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

दिनांक: 21 जून, 2024

सेवा में / To,

एनआरपीसी एवं टीसीसी के सभी सदस्य एवं विशेष आमंत्रित **(**संलग्न सूचीनुसार**)**
Members of NRPC & TCC & Special Invitees (As per List)

विषय: उत्तर क्षेत्रीय विद्युत समिति की 74 वीं बैठक और तकनीकी समन्वय समिति (टीसीसी) की 50 वीं बैठक की अतिरिक्त कार्यसूची के संदर्भ में।

Subject: Additional agenda for 74th Northern Regional Power Committee (NRPC) & 50th Technical Co-ordination Committee (TCC)-reg.

महोदय / महोदया,

उत्तरी क्षेत्रीय विद्युत समिति (एनआरपीसी) की **तकनीकी समन्वय समिति (टीसीसी) की 50 वीं बैठक 28.06.2024 (सुबह 10:00 बजे) रायपुर, छत्तीसगढ़ में होगी।** उत्तरी क्षेत्रीय विद्युत समिति (एनआरपीसी) की **74 वीं बैठक 29.06.2024 (सुबह 10:00 बजे)** को उसी स्थान पर आयोजित की जाएगी। **बैठक की अतिरिक्त कार्यसूची संलग्न है।**

यह अनुरोध किया जाता है कि प्रतिभागी एनआरपीसी सचिवालय को अपनी यात्रा का विवरण (नाम, मोबाइल नंबर, यात्रा की रीति सहित) **seo-nrpc@nic.in** पर दिनाँक **23.06.2024** तक सूचित कर सकते हैं।

The 50th meeting of Technical Co-ordination Committee (TCC) will be held on **28.06.2024 (10:00 AM) at Raipur, Chhattisgarh.** The 74th meeting of Northern Regional Power Committee (NRPC) will be held on **29.06.2024 (10:00 AM) at same place. Additional agenda for the above meetings is attached.**

It is requested that participants may intimate their travel details (Name, Mobile No., Travel Mode etc.) to NRPC Secretariat at **seo-nrpc@nic.in latest by 23.06.2024.**

इसे सदस्य सचिव, एनआरपीसी के अनुमोदन से जारी किया जाता है।
This issues with approval of Member Secretary, NRPC.

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भवदीय
Yours faithfully

Signed by Dharmendra Kumar Meena
Date: 21-06-2024 16:53:10

(डी. के. मीना)
(D. K. Meena)
अधीक्षण अभियंता
Superintending Engineer

Copy to:
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सत्यमेव जयते

उत्तर क्षेत्रीय विद्युत समिति

NORTHERN REGIONAL POWER COMMITTEE

Additional agenda of the

50th meeting of

Technical Co-ordination Committee &

74th meeting of

Northern Regional Power Committee

Date: 28th & 29th June 2024

Time: 10:00 AM

Venue: Raipur, Chhattisgarh

Contents

AA. Additional agenda for TCC meeting

AA.1 Tapping Tertiary of 765/400/33 kV ICT -2 for Reliable Auxiliary Power Supply to ±500kV HVDC Ballia Sub-Station (agenda by POWERGRID)

AA.1.1 The 765/400/132kV HVAC & ±500kV HVDC Ballia Substation is one of the important UHV sub-station of POWERGRID which connects NR and ER region. Due to presence of ±500 kV 2500 MW Ballia-Bhiwadi HVDC Bipole system, the reliable auxiliary power requirement is very essential.

AA.1.2 Presently two auxiliary supplies have been provisioned at Ballia for HVDC and HVAC system. One is from tertiary of 200 MVA,400/132 KV ICT and another is UPPTCL feeder at 33 KV Levels.

AA.1.3 400/132/33 KV, 200 MVA ICT is feeding 02 no. 132 KV Transmission Lines of UPPTCL connected to UPPTCL Sub-Station. In past, approximately 673 no. of faults were detected in UPPTCL lines from August'23 to Oct'23. Considering large number of faults fed by this Transformer in past, the life of this ICT and its reliability has been seriously affected. After deliberation in 213th OCC meeting, UPPTCL has taken corrective measures and fault detection came down up to 200 no. in last 04 months, which is also a big number.

AA.1.4 33kV auxiliary supply from dedicated UPPCL feeder is also not reliable and sometimes it fails 3-4 times in a month and outage duration in number of cases is more than 12 Hrs. Due to frequent breakdowns of UPPCL supply, the auxiliary Power Supply changeover occurs multiple times and leads more stress on HVDC equipment like CB, Valve cooling pumps and UPS by-pass operation which is undesirable.

AA.1.5 Generally, to avoid this situation, HVDC stations have provision for auxiliary supply from tertiary of the two independent ICTs and dedicated feeders from generating plants. In case of Ballia, same is not available.

AA.1.6 Now, the Tertiary supply from 765kV ICT is necessitated for reliable sources to HVDC and HVAC Auxiliary Power Supply. Same was also discussed in 213th & 215th OCC meeting and a committee was formed to review the need of additional source of Auxiliary Power connectivity from tertiary of 765/400/33 KV ICT-2 for reliable auxiliary supply to HVDC Ballia Sub-Station.

AA.1.7 Accordingly, a meeting on Tapping Tertiary of 765/400/33 kV ICT -2 for Reliable Auxiliary Power Supply to ±500kV HVDC Ballia Sub-Station was held on 29.04.24 on virtual mode. The meeting was chaired by GM, NRLDC and attended by POWERGRID, CTUIL & UPPTCL representatives.

AA.1.8 Based on the brief discussion held during the meeting and in light of attached MoM (**Annexure-A**), committee recommended that additional source of Auxiliary Power connectivity from tertiary of 765/400/33 KV ICT-2 is required for reliable auxiliary supply to HVDC Ballia Sub-Station and can be approved with approximate cost estimate of Rs.**1.25 Cr** under ADD-Cap.

AA.1.9 Matter was already discussed in 220th OCC meeting held on 19.06.24 and forum agreed for connectivity of additional source of Auxiliary Power from tertiary of 765/400/33 KV ICT-2 in view to reliable auxiliary supply to HVDC Ballia Sub-Station and with approximate cost estimate of Rs.1.25 Cr under ADD-Cap.

Decision required from Forum:

Forum may deliberate and consider to accord approval for tapping tertiary of 765/400/33kV ICT -2 for reliable auxiliary power supply to ±500kV HVDC Ballia Sub-Station under ADD-CAP.

AA.2 Off-load 400 kV Bus Split arrangement at 400/220 kV Maharanibagh Substation (agenda by POWERGRID)

AA.2.1 Maharanibagh GIS Substation, a critical component of Delhi's power infrastructure, faces operational challenges due to its Double Main Bus Bar setup, leading to frequent and prolonged shutdowns for maintenance.

AA.2.2 In the past four years, the 400 kV GIS at Maharanibagh Substation has undergone three complete shutdowns, each lasting 5-14 days, to resolve defects occurring between the circuit breaker compartment and the Bus Bar. In February 2018, the complete substation was in shutdown for 14 days continuously.

AA.2.3 In August 2023, an issue observed in gas-tight insulator inside the 400 kV Bus Bar-2, near Hyosung GIS Bay – 407 (Transformer-4), necessitating a 4-day shutdown of both 400 kV Bus Bars. This led to a complete interruption of power flow from the 400 kV side.

AA.2.4 Recent incidents, as mentioned above, highlight the urgent need for a sustainable solution to ensure uninterrupted power supply. To address this, a proposal for a 400 kV Bus Bar splitting arrangement between ABB and Hyosung GIS has been put

forward. This arrangement aims to mitigate the risk of complete station shutdowns by allowing the disconnection of faulty segments while maintaining continuous power flow through the healthy side of the Bus Bar.

AA.2.5 Technical feasibility has been assessed, and the financial implications, is approximately 8.7 Cr (Expenditure booking under Add Cap block 2024-2029).

AA.2.6 The agenda was discussed in 219th OCC held on 15.05.2024, wherein, MS NRPC suggested to constitute a committee comprising members from NRLDC, CTU, DTL, HVPNL and UPPCL under chairmanship of Superintending Engineer (Operation), NRPC to visit 400/220 kV Maharanibagh Substation and submit report. Extracts of minutes are attached as **Annexure-B**.

AA.2.7 Subsequently, nominations were sought by NRPC secretariat vide letter dated 17.5.2024 **(Annexure-C)** for constitution of committee.

AA.2.8 Accordingly, constituted committee visited Maharanibagh substation on 12.06.2024 and the same was discussed in the 220th OCC held on 19.06.2024, the proposal was further agreed by OCC forum.

AA.2.9 In view of above, Off-load 400 kV Bus Split arrangement at 400/220 kV Maharanibagh Substation is put up for approval of NRPC forum under ADD-CAP.

Decision required from Forum:

Forum may deliberate and accord approval for the Off-load 400 kV Bus Split arrangement at 400/220 kV Maharanibagh Substation under ADD-CAP.

AA.3 Transmission system for evacuation of power from Rajasthan REZ Ph-V (Part-1 :4 GW) [Sirohi/Nagaur] Complex (agenda by CTUIL)

AA.3.1 System Study for evolution of the proposal was discussed and agreed in the 30th CMETS-NR meeting held on 18.06.24 (Minutes of meeting awaited).

AA.3.2 The estimated cost is **Rs. 5525 Cr**. In which, **NR** Portion is **Rs 3400 Cr**. and WR Portion is Rs 2125 Cr.

AA.3.3 The detailed scheme for transmission system for evacuation of power from Rajasthan REZ Ph-V (Part-1 :4 GW) [Sirohi/Nagaur] Complex is attached as **Annexure-D.**

Decision required from Forum:

Forum may deliberate on above proposal of CTU and may approve accordingly.

AA.4 Optic Fiber connectivity for New Building of NLDC located at "Grand Rue" Ayur Vigyan Nagar, August Kranti Marg, New Delhi (agenda by CTUIL)

AA.4.1 Grid-India vide their letter dated 25.04.24 (copy attached at **Annexure-E**) has requested CTU for planning of fiber optic connectivity to their new building of National Load Dispatch Centre (NLDC) located at “Grand Rue” Ayur Vigyan Nagar, August Kranti Marg, New Delhi. Accordingly, a meeting was convened by CTU on 06.05.2024 to understand the actual requirement of Grid-India for connectivity of New building (MoM attached at **Annexure-F**).

AA.4.2 During the meeting, Grid-India stated that they are planning to start NLDC operations from the new building at August Kranti Marg by 31st Oct’ 2024. In this regard dedicated and redundant Optical Fibre connectivity from ULDC network is required for successful operation of NLDC from new Building. Further, they also mentioned that additional links of POWERTEL may also be required for redundancy of the communication network to NLDC.

AA.4.3 In the meeting, POWERGRID informed that temporary connectivity can be provided by utilisation of POWERTEL fibres (third party leased fibres) at STM 4/16 level which are running near the new building as interim arrangement. POWERGRID further informed that for new POWERTEL links, commercial obligation shall be as per existing norms (i.e. from O&M budget).

AA.4.4 For the permanent arrangement of NLDC fibre optic connectivity, POWERGRID proposed following paths of underground fiber for providing ample redundancy:

(a) NLDC/NRLDC Building at Katwaria Sarai - NLDC New Building, August Kranti Marg - **9 Kms**

(b) Maharani Bagh (ULDC) - NLDC New Building, August Kranti Marg - **12 Kms**

(c) Tughlakabad via Okhla - NLDC New Building at August Kranti Marg - **14 Kms**

In Totality: 35 kms of UGFO

AA.4.5 POWERGRID further stated that it will be beneficial to install 48 Fibre cable instead of 24 fibre cable as cost difference in 24F and 48F cable is nominal in comparison with cost of ROW charges (of CPWD/NDMC) and installation cost. CTU suggested that in place of 48F UGFO cable, 2 nos. of 24F UGFO cable can be installed in redundant separate cable trenches to avoid disconnection in case of frequent construction/digging work by other agencies. 2X24F UGFO cable was agreed in the meeting.

AA.4.6 In addition to above, POWERGRID informed that 3 nos of communication equipment along with 2 nos of 48V DCPS may also be required for redundancy of equipment and input DC POWER supply.

AA.4.7 POWERGRID informed that Cost Estimate for the above work (35 Kms UGFO, 3 nos of communication equipment and 2 nos of 48V DCPS) is Rs. 7 Crs. for 24F arrangement and 8 Cr for 2x24f fibre arrangement respectively.

AA.4.8 Details of proposed scheme is given at **Annexure-G**.

Decision required from Forum:

Forum may deliberate on above proposal of CTU and may approve accordingly

AA.5 Delay in Finalization of First Time Charging case of 220/132/33 kV 160/200 MVA AIS Andheri Sub-Station of HPPTCL (agenda by HPPTCL)

AA.5.1 In order to meet up the growing industrial and domestic demand of the area and also to provide the additional source of supply at existing 132/33/11 kV Sub-Station of HPSEBL at Kala Amb, it was decided in the 31st meeting of Standing Committee on the Power System Planning of Northern Region held on 02.01.2013 that 400/220 kV Sub-Station at Kala Amb shall be established under ISTS and further works of 220/132 kV may be carried out by the Himachal Pradesh State Electricity Board (HPSEBL)

AA.5.2 M/S PKATL (Power Grid Kala Amb Transmission Ltd) a subsidiary of PGCIL was selected as the Transmission Service Provider based on the international tariff based competitive bidding to execute transmission System for "Northern Region System Strengthening Scheme, NRSS-XXXI (Part-A)ll on Build, Own, Operate and Maintain (BOOM) basis and to provide transmission service to the Long Term Transmission Customers of the Project comprising of the following elements:

Establishment of a 7 x 105 MVA (1- ph.), 400/220 kV GIS Sub-station at Kala Amb along with LILO of both circuits of Karcham Wangtoo-Abdullapur 400 kV D/C (Quad Moose) line at Kala Amb (on multi Ckt towers) and 40% Series Compensation on 400 kV Karcham Wangtoo – Kala Amb quad D/C line at Kala Amb ends.

AA.5.3 The 400/220kV Sub-Station at Araindwala was commissioned by M/S PKATL on 12.07. 2017. Due to non- commissioning of 220/132kV Sub-Station at Kala Amb, heavy penalty of approximately ₹5.06 Crore per month was imposed by CERC

(Central Electricity Regulatory Commission) on HPSEBL since July, 2017 as downstream system was not ready to evacuate power.

AA.5.4 Aggrieved by it, HPSEBL filed a Petition against the order of CERC with a plea to Hold and declare that the HPSEBL is not entitled to the recovery of the entire Yearly Transmission Charges (YTC) from the scheduled date of commissioning of the subject transmission system and further Hold and direct that the HPSEBL is entitled to the recovery of the YTC from the Scheduled Date of commissioning of the subject transmission system only under the POC mechanism under the Sharing Regulations of the Commission;

AA.5.5 CERC Vide its order dated 18th of September 2018 ordered that NRSSTL is entitled to recover the Monthly Transmission Charges from HPSEBL and HPSEBL is liable to pay about 84.5% of the charges on bilateral basis till the commissioning of the downstream asset, while the balance 15.5% would be included in the Point of Connection (PoC) Charges as per the Sharing Regulations of the Central Commission.

AA.5.6 Again, HPSEBL filed an appeal 343 of 2018 against the CERC order dated 18th of September 2018 before APPELLATE TRIBUNAL FOR ELECTRICITY AT NEW DELHI. APTEL vide its order dated 09.05.2022 allowed the appeal of HPSEBL and the impugned order dated 18/09/2018 passed by the Central Commission was set aside. The Central Commission was directed to pass a fresh and reasonable order expeditiously, but not later than three months from the date of this judgment.

AA.5.7 Accordingly, the Commission in its order dated 30th June 2023 directed that the transmission charges of (i) LILO of both circuits of Karcham Wangtoo Abdullapur 400 kV D/C (Quad Moose) line at Kala Amb (on multi Ckt towers); (ii) Establishment of a 7 x 105 MVA (1-ph.), 400/220 kV GIS Substation at Kala Amb and (iii) FSC (40% Series Compensation- 400 kV Karcham- Kala Amb quad D/C line at Kala Amb ends) shall be serviced with effect from the date of their commercial operation through the PoC mechanism of the Sharing Regulations, 2010 and in terms of Regulations 5 to 8 of the Sharing Regulations, 2020 with effect from 1.11.2020. CTUIL was directed to implement the order accordingly within one month from the date of issue.

AA.5.8 Rs 345 Cr approximately (paid to PGCIL) have been adjusted by HPSEBL in the bills payable to PGCIL.

AA.5.9 It is clear from above that HP had to fight a long legal battle to secure justice.

Delay details of the case:

AA.5.10 As per the Indian Electricity Grid Code 2023 notification dated 29.05.2023 vide Chapter-3-Connection Code clause 9 i.e. “In case of intra-State transmission system getting connected to inter-State transmission system, Connectivity Agreement shall be signed between intra-State transmission licensee, CTU and inter-State transmission licensee after the award of the project and before physical connection to ISTS.

AA.5.11 Accordingly, HPPTCL applied to CTUIL for approval of Connection details through NSWS portal on 02.01.2024 **(Annexure-H).** Subsequently, after about one month of submissions, CTUIL team shared their observations with HPPTCL on 31.01.2024, which were attended to on 03.02.2024. After protracted pursuance, approved draft of Connection Agreement was received on 28.02.2024.

AA.5.12 It is worth mentioning here that Application for approval of technical connection data from CTUIL was uploaded on 02/01/2024 but the approval of the same along with draft agreement was received on 28.02.2024.

AA.5.13 It is pertinent to mention here that the final draft agreement was received on 28.02.2024 but it could be signed only on 27.03.2024 that too after protracted follow up with M/S PKATL (Power Grid Kala Amb Transmission Ltd) a subsidiary of PGCIL **(Annexure-I).**

AA.5.14 Hence total time taken from submission of data to signing of agreement is around 3 months which could have been curtailed.

AA.5.15 It is further pertinent to mention here that a considerable time was taken in signing of Connection Agreement in case of 33/220 KV S/Stn Prini as well as 220/132/33 KV S/Stn Majra too. It is understood that such a long time was taken as these cases were the first ones to be charged after implementation of IEGC 2023. But the same seems to be unjustified in case of Kala Amb as all the procedures as per latest regulations were in place.

AA.5.16 The final charging code was issued by NRLDC on 29.05.2024 after a period of approximately 5 months.)

AA.5.17 It is highlighted here that HPPTCL through it’s vendor M/S TBEA facilitated M/S PKATL in certain compliances for which services of engineers from Hitachi and M/S siemens India were taken through M/S TBEA. A few of them are highlighted as under:

- Diff block for all relay through Siemens BCU.
- Goosing for Auto Reclose signal in Siemens BCU.

• Prepare 3-phase fault signal logic in siemens BCU new signal Added in BCU.

• Busbar Goose signal for Auto reclose through BCU.

• Signal addition as per COE and NTAMC requirements of all relay 204 and 205 and validation up to local SAS and RTAMC.

• Restrain mode for all relay (As per COE observation and additional requirements of PGCIL)

• Unrestrained mode for all relay. (As per COE observation and additional requirements of PGCIL)

• DR signals as per COE clearance under Powergrid COE supervision at that time of working.

• Some texts of signals are corrected.

• PLCC panel wiring and testing with ABB engineer.

• PLCC card frequency change as per PGCIL team direction.

• Hard wiring from BCU to Main-1 and Main-2 relay as per COE team requirements.

AA.5.18 In addition to above, it is submitted that, during visit of Hitachi/Siemens Relay engineer, the M/S PKATL team was engaged in the erection/Charging of 400 kV and did not depute their team for testing of Differential Relay installed at their end which delayed the testing of Differential Relay.

AA.5.19 Further, the PKATL 400/220 KVS/Stn was commissioned in July 2017 and the land for HPPTCL was finalized in 2018 at a distance of 2.5 kms. As per Annexure -II (1.3.2) of Record of discussions in the third meeting of Sub Group of NRCE for preparation of Reliability Standards for protection system and Communication System held on 20/01/2017, it has been clearly mentioned that for very short lines (less than 30 Kms), line differential Protection with distance protection as back up (Built-in main relay or stand-alone) shall be provided mandatorily as Main-1. PGCIL well aware of this fact, in 2018, should have provided differential Relay well in time which was not done. The same was, later on, provided by HPPTCL in January 2024. Configuration of Differential Relay with BCU at Power Grid end was also facilitated by HPPTCL in March 2024.

AA.5.20 It is obvious from the above that M/S PKATL was not ready for charging of the 220/132kV Sub-Station at Kala Amb (HPPTCL) through 220 KV DC line from 400/220 KV S/Stn PKATL to 220/132 KV/33 KV Andheri S/Stn (HPPTCL) till March 2024 whereas they started collecting charges from HPSEBL w.e.f July 2017. The

period of 3 months w.e.f 02/01/2024 to 28/03/2024 for formalising and signing a **Connection Agreement** is also a matter of concern which needs to be discussed for avoiding such delays in future

Decision required from Forum:

Members may deliberate.

AA.6 Declaration of 400/220/66kV Pooling Sub-Station Wangtoo of HPPTCL as integral part of ISTS system (agenda by HPPTCL)

AA.6.1 Hon'ble CERC, under Regulation 93 of the CERC (Terms and Conditions of Tariff) Regulations, 2024, has specified the procedure to be followed for certification of intra-state transmission systems as ISTS Systems that are being developed or that have already been developed by state transmission licensee and are carrying inter-state power.

AA.6.2 In the LTA meeting held on 29.12.2010 while discussing Connectivity and Long-Term Access (LTA) to Himachal Pradesh Power Corporation Limited (HPPCL), for connectivity and transfer of 195 MW power from Kashang HEP and 450 MW power from Shongtong Karcham HEP it was agreed as under:

"It is proposed to establish a 400kV substation at Sherpa colony by LILO of one circuit of Karcham Wangtoo – Abdullapur 400 kV D/c (quad) line, matching with generation schedule (March'15). The works of establishing 400kV Sherpa colony substation and providing connectivity from the generation project by 400kV D/C can be carried out by CTU / transmission licensee as per provisions of the CERC regulations. With the commissioning of Sherpa colony, power from Kashang, in accordance with CEA master plan, would be pooled at Sherpa colony by LILO of Kashang-Bhabha-Kunihar 220kV line and establishment of transformation capacity of 2x500 MVA. The works (LILO and its bays and provision of ICT & associated bays) would be carried out as a depository work on behalf of HPPCL/HPPTCL".

AA.6.3 As such the 400 kV Pooling Station/Switching station to integrate with existing ISTS system i.e., Karcham Wangtoo-Abdullapur and evacuate power of Shongtong Karcham HEP (450 MW) was to be constructed by CTUIL under ISTS.

AA.6.4 HPPTCL had proposed for approval of DPR from CEA for 400/220 kV Substation at Wangtoo with interlinking 400 kV line with proposed 400 kV Switching/ Pooling Station at Wangtoo/ Sherpa Colony wherein CEA vide letter dated 06.04.2011 advised to revise the scope of works to avoid 2 Nos. 400kV GIS sub-stations within the proximity of 1 km by HPPTCL as well as CTUIL.

AA.6.5 CEA vide letter dated 14.03.2012 approved the revised DPR of the Subject Asset with future scope of 4 No. 400 kV bays for D/C line from Shongtong Karcham HEP and downstream 400 kV line towards Panchkula in future (which is to be evacuated under ISTS).

AA.6.6 HPPTCL has accordingly constructed 400/220/66 kV, 2X315 MVA Substation with a capital cost of INR 405 Crores. As per CEA Master Plan and approval of DPRs the space has been kept for 4 No. of 400 kV bays to ensure seamless integration of upcoming ISTS system.

AA.6.7 Hon'ble HPERC vide Order dated 28.09.2022 had approved the Capital Cost and determined the tariff from COD to FY 2023-24 for 400/220/66kV Pooling Station at Wangtoo. In said Tariff Order, under Section 4.8.7 Hon'ble HPERC had also directed HPPTCL to approach Hon'ble CERC for appropriate recovery of transmission charges through POC mechanism in line with CERC (Sharing of Inter-State Transmission charges and losses) Regulations,2020. In compliance to Hon'ble HPERC directions, HPPTCL vide Affidavit dated 07.01.2023 has filed Petition bearing No. 38/MP/2023 on subject matter.

AA.6.8 In light of the above facts and circumstances, it is evident that establishment of the Subject Asset by HPPTCL has facilitated integration of ISTS power with existing ISTS infrastructure i.e., 400 kV Karcham Wangtoo - Abdullapur line. The subsequent system is also being developed incidental to this 400 kV Substation by CTUIL due to severe ROW constraints, land availability issue in the narrow valley and master plan framed by CEA for Satluj Basin. The same has been reiterated by CTUIL in 18th Consultation Meeting. The relevant extract is reproduced as follows-

"……Further HPPTCL informed that they have already filed a petition in Hon'ble CERC for declaring Wangtoo 400/220 kV S/s as an ISTS asset, as it is envisaging the ISTS power of regional entities. Further, many of the hydro projects in Satluj basin area may seek connectivity through ISTS for which above proposed system incl. Wangtoo S/s shall be utilized. In view of this, it was agreed that as the 400 kV

side of Wangtoo S/s shall be used for evacuation of power under ISTS, accordingly, HPPTCL may take up the matter with CERC for urgent hearing……."

AA.6.9 The Transmission system approved for Shongtong HEP and Tidong HEP and notified on recommendation of NCT (National Committee on Transmission) in Gazette dated- 13.04.2023 is as follows-

i) Interim System [For Shongtong HEP: with time frame of 24 months]

➢ Generation switchyard of Shongtong HEP** to Wangtoo (HPPTCL) 400 kV D/c [Quad$] line (about 18 kms)

➢ 2 nos. of 400 kV bays (GIS) at Wangtoo S/s (HPPTCL)

ii) Final System (To be matching with generation schedule ie.1st July 2026)

➢ Establishment of 2x315 MVA (7x105 MVA 1-ph units including one spare unit), 400/220 kV GIS Pooling Station at Jhangi [along with future provision]

➢ Extension of Wangtoo (HPPTCL) - Shongtong HEP 400 kV (Quad)$ D/c line upto Jhangi PS with one circuit through Shongtong HEP generation switchyard

➢ Wangtoo (HPPTCL) - Panchkula (PG) 400 kV D/c line (Twin HTLS)*

➢ 80 MVAR switchable line reactor at Panchkula end on each circuit of 400 kV Wangtoo (HPPTCL) - Panchkula (PG) D/c line

➢ 125 MVAR, 420kV Bus reactor at Jhangi PS (1-ph units along with one spare unit)

AA.6.10 In the facts and circumstances mentioned above STU is of firm view that the subject asset needs to be declared as an ISTS to be included in the ISTS pool. NRPC is requested to validate the key role being played by 400/220/66 kV Wangtoo substation to integrate the upcoming and existing ISTS system in the upper Satluj valley and thereby ensuring high reliability of ISTS system and declare the said item integral part of ISTS system.

Decision required from Forum:

Members may please deliberate.

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NRPC Members for FY 2024-25

S. No.	NRPC Member	Category	Nominated/ Notified/Delegated Member	E-mail
1	Member (GO&D), CEA	Member (Grid Operation & Distribution), Central Electricity Authority (CEA)	Member (GO&D), CEA	member.god@cea.nic.in
2	Member (PS), CEA	Nodal Agency appointed by the Government of India for coordinating cross-border power transactions	Member (PS), CEA	memberpscea@nic.in
3	CTUIL	Central Transmission Utility	Chief Operating Officer	pcgarg@powergrid.in
4	PGCIL	Central Government owned Transmission Company	Director (Operations)	tyagir@powergrid.in
5	NLDC	National Load Despatch Centre	Executive Director	scsaxena@grid-india.in
6	NRLDC	Northern Regional Load Despatch Centre	Executive Director	nroy@grid-india.in
7	NTPC	Central Generating Company	Director (Finance)	jaikumar@ntpc.co.in
8	BBMB		Chairman	cman@bbmb.nic.in
9	THDC		CGM (EM-Design)	rrsemwal@thdc.co.in
10	SJVN		CMD	sectt.cmd@sjvn.nic.in
11	NHPC		Director (Technical)	rajkumar0610.rkc@gmail.com
12	NPCIL		Director (Finance)	df@npcil.co.in
13	Delhi SLDC	State Load Despatch Centre	General Manager	gmsldc@delhisldc.org
14	Haryana SLDC		Chief Engineer (SO&C)	cesocomml@hvpn.org.in
15	Rajasthan SLDC		Chief Engineer (LD)	ce.ld@rvpn.co.in
16	Uttar Pradesh SLDC		Director	directorsldc@upsldc.org
17	Uttarakhand SLDC		Chief Engineer	anupam_singh@ptcul.org
18	Punjab SLDC		Chief Engineer	ce-sldc@punjabsldc.org
19	Himachal Pradesh SLDC		Managing Director	mdhpsldc@gmail.com
20	DTL	State Transmission Utility	CMD	cmd@dtl.gov.in
21	HVPNL		Managing Director	md@hvpn.org.in
22	RRVPNL		CMD	cmd.rvpn@rvpn.co.in
23	UPPTCL		Managing Director	md@upptcl.org
24	PTCUL		Managing Director	md@ptcul.org
25	PSTCL		CMD	cmd@pstcl.org
26	HPPTCL		Managing Director	md.tcl@hpmail.in
27	IPGCL	State Generating Company	Managing Director	md.ipgpp@nic.in
28	HPGCL		Managing Director	md@hpgcl.org.in
29	RRVUNL		CMD	cmd@rrvun.com
30	UPRVUNL		Director (Technical)	director.technical@uprvunl.org
31	UJVNL		Managing Director	mdujvnl@ujvnl.com
32	HPPCL		Managing Director	md@hppcl.in
33	PSPCL	State Generating Company & State owned Distribution Company	CMD	cmd-pspcl@pspcl.in
34	UHBVN	State owned Distribution Company (alphabetical rotaional basis/nominated by state govt.)	Managing Director	md@uhbvn.org.in
35	Jodhpur Vidyut Vitran Nigam Ltd.		Managing Director	md.jdvvnl@rajasthan.gov.in
36	Paschimanchal Vidyut Vitaran Nigam Ltd.		Managing Director	md@pvvnl.org
37	UPCL		Managing Director	md@upcl.org
38	HPSEB		Managing Director	md@hpseb.in
39	Prayagraj Power Generation Co. Ltd.	IPP having more than 1000 MW installed capacity	Head (Commercial & Regulatory)	sanjay.bhargava@tatapower.com, biplab.chatterjee@tatapower.com
40	Aravali Power Company Pvt. Ltd		CEO	brahmajig@ntpc.co.in
41	Apraava Energy Private Limited		CEO	niraj.gupta@apraava.com
42	Talwandi Sabo Power Ltd.		COO	Vibhav.Agarwal@vedanta.co.in
43	Nabha Power Limited		CEO	sk.narang@larsentoubro.com
44	Lanco Anpara Power Ltd		President	sudheer.kothapalli@meilanparapower.com
45	Rosa Power Supply Company Ltd		Station Director	Hirday.tomar@relianceada.com
46	Lalitpur Power Generation Company Ltd		Managing Director	vksbankoti@bajajenergy.com
47	MEJA Urja Nigam Ltd.		CEO	hopmeja@ntpc.co.in
48	Adani Power Rajasthan Limited		COO, Thermal, O&M	jayadeb.nanda@adani.com
49	JSW Energy Ltd. (KWHEP)		Head Regulatory & Power Sales	jyotiprakash.panda@jsw.in
50	TATA POWER RENEWABLE	IPP having less than 1000 MW installed capacity (alphabetical rotaional basis)	Zonal Head	dhmahabale@tatapower.com
51	UT of J&K	From each of the Union Territories in the region, a representative nominated by the administration of the Union Territory concerned out of the entities engaged in generation/ transmission/ distribution of electricity in the Union Territory.	Chief Engineer, JKSPDCL/JKPDD	cejkpcl2@gmail.com/sojpdd@gmail.com
52	UT of Ladakh		Chief Engineer, LPDD	cepdladakh@gmail.com
53	UT of Chandigarh		Executive Engineer, EWEDC	elop2-chd@nic.in
54	NPCL	Private Distribution Company in region (alphabetical rotaional basis)	Head-Commercial	ssrivastava@noidapower.com
55	Fatehgarh Bhadla Transmission Limited	Private transmission licensee (nominated by cetral govt.)	AVP-O&M	nitesh.ranjan@adani.com
56	NTPC Vidyut Vyapar Nigam Ltd.	Electricity Trader (nominated by central govt.)	CEO	ceonvvn@ntpc.co.in

List of addressee (via mail)

TCC Members for FY 2024-25

S. No.	TCC Member	Category	Nominated/ Notified/Delegated Member	E-mail
1	Director (Operation), HPSEBL	Chairperson, TCC		manojupretisolan@gmail.com
2	Member (GO&D), CEA	Member (Grid Operation & Distribution), Central Electricity Authority (CEA)	Chief engineer(GM Division)	cegm-cea@gov.in
3	Member (PS), CEA	Nodal Agency appointed by the Government of India for coordinating cross-border power transactions	Chief Engineer, PSPA-I Division	i.sharan@nic.in
4	CTUIL	Central Transmission Utility	Dy Chief Operating Officer	ashok@powergrid.in
5	PGCIL	Central Government owned Transmission Company	ED, NR-I	akmishra2@powergrid.in
6	NLDC	National Load Despatch Centre		nomination awaited
7	NRLDC	Northern Regional Load Despatch Centre	Executive Director	nroy@grid-india.in
8	NTPC	Central Generating Company	Regional ED, NR	rednr@ntpc.co.in
9	BBMB		Member (Power)	mp@bbmb.nic.in
10	THDC		GM (EMD)	neerajverma@thdc.co.in
11	SJVN		Director (Projects)	de.sectt@sjvn.nic.in
12	NHPC		ED (O&M)	hod-om-co@nhpc.nic.in
13	NPCIL		Outstanding Scientist & ED (commercial)	nrchoudhary@npcil.co.in
14	Delhi SLDC	State Load Despatch Centre		nomination awaited
15	Haryana SLDC		Chief Engineer/SO & Comml.	cesocomml@hvpn.org.in
16	Rajasthan SLDC			nomination awaited
17	Uttar Pradesh SLDC		Chief Engineer (PSO)/Chief Engineer (C&S)	cepso@upsldc.org
18	Uttarakhand SLDC			nomination awaited
19	Punjab SLDC		Chief Engineer	ce-sldc@pstcl.org
20	Himachal Pradesh SLDC			nomination awaited
21	DTL	State Transmission Utility	Director (Operation)	dir.opr@dtl.gov.in
22	HVPNL		Chief Engineer/SO & Comml.	cesocomml@hvpn.org.in
23	RRVPNL		Chief Engineer (PP&D)	ce.ppm@rvpn.co.in
24	UPPTCL		Director (Planning & Commercial)	director_comm@upptcl.org
25	PTCUL		Chief Engineer	ce_oandmk@ptcul.org
26	PSTCL		Director / Technical	dir-tech@pstcl.org
27	HPPTCL		GM (C&D)	gmcd.tcl@hpmail.in
28	IPGCL	State Generating Company	Director(Tech.)	corporate.ppcl@gmail.com
29	HPGCL		Director/Technical	dirtech@hpgcl.org.in
30	RRVUNL		Dy. Chief Engineer	dyce.elect.katpp@rrvun.com
31	UPRVUNL		Director (Technical)	director.technical@uprvunl.org
32	UJVNL		General Manager	kkjaiswal99@gmail.com
33	HPPCL		Director (Electrical) General Manager(Electrical)	dir_elect@hppcl.in gm_elect@hppcl.in
34	PSPCL	State Generating Company & State owned Distribution Company		nomination awaited
35	UHBVN	State owned Distribution Company (alphabetical rotaional basis/nominated by state govt.)		nomination awaited
36	Jodhpur Vidyut Vitran Nigam Ltd.			nomination awaited
37	Paschimanchal Vidyut Vitaran Nigam Ltd.			nomination awaited
38	UPCL		Director (P)	dpupcl29@gmail.com
39	HPSEB			nomination awaited
40	Prayagraj Power Generation Co. Ltd.	IPP having more than 1000 MW installed capacity	Head – Commercial & Regulatory	Sanjay.bhargava@tatapower.com
41	Aravali Power Company Pvt. Ltd		CEO	brahmajig@ntpc.co.in
42	Apraava Energy Private Limited			nomination awaited
43	Talwandi Sabo Power Ltd.		Dy. Head O&M	ravinder.thakur@vedanta.co.in
44	Nabha Power Limited			nomination awaited
45	Lanco Anpara Power Ltd			nomination awaited
46	Rosa Power Supply Company Ltd		VP-Technical Services	Niranjan.Jena@relianceada.com
47	Lalitpur Power Generation Company Ltd		President	rnbedi.ltp@lpgcl.com
48	MEJA Urja Nigam Ltd.		GM (O&M)	piyushkumar@ntpc.co.in
49	Adani Power Rajasthan Limited		AVP	Manoj.taunk@adani.com
50	JSW Energy Ltd. (KWHEP)		Head of Plant	kaushik.maulik@jsw.in
51	TATA POWER RENEWABLE	IPP having less than 1000 MW installed capacity (alphabetical rotaional basis)		nomination awaited
52	UT of J&K	From each of the Union Territories in the region, a representative nominated by the administration of the Union Territory concerned out of the entities engaged in generation/ transmission/ distribution of electricity in the Union Territory.		nomination awaited
53	UT of Ladakh			nomination awaited
54	UT of Chandigarh			nomination awaited
55	NPCL	Private Distribution Company in region (alphabetical rotaional basis)		nomination awaited
56	Fatehgarh Transmission Limited	Private transmission licensee (nominated by cetral govt.)		nomination awaited
57	NTPC Vidyut Vyapar Nigam Ltd.	Electricity Trader (nominated by central govt.)		nomination awaited

Special Invitees:

1. Smt. Nandita Gorlosa, Chairman, NERPC & Hon'ble Power Minister, Govt. of Assam, Block D, Ground Floor, Janata Bhawan, Dispur, Assam, 781006 [Email: nanditagorlosa77@gmail.com], Telephone no: (0361) – 2237032(O)
2. Shri Gaurav Gupta, Chairperson, SRPC & Managing Director, Karnataka Power Corporation Limited & ACS Energy Department GoK, 240, 2nd floor Vikasa Soudha, Bengaluru, Karnataka 560001. [Email: prs.energy@gmail.com ; acs@karnataka.gov.in] Tel -08022252373
3. Shri Vishal Kumar Dev, IAS, Chairman, ERPC, Principal Secretary to Govt., Department of Energy, Govt. of Odisha, Bhubaneswar. [Email-chairman@gridco.co.in] Tel -06742540098
4. Shri P. Dayanand Chairman CSPTCL & Chairman, WRPC, Office of Chairman, Vidyut Seva Bhavan, Danganiya, Raipur 492 013 (C.G.) [Email: chairmancspc@gmail.com] Tel. 0771 2574000
5. Smt. Rishika Saran, Member Secretary, NPC, Sewa Bhawan, R. K. Puram, New Delhi-66 [Email-cenpc-cea@gov.in]
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7. Shri Asit Singh, Member Secretary, SRPC, No.29, Race Course Cross Road, Bengaluru-560009. [Email: mssrpc-ka@nic.in] Tel -08022287205/9449047107
8. Shri N.S. Mondal, Member Secretary, ERPC,14,Golf Club Road, ERPC Building, Tollygunje,Kolkata-700033. [Email: mserpc-power@nic.in]- Tel 03324239651/9958389967
9. Shri K B Jagtap, Member Secretary, NERPC, NERPC Complex, Dong Parmaw, Lapalang, Shillong-793006. [Email: ms-nerpc@gov.in] Tel -03642534077/ 8652776033

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Annexure-A

Minutes of meeting regarding *Tapping Tertiary of 765/400/33 kV ICT -2 for Reliable Auxiliary Power Supply to ±500kV HVDC Ballia Sub-Station (Agenda by POWERGRID, NR3)*

As per discussion held in 215 OCC meeting held on 12.01.2024, a committee was formed under the chairmanship of General Manager (System Operation), NRLDC to examine the requirement of additional Auxiliary Power Supply to ±500kV HVDC Ballia Substation. Subsequently, nominations were sought from POWERGRID, UPPTCL and CTUIL for formation of committee.

