भारतसरकार
Government of India
केंद्रीयविद्युत्प्राधिकरण
Central Electricity Authority
पश्चिमक्षेत्रीयविद्युत्समिति
Western Regional Power Committee
एफ-3,एमआईडीसीक्षेत्र, अंधेरी (पूर्व), मुंबई- 400 093
F-3, MIDC Area, Andheri (East), Mumbai - 400 093
Website : www.wrpc.gov.in E-mail : as-wrpc@nic.in

No.: WRPC/53rd WRPC Mtg/Minutes/2025/8032-8147 Date: 25.03.2025

To,

(As per enclosed list)
(संलग्न सूची के अनुसार)

Sub: Minutes of 53rd meeting of Western Regional Power Committee (WRPC)-reg.
विषय: पश्चिमी क्षेत्रीय विद्युत समिति (डब्ल्यूआरपीसी) की 53वीं बैठक का कार्यवृत्त- तत्संबंधी।

Sir/ Madam,
महोदय/महोदया,

कृपया 13 मार्च, 2025 को वीडियो कॉन्फ्रेंसिंग के माध्यम से आयोजित 53वीं तकनीकी समन्वय समिति (टीसीसी) बैठक और 53वीं पश्चिमी क्षेत्रीय विद्युत समिति (डब्ल्यूआरपीसी) बैठक के कार्यवृत्त संलग्न देखें।

यह भी सूचित किया जाता है कि उपरोक्त बैठक का कार्यवृत्त डब्ल्यूआरपीसी वेबसाइट: wrpc.gov.in पर उपलब्ध है।

Please find enclosed herewith the Minutes of the 53rd Technical Coordination Committee (TCC) meeting and the 53rd Western Regional Power Committee (WRPC) Meeting held on 13th March, 2025 via video conferencing.

It is also intimated that the Minutes of above meeting is available on the WRPC website: wrpc.gov.in

Yours faithfully,

(Deepak Sharma)
Executive Engineer, WRPC

Encl.: As above

WRPC Members List 2024-25			
S. No.	**Organisation**	**Details**	**Contact Details**
1	Central Electricity Authority	Shri Hemant Jain Member (GO&D), Central Electricity Authority, Sewa Bhavan, R.K. Puram, New Delhi-110 066	Tel. 011-26104217 Fax. 011-26108834 Email: member.god@cea.nic.in
2	Chhattisgarh Transco	Shri R.K. Shukla Managing Director, CSPTCL, 2nd Floor, Vidyut Seva Bhavan, P.O.: Sunder Nagar, Danganiya, Raipur: 492 013 (CG)	Tel. 0771-2574500, 2574300 Fax. 0771-2262141 E-mail: mdtransco@cspc.co.in mdtransco.cg@gmail.com
3	Chhattisgarh Genco	Shri Sanjiv Kumar Katiyar, Managing Director, CSPGCL, P.O.Sunder Nagar, Danganiya, Raipur: 492 013 (CG)	Tel. 0771-2574400, 0771- 4066962 Fax. 0771-2262741 E-mail: mdgenco@cspc.co.in
4	Chhattisgarh Discom	Shri Bhim Singh Kanwar, Managing Director- CSPDCL , 3rd Floor, Vidyut Sewa Bhawan, Danganiya, Raipur (CG): 492 013	Tel. 0771-2574200-PA E-mail :mddiscom@cspc.co.in, mddiscom@gmail.com
5	Chhattisgarh SLDC	Shri K.S.Manothiya , E.D.(LD), SLDC Building, CSPTCL, P.O.Sunder Nagar, Danganiya, Raipur: 492 013 (CG)	Tel. 0771-2574172 Fax. 0771-2574174 E-mail:- celdcg@sldccg.com mddiscom@cspc.co.in ksmanothiyayks@gmail.com
6	Gujarat Genco (GSECL)	Shri Somes Bandyopadhyay Managing Director, Gujarat State Electricity Corp. Ltd., Vidyut Bhavan, Race Course, Vadodara: 390 007 (Guj.)	Tel. No.: (0265) 2342491 Fax No.: (0265) 2344734 E-Mail : md.gsecl@gebmail.com
7	Gujarat Transco	Shri Upendra Pande MD, GETCO, 9th floor, Sardar Patel Vidyut Bhawan, Race Course, Vadodara: 390 007	Tel. 0265-2353085, Fax 0265- 2338152, 2337918 Email: md.getco@gebmail.com
8	Gujrat Discom (Rotational - Uttar Guj)	Shri Arun Mahesh Babu, IAS Managing Director, UGVCL, Mehsana 384 001 (Guj.)	Tel. 02762 222097 Fax. E-mail: md@ugvcl.com ea@ugvcl.com
9	Gujarat SLDC	Shri. Kanti Bhuva Chief Engineer (LD), SLDC, Load Dispatch Centre, 132 kV S/S Premises, Gotri, Vadodara: 390 021	Tel. 0265 -2353171 , 2352103 Fax 0265 -2352019 , 2356469 E-mail: celd@gebmail.com
10	M.P. Transco	Shri Sunil Tiwari Managing Director, M.P.Power Transmission Co. Ltd. Shakti Bhavan, Rampur, Jabalpur: 482 008	Tel. 0761-2661234, Fax 0761-2664141 Email:- md@mptransco.nic.in
11	M.P.Genco.	Shri. Manjieet Singh, Managing Director, M.P. Power Gen. Com. Ltd. Shakti Bhavan, Viduyt Nagar,Rampur, Jabalpur: 482 008	Tel. 0761-2666150 Fax 0761-2665661 membergen@yahoo.com
12	MP Discom (MPPashimKVVCL - Rotational)	Shri Sachin Talewar, Director Technical, M.P. Paschim Kshetra Vidyut Vitran Comp. Ltd., GPH Compound, Polo Ground, Indore 452007	Tel. E-mail:- directortechnicalwz@gmail.com
13	M.P. SLDC	Shri. Prdeep Sachan, Chief Engineer(LD), State Load Dispatch Centre, Nayagaon, Jabalpur: 482 008	Tel. 0761-2702740 Fax 0761-2970119,2664343 Email: ce.sldc@mptransco.nic.in
14	Maharashtra Transco	Shri Dinesh Waghmare, IAS, CMD, MSETCL, Prakashganga, Plot No.C-19, E-Block, Bandra Kurla Complex, Bandra (East), Mumbai – 400051.	Tel. 022-26591253, 26598595 26598588 Fax 022- 26598595 Email: md@mahatransco.in Fort Fax No.22610063

15	Maharashtra Genco	Dr. P. Anbalagan, IAS CMD, MSPGCL, Prakashgad, 2nd Floor, Plot No G-9, Bandra (East), Mumbai: 400 051	Tel. 022-26476231 Fax 022-26471060, 26581400 E-mail : md@mahagenco.in
16	Maharashtra Discom.	Shri Lokesh Chandra, IAS ACS, CMD, MSEDCL. Prakashgad, 6th Floor, Plot No G-9, Bandra (East), Mumbai: 400 051	Tel. 022-26474644 Fax 26478672 Fort.Tel.22619499 Fax.22650741 Email: md@mahadiscom.in mdmsedcl@gmail.com
17	Maharashtra SLDC	Shri Shashank Jewalikar Executive Director, Load Dispatch Centre, Kalwa Thane Belapur Rd., P.O.- Airoli, Navi Mumbai:400 708	Tel. 27601931/2937(O) Fax 022-27601769 E-mail:edmsebholding@gmail.com
18	Goa	Shri Stephen Fernandes Chief Electrical Engineer, Goa Electricity Department, Vidyut Bhawan, 3rd floor, Panaji – Goa: 403 001.	Tel. 0832-2224680 Fax.0832-2426986 E-mail: cee-elec.goa@nic.in aeipm@yahoo.com
19	UT of Daman & Diu and Dadra & Nagar Haveli	Shri Arun T. , IAS, Secretary (Power), Vidyut Bhavan, Near 66 kV Sub-Station, Kachigam, Daman 396 215	Tel. No.: 0260- 2231803 / secretarypower2020@gmail.com
20	Central Govt. Genco. (NTPC)	Shri Jaikumar Srinivasan Director (Finance), National Thermal Power Corp. Ltd., NTPC Bhavan, SCOPE Complex, 7 Institutional Area, Lodhi Road, New Delhi 110 003	Tel. 011-24360461 Email: df@ntpc.co.in
21	Central Govt. Genco. (NPCIL)	Shri Choudhary Nitin Ramchandra Outstanding Scientist,ED (Commercial), Nuclear Power Corp. of India Ltd., 12 N 24, 12th floor, North Wing, Vikram Sarabhai Bhawan,Anushakti Nagar, Mumbai: 400 094.	Tel. 022-25993330 Fax 022- 25993332 E-mail : df@npcil.co.in
22	C.T.U.	Shri Ashok Pal COO, CTUIL, Plot No.2, Sector – 29, Near Iffco Chowk, Gurgaon- 122 001 (Haryana).	pcgarg@powergrid.in coo-ctu@ctuil.in
23	Powergrid	Sh. Naveen Srivastava Director (Operations), PGCIL, "Saudamini", Plot No.2, Sector – 29, Near Iffco Chowk, Gurgaon- 122 001 (Haryana).	Tel. 0124-2571801 Fax 0124-2571802 E-mail: naveensrivastava@powergrid.in
24	National LDC	Shri S. C. Saxena Director (Market Operation) NLDC, Grid Controller of India Limited B-9, Qutab Industrial Area, Katwaria Sarai, New Delhi-110 016	Tel.011-26852583, 40234651 011-26524525, 011-40234652 011-26852843 , Fax 011-26536901 E-mail:- scsaxena@grid-india.in
25	Regional LDC	Shri V. Balaji Executive Director, Grid Controller of India Limited, WRLDC, F-3, MIDC Area, Marol, Andheri (East), Mumbai: 400 093	Tel. 022-28202691 Fax 022-28202630 Email: vbalaji@grid-india.in
26	Other Gencos- more than 1000MW (Trombay- TATA Power)	Shri Ashish Khanna, President - Generation Business, TATA Power, Bombay House, 24 Homi Modi Street, Mumbai 400 001	Tel No. 022-6665 8282 Fax No. 022 6665 8801 Email: goleml@tatapower.com
27	Other Gencos. - more than 1000 MW (RGPPL)	Sh. Santosh Kumar Takhele, CEO, Ratnagiri Gas & Power Pvt.Ltd , Jubilee Tower, 5th Floor, B35-B36 ,Sector -1, Noida. 201 301(U.P)	Tel. 02359- 241073 Fax Email : sktakhele@ntpc.co.in hod-onm.nhdc@nhdcl.com

28	Other Gencos. - more than 1000 MW (NHDC)	Shri Rajeev Jain, MD NHDC Ltd., NHDC Parisar, Shyamala Hills, Bhopal – 462 013(M.P.)	Landline- 0755-4030001 Fax:- 0755-4030003 Email ID:- mdnhdc@nhdcl.com
29	Other Gencos- more than 1000MW (Torrent Power)	Shri Jigish Mehta Executive Director, Torrent Power Gen. Ltd., Sugen Mega Power Project, Off National Highway No.8,Taluka Kamrej, Dist Surat – 394155 (Gujarat).	Tel. 02621-261165 E-mail: jigishmehta@torrentpower.com
30	Other Gencos. - more than 1000 MW (Adani Power Ltd)	Shri Jayadeb Nanda, COO (O&M) Adani Power Ltd, 1st Floor, South Wing, Adani Corporate House, Shantigram, S.G.Highway, Ahmedabad – 382421(Gujarat).	Tel.079-25558818 Fax.079-25557176 E-mail : jayadeb.nanda@adani.com
31	Other Gencos- more than 1000MW (JSW Energy Ltd)	Shri Jyotiprakash Panda, Head Regulatory & Power Sale M/s.JSW Energy Ltd., JSW Centre Bandra Kurla Complex, Bandra (East), Mumbai 400 051	Tel.011-48178700 Fax.011-48178740 E-mail: jyotiprakash.panda@jsw.in
32	Other Gencos-more than 1000MW (Jindal Power Ltd)	Shri Chhavi Nath Singh, ED & Plant Head , Jindal Power Limited, P.O.Tamnar, District:Raigarh, Chhattisgarh – 496 107.	Tel. 07767-302002 Fax .07767-281995 E-mail:- cn.singh@jindalpower.com
33	Other Gencos- More than 1000 MW (Rattan India Power Ltd)	Sh. Baliram Jadhav VP & Station Head, RattanIndia Power Ltd., Plot No.D2 & D2, Part Additional Industrial Area, Nandgaonpeth, Amravati	E-mail: baliram.jadhav@rattanindia.com amit.panchalwar@rattanindia.com
34	Other Gencos - more than 1000MW (Jaypee Nigrie STPR)	Shri Vinod Sharma President & Plant Head, Jaypee Nigrie Super Thermal Power Project, Village & PO: Nigrie, Tahsil: Deosar, Distt:Singrauli (MP)-486889.	E-mail: vinod1.sharma@jalindia.co.in
35	Other Gencos. More than 1000 MW (D.B.Power Ltd)	Shri Manu Namboothiri, Chief Operating Officer, D.B.Power Ltd., Village : Badadhra, Block & Tehsil : Dabhra, Dist : Janjgir, Champa, Chhattisgarh : 495695.	E-mail:- manu.namboothiri@dbpower.in
36	Other Gencos. More than 1000 MW (KSK Mahanadi Power Co.Ltd.)	G P Rao Project Head, KSK Mahanadi Power Co.Ltd.,Akaltara (Nariyara) TPP, Dist:Bilaspur, Chhattisgarh – 495552.	Tel. Fax. E-mail : gprao@ksk.co.in
37	Other Gencos. More than 1000 MW (MB Power (MP)Ltd)	Sh. Abhishek Gupta Vice President – Thermal, MB Power(Madhya Pradesh)Ltd 239,Okhla Industrial Estate, Phase III, New Delhi -110020.	Tel.011-47624215 Fax.011-47624229 E-mail : abhishekgupta@hpppl.in satyendra.singh@hpppl.in
38	Other Gencos. More than 1000 MW (Sasan UMPP)	Shri Subrata Ghosh Project Head,Sasan UMPP, Sasan Power Ltd., Vill: Siddikhurd, P.O.Tiyra, The: Sasan, st:Waidhan,Singroli, Madhya Pradesh – 486 886.	Tel: 78223 05035 Fax: 7822 - 3025087 E-mail: subrata.ghosh@relianceada.com
39	Other Gencos. More than 1000 MW (RKM POWER Gen.)	Shri S.K Bhatnagar, Director & Plant Head, R.K.M. Powergen Pvt. Ltd., No.14, Dr. Giriappa Road, T. Nagar, Chennai 600 017	Tel. No.: 044-66291000 (Gen.No.) Fax : 044 -28158243 / 66291100 E-Mail: shailendra.bhatnagar@rkm.in
40	Other Gencos - more than 1000MW Adani Green Energy	Mr. Chaitanya Prasad Sahu, CEO, Adani Green Energy, Adani Corporate House, Shantigram, Near Vaishnodevi Circle, S.G. Highway, Ahmedabad 382 421 (Guj.)	Email ID: chaitanya.sahoo@adani.com

