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/N/NR-WR

7th April, 2022

As per Distribution List

Sub: Minutes of Joint Study Meeting held on 21.03.2022, 28.03.2022 & 29.03.2022 regarding evolution of NR-WR Inter-regional Transmission Scheme

Dear Sir,

Please find enclosed the minutes of the Joint Study Meeting held on 21.03.2022, 28.03.2022 & 29.03.2022 regarding evolution of NR-WR Inter-regional Transmission Scheme.

Thanking you,

Yours Faithfully,

07/04/22

(Kashish Bhambhani)
Senior DGM (CTU)

Encl : Minutes of Meeting

Distribution List:

Northern Region

Chief Engineer (PSP&A – I) Central Electricity Authority Sewa Bhawan, R.K.Puram, New Delhi-110 066	**Member Secretary** Northern Regional Power Committee 18A, Shaheed Jeet Singh Sansanwal Marg, Katwaria Sarai, New Delhi – 110 016
Director (SO) Power System Operation Corporation Ltd. 9th Floor, IFCI Towers, 61, Nehru Place, New Delhi-110 016	**Executive Director** Northern Regional Load Despatch Centre 18-A, Qutab Institutional Area, Shaheed Jeet Singh Sansanwal Marg, Katwaria Sarai, New Delhi– 110 016
Director (Technical) HP Power Transmission Corporation Ltd. Barowalias, Khalini, Shimla-171002	**Director(W&P)** UP Power Transmission Company Ltd. Shakti Bhawan Extn, 3rd floor, 14, Ashok Marg, Lucknow-226 001
Director (Technical) Punjab State Transmission Corporation Ltd. Head Office, The Mall, Patiala 147001, Punjab	**Director (Projects)** Power Transmission Corporation of Uttrakhand Ltd. Vidyut Bhawan, Near ISBT Crossing, Saharanpur Road, Majra, Dehradun.
Development Commissioner (Power) Power Development Department Grid Substation Complex, Janipur, Jammu	**Director (Technical)** Rajasthan Rajya Vidyut Prasaran Nigam Ltd. Vidyut Bhawan, Jaipur, Rajasthan-302005.
Member (Power) Bhakra Beas Management Board Sector-19 B, Madhya Marg, Chandigarh - 160019	**Superintending Engineer (Operation)** Electricity Circle, 5th Floor, UT Secretariat, Sector-9 D, Chandigarh - 161009
Director (Operations) Delhi Transco Ltd. Shakti Sadan, Kotla Road, New Delhi-110 002	**Director (Technical)** Haryana Vidyut Prasaran Nigam Ltd. Shakti Bhawan, Sector-6, Panchkula-134109, Haryana

Western Region

1. Member Secretary Western Regional Power Committee MIDC area, Marol, Andheri East, Mumbai 400 093	**2. Managing Director** Gujarat Energy Transmission Corp. Ltd, Sardar Patel Vidyut Bhawan, Race Course, Vadodara -390 007
3. Director (Operation) Maharashtra State Electricity Transmission Co. Ltd., 4th Floor, "Prakashganga", Plot No. C-19, E-Block, Bandra – Kurla Complex, Bandra(East), Mumbai- 400051	**4. Managing Director** Chhattisgarh State Power Transmission Co. Ltd., Dangania, Raipur- 492 013
5. Chairman & Managing Director Madhya Pradesh Power Transmission Co. Ltd., Block No. 3, Shakti Bhawan, Rampur, Jabalpur-482 008	**6. Executive Engineer** Administration of Union Territory of Dadra & Nagar Haveli and Daman & Diu Secretariat, Moti Daman - 395 220
7. The Chief Engineer Electricity Department The Government of Goa, Panaji	**8. Executive Director** Western Regional Load Despatch Centre F-3, M.I.D.C. Area, Marol, Andheri East, Mumbai-400 093

Minutes of Joint study meeting for Northern Region & Western Region held on 21.03.2022, 28.03.22 & 29.03.22 over VC regarding evolution of NR-WR Inter-regional Transmission Scheme

The Joint Study Meeting on Transmission Planning for Northern Region & Western Region was held on 21.03.2022, 28.03.22 & 29.03.22 over VC amongst CEA, CTU, POSOCO, WR, and NR constituents to deliberate NR-WR Inter-regional transmission system requirement to relieve overloading of Bhinmal-Zerda line under various operating conditions. List of participants is enclosed at Annexure-I. Sr.DGM, CTUIL welcomed the participants. Gist of deliberations are as given below.