The meeting on Tapping Tertiary of 765/400/33 kV ICT -2 for Reliable Auxiliary Power Supply to ±500kV HVDC Ballia Sub-Station was held on 29.04.24 in virtual mode. The meeting was chaired by GM, NRLDC and attended by POWERGRID, CTUIL & UPPTCL representatives.

Following was discussed in the meeting:

1. In the meeting, POWERGRID, NR-3 representative highlighted that above issue was already discussed in 213th OCC meeting and apprised that currently two auxiliary supplies have been provisioned at Ballia for HVDC and HVAC system. One is from tertiary of 200 MVA,400/132 KV ICT and another is UPPCL feeder at 33 KV Levels.

2. Brief history of Ballia S/s such as plan for 400kV and subsequent upgradation to 765kV was presented by POWERGRID. Detailed presentation as shared by POWERGRID representative during the meeting is attached as Annexure-I.

3. It was mentioned by POWERGRID NR-3 that 400/132/33 KV, 200 MVA ICT is feeding 02 nos. 132 KV Transmission Lines of UPPTCL connected to UPPTCL Sub-Station. Earlier in past, approx 673 no. of faults were detected in UPPTCL lines from August'23 to Oct'23. Considering large number of faults fed by this Transformer in past, the life of this ICT and its reliability has been seriously affected. After deliberation in 213th OCC meeting, UPPTCL has taken corrective measures and fault detection came down upto 200 nos. in last 04 months, which is also a big number.

4. Moreover, POWERGRID NR-3 also apprised that the 33kV auxiliary supply from dedicated UPPCL feeder is also not reliable and sometimes it fails 3-4 times in a month and outage duration in number of cases is more than 12 Hrs. Due to frequent breakdowns of UPPCL supply, the auxiliary Power Supply changeover occurs multiple times and leads to more stress on HVDC equipments like CB, Valve cooling pumps and UPS by-pass operation which is undesirable.

5. POWERGRID representative stated that they have already communicated number of times with UPPTCL and UPPCL to take actions to improve reliability of feeders which are being used for auxiliary supply at HVDC Ballia. However, even after repeated requests, the reliability remains poor. Communications sent from POWERGRID side as shared with committee is attached as Annexure-II.

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महाप्रबंधक (परि.प्र.) / Chief G.M. (AM)
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Ballia

6. GM, NRLDC asked UPPTCL to brief the reason for frequent fault detection in both of the 132 KV lines. UPPTCL representative apprised that fault in their underlying system is being sensed by the relays at POWERGRID end and actual tripping is not occurring.

7. POWERGRID representative stated that 400/132kV single ICT at Ballia has fed number of faults in 132kV through its lifetime. With feeding these many faults, the reliability of 400/132kV ICT is reduced and the ICT is kept under observation as per POWERGRID practice. In case the ICT gets out, there will be no supply at 132kV to UPPTCL and only other auxiliary source for HVDC would be 33kV supply from DISCOM which is also not reliable.

8. GM NRLDC enquired UPPTCL representative about the actions being taken at their end for improving reliability of auxiliary supply to Ballia HVDC. UPPTCL representative stated that instructions have been given to transmission as well as distribution team to improve maintenance for the said lines. However, maintenance of 33kV lines is under jurisdiction of DISCOM. Even with all possible efforts, 33kV lines may trip and remain under long outage. Further, he added that fault in their underlying system is a general phenomenon and could not be avoided as 33kV feeders are passing close to road and also have trees nearby. He added that higher number of tripping during Aug23-Dec23 could be due to rains and wind during monsoon season. During last 4 months, may be due to less storms/rains less number of tripping were reported.

9. CTUIL representative stated that HVDC Ballia is very important element of NR Grid and 02 nos. reliable sources for auxiliary supply must be ensured as per the CEA (Technical standards for connectivity to the Grid) Regulation .

10. Thereafter, POWERGRID NR-3 appraised the detail of auxiliary supply arrangement at all other POWERGRID's HVDC Stations on PAN India basis and stated that most of the HVDC stations are having more than 02 nos. reliable independent sources for auxiliary supply with at least 02 nos. from tertiary of ICTs located in POWERGRID substation.

11. NRLDC representative enquired as CEA standards specify for two reliable auxiliary source of supply, so in case HVDC Ballia is provided with two separate auxiliary supply source by the means of 765/400kV ICT and 400/132kV ICT tertiaries then whether, POWERGRID requires 33kV supply from UP DISCOM.

12. POWERGRID representative stated that they do not require 33kV supply from UP DISCOM for substation auxiliary, but it is required for providing supply to colony in Ballia S/s premises. As the present auxiliary arrangement already has provision for 33kV supply from UP DISCOM, the same would not be dismantled.

13. POWERGRID representative stated that HVDC system is different from normal HVAC substation. In case of HVDC system, if there is any delay in changeover due to any reason, the HVDC auxiliary and HVDC system will trip. In case of normal HVAC

21/2/24

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substation, the supply on DG set can be relied however for HVDC system, DG set cannot be relied as by the time DG set is operational, HVDC auxiliaries may trip.

14. NRLDC representative stated that Ballia-Bhiwadi HVDC is very important link for grid operation. With commissioning of RE generation in Western Rajasthan, presently flow is from Bhiwadi to Ballia. In future, there may be requirement of operating the Ballia-Bhiwadi HVDC from Ballia to Bhiwadi during evening hours and operating from Bhiwadi to Ballia during solar generation period.

15. POWERGRID representative proposed that-

    Additional Source of Auxiliary Power connectivity from tertiary of 765/400/33 kV ICT-2 for Reliable Auxiliary Supply to ±500kV HVDC Ballia Substation with approx. cost estimate of Rs 1.25 Cr may be considered under ADDCAP. Breakup as shared by POWERGRID is attached as Annexure-III.

16. GM, NRLDC asked POWERGRID, NR3 to submit the supporting documents regarding provision of 02 nos. dedicated source from ICT tertiary at other POWERGRID HVDC Stations. Further, they also asked to submit break-up of cost estimate for implementation of above work and copy of previous letters to UPPTCL for intimation of such faults/breakdown.

Analysis by Committee:

a) For all HVDC substations of POWERGRID.across the country which do not have any generating unit connected, two auxiliary sources have been provided from two ICTs located within the premises of POWERGRID S/s.

b) For new HVDC proposed i.e. Bhadla3-Fatehpur HVDC and recently charged Raigarh-Pugalur HVDC, auxiliary supply have been provided from two ICTs located within the premises. Relevant extract of RfP document is attached as Annexure-IV.

c) It is clear from the discussion held in meeting and previous experience that supply from state DISCOM is not reliable and would not be reliable in future also, accordingly 33kV supply from UP DISCOM can not be considered as reliable source.

d) POWERGRID has mentioned that HVDC system is different from normal HVAC substation. In case of HVDC system, if there is any delay in changeover due to any reason, the HVDC auxiliary and HVDC system will trip.

e) 400/132kV ICT at Ballia has fed many faults in 132kV network in case of faults in UPPTCL system accordingly, ICT may become out at any point of time, therefore that source is also not reliable. In case new auxiliary is approved for Balllia S/s, till the

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implementation of that auxiliary scheme, the condition of 400/132kV ICT would further deteriorate.

f) HVDC Ballia is very important element of NR Grid and 02 nos. reliable sources for auxiliary supply need to be ensured as per the CEA standards.

g) Since the proposal by POWERGRID will lead to ADDCAP of 1.25 Cr, the matter may be deliberated at OCC forum and subsequently at NRPC level before submission from POWERGRID side to CERC.

Recommendation:

On the basis of supporting documents and as per prevailing practice in other HVDC stations, proposal of POWERGRID NR3 can be considered and same was agreed by all the representatives from NRLDC, POWERGRID, CTUIL and UPPTCL.

However, final approval shall be issued after deliberation and consent by OCC and then NRPC forum. Additional issues such as installation of meters etc. shall also be taken care by POWERGRID in consultation with respective utility after approval is accorded from NRPC forum.

(SUNIL AHARWAL)

(NRLDC)

RAKESH KUMAR

(CTUIL)

RAKESH KUMAR
Chief Manager
CENTRAL TRANSMISSION UTILITY OF INDIA LTD.
(A Wholly Owned Subsidiary of
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(A Government of India Enterprises)
Plot No.-2, Sector-29, Gurgaon- 122 001 (Haryana)

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Electricity Transmission Division
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(POWERGRID)

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Participant list:

S. No.	Name	Organisation	Designation	
1	Sunil Kumar Aharwal	NRLDC	General Manager	
2	Gaurav Malviya	NRLDC	Manager	
3	Ajit Kumar Yadav	NRLDC	Deputy Manager	
4	Rakesh Kumar	CTUIL	Chief Manager	
5	Pankaj Sharma	POWERGRID	Chief General Manager	
6	Gunjan Agrawal	POWERGRID		
7	TP Verma	POWERGRID		
8	AK Singh	POWERGRID		
9	CB Pal	UPPTCL	Superintending Engineer	- Retired
10	Ashok	UPPTCL	Executive Engineer	

(SUNIL AHARWAL)
NRLDC.

/ PANKAJ SHARMA
Chief G.M. (AM)
कॉर्पोरेशन ऑफ इण्डिया लि.
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Tapping Tertiary of 765/400/33 kV ICT -2 for Reliable Auxiliary Power Supply to ±500kV HVDC Ballia Sub-Station & 765/400/132 KV Ballia HVAC Sub-station.

➢ ***Gist of Balia HVDC & HVDC substations :***

- *500kV Ballia – Bhiwadi HVDC Bi-pole with 2500MW power transfer capacity.*

- *765kV Elements*
  - ❖ *3 Nos of 765kV Circuits (Inter & Intra regional connectivity)*
  - ❖ *2 Nos. of 765/400kV ICTs*
  - ❖ *2 Nos. of 765kv Bus Reactors*

- *400kV Elements*
  - ❖ *10 Nos of 400kV Circuits (Inter & Intra regional connectivity)*
  - ❖ *1 Nos. of 400/132kV ICTs*
  - ❖ *4 Nos. of 400kv Bus Reactors*

- *132kV Elements*
  - ❖ *2 Nos of 132kV Transmission lines (UPPTCL feeders) connected with 200 MVA, 400/132/33kV ICT -1.*

➢ *Successful operation of HVDC auxiliary system such as Thyristor cooling water pump, Tap changer of Convertor transformer etc are wholly dependent on uninterrupted Auxiliary power supply.*

Connectivity of Auxiliary Sources at Ballia HVDC & HVAC Substations

Year 2007

- *400kV Ballia Substation commissioned*
- *Auxiliary source : Only one dedicated 33kV Feeder from UPPTCL S/s.*

Year 2010

- *+/- 500kV HVDC Ballia – Bhiwadi Bi-Pole commissioned*
- *Second Auxiliary sources from 200MVA ,400/132/33kV ICT -1 Tertiary*

Year 2012

- *765kV Ballia Substation was commissioned along with 02 Nos - 765/400/33kV ICTs.*

- ***Presently Auxiliary AC supply of Ballia HVDC & HVAC system are operated and maintained with support of 02 sources:***

  1. From Tertiary of 200MVA ,400/132kV ICT-1 at Balia

  2. 33kV Dedicated feeder from 132/33kV Simrli Jamalpur (UPPTCL) substation.

Constraints in Reliable dual source of Auxiliary supply at Ballia HVDC & HVAC :

1. Tertiary supply connected through 400/132kV ICT 1 at Ballia - Protective relay senses frequent faults in associated 132kV lines.

2. Frequent interruptions in 33kV dedicated UPPTCL feeder.

Operational issues due to Auxiliary supply at Ballia HVDC & HVAC

- *Both supplies are always on load condition to HVDC LVAC buses of Pole- 1 and Pole-2 and Bus Coupler under open condition. This provision is standard for HVDC Auxiliary supply to prevent dead bus condition during changeover in case of any one supply fails.*

- *There were frequent faults in 02 Nos 132 KV transmission lines connected with 400/132/33kV ICT at Ballia and it affects reliability of the ICT. Earlier total 673 line faults were detected in 132kV UPPTCL Lines from August'23 to October'23 and same was discussed and deliberation in 214th OCC meeting. After remedial action, total 200 faults have been detected in last 04 months which is also a big number and same needs to be rectified.*

- *Apart of above frequent faults in 132 KV Lines, frequent breakdown of 33KV UPPTCL feeder has also been noticed and during breakdown of 33 KV UPPTCL feeders,the Auxiliary Power supply changeover occurs multiple times which is undesirable in view of frequent MV/LT CB operation, Valve Cooling Pump changeovers & UPS bypass operation etc.*
- *Detail of frequent fault detection and tripping of 33 KV UPPTCL feeders are tabulated below-*

- ***Fault sensed by 400/132kV ICT at Ballia due to frequent line faults (Period : Jan 24 to Apr 24)***

Date	Time	Locati	Volta	Bay/D	Devic	Information Text	Value	Ackı
11-01-2	11:28:05	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
11-01-2	19:59:1E	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
11-01-2	20:05:43	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
11-01-2	20:06:0E	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
11-01-2	20:10:5E	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
12-01-2	15:49:52	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
12-01-2	16:12:4E	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
13-01-2	07:20:17	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
13-01-2	13:09:42	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
16-01-2	07:20:13	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
17-01-2	15:47:0E	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
18-01-2	08:58:3(	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
19-01-2	19:58:1E	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
20-01-2	07:00:03	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
22-01-2	07:19:5E	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
22-01-2	08:46:5(	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
22-01-2	13:21:4E	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
22-01-2	15:24:03	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
22-01-2	21:38:3(	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
23-01-2	06:46:0E	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
23-01-2	07:21:1E	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
23-01-2	07:30:33	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
24-01-2	11:15:1E	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
27-01-2	06:42:5(	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
27-01-2	06:45:47	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
27-01-2	06:54:01	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
27-01-2	13:06:13	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
28-01-2	03:12:51	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
28-01-2	03:33:5(	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
29-01-2	08:30:21	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
29-01-2	13:32:24	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
30-01-2	15:11:2E	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
30-01-2	16:25:01	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
30-01-2	17:13:53	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	

Date	Time	Locati	Volta	Bay/D	Devic	Information Text	Value	Ackı
31-01-2	16:49:3(	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
01-02-2	08:11:31	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
03-02-2	06:25:51	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
03-02-2	06:39:23	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
03-02-2	10:25:43	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
03-02-2	10:31:3E	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
03-02-2	11:01:4(	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
03-02-2	12:25:31	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
03-02-2	16:20:13	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
05-02-2	03:54:13	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
05-02-2	03:54:13	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
05-02-2	09:57:4E	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
06-02-2	10:30:1E	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
07-02-2	10:40:31	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
08-02-2	12:26:51	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
08-02-2	12:28:5E	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
08-02-2	12:37:32	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
08-02-2	14:27:34	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
09-02-2	08:29:4E	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
12-02-2	12:20:17	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
13-02-2	06:20:0E	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
13-02-2	06:23:12	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
13-02-2	06:32:0E	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
13-02-2	06:43:14	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
14-02-2	05:28:1E	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
14-02-2	06:19:12	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
14-02-2	23:46:3E	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
15-02-2	07:19:5E	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
16-02-2	07:25:0(	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
18-02-2	12:37:21	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
18-02-2	15:33:1E	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
21-02-2	03:19:53	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
21-02-2	03:47:0E	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
21-02-2	14:51:44	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	

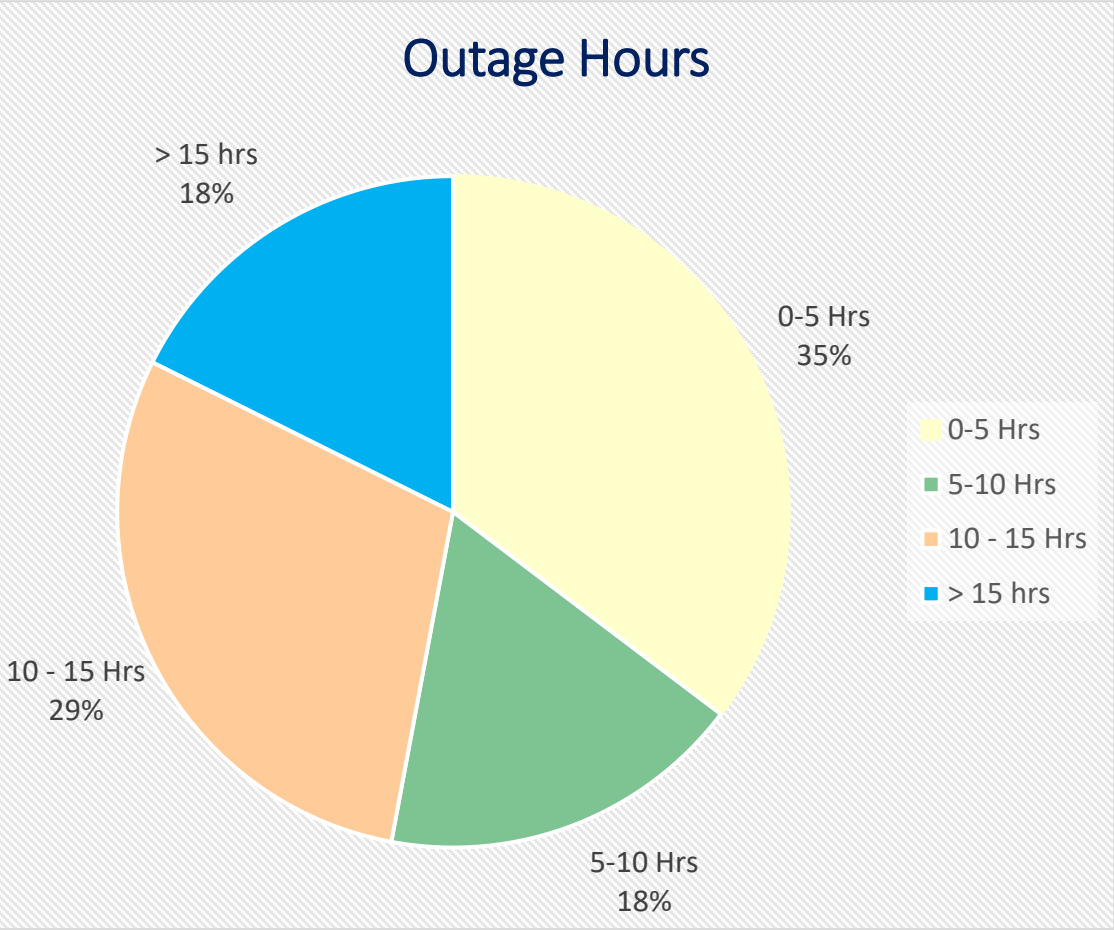
Date	Time	Locati	Volta	Bay/D	Devic	Information Text	Value	Ackr
22-02-2	03:19:05	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
22-02-2	08:04:37	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
22-02-2	16:43:56	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
23-02-2	07:49:13	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
23-02-2	09:09:42	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
26-02-2	09:35:50	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
26-02-2	12:15:08	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
27-02-2	07:37:14	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
28-02-2	11:57:04	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
28-02-2	13:12:12	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
28-02-2	13:14:06	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
29-02-2	08:09:38	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
29-02-2	13:19:31	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
29-02-2	15:59:05	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
01-03-2	07:51:29	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
02-03-2	07:26:32	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
02-03-2	07:32:47	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
02-03-2	07:38:21	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
02-03-2	07:53:12	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
02-03-2	10:05:13	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
02-03-2	14:20:49	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
03-03-2	03:30:05	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
03-03-2	14:25:14	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
04-03-2	14:08:44	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
04-03-2	15:06:10	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
07-03-2	13:30:24	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
08-03-2	04:20:00	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
08-03-2	10:30:44	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
09-03-2	08:55:31	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
10-03-2	17:33:06	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
11-03-2	05:59:04	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
13-03-2	09:10:11	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
13-03-2	17:37:03	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
14-03-2	08:10:37	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	

Date	Time	Locati	Volta	Bay/D	Devic	Information Text	Value	Ackr
14-03-2	11:07:29	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
15-03-2	21:40:56	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
16-03-2	05:53:28	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
17-03-2	07:46:42	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
17-03-2	08:17:01	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
17-03-2	09:46:49	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
17-03-2	12:36:25	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
18-03-2	02:34:04	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
19-03-2	07:45:27	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
19-03-2	08:44:54	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
19-03-2	11:04:16	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
20-03-2	07:54:44	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
20-03-2	08:05:39	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
20-03-2	09:15:13	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
20-03-2	09:22:50	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
20-03-2	09:29:57	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
20-03-2	09:46:21	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
20-03-2	13:10:49	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
20-03-2	13:27:25	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
20-03-2	13:57:39	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
20-03-2	15:01:31	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
20-03-2	16:16:45	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
20-03-2	18:42:07	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
20-03-2	18:48:11	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
20-03-2	19:09:47	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
21-03-2	02:46:30	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
21-03-2	02:52:31	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
21-03-2	12:27:46	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
21-03-2	13:01:39	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
22-03-2	05:46:28	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
23-03-2	07:43:38	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
23-03-2	09:05:29	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
23-03-2	09:09:34	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
23-03-2	13:53:37	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	

Date	Time	Locati	Volta	Bay/D	Devic	Information Text	Value	Ackr
23-03-2	16:58:41	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
24-03-2	09:29:54	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
24-03-2	13:59:59	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
24-03-2	16:55:40	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
25-03-2	07:56:07	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
26-03-2	14:28:08	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
27-03-2	07:21:33	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
27-03-2	08:32:37	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
28-03-2	10:36:43	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
28-03-2	17:36:18	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
29-03-2	10:49:05	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
29-03-2	14:01:33	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
29-03-2	16:48:16	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
30-03-2	08:31:17	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
31-03-2	10:25:57	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
31-03-2	13:08:01	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
01-04-2	10:52:17	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
01-04-2	11:07:49	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
01-04-2	11:35:10	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
01-04-2	12:47:24	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
01-04-2	12:57:30	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
01-04-2	12:58:08	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
01-04-2	13:01:16	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
01-04-2	13:02:10	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
01-04-2	13:17:54	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
01-04-2	13:39:36	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
01-04-2	13:40:51	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
01-04-2	13:40:52	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
01-04-2	14:22:58	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
01-04-2	14:45:16	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
01-04-2	14:47:24	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
01-04-2	15:02:26	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
01-04-2	17:22:35	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
02-04-2	06:49:40	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	

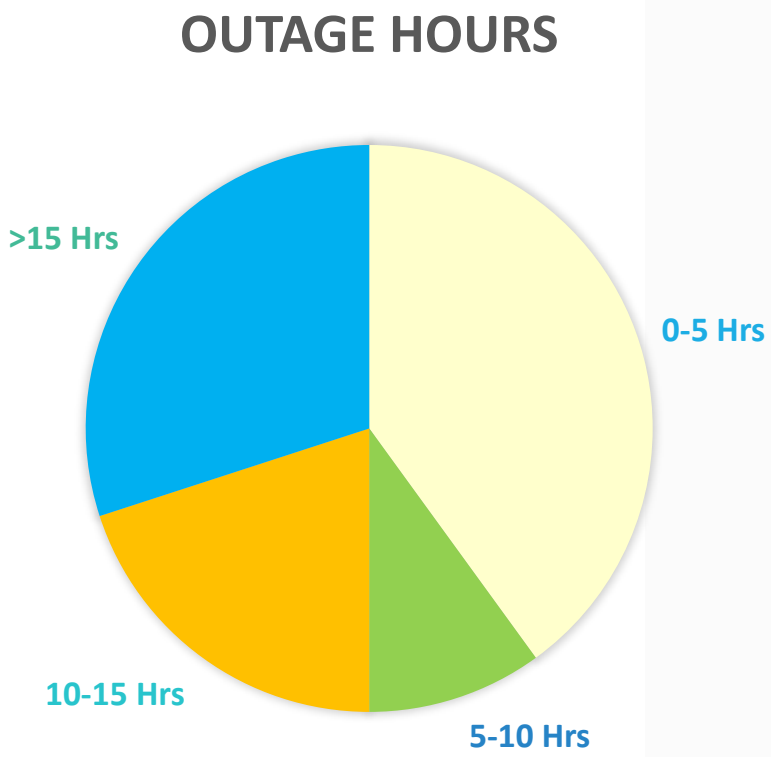
Date	Time	Locati	Volta	Bay/D	Devic	Information Text	Value	Ackr
04-04-2	10:05:53	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
05-04-2	05:39:28	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
05-04-2	07:11:49	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
05-04-2	08:56:56	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
05-04-2	11:10:48	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
06-04-2	06:17:35	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
06-04-2	11:38:09	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
08-04-2	13:50:05	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
08-04-2	14:55:14	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
08-04-2	17:39:21	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
08-04-2	20:12:48	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
08-04-2	20:40:53	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
10-04-2	05:31:26	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
10-04-2	06:05:21	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
10-04-2	10:17:26	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
11-04-2	05:58:58	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
11-04-2	07:36:06	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
11-04-2	11:23:27	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
11-04-2	16:46:37	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
11-04-2	21:33:47	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
13-04-2	07:08:50	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
13-04-2	16:20:01	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
13-04-2	18:27:53	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
14-04-2	07:13:23	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
14-04-2	13:36:39	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
16-04-2	11:29:42	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
16-04-2	12:02:47	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
16-04-2	15:23:12	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
16-04-2	15:41:21	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	
17-04-2	10:55:14	KIOSI	132	BAY 1	7SJ62	Total.Pickup	RAISEI	

- ***Auxiliary Supply – 33kV UPPTCL feeder Interruption details***



33KV UPPCL TRIPPING DETAILS			
Time of Tripping		Line taken into service	
DATE	TIME	DATE	TIME
01.05.2023	20:05	02.05.2023	10:44
07.05.2023	19:40	08.05.2023	12:09
20.05.2023	11:43	20.05.2023	17:59
06.06.2023	23:59	07.06.2023	09:32
10.06.2023	16:14	10.06.2023	17:45
19.06.2023	06:20	19.06.2023	09:37
15.07.2023	14:18	15.07.2023	14:43
07.08.2023	03:29	07.08.2023	15:58
09.08.2023	06:17	09.08.2023	10:10
13.08.2023	08:53	13.08.2023	10:30
17.08.2023	19:58	18.08.2023	13:19
22.08.2023	22:40	23.08.2023	11:58
30.08.2023	18:46	01.09.2023	16:42
03.09.2023	09:35	03.09.2023	16:25
08.09.2023	09:51	09.09.2023	16:15
09.09.2023	20:54	21.09.2023	10:33
26.09.2023	13:09	26.09.2023	15:32
16.10.2023	22:02	17.10.2023	10:39
16.11.2023	23:24	18.11.2023	13:10
19.11.2023	20:19	20.11.2023	16:57

- ***Auxiliary Supply – 33kV UPPTCL feeder Interruption details (Jan 24 – April 24)***



33KV UPPCL TRIPPING TIME			
TRIPPING TIME		RESTORATION TIME	
Date	Time	Date	Time
06-02-24	14:58:13	06-02-24	17:28:35
08-02-24	06:30:58	08-02-24	17:26:16
09-02-24	06:24:49	10-02-24	09:59:11
21-02-24	03:07:16	21-02-24	16:46:53
22-02-24	17:46:34	27-02-24	15:44:56
19-03-24	03:34:49	19-03-24	12:24:28
20-03-24	09:58:00	20-03-24	12:25:56
15-04-24	12:21:30	16-04-24	11:49:50
16-04-24	11:51:00	16-04-24	12:53:40
17-04-24	08:51:30	17-04-24	11:55:10

Availability of Reliable Dual source Auxiliary(HT Feeders) Connectivity in Various HVDC S/S

Substation / Region	Source I	Source II	Others
Champa (WR-1)	765/400/33KV ICT 1 Tertiary	765/400/33KV ICT 4 Tertiary	
Kurushektra(NR1-)	400/220/33KV ICT 1 Tertiary	400/220/33KV ICT 2 Tertiary	State 11kV Feeder for Construction purpose
Raigarh(WR-1)	765/400/33KV ICT 1 Tertiary	765/400/33KV ICT 2 Tertiary	State 11kV Feeder
Pugalur(SR-2)	400/220/33KV ICT 1 Tertiary	400/220/33KV ICT 2 Tertiary	State 11kV Feeder for Colony
Thrissur (SR-2)	400/220/33KV ICT 1 Tertiary	400/220/33KV ICT 2 Tertiary	
Bhadrawati (WR-2)	400/220/33KV ICT 1 Tertiary	400/220/33KV ICT 2 Tertiary	
Vizag (SR-1)	400/220/33KV ICT 1 Tertiary	400/220/33KV ICT 2 Tertiary	State 33 kV Feeder
Bhiwadi (NR-1)	400/220/33KV ICT 1 Tertiary	400/220/33KV ICT 2 Tertiary	State 33 kV Feeder for Colony
Agra HVDC(NR-3)	765/400/33KV ICT 1 Tertiary	400/220/33KV ICT 1 Tertiary	
Agra HVAC(NR-3)	765/400/33KV ICT 2 Tertiary		State 33 kV Feeder
BiswanathCharili(NER)	400/132/33KV ICT 1 Tertiary	400/132/33KV ICT 2 Tertiary	
Alipurduar(ER)	400/132/33KV ICT 1 Tertiary	400/132/33KV ICT 2 Tertiary	
Rihand (NR-3)	Rihand(NTPC) Stage 1	Rihand(NTPC) Stage 2	Rihand(NTPC) Stage 5
Dadri (NR-1)	Dadri(NTPC) Stage 1	Dadri(NTPC) Stage 2	
Talcher (ER)	Talcher Stage 2	Talcher Stage 3	Talcher Stage 4
Kolar (SR-2)	400/220/33KV ICT 1 Tertiary	400/220/33KV ICT 2 Tertiary	State 66 kV Feeder

EXISTING 33KV INTERCONNECTION SCHEME

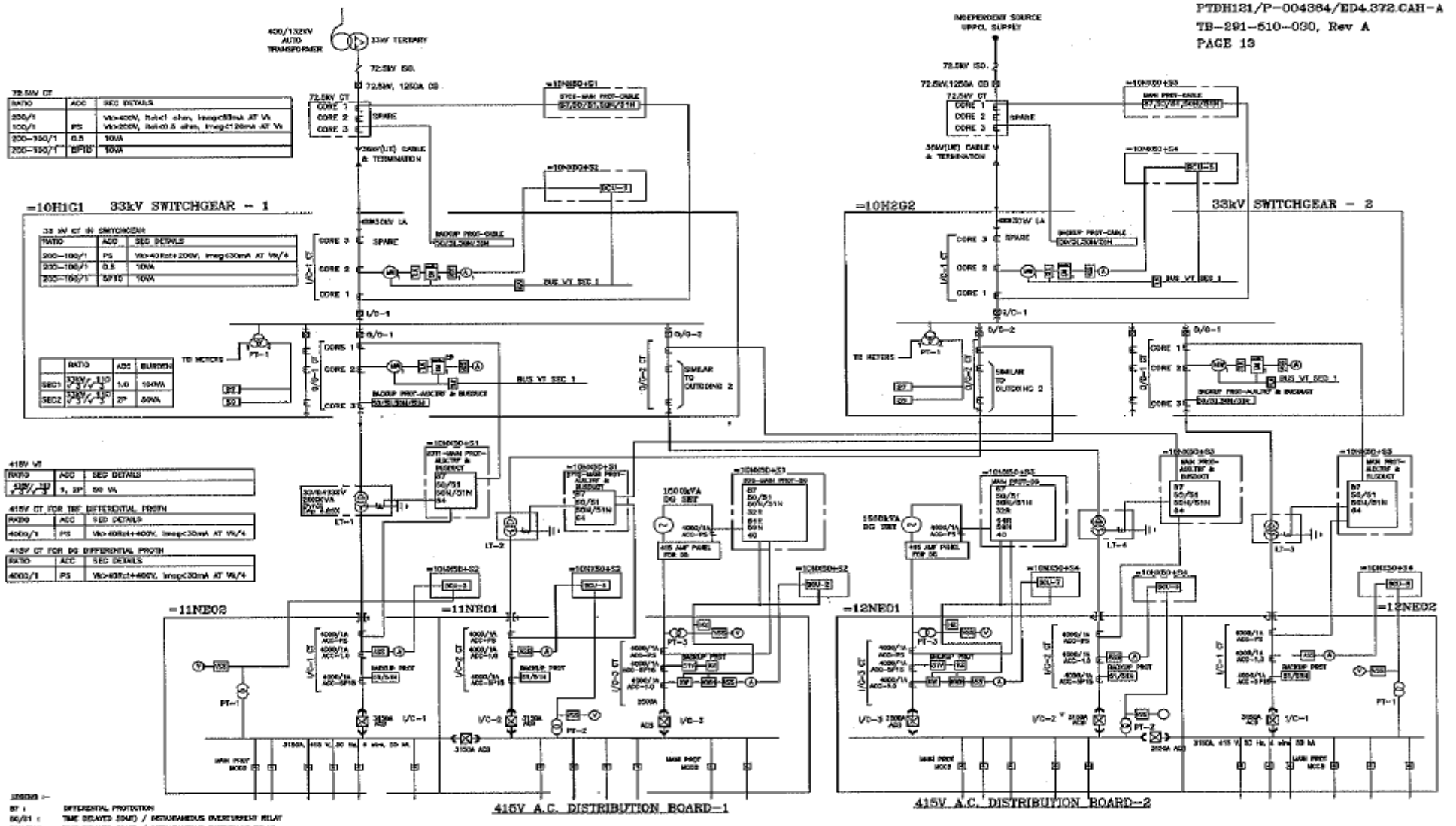
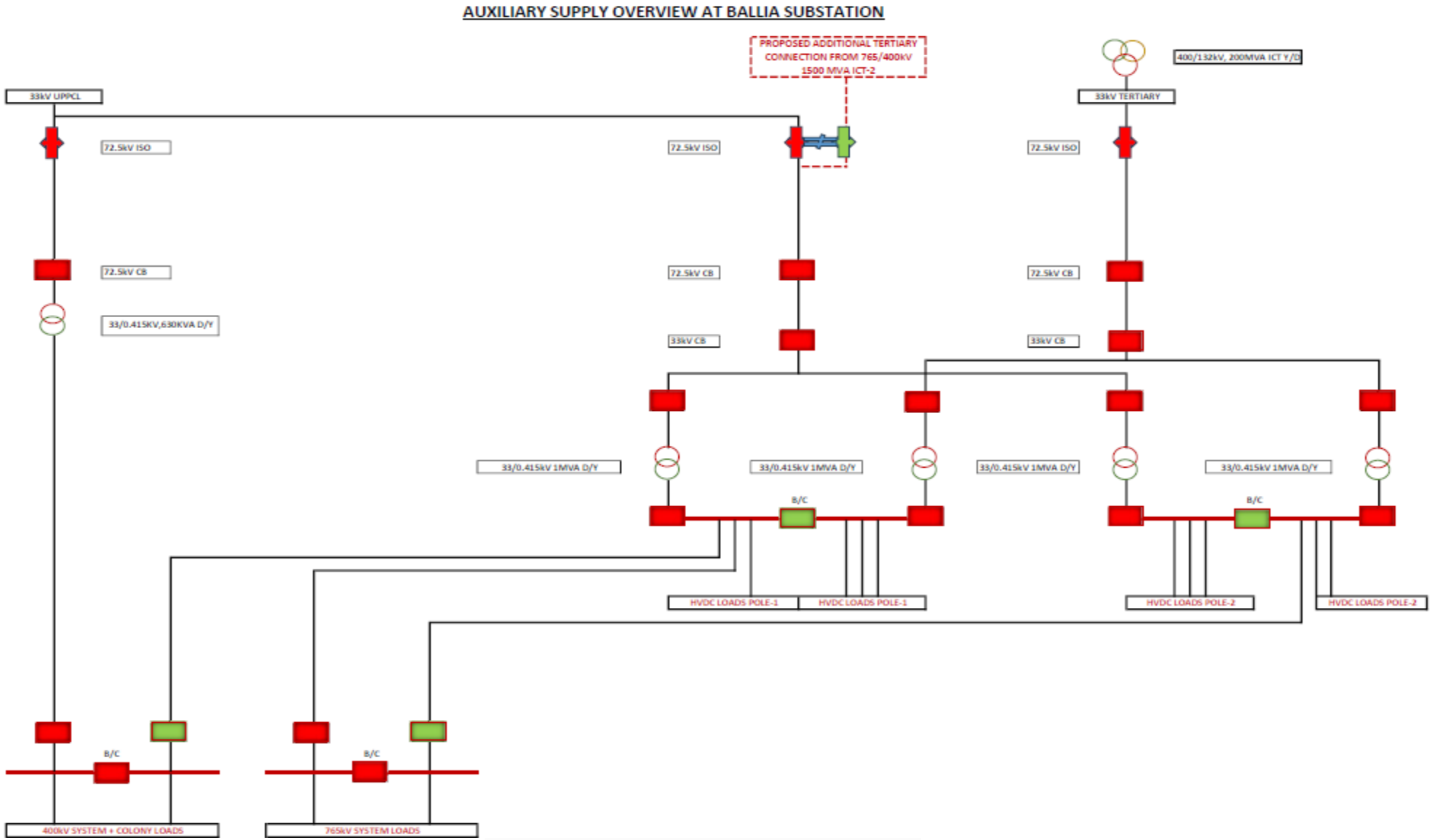
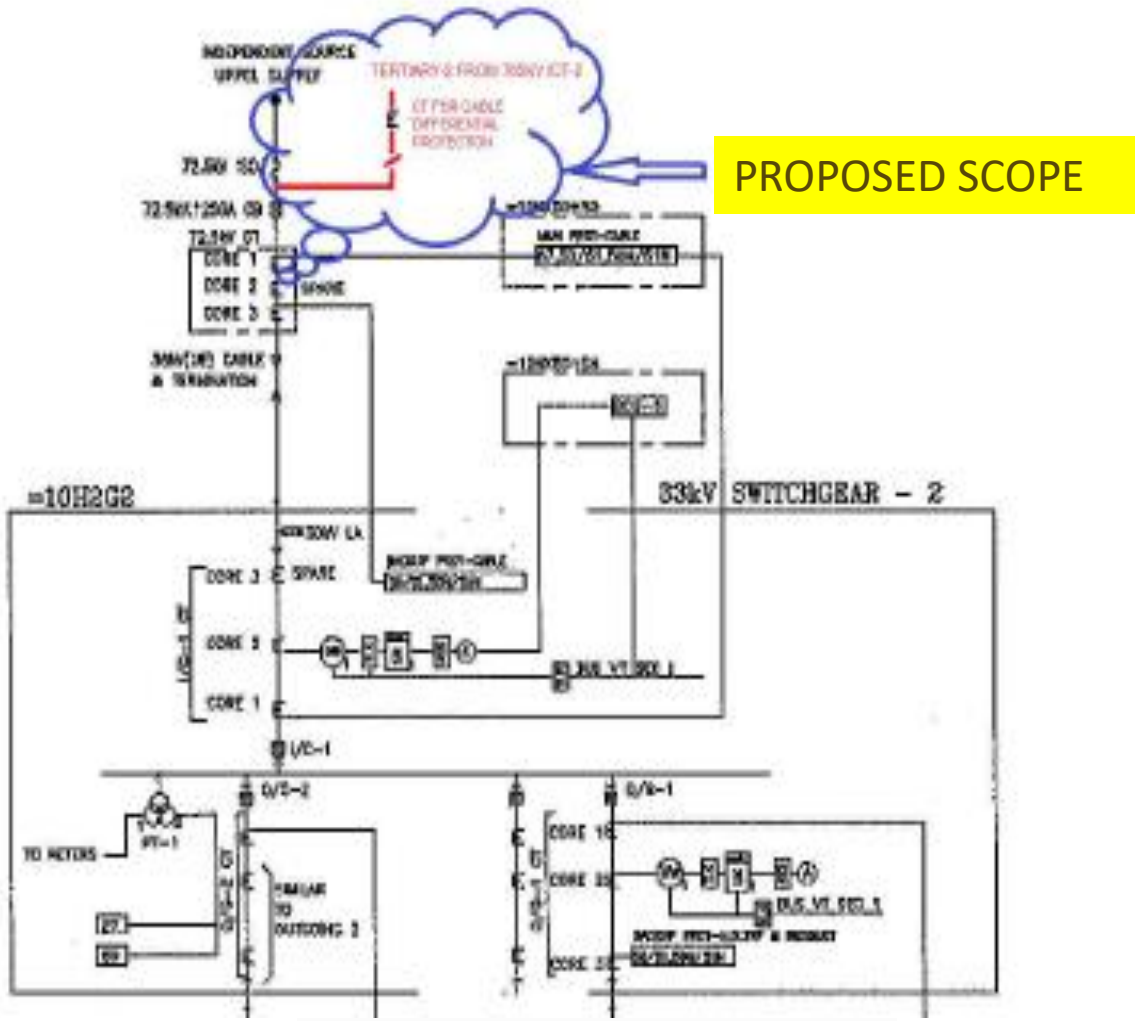


FIGURE 1 – KEY DIAGRAM OF AUXILIARY AC SYSTEM AT BALLIA

PROPOSED AUXILIARY CONNECTION AT BALLIA



PROPOSED 33KV INTERCONNECTION SCHEME



Proposal for Reliable dual source of Auxiliary supply at Balia HVDC & HVAC

- *To ensure reliability of auxiliary system for Balia HVDC & HVAC substation and as mentioned above in other HVDC stations which has provision for reliable dual sources of auxiliary supply from tertiary of the two independent ICTs or dedicated feeders from generating plants/State feeder as per site feasibility.*
- *Separate connection from Tertiary supply of 765/400/33kV ICT-2 is necessitated for reliable sources to HVDC and HVAC Auxiliary Power Supply in view of Non reliability of existing source.*

In view of above facts, POWEGRID proposes that –Optional Source connectivity from tertiary of 765/400/33 kV ICT-2 in addition to the existing UPPTCL Supply(33kV feeder) & 200MVA 400/132kV ICT Tertiary for Reliable Auxiliary Supply to ±500kV HVDC Ballia Substation with approx. cost estimate of Rs 1.25 Cr may be considered under ADDCAP.