41	Other Gencos - more than 1000MW Inox Wind Limited	Sh. Manoj Dixit, Head Power Management , Inox Wind Limited, INOXGFL Towers, 17, Setor-16A, Noida-201 301 (UP)	Email:- manojdixit@gfl.co.in
42	Other Gencos - more than 1000MW GIPCL	Sh. P. S. Goyal, General Manager, (RE-O&M), GIPCL, Ranoli, Vadodara Gujarat-391350	Email ID: psgoyal@gipcl.com
43	Other Gencos - more than 1000MW Bharat Aluminium Company Limited (BALCO)	Vikash Agarwal, Bharat Aluminium Company Limited (BALCO) Balco Nagar, Parsabhata Gate, Chattisgarh dist- Korba Korba-495684	north.aluminium@vedanta.co.in
44	Other Gencos - more than 1000MW Renew Power	Mr. Sunil Barnwal General Manager - CO Head, B2B India Business. (Through Mail)	sunil.barnwal@renew.com
45	Other Gencos - more than 1000MW Avaada Energy	Shri Rajesh Bihari Dwivedi CEO, Avaada Energy,406, 4th Floor, Hubtown Solaries,N.S. Phadke Road, Andheri East, Mumbai - 400 069	avaada@avaada.com
46	Other Gencos Under 1000MW (Rotational) ACB(India) Ltd.	Shri H.M. Jain Director, ACB (Inidia) Limited, 7th Floor, Office Tower, Ambience Mall, NH-8, Gurugram 122 002 (Haryana)	Tel. No.: 0124 2719000 Fax No.: 0124 2719185 E-Mail : harinder.jain@acbindia.com, acbpower@acbindia.com
47	Pvt. Distribution Company (Rotational)	Shri R.D. Patsute, Chief Engineer (Regulatory), The Brihan Mumbai Electric Supply & Transport Undertaking, 1st Floor, Annex Bldg. Colaba Mumbai 400 001	Email: cerc@ bestundertaking.com 022-22799565
48	Private Transmission Licensee – (Rotational)	Shri Nitish Ranjan, AVP, CWRTL 3rd Floor, South Wing, Adani Corporate house, Shantigram S.G.Highway, Ahmedabad 382 421 (Guj.)	Email- nitesh.ranjan@adani.com
49	Member Secretary, WRPC	Shri Deepak Kumar, MemberSecretary, WRPC, F-3, MIDC Area, Marol, Andheri(E), Mumbai -400093.	Tel. 022-28221636 Fax 022-28370193 Email : ms-wrpc@nic.in
SPECIAL INVITEE			
1	MS ERPC	Shri N.S. Mondal Member Secretary, ERPC, Kolkata	Tel: 033-24239652, 24239653 Email: mserpc-power@nic.in
2	MS SRPC	Shri Acit Singh Member Secretary, SRPC, Bengaluru	Tel: 080-22259343 Email: mssrpc@yahoo.com
3	MS NERPC	Shri K. B. Jagtap Member Secretary, NERPC, Shillong	Fax: 0364-2534040 Email: ms-nerpc@gov.in
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5	NPC-CEA	Smt. Rishika Sharan, Chief Engineer , National Power Committee(NPC), 3rd Floor, NRPC Building,CEA, 18-A, SJSS Marg, Katwaria Saria, New Delhi.-110 016	Tel.No.011-26562022 E-mail : cenpccea@gmail.com; rishika_sh@yahoo.com
6	GUVNL	Shri Jaiprakash Shivahare, Gujarat Urja Vikas Nigam Ltd, Sardar Patel Vidyut Bhawan, Race Course, Vadodara: 390 007.	E-mail:- coacom@gebmail.com

7	MPPMCL	Shri Shailendra Janardan CGM(Commercial), MPPMCL Shakti Bhawan, Rampur, Jabalpur.488 008	0761- Email: comml.deptt@mppmcl.com mdofmppmcl@gmail.com shailendra.janardan@mppmcl.com

		TCC Member List 2024-25	
S.NO.	**Organization**	**Name, Designation & Address of Member**	**Contact Details**
1	Chairman TCC	Shri Rajesh Kumar Shukla Managing Director, CSPTCL, 2nd Floor, Vidyut Seva Bhavan, P.O.: Sunder Nagar, Danganiya, Raipur:	Tel. 0771-2574500, 2574300 E-mail: mdtransco@cspc.co.in mdtransco.cg@gmail.com
2	Central Electricity Authority	Shri B. Lyngkhoi Chief Engineer (GM), Central Electricity Authority, Sewa Bhavan, R.K. Puram, New Delhi-110 066	Tel. 011-26732652 Fax. 011-26109750 E-mail:cegm-cea@gov.in gmcea@nic.in
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4	Chhattisgarh Discom	Shri R.A. Pathak Chief Engineer (RA & PM) CSPDCL, 4th floor,Vidyut Sewa Bhawan, Danganiya, Raipur: 492 013 (CG)	Tel. 0771-2574441 Fax 0771-2574442 Email: pathak63ra@gmail.com
5	Chhattisgarh Genco	Shri N.K.Bizora, Executive Director (O&M Gen.), CSPGCL, Vidyut Sewa Bhawan,5th Floor, P.O.Sunder Nagar, Danganiya, Raipur: 492 013 (CG)	Tel.0771-2574421 Fax.0771-2574425 E-mail:- ceonm.gen@cspc.co.in
6	Chhattisgarh SLDC	Shri K.S.Manothiya, E.D.(LD), SLDC Building, CSPTCL, P.O.Sunder Nagar, Danganiya, Raipur: 492 013 (CG)	Tel. 0771-2574172 Fax. 0771-2574174 E-mail:- celdcg@sldccg.com celdcg@sldccg.com ksmanothiyayks@gmail.com
7	Gujarat Genco - (GSECL)	Shri Somes Bandyopadhyay Managing Director, Gujarat State Electricity Corp. Ltd., Vidyut Bhavan, Race Course, Vadodara: 390 007 (Guj.)	Tel. 0265-6612101, 6612115(PA) Fax. 0265-2338848 ,2344734 E-mail : mdgsecl@gebmail.com
8	Gujarat Transco (GETCO)	Shri R. K. Patel Chief Engineer (R. & C.), GETCO, Sardar Patel Vidyut Bhawan, Race Course, Vadodara: 390 007	Tel. 0265 -2353171 , 2352103 Fax 0265 -2352019 , 2356469 E-mail: acerc.getco@gebmail.com
9	Gujrat Discom (Rotational - Uttar Guj)	Shri G.H. Engineer C.E. (Technical) UGVCL, R & C Officer, Visanagar Road, Mehsana 384 001 (Guj.)	Tel. Fax. E-mail: gerc.ugvcl@yahoo.com gerccell@ugvcl.com
10	Gujarat SLDC	Shri Kanti Bhuva Chief Engineer (LD), SLDC, Load Dispatch Centre, 132 kV S/S Premises, Gotri, Vadodara: 390 021	Tel. 0265 -2353171 , 2352103 Fax 0265 -2352019 , 2356469 E-mail: celd@gebmail.com
11	M.P. Transco.	Shri Sunil Tiwari Managing Director, M.P.Power Transmission Co. Ltd. Shakti Bhavan, Rampur, Jabalpur: 482 008.	Tel. 0761- 2661234, Fax 0761-2664141 Email:- md@mptransco.nic.in
12	M.P. Genco.	Shri B.L. Newal, Executive Director (O&M –gen.) M.P. Power Gen. Com. Ltd. Shakti Bhavan, Viduyt Nagar, Rampur, Jabalpur: 482 008.	Tel. E-mail: cecomwz@gmail.com

13	M.P.Discom (Rotational - MPPaschim KVVCL)	Shri Ravi Mishra Chief Engineer(Comml.) & Project Dir. (Smart Meter), Corporate Office , Indore, GPH Compound, Polo Ground, Indore 452 007	Tel. 0761-2661589, 2702602 Fax. 0761-2664572 E-mail:- cecomwz@gmail.com
14	M.P. SLDC	Shri. Prdeep Sachan, Chief Engineer(LD), State Load Dispatch Centre, Nayagaon, Jabalpur: 482 008	Tel. 0761-2702740 Fax 0761-2970119,2664343 Email: ce.sldc@mptransco.nic.in
15	Maharashtra Transco.	Shri. Sandeep Kalantri, Director (Operations), MSETCL, Prakashganga, Plot No.C-19, E-Block, Bandra Kurla Complex, Bandra (East), Mumbai – 400051.	Tel. 022-26595404, 26595003, Fax. 022-26590383,26591254, Gen. 26598595, F. Tel.22621178, Fax. 22619699, E-mail-dirop@mahatransco.in
16	Maharashtra Genco	Shri Sanjay Marudkar Director (Operation) MSPGCL, Prakashgad, 2nd Floor,Plot No G-9, Bandra (E), Mumbai: 400 051	Tel. 022-26476909 Fax. 022-26474190 E-mail:-directorop@mahagenco.in
17	Maharashtra Discom.	Shri. Yogesh Madhukar Gadkari Director (Commercial) (I/C), MSEDCL, Prakashgad, 6th Floor, Plot No G-9, Bandra (East), Mumbai: 400 051	Tel. 022-26476743 Fax.26472976 Fort office Tel.022-22619277 Email:- directorcommsedcl@gmail.com
18	Maharashtra SLDC	Shri Shashank Jewalikar Executive Director, Load Dispatch Centre, Kalwa Thane Belapur Rd., P.O.- Airoli, Navi Mumbai:400 708	Tel. 022-27601762 Fax 022-27601769 E-mail:- cesldc@mahasldc.in
19	Goa	Shri Shri Stephen Fernandes Chief Electrical Engineer, Goa Electricity Department, Vidyut Bhawan, 3rd floor, Panaji – Goa: 403 001.	Tel. 0832-2224680 Fax.0832-2426986 E-mail: cee-elec.goa@nic.in aeipm@yahoo.com
20	UT of Daman & Diu and Dadra & Nagar Haveli	Shri C.A. Parmar, Chief Engineer- DNHPDCL, Room No. 312, 3rd floor, Vidhyut Bhavan, 66 kV Road, Near Secretariat, Amali, Silvassa: 396 230	Tel. 0260-2406558 Email: caparmar1956@gmail.com
21	(a). Central Sector Genco. (NTPC WR-I)	Shri Kamlesh Soni Regional Executive Director (WR-I, HQ) NTPC LTD WR HQ-I, 2nd floor, Samrudhi Venture Park, Marol, Andheri(E), Mumbai-400 093	Phon No. 022-28306326 Email Id :-kamleshsoni@ntpc.co.in
22	(b). Central Sector Genco. (NTPC WR-II)	Sh. Pradipta Kumar Mishra, Regional Executive Director (WR-II), NTPC Ltd., Plot No. 87, Sector -24, Atal Nagar, Naya Raipur Chhattisgarh 492 018	Tel. 022-28227762 Fax. 022-28259364 E-mail: pradipta@ntpc.co.in
23	Central Govt. Genco. (NPCIL)	Shri Sandeep Sarwate, ACE (E & T), Nuclear Power Corp. of India Ltd, 9-N-33,Vikram Sarabhai Bhavan, Anushakti Nagar, Mumbai:400 094	Tel. 022-25991902 Fax.022- 25557890 E-mail:- ssarwate@npcil.co.in.

24	C.T.U.	Shri Ashok Pal COO, CTUIL, Plot No.2, Sector – 29, Near Iffco Chowk, Gurgaon- 122 001 (Haryana).	pcgarg@powergrid.in coo-ctu@ctuil.in
25	Powergrid WR-I	Shri S Subramanian Executive Director, (WR-I), POWERGRID, Sampriti Nagar, Nari Ring Road, Nagpur -440 026	Tel. 0712-2641470 Fax.0712-2641471 E-mail:- subbu@powergrid.in
26	Powergrid WR-II	Shri Rajesh Kumar Executive Director(WR-II) PGCIL, Regional Head Quarters, Plot No. 54, Opp- Ambe Vidhyalay, Sama Sawali Rd., Vadodara 390 008	Tel. 0265-2487594 Fax. 0265-2488564 rajesh.kumar2@powergrid.in
27	National LDC	Smt. S. Usha Head of NLDC, Grid Controller of India Limited B-9, Qutab Industrial Area, Katwaria Sarai, New Delhi-110 016	Tel. 011-26852843 Fax 011-26536901 E-mail:- susha@grid-india.in cmd@posoco.in
28	Regional LDC	Shri V.Balaji, Executive Director, Grid Controller of India, WRLDC. F-3, MIDC Area, Marol, Andheri (East), Mumbai: 400 093	Tel. 022-28202691 Fax 022-28202630 Email: vbalaji@grid-india.in
29	Other Gencos. - more than 1000 MW (Tata Power-Trombay)	Shri Devanand Pallikuth Head - PSCC The Tata Power Company Ltd., Power System Control Centre, Trombay Thermal Power Station-A, Mahul Road, Chembur, Mumbai – 400 074.	Tel.67175371 Fax.67175385 E-mail: p.devanand@tatapower.com
30	Other Gencos. - more than 1000 MW (RGPPL)	Shri Santosh Kumar Takhele, CEO, Ratnagiri Gas & Power Pvt.Ltd , P.O.- Anjanvel, 415 634 (MH)	Tel. 02359- 241073 Fax Email : sktakhele@ntpc.co.in
31	Other Gencos. - more than 1000 MW (NHDC)	Sh. Sandeep Kumar Jain General Manager (O & M), NHDC Ltd., NHDC Office Complex, Shyamala Hills, Bhopal – 462013(M.P.)	Tel.0755-40300090 Email: skjain_nhdc@rediffmail.com hod-onm.nhdc@nhdcl.com
32	Other Gencos – more than 1000MW (Torrent Power Surat)	Shri Ambarish Modha General Manager (O), Sugen Mega Power Project, Off National Highway No.8,Taluka - Kamrej, District : Surat – 394 155	Tel.02621-261000/261663 Fax.02621-661151 E-mail: sugenoperations@torrentpower.com sugenschedule@torrentpower.com
33	Other Gencos – more than 1000MW (Adani Power Ltd.)	Shri Manoj K Taunk, Asso. Vice President (Protection & Metering), Adani Power Ltd, 1st Floor, South Wing, Adani Corporate House Shantigram,S.G.Highway, Ahmedabad – 382421(Gujarat).	Tel.079- 25557400 Fax.079- 25557176 E-mail:- manoj.taunk@adani.com
34	Other Gencos- more than 1000MW (JSW Energy Ltd.)	Shri Peddanna Ramayanam, M/s.JSW Energy Ltd., JSW Centre,Bandra Kurla Complex, Bandra (E), Mumbai 400 051	Tel.022- 42862041, 42868128 Fax. 022-4286 3000 Mobile. E-mail: peddanna.ramayanam@jsw.in
35	Other Gencos- more than 1000MW (Jindal Power Ltd.)	Shri Ajit Kumar Rai, A.V.P. –Power Control Jindal Power Limited, P.O.Tamnar, District:Raigarh, Chhattisgarh – 496 107.	Tel.07767-302112 E-mail:- ajitrai@jindalpower.com

