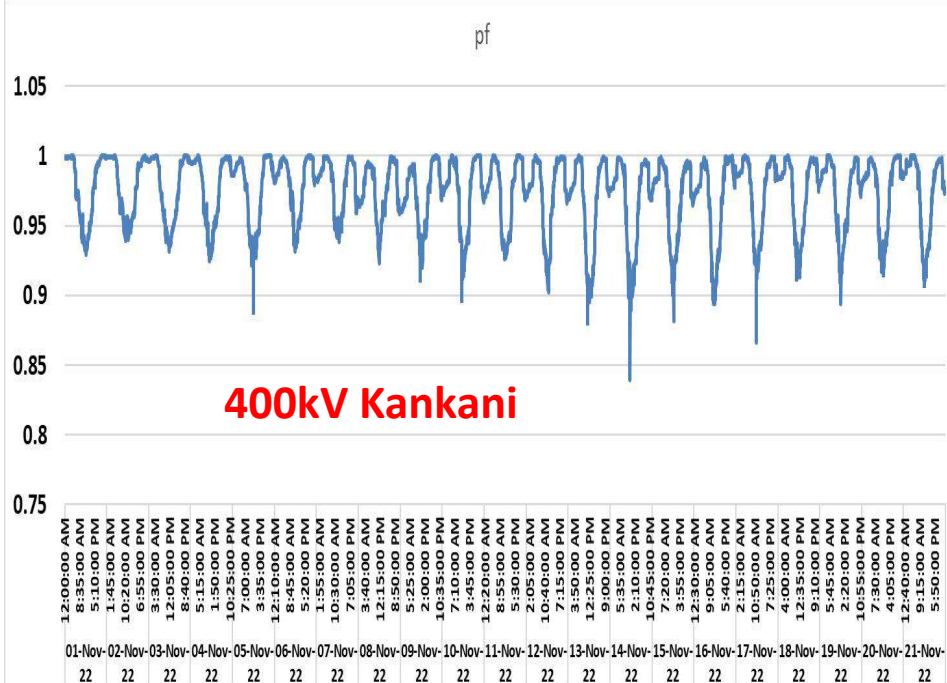
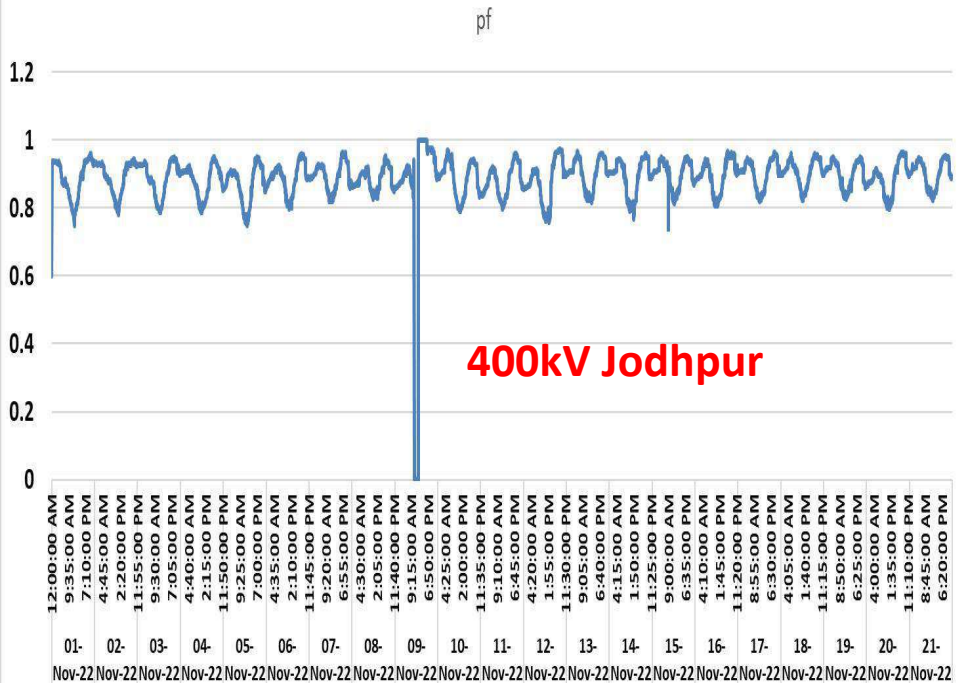