पावरग्रिड
POWERGRID

पावर ग्रिड कॉर्पोरेशन ऑफ इंडिया लिमिटेड
(भारत सरकार का उद्यम)
POWER GRID CORPORATION OF INDIA LIMITED
(A Government of India Enterprise)

कार्यालय/साइट: 765/400 /132 के.वी. एचवीएसी & ±500 के.वी. एचवीडीसी बलिया उपकेंद्र, इब्राहिमपट्टी, बलिया (उ.प्र.)-221716
Office/Site: 765/400/132kV HVAC & ±500 kV HVDC Ballia Substation, Ibrahimpatti, Ballia (U.P.)- 221716

Ref. No.: NR3/BAL/HVDC/132 kV/UPPCL/03 **Date**: 17.04.2024

URGENT

To,

Executive Engineer,
ETD, UPPTCL (I/C Sikandarpur)
Ballia (UP)

Sub: Frequent Fault Current being fed through 132 kV S/C Sikanderpur (UPPCL) Transmission Line from our 200 MVA, 400/132/33 kV Transformer installed at POWERGRID Ibrahimpatti, Ballia Substation.

Our Ref.: Our Letter NR3/BAL/HVDC/132 kV/UPPCL dated 01/09/2022

Dear Sir,

It is to once again inform you that the numerous fault current pickups are still being detected at POWERGRID Ballia end in 132 kV S/C Sikanderpur Transmission Line (Owned by UPPCL). The matter is of deep concern that our 400/132kV 200MVA BHEL ICT is still feeding fault currents because of downstream faults in your network. We have analyzed fault pickups data from 11th Jan 2024 to 17th Apr 2024 and found a total of 200 faults pickups means approximately 50 Faults per month, which shows there is no reduction of the number of faults from our earlier communication. Since the fault currents are being fed from our 200 MVA, 400/132/33 kV Transformer, therefore life expectancy of the transformer is being compromised.

It is therefore once again requested that kindly take appropriate action so that such a serious issue may be resolved on urgency basis.

The matter may please be treated as most urgent.

Thanking you.

Yours truly,

17/04/24

(T.P.Verma)
Sr. DGM (Substation)

टी० पी० वर्मा/T.P. VERMA
उप महाप्रबंधक/Dy. General Manager
पावर ग्रिड कॉर्पोरेशन ऑफ़ इंडिया लिमिटेड
POWER GRID CORPORATION OF INDIA LIMITED
(भारत सरकार का उद्यम/A Govt. of India Enterprise)
765/400/132kV/+500kV HVDC Ballia SS
Ibrahimpatti, Ballia-221716 (U.P.)

CC:

1. CGM (AM), RHQ, NR-3, Lucknow for kind information please.
2. Sr. GM Ballia Substation for kind information please.
3. GM (AM), RHQ, NR-3, Lucknow for kind information please.

पावर ग्रिड कॉर्पोरेशन ऑफ इंडिया लिमिटेड
(भारत सरकार का उद्यम)
POWER GRID CORPORATION OF INDIA LIMITED
(A Government of India Enterprise)

कार्यालय/साइट: 765/400 /132 के.वी. एचवीएसी & ±500 के.वी. एचवीडीसी बलिया उपकेंद्र, इब्राहिमपट्टी, बलिया (उ.प्र.)-221716
Office/Site: 765/400/132kV HVAC & ±500 kV HVDC Ballia Substation, Ibrahimpatti, Ballia (U.P.)- 221716

Ref. No.: NR3/BAL/HVDC/132 kV/UPPCL/02 **Date**: 22.02.2024

URGENT

To,

Executive Engineer,
EEE, UPPCL (Semari Jamalpur)
Ballia

Ref.: Our Letter Ref. NR3/BAL/HVDC/33 KV/UPPCL/01 dated 01.12.2023

Sub: **Frequent interruptions in 33 kV UPPCL Feeder**.

Dear Sir,

As intimated vide above referred letter that we are facing frequent interruptions in the 33 kV dedicated supply from 132/33 kV Simri Jamalpur UPPPCL Substation due to which operation of 2500MW HVDC Ballia-Bhiwadi Line has become very difficult. This power supply is being used to feed power to HVDC auxiliary system such as thyristor cooling water pump, tap changer of converter transformer etc. The successful operation of any HVDC system is totally dependent on successful operation of auxiliary systems which in turn require uninterrupted auxiliary power supply.

However, POWERGRID Ballia Substation is still facing frequent interruptions on 33kV dedicated UPPCL feeder.

It is therefore requested that kindly review & resolve the frequent interruptions in 33kV UPPCL feeder. Also, details of rectification as carried out may also be forwarded to us.

The matter must be treated as most urgent.

Thanking you.

Yours truly,

22/02/24

(T.P.Verma)
Sr. DGM (Substation)

टी॰ पी॰ वर्मा/ T. P. VERMA
उप महाप्रबंधक/Dy. General Manager
पावर ग्रिड कॉर्पोरेशन ऑफ इंडिया लिमिटेड
POWER GRID CORPORATION OF INDIA LIMITED
(भारत सरकार का उद्यम/A Govt. of India Enterprise)
765/400/132kV/±500kV HVDC Ballia SS
Ibrahimpatti, Ballia-221716 (U.P.)

CC: 1. CGM (AM), RHQ, NR-3, Lucknow for kind information please.
2. Sr. GM (AM), RHQ, NR-3, Lucknow for kind information please.
3. Sr. GM Ballia Substation for kind information please.

All Prices are in Indian Rupees.

SI. No.	Item Description	Unit	Qty.	Supply Rate	Supply Amount	Remarks
1	2	3	4			
EX-WORKS SUPPLY CHARGES						
A	**SUPPLY PART :**					
1	72.5kV class, 1250A, 31.5kA Circuit Breaker (3-ph) with support structure.	Nos.	1	5,09,766.00	5,09,766.00	SOR June-23
2	72.5kV class, 100A, 31.5KA, with 120% extended rating Current Transformer (1-ph) as per Technical specification.	Nos.	6	2,14,664.00	12,87,984.00	SOR June-23
3	72.5kV class, Voltage Transformer (1-ph).	Nos.	3	1,11,760.00	3,35,280.00	SOR June-23
4	72.5kV class, 1250A, 31.5kA Isolator (3-ph)-HDB including support insulator without Earthswitch	Set	2	1,87,257.00	3,74,514.00	SOR June-23
5	Standard pipe structures for 72.5kV CT (1-phase)	Nos.	6	17,994.00	1,07,964.00	SOR June-23
6	Standard pipe structures for 72.5kV CVT (1-phase)	Nos.	3	17,994.00	53,982.00	SOR June-23
7	Standard pipe structures for 72.5kV Isolator (3-phase)	Nos.	2	1,02,006.00	2,04,012.00	SOR June-23
8	Standard pipe structures for 72.5kV for BPI (height 5.8m) excluding Wave Trap	Nos.	15	16,172.00	2,42,580.00	SOR June-23
9	Standard pipe structures for 72.5kV for BPI (height 4.4m) excluding Wave Trap	Nos.	3	16,172.00	48,516.00	SOR June-23
10	72.5kV BPI of height 770mm (1-phase)	Nos.	18	5,224.00	94,032.00	SOR June-23
11	28 mm Dia Foundation bolts including nuts, check nuts and washers for lattice and pipe structures.	Nos.	84	725.00	60,900.00	SOR June-23
12	33kV 1Cx**185sqmm** XLPE AL Armoured Cable alongwith Accessoried as per Technical Specification	KM	1.8	5,95,339.00	10,71,610.20	**As per SAP PO 5100046160**
13	33KV XLPE Cable Termination Equipment along with structure and Accessories for Outdoor termination (one set consists of complete requirement for one bay)	SET	1.0	1,14,197.00	1,14,197.00	SOR June-23
14	Power Cable-4C x 6 sqmm Aluminium PVC (1.1kV Grade)	KM	0.2	94,901.00	18,980.20	SOR June-23
15	Power Cable-2C x 6 sqmm Aluminium PVC (1.1kV Grade)	KM	0.2	71,277.00	14,255.40	SOR June-23
16	Contol Cable (PVC)Copper 1.1kV grade - 14C x 2.5 sqmm	KM	2.0	4,10,957.00	8,21,914.00	SOR June-23
17	Contol Cable (PVC)Copper 1.1kV grade - 10C x 2.5 sqmm	KM	2.0	2,45,319.00	4,90,638.00	SOR June-23

SI. No.	Item Description	Unit	Qty.	Supply Rate	Supply Amount	Remarks
18	Contol Cable (PVC)Copper 1.1kV grade - 5C x 2.5 sqmm	KM	1.0	1,33,662.00	1,33,662.00	SOR June-23
19	Control & Relay Panel with Cable Differential Protection, Triple Instantaneous Over Current relay with Adjusted Definite Mean Time, Instantaneous Earth Fault Relay with Adjusted Definite Mean Time, Master Trip relay. / Control, Relay & Protection Panel for 33 kV Transformer (-with Automation in existing SCADA)	Set	1	5,10,694.00	5,10,694.00	SOR June-23
20	Erection Hardware for the 72.2kV Equipment for Tertiary loading as per Technical Spectification (Insulator String, Disc Insulator, Hardware, Conductor, AL Tube, Busbar Materials, Cable Trays, Ba MB, Clamps, Spacers, Connectors including Equipment Connector, Junction Boxes, Earthwire, Earthing Material Risers, Auxiliary Earth Mat (Excluding Main Earthmat) burried Cable Trenches, pipe equipment, & Lighting, all Accessories etc.)	Set	1	6,44,012.00	6,44,012.00	SOR June-23
21	33kV 1Cx185 sqmm XLPE Power straight through Cable Jointing Kit (Raychem/3M Kit)	Nos.	2	4,850.00	9,700.00	Offer dated 19.06.23 at Annexure-3F
22	33KV Heat shrinkable Bus Bar insulation Tube for ACSR Moose conductor-dia 31.77mm (Raychem/3M Kit)	Meter	20	2,655.00	53,100.00	Offer dated 19.06.23 at Annexure-3F
23	33KV Heat shrinkable Bus bar insulation sleeve for 3 Inch IPS Tube - (Raychem/3M Kit)	Meter	80	6,880.00	5,50,400.00	Offer dated 19.06.23 at Annexure-3F
24	33kV Heat shrinkable Tape for Isolator, CT, VT, All Connectors, Corona bell etc (Raychem/3M kit), 1M-1EA	Meter	50	3,515.00	1,75,750.00	Offer dated 19.06.23 at Annexure-3F
B	**MANDATORY SPARES**					
25	One piece of all Clamps and connectors	Set	1	32,200.60	32,200.60	10% Cost of Erection Hardware
26	72.5kV CB 1250A, 31.5kA CB-1 Pole	No	1	3,91,216.00	3,91,216.00	SOR June-23
27	72.5kV class, 100A, 31.5kA, with 120% extended rating Current Transformer (1-ph) with 2 core-100/1 and One Core 50/1	Nos	1	1,43,233.00	1,43,233.00	SOR June-23
28	72.5kV class, Voltage Transformer (1-ph).	Nos	1	1,33,501.00	1,33,501.00	SOR June-23

SI. No.	Item Description	Unit	Qty.	Supply Rate	Supply Amount	Remarks
29	One Pole of 72.5kV class, 1250A, 31.5kA Isolator (3-ph)-HDB including support insulator without Earthswitch	Nos	1	1,43,604.00	1,43,604.00	SOR June-23
30	72.5kV BPI of height 770mm (1-phase)	Nos	1	5,224.00	5,224.00	SOR June-23
	TOTAL				87,77,421.40	

BOQ Cum Cost Estimate for Shifting of UPPCL Auxiliary Supply to Tertiary Bus of 765/400 kV ICT-1 for Reliable Auxiliary Power Supply to ±500kV HVDC Ballia Substation

Estimated Cost (F&I)

Annexure-3B

All Prices are in Indian Rupees.

SI. No.	Item Description	Unit	Qty.	Unit Freight, In –transit Insurance & loading Charges	Total Freight, In –transit Insurance & loading Charges	Remarks
1	2	3	4	5	6 = 4 x 5	
F&I Portion FOR Supply of Materials to POWERGRID, Ballia Sub-Station						
A	**SUPPLY PART :**					
1	72.5kV class, 1250A, 31.5kA Circuit Breaker (3-ph) with support structure.	Nos.	1	20391	20390.64	
2	72.5kV class, 100A, 31.5KA, with 120% extended rating Current Transformer (1-ph) as per Technical specification.	Nos.	6	8587	51519.36	
3	72.5kV class, Voltage Transformer (1-ph).	Nos.	3	4470	13411.2	
4	72.5kV class, 1250A, 31.5kA Isolator (3-ph)-HDB including support insulator without Earthswitch	Set	2	7490	14980.56	
5	Standard pipe structures for 72.5kV CT (1-phase)	Nos.	6	720	4318.56	
6	Standard pipe structures for 72.5kV CVT (1-phase)	Nos.	3	720	2159.28	
7	Standard pipe structures for 72.5kV Isolator (3-phase)	Nos.	2	4080	8160.48	
8	Standard pipe structures for 72.5kV for BPI (height 5.8m) excluding Wave Trap	Nos.	15	647	9703.2	
9	Standard pipe structures for 72.5kV for BPI (height 4.4m) excluding Wave Trap	Nos.	3	647	1940.64	
10	72.5kV BPI of height 770mm (1-phase)	Nos.	18	209	3761.28	
11	28 mm Dia Foundation bolts including nuts, check nuts and washers for lattice and pipe structures.	Nos.	84	29	2436	
12	33kV 1Cx185 sqmm XLPE AL Armoured Cable alongwith Accessoried as per Technical Spectification	KM	2	23814	42864.408	
13	33KV XLPE Cable Termination Equipment along with structure and Accessories for Outdoor termination (one set consists of complete requirement for one bay)	SET	1	4568	4567.88	

SI. No.	Item Description	Unit	Qty.	Unit Freight, In –transit Insurance & loading Charges	Total Freight, In –transit Insurance & loading Charges	Remarks
14	Power Cable-4C x 6 sqmm Aluminium PVC (1.1kV Grade)	KM	0	3796	759.208	
15	Power Cable-2C x 6 sqmm Aluminium PVC (1.1kV Grade)	KM	0	2851	570.216	
16	Contol Cable (PVC)Copper 1.1kV grade - 14C x 2.5 sqmm	KM	2	16438	32876.56	
17	Contol Cable (PVC)Copper 1.1kV grade - 10C x 2.5 sqmm	KM	2	9813	19625.52	
18	Contol Cable (PVC)Copper 1.1kV grade - 5C x 2.5 sqmm	KM	1	5346	5346.48	
19	Control & Relay Panel with Cable Differential Protection, Triple Instantaneous Over Current relay with Adjusted Definite Mean Time, Instantaneous Earth Fault Relay with Adjusted Definite Mean Time, Master Trip relay. / Control, Relay & Protection Panel for 33 kV Transformer (-with Automation in existing SCADA)	Set	1	20428	20427.76	
20	Erection Hardware for the 72.2kV Equipment for Tertiary loading as per Technical Spectification (Insulator String, Disc Insulator, Hardware, Conductor, AL Tube, Busbar Materials, Cable Trays, Ba MB, Clamps, Spacers, Connectors including Equipment Connector, Junction Boxes, Earthwire, Earthing Material Risers, Auxiliary Earth Mat (Excluding Main Earthmat) burried Cable Trenches, pipe equipment, & Lighting, all Accessories etc.)	Set	1	25760	25760.48	
21	33kV 1Cx185 sqmm XLPE Power straight through Cable Jointing Kit (Raychem/3M Kit)	Nos.	2	300	600	Offer dated 19.06.23 at Annexure-3F
22	33KV Heat shrinkable Bus Bar insulation Tube for ACSR Moose conductor-dia 31.77mm (Raychem/3M Kit)	Meter	20	30	600	Offer dated 19.06.23 at Annexure-3F
23	33KV Heat shrinkable Bus bar insulation sleeve for 3 Inch IPS Tube - (Raychem/3M Kit)	Meter	80	30	2400	Offer dated 19.06.23 at Annexure-3F
24	33kV Heat shrinkable Tape for Isolator, CT, VT, All Connectors, Corona bell etc (Raychem/3M kit)	Meter	50	30	1500	Offer dated 19.06.23 at Annexure-3F

SI. No.	Item Description	Unit	Qty.	Unit Freight, In –transit Insurance & loading Charges	Total Freight, In –transit Insurance & loading Charges	Remarks	
	MANDATORY SPARES						
25	One piece of all Clamps and connectors	Set	1	1288	1288.024		
26	72.5kV CB 1250A, 31.5kA CB-1 Pole	No	1	15649	15648.64		
27	72.5kV class, 100A, 31.5kA, with 120% extended rating Current Transformer (1-ph) with 2 core-100/1 and One Core 50/1	Nos	1	5729	5729.32		
28	72.5kV class, Voltage Transformer (1-ph).	Nos	1	5340	5340.04		
29	One Pole of 72.5kV class, 1250A, 31.5kA Isolator (3-ph)-HDB including support insulator without Earthswitch	Nos	1	5744	5744.16		
30	72.5kV BPI of height 770mm (1-phase)	Nos	1	209	208.96		33959.1
	TOTAL				**324638.856**		

BOQ Cum Cost Estimate for Shifting of UPPCL Auxiliary Supply to Tertiary Bus of 765/400 kV ICT-1 for Reliable Auxiliary Power Supply to ±500kV HVDC Ballia Substation

Estimated Cost (Service)

Annexure-3C

All Prices are in Indian Rupees.

Sl. No.	Item Description	Unit	Qty.	Rate	Amout	Remarks
1	3	4	5	6	7	
	ERECTION & CIVIL PORTION					
	Erection Charges					
1	72.5kV class, 1250A, 31.5kA Circuit Breaker (3-ph) with support structure.	Nos.	1	7,843.00	7,843.00	SOR June-23
2	72.5kV class, 100A, 31.5KA, with 120% extended rating Current Transformer (1-ph) as per Technical specification.	Nos.	6	5,377.00	32,262.00	SOR June-23
3	72.5kV class, Voltage Transformer (1-ph).	Nos.	3	1,192.00	3,576.00	SOR June-23
4	72.5kV class, 1250A, 31.5kA Isolator (3-ph)-HDB including support insulator without Earthswitch	Set	2	6,984.00	13,968.00	SOR June-23
5	Standard pipe structures for 72.5kV CT (1-phase)	Nos.	6	1,053.00	6,318.00	SOR June-23
6	Standard pipe structures for 72.5kV CVT (1-phase)	Nos.	3	1,053.00	3,159.00	SOR June-23
7	Standard pipe structures for 72.5kV Isolator (3-phase)	Nos.	2	5,946.00	11,892.00	SOR June-23
8	Standard pipe structures for 72.5kV for BPI (height 5.8m) excluding Wave Trap	Nos.	15	848.00	12,720.00	SOR June-23
9	Standard pipe structures for 72.5kV for BPI (height 4.4m) excluding Wave Trap	Nos.	3	848.00	2,544.00	SOR June-23
10	72.5kV BPI of height 770mm (1-phase)	Nos.	18	1,592.00	28,656.00	SOR June-23
11	28 mm Dia Foundation bolts including nuts, check nuts and washers for lattice and pipe structures.	Nos.	84	404.00	33,936.00	SOR June-23
12	33kV 1Cx185 sqmm XLPE AL Armoured Cable alongwith Accessoried as per Technical Spectification	KM	1.8	2,59,712.00	4,67,481.60	SOR June-23

SI. No.	Item Description	Unit	Qty.	Rate	Amout	Remarks
13	33KV XLPE Cable Termination Equipment along with structure and Accessories for Outdoor termination (one set consists of complete requirement for one bay)	SET	1	10,694.00	10,694.00	SOR June-23
14	Power Cable-4C x 6 sqmm Aluminium PVC (1.1kV Grade)	KM	0.2	26,430.00	5,286.00	SOR June-23
15	Power Cable-2C x 6 sqmm Aluminium PVC (1.1kV Grade)	KM	0.2	26,430.00	5,286.00	SOR June-23
16	Contol Cable (PVC)Copper 1.1kV grade - 14C x 2.5 sqmm	KM	2	43,459.00	86,918.00	SOR June-23
17	Contol Cable (PVC)Copper 1.1kV grade - 10C x 2.5 sqmm	KM	2	38,243.00	76,486.00	SOR June-23
18	Contol Cable (PVC)Copper 1.1kV grade - 5C x 2.5 sqmm	KM	1	31,291.00	31,291.00	SOR June-23
19	Control & Relay Panel with Cable Differential Protection, Triple Instantaneous Over Current relay with Adjusted Definite Mean Time, Instantaneous Earth Fault Relay with Adjusted Definite Mean Time, Master Trip relay. / Control, Relay & Protection Panel for 33 kV Transformer (-with Automation in existing SCADA)	Set	1	9,762.00	9,762.00	SOR June-23
20	Erection Hardware for the 72.2kV Equipment for Tertiary loading as per Technical Spectification (Insulator String, Disc Insulator, Hardware, Conductor, AL Tube, Busbar Materials, Cable Trays, Ba MB, Clamps, Spacers, Connectors including Equipment Connector, Junction Boxes, Earthwire, Earthing Material Risers, Auxiliary Earth Mat (Excluding Main Earthmat) burried Cable Trenches, pipe equipment, & Lighting, all Accessories etc.)	Set	1	72,219.00	72,219.00	SOR June-23

Sl. No.	Item Description	Unit	Qty.	Rate	Amout	Remarks
21	33kV 1Cx185 sqmm XLPE Power straight through Cable Jointing Kit (Raychem/3M Kit)	Nos.	2	590.00	1,180.00	Offer dated 19.06.23
22	33KV Heat shrinkable Bus Bar insulation Tube for ACSR Moose conductor-dia 31.77mm (Raychem/3M Kit)	Meter	20	590.00	11,800.00	Offer dated 19.06.23
23	33KV Heat shrinkable Bus bar insulation sleeve for 3 Inch IPS Tube - (Raychem/3M Kit)	Meter	80	590.00	47,200.00	Offer dated 19.06.23
24	33kV Heat shrinkable Tape for Isolator, CT, VT, All Connectors, Corona bell etc (Raychem/3M kit)	Meter	50	590.00	29,500.00	Offer dated 19.06.23
B	**Civil works**					
25	Excavation of all kind of soil including rock for all leads and lifts, Backfilling, disposal of surplus earth within lead of 2KM as per technical Specification. The surplus earth shall be roughly graded.	CUM	80.73	253.00	20,424.69	SOR June-23
26	Providing and laying in position cement concrete of specified grade including the cost of centering and shuttering - All work up to plinth level : 1:4:8 (1 Cement : 4 coarse sand (zone-III) : 8 graded stone	CUM	2.577	4,017.00	10,353.32	SOR June-23
27	Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering- all work upto plinth level ; 1:5:10 (01 cement: 5 coarse sand (Zone-III): 10 graded stone aggregates 40mm nominal size) and applying cement slurry in the ratio of (1 cement : 6 fine aggregates) with cement consumption for slurry 150kg for every 100sqm as per POWERGRID Norms.	CUM	20.522	3,531.00	72,464.06	SOR June-23

SI. No.	Item Description	Unit	Qty.	Rate	Amout	Remarks
28	Providing and laying in position specified grade of reinforced cement concrete, excluding the cost of centering, shuttering, finishing and reinforcement - All work up to plinth level :1:1.5:3 (1 cement : 1.5 coarse sand (zone-III): 3 graded stone aggregate 20 mm nominal size)	CUM	13.025	6,727.00	87,620.86	SOR June-23
29	Steel reinforcement for R.C.C. work including straightening, cutting, bending, placing in position and binding all complete upto plinth level.Thermo-Mechanically Treated bars. (Chairs, OverLap, wastages, etc. deemed to be included & shall not measured)	MT	0.775	74,937.00	58,043.39	SOR June-23
30	RCC Culvert and Cable Trench Crossing including Supplying and Laying of Hume Pipe 300mm Dia of Grade NP-3 excluding Concrete	RM	30.00	2,363.00	70,890.00	SOR June-23
31	Removing,cleaning and washing of existing stones and respreading of stones in switchyard excluding PCC.	SQM	271.25	100.00	27,125.00	SOR June-23
32	Supplying & spreading of 40mm single sized stone chips to the 100mm thickness over switchyard surface including transportation, loading, unloading and stacking	CUM	13.56	1,947.00	26,406.19	SOR June-23
33	Antiweed Treatment	SQM	187.50	20.00	3,750.00	SOR June-23
34	Demolishing R.C.C. work manually/ by mechanical means including stacking of steel bars and disposal of unserviceable material within 50 metres lead as per direction of	CUM	4.125	2,196.00	9,058.50	SOR June-23
35	Demolishing cement concrete (PCC) manually/ by mechanical means including disposal of material within 50 metres lead as per direction of Engineer - in - charge:Nominal concrete 1:5:10 or leaner mix (i/c equivalent design mix	CUM	18.750	354.00	6,637.50	SOR June-23
36	Burried Cable Trenches for Aux Power Arrangement	M	600.000	1,424.00	8,54,400.00	SOR June-23
	Total				**22,59,151.10**	

Annexure-3D

SUMMARY OF TAXES & DUTIES APPLICABLE ON GOODS		
Sl. No.	**Item Nos.**	**Total Price (INR)**
1	**TOTAL GST ON GOODS**	
	Total GST for Supply of Goods (inter-alia including Type Test Charges) between the Contractor and the Employer which are not included in the Ex-works price.	**15,79,935.85**
2	**TOTAL GST ON SERVICES**	
	Total GST for Service Charges, if, any between the Contractor and the Employer which are not included in the Service Charges	**4,06,647.20**
	GRAND TOTAL [1+2]	**19,86,583.05**

Annexure-3E

(GRAND SUMMARY)		
Sl. No.	**Description**	**Total Price (INR)**
1	**TOTAL SCHEDULE NO. 1**	**87,77,421.40**
	Ex-works price of Plant and Equipment including Type Test Charges	
2	**TOTAL SCHEDULE NO. 2**	**3,24,638.86**
	Local Transportation, In-transit Insurance, loading and unloading	
3	**TOTAL SCHEDULE NO. 3**	**22,59,151.10**
	Service (Installation & commissioning) Charges	
5	**TOTAL [1+2+3]**	**1,13,61,211.36**
	Total Charges excluding GST (Supply and Service Only)	
6	**TOTAL SCHEDULE NO. 4**	**19,86,583.05**
	Taxes and Duties	
7	**GRAND TOTAL [1+2+3+4-5]**	**1,33,47,794.41**

Sl. No.	Item Description	Parameters
16.	HVDC control system*	Main + hot standby
17.	HVDC protection system*	Duplicated Protection
18.	Auxiliary supply source	Supply sources tapped from 33 kV side of 2 nos. of 400/33 kV transformer (50 MVA) at Bhadla HVDC and 33 kV tertiary of 2 Nos. 765/400/33 kV ICT at Fatehpur. Each auxiliary power shall be fetched from both separate sources of the 33 kV auxiliary supply in station
19.	DC Harmonic filter	Minimum One DC filter for each pole at each HVDC terminal station
20.	AC Network Impedance	Relevant CIGRE/IEC document shall be used for the Network harmonic impedance together with information in PSSE network files provided by CTU.
21.	Negative sequence voltage (fundamental frequency)	1% for Design of equipment 1.5% for rating of equipment
22.	HVDC line online fault locator for pole lines	One No. per pole at each terminal station [when not integrated with Control & Protection System]
23.	HVDC paralleling and de-paralleling switch	As per Requirement
24.	Smoothing reactor on DC bus	As per requirement but not less than 33% of total milli Henry (mH) required for each pole, shall be provided on DC pole bus
25.	Blocking filter	As per requirement
26.	Reliability and Availability Design Targets	As per Table 10
27.	Station Loss evaluation criteria	Methodology as per IEC 61803 and Target figures stated in Table 10
28.	System Grounding	Solidly grounded

*TSP can provide integrated Control and Protection system as well, meeting functional requirements.

The criteria for the design and control of the network shall be as follows:

- 400 kV AC bus voltages shall normally be within ±5.0% of nominal voltage (400 kV). Bus voltages outside this range may occur from time to time and may exist for long

in the switchyard from entering the valve hall and overstressing the thyristor valves. It decreases the incident of commutation failures by limiting the rate of change of current caused by rapid voltage changes. It is also being considered to provide smoothing reactor in the neutral bus to optimize the cost of the project. Smoothing reactor will be of air core type.

10.2.9 TELECOMMUNICATION

The proper and smooth operation of the HVDC system shall depend on a highly reliable and effective telecommunication system between the two terminals. For this purpose, necessary telecommunication equipment, through Fibre Optic communication network shall be provided between the converter stations. This shall be achieved by installing optical ground wire(OPGW) with 24 fibres on one of the peaks of the 800 kV HVDC line and repeater station. Repeater station shall be preferably located in the substation en route to HVDC line. The fibre optic communication channels shall be used for both data and speech between the converter stations. The backup to this Fiber Optic link shall be provided with F.O Network being developed for AC substations in WR & SR.

10.2.10DEDICATED METALLIC RETURN

Additional third conductor shall be used as return path between HVDC converters. The necessary DC switchgear arrangement required for establishing the return path shall be part of HVDC terminal. The conductor shall be laid on the same tower on which the pole conductors are installed with due consideration to electrical clearances (ROW), current rating etc.

10.2.11 AUXILIARY ELECTRICAL & MECHANICAL SYSTEM

A HVDC station requires a very reliable auxiliary power supply for smooth operation. For the Pugalur terminal, the auxiliary power requirement is proposed to be met from the two 400/110/33kV, 200 MVA transformers to be procured as part of Scheme 1 scope. For Raigarh station, the auxiliary power shall be taken at 33kV from the tertiary of two 765 kV ICT's existing at Raigarh. Back up auxiliary power for both terminals shall be available from suitably rated DG sets.

Other systems such as Control room Air conditioning, Fire fighting, illumination system, Oil handling, AC and DC auxiliary power supplies, station grounding, Public address and internal communication system, etc. shall be suitably provided as is mandatory in all HVDC Installation. An independent VESDA (or equivalent) System shall be installed in each valve hall for early detection of incipient fire/smoke. In addition, UV sensors to detect electrical arcs shall also be installed within the valve hall. A fully computerized and automatic Building Management System (BMS) shall control the operation of the mechanical systems serving the valve hall and service building and other systems.. Bore-well water is proposed to be used to meet the water requirements of the project.

10.2.12 CREEPAGE DISTANCES AND ELECTRIC FIELD

The creepage distances being specified for the HVDC system are as follows:

Annexure-B

सत्यमेव जयते

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

विषय: उत्तर क्षेत्रीय विद्युत समिति की प्रचालन समन्वय उप-समिति की 219वीं बैठक का कार्यवृत |

Subject: Minutes of the 219th OCC meeting of NRPC.

उत्तर क्षेत्रीय विद्युत समिति की प्रचालन समन्वय उप-समिति की 219वीं बैठक दिनांक 15.05.2024 को आयोजित की गयी थी। उक्त बैठक का कार्यवृत्त उत्तर क्षेत्रीय विद्युत समिति की वेबसाइट http://164.100.60.165 पर उपलब्ध है। यदि कार्यवृत पर कोई टिप्पणी हो तो कार्यवृत जारी करने के एक सप्ताह के अन्दर इस कार्यालय को भेजें |

The 219th meeting of the Operation Co-ordination Sub-Committee (OCC) of NRPC was held on 15.05.2024. The Minutes of this meeting has been uploaded on the NRPC website http://164.100.60.165. Any comments on the minutes may kindly be submitted within a week of issuance of the minutes.

संलग्नक:यथोपरि।

Signed by Omkishor
Date: 28-05-2024 17:32:36

(ओमकिशोर)
कार्यपालक अभियंता (प्रचालन)

सेवा में,

उ.क्षे.वि.स. के प्रचालन समन्वय उप-समिति के सभी सदस्य

A.11.5. OCC forum agreed with proposed revision in SPS. Further, with regard to NRLDC comments on implemented logic which decides priority in Nehtaur SPS and time delay to be kept, agenda may be brought by UPSLDC in next OCC meeting.

A.12. Table Agenda 2: Request to consider Off-load 400 kV Bus Split arrangement at 400/220 kV Maharanibagh Substation (Agenda by Powergrid NR-1)

A.12.1 EE(O), NRPC apprised forum that Powergrid NR-1 is facing operational challenges at Maharanibagh GIS Substation due to its Double Main Bus Bar setup, leading to frequent and prolonged shutdowns for maintenance.

A.12.2 Further he mentioned that in the past four years, the 400 kV GIS at Maharanibagh Substation has undergone three complete shutdowns, each lasting 5-14 days, to resolve defects occurring between the circuit breaker compartment and the Bus Bar. In February 2018, the complete substation was in shutdown for 14 days continuously. In August 2023, an issue observed in gas-tight insulator inside the 400 kV Bus Bar-2, near Hyosung GIS Bay – 407 (Transformer-4), necessitating a 4-day shutdown of both 400 kV Bus Bars. This led to a complete interruption of power flow from the 400 kV side.

A.12.3 To address this, Powergrid NR-1 has proposed for a 400 kV Bus Bar splitting arrangement between ABB and Hyosung GIS. This arrangement aims to mitigate the risk of complete station shutdowns by allowing the disconnection of faulty segments while maintaining continuous power flow through the healthy side of the Bus Bar.

A.12.4 Further, CGM Powergrid mentioned that Technical feasibility has been assessed, and the financial implications, is approximately 8.7 Cr(Expenditure booking under Add Cap block 2024-2029).

A.12.5 In the meeting, Powergrid NR-1 representative presented the bus split arrangement at 400/220 kV Maharanibagh Substation to the forum.

A.12.6 MS, NRPC suggested that a committee of members from NRLDC, CTU, DTL, HVPN and UPPTCL may be constituted under chairmanship of Superintending Engineer (Operation), NRPC that would visit 400/220 kV Maharanibagh Substation and submit its report before the next OCC meeting regarding the need to consider the Off-load 400 kV Bus Split arrangement at 400/220 kV Maharanibagh Substation.

A.13. Table Agenda 3: Low voltage at RVPN's 220 kV GSSs in the vicinity of 400 kV GSS Bhinmal (PG) - (Agenda by RVPN)

A.13.1. RVPN vide mail dated 13.05.2024 has intimated that to control High loading of 400kV Bhinmal-Zerda line, following scheme was approved in 53rd NRPC

Annexure-C

सत्यमेव जयते

भारत सरकार

Government of India

विद्युत मंत्रालय

Ministry of Power

उत्तर क्षेत्रीय विद्युत समिति

Northern Regional Power Committee

सेवा में/ To,

1. Chief General Manager (SO), NRLDC [Email: somara.lakra@grid-india.in]
2. General Manager (CTU) [Email: kashish@powergrid.in]
3. AGM DTL [Email: bl.gujar@dtl.gov.in]
4. Chief Engineer UPPTCL [Email: director_op@upptcl.org]
5. Chief Engineer HVPN [Email: cetspkl@hvpn.org.in]

Sub: Nomination for the Committee to visit 400/220 kV Maharanibagh Substation regarding Off-load 400 kV Bus Split arrangement at 400/220 kV Maharanibagh Substation.

महोदय,

Reference is invited to discussion held in the 219th OCC meeting (held on 15th May, 2024) on the agenda item of Powergrid NR-1 “to consider Off-load 400 kV Bus Split arrangement at 400/220 kV Maharanibagh Substation” (detailed agenda attached as Annexure) wherein, it was decided that a committee may be formed under chairmanship of Superintending Engineer (Operation), NRPC and having members from NRLDC, CTU, DTL, HVPN and UPPTCL. The committee would visit 400/220 kV Maharanibagh Substation and submit its report before the next OCC meeting regarding the need to consider the Off-load 400 kV Bus Split arrangement at 400/220 kV Maharanibagh Substation.