36	Other Gencos- More than 1000 MW (Rattan India Power Ltd.)	Shri Baliram Jadhav VP & Station Head RattanIndia Power Ltd., Power No.D2 & D2 Part Additional Industrial Area, Nandgaonpeth, Amravati -444 901.	E-mail: baliram.jadhav@rattanindia.com amit.panchalwar@rattanindia.com
37	Other Gencos.- More than 1000 MW (Jaypee Nigrie)	Shri Navin Tinguria Vice President, Jaypee Nigrie Super Thermal Power Project, Village & PO: Nigrie, Tahsil: Deosar, Distt:Singrauli (MP)-486889.	E-mail: navin.tinguria@jalindia.co.in
38	Other Gencos. More than 1000 MW (D.B.Power Ltd.)	Sh. Manu Namboothiri, D.B.Power Ltd., Village : Badadhra, Block & Tehsil : Dabadhra, Dist : Janjgir, Champa, Chhattisgarh : 495695.	manu.namboothiri@dbpower.in
39	Other Gencos. More than 1000 MW (KSK Mahanadi Power Co.Ltd.)	Shri G. P. Rao Project Head), KSK Mahanadi Power Co.Ltd., Akaltara (Nariyara) TPP Dist:Bilaspur, Chhattisgarh – 495552.	E-mail:- gprao@ksk.co.in
40	Other Gencos. More than 1000 MW (MB Power (MP)Ltd)	Shri Rahul S.Sharma, GM - Business Development, MB Power(Madhya Pradesh)Ltd 239,Okhla Industrial Estate, Phase III, New Delhi -110020	Tel.011-47624100 Extn.496 E-mail:- Sharma.rahul@hpppl.in
41	Other Gencos. More than 1000 MW (Sasan UMPP.)	Shri Prakash Chandra Upadhyay Operation Head, Sasan UMPP, Sasan Power Ltd., Vill: Siddikhurd, P.O.Tiyra, The: Sasan, Dist:Waidhan,Singroli, Madhya Pradesh – 486 886.	E-Mail: Prakash.c.upadhyay@relianceada.com
42	Other Gencos. More than 1000 MW (RKM Power Gen. Pvt. Ltd.)	Shri S.K Bhatnagar, Head Operations, R.K.M. Powergen Pvt. Ltd., No.14, Dr. Giriappa Road, T. Nagar, Chennai 600 017	Tel. No.: 044-66291000 (Gen.No.) Fax : 044 -28158243 / 66291100 E-Mail: shailendra.bhatnagar@rkm.in
43	Other Gencos - more than 1000MW Adani Green Energy	Mr. Rajesh Kumar Gupta, Associate VP, Adani Green Energy Adani Corporate House, Shantigram, Near Vaishnodevi Circle, S.G. Highway, Ahmedabad 382 421 (Guj.)	Email ID: rajesh.gupta@adani.com
44	Other Gencos - more than 1000MW Inox Wind Ltd.	Sh. Rajas Ranjan Acharya, General Manager (Power Evacuation) , Inox Wind Limited, INOXGFL Towers, 17, Setor-16A, Noida-201301 (UP)	Email:- rajas.acharya@inoxwind.com
45	Other Gencos - more than 1000MW GIPCL	Sh. S. Mani, Addl. General Manager (Commercial & Legal) , GIPCL, Ranoli, Vadodara Gujarat-391350	Email ID: svmani@gipcl. Com
46	Other Gencos - more than 1000MW Bharat Aluminium Company Limited (BALCO)	Vikash Agarwal, Bharat Aluminium Company Limited (BALCO) Balco Nagar, Parsabhata Gate, Chattisgarh dist- Korba Korba-495684	north.aluminium@vedanta.co.in
47	Other Gencos - more than 1000MW Renew Power	Mr. Sunil Barnwal General Manager - CO Head, B2B India Business. (Through Mail)	sunil.barnwal@renew.com

48	Other Gencos - more than 1000MW Avaada Energy	Shri Vivek Kumar Jain CEO, Avaada Energy,406, 4th Floor, Hubtown Solaries,N.S. Phadke Road, Andheri East, Mumbai - 400 069	Vivek.jain@avaada.com avaada@avaada.com
49	Other Gencos Under 1000MW (Rotational - ACB (India)Ltd.	Shri G. Sambasiva Rao Vice President (Power), ACB (India) Ltd., Regional Headquarters, Village: Chakabura, Post: Jawali, Tehsil: Kathghora, Distt.: Korba (CG) 495 445	Tel. No.: 07759 - 285321 E-mail: Sambasiva.Rao@acbindia.com acbpower@acbindia.com
50	Other Gencos - more than 1000MW Pvt. Distribution Company (Rotational)	Shri R.D. Patsute, Chief Engineer (Regulatory) The Brihan Mumbai Electric Supply & Transport Undertaking, 1st Floor, Annex Building, Colaba, Mumbai 400 001	Email: cerc@ bestundertaking.com 022-22799565
51	Private Transmission Licensee – (Rotational)	Shri Abhishek Kukreja, Lead-O&M, CWRTL 3rd Floor, South Wing, Adani Corporate house, Shantigram S.G.Highway, Ahmedabad 382 421 (Guj.)	Email- abhishek.kukreja@adani.com
52	Member Secretary, WRPC	Shri Deepak Kumar, Member Secretary, WRPC, F-3, MIDC Area, Marol, Andheri(E), Mumbai -400093.	Tel. 022-28221636 Fax 022-28370193 Email : ms-wrpc@nic.in
SPECIAL INVITEE			
1	MS ERPC	Shri N.S. Mondal Member Secretary, ERPC, Kolkata	Tel: 033-24239652, 24239653 Email: mserpc-power@nic.in
2	MS SRPC	Shri Acit Singh Member Secretary, SRPC, Bengaluru	Tel: 080-22259343 Email: mssrpc-ka@nic.in
3	MS NERPC	Shri K. B. Jagtap Member Secretary, NERPC, Shillong	Fax: 0364-2534040 Email: ms-nerpc@gov.in
4	MS NRPC	Sh. V. K. Singh Member Secretary, NRPC, New Delhi	Fax: 011-26868528, 26865206 Email: ms-nrpc@nic.in
5	NPC	Smt. Rishika Sharan, Chief Engineer , National Power Committee(NPC), 3rd Floor, NRPC Building,CEA, 18-A, SJSS Marg, Katwaria Saria, New Delhi.-110 016	Tel.No.011-26562022 E-mail : cenpccea@gmail.com; rishika_sh@yahoo.com
6	GUVNL	Shri Jaiprakash Shivahare, Gujarat Urja Vikas Nigam Ltd, Sardar Patel Vidyut Bhawan, Race Course, Vadodara: 390 007.	E-mail:- coacom@gebmail.com
7	MPPMCL	Shri Shailendra Janardan CGM(Commercial), MPPMCL Shakti Bhawan, Rampur, Jabalpur.	Mobile No. 94258 05540 Email: comml.deptt@mppmcl.com mdofmppmcl@gmail.com shailendra.janardan@mppmcl.com



भारत सरकार

Government of India

केन्द्रीय विद्युत प्राधिकरण

Central Electricity Authority

पश्चिम क्षेत्रीय विद्युत समिति, मुंबई

Western Regional Power Committee, MUMBAI

तक.सम.स. / प.क्षे.वि.स.

की दिनांक 13 मार्च 2025 को

वीडियो कॉन्फ्रेंसिंगके माध्यम से

आयोजित 53वीं बैठक का कार्यवृत्त

Minutes of 53rd Meeting of TCC/WRPC

held on 13th March 2025 via

Video Conferencing

Minutes of the 53rd WRPC Meeting

The 53rd meeting of WRPC was held on 13th March 2025 through online mode. The list of participants is enclosed at Annexure I.

As the chairperson of WRPC has yet to be appointed, MS WRPC proposed the name of Shri Hemant Jain, Member (GO&D), CEA, to chair the meeting. The members agreed.

Member (GO&D), CEA welcomed all the participants and requested MS WRPC to take up the agenda items.

Item No. 1: New ISTS proposals costing more than 500 Crores.

(CTUIL)

CTUIL has proposed the following network expansion scheme for implementation under ISTS:

Sl. No.	Items	Details
1.	Name of Scheme	Transmission system for evacuation of power from Rajasthan REZ Ph-IV (Part-5 :6 GW) [Barmer Complex] Barmer-II: 6GW (Solar)
2.	Scope of the scheme	Details of Transmission scheme (for VSC and LCC alternatives) are enclosed in **Annexure-1.1**.
3.	Depiction of the scheme on Transmission Grid Map	Attached at **Exhibit-I**.
4.	Upstream/downstream system associated with the scheme	765/400/220 kV Fatehgarh-IV PS (Sec-2) PS and Barmer-I PS are under implementation as part of Rajasthan REZ Ph-IV (Part-2 :5.5 GW) scheme. 765/400/220 kV Fatehgarh-IV PS(Sec-2) is being interconnected to Sirohi S/s (Under implementation), Beawar S/s (Under implementation) and Fatehgarh-III PS (Sec-2) (Under Implementation) at 765 kV level and Bhinmal (PG) & Barmer-I PS (Under Implementation) at 400 kV level. 765/400/220 kV Barmer-I PS is being interconnected to Sirohi PS (Under Implementation) & Merta-II PS (Under Implementation) at 765 kV level and Fatehgarh-III PS (Sec-2) PS & Fatehgarh-IV PS(Sec-2) PS (Under Implementation) at 400kV level. South Kalamb S/s establishment with 2x1500 MVA, 765/400 kV ICTs with 2x330 MVAR, 765 kV bus reactor and 2x125 MVAR, 420 kV bus reactor along with LILO of Pune-III – Boisar-II 765 kV D/c line (Under bidding).

Sl. No.	Items	Details
		Further, another network expansion scheme which includes Creation of new 765 kV & 400 kV Bus Sections-II & III through sectionalisation along with ICT augmentation (3x1500 MVA, 765/400 kV ICTs) at Bus Section -III at both 765 kV & 400 kV levels along with downstream 400 kV lines at bus section-III from South Kalamb S/s with implementation timeframe of 24 months from effective date is required for dispersal of power from subject HVDC towards load centres in Maharashtra. (Under Approval).
5.	Objective / Justification	The present scheme comprises Transmission scheme for evacuation of power as part of Rajasthan REZ Ph-IV (Part-5: 6GW) (Barmer Complex) In the 36th CMETS-NR meeting held on 15.01.2025, it was deliberated that considering the applications received at Barmer-II PS, transmission scheme is evolved as part of Rajasthan REZ Ph-IV (Part-5: 6GW) (Barmer Complex) As part of Renewable Energy Zones (REZs) identified by MNRE/SECI with a total capacity of 75 GW REZs in Rajasthan, evacuation system for 13 GW was planned at Fatehgarh (5 GW) & Barmer (8 GW) complex. Transmission scheme for Rajasthan REZ Ph-IV (Part-2:5.5GW) (Jaisalmer/Barmer Complex) was approved in 14th NCT meeting for injection at Fatehgarh-IV PS (4 GW) & Barmer-I PS (1.5 GW) in Rajasthan and also under implementation. Further, for evacuation of power beyond 5.5 GW from Fatehgarh-IV PS/Barmer-I PS, transmission system for 3.5GW was approved in 19th NCT meeting, thus making the total approved capacity of 9 GW (5.5 GW+3.5 GW) at Fatehgarh/Barmer complex. In the joint study meeting held on 28.12.2023 & 09.01.2024, CTU stated that as per the committee report, Barmer-II PS was planned for 6 GW RE potential (2 GW BESS capacity) with 4 GW evacuation capacity. In 27th CMETS-NR meeting held on 10.01.2024, SECI informed that at present there is no clear visibility for RE projects with BESS before 2027 as award process will take time (1-2 years). In view of that, 7.5 GW RE potential (solar) remains untapped due to non-materialisation of BESS capacity (Fatehgarh- IV:4 GW + Barmer-I: 1.5 GW + Barmer-II: 2 GW). Accordingly, it was suggested that 2 GW additional RE potential may be considered for planning of transmission scheme from Barmer- II PS. At present, connectivity of about 6 GW capacity is already granted at Barmer-II PS. Beyond that, about 6 GW connectivity applications are granted/agreed for grant/received at Barmer-III PS.

Sl. No.	Items	Details
		Based on earlier Grid India observation and recent planned scheme in other regions, study files were modified for 2030 time frame. For evacuation of 6 GW capacity from Barmer-II PS, HVDC system from Barmer-II PS is being planned comprises establishment of Barmer-II PS and HVDC line from Barmer-II PS to Western region (near South of Kalamb) as well as EHVAC system for injection of power at Barmer-II PS and onward dispersal of power in Western region. Studies were carried out in the 2030-time frame for solar maximized scenario and shared on 22.11.2024 with all constituents. Grid-India vide mail dated 11.12.2024 provided their observation on all India files as well as on the proposed transmission scheme, which were deliberated in detail in 36th CMETS-NR meeting. As per discussion held in 25th NCT meeting on 28.11.2024, both VSC & LCC technology are considered in the present proposal and to be discussed along with comparative analysis in NCT meeting. A comparative analysis of VSC and LCC technology (incl. Grid-India inputs) is enclosed in **Annexure-1.2**. Grid-India in the 36th CMETS-NR meeting further reiterated that SCR of Barmer-II is on the lower side even with considering 2 nos. of Syncon units. CTU stated that SCR of Barmer-II PS is about 3, which is under the most pessimistic scenario with calculation methodology suggested by Grid-India, however, in actual the SCR would be much higher. Additionally, as per CTU understanding and their discussion with OEMs in earlier HVDC packages, minimum SCR requirement for HVDC operation for VSC technology is >1, whereas for LCC technology is > 2.5. The SCR of 400 kV Barmer-II PS will further improve with future interconnection planned for Barmer-III PS (HVDC) with Barmer-II PS in the next 5-6 months. Grid-India vide mail 22.01.2025 as well as in the meeting highlighted the following advantages of VSC based HVDC: • Strong AC systems may not be required as there are no issues of commutation failures and the HVDC operates effectively in weak or even "islanded" grids. • Capable of providing black start services: One LCC HVDC (Bhadla3-Fatehpur) is under implementation, having one VSC HVDC would help to harness advantages of both configurations. • Minimal harmonics due to PWM-based control. Smaller filters are required. • Superior fault ride-through capability.

Sl. No.	Items	Details
		• Can provide grid-forming services, voltage regulation, and frequency support, i.e. ability to maintain appropriate system parameters in different renewable generation scenarios. Grid-India further stated in their comments that technically VSC based HVDC is a better alternative than LCC based HVDC keeping in view the low system strength at Barmer-II (SCR < 2.0 without SynCons and ~2.5 with SynCons) and the reactive power and oscillations issues already being faced in the complex. Grid-India further emphasized on control interaction studies, POD studies and filter arrangement modelling. Grid-India stated that space for Syn Con and STATCOMs is to be kept at Barmer-II PS as part of future scope so that in case LCC HVDC is approved and any operational issues are faced in future, additional syncon or STATCOM can be provided for system strengthening. CEA agreed on the proposed scheme for taken up in NCT meeting with both configurations (LCC/VSC). In the CMETS-NR, it was deliberated that the final decision regarding implementation of HVDC as LCC or VSC would be taken in NCT meeting. The transmission scheme for evacuation of power as part of Rajasthan REZ Ph-IV (Part-5: 6 GW) (Barmer Complex) was also deliberated and agreed in 35th CMETS-WR meeting held on 07.02.2025 (MOM awaited). Considering the above deliberations and receipt of connectivity application in Barmer complex, the Transmission scheme for evacuation of power as part of Rajasthan REZ Ph-IV (Part-5: 6 GW) (Barmer Complex) was agreed in 36th CMETS-NR & 35th CMETS-WR meeting. As far as WR portion is concerned, the HVDC link is terminating in WR at South Kalamb S/s. The South Kalamb S/s is being established with 2x1500 MVA, 765/400 kV ICTs with 2x330 MVAR, 765 kV bus reactor and 2x125 MVAR, 420 kV bus reactor along with LILO of Pune-III – Boisar-II 765 kV D/c line is presently under bidding stage. From studies & as per discussions held with MSETCL in a meeting amongst CEA, CTU & MSETCL on 22.01.2025 & in 35th CMETS-WR held on 07.02.2025, the downstream lines are planned from South Kalamb S/s as per details at **Annexure-III**. The same shall facilitate reliable dispersal of power getting pooled at South Kalamb S/s.