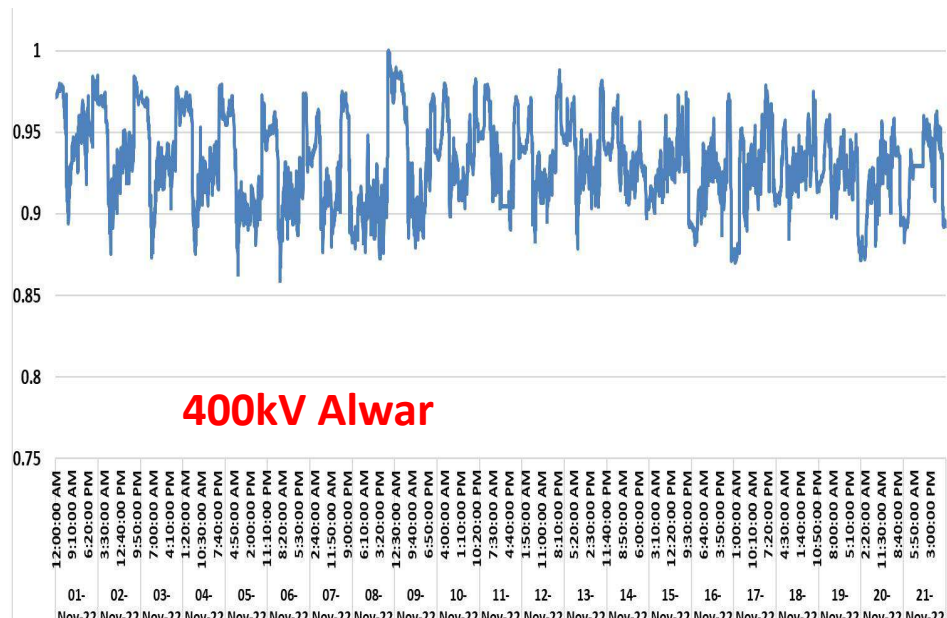
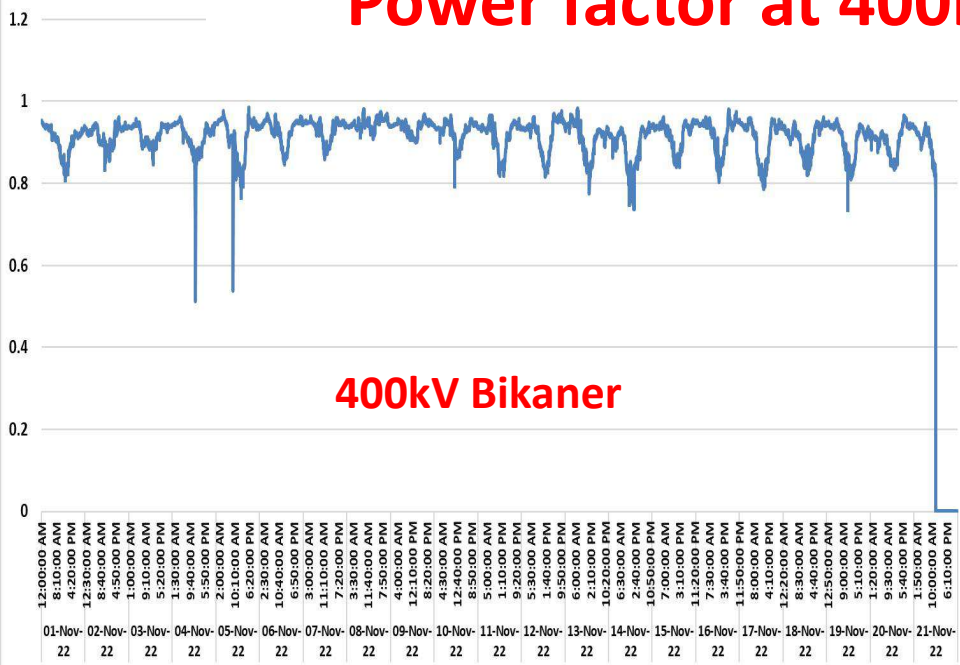