In view of the above, NRLDC, CTU, DTL, HVPN and UPPTCL are requested to send the nomination of the officer(s) at seo-nrpc@nic.in in the format as below-

S. No.	Name (Sh./Ms./Mrs.)	Designation	Organization	Contact no.	Email address

This issues with the approval of Member Secretary, NRPC.

Signed by Dharmendra Kumar Meena
Date: 17-05-2024 10:06:20

Encls: As above

(डी. के. मीना)
अधीक्षण अभियंता (प्रचालन)

Copy to: CGM, Powergrid NR-1

Annexure

Ref: -N1/AM/ **Date: - 10st May'2024**

To,
SE (Operation)
Northern Regional Power Committee,
18-A, Qutab Institutional Area,
Katwaria Sarai, New Delhi-110 016

Subject- Regarding Off-load 400 kV Bus Split arrangement at 400/220 kV Maharanibagh Substation.

Dear Sir,

Maharanibagh GIS Substation is an integral part of Delhi's main ring infrastructure and plays a pivotal role in ensuring the uninterrupted supply of power to the region, boasting an impressive installed capacity of 1630 MVA.

Currently, the substation comprises 12 bays of 400 kV and 09 bays of 220 kV, accommodating a total of 04 transformers, including 2 units of 500 MVA and 2 units of 315 MVA, along with a Bus Reactor of 125 MVAR and 06 transmission lines of 400 kV. Commissioned in 2007 under the High-Capacity East – North Inter Connector-II project, the substation has evolved over the years to meet the escalating power demands of the region, with additional transformers and bays being added in 2010 to address increased power requirements.

However, despite its critical role, the Maharanibagh Substation faces operational challenges, particularly due to its Double Main (DM) Bus Bar arrangement in both the 400 kV and 220 kV GIS. This arrangement, while efficient under normal circumstances, poses significant drawbacks, particularly in the event of any issue arising between the Circuit Breaker and Bus Bar compartments. Such issues have necessitated several complete shutdowns of the 400 kV GIS over the past four years, with each shutdown lasting between 5 to 14 days, thereby disrupting power supply and reducing the substation's reliability and availability.

To address these challenges, we propose the implementation of an off-load 400 kV Bus Bar splitting arrangement between ABB and Hyosung GIS, specifically between bays 405 & 406. This arrangement would allow for the disconnection or splitting of the Bus Bar, ensuring continuous power flow through the healthy side and minimizing disruptions to service. Each side of the bus splitter will be equipped with 02 transformers and at least 02 lines, thereby ensuring continued power supply, even though at a reduced capacity, during maintenance or fault rectification activities.

केन्द्रीय कार्यालय : "सौदामिनी" प्लॉट सं. 2, सैक्टर–29, गुरुग्राम–122001, (हरियाणा), दूरभाष : 0124–2571700–719
Corporate Office : "Saudamini", Plot No. 2, Sector-29, Gurugram-122001, (Haryana) Tel. : 0124-2571700-719
पंजीकृत कार्यालय : बी–9, कुतुब इंस्टीट्यूशनल एरिया, कटवारिया सराय, नई दिल्ली–110016 011-26560112, 26564812, 26564812, 26564892, सीआईएन : L40101DL1989GOI038121
Registered Office : B-9, Qutab Institution Area, Katwaria Sarai, New Delhi-110016. Tel.: 011-26560112, 26564812, 26564812, 26564892, CIN : L40101DL1989GOI038121
Website : www.powergridindia.com

Technical feasibility of Off-load 400 kV Bus Split arrangement has been assessed, and the financial implications, is approximately 8.7 Cr (Expenditure booking under Add Cap block 2024-2029).

Considering the significant benefits that this arrangement would bring, including system improvement and increased grid reliability, it is requested to kindly look into the proposal for Off-load 400 kV Bus Split arrangement at 400/220 kV Maharanibagh Substation.

Thanking you.

Yours sincerely,

(Vishal Roy)
Sr. DGM (RTAMC, NR-1)

Copy: -

i) MS (NRPC) (For kind information please.)

ii) CGM-AM , NR-1

iii) CGM, NRLDC

केन्द्रीय कार्यालय : "सौदामिनी" प्लॉट सं. 2, सैक्टर–29, गुरुग्राम–122001, (हरियाणा), दूरभाष : 0124–2571700–719
Corporate Office : "Saudamini", Plot No. 2, Sector-29, Gurugram-122001, (Haryana) Tel. : 0124-2571700-719
पंजीकृत कार्यालय : बी–9, कुतुब इंस्टीट्यूशनल एरिया, कटवारिया सराय, नई दिल्ली–110016 011-26560112, 26564812, 26564812, 26564892, सीआईएन : L40101DL1989GOI038121
Registered Office : B-9, Qutab Institution Area, Katwaria Sarai, New Delhi-110016. Tel.: 011-26560112, 26564812, 26564812, 26564892, CIN : L40101DL1989GOI038121
Website : www.powergridindia.com

Enclosure-I

Transmission system for evacuation of power from Rajasthan REZ Ph-V (Part-1 :4 GW) [Sirohi/Nagaur] Complex

S. No.	Items	Details
1.	Name of Scheme	**Transmission system for evacuation of power from Rajasthan REZ Ph-V (Part-1 :4 GW) [Sirohi/Nagaur] Complex**
2.	Scope of the scheme	**Transmission system for evacuation of power from Rajasthan REZ Ph-V (Part-1 :4 GW) [Sirohi/Nagaur] Complex, Transmission scheme** **1. Transmission system for immediate Evacuation of Power from Sirohi S/s (2GW)** • 5x500MVA, 400/220kV ICTs at Sirohi S/s along with associated transformer bays • 6 nos. 220kV line bays at Sirohi S/s for RE interconnection • 220 kV Sectionalizer bay (1 set) along with 220 kV BC (2 Nos.) bay and 220 kV TBC (2 Nos.) bay at Sirohi S/s **2. Transmission system for immediate Evacuation of Power from Merta-II S/s (2GW*)** • 3x500MVA, 400/220kV ICTs at Merta-II S/s along with associated transformer bays • 4 nos. 220kV line bays at Merta-II S/s for RE interconnection • 220 kV Sectionalizer bay (1 set) along with 220 kV BC (1 No.) bay and 220 kV TBC (1 No.) bay at Merta-II S/s **3. Transmission system for Common Evacuation of Power from Sirohi PS (2GW) & Merta-II PS (2GW*)** **a) NR-WR Inter regional corridor** • Sirohi – Mandsaur PS 765KV D/c line (~ 320kms) along with 240 MVAr switchable line reactor at Sirohi S/s end 330MVAr switchable line reactor at Mandsaur PS end for each circuit of Sirohi – Mandsaur PS 765KV D/c line **b) Western region** • Mandsaur PS – Khandwa (New) 765kV D/c line (~230km.) along with 240MVAr switchable line reactor for each circuit at each end of Mandsaur PS – Khandwa (New) 765kV D/c line ***Transmission scheme for immediate evacuation of 1GW RE from Merta-II S/s to facilitate connectivity to RE generation developers was deliberated and approved in 19th NCT meeting held on 29.04.24**
3.	Depiction of the scheme on Transmission Grid Map	Attached at **Exhibit-I**
4.	Upstream/downstream system associated with the scheme	765/400kV Sirohi & 765/400kV Mandsaur PS are under bidding, to be implemented as part of Transmission system for evacuation of power from Rajasthan REZ Ph-IV (Part 2: 5.5 GW)

S. No.	Items	Details
		(Jaisalmer/Barmer Complex). 765/400KV Sirohi S/s is being interconnected to Fatehgarh-IV PS (Sec-2), Barmer-I PS, Rishabdeo S/s at 765kV level. At 400kv level Sirohi S/s is being interconnected to Chittorgarh(PG) S/s. 765/400kV Mandsaur PS is being interconnected to Indore (PG), Beawar S/s, Rishabdeo S/s and Kurawar S/s at 765kv level. At 400kV level various RE generators are proposed to be interconnected for injection from Mandsaur PS. 765/400kV Khandwa (New) S/s is existing substation of M/s Sterlite which is interconnected to Indore (PG) and Dhule (Sterlite) at 765kV level and Khargone S/s at 400kV level.
5.	**Objective / Justification**	1. The present scheme comprises Transmission system for evacuation of power from Rajasthan REZ Ph-V (Part-1 :4 GW) [Sirohi/Nagaur] Complex. 2. A Joint study meeting was held on 09.05.24 with stakeholders in NR to deliberate & finalize the Transmission system for evacuation of power from Rajasthan REZ Ph-V (Part-1 :4 GW) [Sirohi/Nagaur] Complex, Transmission scheme for Rajasthan REZ Ph-IV (Part-5 : 6GW) (Barmer Complex) & Rajasthan REZ Ph-IV (Part-6 : 6GW) (Bhadla/Bikaner Complex). 3. In the above Joint study meeting, Grid-India observations on proposed transmission schemes as well as on All India Study files (2027 & 2029 time frame) were deliberated and same was also communicated by Grid-India vide their mail dated 09.05.24 (Copy of Grid-India observations are enclosed in **Annexure-1**) 4. In the above Joint study meeting, it was decided that comprehensive schemes discussed may be segregated in two phases (Phase-1: Transmission scheme for Rajasthan REZ Ph-V (Part-1: 4GW) (Sirohi/Nagaur Complex) & Phase-2: Transmission scheme for Rajasthan REZ Ph-IV (Part-5 : 6GW) (Barmer Complex) & Rajasthan REZ Ph-IV (Part-6 : 6GW) (Bhadla/Bikaner Complex). 5. In Phase-1, PSS/E files shall be modified w.r.t discussion and comments received from Grid-India on 2027 time frame study files. Revised PSS/E files will be circulated to NR stakeholders for finalization of proposed scheme in next Joint study/CMETS-NR meeting (Jun'24). After finalization of Phase-1 scheme i.e. Transmission scheme for Rajasthan REZ Ph-V (Part-1: 4GW) (Sirohi/Nagaur Complex), PSS/E files shall be modified for 2029 time frame w.r.t discussion and other observations/comments received from Grid-India on 2029 timeframe study files and subsequently proposal for Rajasthan REZ Ph-IV (Part-5 : 6GW) & REZ Ph-IV (Part-6 : 6GW)) scheme (Ph-2) will be taken up in Joint meeting/CMETS-NR meeting for stakeholders consultation. 6. Accordingly as part of Phase-1, revised PSS/E files for solar maximized scenario (SC-4 & 7) along with Scenario 8 (evening peak) & Scenario 9 (night off peak) files for 2027 time frame along with reply to Grid-India observations on 2027 timeframe files was sent on 04.06.24 to all stakeholders (Copy of CTU reply is enclosed in **Annexure-2**). Result of system studies enclosed in **Exhibit-II**. Subsequently, Grid India vide their mail

S. No.	Items	Details
		dated 13.06.24 sent observations on revised PSS/E files (Copy of Grid-India observations enclosed in **Annexure-3**) which were deliberated in 30th CMETS-NR meeting held on 18.06.24. In the meeting, CEA agreed for the proposal. Major Grid-India observations on 2027 timeframe files are as under a) Higher demand considered in WR & ER region b) High loading in EHVAC lines in ER and in WR-ER in solar peak hours c) N-1 non compliance of ICTs in Rajasthan (Intra state and Inter state) d) Dynamic simulation studies incl. inertia studies for various contingency scenarios e) Critical loading and higher angular separation (>20 degree) under N-1/N-1-1 contingency of 765kV Bikaner-Moga D/c line as well as Low SCR of Sirohi PS 7. It was deliberated in CMETS-NR meeting that Transmission planning is carried out for peak load scenario. In view of that, it is observed that load growth of more than 7 % is observed in winter solar peak hours in All India & most of the regions. Green Hydrogen and bulk consumer load is considered over and above to EPS demand in planning studies. 8. For high loading in EHVAC lines in ER, it was stated that reconductoring of some of the lines i.e. 400kV Farakka – Kahalgaon and 400kV Talcher – Meramundali is recently agreed in CMETS-ER meeting. Reconductoring of Ranchi New – New PPSP 400kV D/c line and any other augmentation in ISTS and commensurate STU network would be identified based on the joint study meeting scheduled in next month with WBSETCL. Reconductoring of 400kV Farakka – Sagardighi and 400kV Rourkela – Chaibasa 400kV D/c line would be taken up for discussion in CMETS-ER meeting (Jul'24). Additional corridor from WR to ER needs to be envisaged for relieve the loading around Ranchi area. Augmentation of ICTs in WBSETCL, DVC & Odisha area have been informed to respective STUs in various CMETS-ER meetings. 9. For intra state ICT overloading in Rajasthan, RVPN stated that for Hindaun ICT work awarded in Mar'24 (24 months schedule) and for Chittorgarh, Heerapura and Deedwana ICTs proposal is in process. CTU stated that necessary augmentation (Kota and Bhinmal ICT) will be carried out in ISTS in consultation with stakeholders consultation once space availability from TSP for Bhinmal and real time loading data from NRLDC is received for implementation in 2027 timeframe or earlier. NRLDC agreed for the same 10. For dynamic simulation studies and stability studies, CTU stated presently there are convergence issues being faced in dynamic simulation for 2027 scenario for which consultation of IIT Mumbai is also under progress. In view of that, Dynamic simulation studies for planning scenario may take some time. CTU also requested that Grid-India may also share present time frame converged dynamic file which will help to resolve convergence issues in dynamics file for 2027 timeframe w.r.t

S. No.	Items	Details
		Generator models (conventional/RE) used by Grid-India. In reply Grid-India stated that they are also facing convergence issues for present timeframe file and prepared dynamics file with some assumptions. They also shared some models with CTU in past. However for preparation for planning stage dynamic file, CTU and Grid-India can work together to prepare load flow first w.r.t dynamics file and subsequent Dynamic data file (Dyr) shall be prepared with help of models available with Grid-India. 11. CTU stated that to resolve the issue of higher angular separation (>20 degree) under N-1/N-1-1 contingency of 765kV Bikaner-Moga D/c line, suitable strengthening scheme is already under planning. As part of above scheme LILO of 765kV Bikaner -Moga line is envisaged which will reduce the angular separation (<30 degree). The above scheme will be taken up in Jul'24 meeting. 12. For low SCR at Sirohi PS(4.2), CTU stated that no additional connectivity will be granted beyond 2 GW at 220kV level of Sirohi PS with proposed system (400/220kV ICTs at Sirohi PS+765kV Sirohi - Mandsaur). With growing interconnection and planned network in future, SCR at Sirohi may increase. 13. Considering receipt of connectivity application of new RE generators in Sirohi & Nagaur/Merta complexes, connectivity transmission scheme (as per S.No.2) was agreed in 30th CMETS-NR meeting for evacuation of power from Sirohi/Nagaur Complex as part of Rajasthan REZ Ph-V (Part-1 :4 GW) scheme.
6.	**Estimated Cost**	**Rs. 5525 Cr.** **NR Portion : Rs 3400 Cr** **WR Portion : Rs 2125 Cr**
7.	**Need of phasing, if any**	Not Applicable
8.	**Implementation timeframe**	24 months from allocation of project
9.	**System Study for evolution of the proposal**	Studies discussed and agreed in following meeting • 30th CMETS-NR meeting held on 18.06.24 (Minutes of meeting awaited) Load flow results is attached at **Exhibit-II**

Exhibit-I

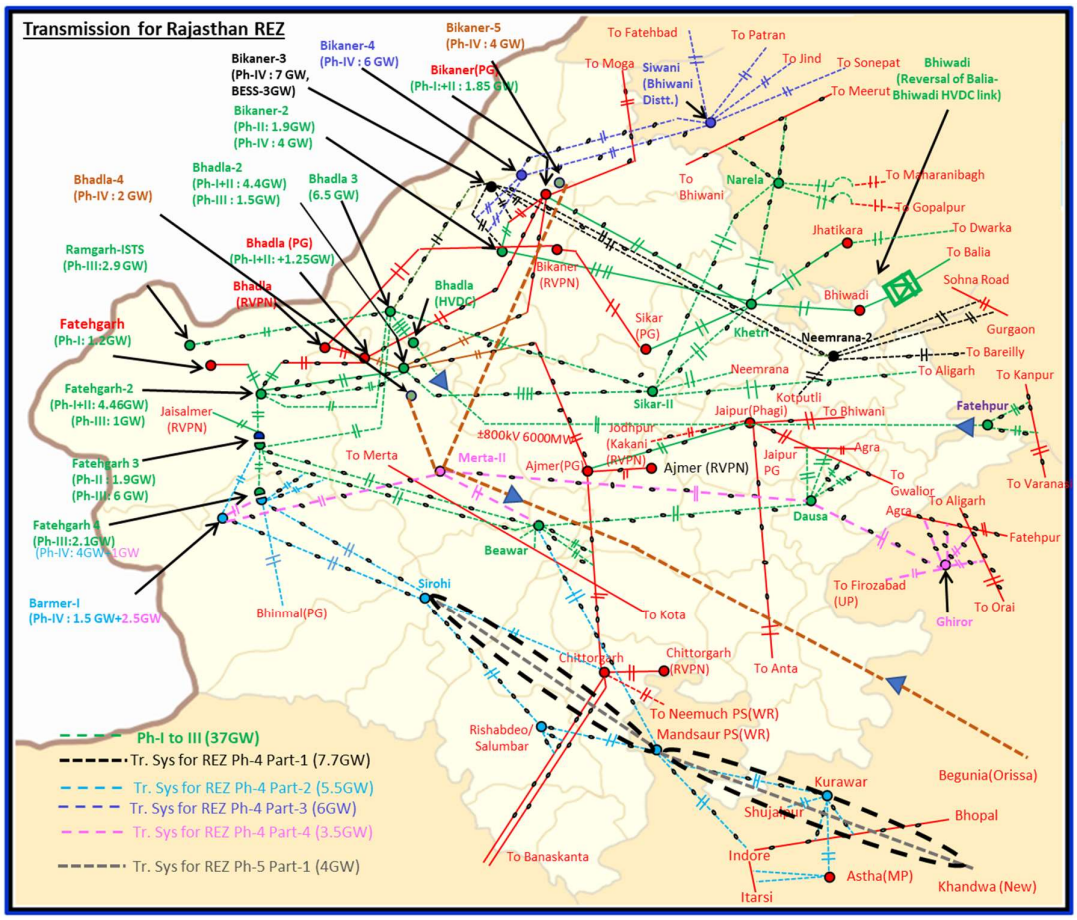


Fig-1 : Transmission system for evacuation of power from Rajasthan REZ Ph-V (Part-1 :4 GW)

NLDC Inputs on Rajasthan REZ Phase-IV and V Schemes

1. Schemes proposed for:

a) Rajasthan REZ Ph-IV (Part-5 : 6GW) (Barmer Complex)
b) Rajasthan REZ Ph-IV (Part-6 : 6GW) (Bhadla/Bikaner Complex)
c) Rajasthan REZ Ph-V (Part-1: 4GW) (Sirohi/Nagaur Complex)

S.No	Transmission Scheme	RE Potential	Status
A	**Under Bidding/ Approved**		
1	Rajasthan REZ Ph-IV (Part-1 :7.7GW) (Bikaner Complex)	14 GW (Solar 14GW, BESS:6GW) Bikaner-II : 3.7GW Bikaner-III: 4GW	Awarded
2	Rajasthan REZ Ph-IV (Part-2 :5.5GW) (Jaisalmer/Barmer Complex)	5.5GW (Solar) Fatehgarh-IV: 4 GW Barmer-I: 1.5 GW	Under Bidding
3	Rajasthan REZ Ph-IV (Part-3 :6GW) (Bikaner Complex)	6 GW (Solar) Bikaner-IV:6GW	Under Bidding (Recently approved in NCT
B	**Planned/Under Planning**		
1	Rajasthan REZ Ph-IV (Part-4 :3.5GW) (Jaisalmer/Barmer Complex)	3.5 GW (Solar) Fatehgarh-IV: 1 GW Barmer-I: 2.5 GW	**Recently approved in NCT**
2	Rajasthan REZ Ph-IV (Part-5 : 6GW) (Barmer Complex)	6 GW (Solar) Barmer-II : 6GW	**Timeframe : 2029 (HVDC)**
3	Rajasthan REZ Ph-IV (Part-6 : 6GW) (Bhadla/Bikaner Complex)	6 GW (Solar) Bhadla-IV: 2 GW Bikaner-V: 4 GW*	
4	**Rajasthan REZ Ph-V (Part-1: 4GW) (Sirohi/Nagaur Complex)**	**4 GW (Solar)** **Sirohi: 2 GW** **Nagaur: 2 GW**	**Present proposal** **Timeframe : 2027 (EHVAC)**

NLDC Inputs on Rajasthan REZ Phase-IV and V Schemes

2. Inputs on AC Scheme proposed for Rajasthan REZ Ph-V (Part-1: 4GW) (Sirohi/Nagaur Complex)

Proposed System (Timeframe – 2027):

- 5x500MVA, 400/220kV ICTs at Sirohi S/s along with transformer bays
- Sirohi – Mandsaur PS 765KV D/c line (~ 320 kms) along with 330 MVAr switchable line reactor for each circuit at each end of Sirohi – Mandsaur PS 765KV D/c line
- Mandsaur PS – Khandwa (New) 765kV D/c line (~230km.) along with 240MVAr switchable line reactor for each circuit at each end of Mandsaur PS – Khandwa (New) 765kV D/c line

a) Load-Generation Balance and IR Flows

S. No.	Region	Load (MW)	Generation (MW)	IR Exchange (MW)	20th EPS Peak Load in 2026-27 (MW)	Average Demand Met in Solar Hours in Feb 2024 (MW)
1	NR	78239	109488	31249	97898	59664
2	WR	98877	92846	-6030	89547	72184
3	SR	78984	94860	15876	80864	62000
4	ER	29496	14828	-14668	37265	20000
5	NER	2941	2654	-287	4855	2000
6	All India	288536	314676	x	277201	216185

S. No.	State	Load (MW)	Generation (MW)	IR Exchange (MW)	20th EPS Peak Load in 2026-27 (MW)	Average Demand Met in Solar Hours in Feb 2024 (MW)
1	Rajasthan	19376	81119	31249	21175	17000

i. Demand considered at all India level as well as in some of the regions in Feb 2027 period is even more than the peak demand of the year 2026-27 as per 20th EPS report.

ii. The actual average demand met during Feb'24 solar hours has also been provided for reference. It appears that the growth demand considered in NR, WR, ER, and at all India level is on the higher side. Same may be reviewed.

iii. Solar and Thermal Generation

- ~190000 MW solar generation considered in service at all India level
- ~62000 MW solar generation is in service in Rajasthan

- ~22000 MW RE generation in Khavda complex has been considered in the case

- Thermal generation has been uniformly backed down to 55% (especially in NR and WR) at most of the stations. It is suggested that the generation may be scaled as per the merit order. Cheaper thermal generating stations like Singrauli and Rihand are also running at 55% level.

- Some of the thermal generating stations (like Vadinar, Khaparkheda, Tiroda-APL etc.) are running below 40% tech min level also. Same may be clarified.

- Many units with no active power generation (Pgen = 0) are kept on in the case. These units are also providing reactive power support in the study case. The voltages in the case, therefore, may not represent the actual scenario. Such units shall therefore be kept off in the case.

iv. With above-mentioned corrections in demand and generation, the whole LGB of the study case will change. This might result in significant changes in network flows also. Therefore, it is suggested that the proposed system may be tested on realistic load-generation scenario for 2026-27, preferably the one coming out of production cost modelling studies.

v. There is significant amount of power flow towards eastern region during solar hours resulting in very high loading and low voltages in the ER grid. It is suggested that system augmentation in ER may be taken up on priority so that the required system gets commissioned with the associated RE generation (2026-27 timeframe).

The details of N-1 non-compliance, high line loading, and low voltages are provided in subsequent sections.

b) Network Loadings

i. With the proposed scheme, there is improvement in loading of 400 kV RAPP – Shujalpur D/C.

ii. Several ICTs in Rajasthan are loaded much above the N-1 limit (Deedwana - PG, Hindaun, Hirapura, Chittorgarh, Kota – PG etc.)

iii. In the base case, several ICTs in WR are violating N-1 criteria (765/400 kV Jamnagar - ISTS, 765/400 kV Indore – PG, 400/220 kV Mandsaur, 400/220 kV Hazira, 400/132 kV Kirnapur – MP, 400/220 kV Navi Mumbai etc.)

iv. Critical loading in 400 kV Farakka – Kahalgaon D/C, 400 kV New Ranchi – PPSP D/C and ICTs in West Bengal is already observed in real-time during solar hours. These elements are severely loaded in the base case also (2027 timeframe).

Details of Lines and ICTs loaded around/more than the N-1 loading limit in NR, WR & ER are given in **Annexure – 1.**

v. 765 kV Ghiror – Aligarh is completely off-loaded (5 MW loading in each ckt)

vi. 765 kV Aligarh – G.Noida touches 2800 MW (Scenario – 7) & 3400 MW (Scenario – 4) on N-1 of 765 kV Aligarh – Kanpur

vii. Angular difference between 765 kV Bikaner and 765 kV Moga touches 26° under N-1

viii. RATE-2 limits of several lines are not available. The same may be corrected in the cases shared by CTUIL.

ix. Angular Separation:

Scenario	765 kV Sirohi – Mandsaur D/C Line	765 kV Sirohi – Risabhdeo D/C	765 kV Neemuch – Khandwa D/C
Base Case	14.4° (1746 MW)	9.5° (1744 MW)	7.3° (1230 MW)
Under N-1 Contingency	17.5° (2100 MW)	12.4° (2254 MW)	9.3° (1581 MW)
Under N-1-1 Contingency	22.3°	17.9°	13.2°

c) Voltages

i. Very low voltages have been experienced at various nodes in the system including in NR RE Complex.

ii. The voltages under N-1 condition (depleted network conditions) will further dip.

765 kV Level

Name	Base kV	Bus No.	Voltage (p.u.)	Voltage (kV)
SIWANI	765	147880	0.94	719
NORTH CHN	765	548008	0.95	730
NCTPS-STG3	765	548013	0.95	730
MADHUGIRI	765	528001	0.95	730
ETPSREP7	765	548124	0.95	730
TIRUVLM	765	548087	0.95	730
ARIYALUR7	765	548127	0.95	730
BIKANER-IV	765	167000	0.96	736
MOGA-PG	765	137703	0.96	738
SIKAR	765	167497	0.97	740
BHADLA-2	765	167498	0.97	743

NLDC Inputs on Rajasthan REZ Phase-IV and V Schemes

Name	Base kV	Bus No.	Voltage (p.u.)	Voltage (kV)
BIKANER-NW	765	167458	0.97	745
NARELA	765	157001	0.97	745
KHETRI	765	167774	0.97	746
MUL	765	358129	0.97	746
JHATI-PG	765	157708	0.98	746
KURAWAR-7	765	368086	0.98	747
KURN4_7	765	508887	0.98	747
KURNOOL-III	765	508049	0.98	748
MAHESHWARAM	765	518051	0.98	749
BHIWN-PG	765	147704	0.98	749

400 kV Level

Name	Base kV	Bus No.	Voltage (p.u.)	Voltage (kV)
YELAHNKA	400	524084	0.93	373
DHANLLI	400	524025	0.93	374
JEY-BOL_FSC	400	424005	0.94	374
HDURGA	400	524102	0.94	374
PEENYA4	400	524169	0.94	374
MYSORE4	400	524010	0.94	374
NELMANG4	400	524007	0.94	375
BIDADI	400	524077	0.94	375
PULNTOPE4	400	544125	0.94	375
MANALI4	400	544040	0.94	376
KORATUR4	400	544035	0.94	376
THERVOI4	400	544126	0.94	376
HOODI4	400	524005	0.94	377
SMNH	400	524001	0.94	377
TARAMANI4	400	544015	0.94	377
MYLSNDRA	400	524035	0.94	377
MADHUGI4	400	524098	0.94	377
KADAKOLA	400	524106	0.94	377
GUINDY4	400	544133	0.94	378
KOYAMBEDU4	400	544019	0.95	378
SHOLNGNR	400	544091	0.95	378
MUL	400	354129	0.95	378
FSC-4	400	504999	0.95	379
FSC-3	400	504998	0.95	379
SIWANI	400	144880	0.95	379
DOMSANDRA	400	524171	0.95	379
MALEKTT	400	544086	0.95	379
SVCHTRM	400	544090	0.95	379
SPBUDUR4	400	544002	0.95	379
ALMATI4	400	544022	0.95	380
CHENN-EX	400	544000	0.95	380

d) Short Circuit Ratio

Bus/Station	Connected RE Capacity	Fault Level	SCR (Without Current Contribution of immediate RE to be Connected)
220 kV Sirohi	2000 MW	8418 MVA	**4.2**
220 kV Merta – II	1000 MW	5734 MVA	5.7
400 kV Merta - II	1000 MW	20226 MVA	20.2

e) Dynamic Simulation Studies – With more than 62,000 MW solar generation and three HVDC terminals in Rajasthan in close vicinity, it is important that stability aspects are also studied in detail at the planning stage. The generation is also getting evacuated through large EHV lines and hence, transient stability analysis also becomes important. Therefore, it is suggested that the results of the dynamic simulation studies may be shared.

f) Study cases for other scenarios – The study cases for evening and solar peak scenario (Feb and June) have been shared. The study cases for balance 06 scenarios especially the off-peak cases may also be shared so that voltage related issues may also be examined in detail.

NLDC Inputs on Rajasthan REZ Phase-IV and V Schemes

3. Inputs on proposed Transmission Schemes for:

3.1: Rajasthan REZ Ph-IV (Part-5: 6GW) (Barmer Complex)
3.2: Rajasthan REZ Ph-IV (Part-6: 6GW) (Bhadla/Bikaner Complex)

Proposed Transmission scheme for Rajasthan REZ Ph-IV (Part-5: 6GW) (Barmer Complex) - (Timeframe – 2029)

- Establishment of 400/220kV, 6x500MVA S/s at suitable location near Barmer (Barmer-II Substation) along with 2x125 MVAr bus reactor
- LILO of both ckts of 400kV Fatehgarh-IV PS - Barmer-I PS at Barmer-II PS
- Establishment of 6000 MW, ± 800 kV Barmer-II (HVDC) [LCC] terminal station (4x1500 MW) at a suitable location near Barmer-II substation
- Establishment of 6000 MW, ± 800 kV South Kalamb S/s (HVDC) [LCC] terminal station (4x1500 MW) at a suitable location near South of Kalamb
- Establishment 2x1500MVA, 765/400kV Substation near South of Kalamb with 2x330 MVAR, 765 kV bus reactor and 2x125 MVAR, 420 kV bus reactor
- LILO of Pune-III – Boisar-II 765kV D/c line at South Kalamb with associated bays at South Kalamb S/s
- ±800 kV HVDC line between Barmer-II (HVDC) & South Kalamb (HVDC) (with Dedicated Metallic Return) (1000kms)

Proposed Transmission scheme for Rajasthan REZ Ph-IV (Part-6: 6GW) (Bhadla/Bikaner Complex) - (Timeframe – 2029)

- Establishment of 765/400kV, 4x1500 MVA S/s & 400/220kV, 2x500MVA pooling station at suitable location near Bikaner (Bikaner-V PS)
- LILO of both ckts of 400kV Bikaner-II PS- Khetri D/c line at Bikaner-V PS (20km)
- Establishment of 765/400kV, 3x1500 MVA S/s & 400/220kV 3x500MVA pooling station at suitable location near Bhadla (Bhadla-IV PS) along with 2x125 MVAr & 2x240 MVAr bus reactor
- Bhadla-IV PS – Bikaner-V 765KV D/c line (~ 150kms) along with 240 MVAr switchable line reactor
- for each circuit at Bhadla-IV PS end of Bhadla-IV PS – Bikaner-V PS 765kV D/c line
- Bhadla-IV PS – Bhadla-III PS 400kV D/c line (Quad) (~30kms)

NLDC Inputs on Rajasthan REZ Phase-IV and V Schemes

- Establishment of 6000 MW, ± 800 kV Bikaner-V (HVDC) [LCC] terminal station (4x1500 MW) at suitable location near Bikaner

- Establishment of 6000 MW, ±800 kV Begunia (HVDC) [LCC] terminal station (4x1500 MW) at
- Begunia (Distt. Khordha), Orissa

- ±800 kV HVDC line between Bikaner-V (HVDC) & Begunia (HVDC) (with Dedicated Metallic
- Return) - 1900 km

- Establishment of 765/400kV, 5x1500 MVA S/s substation station at Begunia along with 2x125
- MVAr & 2x240 MVAr bus reactor

- Begunia - Paradeep (ISTS)* 765kV D/c line along with associated bays at both ends

- Begunia – Gopalpur (ISTS)# 765kV D/c line along with associated bays at both ends (150km)
- along wih 240MVAr switchable line reactor for each circuit at Begunia end of Begunia –Gopalpur
- (ISTS) 765kV D/c line

- Begunia – Khuntuni (OPTCL)@ 765kV D/c line

a) Load-Generation Balance

S. No.	Region	Load	Generation	IR Exchange	20th EPS Peak Load in 2028-29	Average Demand Met in Solar Hours in Feb 2024
1	NR	85756	129923	44167	109714	59664
2	WR	109083	107587	-1496	100246	72184
3	SR	81317	103944	22627	91285	62000
4	ER	43981	19628	-24352	42546	20000
5	NER	2869	2655	-214	5481	2000
6	All India	323005	363737	x	313098	216185

S. No.	State	Load	Generation	IR Exchange	20th EPS Peak Load in 2028-29	Average Demand Met in Solar Hours in Feb 2024
1	Rajasthan	21377	96462	75086	23590	17000
2	Odisha	21379	8599	-12780	8514	4300

NLDC Inputs on Rajasthan REZ Phase-IV and V Schemes

i. Demand considered at all India level as well as in some of the regions in Feb 2029 period is even more than the peak demand of the year 2028-29 as per 20th EPS report.

ii. The actual average demand met during Feb'24 solar hours has also been provided for reference. It appears that the growth demand considered in WR, ER, and at all India level is on the higher side. Same may be reviewed.

iii. In the 20th EPS report, following is also mentioned:

"Factors like reduction in transmission & distribution losses, energy efficiency improvement measures, ***production of green hydrogen, penetration of electric vehicles****, roof-top solar, solar pumps etc. have appropriately been factored in the electricity demand forecast."*

Therefore, the increase in demand due to green hydrogen load has already been captured in the 20th EPS figures.

iv. Solar and Thermal Generation

- ~225408 MW solar generation considered in service at all India level
- ~89510 MW solar generation is in service in Rajasthan
- ~42000 MW solar generation in Gujarat and ~24500 MW Khavda complex has been considered in the case

- Thermal generation has been uniformly (especially in NR and WR) backed down to 55% at most of the stations. It is suggested that the generation may be scaled as per the merit order. Cheaper thermal generating stations like Singrauli and Rihand are also running at 55% level.

- Some of the thermal generating stations (like Chandrapur, Vadinar, Khaparkheda, Tiroda-APL etc.) are running below 40% tech min level also. Same may be clarified.

- Many units with no active power generation (Pgen = 0) are kept on in the case. These units are also providing reactive power support in the study case. The voltages in the case, therefore, may not represent the actual scenario. Such units shall therefore be kept off in the case.

v. With above-mentioned corrections in demand and generation, the whole LGB of the study case will change. This might result in significant changes in network flows also. Therefore, it is suggested that the proposed system may be tested on realistic load-generation scenario for 2028-29, preferably the one coming out of production cost modelling studies.

NLDC Inputs on Rajasthan REZ Phase-IV and V Schemes

b) Network Loading

i. Barmer II – South Kalamb HVDC Link

- N-1 criteria is not satisfied for 400/220 kV ICTs at Barmer – II: 3000 MVA Transformation capacity for 3000 MW RE generation
- No filter arrangement modelled at HVDC terminal at Barmer - II
- On the outage of a 3000 MW Bipole of HVDC Barmer – II – South Kalamb, the loading of 765/400 kV ICTs at Barmer – I is seen to be N-1 non-compliant
- Three bus sections have been created at 400 kV Muradabad/South Kalamb station. Following issues are observed in the base case.
    - 2x1500 MVA ICTs at Section – 3 are loaded up to N-1 limit. Loading after N-1: 1490 MVA (Scenario – 4) & 1460 MVA (Scenario – 7).
- On the outage of a 1500 MW monopole of HVDC Barmer – II – South Kalamb, the loading of lines and ICTs around Barmer – II is seen to be N-1 compliant

ii. Bikaner V – Begunia HVDC Link

- N-1 compliance not satisfied for 400/220 kV ICTs at Bikaner – V: 2000 MVA Transformation capacity for 2000 MW RE generation
- STATCOM with 9999 MVA capacity connected to Bikaner – V station as filter arrangement
- On the outage of a 1500 MW monopole or 3000 MW Bipole of HVDC Bikaner – V – Begunia, the loading of lines and ICTs around Bikaner – V/Bhadla - IV is seen to be N-1 compliant
- 765/400 kV ICTs at Gopalpur are loaded up to the full rating and are N-1 non-compliant in the base case itself for the considered bulk load

iii. Highly Loaded Lines/ICTs

- Several ICTs in Rajasthan are loaded much above the N-1 limit (Deedwana - PG, Hindaun, Hirapura, Chittorgarh, Kota - PG).
- In the base case, several ICTs in WR are violating N-1 criteria (765/400 kV Jamnagar - ISTS, 765/400 kV Indore – PG, 400/220 kV Mandsaur, 400/220 kV Hazira, 400/132 kV Kirnapur – MP, 400/220 kV Navi Mumbai etc.)
- Presently, critical loading in 400 kV Farakka – Kahalgaon D/C, 400 kV New Ranchi – PPSP D/C and ICTs in West Bengal are already observed in real-time. These elements are severely loaded in the base case also (2028-29 timeframe).

Details of Lines and ICTs loaded around/more than the N-1 loading limit in NR, WR & ER are given in Annexure – 2.

iv. Other Comments

- 765 kV Narela ISTS – Meerut loaded beyond 2600 MW in base case. Loading exceeds 3100 MW under the outage of 765 kV Moga – Meerut etc.
- 765 kV Aligarh – G.Noida touches 3200 MW (Scenario – 4) on N-1 of 765 kV Aligarh – Kanpur.
- RATE-2 limits of several lines are not available. The same may be corrected in the cases shared by CTUIL.

c) Voltages

i. Very low voltages have been experienced at various nodes in the system including in NR RE complex and ER load centres.
ii. The voltages under N-1 condition (depleted network conditions) will further dip.
iii. No reactive power consumption considered for bulk loads considered at Paradeep & Goplapur station.
   a. With 0.95 lag power factor voltages of 400 kV Gopalpur, 400 kV Paradeep – ISTS and STU stations go below 0.9 pu in steady state. 765 kV level voltage of Paradeep – ISTS & Goplapur – ISTS go below 710 kV. ***This is the case when a dynamic FACTS device of the capacity of 9999 MVA is connected at Begunia – HVDC as filter arrangement.***
   b. ***When a 50% fixed shunt is connected at 400 kV Begunia HVDC (in place of 9999 MVA STATCOM) and with 0.95 pf operation of bulk loads at Paradeep and Gopalpur, voltage collapse is seen in the complex.***

765 kV Level

Name	Base kV	Bus No.	Voltage (p.u.)	Voltage (kV)
MANGALORE	765	528045	0.95	729
BARMER1	765	167883	0.96	738
SIROHI	765	167492	0.97	742
LALITPUR	765	177710	0.97	742
TALBEHAT	765	177715	0.97	744
TUTICORIN	765	548098	0.97	746
PARADEEP	765	428017	0.98	746
KISHENPUR	765	117706	0.98	748
GOPALPUR	765	428020	0.98	748
DUBURI_765	765	428024	0.98	748
FATEHG-4	765	167482	0.98	750

NLDC Inputs on Rajasthan REZ Phase-IV and V Schemes

400 kV Level

Name	Base kV	Bus No.	Voltage (p.u.)	Voltage (kV)
BARMER-II	400	164885	0.94	378
MANGALORE	400	524045	0.94	375
TUTICORIN	400	544098	0.95	382
JEY-BOL_FSC	400	424005	0.93	374
MUL	400	354129	0.95	381

d) Short Circuit Ratio (SCR)

Bus/Station	Connected RE/LCC HVDC Capacity	Fault Level	SCR (Without Current Contribution of immediate RE to be Connected)
220 kV Barmer - II	3000 MW RE	11906 MVA	**3.96**
400 kV Barmer - II	6000 MW RE + 6000 MW LCC HVDC	23606 MVA	**3.93** **1.97*** (*Considering the requirement of system strength for both LCC HVDC and RE plant)
220 kV Bikaner - V	2000 MW RE	9470 MVA	**4.7**
400 kV Bikaner – V	4000 MW RE + 6000 MW LCC HVDC	23152 MVA	5.7 **2.3*** (*Considering the requirement of system strength for both LCC HVDC and RE plant)
220 kV Bhadla - IV	1000 MW RE	7956 MVA	7.9
400 kV Bhadla - IV	2000 MW RE	23586 MVA	11.8
400 kV Begunia HVDC	6000 MW LCC HVDC	27867 MVA	4.5

e) HVDC Schemes

02 nos. 6000 MW LCC based HVDCs have been proposed for evacuation of bulk power from Rajasthan.