Sl. No.	Items	Details
6.	Estimated Cost	For LCC technology: Rs 26,500 Cr. For VSC technology: Rs 38,000 Cr.
7.	Need of phasing, if any	Not Applicable
8.	Implementation timeframe	54 months from the allocation of project (Pole-1: 48 months, Pole-2: 54 months)
9.	System Study for evolution of the proposal	Studies discussed and agreed in the following meeting: • 36th CMETS-NR meeting held on 15.01.2025 (MOM attached in **Annexure-IV**) • 35th CMETS-WR meeting held on 07.02.2025 (MOM awaited) • Load flow results are attached at **Exhibit-II** (for NR) and **Exhibit-III** (for WR)

3. In line with MoP office order no. 15/3/2018-Trans-Pt (5) dated 28.10.2021 regarding reconstitution of NCT, views of RPC are required for proposals costing more than Rs. 500 Crores before consideration by National Committee on Transmission. Further, Para 6 (3A) & Para 11 of MoP Gazette dated 03.12.2021 on resolution for establishment of WRPC stipulates the following:

> *"3A- To provide views on the inter-state transmission system planned by CTU within 45 days of receipt of the proposal by the concerned RPC. The views of RPC will be considered by National Committee on Transmission for sending their recommendation to Ministry of Power for approval of new inter-state transmission system."*

WRPC may like to discuss/approve.

53rd WRPC Discussions:

CTUIL representative explained the above agenda.

MS WRPC enquired about the total RE potential identified in the Rajasthan area and the timelines planned for different phases of development. CTUIL stated that MNRE has identified RE potential of around 115 GW and the development plan is spread over four phases. The phase-I of 8.9 GW has already been commissioned. The phase-2 of 8.2 GW has been partly commissioned & is planned to be commissioned completely by June 2025. The phase-3 of 20 GW capacity shall commence progressively from April 2025 till

February 2026 and phase 4 of 75 GW capacity from December 2025 till December 2030 (15 GW is under implementation). CTUIL added that an additional potential of 55 GW has also been identified in this area by MNRE.

PGCIL stated that MSETCL has undertaken upgradation of their downstream network and enquired whether they are also required to upgrade their upstream network and equipment. They also requested to share with them the loading scenario with the implementation of this scheme. CTUIL replied that the load flow study results and loading scenario with the implementation of the scheme have already been enclosed as annexure and PGCIL may check it.

SE(P) WRPC stated that, as has been brought out in the agenda, under the most pessimistic scenario, the SCR at Barmer end is about 3 and therefore, it is sufficient to avoid commutation failure in HVDC LCC system. The advantages of the VSC HVDC system, such as minimal harmonics, superior fault ride-through capability and voltage regulation, can be achieved through cheaper alternatives such as STATCOM & syncons. The main advantage of VSC technology is its capability to provide black start facility at Rajasthan REZ. The capability of providing black start services is most suitable for offshore wind farms, however, the Rajasthan REZ is an onshore facility and it is already connected with other AC interconnections. Further, there may be a low probabilistic opportunity of black start to the Kallam area due to the intermittent nature of RE generation at the other end (Rajasthan REZ). CTUIL stated that all the aspects involved in the choice of technology would be discussed and decided by NCT.

PGCIL stated that they also feel that the utilization of the advantages of this technology needs to be studied and also, there are limited suppliers of VSC-based HVDC systems. PGCIL further stated that they shall provide their views on the choice of whether to go with LCC or VSC technology for HVDC after consulting their Engineering team. MS WRPC stated that as there may be a delay in this consultation process, PGCIL may submit their views directly to NCT.

MS WRPC further enquired CTUIL regarding the plan for downstream network and the timelines of implementation. CTUIL replied that LILO of Nagothane – Padghe 400 kV D/c line at South Kalamb, LILO of Pune(AIS) – Navi Mumbai 400 kV line at South Kalamb, LILO of Pune(AIS) – Vikhroli 400 kV line at South Kalamb, LILO of Pune(AIS) – Vikhroli 400 kV line at South Kalamb and upgradation of 400 kV bay at Pune(AIS) of

POWERGRID (associated with Pune(AIS) – Vikhroli 400 kV line) of Western Transco Power Ltd. (a subsidiary of AESL) commensurate with the reconductoring capacity of 2100 MVA per ckt at nominal voltage has also been planned. MSETCL supplemented that they have already included the above LILO lines (implementation schedule 2027-28) in their STU plan matching with the CTU plan (South Kalamb implementation schedule Jan 2028).

Member (GO&D) stated that the transmission scheme proposed by CTUIL should be viewed holistically since the transmission network should be ready before the RE generation commissioning.

WRPC approved the schemes and recommended for taking it up at NCT along with their above observations for further deliberations.

Item No. 2: Nomination for National Committee on Transmission (NCT).

Ministry of Power, vide its letter dated 18.02.2025 (**Annexure-2.1**), has issued amendment in the composition of the National Committee on Transmission (NCT). The composition of NCT is now as follows:

1. Chairperson, CEA - Chairman
2. Member (Power System), CEA - Member
3. Member (Economic & Commercial), CEA - Member
4. Joint Secretary level officer looking after transmission in M/o of New & Renewable Energy, Govt. of India - Member
5. Director (Trans), M/o Power, Govt. of India - Member
6. Chief Operating Officer, Central Transmission Utility - Member
7. CMD, GRID-INDIA - Member
8. Advisor (Energy), NITI Aayog - Member
9. Two Experts from Power Sector to be nominated by MoP* - Members
10. **Nominee of each of the five Regional Power Committees (RPCs) – Member**
11. Chief Engineer (from Power System Wing), CEA - Member Secretary

*Will be nominated for a maximum period of two years from the date of their nomination.

2. The Terms of Reference (ToR) of the NCT and other conditions remain same as mentioned in this Ministry's Office Order No. 15/3/2018-Trans-Pt (5) dated 28.10.2021 (**Annexure-2.2**).

3. In view of the above amendment issued by MoP, an appropriate nomination from WRPC to NCT is to be decided.

53rd WRPC Discussions:

MS WRPC explained the agenda and stated that in the recent amendment of the NCT composition, MoP has also included representatives of each of the five Regional Power Committees (RPCs). He proposed that the Chairperson TCC from WRPC may be the representative of NCT from WRPC and Member Secretary, WRPC may be the alternate member in the absence of TCC Chairperson.

WRPC agreed to the above.

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Exhibit-I

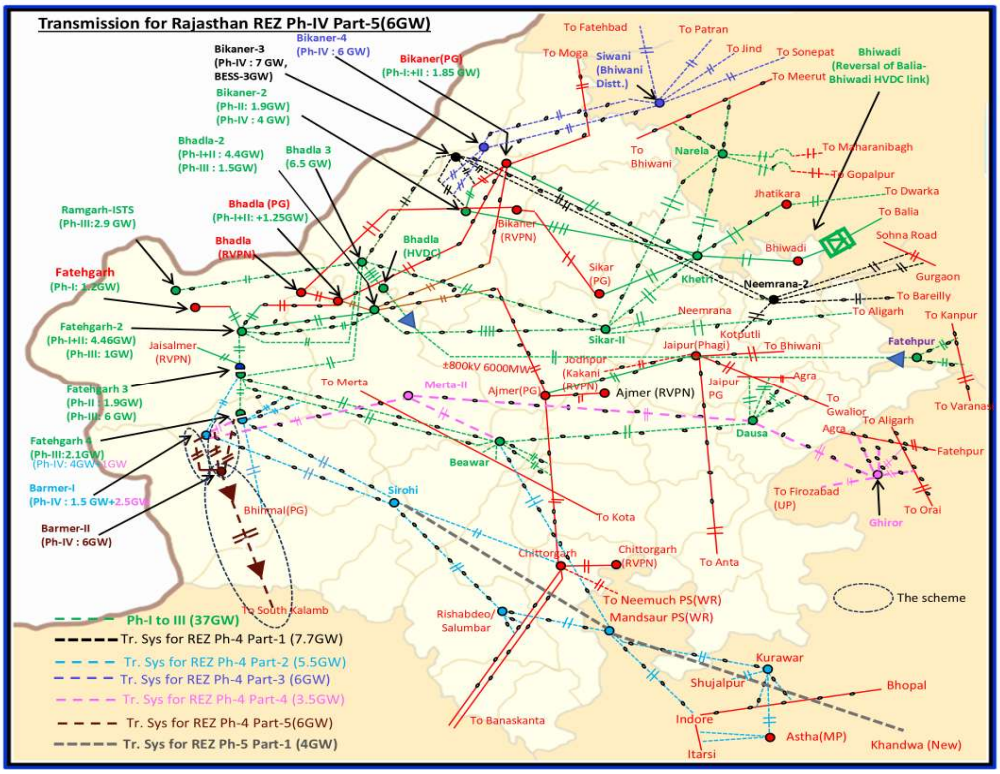


Fig: 1. Transmission system for evacuation of power as part of Rajasthan REZ Ph-IV (Part-5: 6 GW) (Barmer Complex)

Annexure-IA

Proposed Transmission system for evacuation of power from Rajasthan REZ Ph-IV (Part-5 :6 GW) [Barmer Complex] Barmer-II : 6GW (Solar)

A. Alternative-1 : LCC Configuration

Sl. No.	Description of Transmission Element	Scope of work (Type of Substation/Conductor capacity/km/no. of bays etc.)
1	Establishment of 400/220kV, 6x500MVA S/s at suitable location near Barmer (Barmer-II Substation) along with 2x125 MVAr bus reactor **Future provisions (excl. scope of present scheme):** ➢ 400 kV line bays along with switchable line reactor – 6 ➢ 400 kV line bays –4 nos. ➢ 400 kV Bus Reactor along with bays: 1 no. ➢ 400/220 kV ICT along with bays-4 Nos. ➢ 400 kV Sectionalization bays: 2 sets ➢ 220 kV line bays for connectivity of RE Applications -5 Nos. ➢ 220kV Sectionalization bay: 2 sets ➢ 220 kV BC (2 Nos.) & TBC (2 Nos.) ➢ 2 nos. of Syncon units at 400kV level along with 2 nos. of 400kV bays ➢ STATCOM (2x±300 MVAr, 4x125 MVAr MSC, 2x125 MVAr MSR) along with 400 kV bays (2 Nos.)	Barmer-II PS - AIS • 400/220 kV 500 MVA ICTs- 6 nos. • 400 kV ICT bays- 6 no. • 220 kV ICT bays- 6 no. • 125 MVAr Bus Reactor-2 nos. • 400 kV Bus reactor bays- 2 no. • 400kv line bays– 4 nos. (for RE interconnection) • 220KV line bays – 7 nos. (for RE connectivity) • 220kV Sectionalization bay: 1 set • 220 kV BC (2 Nos.) & TBC (2 Nos.)
2	LILO of both ckts of 400kV Fatehgarh-IV PS - Barmer-I PS at Barmer-II PS	Line Length ~ 20 km (LILO length ~ 20 km) • 400 kV line bays-4 nos. (at Barmer-II PS end)
3	400kV Barmer-II PS - Barmer-I PS D/c line (Quad)	Line Length – (~30 km) • 400 kV line bays at Barmer-II PS – 2 nos. • 400 kV line bays at Barmer-I PS S/s – 2 nos.
4	Establishment of 2 nos. 3000 MW (Bipole configuration), ± 800 kV Barmer-II (HVDC) [LCC] terminal station (2x1500 MW) at a suitable location near Barmer-II substation	HVDC terminal station (± 800 kV, 3000 MW (Bipole configuration)- 2nos.) ➢ 400/33 kV, 2x50 MVA transformers for exclusively supplying auxiliary power to HVDC terminal. ➢ 400kV bus sectionaliser -2 nos. (1 Set) at Barmer-II (HVDC) station
5	Establishment of 2 nos. 3000 MW (Bipole configuration), ± 800kV South Kalamb S/s (HVDC) [LCC] terminal station (2x1500 MW) at a suitable location near South of Kalamb	HVDC terminal station (± 800 kV, 3000 MW (Bipole configuration)- 2nos.) ➢ 400kV bus sectionaliser -2 nos. (1 Set) at South Kallamb (HVDC) station

Sl. No.	Description of Transmission Element	Scope of work (Type of Substation/Conductor capacity/km/no. of bays etc.)
6	±800 kV HVDC Bipole line (Hexa lapwing) between Barmer-II (HVDC) & South Kalamb (HVDC) (with parallel Dedicated Metallic Return) (capable to evacuate 6000MW) (1100kms) [with 100% reactive power capability]	Line Length – (~1100 km)
7	Augmentation of South Kalamb S/s# by 4x1500MVA, 765/400kV ICTs (3 on 400kV & 765kV Section-II & 1 No. on 400kV & 765kV Section-I) along with 2x330 MVAR, 765 kV bus reactor & 2x125 MVAR, 420 kV bus reactor on Section-II which will be established under a different network expansion scheme in WR as per details given below * (2x1500 MW HVDC Bipole-I to be terminated on 400 kV Sec-I & 2x1500 MW HVDC Bipole-II to be terminated on 400 kV Sec-II of South Kalamb S/s & 765kV bus sectionalizer to be kept normally closed & 400kV bus sectionalizer to be kept normally open)	• 765/400 kV 1500 MVA ICTs- 4 nos. • 765 kV ICT bays- 4 no. • 400 kV ICT bays- 4 no • 330 MVAr Bus Reactor-2 nos. (at bus section-II) • 765 kV Bus reactor bays- 2 nos. (at bus section-II) • 125 MVAr Bus Reactor-2 nos. (at bus section-II) • 400 kV Bus reactor bays- 2 nos. (at bus section-II)
8	2 nos. of Syncon units at 400kV level of Barmer-II PS (1 no. of SynCon unit comprises dynamic support of +300MVAr/-150MVAr (Minimum) & Short circuit contribution at PCC of 1200MVA (Minimum) **** Value of inertia constant (H) shall be provided in RfP document.***	• Syncon units – 2 nos. • 400kv line bays – 2nos.

#South Kalamb S/s establishment with 2x1500 MVA, 765/400 kV ICTs with 2x330 MVAR, 765 kV bus reactor and 2x125 MVAR, 420 kV bus reactor alongwith LILO of Pune-III – Boisar-II 765 kV D/c line (presently under bidding stage).