**Bhilwara ICT loading**

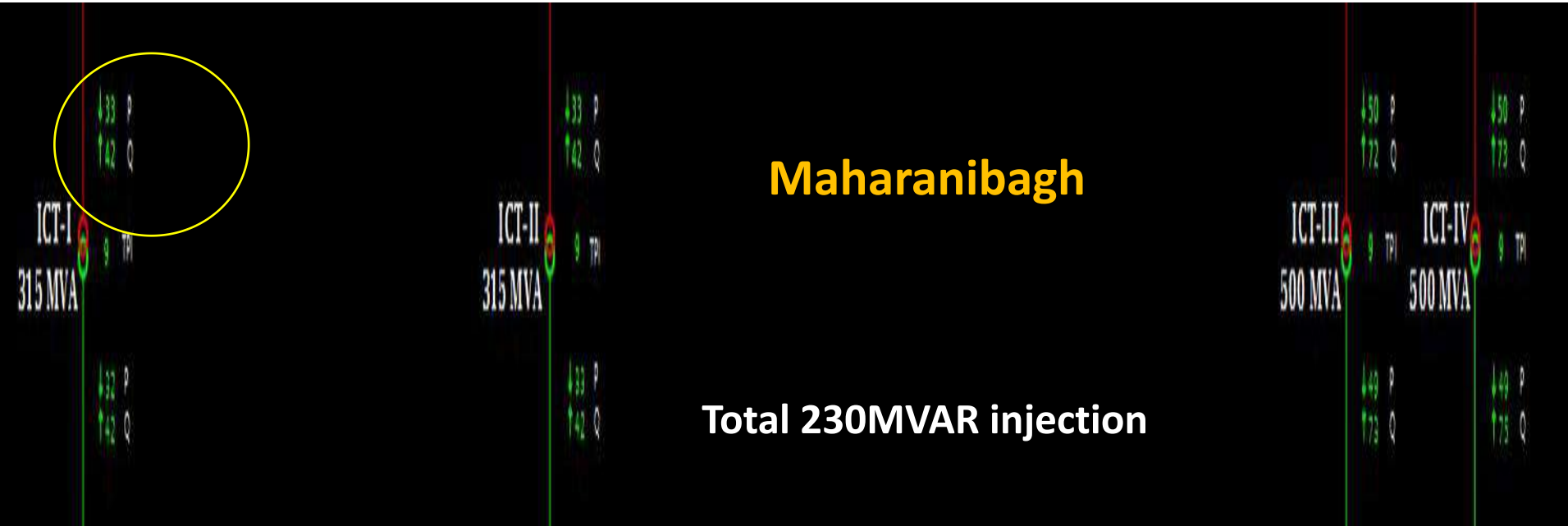
**1\*315 + 1\*500 MVA**



# Power factor at 400kV stations – Nov'2022



# MVAR injection from 220kV to 400kV (28.11.2022 @03.00hrs )



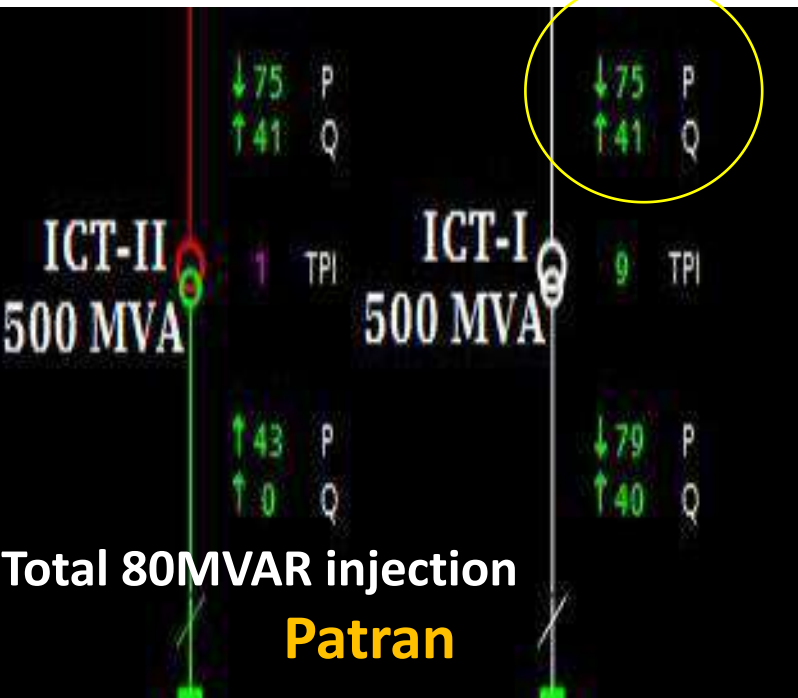