±800 kV, 6000 MW HVDC Barmer-II - South Kalamb – 1000 kMs
±800 kV, 6000 MW HVDC Bikaner-V - Begunia – 1900 kMs

i. The rationale for terminating these HVDCs in WR (Maharashtra) and ER (Odisha) may be provided.

Further, as highlighted in section (a) on Load-Generation Balance, the LGB of the case is subject to change with the proposed corrections which may lead to requirement of new transmission lines in other locations than the one currently proposed.

The production cost modelling studies duly factor in the RRO targets for each states, RE integration targets, flexibility requirements, merit order etc. Therefore, it is suggested that the study scenario may be finalized based on the output of the production cost modelling studies for the same timeframe. This LGB will itself indicate the paths/corridors along with the system augmentation is required.

ii. The overload capability and reverse power capability of both the HVDCs has not been defined and kept open. As HVDC are planned for bulk evacuation of RE power, the outage of single or both poles of the HVDC may lead to curtailment in RE generation. This curtailment may be avoided/minimized by specifying the continuous and transient **ambient temperature-based overload capability** for the proposed HVDCs.

Similar reverse power capability may also be specified for the proposed HVDCs.

iii. With the proposed HVDCs, there will 03 nos. 6000 MW HVDC terminals in Rajasthan in close vicinity. The system strength of the Rajasthan RE complex is already on the lower side. With a large number of power electronic controllers (RE + HVDCs) in close proximity, there is a very high probability of controller interactions in the complex. Such interactions are already being observed in the Rajasthan RE complex with ~20 GW of RE capacity at present.

It is suggested that controller interaction studies (screening and if required detailed) may be carried out (using generic models for future capacities) to identify the potential interaction issues in the complex.

iv. The feature of power oscillation damping is also important for LCC based HVDC and shall be suitably added in specifications. The provision of tuning of POD based on measurement data may also be specified.

v. At least one VSC based HVDC may be planned in the complex keeping in view the black start requirements. The VSC based HVDC would also provide steady state and dynamic reactive power support.

vi. Filter sizing becomes important with low SCR at converter stations. Keeping in view the low SCR/fault level, it is proposed that the filter sizing shall be granular to avoid wide voltage variations during switching.

f) Name of New Substations – It is requested to assign unique name for envisaged RE pooling stations. As several pooling substations with identical names but different numerical suffixes have been planned in the same district along with multiple

interconnections, there is a chance of miscommunication during real-time operation among multiple constituents. For clarity of operation and ensuring that names of different substations are easily distinguished from each other, it is suggested that after finalization of the exact location, the ISTS substations are uniquely named as per the geographical name of the nearest location like village or taluk.

g) **Dynamic Simulation Studies –** With more than 89,000 MW solar generation and three HVDC terminals in Rajasthan in close vicinity, it is important that stability aspects are also studied in detail at the planning stage. The generation is also getting evacuated through large EHV lines and hence, transient stability analysis also becomes important. Therefore, it is suggested that the results of the dynamic simulation studies may be shared.

h) **Study cases for other scenarios –** The study cases for evening and solar peak scenario (Feb and June) have been shared. The study cases for balance 06 scenarios especially the off-peak cases may also be shared so that voltage related issues may also be examined in detail.

NLDC Inputs on Rajasthan REZ Phase-IV and V Schemes

Annexure - 1

From Bus No	From Bus Name	From Bus Voltage	To Bus No	To Bus Name	To Bus Voltage	CKT	LOADING IN MVA	RATING IN MVA	PERCENT LOADING
199	TARAPR-3&4	21	374017	TAPS4	400.00*	1	417.3	635	65.7
199	TARAPR-3&4	21	374017	TAPS4	400.00*	2	417.4	635	65.7
12944	KANDAL	400.00*	26456	CHIMANGAON13	132	1	79.9	111	72
112235	KISHENPUR	220.00*	114422	KISHENPUR	400	1	331.4	315	105.2
112235	KISHENPUR	220.00*	114422	KISHENPUR	400	2	331.4	315	105.2
112235	KISHENPUR	220.00*	114422	KISHENPUR	400	3	331.4	315	105.2
162093	DEEDWANA-42	220	164415	DEEDWANA	400.00*	1	235.5	315	74.8
162093	DEEDWANA-42	220	164415	DEEDWANA	400.00*	2	235.5	315	74.8
162207	HINDAU-4	220	164409	HINDAU-4	400.00*	1	326	315	103.5
162207	HINDAU-4	220	164409	HINDAU-4	400.00*	2	326	315	103.5
162211	HIRAPURA	220	164406	HERAPU-4	400.00*	1	288.9	315	91.7
162211	HIRAPURA	220	164406	HERAPU-4	400.00*	2	229.3	250	91.7
162211	HIRAPURA	220	164406	HERAPU-4	400.00*	3	229.3	250	91.7
162211	HIRAPURA	220	164406	HERAPU-4	400.00*	4	229.3	250	91.7
162228	CHITTOR-42	220	164428	CHITTOR4	400.00*	1	292.1	315	92.7
162228	CHITTOR-42	220	164428	CHITTOR4	400.00*	2	292.1	315	92.7
162228	CHITTOR-42	220	164428	CHITTOR4	400.00*	3	292.1	315	92.7
162271	CHABRA-2	220	164411	CHABRA-4	400.00*	1	253.2	315	80.4
162283	BASSI	220	164431	BASSI	400.00*	1	254.3	315	80.7
162283	BASSI	220	164431	BASSI	400.00*	2	254.3	315	80.7
162283	BASSI	220	164431	BASSI	400.00*	3	403.6	500	80.7
162300	KALISIND	220	164412	KALISI-4	400.00*	2	566.8	500	113.4
162329	AJMER42	220	164416	AJMER	400.00*	1	243.6	315	77.3
162329	AJMER42	220	164416	AJMER	400.00*	2	243.6	315	77.3
162914	BHINM-PG	220	164405	BHINMAL	400.00*	1	806.4	945	85.3
162919	KOTA	220.00*	164420	KOTA	400	1	310.3	315	98.5
162919	KOTA	220.00*	164420	KOTA	400	2	310.3	315	98.5
164404	BHADLA	400.00*	164456	BIKANE-4	400	1	1146.4	1714	66.9
164404	BHADLA	400.00*	164456	BIKANE-4	400	2	1146.4	1714	66.9
164419	RAPS_C4	400.00*	364021	SHUJALPR-4	400	1	665.7	857	77.7
164419	RAPS_C4	400.00*	364021	SHUJALPR-4	400	2	665.7	857	77.7
164429	CHIT-NEW	400	164492	SIROHI	400.00*	1	656.6	850	77.2
164429	CHIT-NEW	400	164492	SIROHI	400.00*	2	656.6	850	77.2
174445	MUZAFRN4	400	174905	MEERUT	400.00*	1	580.6	857	67.8
192221	KASHIPU2	220	194467	KASHIPU4	400.00*	1	226.8	315	72
192221	KASHIPU2	220	194467	KASHIPU4	400.00*	2	226.8	315	72
192221	KASHIPU2	220	194467	KASHIPU4	400.00*	3	226.8	315	72
192225	RISHIKE2	220	194426	RISHIKE4_PT	400.00*	1	208	315	66
192225	RISHIKE2	220	194426	RISHIKE4_PT	400.00*	2	158.4	240	66
352022	HAZIRA2	220	354022	HAZIRA4	400.00*	1	347.3	500	69.5
352022	HAZIRA2	220	354022	HAZIRA4	400.00*	2	347.3	500	69.5
352022	HAZIRA2	220	354022	HAZIRA4	400.00*	3	347.2	500	69.4

NLDC Inputs on Rajasthan REZ Phase-IV and V Schemes

From Bus No	From Bus Name	From Bus Voltage	To Bus No	To Bus Name	To Bus Voltage	CKT	LOADING IN MVA	RATING IN MVA	PERCENT LOADING
352140	HALWAD NEW	220	354036	HALVAD NEW	400.00*	1	230	315	73
352140	HALWAD NEW	220	354036	HALVAD NEW	400.00*	2	230	315	73
354022	HAZIRA4	400.00*	354290	SOUTH OLPAD	400	1	964.7	857	112.6
354079	JAMNAGAR	400	358079	JAMNAGAR7	765.00*	2	987.7	1500	65.8
354079	JAMNAGAR	400	358079	JAMNAGAR7	765.00*	3	987.7	1500	65.8
361336	KIRNAPUR-421	132	364049	KIRNAPUR	400.00*	1	70.4	100	70.4
361336	KIRNAPUR-421	132	364049	KIRNAPUR	400.00*	2	70.4	100	70.4
361336	KIRNAPUR-421	132	364049	KIRNAPUR	400.00*	3	70.4	100	70.4
362003	INDORE-42	220	364001	INDORE-4	400.00*	1	262.3	315	83.3
362003	INDORE-42	220	364001	INDORE-4	400.00*	2	262.3	315	83.3
362003	INDORE-42	220	364001	INDORE-4	400.00*	3	262.3	315	83.3
362003	INDORE-42	220	364001	INDORE-4	400.00*	4	262.3	315	83.3
362113	MANDSOUR-42	220	364039	MANDSAUR-4	400.00*	1	262.1	315	83.2
362113	MANDSOUR-42	220	364039	MANDSAUR-4	400.00*	2	262.1	315	83.2
362189	DATIYA NEW2	220.00*	364189	DATIYA NEW4	400	1	440.3	500	88.1
362189	DATIYA NEW2	220.00*	364189	DATIYA NEW4	400	2	440.3	500	88.1
364023	INDORE-74	400.00*	368023	INDORE-7	765	2	1506	1500	100.4
372365	NAVI-MUM220	220	374217	NAVI-MUM	400.00*	1	267.3	315	84.9
372365	NAVI-MUM220	220	374217	NAVI-MUM	400.00*	2	267.3	315	84.9
372460	VIKROLI220	220	374068	VIKROLI400	400.00*	1	330	500	66
372460	VIKROLI220	220	374068	VIKROLI400	400.00*	2	330	500	66
372460	VIKROLI220	220	374068	VIKROLI400	400.00*	3	330	500	66
374008	DHULE4	400.00*	374011	BABLESWAR	400	2	668.7	857	78
414010	KAHALGAON-B	400.00*	444019	FARAKKA	400	1	943.9	852	110.8
414010	KAHALGAON-B	400.00*	444019	FARAKKA	400	2	943.9	852	110.8
442012	KTPS220	220	444012	KOLAGHAT	400.00*	1	281	315	89.2
442012	KTPS220	220	444012	KOLAGHAT	400.00*	2	281	315	89.2
442015	CHANDITALA_N	220	444015	CHANDITALA_N	400.00*	1	283.5	315	90
442015	CHANDITALA_N	220	444015	CHANDITALA_N	400.00*	2	283.5	315	90
442015	CHANDITALA_N	220	444015	CHANDITALA_N	400.00*	3	283.5	315	90
442685	JEERAT	220	444008	JEERAT	400.00*	1	242.9	315	77.1
442685	JEERAT	220	444008	JEERAT	400.00*	2	242.9	315	77.1
442685	JEERAT	220	444008	JEERAT	400.00*	3	242.9	315	77.1
442685	JEERAT	220	444008	JEERAT	400.00*	4	242.9	315	77.1
444074	PPSP_NEW	400.00*	444075	PURULIAPS	400	1	657.5	850	77.3
444074	PPSP_NEW	400.00*	444075	PURULIAPS	400	2	657.5	850	77.3
444074	PPSP_NEW	400	474047	RANCHI-NEW	400.00*	1	881.1	1093	80.6
444074	PPSP_NEW	400	474047	RANCHI-NEW	400.00*	2	881.1	1093	80.6
452001	DURGAPUR TPS	220	454001	DURGAPUR TPS	400.00*	1	379.2	500	75.8
452001	DURGAPUR TPS	220	454001	DURGAPUR TPS	400.00*	2	379.2	500	75.8
452002	MEJIA-B	220	454002	MEJIA-B	400.00*	1	237.4	315	75.4
452002	MEJIA-B	220	454002	MEJIA-B	400.00*	2	237.4	315	75.4

NLDC Inputs on Rajasthan REZ Phase-IV and V Schemes

Annexure – 2

From Bus No	From Bus Name	From Bus Voltage	To Bus No	To Bus Name	To Bus Voltage	CKT	LOADING IN MW	RATING IN MVA	PERCENT LOADING
199	TARAPR-3&4	21	374017	TAPS4	400.00*	1	417.3	635	65.7
199	TARAPR-3&4	21	374017	TAPS4	400.00*	2	417.4	635	65.7
12944	KANDAL	400.00*	26456	CHIMANGAON13	132	1	79.9	111	72
112235	**KISHENPUR**	**220.00***	**114422**	**KISHENPUR**	**400**	**1**	**331.4**	**315**	**105.2**
112235	**KISHENPUR**	**220.00***	**114422**	**KISHENPUR**	**400**	**2**	**331.4**	**315**	**105.2**
112235	**KISHENPUR**	**220.00***	**114422**	**KISHENPUR**	**400**	**3**	**331.4**	**315**	**105.2**
162093	**DEEDWANA-42**	**220**	**164415**	**DEEDWANA**	**400.00***	**1**	**235.5**	**315**	**74.8**
162093	**DEEDWANA-42**	**220**	**164415**	**DEEDWANA**	**400.00***	**2**	**235.5**	**315**	**74.8**
162207	**HINDAU-4**	**220**	**164409**	**HINDAU-4**	**400.00***	**1**	**326**	**315**	**103.5**
162207	**HINDAU-4**	**220**	**164409**	**HINDAU-4**	**400.00***	**2**	**326**	**315**	**103.5**
162211	**HIRAPURA**	**220**	**164406**	**HERAPU-4**	**400.00***	**1**	**288.9**	**315**	**91.7**
162211	**HIRAPURA**	**220**	**164406**	**HERAPU-4**	**400.00***	**2**	**229.3**	**250**	**91.7**
162211	**HIRAPURA**	**220**	**164406**	**HERAPU-4**	**400.00***	**3**	**229.3**	**250**	**91.7**
162211	**HIRAPURA**	**220**	**164406**	**HERAPU-4**	**400.00***	**4**	**229.3**	**250**	**91.7**
162228	**CHITTOR-42**	**220**	**164428**	**CHITTOR4**	**400.00***	**1**	**292.1**	**315**	**92.7**
162228	**CHITTOR-42**	**220**	**164428**	**CHITTOR4**	**400.00***	**2**	**292.1**	**315**	**92.7**
162228	**CHITTOR-42**	**220**	**164428**	**CHITTOR4**	**400.00***	**3**	**292.1**	**315**	**92.7**
162271	CHABRA-2	220	164411	CHABRA-4	400.00*	1	253.2	315	80.4
162283	BASSI	220	164431	BASSI	400.00*	1	254.3	315	80.7
162283	BASSI	220	164431	BASSI	400.00*	2	254.3	315	80.7
162283	BASSI	220	164431	BASSI	400.00*	3	403.6	500	80.7
162300	**KALISIND**	**220**	**164412**	**KALISI-4**	**400.00***	**2**	**566.8**	**500**	**113.4**
162329	AJMER42	220	164416	AJMER	400.00*	1	243.6	315	77.3
162329	AJMER42	220	164416	AJMER	400.00*	2	243.6	315	77.3
162914	**BHINM-PG**	**220**	**164405**	**BHINMAL**	**400.00***	**1**	**806.4**	**945**	**85.3**
162919	**KOTA**	**220.00***	**164420**	**KOTA**	**400**	**1**	**310.3**	**315**	**98.5**
162919	**KOTA**	**220.00***	**164420**	**KOTA**	**400**	**2**	**310.3**	**315**	**98.5**
164404	BHADLA	400.00*	164456	BIKANE-4	400	1	1146.4	1714	66.9
164404	BHADLA	400.00*	164456	BIKANE-4	400	2	1146.4	1714	66.9
164419	RAPS_C4	400.00*	364021	SHUJALPR-4	400	1	665.7	857	77.7
164419	RAPS_C4	400.00*	364021	SHUJALPR-4	400	2	665.7	857	77.7
164429	CHIT-NEW	400	164492	SIROHI	400.00*	1	656.6	850	77.2
164429	CHIT-NEW	400	164492	SIROHI	400.00*	2	656.6	850	77.2
174445	MUZAFRN4	400	174905	MEERUT	400.00*	1	580.6	857	67.8
192221	KASHIPU2	220	194467	KASHIPU4	400.00*	1	226.8	315	72
192221	KASHIPU2	220	194467	KASHIPU4	400.00*	2	226.8	315	72
192221	KASHIPU2	220	194467	KASHIPU4	400.00*	3	226.8	315	72
192225	RISHIKE2	220	194426	RISHIKE4_PT	400.00*	1	208	315	66
192225	RISHIKE2	220	194426	RISHIKE4_PT	400.00*	2	158.4	240	66
352022	**HAZIRA2**	**220**	**354022**	**HAZIRA4**	**400.00***	**1**	**347.3**	**500**	**69.5**
352022	**HAZIRA2**	**220**	**354022**	**HAZIRA4**	**400.00***	**2**	**347.3**	**500**	**69.5**

NLDC Inputs on Rajasthan REZ Phase-IV and V Schemes

From Bus No	From Bus Name	From Bus Voltage	To Bus No	To Bus Name	To Bus Voltage	CKT	LOADING IN MW	RATING IN MVA	PERCENT LOADING
352022	HAZIRA2	220	354022	HAZIRA4	400.00*	3	347.2	500	69.4
352140	HALWAD NEW	220	354036	HALVAD NEW	400.00*	1	230	315	73
352140	HALWAD NEW	220	354036	HALVAD NEW	400.00*	2	230	315	73
354022	HAZIRA4	400.00*	354290	SOUTH OLPAD	400	1	964.7	857	112.6
354079	JAMNAGAR	400	358079	JAMNAGAR7	765.00*	2	987.7	1500	65.8
354079	JAMNAGAR	400	358079	JAMNAGAR7	765.00*	3	987.7	1500	65.8
361336	KIRNAPUR-421	132	364049	KIRNAPUR	400.00*	1	70.4	100	70.4
361336	KIRNAPUR-421	132	364049	KIRNAPUR	400.00*	2	70.4	100	70.4
361336	KIRNAPUR-421	132	364049	KIRNAPUR	400.00*	3	70.4	100	70.4
362003	INDORE-42	220	364001	INDORE-4	400.00*	1	262.3	315	83.3
362003	INDORE-42	220	364001	INDORE-4	400.00*	2	262.3	315	83.3
362003	INDORE-42	220	364001	INDORE-4	400.00*	3	262.3	315	83.3
362003	INDORE-42	220	364001	INDORE-4	400.00*	4	262.3	315	83.3
362113	MANDSOUR-42	220	364039	MANDSAUR-4	400.00*	1	262.1	315	83.2
362113	MANDSOUR-42	220	364039	MANDSAUR-4	400.00*	2	262.1	315	83.2
362189	DATIYA NEW2	220.00*	364189	DATIYA NEW4	400	1	440.3	500	88.1
362189	DATIYA NEW2	220.00*	364189	DATIYA NEW4	400	2	440.3	500	88.1
364023	INDORE-74	400.00*	368023	INDORE-7	765	2	1506	1500	100.4
372365	NAVI-MUM220	220	374217	NAVI-MUM	400.00*	1	267.3	315	84.9
372365	NAVI-MUM220	220	374217	NAVI-MUM	400.00*	2	267.3	315	84.9
372460	VIKROLI220	220	374068	VIKROLI400	400.00*	1	330	500	66
372460	VIKROLI220	220	374068	VIKROLI400	400.00*	2	330	500	66
372460	VIKROLI220	220	374068	VIKROLI400	400.00*	3	330	500	66
374008	DHULE4	400.00*	374011	BABLESWAR	400	2	668.7	857	78
414010	KAHALGAON-B	400.00*	444019	FARAKKA	400	1	943.9	852	110.8
414010	KAHALGAON-B	400.00*	444019	FARAKKA	400	2	943.9	852	110.8
442012	KTPS220	220	444012	KOLAGHAT	400.00*	1	281	315	89.2
442012	KTPS220	220	444012	KOLAGHAT	400.00*	2	281	315	89.2
442015	CHANDITALA_N	220	444015	CHANDITALA_N	400.00*	1	283.5	315	90
442015	CHANDITALA_N	220	444015	CHANDITALA_N	400.00*	2	283.5	315	90
442015	CHANDITALA_N	220	444015	CHANDITALA_N	400.00*	3	283.5	315	90
442685	JEERAT	220	444008	JEERAT	400.00*	1	242.9	315	77.1
442685	JEERAT	220	444008	JEERAT	400.00*	2	242.9	315	77.1
442685	JEERAT	220	444008	JEERAT	400.00*	3	242.9	315	77.1
442685	JEERAT	220	444008	JEERAT	400.00*	4	242.9	315	77.1
444074	PPSP_NEW	400.00*	444075	PURULIAPS	400	1	657.5	850	77.3
444074	PPSP_NEW	400.00*	444075	PURULIAPS	400	2	657.5	850	77.3
444074	PPSP_NEW	400	474047	RANCHI-NEW	400.00*	1	881.1	1093	80.6
444074	PPSP_NEW	400	474047	RANCHI-NEW	400.00*	2	881.1	1093	80.6
452001	DURGAPUR TPS	220	454001	DURGAPUR TPS	400.00*	1	379.2	500	75.8
452001	DURGAPUR TPS	220	454001	DURGAPUR TPS	400.00*	2	379.2	500	75.8
452002	MEJIA-B	220	454002	MEJIA-B	400.00*	1	237.4	315	75.4
452002	MEJIA-B	220	454002	MEJIA-B	400.00*	2	237.4	315	75.4

NRLDC Inputs on Joint study meeting for Transmission system for evacuation of RE power from Rajasthan (REZ Ph-V (Part-1 : 4 GW), REZ Ph-IV (Part-5 : 6GW) & REZ Ph-IV (Part-6 : 6GW))

SCENARIO 2028-2029

1. SCR of following Station are below 5 considering Xsource of IBRs as 999pu :

Bus	Name	Generation connected	Fault MVA	SCR
163482	[FATEHG4-SPL	3480	12172.67	3.50
162885	[BARMER-II HV	3000	11803.85	3.93
162883	[BARMER-I	4000	16338.1	4.08
162495	[BIKANER-2	4460	18780.77	4.21
162399	[ESSEL	750	3174.92	4.23
162492	[SIROHI	2000	9235.59	4.62
162002	[BIKANER-V	2000	9805.4	4.90

- *HVDC Barmer-II – South Kalamb(1000km), HVDC Bikaner-V – Begunia (1900km) are proposed as a LCC. Low SCR at Barmer-II and Bikaner-V may not be suitable for LCC HVDC. Either additional connectivity/Synchronous Condensor may be thought of in above station to improve SCR (minimum 5) or VSC HVDC in place of LCC HVDC may be considered.*

2. Buses with high angular difference >20 degree under N-0/N-1

From	To	Ang. Diff (N-0)	Ang. Diff (N-1)
164774 Khetri	164495 Bikaner-2	23	25
164404 Bhadla	164456 Bikaner-4	19	24.2
167497 Sikar New	167484 Bhadla-3	16.8	21.2
167458 Bikaner-NW	137703 Moga	20.2	25
164404 Bhadla	164400 Merta	22.2	25.5
167080 NeemR(NEW)	167505 Bikaner-3	18.3	22.2

- *As per CEA TPC 3.14.12, Stability studies may be carried out for the above lines.*

3. Many thermal plants are observed to be **switched off during Solar time** and **Switched on (close to rated IC) during evening hours**. The philosophy may be reviewed/confirmed else sufficient BESS/Energy storage capacity may be thought off to absorb the excess RE generation during day time. Some plants in NR are listed below:

Plant/Unit (MW)	Solar Peak(MW)	Evening peak(MW)
Kalisindh (2 X 600)	0	1020
Chabra SC Unit# 6 (660)	0	560
Kanpur Unit #1 (600)	0	560
Lalitpur (3 X 660)	0	1120
Ghatampur Unit#3 (660)	0	560
Obra Unit#3,4,5 (600)	0	540
Unchahar Unit#4,5 (420)	0	170
Ropar Unit#2,3,4 (630)	0	540

4. Approx 4000 MW Solar generation in Rajasthan State control area is not being dispatched in solar peak case. Rajasthan solar dispatched is ~8000 WM against ~12000MW Installed intrastate Solar capacity in Basecase.
5. No of ICTs at 164505 Bikaner-3 may be checked: 1 X 6000MVA + 5 X 1500 MVA

NRLDC Inputs on Joint study meeting for Transmission system for evacuation of RE power from Rajasthan (REZ Ph-V (Part-1 : 4 GW), REZ Ph-IV (Part-5 : 6GW) & REZ Ph-IV (Part-6 : 6GW))

6. Giral plant is observed to be running. May be rectified.

7. At 164001 Bikaner-V, STATCOM is considered in service with Shunt Max capacity of 9999 MVA and Bridge Max capacity of 9999 MW. After taking out the STATCOM, voltage is dipping from 400 kV to 378kV.

Grid-India (NLDC/NRLDC) observations on Joint study meeting held on 09.05.24 to deliberate & finalize the Transmission system for evacuation of power from Rajasthan REZ Ph-V (Part-1 :4 GW) [Sirohi/Nagaur] Complex

1. Demand considered at all India level as well as in some of the regions in Feb 2027 period is even more than the peak demand of the year 2026-27 as per 20th EPS report. The actual average demand met during Feb'24 solar hours has also been provided for reference. It appears that the growth demand considered in NR, WR, ER, and at all India level is on the higher side. Same may be reviewed.

CTU reply :

S.No	Region	Demand considered in PSSE files (GW)	Peak demand in Feb'24 (in Winter Solar peak hours) (GW)	Anticipated Peak demand in Feb'27 (in Winter Solar peak hours) (@7% CAGR) (GW)	Demand considered in Revised PSSE files (in Winter Solar peak hours) (GW)
1	NR	78.2	63.8	78.2	79.5
2	WR	98.8 (Considering additional load of GH/BKC-8.2GW)	73.3	89.8	99.8 (Considering additional load of GH/BKC-8.2GW)
3	ER	29.5 (considering additional load of GH-3GW, BKC:0.3GW)	22.1	27.1	29.6 (considering additional load of GH/BKC-3.3GW)
	All India	288.5	220.7	270.3	291.7 (considering additional load of GH/BKC -13GW)

**** GH – Green Hydrogen, BKC – Bulk Consumer***

From the historical data (Feb'23 to Feb'24) analysis, load growth of about 7 % is observed in winter solar peak hours in All India & most of the regions. Based on extrapolation of above load growth, expected load of Feb'27 (in winter solar peak hours) is indicated on the table above which is considered in PSS/E file. Further additional demand from Green Hydrogen, Bulk consumer is also considered the studies (included in total demand figure).

- Green hydrogen / Bulk loads considered in ER are as under
  - 1500MW: Paradeep,
  - 1500MW: Gopalpur,
  - 180MW: Vedanta & 100MW: IPCL
- Major Bulk loads/ Green hydrogen considered in WR are as under
  - 4500MW: MUL Gujarat (including 1500MW Green Hydrogen)
  - 3700MW: Jamnagar/Jam Khambaliya Complex

2. Thermal generation has been uniformly backed down to 55% (especially in NR and WR) at most of the stations. It is suggested that the generation may be scaled as per the merit order. Cheaper thermal generating stations like Singrauli and Rihand are also running at 55% level. some of the thermal generating stations (like Vadinar, Khaparkheda, Tiroda-APL etc.) are running below 40% tech min level also. Same may be clarified.

CTU reply – In revised files, merit order dispatch is being followed up to an extent and incorporated in revised PSS/E files. Dispatch of Cheaper thermal generating stations in Singrauli and Rihand complex kept higher to match LGB. .

Dispatches of major thermal generating stations of states such as Vadinar, Khaparkheda, Tiroda-APL, Chandrapur have been changed to 40%. Further, generation with very low dispatches has also been switched off.

3. Many units with no active power generation (Pgen = 0) are kept on in the case. These units are also providing reactive power support in the study case. The voltages in the case, therefore, may not represent the actual scenario. Such units shall therefore be kept off in the case

CTU reply - Incorporated (all such units are now kept off)

4. With above-mentioned corrections in demand and generation, the whole LGB of the study case will change. This might result in significant changes in network flows also. Therefore, it is suggested that the proposed system may be tested on realistic load generation scenario for 2026-27, preferably the one coming out of production cost modelling studies.

CTU reply – Modified PSSE files are enclosed. It is observed that with above modifications in LGB, there will be no impact on the proposed transmission scheme for evacuation of power from Rajasthan REZ Ph-V (Part-1 :4 GW) [Sirohi/Nagaur] Complex.

5. There is significant amount of power flow towards eastern region during solar hours resulting in very high loading and low voltages in the ER grid. It is suggested that system augmentation in ER may be taken up on priority so that the required system gets commissioned with the associated RE generation (2026-27 timeframe).

CTU reply - Reconductoring of 400kV Farakka – Kahalgaon & Talcher – Meramundali 400kV D/c lines in under advance stage of stakeholder consultation. Other system, if required in ISTS would be taken up on priority

6. Several ICTs in Rajasthan are loaded much above the N-1 limit (Deedwana - PG, Hindaun, Hirapura, Chittorgarh, Kota – PG etc.

CTU reply – Most of the ICTs i.e. Deedwana, Hindaun, Heerapura, Chittorgarh are getting overloaded in planning studies due to the increase in load of Rajasthan. Some of the ICTs are even critically loaded in present time frame and issue of high loading is deliberated in various OCC/NRPC meetings. In above meetings, RVPN is already requested to carry out 400/220kV ICT augmentation works or feeder reconfiguration to relive ICT loadings.

Loading of 400/220kV Kota (PG) ICT is higher due to low dispatch of KTPS generation units. Loading of Bhinmal ICT is higher in Sc-7 due to increasing demand.

Above ICT loading will be reviewed in consultation with NRLDC w.r.t real time loading and Grid-India operational feedback report and necessary augmentation will be carried out in ISTS, if required, as per the present practice.

7. In the base case, several ICTs in WR are violating N-1 criteria (765/400 kV Jamnagar - ISTS, 765/400 kV Indore – PG, 400/220 kV Mandsaur, 400/220 kV Hazira, 400/132 kV Kirnapur – MP, 400/220 kV Navi Mumbai etc.)

CTU reply – In Jamnagar Complex, applications from bulk consumer to the tune of about 1800MW has been received, whereas in PSSE file load of 3700MW has been considered. Accordingly, ICT augmentation would be taken up with receipt of further applications.

Augmentation of Transformation capacity at 765/400kV Indore S/s by 1x1500MVA ICT (3rd) [terminated on 400kV Bus section A with Indore & Khandwa 400kV D/c lines] has been agreed in CMETS-WR & is presently under implementation. On other section, under contingency of any line, sectionaliser can be closed to reduce loading on 765/400kV ICT. To resolve issue of overloading at Mandsaur,1X500MVA,400/220kV ICT (3rd) at Mandsaur S/s has been planned & is being implemented by MPPTCL. Establishment of 400/220kV Hazira-II (GIS) S/s through Installation of 1x500MVA, 400/220kV ICT has been agreed for drawl of power at Hazira in WR-CMETS meeting to reduce overloading on Hazira S/s. ICT augmentation or shifting of proposed Data Centres load at Navi Mumbai is being taken up with MSETCL.

8. Critical loading in 400 kV Farakka – Kahalgaon D/C, 400 kV New Ranchi – PPSP D/C and ICTs in West Bengal is already observed in real-time during solar hours. These elements are severely loaded in the base case also (2027 timeframe)

CTU reply – Reconductoring of 400kV Farakka – Kahalgaon D/c line in under active stages of discussion.

New generation are expected in Purulia area viz. Raghunathpur (2x660MW) and DTPS-Waria (1x800MW). With this, the loading on Ranchi – New Purulia is expected to be relieved. Nevertheless, analysis of loading on Ranchi – New Purulia 400kV D/c line would be taken up for discussion in future.

9. 765 kV Ghiror – Aligarh is completely off-loaded (5 MW loading in each ckt)

CTU reply - 765 kV Ghiror – Aligarh D/c line is formed through LILO of existing 765V Aligarh-Orai D/c line at Ghiror S/s for optimal utilization of above line in solar maximized scenario. It is to be mention that 765kV Ghiror and Aligarh both are the major substations for dispersal of RE power towards load centers in UP. In view of huge RE injection each at 765kV Aligarh & 765kV Ghiror S/s, 765 kV Ghiror – Aligarh line gets off-loaded. However in other than solar maximized scenario, line loading is more than loading in solar maximized scenario In future studies and schemes, efforts to be made for optimal utilization of Aligarh-Ghiror section.

10. 765 kV Aligarh – G.Noida touches 2800 MW (Scenario – 7) & 3400 MW (Scenario – 4) on N-1 of 765 kV Aligarh – Kanpur

11. **CTU reply –** In the planning studies, maximum loading of 3500MW is considered on 765kv D/c lines in N-1 contingency in case other parameters i.e. angular separation, bus voltages are withing stipulated limit as per transmission planning criteria. In 765kV Aligarh – G.Noida line, angular separation is within limit and voltages are is in order on N-1 contingency of 765 kV Aligarh – Kanpur

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12. Angular difference between 765 kV Bikaner and 765 kV Moga touches 26° under N-1 (NLDC). Additionally, some Buses i.e. 400kV Bikaner-II – Khetri, 765kV Bhadla-III-Sikar-II, 765kV Bikaner-III-Neemrana-2 have angular difference >20 degree under N-0/N-1 (NRLDC)

    CTU reply – The loading of 765 kV Bikaner and 765 kV Moga will gradually increase in next 3 years in planning studies due to increasing RE injection at Bikaner. Stability studies shall be carried out for 765kV Bikaner-Moga D/c line and 400kV Bikaner-II – Khetri D/c line for 2027 timeframe, once dynamics file is prepared. Presently there are convergence issues being faced in dynamic simulation for 2027 scenario for which consultation of IIT Mumbai is also under progress.

    Angular separation of 765kV Bhadla-III-Sikar-II & 765kV Bikaner-III-Neemrana-2 is below 20 degree in N-1 contingency in 2027 timeframe files (angular separation >20 degree in N-1 contingency in 2029 timeframe files for which Stability studies shall be carried out once dynamics file is prepared)

13. RATE-2 limits of several lines are not available. The same may be corrected in the cases shared by CTUIL.

    CTU reply - Incorporated.

14. Very low voltages have been experienced at various nodes in the system including in NR RE Complex. ii. The voltages under N-1 condition (depleted network conditions) will further dip.

    CTU reply – In revised PSSE files most of the bus voltage are within limits of 0.97-1.03 pu on all 400kV and 765kV buses in NR considering switching on/off of bus and line reactors (switchable) wherever required.

15. Low SCR of Sirohi PS (4.2)

    CTU reply – Short circuit Ratio of 400kV and 220kV of Sirohi PS is about 8.7 and 4.2 respectively. No additional connectivity will be granted beyond 2 GW at 220kV level of Sirohi PS with proposed system (400/220kV ICTs at Sirohi PS+765kV Sirohi-Mandsaur). With growing interconnection and planned network in future, SCR at Sirohi may increase.

16. Dynamic Simulation Studies – With more than 62,000 MW solar generation and three HVDC terminals in Rajasthan in close vicinity, it is important that stability aspects are also studied in detail at the planning stage. The generation is also getting evacuated through large EHV lines and hence, transient stability analysis also becomes important. Therefore, it is suggested that the results of the dynamic simulation studies may be shared.

CTU reply – Comment is pertaining to 2029 timeframe files, however dynamics file is under preparation. Presently there are convergence issues being faced in dynamic simulation for 2027 scenario for which consultation of IIT Mumbai is also under progress

17. Study cases for other scenarios – The study cases for evening and solar peak scenario (Feb and June) have been shared. The study cases for balance 06 scenarios especially the off-peak cases may also be shared so that voltage related issues may also be examined in detail.

    CTU reply – As per the comments, Scenario 8 (evening peak) & Scenario 9 (night off peak) along with revised solar maximized scenario (SC-4& 7) files is attached.