**** Network Expansion Scheme: Creation of New 765kV & 400kV Bus Sections-II & III through 765 kV Sectionalization bay: 2 sets & 400 kV Sectionalization bay: 2 sets alongwith 2x330 MVAR, 765 kV bus reactor & 2x125 MVAR, 420 kV bus reactor on Section-III is being proposed along with ICT augmentation (3x1500MVA, 765/400kV ICTs) at Bus Section -III at both 765kV & 400kV levels alongwith downstream 400kV lines at bus section-III from South Kalamb S/s with implementation timeframe of 24 months from effective date. [400kV Sectionaliser between Sections-I & II & between sections-II & III to be normally open. Further, 765kV sectionaliser between Sections-I & II & between II & III shall be kept normally closed. The 400kV sectionalisers can be closed under contingency conditions.].***

B. Alternative-2: VSC Configuration

Sl. No.	Description of Transmission Element	Scope of work (Type of Substation/Conductor capacity/km/no. of bays etc.)
1	Establishment of 400/220kV, 6x500MVA S/s at suitable location near Barmer (Barmer-II Substation) along with 2x125 MVAr bus reactor **<u>Future provisions (excl. scope of present scheme):</u>** ➢ 400 kV line bays along with switchable line reactor –6 ➢ 400 kV line bays –4 nos. ➢ 400 kV Bus Reactor along with bays: 1 no. ➢ 400/220 kV ICT along with bays-4 Nos. ➢ 400 kV Sectionalization bays: 2 sets ➢ 220 kV line bays for connectivity of RE Applications -5 Nos. ➢ 220kV Sectionalization bay: 2 sets ➢ 220 kV BC (2 Nos.) & TBC (2 Nos.) ➢ 2 nos. of Syncon units* at 400kV level along with 2 nos. of 400kV bays ➢ STATCOM (2x+300 MVAr, 4x125 MVAr MSC, 2x125 MVAr MSR) along with 400 kV bays (2 Nos.) ***1 no. of SynCon unit comprises dynamic support of +300MVAr/-150MVAr (Minimum) & Short circuit contribution at PCC of 1200MVA (Minimum). Value of inertia constant (H) shall be provided in RfP document***	Barmer-II PS - AIS • 400/220 kV 500 MVA ICTs- 6 nos. • 400 kV ICT bays- 6 no. • 220 kV ICT bays- 6 no. • 125 MVAr Bus Reactor-2 nos. • 400 kV Bus reactor bays- 2 no. • 400kv line bays– 4 nos. (for RE interconnection) • 220KV line bays – 7 nos. (for RE connectivity) • 220kV Sectionalization bay: 1 set • 220 kV BC (2 Nos.) & TBC (2 Nos.)
2	LILO of both ckts of 400kV Fatehgarh-IV PS - Barmer-I PS at Barmer-II PS	Line Length ~ 20 km (LILO length ~ 20 km) • 400 kV line bays-4 nos. (at Barmer-II PS end)
3	Establishment of 2 nos. 3000 MW (Double Bipole configuration), ±600kV Barmer-II (HVDC) [VSC] terminal station (2x1500 MW) at a suitable location near Barmer-II substation	HVDC terminal station (± 600 kV, 3000 MW (Double Bipole configuration)- 2nos.) ➢ 400/33 kV, 2x50 MVA transformers for exclusively supplying auxiliary power to HVDC terminal. ➢ 400kV bus sectionaliser -2 nos. (1 Set) at Barmer-II (HVDC) station
4	Establishment of 2 nos. 3000 MW (Double Bipole configuration), ± 600kV South Kalamb S/s (HVDC) [VSC] terminal station (2x1500 MW) at a suitable location near South of Kalamb	HVDC terminal station (± 600 kV, 3000 MW (Double Bipole configuration)- 2nos.)
5	±600 kV HVDC Double Bipole line (2xD/c) (Quad Lapwing on same tower) between Barmer-II (HVDC) & South Kalamb (HVDC) (with parallel Dedicated Metallic Return) (capable to evacuate 6000MW) (1100kms) [with 100% reactive power capability]	Line Length – (~1100 km)

Sl. No.	Description of Transmission Element	Scope of work (Type of Substation/Conductor capacity/km/no. of bays etc.)
6	Augmentation of South Kalamb S/s[#] by 4x1500MVA, 765/400kV ICTs (3 on 400kV & 765kV Section-II & 1 No. on 400kV & 765kV Section-I) along with 2x330 MVAR, 765 kV bus reactor & 2x125 MVAR, 420 kV bus reactor on Section-II which will be established under a different network expansion scheme in WR as per details given below* (2x1500 MW HVDC Bipole-I to be terminated on 400 kV Sec-I & 2x1500 MW HVDC Bipole-II to be terminated on 400 kV Sec-II of South Kalamb S/s & 765kV bus sectionalizer to be kept normally closed & 400kV bus sectionalizer to be kept normally open)	• 765/400 kV 1500 MVA ICTs- 4 nos. • 765 kV ICT bays- 4 no. • 400 kV ICT bays- 4 no • 330 MVAr Bus Reactor-2 nos. (at bus section-II) • 765 kV Bus reactor bays- 2 nos. (at bus section-II) • 125 MVAr Bus Reactor-2 nos. (at bus section-II) • 400 kV Bus reactor bays- 2 nos. (at bus section-II)

#South Kalamb S/s establishment with 2x1500 MVA, 765/400 kV ICTs with 2x330 MVAR, 765 kV bus reactor and 2x125 MVAR, 420 kV bus reactor alongwith LILO of Pune-III – Boisar-II 765 kV D/c line is presently under bidding stage).

**** Network Expansion Scheme: Creation of New 765kV & 400kV Bus Sections-II & III through 765 kV Sectionalization bay: 2 sets & 400 kV Sectionalization bay: 2 sets alongwith 2x330 MVAR, 765 kV bus reactor & 2x125 MVAR, 420 kV bus reactor on Section-III is being proposed along with ICT augmentation (3x1500MVA, 765/400kV ICTs) at Bus Section -III at both 765kV & 400kV levels alongwith downstream 400kV lines at bus section-III from South Kalamb S/s with implementation timeframe of 24 months from effective date. [400kV Sectionaliser between Sections-I & II & between sections-II & III to be normally open. Further, 765kV sectionaliser between Sections-I & II & between II & III shall be kept normally closed. The 400kV sectionalisers can be closed under contingency conditions.]***

Annexure-III

~~Annexure-IB~~

Downstream lines planned from South Kalamb S/s

Sl. No.	Description of Transmission Element	Scope of work (Type of Substation/Conductor capacity/km/no. of bays etc.)
Part A		
1	• Creation of New 765kV Bus Section-III & 400kV Bus Section-III through 765 kV Sectionalization bay: 1 set & 400 kV Sectionalization bay: 1 set alongwith 2x330 MVAR, 765 kV bus reactor & 2x125 MVAR, 420 kV bus reactor on Section-III. 400kV Sectionaliser between Sections-II & III to be kept normally open and 765kV sectionaliser between Sections-II & III shall be kept normally closed. The 400kV sectionaliser can be closed under contingency conditions. • Installation of 3x1500MVA, 765/400kV ICTs at South Kalamb S/s (400kV Sec-III & 765kV Section-III)	• 765/400 kV 1500 MVA ICTs- 3 nos. • 765 kV ICT bays- 3 no. (at bus section-III) • 400 kV ICT bays- 3 no (at bus section-III) • 330 MVAr Bus Reactor-2 nos. (at bus section-III) • 765 kV Bus reactor bays- 2 nos. (at bus section-III) • 125 MVAr Bus Reactor-2 nos. (at bus section-III) • 400 kV Bus reactor bays- 2 nos. (at bus section-III) • 765 kV Sectionalization bay: 1 set • 400 kV Sectionalization bay: 1 set
2	LILO of Nagothane – Padghe 400kV D/c line at South Kalamb	LILO route length~10km.
3	LILO of Pune(AIS) – Navi Mumbai 400kV line at South Kalamb	LILO route length~10km.
4	LILO of Pune(AIS) – Vikhroli 400kV line at South Kalamb	LILO route length~10km.
Part-B (Refer Note-2):		
5	Reconductoring of the balance line section of Pune(AIS) – Vikhroli 400kV line (upto LILO point of LILO of Lonikand-Kalwa 400kV line at Pune(AIS)) of Western Transco Power Ltd. (a subsidiary of AESL) with conductor having capacity of 2100MVA per ckt at nominal voltage*	1.707 km. reconductoring (under ownership of WTPL)
6	Upgradation of 400kV bay at Pune(AIS) of POWERGRID (associated with Pune(AIS) – Vikhroli 400kV line) of Western Transco Power Ltd. (a subsidiary of AESL) commensurate with the reconductoring capacity of 2100MVA per ckt at nominal voltage	Upgradation of the Complete Dia 6 (Vikroli Line Main Bay, Tie Bay & 315 MVA ICT3 Main Bay) to be carried out (as informed by POWERGRID)

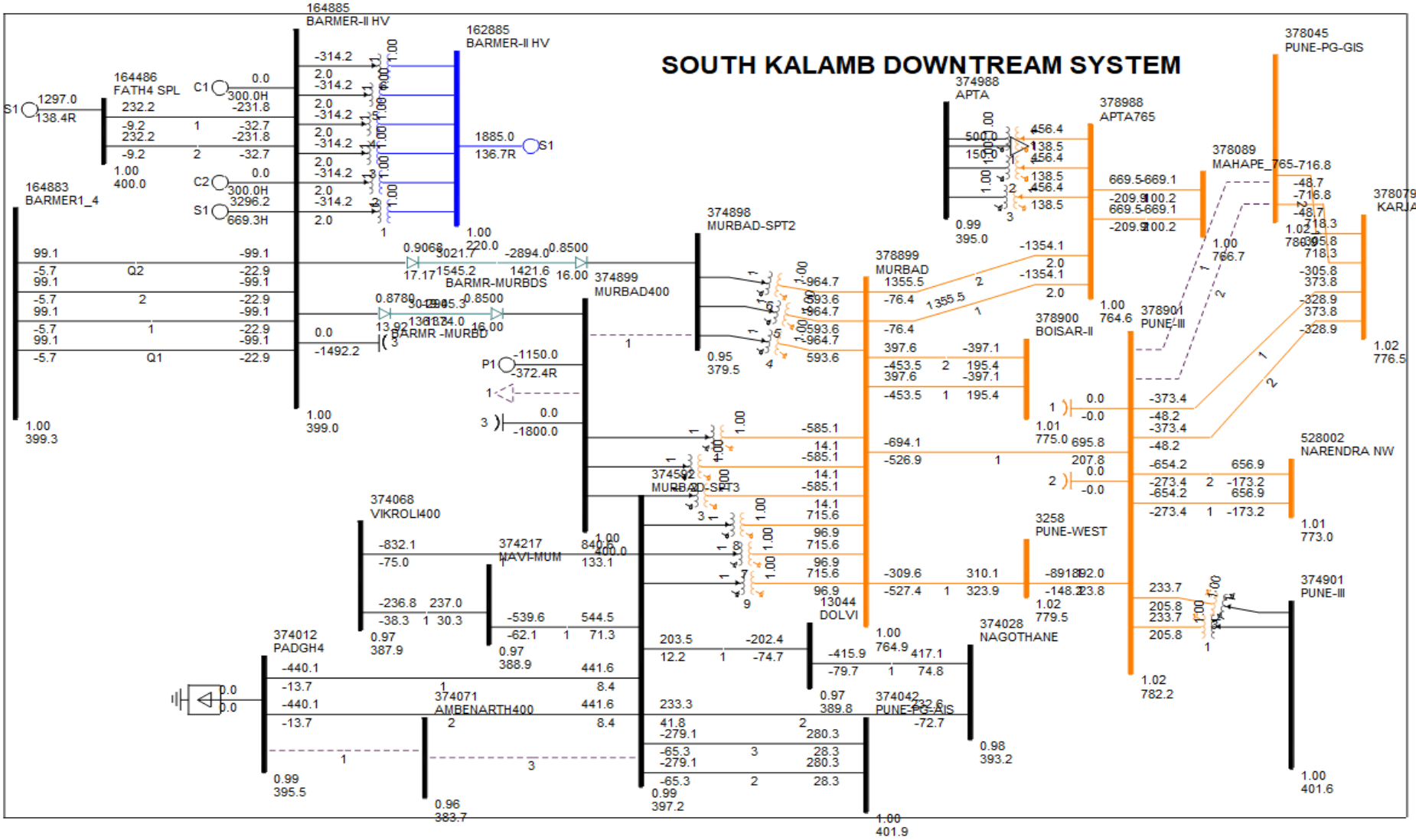
**MSETCL shall reconductor the balance line portion from above LILO point upto Kalwa with conductor having capacity of 2100MVA per ckt at nominal voltage*

Note:

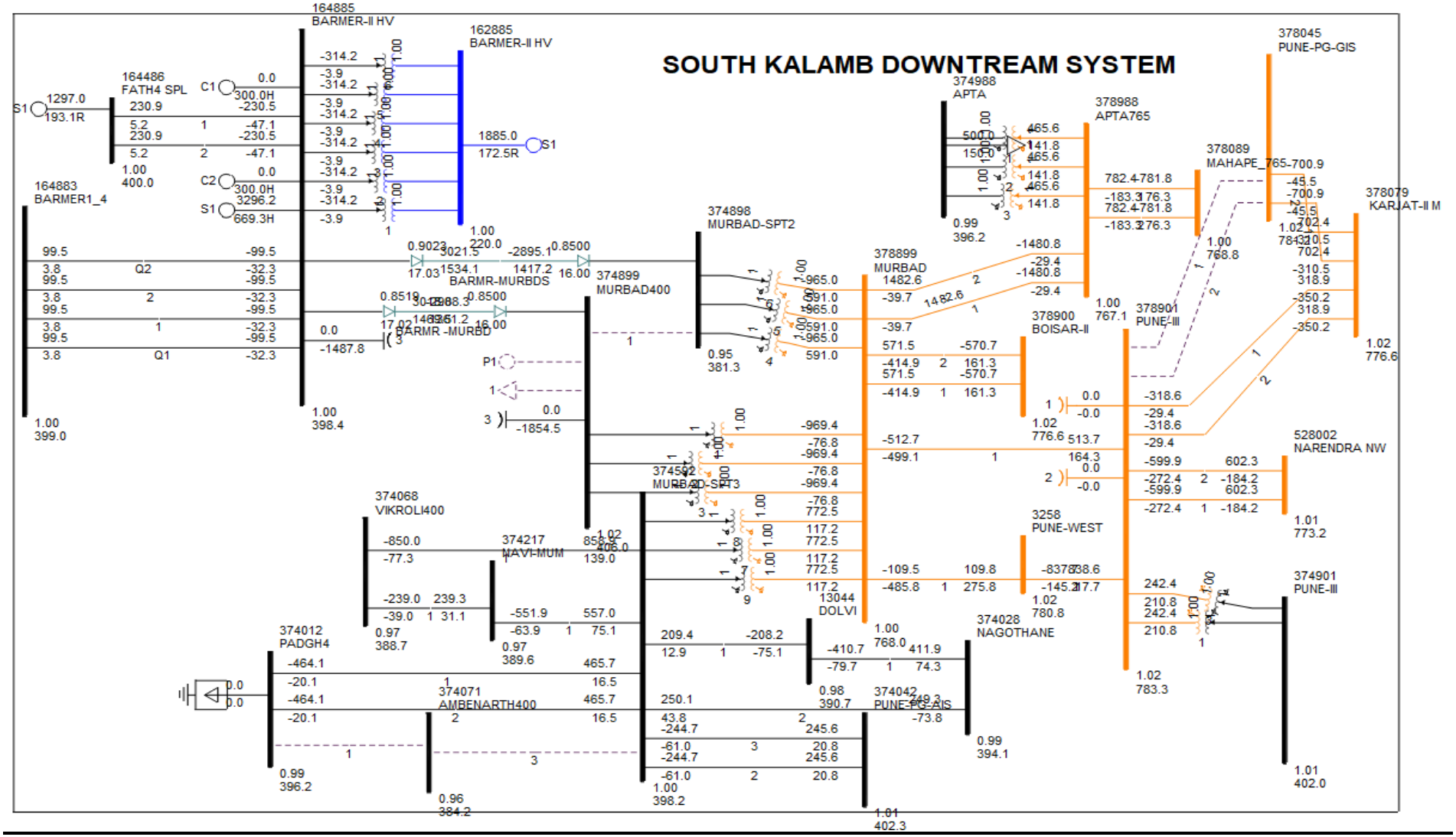
1. As informed by MSETCL, LILO of Pune(AIS) – Kalwa 400kV line at Vikhroli has already been implemented by Kharghar Vikhroli Transmission Limited (under In-STS TBCB) with high capacity conductor.