## Mandola

Total 120MVAR injection



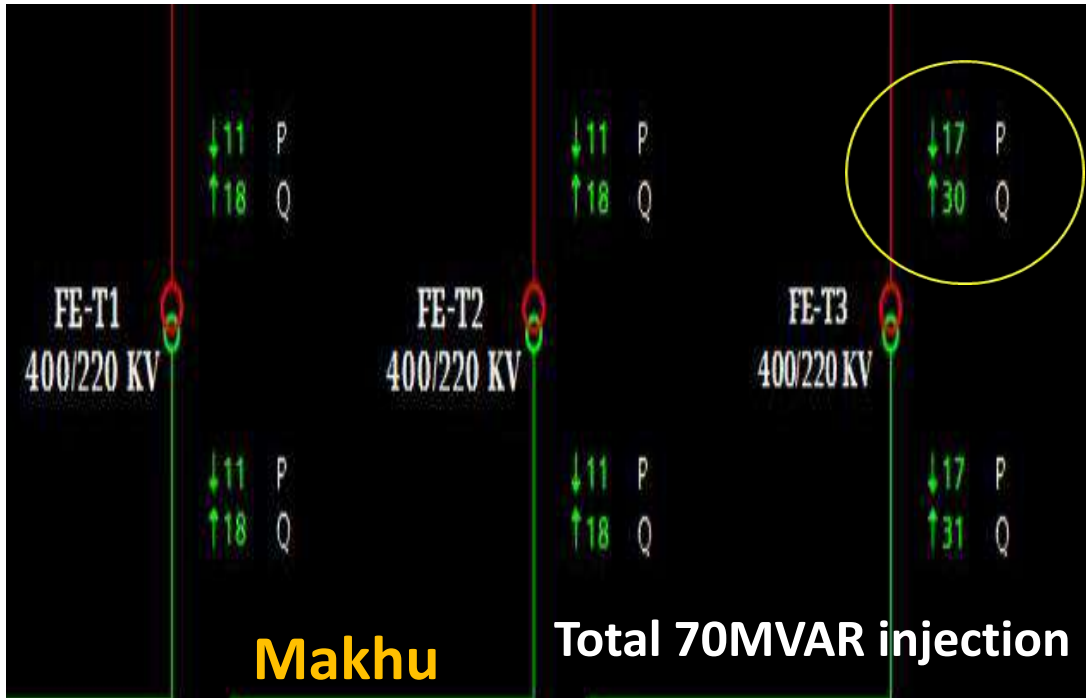
Total 90MVAR injection

## Sohna Road



Total 80MVAR injection

## Patran



Total 70MVAR injection

## Makhu