18. Giral plant is observed to be running. May be rectified (NRLDC).

    CTU reply – Giral plant is now kept off

NLDC Inputs on Revised Scheme for Rajasthan REZ Phase- V RE

1. Schemes proposed for:

a) Rajasthan REZ Ph-V (Part-1: 4GW) (Sirohi/Nagaur Complex)

S.No	Transmission Scheme	RE Potential	Status
A	**Under Bidding/ Approved**		
1	Rajasthan REZ Ph-IV (Part-1 :7.7GW) (Bikaner Complex)	14 GW (Solar 14GW, BESS:6GW) Bikaner-II : 3.7GW Bikaner-III: 4GW	Awarded
2	Rajasthan REZ Ph-IV (Part-2 :5.5GW) (Jaisalmer/Barmer Complex)	5.5GW (Solar) Fatehgarh-IV: 4 GW Barmer-I: 1.5 GW	Under Bidding
3	Rajasthan REZ Ph-IV (Part-3 :6GW) (Bikaner Complex)	6 GW (Solar) Bikaner-IV:6GW	Under Bidding (Recently approved in NCT
B	**Planned/Under Planning**		
1	Rajasthan REZ Ph-IV (Part-4 :3.5GW) (Jaisalmer/Barmer Complex)	3.5 GW (Solar) Fatehgarh-IV: 1 GW Barmer-I: 2.5 GW	**Recently approved in NCT**
2	Rajasthan REZ Ph-IV (Part-5 : 6GW) (Barmer Complex)	6 GW (Solar) Barmer-II : 6GW	**Timeframe : 2029 (HVDC)**
3	Rajasthan REZ Ph-IV (Part-6 : 6GW) (Bhadla/Bikaner Complex)	6 GW (Solar) Bhadla-IV: 2 GW Bikaner-V: 4 GW*	
4	**Rajasthan REZ Ph-V (Part-1: 4GW) (Sirohi/Nagaur Complex)**	**4 GW (Solar)** **Sirohi: 2 GW** **Nagaur: 2 GW**	**Present proposal** **Timeframe : 2027 (EHVAC)**

NLDC Inputs on Revised Scheme for Rajasthan REZ Phase- V RE

2. Inputs on AC Scheme proposed for Rajasthan REZ Ph-V (Part-1: 4GW) (Sirohi/Nagaur Complex)

Proposed System (Timeframe – 2027):

- 5x500MVA, 400/220kV ICTs at Sirohi S/s along with transformer bays
- Sirohi – Mandsaur PS 765KV D/c line (~ 320 kms) along with 330 MVAr switchable line reactor for each circuit at each end of Sirohi – Mandsaur PS 765KV D/c line
- Mandsaur PS – Khandwa (New) 765kV D/c line (~230km.) along with 240MVAr switchable line reactor for each circuit at each end of Mandsaur PS – Khandwa (New) 765 kV D/c line

a) Load-Generation Balance and IR Flows (Feb 2027 scenario)

S. No.	Region	Load (MW)	Gen. (MW)	IR Exchange (MW)	20th EPS Peak Load in 2026-27 (MW)	Average Demand Met in Solar Hours in Feb 2024 (MW)	Peak Demand met in Feb 2024 (MW)	Peak Demand met in Feb 2023 (MW)
1	NR	79604	109895	30291	97898	59664	63791	59366
2	WR	99798	99386	-412	89547	72184	74167	76524
3	SR	79758	94860	15102	80864	62000	65591	60906
4	ER	29644	14828	-14816	37265	20000	23531	22325
5	NER	2974	2654	-320	4855	2000	2822	2849
6	All India	291780	321625	x	277201	216185	221989	211325

S. No.	State	Load (MW)	Gen. (MW)	IR Exchange (MW)	20th EPS Peak Load in 2026-27 (MW)	Average Demand Met in Solar Hours in Feb 2024 (MW)	Peak Demand met in Feb 2024 (MW)	Peak Demand met in Feb 2023 (MW)
1	Rajasthan	19593	80348	60755	21175	17000	18058	16959

i. It has been mentioned that CAGR of 7% has been considered on the peak demand met by respective states in Feb 2024 at regional and all India level. Over this, green hydrogen load of 13 GW has been considered in ER (3.3 GW) and WR (8.2 GW).

ii. The peak and average (in solar hours) demand met during Feb'23 and Feb'24 solar hours has been provided for reference. It appears that the CAGR of 7% considered at regional and all India level is on the higher side. Same may be reviewed.

The all India demand considered in Feb 2027 is even more than the EPS peak demand for 2026-27 + 13 GW green hydrogen load.

NLDC Inputs on Revised Scheme for Rajasthan REZ Phase- V RE

iii. Solar and Thermal Generation

- ~192724 MW solar generation considered in service at all India level
- ~72500 MW solar generation is in service in Rajasthan
- ~27770 MW solar generation is in service in Rajasthan
- ~19100 MW solar generation in Khavda complex has been considered in the case

- Still some machines (bus - 424027) with no active power generation (Pgen = 0) are kept on in the case. These units are also providing reactive power support in the study case. The voltages in the case, therefore, may not represent the actual scenario. Such units shall therefore be kept off in the case.

- In the revised case also, some of the thermal generating stations (like 412001, 362014 etc.) are running below 40% tech min level also. Same may be clarified.

- Further, the swing bus generation (Farakka) is negative – (-) 2500 MW which would further increase the demand by around 5000 MW.

- The thermal generation has been backed down to 40%, 45% and 55% level. The tech min level considered in the case may be mentioned. Though, it is mentioned that merit order has been considered, but cheaper thermal generating stations like Singrauli and Rihand are running at only 65-70% level. Dispatch in Yadadri etc. is around 85%.

iv. With above-mentioned corrections in demand and generation, the LGB of the study case will change. This might result in changes in network flows also. Therefore, it is suggested that the proposed system may be tested on realistic load-generation scenario for 2026-27, preferably the one coming out of production cost modelling studies.

The details of N-1 non-compliance, high line loading, and low voltages are provided in subsequent sections.

NLDC Inputs on Revised Scheme for Rajasthan REZ Phase- V RE

b) Network Loadings

i. Several ICTs in Rajasthan are loaded much above the N-1 limit (Deedwana - PG, Hindaun, Hirapura, Chittorgarh, Kota – PG etc.)

CTUIL Response –

Most of the ICTs i.e. Deedwana, Hindaun, Heerapura, Chittorgarh are getting overloaded in planning studies due to the increase in load of Rajasthan. Some of the ICTs are even critically loaded in present time frame and issue of high loading is deliberated in various OCC/NRPC meetings. In above meetings, RVPN is already requested to carry out 400/220kV ICT augmentation works or feeder reconfiguration to relive ICT loadings.

Loading of 400/220kV Kota (PG) ICT is higher due to low dispatch of KTPS generation units. Loading of Bhinmal ICT is higher in Sc-7 due to increasing demand.

Above ICT loading will be reviewed in consultation with NRLDC w.r.t real time loading and Grid- India operational feedback report and necessary augmentation will be carried out in ISTS, if required, as per the present practice.

Grid-India Response

RVPNL may also be invited in the meeting and necessary augmentation required at intra-state level may also be planned at this stage.

For augmentation required at ISTS level, the planning may be carried out at this stage only.

ii. Many lines in ER and WR-ER boundary are critically loaded in solar peak case:

- 400 kV Farakka – Kahalgaon D/C,
- 400 kV New Ranchi – PPSP D/C
- 400 kV Ranchi – Sipat D/C
- 765 kV Dharamjaigarh – New Ranchi D/C
- 400 kV Rourkela – Chaibasa D/C
- 400 kV Gaya – Maithon D/C
- ICTs in West Bengal (Kolaghat, Chanditala) and DVC (Mejia-B, Durgapur)

CTUIL Response - Re-conductoring of 400 kV Farakka – Kahalgaon & Talcher – Meramundali 400 kV D/c lines in under advance stage of stakeholder consultation. Other system, if required in ISTS would be taken up on priority.

Grid-India Response: There is significant amount of power flow towards eastern region during solar hours resulting in very high loading in the ER grid. The issue is also being faced in the current scenario during solar hours. It is suggested that system augmentation in ER in a holistic manner may be taken up on priority so that the required system gets commissioned with the associated RE generation (2026-27 timeframe).

v. Angular Separation:

Scenario	765 kV Sirohi – Mandsaur D/C Line	765 kV Sirohi – Risabhdeo D/C	765 kV Neemuch – Khandwa D/C	765 kV Bikaner – Moga D/C	765 kV Bikaner – Khetri D/C
Base Case	14.4° (1746 MW)	9.5° (1744 MW)	7.3° (1230 MW)	18.2° (1914 MW)	18.2° (2425 MW)
Under N-1 Contingency	17.5° (2100 MW)	12.4° (2254 MW)	9.3° (1581 MW)	24.4° (2526 MW)	20° (2995 MW)
Under N-1-1 Contingency	22.3°	17.9°	13.2°	42.45°	25.1°

vi. HVDC Balia – Bhiwadi is running from Balia to Bhiwadi in evening peak scenario while the direction is Bhiwadi to Balia in solar peak case. The daily reversal of HVDC may also be highlighted in the scheme as reluctance is faced from asset owners regarding frequent reversal in HVDC direction.

The details of other highly loaded elements have already been shared earlier.

c) Voltages

i. It has been observed that SLRs of various 765 kV lines have been opened in the solar peak case to maintain the voltages. These SLRs have been taken back in service in the off-peak case to avoid high voltages in the system.

However, in real-time, reluctance is faced from transmission licensees regarding switching of these SLRs. Even resistance is being faced in case of frequent switching of bus reactors.

Daily operation of SLRs to control the voltage may be mentioned explicitly in the schemes as well as included in the RfP also.

NLDC Inputs on Revised Scheme for Rajasthan REZ Phase- V RE

d) Short Circuit Ratio

Bus/Station	Connected RE Capacity	Fault Level	SCR (Without Current Contribution of immediate RE to be Connected)
220 kV Sirohi	2000 MW	8413 MVA	**4.2**
220 kV Merta – II	1000 MW	5734 MVA	5.7
400 kV Merta - II	1000 MW	20302 MVA	20.3

This SCR is considering the optimistic scenario that RE plants will provide 1 p.u. short circuit contribution. However, the plants are providing the same in real-time. Same may be considered while computing the SCR.

e) Dynamic Simulation Studies

With more than 72,500 MW solar generation in Rajasthan in close vicinity by Feb 2027, it is important that stability aspects are also studied in detail at the planning stage. The generation is also getting evacuated through large EHV lines and hence, transient stability analysis also becomes important. Therefore, it is suggested that the results of the dynamic simulation studies may be shared.

CTU reply – Comment is pertaining to 2029 timeframe files, however dynamics file is under preparation. Presently there are convergence issues being faced in dynamic simulation for 2027 scenario for which consultation of IIT Mumbai is also under progress.

Grid-India response – At present, even after than 15 GW RE at ISTS level in Rajasthan, the dynamic simulation studies have not been carried out. Keeping in view the multiple generation loss events in Rajasthan RE complex, it is once again requested that the studies may be carried out at the time of proposing the evacuation scheme.

f) Other Inputs:

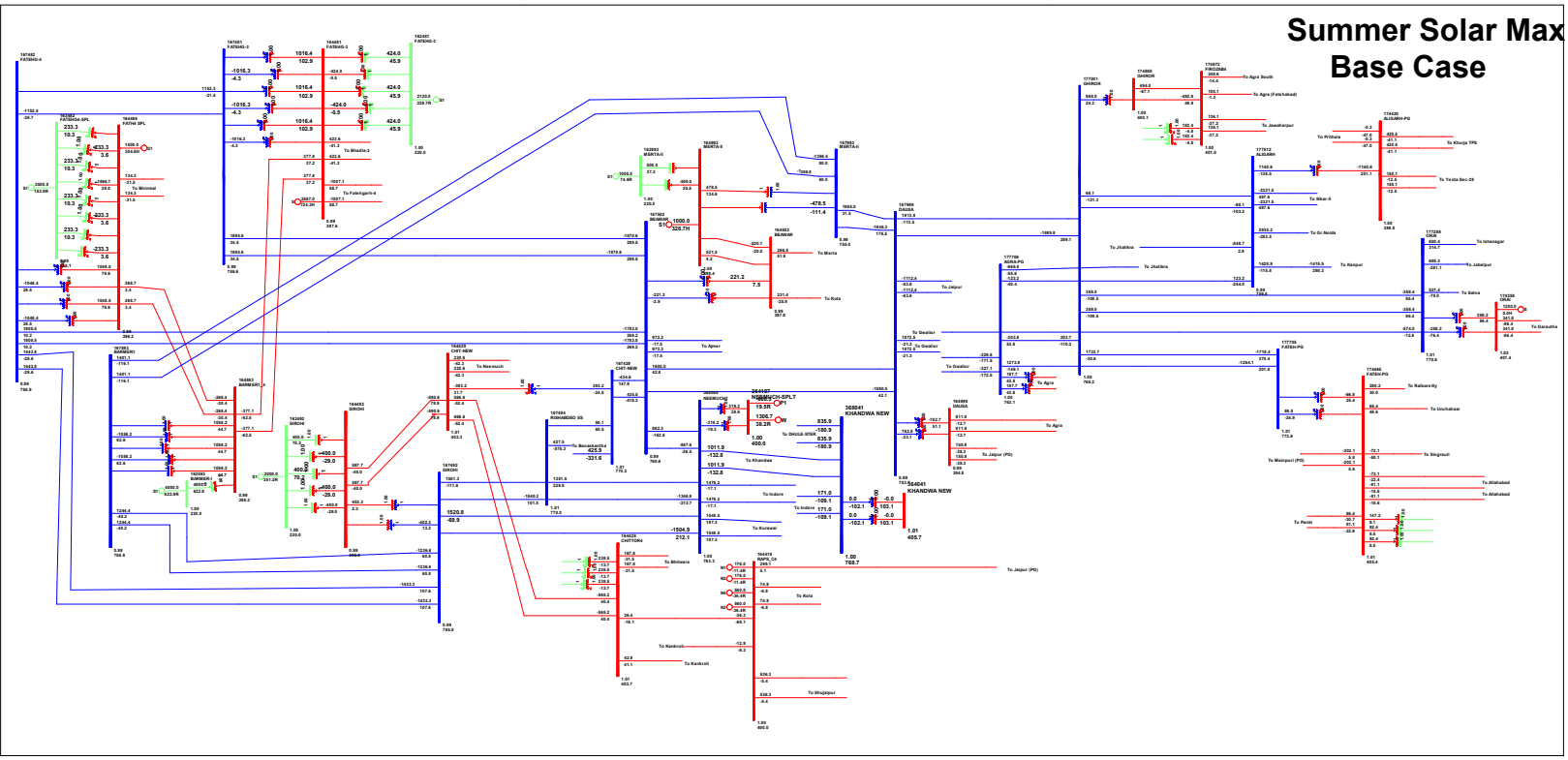
i. In addition to merit order dispatch, inertia would also be a deciding factor for a unit to remain switch on or off. Same may also be factored in.

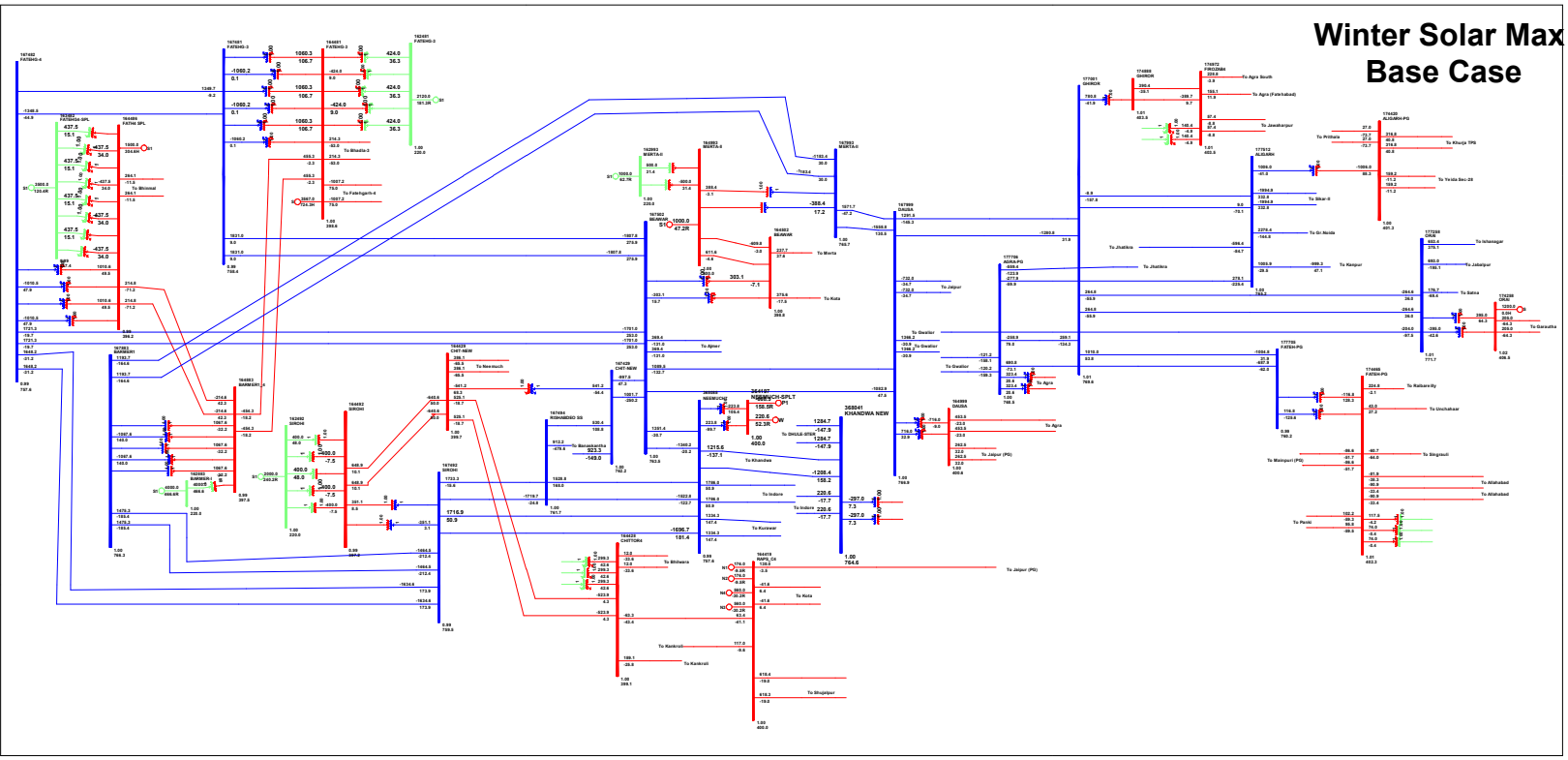
ii. Wherever long lines are getting planned like in this case 765 kV Sirohi-Mandsaur (320 Km), the range of line length may be provided as it is possible that route length may increase during commissioning phase.

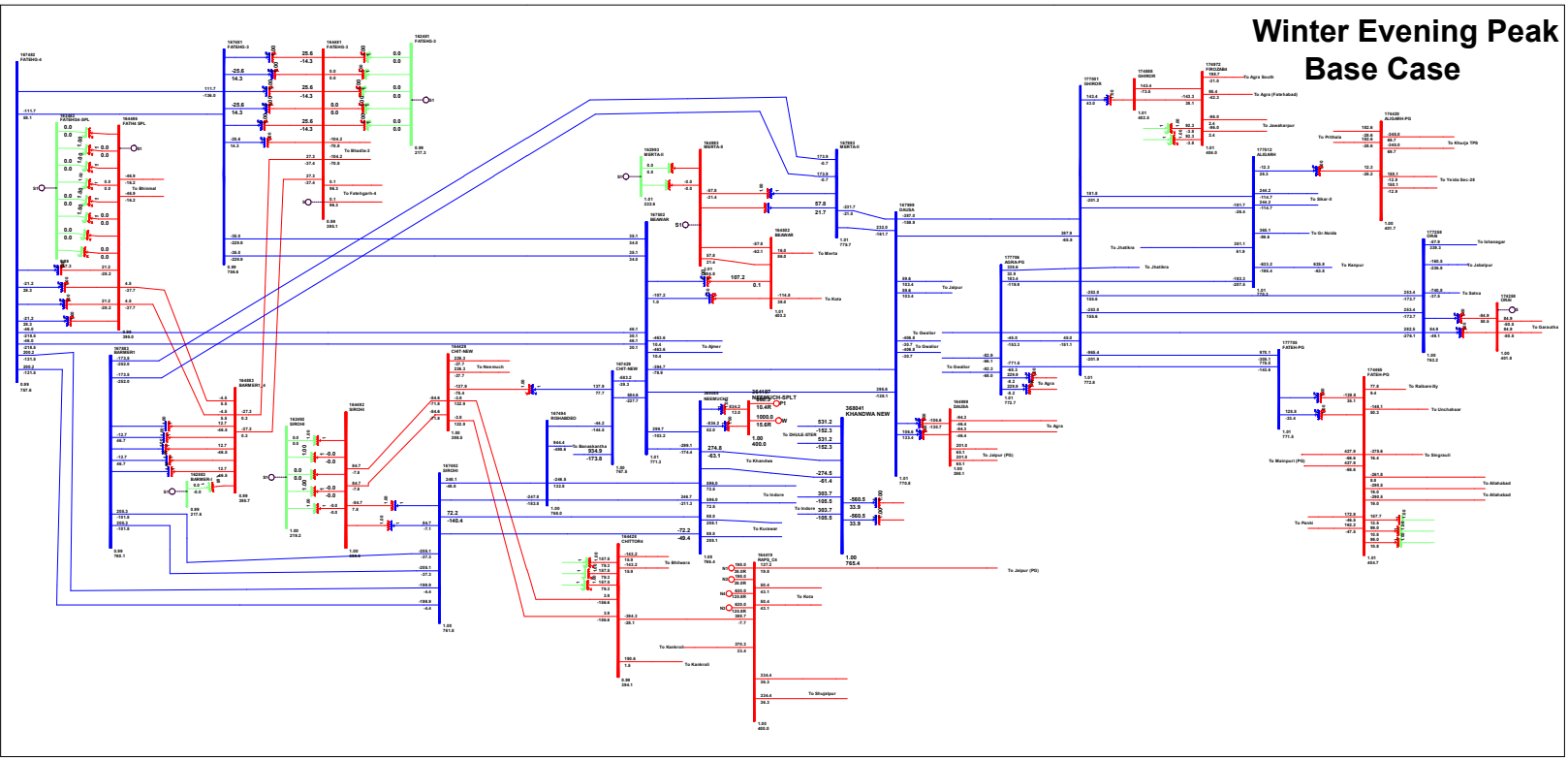
iii. Intra-state network wherever connected or proposed to be connected may be specified. All such long HVDCs and AC lines will impact Rajasthan ATC/TTC.

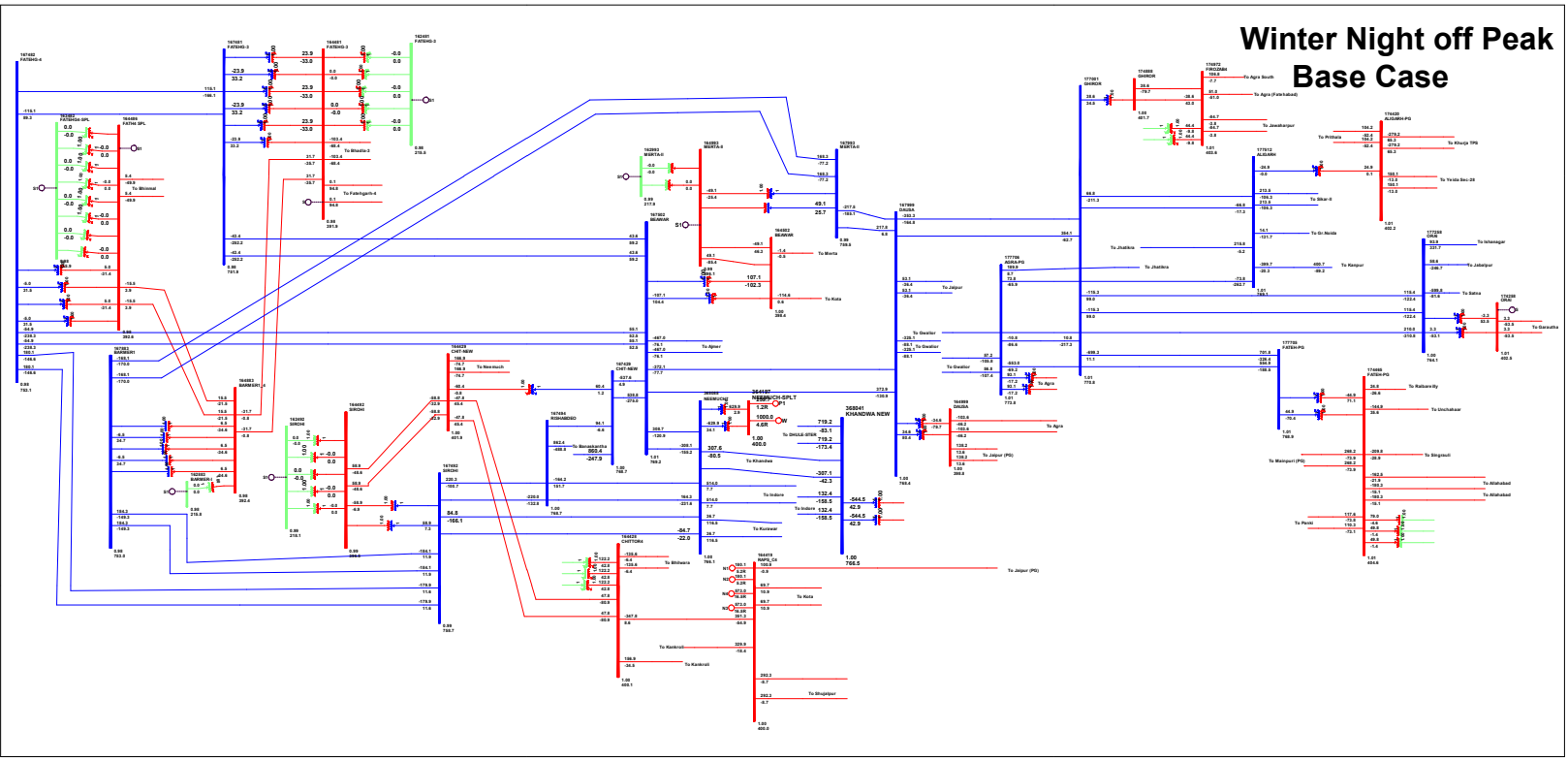
iv. **Name of New Substations** – It is requested to assign unique name for envisaged RE pooling stations. As several pooling substations with identical names but different numerical suffixes have been planned in the same district along with multiple interconnections, there is a chance of miscommunication during real-time operation among multiple constituents. For clarity of operation and ensuring that names of different substations are easily distinguished from each other, it is suggested that after finalization of the exact location, the ISTS substations are uniquely named as per the geographical name of the nearest location like village or taluk.

Exhibit-II




Winter Solar Max
Base Case


Winter Evening Peak
Base Case


Winter Night off Peak
Base Case

ग्रिड-इंडिया GRID-INDIA

ग्रिड कंट्रोलर ऑफ इंडिया लिमिटेड
(भारत सरकार का उद्यम)
GRID CONTROLLER OF INDIA LIMITED
(A Government of India Enterprise)
[formerly Power System Operation Corporation Limited (POSOCO)]
राष्ट्रीय भार प्रेषण केन्द्र / National Load Despatch Centre

कार्यालय : बी-9, प्रथम एवं द्वितीय तल, कुतुब इंस्टीट्यूशनल एरिया, कटवारिया सराय, नई दिल्ली - 110016
Office : 1st and 2nd Floor, B-9, Qutab Institutional Area, Katwaria Sarai, New Delhi -110016
CIN : U40105DL2009GOI188682, Website : www.grid-india.in, E-mail : gridindiacc@grid-india.in, Tel.: 011- 42785855

Ref: NLDC/New_Building/OPGW_CTU/April'24/1 Dated:25th April'2024

To,

Chief Operating Officer,
CTUIL,
Sector– 29, Gurgaon – 122001
Haryana

Subject: Optical Fibre Connectivity at New Building of NLDC located at "Grand Rue" - Ayur Vigyan Nagar, August Kranti Marg, New Delhi

Dear Ma'am/Sir,

Presently, National Load Despatch Centre (NLDC) is being operated from 1st Floor of B-9, Katwaria Sarai, New Delhi. All the Operation Technology (OT) systems viz. NLDC SCADA, REMC, URTDSM & ERLDC Back-up SCADA system are installed and operational from Data Centre situated at B-9, Katwaria Sarai. All the dedicated LAN connectivity of OT system at NLDC with other RLDCs (for SCADA -ICCP and PDC connectivity, NTAMC, Power Plants (RTUs for AGC) etc, Voice Communication & Video conferencing facility, MPLS connectivity for WBES is being provided by POWERTEL and ULDC. ULDC Communication is also used for cross border Voice and Data communication with Nepal, Bhutan and Bangladesh.

Present OPGW Connectivity at NLDC are described below:

Sr. No.	Link Description	Remarks
1	POWERTEL	Being Used for NLDC SCADA , URTDSM & for OT
2	ULDC	Being Used for NLDC SCADA, REMC , URTDSM , VoIP & Video Conferencing

Details of links being used is given in Annex-I.

GRID-INDIA recently acquired premises located at "Grand Rue" - Ayur Vigyan Nagar, August Kranti Marg, New Delhi, and intends to shift Control centre functions to the new building. It is expected that NLDC operation shall start from December 2024 at its new building.

In view of this, it is requested to plan and provide following at "Grand Rue" - Ayur Vigyan Nagar, August Kranti Marg, New Delhi at the earliest.

1. POWERTEL links (with redundancy) being used for ULDC purpose
2. Redundant ULDC communication
3. Installation of Communication Equipment as per requirement
4. Supply and Installation of redundant DC Power Supply (DCPS) for Orange Exchange and Communication Equipments.

Since it is expected that that control room functions shall shift to new building by December 2024. It is requested to please advise the concerned to plan and implement redundant communication for NLDC control room operation at the new location at the earliest.

Yours Faithfully

(S C Saxena)
Executive Director, NLDC

CC:

1. **Executive Director, GA & C, POWERGRID**

Annexure-1

Sr.No.	Connectivity Purpose	Link Description	Bandwidth	Remarks
1	NLDC SCADA	POWERTEL Link 1	50 Mbps for All RLDCS	Used for NLDC SCADA. Each RLDC Link has 10 Mbps bandwidth.
2		POWERTEL Link 2	50 Mbps for All RLDCS	
3		ULDC Link 1	50 Mbps for All RLDCS	
4		ULDC Link 2	50 Mbps for All RLDCS	
5		ULDC Link for NR	10 Mbps	
6		ULDC Link for WR	10 Mbps	
7		POWERTEL Link for CERC	10 Mbps	
8		POWERTEL Link for NPMC	10 Mbps	
9		POWERTEL Link 1	100 Mbps Link	Used for Intersite Link Bewteen Main NLDC and Backup NLDC
10		POWERTEL Link 2	100 Mbps Link	
11		ULDC Link 1	100 Mbps Link	
12		ULDC Link 2	100 Mbps Link	
13		ULDC Link Backup SR	10 Mbps Link	Used for Main NLDC to Backup RLDCs ICCP connectivity
14		ULDC Link Backup NR	10 Mbps Link	
15		ULDC Link Backup WR	10 Mbps Link	
16		ULDC Link Backup NER	10 Mbps Link	
17		ULDC Link for BHUTAN	10 Mbps Link	International ICCP Connectivity
18		ULDC Link for NEPAL	10 Mbps Link	
19		AGC ULDC Link 1	1000 Mbps	Being used for AGC. Each Plant has two link with 10 Mbps Bandwidth. Total Plant presently 80 Plants. For future , link may be planned for 100 Plants.
20		AGC ULDC Link 2	1000 Mbps	
21	REMC	REMC ULDC Link 1	30 Mbps for All RLDCS	Used for REMC ICCP Connectivity
22		REMC ULDC Link 2	30 Mbps for All RLDCS	
23	Backup ERLDC	ULDC Link	150 Mbps	Used for Intersite Link Bewteen Main ERLDC and Backup ERLDC. 100 Mbps Link ; Each ER States 10 Mbps Link
24	URTDSM	ULDC Link NR	100 Mbps	Used for URTDSM
25		ULDC Link NTAMC	100 Mbps	
26		ULDC Link SR	100 Mbps	
27		ULDC Link ER	100 Mbps	
28		ULDC Main URTDSM to Backup URTDSM at Kolkata	100 Mbps	
29		POWERTEL LINK WR	100 Mbps	
30		POWERTEL Link NER	20 Mbps	
31		POWERTEL Link CEA	30 Mbps	
32	VoIP	ULDC NR Link	10 Mbps	Orange EPABX is being used for IP Phones and Intercoms.
33		All RLDCs Link with POWERTEL	40 Mbps	
34		ULDC Bhutan Link	10 Mbps	
35		ULDC Bangladesh Link	10 Mbps	
36		ULDC Nepal Link	10 Mbps	

Minutes of Meeting Regarding Optical fibre connectivity at New Building of NLDC located at "Grand Rue" New Delhi on 06th May 2024 in Virtual Mode

A meeting was convened on 06.05.2024 by CTU through virtual mode (MS-Teams Platform) in view of the letter dated 25.04.24 received from Grid-India (copy attached at ***Annexure-I***) regarding provision of fiber optic connectivity to the new building of NLDC located at "Grand Rue" New Delhi.

The list of participants is attached at ***Annexure-II***.

DGM (CTU) welcomed all the participants at the meeting and proceeded with the agenda.

Agenda of the Meeting

Planning for Optical Fibre Connectivity at the New Building of NLDC located at "Grand Rue" - Ayur Vigyan Nagar, August Kranti Marg, New Delhi from ULDC fiber network.

Deliberation:

CTU requested Grid-India to explain the requirement in view of fiber optic connectivity for New Building of NLDC located at "Grand Rue".

Grid-India Explained that they have purchased new building located at "Grand Rue" - Ayur Vigyan Nagar, August Kranti Marg, New Delhi and are planning to start NLDC operation by 31st Oct 2024. All IT and Operation Technology (OT) systems need to be shifted by 31st Oct' 2024.

In this regard there will be requirement of dedicated and redundant Optical Fibre connectivity to successfully start the NLDC control room for power system operations from the said Building. Further, additional links of POWERTEL may be required for the same.

CTU enquired that the Power system operation shall be performed only from the new building control centre or both control centres located at existing and new building.Grid-India stated that the existing communication system at NLDC building at Katwaria Sarai will be in service as ERLDC Backup will remain in existing Building at Katwaria Sarai. Further for smooth transition from old building to new building parallel operation will be done for NLDC for few months.

CTU requested POWERGRID to provide the interim connectivity, suitable fiber paths(main and redundant), requirement of Fiber Cables, FOTE etc. to provide connectivity to new building. POWERGRID informed that temporary connectivity can be provided by using connectivity of POWERTEL as POWERTEL fibre is running near the building and Optical Connectivity can be taken from POWERTEL at STM-16 level to provide the said connectivity. POWERGRID further informed that existing POWERTEL links shall be extended and their commercial treatment shall be done as per existing norms (from O&M budget).

POWERGRID stated that permanent connectivity of New Building needs to be done from ULDC network. POWERGRID suggested the following paths considering redundancy for fiber optic connectivity:

(a) NLDC/NRLDC at Katwaria Sarai ⇨ NLDC New Building, August Kranti Marg.
(b) Maharani Bagh (ULDC) ⇨ NLDC New Building, August Kranti Marg
(c) Tughlaqabad ⇨ Okhla ⇨ NLDC New Building, August Kranti Marg

POWERGRID stated that it will be beneficial to install 48 Fibre cable as cost difference in 24F and 48F cable is nominal in comparison with cost of ROW to avoid future RoW requirement. CTU suggested that in place of 48F UGFO cable, 2 nos. of 24F UGFO cable can be installed in redundant cable trenches to avoid disconnection in case of frequent construction/digging work by other agencies. The participants agreed for 2X24F UGFO cable option.

CTU requested POWERGRID to provide the BoQ and Cost estimate including RoW charges , FOTE , 2x24F UGFO Fibre cable, DCPS and other required hardware for the above paths to take up this agenda for RPC review on urgency bases as requested by Grid-Inida.

CTU requested POWERGRID to submit the detailed requirement and plan for connectivity of NLDC new building with tentative cost estimate by 14.05.24 so that agenda can be put up by CTU in upcoming NRPC for their views.

Detailed proposal shall consist of BoQ and cost estimate for all three paths as mentioned above

- Fibre Optic Terminal Equipment
- DC Power Supply System
- Fiber Optic Cable (2x24F)
- RoW charges involved
- Supply, Installation, Testing & Commissioning of FOTE, DCPS & OFC

Meeting ends with vote of thanks.

Annexure-II

List of Participants

S. No.	Name	Designation	E mail	Phone
CTUIL				
1.	Sh H S Kaushal	Sr. General Manage	hsk@powergrid.in	
2.	Sh. T P Verma	Dy. General Manage	tejprakash@powergrid.in	9650598191
3.	Sh. Prakhar Pathak	Engineer	Prakharpathak321@powergrid.in	8953109167
Grid-India				
3.	Shri Alok Kumar	Sr. General Manage		9999039321
4.	Shri Ankur Gulati	Dy. General Manage		9869080336
5.	Shri Deepak Kumar	Manager		
POWERGRID				
6.	Smt. Shyama Kumari	Sr. Dy. General Manager		9873918459
7.	Sh. Narendra Kumar Meena	Dy. General Manager		9810082410
8.	Sh. Sandeep Kumar Gupta	Chief Manager		8826094855

Scheme: Optical Fibre Connectivity for NLDC new building, August Kranti Marg, New Delhi.