2. As decided in the 26th NCT meeting held on 06.01.2025, all the reconductoring proposals will be deliberated in NCT along with cost breakup of Reconductoring portion and the developer who is awarded the scheme under RTM shall approach the appropriate commission in terms of the existing provisions of the regulations.

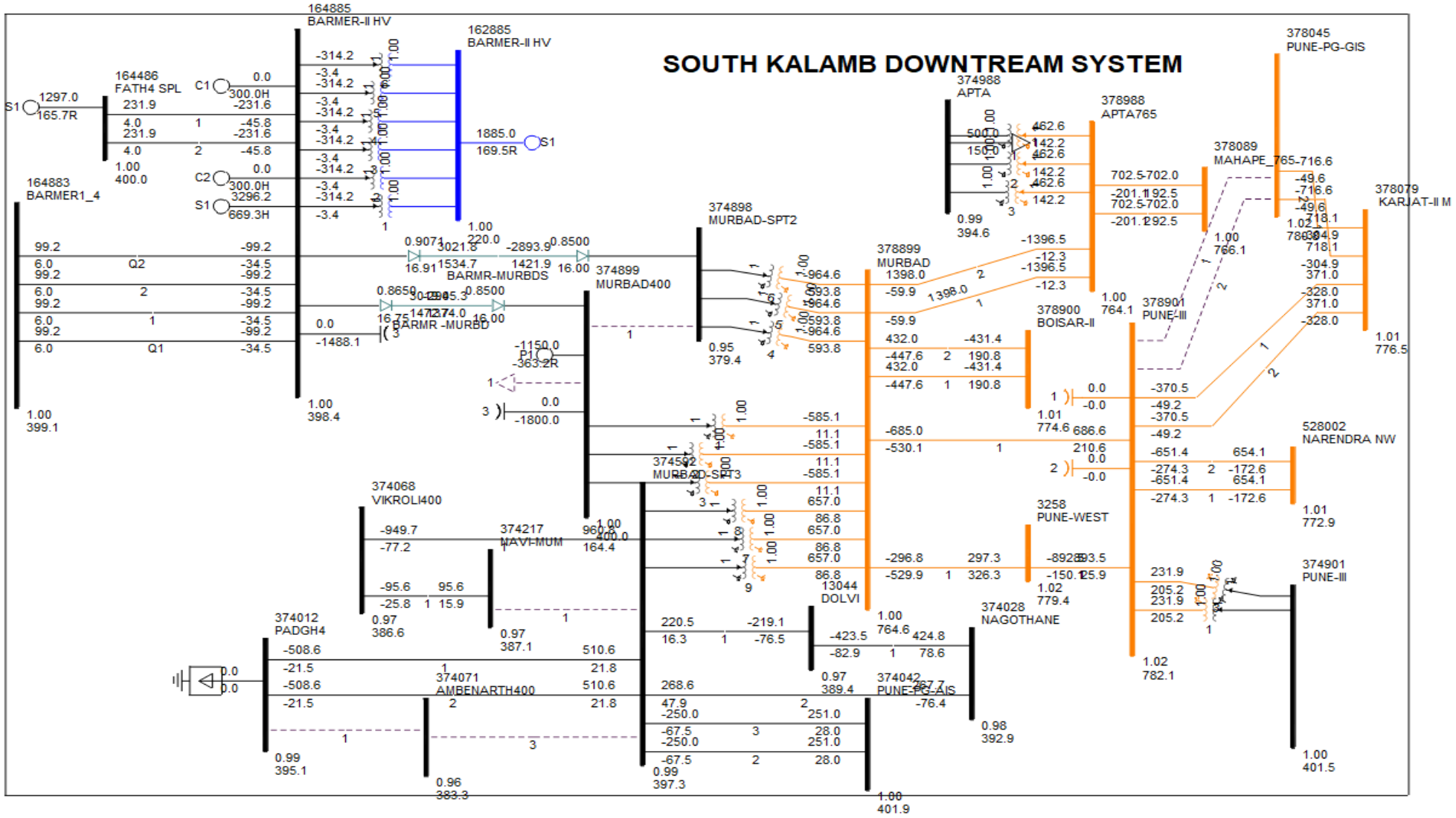
BASE CASE POWER FLOW



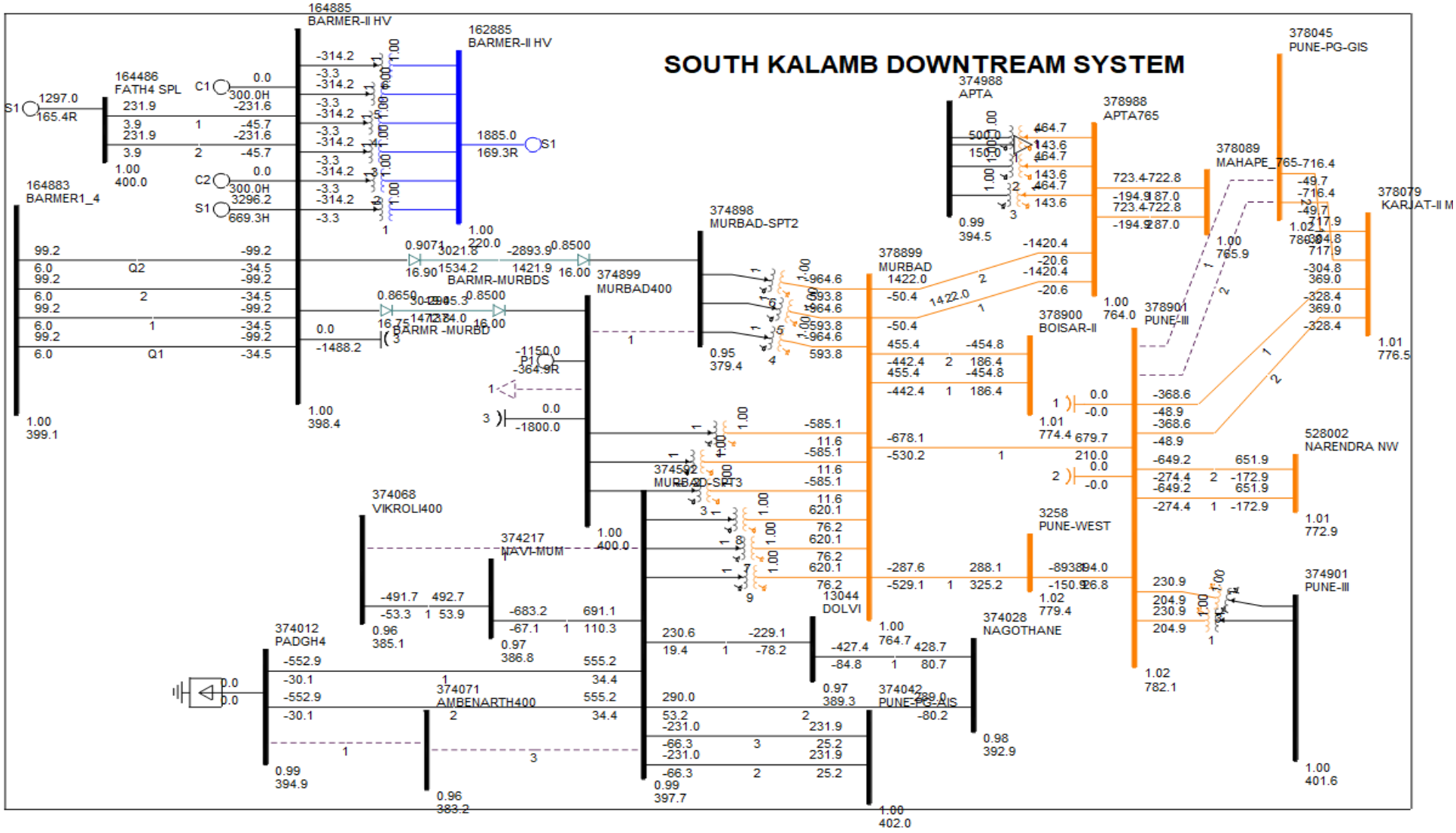
POWER FLOW WITH 1150MW PSP UNDER OUTAGE MODE



POWER FLOW WITH NAVI MUMBAI – SOUTH KALAMB 400kV LINE UNDER OUTAGE MODE



POWER FLOW WITH VIKHROLI – SOUTH KALAMB 400kV LINE UNDER OUTAGE MODE



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: CTU/N/00/CMETS_NR/36 **Date:** 24-02-2025

As per distribution list

Subject: 36th Consultation Meeting for Evolving Transmission Schemes in Northern Region-Minutes of Meeting

Dear Sir/Ma'am,

Please find enclosed the minutes of the 36th Consultation Meeting for Evolving Transmission Schemes in Northern Region held on 15th January 2025 (Wednesday) through virtual mode.

The minutes are also available at CTU website (www.ctuil.in)

Thanking you,

Yours faithfully,

(Partha Sarathi Das)
Sr. General Manager (CTU)

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Minutes of Meeting for 36th Consultation Meeting for Evolving Transmission Schemes in Northern Region held on 15.01.2025

A. Confirmation of minutes of 35th Consultation Meeting for Evolving Transmission Schemes (CMETS) in Northern Region held on 29.10.2024

The 36th Consultation Meeting for Evolving Transmission Schemes in Northern Region (CMETS-NR) was held through VC on 15/01/2025. List of participants is enclosed at **Annexure-A.**

It was informed that minutes of the 35th CMETS-NR meeting were circulated vide CTU letter dated 14.11.2024. No comments were received; accordingly, minutes is confirmed as circulated.

B. Dedicated Transmission System (Under Applicant Scope) of connectivity granted to M/s Vismaya Five Renewables Pvt. Ltd. (App. No. 2200000954) at Barmer-II PS

It was informed that in 35th CMETS-NR meeting held on 29.10.2024, 250MW connectivity was agreed to be granted to M/s Vismaya Five Renewables Pvt. Ltd. (App. No. 2200000954) at Barmer-II PS through 220kV S/c line from generation project. Further, another 50MW connectivity was also agreed to be granted to M/s Vismaya Five Renewables Pvt. Ltd. (App. No. 2200001285) at Barmer-II PS through 220kV S/c line from common pooling station of both RE Projects. Subsequently, M/s Vismaya vide letter dated 03.12.2024 requested to grant connectivity to both applications at Barmer-II PS through 220kV S/c line from common pooling station of both projects. It was also informed that based on the above request, intimations for in-principle grant of connectivity were issued to M/s Vismaya five (App no. 2200000954). Same was noted.

C. Change in common transmission scheme for connectivity of M/s Solarcraft Power (300MW) & M/s Sunsure solar park (300MW)

It was informed that in 25th CMETS-NR meeting, transmission scheme for evacuation of power from Bikaner-IV PS as part of Rajasthan REZ Ph-IV (Part-3) [Bikaner IV :3.6GW] was agreed. Subsequently, in-principal intimation of M/s Solarcraft Power (300MW) & M/s Sunsure solarpark (300MW) was issued on 13.12.23 for connectivity at Bikaner-IV PS.

It was also informed that the scheme was modified and comprehensive scheme for “Transmission system for evacuation of power from Rajasthan REZ Ph-IV (Part-3: 6 GW) [Bikaner complex]” was agreed in 27th CMETS-NR meeting held on 28.01.24. The scheme is recently awarded and under implementation with commissioning schedule of Nov’26.

Accordingly, it was agreed that transmission system for connectivity under GNA shall be modified as part of final intimation which will be issued shortly to M/s Solarcraft Power (300MW) & M/s Sunsure solarpark (300MW) as per the final scheme approved i.e. Transmission system for evacuation of power from Rajasthan REZ Ph-IV (Part-3: 6 GW) [Bikaner complex]. Applicant has enquired that whether there will be any change SCOD date. CTUIL has clarified that there will not be any change in SCOD date & only transmission system for connectivity under GNA is being revised in the final intimation. Same was noted.

D. Change in common transmission scheme for connectivity of M/s NTPC Renewable Energy Limited

It was informed that M/s NTPC Renewable Energy Limited has been grated connectivity at Bikaner-IV PS against their five(5) numbers connectivity applications(2200000244-150MW, 2200000308-700MW, 2200000373-400MW, 2200000358-250MW, 2200000420-400MW) through 400kV D/c line. Out of these, connectivity App no. 2200000420 (400MW) has been granted with following system for dedicated transmission line :

- Common pooling station for NTPC Renewable Energy Limited Solar Power Projects (App No. 2200000244 (150 MW), 2200000308 (700 MW), 2200000373 (400 MW), 2200000358 (250 MW) & 2200000420 (400 MW) – Bikaner-IV PS 400 kV D/c line (Suitable to carry minimum 950 MW per circuit at nominal voltage)

In this regard, it is informed that system for dedicated transmission line for above application of M/s NTPC Renewable Energy Limited (2200000420) has been revised in the that final connectivity intimation as below for better clarity:

- Common pooling station for NTPC Renewable Energy Limited RE Power Projects (App No. 2200000244 (150 MW), 2200000308 (700 MW), 2200000373 (400 MW), 2200000358 (250 MW) & 2200000420 (400 MW) – Bikaner-IV PS 400 kV D/c line (Suitable to carry minimum 950 MW per circuit at nominal voltage) – under applicant scope

  Connectivity of 400 MW (App No. 2200000420) to NTPCREL is granted in sharing with App. No. 2200000308(700 MW) & 2200000373(400 MW) through same bays and common DTL.

Same was noted.

E. Dedicated Transmission System (Under Applicant Scope) of connectivity granted to Avaada Waterbattery Private Limited (AWPL) (App. No. 2200000553) for its Pumped Storage Plant in Sonbhadra distt, Uttar Pradesh

In 31st CMETS-NR meeting held on 27.06.2024, 1120 MW connectivity was agreed to be granted to Avaada Waterbattery Private Limited (AWPL) (App. No. 2200000553) at Robertsganj PS through 400kV D/c line from generation project. Further, another 596 MW connectivity was also agreed to be granted to M/s AWPL (App. No. 2200001086) at Robertsganj PS through 400kV D/c line from common pooling station of both PSPs. Based on the above, connectivity was granted to M/s AWPL (App no. 2200001086) at Robertsganj PS through 400kV D/c line from common pooling station of both PSPs. Accordingly, DTL for M/s AWPL (App. No. 2200000553) may also considered in line with M/s AWPL (App. No. 2200001086). Same shall be incorporated in intimation also. Same was noted.