I. Background:

In the 4th NRPC(TP) meeting held on 05.10.21 & 12.10.21, following transmission system was proposed to address overloading of Bhinmal-Zerda line:

- LILO of 2nd ckt of 400 kV Kankroli-Zerda line at Bhinmal (PG).
- Karkroli-Bhinmal LILO section to be constructed with Twin Moose conductor and Bhinmal-Zerda LILO section to be constructed with Quad Moose/Twin HTLS conductor (with minimum capacity of 2100 MVA at nominal voltage)
- Reconductoring of existing Bhinmal-Zerda section with high capacity (Quad Moose/Twin HTLS) conductor with minimum capacity of 2100MVA at nominal voltage
- In addition to this, reconductoring of 400 kV Barmer (RVPNL)-Bhinmal(PG) D/c line of RVPNL with high capacity (Quad Moose/Twin HTLS) conductor with minimum capacity of 2100 MVA at nominal voltage is also required. The same must be taken up by RVPNL in time frame of Rajasthan Phase-III scheme.

RVPN in the above meeting had mentioned that power is flowing towards Zerda (Gujarat) because of low wind scenario in western region and alternate ISTS system may be planned from rich RE source of Rajasthan like Fatehgarh area to Bhinmal or to Zerda directly. Accordingly, RVPN requested that a joint study may be carried out and accordingly, the transmission system may be planned.

After deliberations, it was agreed that the issue may be studied further and discussed in a separate meeting and accordingly put up for deliberations in the next meeting of NRPC(TP).

Subsequently, NLDC(POSOCO) vide letter dated 7th Feb, 2021 requested to take actions to relieve the transmission constraints due to high loadings on 400kV inter regional transmission lines between Gujarat (WR) & Rajasthan (NR). In the letter, it was informed that the loading is N-1 insecure particularly when the generation within Gujarat is low and demand in Gujarat is high. Situation aggravates when the above coincides with high RE in Rajasthan (Solar Max scenario) and low demand in Northern Region. The non-availability of reverse power flow on HVDC Mundra-Mahendragarh Bipole further compounded the problem in operational horizon. In the coming months, the new RE capacity addition in Jaisalmer, Barmer and Ramgarh area of Rajasthan is expected. The incremental RE injection may aggravate the situation causing further increase in line loadings. It was also informed the high loadings on these lines are limiting constraint in ATC/TTC calculation between western region and northern region and are likely to be in the future also. Considering the severity of overloading of 400kV Bhinmal - Zerda line, additional strengthening scheme need to be planned.

POSOCO vide letter dated 22.02.2022 further informed about the power flow pattern in WR-NR corridors under the prevailing scenario of high RE generation in Rajasthan, low demand in Northern region, high demand in Western & Southern region coupled with low generation from imported coal based conventional generations in Gujarat (mainly CGPL & Mundra UMPP)

due to various issues and non-availability of HVDC Mundra-Mahendargarh bipole in reverse direction (NR to WR). It was informed that the current TTC/ATC declared by POSOCO for NR-WR corridor is 2500/2000 MW with 400 kV Bhinmal-Zerda line as a limiting constraint and there have been instances when the export capability (ATC) of NR-WR corridor is breached during peak export hours.

Considering all above aspects, CTU carried out studies and the following scheme was proposed as per the immediate requirement (short term) as well as requirement in 2024-25 (medium term) time frame to relieve 400kV WR-NR IR corridor loadings:

Phase-I(For Short term)