S. No.	Items	Details
1.	Name of Scheme	Optical Fibre Connectivity for NLDC new building, August Kranti Marg, New Delhi
2.	Scope of the scheme	Supply and installation of (2X24F) Underground Optical Fibre for 35 Kms including RoW charges, 3 no. of FOTE and 2 no. of 48V DCPS
3.	Depiction of the scheme on FO Map	N/A
4.	Objective / Justification	i. Grid-India vide their letter dated 25.04.24 (copy attached at **Annexure-E**) has requested CTU for planning of fiber optic connectivity to their new building of National Load Dispatch Centre (NLDC) located at "Grand Rue" Ayur Vigyan Nagar, August Kranti Marg, New Delhi. Accordingly a meeting has been conveyed by CTU on 06.05.2024 to understand the actual requirement of Grid-India for connectivity of New building (MoM attached at **Annexure-F**). ~~ii.~~ As per meeting held on 06.05.2024 among Grid-India, POWERGRID and CTU. Scheme was prepared based on the inputs from POWERGRID regarding requirement of UGFO, FOTE, RoW charges
5.	Estimated Cost &Funding	**Rs. 8 Cr.** (approx.)
6.	Implementation timeframe	12 months from the date of allocation
7.	Implementing Agency / Mode	**POWERGRID in RTM**
8.	Deliberations in different meetings	Meeting held among Grid-India, POWERGRID and CTU on 06.05.2024

Approval Name: **Application for submission of Technical Connection data for Connectivity Agreement_2**

SWS ID:	SW1149165101
Applied By:	Sahil Verma
Applied On:	02 Jan 2024 01:03:03 PM
Ministry Name:	Ministry of Power
Department Name:	Central Transmission Utility

Form Name

SUBMISSION OF TECHNICAL CONNECTION DATA TO BE FURNISHED TO CTU FOR SIGNING OF "CONNECTIVITY AGREEMENT"

Details of Applicant

Name of the Applicant Company	H. P. POWER TRANSMISSION CORPORATION LIMITED

Details of Grant of Connectivity

Connectivity Intimation No.	
Date	
Quantum for which connectivity is granted	
Substation at which connectivity granted	
State	Himachal Pradesh

Address of Correspondence

Address 1	HPPTCL HIMFED BHAWAN SHIMLA
Address 2	
Country	India
State	Himachal Pradesh

Primary Contact Details

Primary Contact Person	MANOJ

Designation of Primary Contact Person	General Manager
Primary Phone Number (Mobile)	+91 9418407222
Primary Email ID	ermanoj1@yahoo.com

Alternate Contact Details

Alternate Contact Person	PARDEEP SINGH
Designation of Alternate Contact Person	SENIOR MANAGER
Alternate Phone Number (mobile)	+91 8278715343
Alternate Email ID	SMKALAAMB.TCL@HPMAIL.IN

Status of Applicant Company Details

Status of Applicant Company	ISTS Licensee
Estimated time of Completion of Project	15/01/2024

Detail & Drawings: Details

Annexure-A: Bay allocation, Equipment ratings, Protection equipment, System recording, Site responsibility details (Click on the icon to 1. Download the Template; 2. Fill it; then 3. Upload the File)	Annexure - A (CON-5 details).docx

Detail & Drawings: Attachments

Annexure-A(I): Equipment Drawings for confirming the Ratings	
Annexure-A(II): Protection SLD containing protection details of the transmission system to be made	KALA AMB SLD.pdf
Annexure-A(III): CRP & scheme drawings containing protection of the transmission system	
Annexure-A(IV): PLCC/FOTE Drawings for the Transmission Lines under the Scheme	PLCC PKATL.pdf

Detail & Drawings: Maps and Diagram

Schedule-I: Survey of India Topo-sheet clearly making the location of the Proposed Site	220 kV HPPTCL Substation on TOPOSHEET 1.pdf

Schedule-II (A): Site plan (both pdf and autocad file) in appropriate scale indicating Generators, Transformer, Site building	Upload PDF & Cloud Link
Schedule-II (A): Upload PDF	Site Plan HPPTCL Andehri.pdf
Schedule-II (A): Cloud link for .dwg file (AUTOCAD) to be uploaded	https://drive.google.com/file/d/1IOVx_nUSeunVZHUMPIIcjOTxh9eHcZD_/view?usp=drive_link
Schedule-II (B): Site plan of the ISTS substation at which connectivity granted (Autocad 2000 & above versions)	Site Plan PKATL.pdf
Schedule-III (A): Electrical Single Line Diagram (SLD) (both pdf and autocad) of the proposed facility detailing all significant items of plant (Autocad 2000 & above versions)	Upload PDF & Cloud Link
Schedule-III (A): Upload PDF	KALA AMB SLD.pdf
Schedule-III (A): Cloud link for .dwg file (AUTOCAD) to be uploaded	https://drive.google.com/file/d/1Qs_ueFuEdZ5km-esDIFd8RpnS4dCEnHH/view?usp=drive_link
Schedule-III (B): Electrical Single Line Diagram (SLD) of ISTS substation at which connectivity granted	SLD Kala Amb GIS PGCIL.pdf
Annexure-C(V): General Arrangement (GA) drawing indicating proposed facility	General Arrangement HPPTCL.pdf
Annexure-C(IV): Sub-Station Automation System (SAS) ring diagram indicating interconnections of various IEDs/Engg PC/Gateway etc.	ARCHITECTURE SAS KALA AMB.PDF
PERT Chart: Program Evaluation Review Technique (PERT) of Project indicating major activities with their completion scheduled	PERT Chart.pdf

TECHNICAL DETAILS and STUDIES: Transmission Line Data

Annexure-C(I): Transmission Line Tower, Conductor & Earth-wire/OPGW Details (Click on the icon to 1. Download the Template; 2. Fill it; then 3. Upload the File)	Annexure(C-1).docx
Annexure-C(II): Schematic Drawing of DA/A Type Tower clearly indicating Position of Conductor and E/wire	
Annexure-C(III): Equivalent Resistance, Reactance and Susceptance (R,X and B) Parameters of Transmission Line (Click on the icon to 1. Download the Template; 2. Fill it; then 3. Upload the File)	Annexure-C(III).doc

TECHNICAL DETAILS AND STUDIES: Communication Data

Annexure-D(I): Details of communication system i.e. OPGW Cable, FOTE, FODP, Approach Cable, PMU etc. as per the format, in case of Generator (Click on the icon to 1. Download the Template; 2. Fill it; then 3. Upload the File)	Annexure-D(I).doc
Annexure-D(II): Details of communication system i.e. OPGW Cable, FOTE, FODP, Approach Cable, PMU etc. as per the format, in case of TSP (Click on the icon to 1. Download the Template; 2. Fill it; then 3. Upload the File)	Annexure(D-II) Communication.docx
Annexure-D(III): Communication connectivity diagram	FOTE DRAWINNGS KALA AMB-ANDEHRI.pdf

TECHNICAL DETAILS AND STUDIES: Transformer Data

Schedule VII: Two winding transformer data (Click on the icon to 1. Download the Template; 2. Fill it; then 3. Upload the File)	Schedule_VIII_Two_Winding_Trans.doc
Schedule VIII: Three winding transformer data (Click on the icon to 1. Download the Template; 2. Fill it; then 3. Upload the File)	Schedule_VIII_Three_Winding_Trans.doc

TECHNICAL DETAILS AND STUDIES: Dynamic simulation data - RE Machines.

Schedule-XI(XIV): Transformer datasheet	

Declaration

I confirm that I am well aware of the relevant CERC/CEA Regulations and Detailed Procedure and all the details entered by me are in conformity with the Regulations. I submit that all the details given in the Application are true and correct and nothing material has been concealed thereof. I also submit that the documents attached are scanned/true copies of their respective originals. I hereby confirm that the above data submitted with the application are pertaining to connection sought for the ISTS. Further, any additional data sought for processing the application shall be furnished.	Accepted

Details of Documents Enclosed with the application

Annexure-A	Bay allocation, Equipment ratings, Protection equipment, System recording, Site responsibility details (Click on the icon to 1. Download the Template; 2. Fill it; then 3. Upload the File)

Annexure-A(I)	Equipment Drawings for confirming the Ratings
Annexure-A(II)	Protection SLD containing protection details of the transmission system to be made
Annexure-A(III)	CRP & scheme drawings containing protection of the transmission system
Annexure-A(IV)	PLCC/FOTE Drawings for the Transmission Lines under the Scheme
Schedule-I	Survey of India Topo-sheet clearly making the location of the Proposed Site
Schedule-II (A)	Upload PDF
Schedule-II (B)	Site plan of the ISTS substation at which connectivity granted (Autocad 2000 & above versions)
Schedule-III (A)	Upload PDF
Schedule-III (B)	Electrical Single Line Diagram (SLD) of ISTS substation at which connectivity granted
Annexure-C(V)	General Arrangement (GA) drawing indicating proposed facility
Annexure-C(IV)	Sub-Station Automation System (SAS) ring diagram indicating interconnections of various IEDs/Engg PC/Gateway etc.
PERT Chart	Program Evaluation Review Technique (PERT) of Project indicating major activities with their completion scheduled
Annexure-C(I)	Transmission Line Tower, Conductor & Earth-wire/OPGW Details (Click on the icon to 1. Download the Template; 2. Fill it; then 3. Upload the File)
Annexure-C(II)	Schematic Drawing of DA/A Type Tower clearly indicating Position of Conductor and E/wire
Annexure-C(III)	Equivalent Resistance, Reactance and Susceptance (R, X and B) Parameters of Transmission Line (Click on the icon to 1. Download the Template; 2. Fill it; then 3. Upload the File)

Annexure-D(I)	Details of communication system i.e. OPGW Cable, FOTE, FODP, Approach Cable, PMU etc. as per the format, in case of Generator (Click on the icon to 1. Download the Template; 2. Fill it; then 3. Upload the File)
Annexure-D(II)	Details of communication system i.e. OPGW Cable, FOTE, FODP, Approach Cable, PMU etc. as per the format, in case of TSP (Click on the icon to 1. Download the Template; 2. Fill it; then 3. Upload the File)
Annexure-D(III)	Communication connectivity diagram
Schedule VII	Two winding transformer data (Click on the icon to 1. Download the Template; 2. Fill it; then 3. Upload the File)
Schedule VIII	Three winding transformer data (Click on the icon to 1. Download the Template; 2. Fill it; then 3. Upload the File)
Schedule-XI(XIV)	Transformer datasheet

Signature Not Verified

Digitally Signed.
Name: KAMALJEET SINGH
Date: 02-Jan-2024 13:06:23

Annexure-I

सत्यमेव जयते

INDIA NON JUDICIAL

Government of Himachal Pradesh

₹100

e-Stamp

Certificate No.	:	IN-HP12415702670363W
Certificate Issued Date	:	26-Mar-2024 12:06 PM
Account Reference	:	SELFPRINT (PU)/ hp-self/ SHIMLA/ HP-SM
Unique Doc. Reference	:	SUBIN-HPHP-SELF21144962116186W
Purchased by	:	HARMANJEET SINGH
Description of Document	:	Article 5 Agreement or Memorandum of an Agreement
Property Description	:	CONNECTIVITY AGREEMENT BETWEEN CTUIL, HPPTCL AND PKATL
Consideration Price (Rs.)	:	100 (One Hundred only)
First Party	:	CTUIL
Second Party	:	HPPTCL AND PKATL
Stamp Duty Paid By	:	HPPTCL AND PKATL
Stamp Duty Amount(Rs.)	:	100 (One Hundred only)

₹100

SELF PRINTED CERTIFICATE TO BE VERIFIED BY THE RECIPIENT AT WWW.SHCILESTAMP.COM

IN-HP12415702670363W

Please write or type below this line

Connectivity Agreement-IEGC

Connectivity Agreement

THIS AGREEMENT is made on this the [..27th.....] day of [.....March..], 2024

AMONGST

[***Central Transmission Utility of India Limited***] (hereinafter called the "**CTU**") having its registered office at Plot No. 2, Sector 29, Gurugram 122001, Haryana, which expression shall

General Manager (C&D)
HPPTCL, Tutikandi Shimla-5

Statutory Alert:
1. The authenticity of this Stamp certificate should be verified at www.shcilestamp.com/ or using e-Stamp Mobile App of Stock Holding. Any discrepancy in the details on this Certificate and as available on the website / Mobile App renders it invalid.
2. The onus of checking the legitimacy is on the users of the certificate.
3. In case of any discrepancy please inform the Competent Authority.

POWERGRID Kala Amb Transmission Limited

Central Transmission Utility of India Ltd. Gurugram

unless repugnant to the context or meaning thereof be deemed to mean and include its successors or permitted assigns;

[*H.P. Power Transmission Corporation Limited having its registered office at* **Himfed Bhawan, Panjari, Shimla. H.P- 171005]** (herein after called "**the Applicant [STU/InSTL]**") which expression shall unless repugnant to the context or meaning thereof be deemed to mean and include its successors or permitted assigns;

And

[POWERGRID Kala Amb Transmission Limited (PKATL) *having its registered office at* ***B-9, Qutab Institutional Area, Katwaria Sarai, New Delhi-110016]*** (herein after called ***"inter-State transmission licensee*** **[ISTL]**) which expression shall unless repugnant to the context or meaning thereof be deemed to mean and include its successors or permitted assigns;.

Applicant (STU/InsTL) and Inter-state Transmission Licensee are hereinafter collectively referred to as "Parties" and individually as "Party".

WHEREAS:

(A) The Applicant has applied to the CTU vide application no. **610900004** dated **02/01/2024** for connection of **[*220 kV Kala Amb (PKATL)-Andheri, Kala Amb (HPPTCL) D/C (Zebra) line on M/C Towers*]** facility to the Inter-State Transmission System (ISTS) network.

(B) The CTU has agreed to the connection of **[*220 kV Kala Amb (PKATL)-Andheri, Kala Amb (HPPTCL) D/C (Zebra) line on M/C Towers*]** Facility to transmit electricity as well as real time data telemetry to and from the Facility through the ISTS network.

(C) The inter-State transmission licensee/ State Transmission Utility/ intra-State transmission licensee is entering into this connectivity agreement with the ISTS licensee(s) to which it is getting connected and Central Transmission Utility, as provided for in Central Electricity Regulatory Commission (Indian Electricity Grid Code) Regulations, 2023 and Central Electricity Regulatory Commission (Connectivity and General Network Access to the inter-State Transmission System) Regulations, 2022.

(D) The Parties have entered into this connectivity agreement to record the terms and conditions upon which the Parties will carry out their respective Connection Works specific to the scope mentioned herein, in accordance with the Connectivity Agreement. The responsibilities of the parties are defined accordingly in this Agreement.

(E) The parties shall separately take up modalities for implementation of the works on mutually agreed terms and conditions. The scope of works, time schedule for completion of works, including the timelines for the various milestones to be reached for completion of works (PERT chart), shall form an appendix to this agreement, and shall form the basis for evaluating if the works by the parties have been executed in time.

Penalties for non-completion of works in time by one party resulting in financial losses to the other party may be appropriately priced, as per mutual agreement, for indemnification of each other against losses incurred in this regard. Similarly, for the regular O&M of the connection equipment owned by the Applicants and located in the ISTL/STU/InSTL (as applicable) premises/switchyard, the parties shall separately take up the O&M agreement on mutually agreed terms and conditions.

HPPTCL, Tutikandi Shimla-5

(F) Further, a signed copy of the agreement along with all the Annexures, and amendments whenever made, shall be submitted to RLDC/NLDC by ***H.P. Power Transmission Corporation Limited***.

IT IS HEREBY AGREED as follows:

1. General Conditions for Connectivity

1.1 The Parties agree to the following General Conditions:

(a) The parties shall abide by all the applicable provisions of Electricity Act, 2003, Regulations/Detailed Procedures and Central Electricity Regulatory Commission (Indian Electricity Grid Code) Regulations, 2023 and Central Electricity Regulatory Commission (Connectivity and General Network Access to the inter-State Transmission System) Regulations, 2022, in respect of procedure of grant of connectivity and other matters.

(b) The applicant and ISTL/STU/InSTL, as the case may be, shall be responsible for planning, design, construction, safe and reliable operation & maintenance of its own equipment in accordance with the Act/Regulations/Procedures, including but not limited to, Central Electricity Authority (Technical Standards for Connectivity to the Grid) Regulations, 2007, Central Electricity Authority (Technical Standards for Construction of electrical plants and electric lines) Regulations, 2022, Central Electricity Authority (Grid Standards) Regulations, CERC Sharing Regulations, 2020, CERC Indian Electricity Grid Code (IEGC) Regulations, 2023 and its amendments thereof as well as other statutory provisions. In case of bay extensions, the applicant shall consider the existing station(s) as DCP at respective ends (as the case may be).

(c) The Applicant shall provide necessary facilities for voice & data communication for transfer of real time operational data from their station to Data Collection Point (DCP) of Inter-State transmission licensees as per IEGC Regulations, 2023. ISTL/ STU/InSTL (as applicable) shall provide access to Applicant's data transfer through communication network on mutually agreed terms. Additional communication system from DCP to the concerned RLDC shall be the responsibility of ISTL/STU/InSTL (as applicable); however, its cost shall be borne by the Applicant. The responsibility of data transfer shall be that of the Applicant.

(d) This agreement (Connectivity Agreement-IEGC) being in the nature of a technical agreement shall have no commercial implications/repercussion whatsoever coming out from the terms of this agreement and shall have no commercial bearing on CTUIL.

1.2 The following documents and their schedules which have been initialled by the parties and annexed herewith shall be deemed to form an integral part of this Agreement in the order of precedence listed below:-

(a) Additional information for signing Connectivity Agreement

(b) Connection details Letter ***(No. Ref: C/CTU/NR/HPPTCL/610900004 dated 28.02.24)***;

(c) This Agreement;

1.3 **Availability of Statutory/Regulatory Approval**

The applicant shall be responsible for obtaining the statutory clearances/approval including transmission licensee (if required) for carrying out the works requiring connection to the ISTS.

General Manager (C&D)
HPPTCL, Tutikandi Shimla-5

Central Transmission Utility of India Ltd. Gurugram

POWER GRID Kala Amb HPKATL Transmission Limited

2 Agreement To Pay Charges And Costs

2.1 Agreement to additional costs

The applicant declares that it shall pay the cost towards modification/alterations to the infrastructure of ISTL/STU/InSTL (as applicable) for accommodating the proposed connection as specified in the letter of CTU furnishing connection details.

2.2 Agreement to pay for damages.

The applicant declares that it shall pay/ make good damages, if any, caused to the property of the ISTL/STU/InSTL (as applicable), which has been notified by the ISTL/STU/InSTL (as applicable), within reasonable time of its occurrence, during the course of control, operation and maintenance of the equipment.

2.3 Agreement to pay Charges for construction of Bays:

The Applicant will execute an agreement with ISTL/STU/InSTL (as applicable) for the erection of equipment of Applicant in the substation premises of the ISTL/STU/InSTL (as applicable) for construction of bays, if required. For this purpose, the applicant shall pay charges to the ISTL/STU/InSTL (as applicable) on mutually agreed terms.

2.4 Agreement to pay O&M Charges:

The Applicant shall pay O&M charges to the ISTL/STU/InSTL (as applicable) on mutually agreed terms for the bay equipment of Applicant being operated & maintained by the ISTL/STU/InSTL (as applicable) in their substation. These O&M charges will be governed from time to time as per mutually agreed terms.

3. Conditions Precedent to the implementation of the Commissioning Instructions

The applicant shall procure appropriate "Charging Instructions" prior to first charging of the equipment through the grid. The charging instructions shall be issued on confirmation from the Applicant (ISTL/STU/InSTL, as applicable) that:

(a) the Connection Works have been completed;

(b) the Applicant has complied with its all obligations as set out in the Connection details Letter;

(c) the Applicant has demonstrated the voice & data communication facilities to concerned RLDC;

(d) the Applicant have obtained necessary approvals like PTCC, clearance from Electrical Inspectorate of CEA etc. from competent authority;

(e) the Applicant have complied with its obligations under the Central Electricity Authority (Technical Standards for Connectivity to the Grid) Regulations, 2007 and its amendment thereof.

4. Metering

The applicant shall provide and maintain the Metering equipment, in accordance with the Central Electricity Authority (Installation and Operation of Meters) Regulations, 2006 and IEGC regulation, 2023 and its amendment thereof.

General Manager (C&D)
HPPTCL, Tutikandi Shimla-5

POWERGRID Kala Amb Transmission Limited

Central Transmission Utility of India Ltd. Gurugram

5.1 Site Access

The Applicant shall also allow, on prior permission, site access to the ISTL/ STU/InSTL(as applicable) employees and/or authorized agents / invitees to carry out preliminary site investigation works, inspections etc. in the connection site of the Applicant, provided that a written request has been made giving reasonable advance notice. Further applicant shall also allow, on prior permission, site access to the CTU/CEA/RLDC employees and/or authorized agents / invitees.

5.2 Conditions of access

Site access for the Applicant (ISTL/STU/InSTL, as applicable) shall include the right to bring such vehicles, plant, machinery and construction materials as shall be reasonably necessary to carry out the functions in respect of which the permission of access is granted. Being a restricted area, any individual to whom access is given under the Agreement shall comply with all reasonable directions given by the Applicant (ISTL/STU/InSTL, as applicable) and its duly authorized employees and agents to safeguard the interest of safety and security requirements of personnel and equipment. All such access shall be exercisable without payment of any kind/monies.

6. Transfer Assignment and Pledge

The Applicant shall not transfer, assign or pledge its rights and obligations under this connection agreement to any other person/entity except as provided under the provisions of the CERC GNA Regulations.

7. Notice

All correspondence/notices required or referred to under this Agreement shall be in writing and signed by the respective authorized signatories of the parties mentioned herein, unless otherwise notified. Each such notice shall be deemed to have been duly given if delivered or served by Email/registered mail/speed post of the department of post with an acknowledgment due or by a courier agency with proof of delivery to other party (ies) as per authorization by parties.

The authorities of the parties who shall be responsible for the correspondence notices etc. in connection with this agreement shall be informed in advance.

8. Confidentiality

The parties shall keep in confidence any information obtained under this Connectivity Agreement and shall not divulge the same to any third party without the prior written consent of the other party, unless such information is

a) in the public domain,
b) already in the possession of the receiving party,
c) required by the Govt. Ministries/Agencies/Court of competent jurisdiction.

The information exchanged herein between the parties shall be used only for the purpose of, and in accordance with, this Agreement and for the purpose stated herein. This clause shall remain in force even after termination of Connectivity Agreement.

The Parties are aware that if any falsity / inaccuracy / incorrectness is detected at any stage, applicant shall be liable for rejection or revocation of connection to ISTS along with all associated consequences in this regard, including encashment of bank guarantee and any other suitable action deemed fit under the law

General Manager (C&D)
HPPTCL, Tutikandi Shimla-5

9. Indemnification:

This is agreed to by Applicant and Inter-State transmission licensee, signing this agreement to indemnify and hold CTU harmless at all time from and against any and all damages, losses, liabilities, obligations, penalties, cause of action, claims of any kind (including, without limitation, reasonable attorneys' fees and expenses) (collectively, "Losses"), suffered, inc urred or paid, directly, as a result of, in connection with or arising out of and relating to exercise of CTU's actions pursuant to and in accordance with this Agreement.

10. Governing Laws

The agreement shall be governed by Indian Laws and Rules made thereunder.

11. Amendment to The Connectivity Agreement

In case of Modification to point of connection like re-allocation of bays, upgradation of voltage level etc. by either of the parties, if mutually agreed, an amendment to the Connectivity Agreement shall be executed between the parties within 30 days of implementing such modification.

IN WITNESS WHEREOF the CTU and the Applicant (Bulk Consumer/ Distribution licensee/ISTL/ STU/InSTL, as applicable) have caused this Agreement to be executed by duly authorized representative on date above first herein written.

Witness Name: -
Vishwas Kanwar
DGM, CTUIL

Signed for and on behalf of: -
[CTU Details]
V. THANGAMAYAN
वरि. महाप्रबंधक / Sr. General Manager
CENTRAL TRANSMISSION UTILITY OF INDIA LTD
(A Wholly Owned Subsidiary of
Power Grid Corporation of India Limited)
(A Government of India Enterprise)
Saudamini, Plot No. 02, Sector-29, Gurugram-122 001

Witness Name: -
RAHUL SINGH
Assistant Engineer (Electrical)
H.P.P.T.C.L., PIU Kala-Amb,
Distt. Sirmour (H.P.)-173030

Signed for and on behalf of: -
[Applicant (STU/InsTL) Details]
General Manager (C&D)
HPPTCL, Tutikandi Shimla-5

Witness Name: -
Vineet Kumar
DGM

Signed for and on behalf of: -
[ISTL Details]
POWERGRID Kala Amb Transmission Limited
पीकेएटीएल/PKATL

Appendix

Time schedule for completion of works of STU/InSTL/ISTS Licensee/Applicant, including the timelines for the various milestones to be reached for completion of works (PERT chart)

General Manager (C&D)
HPPTCL, Tutikandi Shimla-5

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

Ref: C/CTU/NR/HPPTCL/610900004

Date: 28/02/2024

Shri Manoj
General Manager
H.P. Power Transmission Corporation Limited
Himfed Bhawan,
Shimla, H.P- 175105

Subject: Connection details (FORMAT-CONN-TD-4) for connection of 220 kV (Zebra) D/C line on M/C Towers from 400/220 kV Kala Amb Substation PKATL to 220/132/33 kV Andheri, Kala Amb Substation of HPPTCL in ISTS by H.P. Power Transmission Corporation Limited.

Dear Sir,

This is with reference to your application Id. 610900004 dated 02/01/2024 and subsequent correspondences furnishing additional details vide mails dated 02/01/2024 to 16/02/2024 for signing of connection agreement and seeking connectivity to the ISTS.

Based on the details provided by M/s H.P. Power Transmission Corporation Limited (HPPTCL), It is hereby permitted Connectivity to the grid as per the details given below:

Sl. No.	Item Description		Details
1.	Name of the Link (Sub-station/Line) at/for which connectivity granted	:	220 kV Kala Amb (PKATL)- Andheri, Kala Amb (HPPTCL) D/C (Zebra) line on M/C Towers
2.	Voltage level	:	220kV
3.	Type of Link	:	220 kV D/c line on M/c Tower (AC link)
4.	Reactive compensation to be provided	:	----
5.	Expected date of commercial operation	:	February'2024*
6.	Bay allocated in the switchyard of connectivity	:	[refer **Annexure-I**]
7.	Equipment to be provided in the allocated bay meeting the requirement of Central Electricity Authority (Technical Standards for Connectivity to the Grid) Regulations, 2007 which shall be compatible with the equipment installed at other end.	:	[refer **Annexure-II**]
8.	Protection Equipment to be provided shall be meeting the requirements of Central Electricity Authority (Technical Standards for Connectivity to the Grid) Regulations, 2007 and shall be compatible & matching with the equipment installed at other end	:	[refer **Annexure-II**]

Sl. No.	Item Description		Details
9.	System recording & SCADA Equipment shall be meeting the technical standards as per Central Electricity Authority (Technical Standards for Connectivity to the Grid) Regulations, 2007 and shall be compatible to facilitate exchange of data with the existing system installed in the ISTS network.	:	[refer **Annexure-III(a) & III(b)**]
10.	Details of the modification/ alteration to existing facilities for accommodating proposed connection and its estimated cost.	:	[refer **Annexure-IV**]
11.	Name of Communication Link for Data and Voice Communication	:	[refer **Annexure-V**]
12.	Communication equipment details upto ISTS Data Collection Point	:	[refer **Annexure-V**]
13.	Site responsibility schedule	:	[refer **Annexure-VI**]

* As informed by the applicant

All the equipment and systems to be provided by applicant shall have to conform to the technical standards as specified in the Central Electricity Authority (Technical Standards for Connectivity to the Grid) Regulations, 2007 & Central Electricity Authority (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations,2022 and CEA (Measures relating to Safety and Electric Supply) Regulations, 2023 and amendments thereof.

The applicant will establish, test, commission and demonstrate the voice and data communication facilities with concerned LDC before test charging. At the connection point to the ISTS, cost of modifications if any, shall be borne by the applicant.

As per the CERC GNA Regulations 2022 and IEGC Regulations 2023, the applicant shall execute Connectivity Agreement (Connectivity Agreement-IEGC) among M/s H.P. Power Transmission Corporation Limited (HPPTCL), PKATL and CTUIL for which the applicant is requested to contact at following address:

Shri V. Thiagarajan
Sr. General Manager,
Central Transmission Utility of India Limited,
(Wholly Owned Subsidiary of Power Grid Corporation of India Limited)
Plot No.2, Sector-29, Gurugram
Haryana-122001

Thanking You

Yours faithfully,

28/2/2024
(K. K. Sarkar)
Senior General Manager

Copy to:

1. MD/CEO, (PKATL)

With respect to signing of "Connectivity Agreement (Connectivity Agreement-IEGC)*" among HPPTCL, PKATL and CTUIL.*

Annexure - I

Bay allocated in switchyard of connectivity

A. Sub-station (Intra-State TS) End details:

1.	**Name of substation and ownership:**	220/132/33kV AIS Andehri, Kala Amb of HPPTCL
2.	**Name of the bay and bay identification number:**	220kV Bay No. **204** and **205** for termination of Andehri, Kala Amb (HPPTCL) – Kala Amb (PKATL) 220kV D/c line on M/c tower

B. Sub-station (ISTS) End details:

1.	**Name of substation and ownership:**	400/220 kV GIS Kala Amb Substation of PKATL
2.	**Name of the bay and bay identification number:**	220kV Bay No. **204** and **205** for termination of Kala Amb (PKATL) – Andehri, Kala Amb (HPPTCL) 220kV D/c line on M/c tower

Annexure - II

Equipment to be provided in the allocated bay meeting the technical standards as per Central Electricity Authority (Technical Standards for Connectivity to the Grid) Regulations, 2007 and amendments thereof

Bus Switching Scheme: (i) Double Main Bus Scheme at Andheri, Kala Amb end (HPPTCL)
(ii) Double Main Bus Scheme at Kala Amb end (PKATL)

Sl. No.	Name of Equipment	(Intra-State TS) Station end			(ISTS) Station end		
		Type	Nos	Ratings	Type	Nos	Ratings
1.	Circuit Breaker (3 phase)	AIS	2	220kV, 2000A, 40kA for 1 sec	GIS	2	220kV, 3000A, 40kA for 1 sec
2.	Disconnecting Switch	--	--	--	GIS	6	220kV, 3000A, 40kA for 1 sec
3.	Maintenance Earthing Switch	--	--	--	GIS	4	220kV, 3000A, 40kA for 1 sec
4.	High speed Earthing switch	--	--	--	GIS	2	220kV, 3000A, 40kA for 1 sec
5.	Isolator without Earth Switch (3 phase)	AIS	4	220kV, 2000A, 40kA for 1 sec	--	--	--
6.	Isolator with one Earth Switch (1 phase)	AIS	2	220kV, 2000A, 40kA for 1 sec	--	--	--
7.	CT (1 phase)	AIS	6	220 kV, 2000A, *Core details: - Core-1: 2000-1000/1A, CL: PS Core-2: 2000-1000/1A, CL: 0.2S, 15VA Core-3: 2000-1000/1A, CL: 5P15, 15VA Core-4: 2000-1000/1A, CL: PS Core-5: 2000-1000/1A, CL: PS*	GIS	6	220kV, 3000A, 40kA for 1 sec *Core details: - Core-1: 3000-1600-800/1A, CL: TPS Core-2: 3000-1600-800/1A, CL: TPS Core-3: 3000-1600-800/1A, CL:0.2S,20VA Spare Core details: - Core-1: 3000-1600-800/1A, CL: TPS Core-2: 3000-1600-800/1A, CL: TPS*
8.	Bus PT	AIS	6	220/√3-110/√3, 110/√3110/√3 *Core details: - Core-1: CL:3P, 50VA Core-2: CL:3P, 50VA*	GIS	6	220/√3-110/√3, 110/√3110/√3 *Core details: - Core-1: CL:3P, 50VA Core-2: CL:3P, 50VA*

CENTRAL TRANSMISSION UTILITY OF INDIA LTD.

Sl. No.	Name of Equipment	(Intra-State TS) Station end			(ISTS) Station end		
		Type	Nos	Ratings	Type	Nos	Ratings
				Core-3: CL:0.2, 50VA			*Core-3: CL:0.2, 50VA*
9.	CVT	AIS	6	220kV **220/√3-110/√3, 110/√3, 110/√3** *Core details: -* *Core-1:CL:0.2 ,50VA* *Core-2: CL:3P, 50VA* *Core-3: CL:3P, 50VA*	AIS	6	220kV **220/√3-110/√3, 110/√3, 110/√3** *Core details: -* *Core-1: CL:3P, 50VA* *Core-2: CL:3P, 50VA* *Core-3: CL:0.2, 50VA*
10.	Wave Trap	AIS	2	220kV, 1250A, 0.5mH	AIS	2	220kV, 1600A, 0.5mH
11.	Surge Arrester	AIS	6	198kV, 10kA, Class-3	AIS	6	198kV, 10kA, Class-3

Annexure – II

Protection Equipment to be provided by applicant shall be meeting the technical standards as per Central Electricity Authority (Technical Standards for Connectivity to the Grid) Regulations, 2007 and amendments thereof and shall be compatible & matching with the equipment installed at other end.

1. **Name of Substation and Voltage level:**
   a. 220/132/33 kV Substation at Andheri, Kala Amb of M/s H.P. Power Transmission Corporation Limited, Voltage Level: 220/132/33kV
   b. 400/220kV GIS Substation at Kala Amb of M/s PKATL, Voltage Level: 400/220kV

2. **Name of the Lines**: 220 kV (ACSR Zebra) D/C line on M/C Towers from 400/220 kV Kala Amb Substation PKATL to 220/132/33 kV Andheri, Kala Amb Substation of HPPTCL

Details of Protection at Andheri, Kala Amb of M/s H.P. Power Transmission Corporation Limited:

Description	Protection type	Make	Model
Main-1 Protection	Differential Protection within built distance protection with tele protection through PLCC Channel	ABB	RED 670
Main-2 Protection		GE/Alstom	P546
BCU	Auto Reclose Function	ABB	REC 650

Details of Protection at Kala Amb GIS Substation of PKATL:

Description	Protection type	Make	Model
Main-1 Protection	Differential Protection within built distance protection with tele protection through PLCC Channel	ABB	RED 670
Main-2 Protection		GE/Alstom	P546
BCU	Auto Reclose Function	Siemens	6MD86

Annexure-III(a)

System Recording Equipment to be provided in the allocated bay meeting the technical standards as per Central Electricity Authority (Technical Standards for Connectivity to the Grid) Regulations, 2007 and amendments thereof

Sl. No.	Name of Equipment	(Intra-State TS) Station end		ISTS-Station end	
		Nos.	Ratings	Nos.	Ratings
1.	Event Logger	-	Inbuilt feature of Relay/IED	-	Inbuilt feature of Relay/IED
2.	Disturbance recorder	-	Inbuilt feature of Relay/IED	-	Inbuilt feature of Relay/IED
3.	Fault locator	-	Inbuilt feature of Relay/IED	-	Inbuilt feature of Relay/IED
4.	PLCC details of transmission line	02	Make: ABB Model: ETL41+NSD50	02	Make: ABB Model: ETL41+NSD50
5.	FOTE details	01	Make: SIEMENS Model- NPT1200	01	Make: SIEMENS Model- NPT1200

Annexure-III (b)

Communication Equipment details up to ISTS Data Collection Point SCADA equipment shall be meeting the technical standards as per Central Electricity Authority (Technical Standards for Connectivity to the Grid) Regulations, 2007 and amendments thereof and shall be compatible to facilitate exchange of data with the existing system installed in the ISTS network.

Sl.No	Name of Equipment	Nos.	Details
1	**Data Acquisition System** - Remote Terminal Unit/SAS/DAS Gateway	02	Gateway providing data on IEC 60870-5-104 protocol
2(a)	**Communication Equipment** SDH/MUX/Data & Voice card required if any at data collection point for Interim/ Permanent arrangement.	As per Details	**At 400/220kV Andheri, Kala-Amb (HPPTCL) S/s:** SDH equipment (min STM-4) along with necessary optical interface/s supporting MSP (Multiplex Section Protection 1+1) for 400/220kV Kala – Amb (PG) direction and tributary cards. **At 400/220kV Kala-Amb (PKATL) Substation:** SDH equipment (min STM-4) along with necessary optical interface/s supporting MSP (Multiplex Section Protection 1+1) for 400/220kV Kala – Amb (HPPTCL)) direction and Necessary optical interface for local patching and tributary cards.
2(b)	**Approach Cable & FODP**	As per Details	**At 400/220kV Andheri, Kala-Amb (HPPTCL) S/s:** FODP and Approach cable as per site condition **At 400/220kV Kala-Amb (PKATL) Substation:** FODP and Approach cable as per site condition.
3	**Cyber Security Requirement**	As per Details	Applicant to provide appropriate cyber security equipment to secure perimeter communication as per CEA (Cyber Security in Power Sector) Guidelines, 2021

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Annexure-IV

Details of the modification/alteration to existing facilities for accommodating proposed connection and its estimated cost

-Nil-

Annexure-V

Communication Link details up to ISTS Data Collection Point

Requirement of Channels:

(1) 2 Nos Data Channel (600Baud) /64 Kbps or Ethernet channel for SAS / RTU
(2) 1 No Speech channel

***Data Collection Point for:** 400/220kV Andheri, Kala Amb (HPPTCL) S/s

Data Collection Point (DCP): 400/220kV Kala Amb (PKATL) S/s

Wideband Link (Configuration of Data & Voice channel in wideband Link by regional ULDC team)
400/220kV Kala Amb (PG) - NRLDC, NEW Delhi

Note: * Data of Andheri, Kala-Amb (HPPTCL) shall route to HPPTCL SLDC through ISTS network.

Annexure-VI

Site Responsibility Schedule

A. Principle & Procedure:

The responsibility of control, operation, maintenance & all matters pertaining to safety of equipments and apparatus at the connection point shall lie with the owner. For ease of day-to-day operation as a general practice O&M is carried out by the owner of the substation in whose premises the proposed bay is located for which a separate O&M contract is entered into based on mutually agreed terms and conditions.

B. List of equipment and their ownership at the connection point:

Sl. No.	Name of Equipment	Ownership	
		(Intra-State TS) Station end	ISTS- Station end
1.	Circuit Breaker (with PIR /CSD if required))	M/s H.P. Power Transmission Corporation Limited	M/s PKATL
2.	Isolator (with no. of Earth Switch as required)		
3.	Disconnecting Switch (For GIS)		
4.	Maintenance Earthing Switch (For GIS)		
5.	High speed Earthing switch (For GIS)		
6.	CT		
7.	Line CVT		
8.	Bus CVT		
9.	PT (Metering)		
10.	Wave trap		
11.	Surge Arrester		
12.	ICT		
13.	Line Reactor		

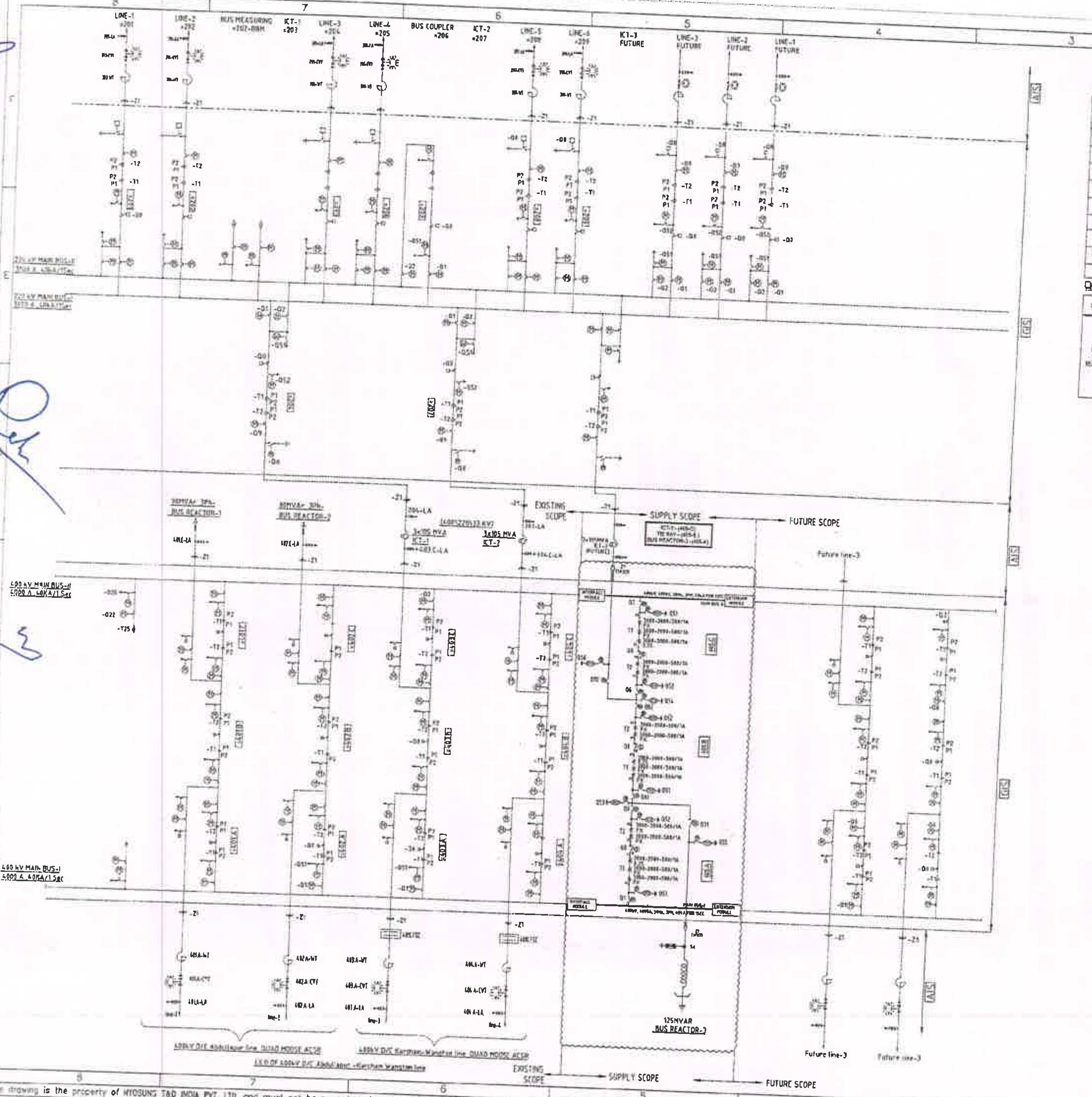
C. Site common Drawings:

a. Single Line Diagram (SLD) (Andheri Kala Amb s/s: Drawing No.- 1TEIE2101001XX, Rev. 01 & Kala Amb S/s: Drawing No.- TB201909-1001757-SC3070-SLD, Rev. 01)

b. General Arrangement Drawing (GA) (Drawing No.- 1TEIE2101002XX, Rev. 04 & SL/PQ-453/ELE/PLAN/002 Rev. 01) & Kala Amb S/s: Drawing No.- G71770-AD987-V160-F01)

CENTRAL TRANSMISSION UTILITY OF INDIA LTD.