F. Application related matters in Northern Region

F1. Applications for Connectivity to ISTS under CERC (Connectivity and General Network Access to the inter-State Transmission System) Regulations, 2022 received in Sep'24

It was informed that M/s TEQ Green Power IX Pvt. Ltd. had applied for grant of 208.5MW (App no. 2200001300) connectivity at Barmer PS. M/s TEQ had also applied another application (App. No. 2200001136 : 120MW) for connectivity at Barmer PS. However, there was no sufficient margin available at

Barmer PS and Barmer-II PS. Accordingly, it was proposed to grant connectivity for combined capacity of 328.5 MW (208.5MW + 120MW) at Barmer-III PS through 220kV S/c line.

Subsequently, M/s TEQ Green decided to withdraw their earlier application of 120 MW (App. No. 2200001136). In view of this, it was decided that application for 208.5MW (App. No. 2200001300) shall be again discussed in the next CMETS NR meeting for grant. In line with decision of 35th CMETS-NR meeting, the following applications were discussed in meeting:

Sl. No.	Application ID	Applicant	Project Location	Submission Date	Nature of Applicant	Criterion for applying	Injection at ISTS point (MW)	Start Date of Connectivity (As per Application)	Connectivity location (As per Application)	Conn BGs requirement
1.	2200001300	TEQ Green Power IX Private Limited	Barmer distt., Rajasthan	30.09.2024	Generator (Solar)	LoA or PPA	208.5	15.06.2027	Barmer PS	• Conn BG1: Rs. 50 Lakh • Conn BG2: Rs. 3 Cr. • Conn BG3: Rs. 2 lakh/MW

It was informed that M/s TEQ Green Power IX Pvt. Ltd. has applied for 208.5MW connectivity at Barmer PS. However, there is no sufficient margin available at Barmer PS and Barmer-II PS. Accordingly, it was agreed to grant connectivity at Barmer-III PS at 220kV level through 220kV S/c line. Further another application of /s Unique Hytech (150MW) is also proposed to be granted in sharing with M/s TEQ in present meeting. M/s TEQ has been requested to confirm the tower configuration and bay scope at Barmer-III PS. M/s TEQ Green Power IX Pvt. Ltd. has confirmed that tower configuration shall be S/c line on D/c towers and requested to include scope of bay under ISTS.

It was also informed that the transmission system for evacuation of power from Barmer-III is presently under evolution. Upon evolution, the scheme shall be discussed in a separate joint study meeting among CEA, CTUIL, Grid India & Stakeholders followed by the subsequent CMETS meeting. The detailed transmission system shall be informed upon finalization and approval of the scheme.

M/s TEQ has requested Start Date of Connectivity under GNA from 15.06.2027. Considering the same and expected commissioning date of transmission system (i.e. 30.09.2030), it was agreed that the start date of Connectivity under GNA shall be 30.09.2030 (interim). Details of Transmission system for connectivity of M/s TEQ under GNA is as below:

Details of Transmission system for Connectivity under GNA:

A. **Associated Transmission System (ATS):** NIL

B. **Transmission System under applicant scope:**

- M/s TEQ Green Power IX Ltd. RE Power Project – Barmer-III PS 220 kV S/c line on D/c tower (suitable to carry minimum 358.5 MW at nominal voltage)

C. <u>Transmission system for Connectivity under GNA</u>: As per **Annexure-I**

Start Date of Connectivity under GNA: 30.09.2030 (Interim). Final date shall be confirmed upon award of the system.

F2. Applications for Connectivity to ISTS under CERC (Connectivity and General Network Access to the inter-State Transmission System) Regulations, 2022 received in Oct'24

It was informed that following applications for grant of connectivity have been received in the month of Oct'24:

Sl. No.	Application ID	Applicant	Project Location	Submission Date	Nature of Applicant	Criterion for applying	Injection at ISTS point (MW)	Start Date of Connectivity (As per Application)	Connectivity location (As per Application)
1.	2200001326	Avaada Rjbikaner Private Limited	Bikaner distt., Rajasthan	03.10.2024	Generator (Solar)	Land Route	940	31.12.2026	Bikaner-V PS
2.	2200001316	Avaada Rjsustainable Private Limited	Bikaner distt., Rajasthan	04.10.2024	Generator (Solar)	Land Route	660	31.12.2026	Bhadla-IV PS
3.	2200001353	Avaada Energy Private Limited	Bikaner distt., Rajasthan	14.10.2024	Generator (Solar)	NHPC LOA	350	31.03.2027	Bikaner-V PS
4.	2200001352	Avaada Energy Private Limited	Barmer distt., Rajasthan	14.10.2024	Generator (Solar)	NHPC LOA	750	31.03.2027	Barmer-II PS
5.	2200001366	Acme Gamma Urja Private Limited	Barmer distt., Rajasthan	18.10.2024	Generator (Solar)	Land Route	350	31.12.2026	Barmer-I PS
6.	2200001382	Junachay Wind Energy Private Limited	Jaisalmer distt., Rajasthan	22.10.2024	Generator (Wind)	Land BG Route	100	01.04.2027	Ramgarh PS

Sl. No.	Application ID	Applicant	Project Location	Submission Date	Nature of Applicant	Criterion for applying	Injection at ISTS point (MW)	Start Date of Connectivity (As per Application)	Connectivity location (As per Application)
7.	2200001391	Dharvi Kalan Wind Energy Private Limited	Jaisalmer distt., Rajasthan	22.10.2024	Generator (Wind)	Land BG Route	100	01.04.2027	Ramgarh PS
8.	2200001390	Dangri Wind Energy Private Limited	Jaisalmer distt., Rajasthan	22.10.2024	Generator (Wind)	Land BG Route	100	01.04.2027	Ramgarh PS
9.	2200001372	Rohat Solar Park Private Limited	Barmer distt., Rajasthan	23.10.2024	Renewable Power Park developer (Solar)	Land Route	350	31.12.2027	Barmer-III PS
10.	2200001396	Hexa Climate Solutions Private Limited	Jodhpur distt., Rajasthan	24.10.2024	Generating station(s), including REGS(s), with ESS (Solar)	Land BG Route	50	31.10.2026	Fatehgarh-III PS
11.	2200001398	Enren-IV Energy Private Limited	Barmer distt., Rajasthan	24.10.2024	Generator (Solar)	Land BG Route	300	30.08.2027	Barmer-III PS
12.	2200001404	Aright Foods And Energy Private Limited	Bikaner distt., Rajasthan	25.10.2024	Renewable Power Park developer (Solar)	Land Route	2000	30.09.2027	Bhadla-III PS
13.	2200001407	Unique Hytech Renewable Energy Private Limited	Jaisalmer, Barmer distt., Rajasthan	26.10.2024	Generator (Wind)	Land Route	150	31.10.2029	Barmer-III PS
14.	2200001417	Sprng Green Energy 4 Private Limited	Bikaner distt., Rajasthan	29.10.2024	Generator (Solar)	Land BG Route	400	30.06.2029	Bhadla-IV PS

Sl. No.	Application ID	Applicant	Project Location	Submission Date	Nature of Applicant	Criterion for applying	Injection at ISTS point (MW)	Start Date of Connectivity (As per Application)	Connectivity location (As per Application)
15.	2200001420	Azure Power Fifty One Private Limited	Jodhpur distt., Rajasthan	30.10.2024	Generator (Solar)	Land Route	600	31.12.2029	Bhadla-IV PS
16.	2200001422	Avaada Energy Private Limited	Barmer distt., Rajasthan	30.10.2024	Generating station(s), including REGS(s), with ESS (Solar)	SJVN LOA	800	30.06.2027	Barmer-II PS

Sl. No.	Application ID	Applicant	Project Location	Submission Date	Nature of Applicant	Criterion for applying	Injection at ISTS point (MW)	Start Date of Connectivity (As per Application)	Connectivity location (As per Application)	Conn BGs requirement
1.	2200001326	Avaada Rjbikaner Private Limited	Bikaner distt., Rajasthan	03.10.2024	Generator (Solar)	Land Route	940 (reduced to 354MW)	31.12.2026	Bikaner-V PS	• Conn BG1: Rs. 50 Lakh • Conn BG2: Rs 3 Cr Conn BG3: Rs. 2 lakh/MW
It was informed that the M/s Avaada Rjbikaner Pvt. Ltd. (ARJBPL) has applied for 940MW connectivity at Bikaner-V PS. At present, 5126 MW connectivity is already granted at Bikaner-V PS. Further, considering the margins of 284 MW available in already granted bays (Iraax: 50 MW, Avaada/SA Renewables: 64 MW & Juniper: 170 MW), total connectivity quantum at Bikaner-V PS will be 5410MW. As Bikaner-V PS is being planned for 6000 MW, margin of only 590MW quantum is available at Bikaner-V PS excl. enhancement margin of 284MW as indicated above.										

Accordingly, it was informed that M/s ARJBPL can only be granted connectivity at Bikaner-VI PS for the present application of 940MW. M/s Avaada informed that they have another application of 350MW (App no. 2200001353) in subsequent section which is proposed to be grant at Bikaner-V PS which is agreeable to them. Further, they wish to avail balance margin available at Bikaner-V PS after grant of 350MW (App no. 2200001353) by reducing their application quantum of app no. 2200001326 from 940MW.

Considering proposed grant of M/s Avaada for 350MW (App no. 2200001353), margin of only 240MW (590MW-350MW) is available at Bikaner-V PS excl. enhancement margin of 284MW as indicated above. M/s Avaada requested to review the available margin out of enhancement margin. Based on request of M/s Avaada and deliberations in the meeting, 50MW margin in M/s Iraax bay and 64MW margin in Avaada/SA bay was decided to be released as these bays are utilized near the optimal limits, however 170MW margin in granted bay of M/s Juniper (130MW) could not be released due to sub optimal utilization of 220kV bay. Accordingly, total 354MW (240+50+64) margin available was offered for fresh connectivity excl. enhancement margin of 170MW (in Juniper bay)

M/s Avaada requested that they want to avail 354MW margin available at Bikaner-V PS by reducing application quantum of app no. 2200001326 from 940MW to 354MW. CTU informed that M/s Avaada may submit CEA installed capacity certificate for revised capacity. Accordingly, M/s ARJBPL vide mail dated 22/01/2024 confirmed to reduce the connectivity quantum to 354MW for their App no. 2200001326 along with revised CEA certificate.

It was informed that M/s Avaada have another connectivity granted of 136MW (App no. 2200000561) at Bikaner-V PS in sharing with the M/s SA Renewable Infra Pvt limited (100MW). In order to optimize right of way requirement, CTUIL advised M/s Avaada to combine both the connectivity applications (2200000561:136MW & 2200001326: 354MW) together in terms of common PS with total 490MW connectivity through 220kV D/c line to save on two nos. S/c line on D/c tower to only D/c tower. In above case, M/s Avaada need not to sharing with M/s SA renewables as well. This will also optimally utilize the RoW at Bikaner-V PS. M/s ARJBPL agreed for the above proposal of common PS and informed that the bay shall be under ISTS scope (1 no bay associated with each project i.e. App no. 2200001326 & App no. 2200000561)

It was also informed that connectivity application of M/s SA renewable will be discussed in next CMETS-NR meeting for sharing of its connectivity with other RE projects in Bikaner-V PS. M/s Avaada intimation for application (App no. 2200001326) will be issued after deliberation of M/s SA renewables sharing with other bays of Bikaner-V PS in next CMETS-NR meeting.

It may be noted that the transmission system for evacuation of power from Bikaner-V is presently under evolution. Upon evolution, the scheme shall be discussed in a separate joint study meeting among CEA, CTUIL, Grid India & Stakeholders followed by the subsequent CMETS meeting. The detailed transmission system shall be informed upon finalization and approval of the scheme.

M/s ARPL has requested Start Date of Connectivity under GNA from 31.12.2026. Considering the same and expected commissioning date of transmission system (i.e. 31.03.2030), the start date of Connectivity under GNA shall be 31.03.2030 (interim). Details of Transmission system for connectivity of M/s Avaada Rjbikaner Private Limited under GNA is as below:

Details of Transmission system for Connectivity under GNA:

A. **Associated Transmission System (ATS):** NIL

B. Transmission System under applicant scope:

i. Common Pooling station for Avaada RJBikaner Private Limited RE power project (App. No. 2200000561- 136 MW & App. No. 2200001326-354 MW) – Bikaner-V PS 220 kV D/c line (suitable to carry minimum 300 MW per circuit at nominal voltage)

C. Transmission system for Connectivity under GNA: As per **Annexure-IV**

Start Date of Connectivity under GNA: 31.03.2030 (Interim). Final date shall be confirmed upon award of the system.

2.	2200001316	Avaada Rjsustainable Private Limited	Bikaner distt., Rajasthan	04.10.2024	Generator (Solar)	Land Route	660	31.12.2026	Bhadla-IV PS	• Conn BG1: Rs. 50 Lakh • Conn BG2: Nil (bay in sharing) • Conn BG3: Rs. 2 lakh/MW

It was informed that the M/s Avaada RjSustainable Pvt. Ltd. (ARPL) has applied for 660MW connectivity at Bhadla-IV PS. At present 3165MW connectivity is already granted at Bhadla-IV PS. In 34th CMETS-NR meeting held on 20.09.2024, M/s Avaada was granted connectivity of 700MW quantum at Bhadla-IV PS. M/s Avaada requested to provide connectivity of their earlier granted application (App No. 2200001085 :700 MW) with this application through common pooling station on 400kv S/c line. CTU stated that 1360MW connectivity on 400kV S/c line may create voltage issues (in case of longer line) as well as outage of complete generation (1360MW) in case of contingency of line. Accordingly, it is suggested that connectivity may be provided on 400kV D/c line to improve resiliency. M/s Avaada insisted for connectivity through 400kV S/c line for combined capacity of 1360MW and agreed to take aforesaid risk indicated by CTUIL.

Accordingly, it was agreed to grant connectivity at Bhadla-IV PS at 400 kV level through 400 kV S/c line. M/s ARPL was requested to confirm the tower configuration and bay scope at Bhadla-IV PS. M/s ARPL has confirmed that they prefer 400kV S/c line on S/c Tower. CTUIL advised to adopt 400kV D/c tower instead of S/c tower to optimize the RoW. However, M/s ARPL has insisted for 400kV S/c line on S/c tower, however, they have confirmed that they will implement the D/c tower at substation entry for RoW corridor optimisation. Accordingly, it has been agreed to grant connectivity with 400kV S/c line on S/c tower with D/c tower at substation entry.

It was informed that the transmission system for evacuation of power from Bhadla-IV is presently under evolution. Upon evolution, the scheme shall be discussed in a separate joint study meeting among CEA, CTUIL, Grid India & Stakeholders followed by the subsequent CMETS meeting. The detailed transmission system shall be informed upon finalization and approval of the scheme.

M/s ARPL has requested Start Date of Connectivity under GNA from 31.12.2026. Considering the same and expected commissioning date of transmission system (i.e. 31.03.2030), the start date of Connectivity under GNA shall be 31.03.2030 (interim). Details of Transmission system for connectivity of M/s AEPL under GNA is as below:

Details of Transmission system for Connectivity under GNA:

A. Associated Transmission System (ATS): NIL

B. Transmission System under applicant scope:

i. Common Pooling station for Avaada Rjsustainable Private Limited RE Power Project(2200001316 - 660 MW) & M/s Avaada Energy Private Limited (2200001085 – 700 MW) – Bhadla-IV PS 400 kV S/c line (suitable to carry minimum 1360 MW at nominal voltage)

C. Transmission system for Connectivity under GNA: As per **Annexure-III**

Start Date of Connectivity under GNA: 31.03.2030 (Interim). Final date shall be confirmed upon award of the system.