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

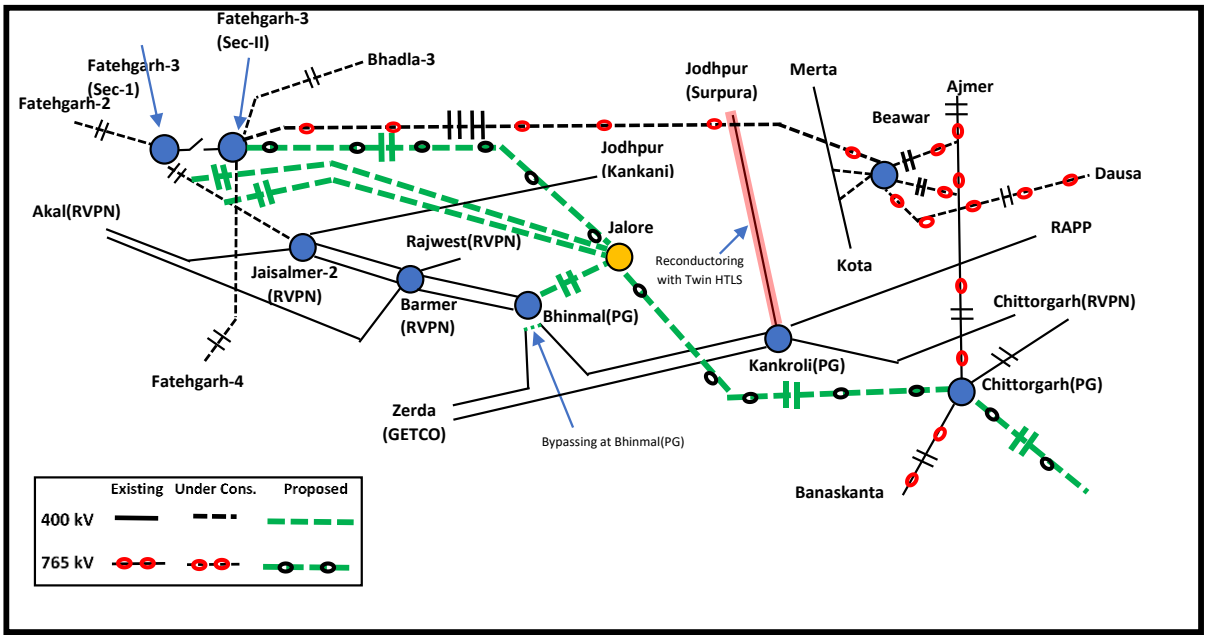
Phase-II(For medium term)

- Establishment of 765/400 kV, 2x1500 MVA Jalore/Bhinmal S/s at a suitable location near Jalore/Bhinmal
- 400 kV Jalore/Bhinmal – Bhinmal(PG) D/c line(Twin HTLS)-40 km
- LILO of both circuits of 400kV Fatehgarh-3 PS – Jaisalmer-2 (RVPN) line at Jalore/Bhinmal(LILO length 200 km)
- 765kV Fatehgarh-3 PS– Jalore/Bhinmal D/c line -210 km
- 765kV Jalore/Bhinmal – Chittorgarh(PG) D/c line -210 km
- 765kV Chittorgarh(PG) – Indore(PG) D/c line- 290 km
- Associated reactive compensation

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

** with minimum capacity of 2100 MVA/ckt at nominal voltage*

Proposed NR-WR IR strengthening scheme



II. Deliberations in the joint study meeting

Deliberations on 21.03.22

CTU informed that with the new emerging scenario in Gujarat/WR due to imported coal issue along with high demand, Gujarat is drawing more power from NR in solar max scenario. Rajasthan is also witnessing more RE generation in ISTS with allocation to WR & SR on firm basis from manufacturing linked plants (~7000 MW allocation to Andhra Pradesh (SR) with 2024-25 timeframe).

CTU also informed that the proposed Jalore S/s can also be utilized to evacuate power from areas around Jalore & the adjacent areas of Sanchore, Pali, Sirohi etc. which are identified pockets by SECI/MNRE for future RE capacity addition in 2030 as part of 500 GW RE plan of government of India. CTU also highlighted that after 400 kV Bhinmal-Zerda line, the next limiting constraint for export of power from NR-WR is 400 kV RAPP-Shujalpur D/c line. Proposed Jalore-Chittorgarh-Indore corridor relieves the loading of RAPP-Shujalpur.

RVPN enquired about the timeframe of the system and also informed that with bypassing arrangement at Bhinmal in the interim period till the time of implementation of Jalore system, the Bhinmal S/s may face issues due to single point connection from Barmer. CTU informed that difference in implementation of proposed short term & medium term scheme shall be about 8-12 months. However, the bypass arrangement is being proposed inside the Bhinmal substation with isolator and breaker arrangement with an option to restore the LILO through switching arrangement. Therefore, the LILO arrangement can be restored/bypassed as per the operational requirement. RVPN & GETCO agreed to the scheme in principally. However, Barmer has good short circuit strength for feeding to Bhinmal even in the bypassed arrangement.

NLDC(POSOCO) informed that the scheme appears to be in order, however additional cases of Peak scenario and Off-Peak scenario need to be conducted to see the adequacy of evolved transmission scheme. WRLDC(POSOCO) asked to check the loadings in SR export scenario when both NR and SR are exporting to WR. NLDC(POSOCO) also indicated that suitable protection mechanism for both the options of bypassing arrangement at Bhinmal S/s as well as for restoration need to be included. The same was agreed.