TB201909-10017



NOTES

1. THE DESCRIBED EQUIPMENTS ARE [illegible]
2. INSULATION LEVEL & CONTINUOUS VOLTAGE RATING OF INSULATING LINK TO BE [illegible]

LEGENDS

SYMBOL	DEVICE NO	DESCRIPTION
	04	CIRCUIT BREAKER WITHOUT CONTROLLER
	01, 02, 06, 061, 062, 091, 092	DISCONNECTING SWITCH
	051, 052, 053, 054, 055, 056	MAINTENANCE EARTHING SWITCH
	T1	CURRENT TRANSFORMER FOR MAINBUS & [illegible]
	T2	CURRENT TRANSFORMER FOR MAINBUS
	Z3	GAS TO AIR BUSHING
	SA, 336kV	SURGE ARRESTER
	125MVAR, BUS REACTOR	125MVAR, BUS REACTOR
		UNDER PRESENT SCOPE
		EXISTING/FUTURE SCOPE

CT DATA

SYSTEM PARAMETERS

Sl No.	DESCRIPTION OF PARAMETER	400kV SYSTEM
1	SYSTEM OPERATING VOLTAGE	400kV
2	MAX. OPERATING VOLTAGE OF THE SYSTEM (rms)	420kV
3	RATED FREQUENCY	50Hz
4	NO. OF PHASES	3
5	RATED INSULATION LEVELS	
	i) FULL WAVE IMPULSE WITHSTAND VOLTAGE (1.2/50microsec)	[illegible]
	ii) SWITCHING IMPULSE WITHSTAND VOLTAGE (250/2500microsec) DRY & WET	[illegible]
	iii) ONE MINUTE POWER FREQUENCY DRY & WET WITHSTAND VOLTAGE (rms)	[illegible]
6	MIN. CREEPAGE DISTANCE	[illegible]
7	MIN. CLEARANCE IN AIR PORTION	
	i) PHASE TO PHASE	[illegible] (FOR CONDUCTOR TO CONDUCTOR CONFIGURATION) [illegible] (FOR ROD TO CONDUCTOR CONFIGURATION)
	ii) PHASE TO EARTH	[illegible]
	iii) SECTIONAL CLEARANCE	[illegible]
8	RATED SHORT CIRCUIT CURRENT FOR 1 SEC. DURATION	40kA

REFERENCE DRAWINGS/DOCUMENTS

KEY SINGLE LINE DIAGRAM (TENDER)	[illegible]
GENERAL ARRANGEMENT LAYOUT (TENDER)	[illegible]
KALA AMB GIS S/S ELECTRICAL LAYOUT PLAN AND SECTION	[illegible]

HYOSUNG REFERENCE DRAWINGS

SINGLE LINE	SINGLE LINE DIAGRAM WITHOUT DATA	[illegible]
LAYOUT	LAYOUT FOR [illegible] / LAYOUT FOR GIS	[illegible]
GAS SYSTEM	GAS SYSTEM DIAGRAM	[illegible]

REVISIONS

REV. No	REVISED DATE	DESCRIPTION	DRAWN	DESIGNED	CHECKED	APPROVED
1	01.AUG.'22	REVISED AS PER COMMENTS	B.J	S.T/R.H	[illegible]	[illegible]
0	11.JUNE.'22	FIRST ISSUED FOR APPROVAL	S.T	R.H	[illegible]	[illegible]

CLIENT: POWER GRID CORPORATION OF INDIA LTD.

SUPPLIER / CONTRACTOR: HYOSUNG T&D INDIA Pvt. Ltd.

PROJECT: 400kV GIS EXTENSION AT KALA AMB

JOB No.:

	NAME	SIGN	DATE
DRWN	B.J	B.J	01.AUG.'22
DSGN	S.T/R.H	S.T/R.H	01.AUG.'22
CHKD	D.M	D.M	01.AUG.'22
APPD	J.S.PARK	J.S.PARK	01.AUG.'22

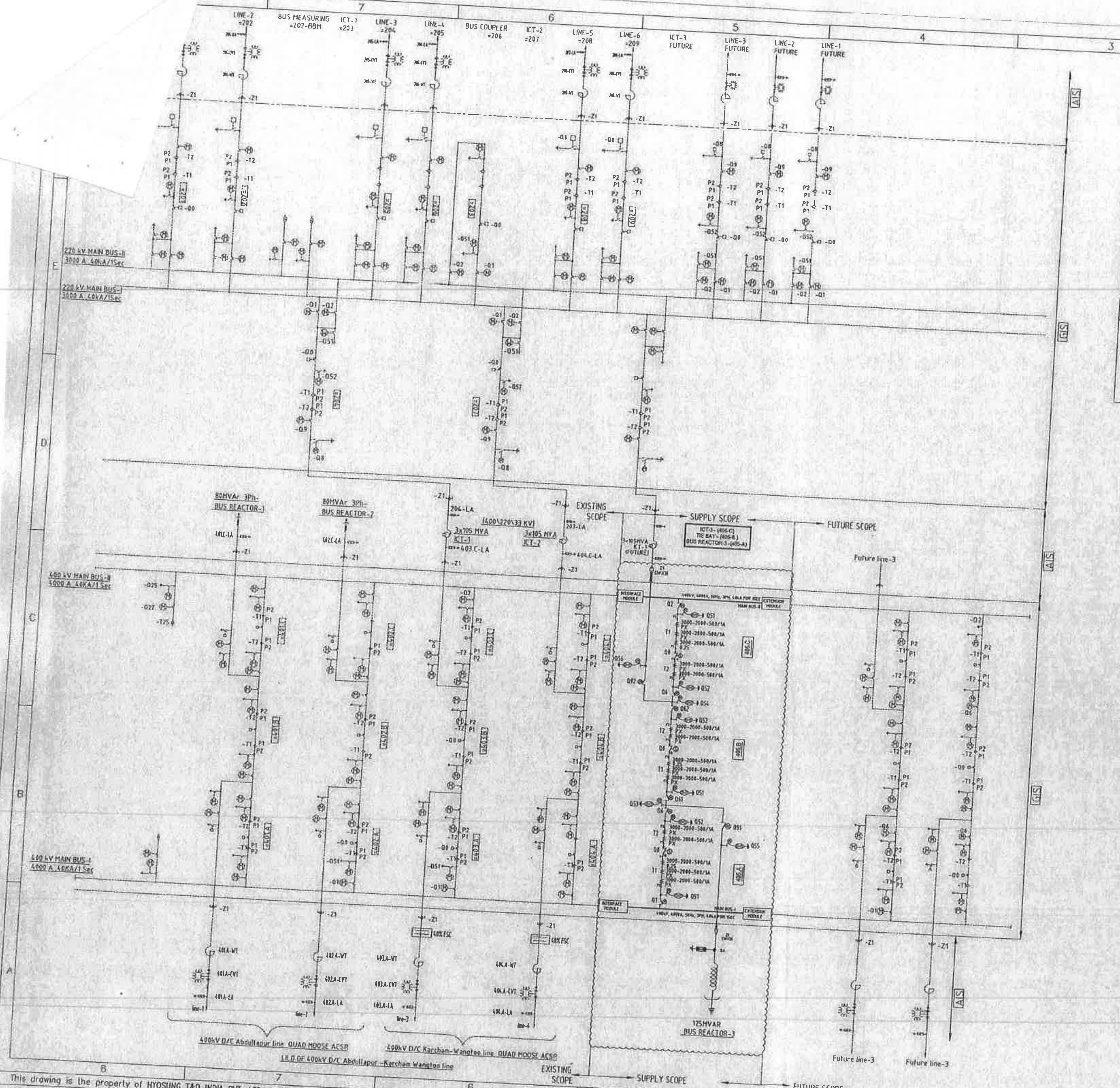
TITLE: 400kV GIS SUBSTATION KALA AMB GIS S/S- SINGLE LINE DIAGRAM (WITH CT DATA)

SCALE: NTS

DRG. No. H I - 1 0 3 4 0 1 3 - E P C - 0 1

SIZE: A1 REV: 1

RELEASED FOR: ☐ PRELIMINARY ☐ TENDER ☐ INFORMATION ☑ APPROVAL ☐ CONSTRUCTION



NOTES

1. THE DESCRIBED EQUIPMENTS ARE 400(420)kV RATINGS.
2. INSULATION LEVEL & CONTINUOUS VOLTAGE RATING OF INSULATING LINK OF ES : 1K

LEGENDS

SYMBOL	DEVICE NO	DE[SCRIPTION]			
	00	CIRCUIT BREAKER WIT[H] WITHOUT CONTROLLE[D]			
	Q1, Q2, Q6, Q61, Q62, Q91, Q92,	DISCONNECTING SWITCH	MOTOR DRIVEN, MANUAL (3PHASE OPERATION)	8 (3-PHASE)	8 (3-PHASE)
	Q51, Q52, Q53, Q54, Q55, Q56	MAINTENANCE EARTHING SWITCH	MOTOR DRIVEN, MANUAL (3PHASE OPERATION)	10 (3-PHASE)	10 (3-PHASE)
	T1	CURRENT TRANSFORMER (FOR MAINBUS & TIE)	RING TYPE	9 (1-PHASE)	9 (1-PHASE)
	T2	CURRENT TRANSFORMER (FOR MAINBUS)	RING TYPE	9 (1-PHASE)	9 (1-PHASE)
	Z1	GAS TO AIR BUSHING		6 (1-PHASE)	6 (1-PHASE)
	SA, 336kV	SURGE ARRESTER		3 (1-PHASE)	3 (1-PHASE)
	125MVAR, BUS REACTOR	125MVAR, BUS REACTOR		1 (3-PHASE)	1 (3-PHASE)
		UNDER PERCENT SCOPE			
		EXISTING/FUTURE SCOPE			

CT DATA

DEVICE NO	CT NO. / SPEC	T1 CORE-1			T1 CORE-2			T1 CORE-3			T2 CORE-1			T2 CORE-2		
FOR ICT BAY TIE BAY REACTOR BAY	Ratio(A/A)	3000/1	2000/1	500/1	3000/1	2000/1	500/1	3000/1	2000/1	500/1	3000/1	2000/1	500/1	3000/1	2000/1	500/1
	Burden(VA)	-	-	-	-	-	-	120	80	20	-	-	-	-	-	-
	Vk(V)	≥3000	≥2000	≥500	≥3000	≥2000	≥500	-	-	-	≥3000	≥2000	≥500	≥3000	≥2000	≥500
	Im(mA) at Vk	≤20	≤30	≤120	≤20	≤30	≤120	-	-	-	≤20	≤30	≤120	≤20	≤30	≤120
	Rct(Ohm)	≤15	≤10	≤2.5	≤15	≤10	≤2.5	-	-	-	≤15	≤10	≤2.5	≤15	≤10	≤2.5
	ISF	-			-			≤5			-			-		
	Accuracy class	PX			PX			0.2S			PX			PX		
	APPLICATION	PROTECTION			PROTECTION			METERING			PROTECTION			PROTECTION		

SYSTEM PARAMETERS:

Sl.No.	DESCRIPTION OF PARAMETER	400kV SYSTEM
1	SYSTEM OPERATING VOLTAGE	400kV
2	MAX. OPERATING VOLTAGE OF THE SYSTEM (rms)	420kV
3	RATED FREQUENCY	50Hz
4	NO. OF PHASES	3
5	RATED INSULATION LEVELS: i) FULL WAVE IMPULSE WITHSTAND VOLTAGE (1.2/50microsec.) ii) SWITCHING IMPULSE WITHSTAND VOLTAGE (250/2500microsec.) DRY & WET iii) ONE MINUTE POWER FREQUENCY DRY & WET WITHSTAND VOLTAGE (rms)	 1550kVp 1050kVp 630kV
6	MIN. CREEPAGE DISTANCE	25MM/kV (10500MM)
7	MIN. CLEARANCE IN AIS PORTION: i) PHASE TO PHASE ii) PHASE TO EARTH iii) SECTIONAL CLEARANCE	4000MM (FOR CONDUCTOR TO CONDUCOR CONFIGURATION) 4200MM (FOR ROD TO CONDUCTOR CONFIGURATION) 3500MM 6500MM
8	RATED SHORT CIRCUIT CURRENT FOR 1 SEC. DURATION	40kA

REFERENCE DRAWINGS/DOCUMENTS:

KEY SINGLE LINE DIAGRAM (TENDER)	C/ENGG/NR-4/KALAAMB/EXTN/SLD/01
GENERAL ARRANGEMENT LAYOUT (TENDER)	C/ENGG/NR-4/KALAAMB/EXTN/GA/01
KALA AMB GIS S/S- ELECTRICAL LAYOUT PLAN AND SECTION	HI-10184015-EPC-02

HYOSUNG REFERENCE DRAWINGS

SINGLE LINE	SINGLE LINE DIAGRAM WITH CT DATA : HI-10184015-A01-01
LAYOUT	LAYOUT FOR GIB : HI-10184015-A02-01 LAYOUT FOR GIS : HI-10184015-A02-02
GAS SYSTEM	GAS SYSTEM DIAGRAM : HI-10184015-A06-01

REV. No	REVISED DATE	DESCRIPTION	DRAWN	DESIGNED	CHECKED	APPROVED
1	01.AUG.'22	REVISED AS PER COMMANDS	D.J	S.T/R.H	D.M	J.S.PARK
0	11.JUNE.'22	FIRST ISSUED FOR APPROVAL	S.T	R.H	D.M	J.S.PARK

REVISIONS

CLIENT: POWER GRID CORPORATION OF INDIA LTD.

SUPPLIER / CONTRACTOR: HYOSUNG T&D INDIA Pvt. Ltd.

PROJECT: 400kV GIS EXTENSION AT KALA AMB

JOB No.:

	NAME	SIGN	DATE
DRWN	D.J	D.J	01.AUG.'22
DSGN	S.T/R.H	S.T/R.H	01.AUG.'22
CHKD	D.M	D.M	01.AUG.'22
APPD	J.S.PARK	J.S.PARK	01.AUG.'22

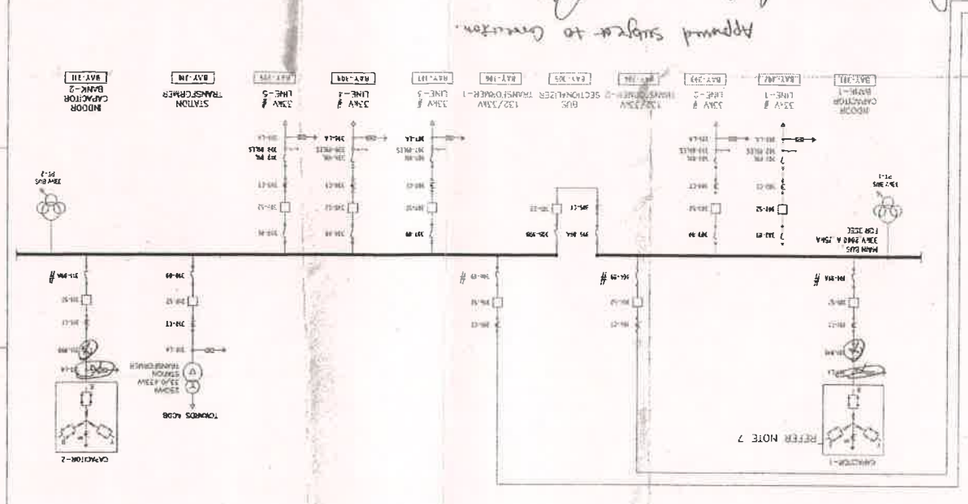
TITLE: 400kV GIS SUBSTATION KALA AMB GIS S/S- SINGLE LINE DIAGRAM (WITH CT DATA)

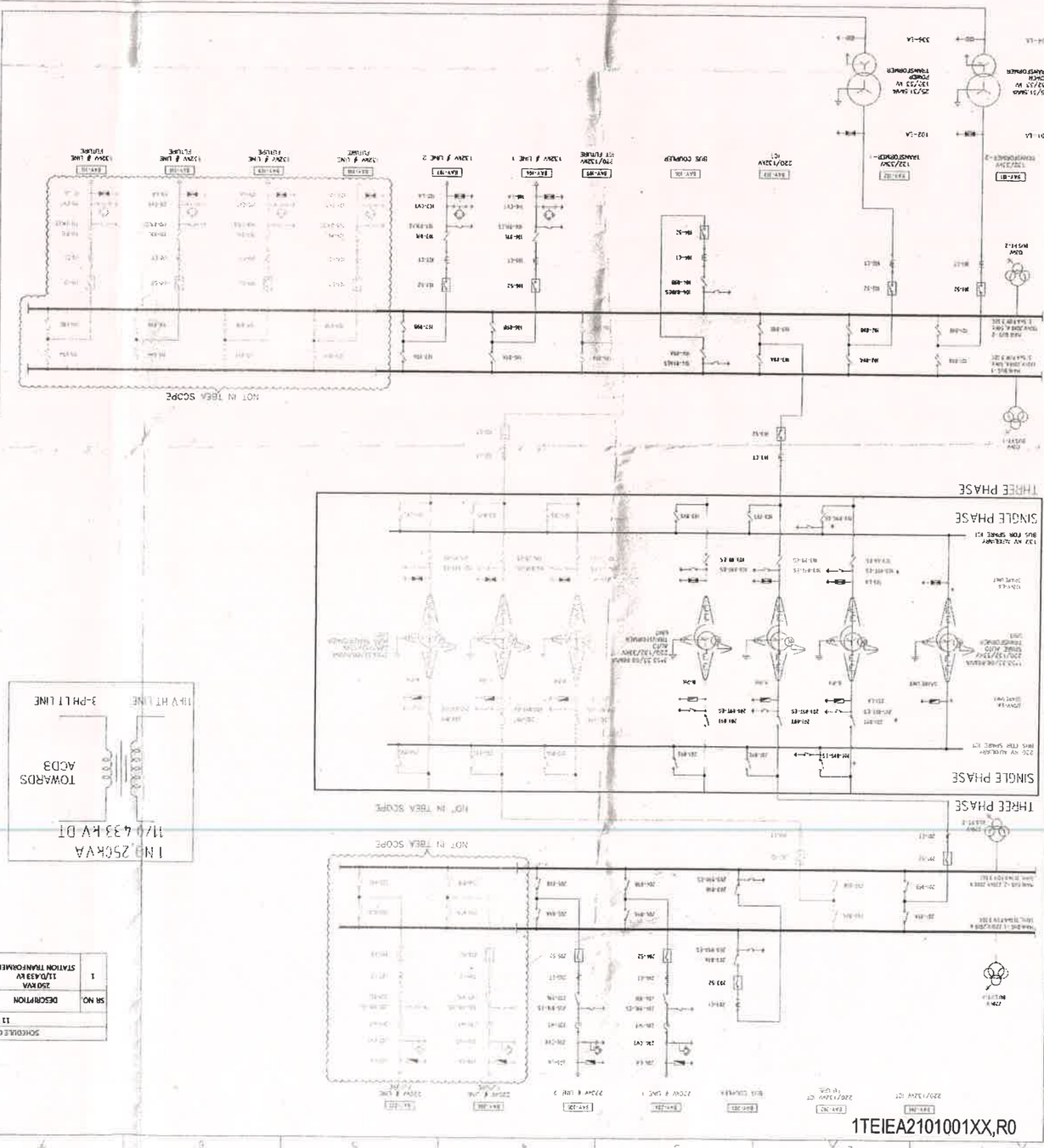
SCALE: NTS

PROJECTION

DRG. No. HI-10184015-EPC-01 — SHEET 1 OF 1 — SIZE A1 — REV. 1

RELEASED FOR: ☐ PRELIMINARY ☐ TENDER ☐ INFORMATION ☑ APPROVAL ☐ CONSTRUCTION





1TBEA2101001XX,R0

SCHEDULE OF EQUIPMENT
11 kV

SR NO.	DESCRIPTION	LEGEND	REQUIRED QTY.
1	250 kVA 11/0.433 kV STATION TRANFORMER		1

SCHEDULE OF EQUIPMENT

SR NO.	DESCRIPTION	220 kV	EQ. CODE	LEGEND	REQUIRED QTY.	132 kV	EQ. CODE	LEGEND	REQUIRED QTY.	33 kV	EQ. CODE	LEGEND	REQUIRED QTY.
1	AUTO TRANSFORMER	1-PH 53.33/56.66 MVA 220/132/33 kV AUTO TRANSFORMER	-		4	-	-	-	-	-	-	-	-
2	POWER TRANSFORMER	-	-	-	-	3-PH, 25/31.5 MVA 132/33kV POWER TRANSFORMER	-		2	-	-	-	-
3	STATION TRANSFORMER	-	-	-	-	-	-	-	-	250 kVA 33/0.433 kV STATION TRANSFORMER	-		1
4	LIGHTNING ARRESTOR	1-PH 198kV 10kA	203 LA 204 LA 205 LA LA FOR SPARE UNIT		12*	1-PH 120kV 10kA	103 LA 105 LA 107 LA 101 LA 102 LA LA FOR SPARE UNIT		15*	1-PH 30kV 10kA	301 LA 302 LA 303 LA 304 LA 306 LA 307 LA 308 LA 309 LA 310 LA 311 LA		30 24
5	CAPACITOR VOLTAGE TRANSFORMER	1-PH 220kV ,4400pF	204 CVT 205 CVT		6	1-PH 132 kV ,4400pF	107 CVT 106 CVT		6	-	-	-	-
6	WAVE TRAP	245 kV ,0.5mH, 1250 A	204 WT 205 WT		2	-	-	-	-	-	-	-	-
7	CIRCUIT BREAKER	3-PH 245kV 2000A SF6 CB	201-52 203-52 204-52 205-52		4	3-PH 145kV 2000A SF6 CB	101-52 102-52 103-52 104-52 106-52 107-52		6	3-PH 36kV 1250A VCB	301-52 302-52 303-52 304-52 305-52 306-52 307-52 308-52 309-52 310-52 311-52		11
8	ISOLATOR WITH ONE ES	3-PH 245kV 2000A	[illegible] 203 89B 204 89L 205 89L		4 SET	3-PH 145kV 2000A	106 89L 107 89L 104 89A 104 89B		4 SET	3-PH 36kV 2000A	303 89L 302 89L 307 89L 306 89L 309 89L		5
9	ISOLATOR WITH ONE ES	1-PH 245kV 2000A	201 89T*** (3) 201 89U*** (1)		4 Nos. *ISO WITH E/S FOR AUTO XMER BAY	1-PH 145kV 2000A	101 89T*** (3) 101 89U*** (1)		4 Nos. *ISO WITH E/S FOR AUTO XMER BAY	-	-	-	-
10	ISOLATOR WITHOUT ES	3-PH 245kV 2000A 1-ф 1set of 3nos	201 89A 201 89B 203 89A 204 89B 205 89A 205 89B		6 SET	3-PH 145kV 2000A 1-ф 1set of 3nos	101 89A 101 89B 102 89A 102 89B 103 89A 103 89B 106 89A 106 89B 107 89A 107 89B		10 SET	3-PH 36kV 2000A	301 89A 301 89B 302 89 303 89 304 89 306 89 307 89 305 89A 305 89B 308 89 309 89 310 89 311 89A 311 89B		14 12
11	ISOLATOR WITHOUT ES	1-PH 245kV 2000A	201 89S***		2 Nos. FOR AUTO XMER BAY	1-PH 145kV 2000A	101 89S***		2 Nos. FOR AUTO XMER BAY	-	-	-	-
12	POTENTIAL TRANSFORMER	1-PH 220/√3 kV / 110/√3-110/√3-110/√3 V	220kV BUS PT-1 220kV BUS PT-2		6	1-PH 132/√3 kV/ 110/√3-110/√3-110/√3 V	132kV BUS PT-1 132kV BUS PT-2		6	1-PH 33/√3 kV / 110/√3-110/√3-110/√3 V	33kV BUS PT-1 33kV BUS PT-2		6
13	CURRENT TRANSFORMER (5 CORE)	1-PH WITH RATIO: 2000-1000/1-1-1-1-1 A	201 CT 203 CT 205 CT		9	1-PH WITH RATIO: 2000-1000/1 1-1-1-1 A	104 CT		3*	1-PH WITH RATIO: 1200-600/1-1-1-1 A	304 CT 305 CT		6
						1-PH WITH RATIO: 1200/1-1-1-1-1 A	103 CT		3				
						1-PH WITH RATIO: 300-150/1-1-1-1-1 A	101 CT 102 CT		6				
		1-PH WITH RATIO: 1200-600/1-1-1-1-1 A	202 CT		3	1-PH WITH RATIO: 800-400/1-1-1-1-1 A	107 CT 106 CT		6				
	CURRENT TRANSFORMER (4 CORE)	-	-		-	-	-		-	1-PH WITH RATIO: 600-300/1-1-1-1 A	301 CT 302 CT 303 CT 307 CT 308 CT 309 CT 311 CT		21*
	CURRENT TRANSFORMER (3 CORE)	-	-		-	-	-		-	1-PH WITH RATIO: 1200-600/1-1-1 A	305 CT		3
										1-PH WITH RATIO: 125/1-1-1 A	310 CT		3
14	CAPACITOR BANK	-	-	-	-	-	-	-	-	33 kV 5.43 MVAr WITH NCT	-		2

* There is no any requirement of Isolator & LA for Capacitor banks.

Approved subject to Correction.

Assistant Engineer
O/o DGM & Head Trans Design
HPPTCL Anu, Hamirpur (H.P.)

Sr. Manager
O/o DGM & Head Trans. Designs,
HPPTCL, Hamirpur (H.P.)

13/07/2021
AGM & Head Trans Design
HPPTCL Anu

NOTES -

1. THE ISOLATOR WITH EARTH SWITCH ,ISOLATOR WITHOUT EARTH SWITCH AND LIGHTING ARRESTORS MARKED WITH (*) ARE NOT GIVEN IN PRICE SCHEDULE . HOWEVER,THE SAME ARE REQUIRED IN THE TRANSFORMER BAY TO ISOLATE THE SAME DURING MAINTENANCE.
2. 132kV WAVETRAPS ARE NOT CONSIDERED IN SLD AS PER PRE-BID CLARIFICATION ,3 LINE ITEM_21.
3. QUANTITIES FOR 132kV AND 33kV CTs ARE CONSIDERED AS PER TENDER SLD GIVEN BY HPPTCL.
4. RATING FOR ALL VOLTAGE LEVEL CB AND ISOLATOR ARE TAKEN AS PER PRICE SCHEDULE.
5. LINE ITEM FOR THE 220/132 kV TRANSFORMER NCT HAS NOT BEEN CONSIDERED IN PRICE SCHEDULE HOWEVER IT IS TECHNICALLY REQUIRED.
6. CONFIRMATION IS REQUIRED FOR 11kV LINE FROM WHERE SUPPLY HAS TO BE TAKEN FOR STATION TRANSFORMER.
7. DETAIL OF THE CAPACITOR BANK IS TENTATIVE AND WILL BE FINALIZED AFTER VENDOR APPROVAL.
8. THE CT CORE DETAILS WILL BE FURNISHED IN PROTECTION SLD.
9. QUANTITIES AND LOCATION FOR WAVETRAP SHALL BE FINALIZED AFTER CONFIRMATION FROM CUSTOMER END.
10. THE 33kV ISOLATORS(W/O ES) MARKED WITH '#' ARE NOT GIVEN IN PRICE SCHEDULE

REFERENCE DRAWING No.

1. TENDER SLD-KALA AMB SUBSTATION

REV.	DESCRIPTION	DATE	DRN	CHK	APPR
R3					
R2					
R1					
00	FOR APPROVAL	11/05/2021	PMK	BS/SP	SIC

PACKAGE:- DESIGN, ENGINEERING, MANUFACTURING, TESTING OF EQUIPMENT, DELIVERY, STORAGE AT SITE, ERECTION ALONG WITH CHEMICAL ALLIED WORKS & CIVIL WORKS, TESTING & COMMISSIONING OF EQUIPMENT ON TURN KEY BASIS FOR 220/132/33 kV, 160/200 MVA SUB-STATION AT ANCHERI NEAR KALA AMB, DISTRICT SIRMOUR (HIMACHAL PRADESH)

LOA/MEMO NO. : HPPTCL/PROC/2021/220 kV ALS SUBSTATION/2018 [illegible] DATED 02-05-2018

CLIENT: HIMACHAL PRADESH POWER TRANSMISSION CO. LTD (A STATE GOVT. UNDERTAKING)

PROJECT: 220/132/33kV SUB STATION,KALA AMB,HPPTCL

TITLE : SINGLE LINE DIAGRAM

TBEA 特变电工

"TBEA Green Energy Park"
National Highway 8,
Miyagam, Karjan
Vadodara, Gujarat - 391440.

DRAWN	PMK
CHECKED	BMS/SAP
APPROVED	SIC
PASSED	VSG
DATE	11/05/2021
SCALE	N.T.S
DRAWING No	1TBEA2101001XX
SHEET No.	01 OF 01
REV.	R0

SIZE-A2

National Single Window System

Application Id

610900004

Approval Name: **Application for submission of Technical Connection data for Connectivity Agreement_2**

SWS ID:	SW1149165101
Applied By:	Sahil Verma
Applied On:	02 Jan 2024 01:03:03 PM
Ministry Name:	Ministry of Power
Department Name:	Central Transmission Utility

Form Name

SUBMISSION OF TECHNICAL CONNECTION DATA TO BE FURNISHED TO CTU FOR SIGNING OF "CONNECTIVITY AGREEMENT"

Details of Applicant

Name of the Applicant Company	H. P. POWER TRANSMISSION CORPORATION LIMITED

Details of Grant of Connectivity

Connectivity Intimation No.	
Date	
Quantum for which connectivity is granted	
Substation at which connectivity granted	
State	Himachal Pradesh

Address of Correspondence

Address 1	HPPTCL HIMFED BHAWAN SHIMLA
Address 2	
Country	India
State	Himachal Pradesh

Primary Contact Details

Primary Contact Person	MANOJ

Designation of Primary Contact Person	General Manager
Primary Phone Number (Mobile)	+91 9418407222
Primary Email ID	ermanoj1@yahoo.com

Alternate Contact Details

Alternate Contact Person	PARDEEP SINGH
Designation of Alternate Contact Person	SENIOR MANAGER
Alternate Phone Number (mobile)	+91 8278715343
Alternate Email ID	SMKALAAMB.TCL@HPMAIL.IN

Status of Applicant Company Details

Status of Applicant Company	ISTS Licensee
Estimated time of Completion of Project	15/01/2024

Detail & Drawings: Details

Annexure-A: Bay allocation, Equipment ratings, Protection equipment, System recording, Site responsibility details (Click on the icon to 1. Download the Template; 2. Fill it; then 3. Upload the File)	Annexure - A (CON-5 details).docx

Detail & Drawings: Attachments

Annexure-A(I): Equipment Drawings for confirming the Ratings	
Annexure-A(II): Protection SLD containing protection details of the transmission system to be made	KALA AMB SLD.pdf
Annexure-A(III): CRP & scheme drawings containing protection of the transmission system	
Annexure-A(IV): PLCC/FOTE Drawings for the Transmission Lines under the Scheme	PLCC PKATL.pdf

Detail & Drawings: Maps and Diagram

Schedule-I: Survey of India Topo-sheet clearly making the location of the Proposed Site	220 kV HPPTCL Substation on TOPOSHEET 1.pdf

Schedule-II (A): Site plan (both pdf and autocad file) in appropriate scale indicating Generators, Transformer, Site building	Upload PDF & Cloud Link
Schedule-II (A): Upload PDF	Site Plan HPPTCL Andehri.pdf
Schedule-II (A): Cloud link for .dwg file (AUTOCAD) to be uploaded	https://drive.google.com/file/d/1IOVx_nUSeunVZHUMPIIcjOTxh9eHcZD_/view?usp=drive_link
Schedule-II (B): Site plan of the ISTS substation at which connectivity granted (Autocad 2000 & above versions)	Site Plan PKATL.pdf
Schedule-III (A): Electrical Single Line Diagram (SLD) (both pdf and autocad) of the proposed facility detailing all significant items of plant (Autocad 2000 & above versions)	Upload PDF & Cloud Link
Schedule-III (A): Upload PDF	KALA AMB SLD.pdf
Schedule-III (A): Cloud link for .dwg file (AUTOCAD) to be uploaded	https://drive.google.com/file/d/1Qs_ueFuEdZ5km-esDIFd8RpnS4dCEnHH/view?usp=drive_link
Schedule-III (B): Electrical Single Line Diagram (SLD) of ISTS substation at which connectivity granted	SLD Kala Amb GIS PGCIL.pdf
Annexure-C(V): General Arrangement (GA) drawing indicating proposed facility	General Arrangement HPPTCL.pdf
Annexure-C(IV): Sub-Station Automation System (SAS) ring diagram indicating interconnections of various IEDs/Engg PC/Gateway etc.	ARCHITECTURE SAS KALA AMB.PDF
PERT Chart: Program Evaluation Review Technique (PERT) of Project indicating major activities with their completion scheduled	PERT Chart.pdf

TECHNICAL DETAILS and STUDIES: Transmission Line Data

Annexure-C(I): Transmission Line Tower, Conductor & Earth-wire/OPGW Details (Click on the icon to 1. Download the Template; 2. Fill it; then 3. Upload the File)	Annexure(C-1).docx
Annexure-C(II): Schematic Drawing of DA/A Type Tower clearly indicating Position of Conductor and E/wire	
Annexure-C(III): Equivalent Resistance, Reactance and Susceptance (R,X and B) Parameters of Transmission Line (Click on the icon to 1. Download the Template; 2. Fill it; then 3. Upload the File)	Annexure-C(III).doc

TECHNICAL DETAILS AND STUDIES: Communication Data

Annexure-D(I): Details of communication system i.e. OPGW Cable, FOTE, FODP, Approach Cable, PMU etc. as per the format, in case of Generator (Click on the icon to 1. Download the Template; 2. Fill it; then 3. Upload the File)	Annexure-D(I).doc
Annexure-D(II): Details of communication system i.e. OPGW Cable, FOTE, FODP, Approach Cable, PMU etc. as per the format, in case of TSP (Click on the icon to 1. Download the Template; 2. Fill it; then 3. Upload the File)	Annexure(D-II) Communication.docx
Annexure-D(III): Communication connectivity diagram	FOTE DRAWINNGS KALA AMB-ANDEHRI.pdf

TECHNICAL DETAILS AND STUDIES: Transformer Data

Schedule VII: Two winding transformer data (Click on the icon to 1. Download the Template; 2. Fill it; then 3. Upload the File)	Schedule_VIII_Two_Winding_Trans.doc
Schedule VIII: Three winding transformer data (Click on the icon to 1. Download the Template; 2. Fill it; then 3. Upload the File)	Schedule_VIII_Three_Winding_Trans.doc

TECHNICAL DETAILS AND STUDIES: Dynamic simulation data - RE Machines.

Schedule-XI(XIV): Transformer datasheet	

Declaration

I confirm that I am well aware of the relevant CERC/CEA Regulations and Detailed Procedure and all the details entered by me are in conformity with the Regulations. I submit that all the details given in the Application are true and correct and nothing material has been concealed thereof. I also submit that the documents attached are scanned/true copies of their respective originals. I hereby confirm that the above data submitted with the application are pertaining to connection sought for the ISTS. Further, any additional data sought for processing the application shall be furnished.	Accepted

Details of Documents Enclosed with the application

Annexure-A	Bay allocation, Equipment ratings, Protection equipment, System recording, Site responsibility details (Click on the icon to 1. Download the Template; 2. Fill it; then 3. Upload the File)

Annexure-A(I)	Equipment Drawings for confirming the Ratings
Annexure-A(II)	Protection SLD containing protection details of the transmission system to be made
Annexure-A(III)	CRP & scheme drawings containing protection of the transmission system
Annexure-A(IV)	PLCC/FOTE Drawings for the Transmission Lines under the Scheme
Schedule-I	Survey of India Topo-sheet clearly making the location of the Proposed Site
Schedule-II (A)	Upload PDF
Schedule-II (B)	Site plan of the ISTS substation at which connectivity granted (Autocad 2000 & above versions)
Schedule-III (A)	Upload PDF
Schedule-III (B)	Electrical Single Line Diagram (SLD) of ISTS substation at which connectivity granted
Annexure-C(V)	General Arrangement (GA) drawing indicating proposed facility
Annexure-C(IV)	Sub-Station Automation System (SAS) ring diagram indicating interconnections of various IEDs/Engg PC/Gateway etc.
PERT Chart	Program Evaluation Review Technique (PERT) of Project indicating major activities with their completion scheduled
Annexure-C(I)	Transmission Line Tower, Conductor & Earth-wire/OPGW Details (Click on the icon to 1. Download the Template; 2. Fill it; then 3. Upload the File)
Annexure-C(II)	Schematic Drawing of DA/A Type Tower clearly indicating Position of Conductor and E/wire
Annexure-C(III)	Equivalent Resistance, Reactance and Susceptance (R, X and B) Parameters of Transmission Line (Click on the icon to 1. Download the Template; 2. Fill it; then 3. Upload the File)

Approval Name: **Application for submission of Technical Connection data for Connectivity Agreement_2**

Annexure-D(I)	Details of communication system i.e. OPGW Cable, FOTE, FODP, Approach Cable, PMU etc. as per the format, in case of Generator (Click on the icon to 1. Download the Template; 2. Fill it; then 3. Upload the File)
Annexure-D(II)	Details of communication system i.e. OPGW Cable, FOTE, FODP, Approach Cable, PMU etc. as per the format, in case of TSP (Click on the icon to 1. Download the Template; 2. Fill it; then 3. Upload the File)
Annexure-D(III)	Communication connectivity diagram
Schedule VII	Two winding transformer data (Click on the icon to 1. Download the Template; 2. Fill it; then 3. Upload the File)
Schedule VIII	Three winding transformer data (Click on the icon to 1. Download the Template; 2. Fill it; then 3. Upload the File)
Schedule-XI(XIV)	Transformer datasheet

Validity unknown
Digitally Signed
Name: KAMAL JEET SINGH
Date: 02-Jan-2024 13:06:23

HPPTCL-PRJ0F9/5/2023-Project Cell-HPPTCL HQ

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HPPTCL
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H.P. POWER TRANSMISSION CORPORATION LTD.

(A State Govt. Undertaking)

Regd. Office: Himfed Bhawan, New ISBT Road, Panjari, Shimla-171005
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(CIN): U40101HP2008SGC030950
(GSTIN):02AACCH1548M1ZP

TO WHOM IT MAY CONCERN

Er. Manoj Kumar General Manager (Contracts & Design) HPPTCL is authorized to sign and execute connectivity agreements on behalf of HP Power Transmission Corporation Ltd. (STU-HP) in accordance with the GNA Regulations 2022 and IEGC Regulations 2023.

Director (Planning & Contracts)
HPPTCL, Shimla