NLDC(POSOCO) also asked to conduct the study of worst case scenario without the option of reverse flow in Mundra-Mahendragarh HVDC line with generation of only one unit each at CGPL and APL in Gujarat. Scenario were studied and shared wherein loadings were found to be in order. WRLDC(POSOCO) highlighted the issue of overvoltage in Mundra and adjacent system due to reversal of Mundra-Mahendragarh HVDC line.

CEA opined that the scheme has to be studied comprehensively with REZ scheme in Rajasthan beyond Phase-3. CEA also highlighted that due to flow of power from Fatehgarh-3 towards WR, the transmission system beyond Fatehgarh-3 which are part of Phase-3 system is relieved. Regarding the additional margin created in Phase-3 system, CTU informed that the margin can be utilized for evacuation of incremental RE capacity addition in Fatehgarh complex. From the preliminary studies it was found that additional 2500 MW can be evacuated from Fatehgarh-4 S/s(with upgradation to 765 kV and LILO of two ckts of F3-Beawar 2xD/c line) utilizing the existing margin of Phase-3 system.

CTU also clarified that the timeframe for proposed scheme under short term is approx. 18 months, whereas ph-2 (medium term) scheme is required by 2024 time frame.

After deliberations, it was decided that another meeting may be scheduled for further deliberation on the scheme and CTU will also share the studies in the scenarios requested by NLDC/NRLDC and WRLDC.

CTU vide email dated 24.03.2022 shared the studies in all the scenarios requested by NLDC and WRLDC.

Deliberations on 28.03.22 & 29.03.22

Subsequently, another round of joint study meeting with stakeholders were held on 28.03.2022 & 29.03.2022 over VC for further deliberations on the scheme.

POSOCO indicated that as per their studies on the short-term measure proposed by CTU i.e. bypassing of 400 kV Kankroli - Bhinmal & 400 kV Bhinmal - Zerda lines at Bhinmal to make 400 kV Kankroli – Zerda direct line, following is observed:

- Bypassing of 400 kV Kankroli - Bhinmal & 400 kV Bhinmal - Zerda at Bhinmal would help in relieving the high loading on 400 kV Bhinmal – Zerda S/C (direct line between Kankroli and Zerda)
- The loading of 400 kV Jodhpur – Kankroli would however increase, thereby necessitating reconductoring of the same in matching timeframe of bypass arrangement.
- The loading on 400 kV Banaskatha–Veloda D/C lines will also increase with the proposed bypass arrangement.

CTU informed that LILO of 400 kV Zerda – Ranchodpura S/C line at Banaskatha and commissioning of 3rd 765/400 kV, 1500 MVA ICT at Vadodara is expected to be completed in next one month. After implementation of these schemes, the loading of 400 kV Banaskantha – Veloda D/c is found to be within limits.

POSOCO confirmed that after considering all the above schemes, increment in NR-WR TTC is observed. The quantum will depend on the feasibility of operation of HVDC Mundra – Mahendragarh in reverse direction (NR to WR) and generation at APL+CGPL. However broadly NR-WR ATC/TTC enhancement of about 3.5 GW leading to about 6 GW NR-WR ATC/TTC is observed as per the studies.

CEA enquired about the quantum of LTA received by CTU in the Rajasthan in the Phase I, II and III pockets of Rajasthan and whether the studies have been carried out considering the present LTA received by CTU or the entire quantum of Phase I-III potential (37 GW).

CTU informed that the studies have been carried out in 2024-25 timeframe considering the entire quantum of 31 GW RE potential (excluding 6 GW corresponding to Bhadla-3 HVDC). However, at present CTU has received LTA for 23 GW including about 7GW of Manufacturing LoA based LTA application with allocation to Andhra Pradesh.

CTU informed that out of total 23 GW LTA, 7GW of LTA application has been received in last 2-3 months and considering the Stage-II connectivity granted at Rajasthan pooling stations (about 36 GW), Stage-II connectivity may get converted to LTA shortly. Therefore, considering the timeline (2024-25) for the requirement of additional north-west IR corridor, the studies were carried out with entire Ph-3 system along with 31 GW RE potential.

CEA requested CTU to study whether the 765kV Fatehgarh3-Jalore-Chittorgarh-Indore corridor is required with the present LTA (23 GW).

Thereafter on 29.03.22, CTU presented the studies and informed that with present LTA of 23 GW, the Phase-I Short term system is required in the new emerging scenario, but constraints are not observed without the proposed Phase-II medium term system. However, with incremental LTA of about 2.5-3 GW in Fatehgarh complex, there will be limiting constraint in the 400 kV RAPS-Shujalpur line. Therefore, with additional LTA of about 2.5-3 GW, there will be requirement of another high capacity corridor i.e Ph-II medium term solution.

CEA informed that at present the transmission plan for 500 GW RE by 2030 including 75 GW in Rajasthan is under study and the corresponding evacuation schemes will be finalized in next 1-2 months. Planning of Fatehgarh-3-Jalore system along with the Chittorgarh-Indore line may be studied along with the above comprehensive system study.

CTU informed that considering reconductoring requirement (188 km) in Ph-1 (short term) scheme, schedule has been kept as 18 months. POSOCO suggested that scheme is urgently requirement for enhancing ATC/TTC between NR-WR. CEA indicated that schedule may be kept as 15 months instead of 18 months.

Accordingly, it was decided that Ph-1 (short term) scheme may be implemented as inter regional system strengthening scheme (ISTS). The scope of work of above North-West Inter-regional system strengthening scheme shall include following elements:

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

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

** with minimum capacity of 2100 MVA/ckt at nominal voltage*

Phase-II medium term scheme was also agreed in principally. However, same shall be reviewed during comprehensive analysis for 75 GW RE Potential in Rajasthan as part of 500 GW RE plan. In case, additional LTA (about 3 GW) is received in Rajasthan which necessitates requirement of additional corridor from NR to WR, Ph-2 medium term scheme can be reviewed earlier also.

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Annexure-I

List of Participants

VC on 21.03.22

Name	Organization	Designation
Shri Naresh Bhandari	NRPC	Member Secretary
Shri Awdhesh Kumar Yadav	CEA	Director
Smt. Manjari Chaturvedi	CEA	Director
Smt. Pushpa Seshadri	WRLDC	Senior General Manager
Shri Vivek Pandey	NLDC	General Manager
Shri Alok Kumar	NRLDC	Sr. General Manager
Smt. Suruchi Jain	NRLDC	DGM
Shri Priyam Jain	NLDC	Manager
Shri Gaurav Malviya	NRLDC	Deputy Manager
Shri M Venkateswara Rao	WRLDC	Deputy Manager
Shri A K Bissa	RVPN	XEN
Shri Satyendra Kumar	UPPTCL	EE (TP&PSS)
Shri M M Dhoke	MPPTCL	SE
Shri Deepak Patel	GETCO	
Shri Jasbir Singh	CTUIL	CGM
Shri V Thiagarajan	CTUIL	Sr. GM
Shri Kashish Bhambhani	CTUIL	Sr. DGM
Shri Sandeep Kumawat	CTUIL	Chief Manager
Shri Narendra Sathvik R	CTUIL	Manager
Shri Pratyush Singh	CTUIL	Manager
Smt. Ankita Singh	CTUIL	Chief Manager
Shri Yatin Sharma	CTUIL	Dy Manager

VC on 28.03.22 & 29.03.22

Name	Organization	Designation
Shri Naresh Bhandari	NRPC	Member Secretary
Shri Awdhesh Kumar Yadav	CEA	Director
Smt. Manjari Chaturvedi	CEA	Director
Smt. Komal	CEA	
Shri Nitin Deswal	CEA	
Smt. Pushpa Seshadri	WRLDC	Senior General Manager
Shri Vivek Pandey	NLDC	General Manager
Shri Alok Kumar	NRLDC	Sr.General Manager
Shri Prabhakar Porwal	NLDC	
Smt. Suruchi Jain	NRLDC	DGM
Shri Priyam Jain	NLDC	Manager
Shri Gaurav Malviya	NRLDC	Deputy Manager
Shri M Venkateswara Rao	WRLDC	Deputy Manager
Shri A P Gupta	RVPN	
Shri V A Kale	RVPN	
Shri K K Meena	RVPN	
Shri Nitin Kumar	PSTCL	
Shri Mukul Gupta	PSTCL	
Shri Lovleen Singh	DTL	
Shri Sujeeth Kumar	UPPTCL	
Shri M M Dhoke	MPPTCL	SE
Shri Deepak Patel	GETCO	
Shri Jasbir Singh	CTUIL	CGM
Shri P S Das	CTUIL	Sr. GM
Shri Kashish Bhambhani	CTUIL	Sr. DGM
Shri Sandeep Kumawat	CTUIL	Chief Manager
Shri Narendra Sathvik R	CTUIL	Manager
Shri Pratyush Singh	CTUIL	Manager
Smt. Ankita Singh	CTUIL	Chief Manager
Shri Yatin Sharma	CTUIL	Dy Manager