3.	2200001353	Avaada Energy Private Limited	Bikaner distt., Rajasthan	14.10.2024	Generator (Solar)	NHPC LOA	350	31.03.2027	Bikaner-V PS	• Conn BG1: Rs. 50 Lakh • Conn BG2: Nil (bay in sharing) • Conn BG3: Rs. 2 lakh/MW

It was informed that the M/s Avaada Energy Pvt. Ltd. (AEPL) has applied for connectivity of 350MW at Bikaner-V PS. In 35th CMETS-NR meeting held on 29.10.24, M/s Avaada is already granted connectivity at 400 kV level of Bikaner-V PS for their 560 MW solar project (App No. -2200001254) through 400 kV S/c line. In the earlier CMETS-NR meeting M/s Avaada informed that considering their future projects coming up in same complex, they would like to obtain connectivity at 400 kV level for their 560 MW solar project.

Considering availability of margins at Bikaner-V PS, it was agreed to grant connectivity for the present application at Bikaner-V PS at 400 kV level through common pooling station in sharing with earlier granted application of M/s AEPL (App. No. 2200001254 (560 MW)). M/s Avaada informed that Avaada energy (App. No. 2200001254- 560 MW) will be the lead generator for above connectivity.

It may be noted that the transmission system for evacuation of power from Bikaner-V is presently under evolution. Upon evolution, the scheme shall be discussed in a separate joint study meeting among CEA, CTUIL, Grid India & Stakeholders followed by the subsequent CMETS meeting. The detailed transmission system shall be informed upon finalization and approval of the scheme.

M/s ARPL has requested Start Date of Connectivity under GNA from 31.03.2027. Considering the same and expected commissioning date of transmission system (i.e. 31.03.2030), the start date of Connectivity under GNA shall be 31.03.2030 (interim). Details of Transmission system for connectivity of M/s AEPL under GNA is as below:

Details of Transmission system for Connectivity under GNA:

A. **Associated Transmission System (ATS):** NIL

B. **Transmission System under applicant scope:**

   ii. Common Pooling station for Avaada Suryaenergy Private Limited Solar power project (App. No. 2200001254- 560 MW) & Avaada Energy Pvt. Ltd. RE Power Project (App. No. 2200001353- 350 MW) – Bikaner-V PS 400 kV S/c line on D/c tower (suitable to carry minimum 910 MW per circuit at nominal voltage)

C. **Transmission system for Connectivity under GNA**: As per **Annexure-IV**

Start Date of Connectivity under GNA: 31.03.2030 (Interim). Final date shall be confirmed upon award of the system.

With above grants of M/s Avaada (as per S.No. 1 & 3) , total connectivity quantum at Bikaner-V PS will be 5830MW. As Bikaner-V PS is being planned for 6000 MW, no margin is available at Bikaner-V PS for connectivity excl. enhancement margin of 170MW as indicated above. Hence Bikaner-V PS shall be closed for further grant of connectivity beyond 5830 MW excl. enhancement margin.

4.	2200001352	Avaada Energy Private Limited	Barmer distt., Rajasthan	14.10.2024	Generator (Solar)	NHPC LOA	750	31.03.2027	Barmer-II PS	• To be discussed

It was informed that M/s Avaada Energy Pvt. Ltd. (AEPL) has applied for 750MW connectivity at Barmer-II PS. However, there is no sufficient margin available at Barmer-II PS. Further one more application from M/s AEPL (App no.- 2200001422) for 800MW connectivity at Barmer-II PS is discussed in meeting in subsequent sections.

During the meeting, it was discussed that the proposed location of the generating station of M/s AEPL is very close to the GIB area. It appears that there is a significant transmission line length involved between the proposed solar plant and Barmer-II S/s to avoid infringement with the GIB zone. Accordingly, it was agreed that M/s AEPL will review their location of the generating station, and details of connectivity shall be discussed in the next CMETS-NR meeting.

5.	2200001366	Acme Gamma Urja Private Limited	Barmer distt., Rajasthan	18.10.2024	Generator (Solar)	Land Route	350	31.12.2026	Barmer-I PS	• Conn BG1: Rs. 50 Lakh • Conn BG2: Rs 3 Cr • Conn BG3: Rs. 2 lakh/MW

It was informed that M/s ACME Gamma Urja Pvt. Ltd. (AGUPL) has applied for 350MW connectivity at Barmer-I PS. However, there is no sufficient margin available at Barmer-I PS and Barmer-II PS. Accordingly, it was agreed to grant connectivity at Barmer-III PS at 220kV level through 220kV S/c line. M/s AGUPL confirmed that the tower configuration as S/c on D/c tower and requested for bay allocation under ISTS at Barmer-III PS.

It was also informed that the transmission system for evacuation of power from Barmer-III is presently under evolution. Upon evolution, the scheme shall be discussed in a separate joint study meeting among CEA, CTUIL, Grid India & Stakeholders followed by the subsequent CMETS meeting. The detailed transmission system shall be informed upon finalization and approval of the scheme.

M/s AGUPL has requested Start Date of Connectivity under GNA from 31.12.2026. Considering the same and expected commissioning date of transmission system (i.e. 30.09.2030), the start date of Connectivity under GNA shall be 30.09.2030 (interim). It was informed that details of Transmission system for connectivity of M/s AGUPL under GNA is as below:

Details of Transmission system for Connectivity under GNA:

A. Associated Transmission System (ATS) : NIL

B. Transmission System under applicant scope

i. Acme Gamma Urja Private Limited RE Power Project – Barmer-III PS 220 kV S/c line on D/c tower (suitable to carry minimum 350 MW at nominal voltage)

C. Transmission system for Connectivity under GNA: As per **Annexure-I**

Start Date of Connectivity under GNA: 30.09.2030 (Interim). Final date shall be confirmed upon award of the system.

6.	2200001382	Junachay Wind Energy Private Limited	Jaisalmer distt., Rajasthan	22.10.2024	Generator (Wind)	Land BG Route	100	01.04.2027	Ramgarh PS	• Conn BG1: Rs. 50 Lakh • Conn BG2: Rs 3 Cr. • Conn BG3: Rs. 2 lakh/MW

It was informed that M/s Junachay Wind Energy Pvt. Ltd. (JWEPL) has applied for 100MW connectivity at Ramgarh PS. However, there is no sufficient margin available at Ramgarh PS. Further, it is also to mention that M/s JWEPL has also submitted copy of sharing agreement signed among M/s JWEPL (2200001382), M/s Dangri (2200001390-100MW) and M/s Dharvi Kalan (2200001391 – 100MW) in which M/s Junachay shall act as lead generator on behalf of them to undertake all commercial responsibilities. Applications by M/s Dangri and M/s Dharvi were discussed in the meeting. It was agreed to grant connectivity at Ramgarh-II PS at 220 kV level through 220 kV S/c line. M/s JWEPL confirmed that tower configuration at Ramgarh-II PS shall be S/C line on D/c tower & they have requested for allocation of ISTS bay.

It may be noted that the transmission system for evacuation of power from Ramgarh-II is presently under evolution. Upon evolution, the scheme shall be discussed in a separate joint study meeting among CEA, CTUIL, Grid India & Stakeholders followed by the subsequent CMETS meeting. The detailed transmission system shall be informed upon finalization and approval of the scheme.

M/s JWEPL has requested Start Date of Connectivity under GNA from 01.04.2027. Considering the same and expected commissioning date of transmission system (i.e. 31.03.2030), the start date of Connectivity under GNA shall be 31.03.2030 (interim). Details of Transmission system for connectivity of M/s JWEPL under GNA is as below:

Details of Transmission system for Connectivity under GNA:

A. Associated Transmission System (ATS): NIL

B. Transmission System under applicant scope:

i. Junachay Wind Energy Pvt. Ltd. RE Power Project – Ramgarh-II PS 220 kV S/c line on D/c tower (suitable to carry minimum 300 MW at nominal voltage)

C. Transmission system for Connectivity under GNA: As per **Annexure-V**

Start Date of Connectivity under GNA: 31.03.2030 (Interim). Final date shall be confirmed upon award of the system.

7.	2200001391	Dharvi Kalan Wind Energy Private Limited	Jaisalmer distt., Rajasthan	22.10.2024	Generator (Wind)	Land BG Route	100	01.04.2027	Ramgarh PS	• Conn BG1: Rs. 50 Lakh • Conn BG2: Nil (Bay in sharing) • Conn BG3: Rs. 2 lakh/MW

It was informed that M/s Dharvi Kalan Wind Energy Pvt. Ltd. (DKWEPL) has applied for 100MW connectivity at Ramgarh PS. However, there is no sufficient margin available at Ramgarh PS. Further, as informed above, M/s JWEPL (2200001382) has also submitted copy of sharing agreement signed among M/s JWEPL(2200001382 – 100MW), M/s Dangri (2200001390 – 100MW) and M/s Dharvi Kalan (2200001391) in which M/s Junachay shall act as lead generator on behalf of them to undertake all commercial responsibilities. It was agreed to grant connectivity to M/s DKWEPL at Ramgarh-II PS at 220 kV in sharing with M/s JWEPL (App. No. 22000001382).

It was informed that the transmission system for evacuation of power from Ramgarh-II is presently under evolution. Upon evolution, the scheme shall be discussed in a separate joint study meeting among CEA, CTUIL, Grid India & Stakeholders followed by the subsequent CMETS meeting. The detailed transmission system shall be informed upon finalization and approval of the scheme.

M/s DKWEPL has requested Start Date of Connectivity under GNA from 01.04.2027. Considering the same and expected commissioning date of transmission system (i.e. 31.03.2030), the start date of Connectivity under GNA shall be 31.03.2030 (interim). Details of Transmission system for connectivity of M/s DKWEPL under GNA is as below:

Details of Transmission system for Connectivity under GNA:

A. Associated Transmission System (ATS): NIL

B. Transmission System under applicant scope:

i. Through sharing of dedicated transmission of M/s Junachay Wind Energy Pvt. Ltd. RE Power Project – Ramgarh-II PS 220 kV S/c line on D/c tower (suitable to carry minimum 300 MW at nominal voltage)
ii. Infrastructure required for sharing dedicated transmission system – under the scope of M/s Dharvi Kalan Wind Energy Pvt. Ltd.

C. Transmission system for Connectivity under GNA: As per **Annexure-V**

Start Date of Connectivity under GNA: 31.03.2030 (Interim). Final date shall be confirmed upon award of the system.

8	2200001390	Dangri Wind Energy Private Limited	Jaisalmer distt., Rajasthan	22.10.2024	Generator (Wind)	Land BG Route	100	01.04.2027	Ramgarh PS	• Conn BG1: Rs. 50 Lakh • Conn BG2: Nil (Bay in sharing) • Conn BG3: Rs. 2 lakh/MW

It was informed that M/s Dangri Wind Energy Pvt. Ltd. (DWEPL) has applied for 100MW connectivity at Ramgarh PS. However, there is no sufficient margin available at Ramgarh PS. Further, as informed above that M/s JWEPL (2200001382) has also submitted copy of sharing agreement signed among M/s JWEPL(2200001382 – 100MW), M/s Dangri (2200001390 – 100MW) and M/s Dharvi Kalan (2200001391) in which M/s Junachay shall act as lead generator on behalf of them to undertake all commercial responsibilities. It was agreed to grant connectivity to M/s DWEPL at Ramgarh-II PS at 220 kV in sharing with M/s JWEPL (App. No. 22000001382).

It may be noted that the transmission system for evacuation of power from Ramgarh-II is presently under evolution. Upon evolution, the scheme shall be discussed in a separate joint study meeting among CEA, CTUIL, Grid India & Stakeholders followed by the subsequent CMETS meeting. The detailed transmission system shall be informed upon finalization and approval of the scheme.

M/s DWEPL has requested Start Date of Connectivity under GNA from 01.04.2027. Considering the same and expected commissioning date of transmission system (i.e. 31.03.2030), the start date of Connectivity under GNA shall be 31.03.2030 (interim). Details of Transmission system for connectivity of M/s DWEPL under GNA is as below:

Details of Transmission system for Connectivity under GNA:

A. Associated Transmission System (ATS): NIL

B. Transmission System under applicant scope:

i. Through sharing of dedicated transmission of M/s Junachay Wind Energy Pvt. Ltd. RE Power Project – Ramgarh-II PS 220 kV S/c line on D/c tower (suitable to carry minimum 300 MW at nominal voltage)
ii. Infrastructure required for sharing dedicated transmission system – under the scope of M/s Dangri Wind Energy Pvt. Ltd.

C. Transmission system for Connectivity under GNA: As per **Annexure-V**

Start Date of Connectivity under GNA: 31.03.2030 (Interim). Final date shall be confirmed upon award of the system.

9	2200001372	Rohat Solar Park Private Limited	Barmer distt., Rajasthan	23.10.2024	Renewable Power Park developer (Solar)	Land Route	350	31.12.2027	Barmer-III PS	• Conn BG1: Rs. 50 Lakh • Conn BG2: Rs 3 Cr • Conn BG3: Rs. 2 lakh/MW

It was informed that M/s Rohat Solar Park Pvt. Ltd. (RSPPL) has applied for 350MW connectivity at Barmer-III PS. It was agreed to grant connectivity at Barmer-III PS at 220kV level through 220kV S/c line. It was informed that line length of the dedicated line of M/s RSPPL is about 90-95kms, therefore RPPD may optimize the line length. M/s RSPPL confirmed that the tower configuration for connectivity at Barmer-III PS shall be on S/c on S/c tower and requested to allocate bay under ISTS.

It was also informed that the transmission system for evacuation of power from Barmer-III is presently under evolution. Upon evolution, the scheme shall be discussed in a separate joint study meeting among CEA, CTUIL, Grid India & Stakeholders followed by the subsequent CMETS meeting. The detailed transmission system shall be informed upon finalization and approval of the scheme.

M/s RSPPL has requested Start Date of Connectivity under GNA from 31.12.2027. Considering the same and expected commissioning date of transmission system (i.e. 30.09.2030), the start date of Connectivity under GNA shall be 30.09.2030 (interim). Details of Transmission system for connectivity of M/s RSPPL under GNA is as below:

Details of Transmission system for Connectivity under GNA:

A. Associated Transmission System (ATS): NIL

B. Transmission System under applicant scope

i. Rohat Solar Park Pvt. Ltd. RE Power Park – Barmer-III PS 220 kV S/c line (suitable to carry minimum 350 MW at nominal voltage)

C. Transmission system for Connectivity under GNA: As per **Annexure-I**

Start Date of Connectivity under GNA: 30.09.2030 (Interim). Final date shall be confirmed upon award of the system.

10.	2200001396	Hexa Climate Solutions Private Limited	Jodhpur distt., Rajasthan	24.10.2024	Generating station(s), including REGS(s),	Land BG Route	50	31.10.2026	Fatehgarh-III PS	• Conn BG1: Rs. 50 Lakh

					with ESS (Solar)					• Conn BG2: NIL (Bay in sharing) • Conn BG3: Rs. 2 lakh/MW

It was informed that M/s Hexa Climate Solutions Pvt. Ltd. (HCSPL) has applied for 50MW connectivity at Fatehgarh-III PS. In this regard, it is informed that 50MW margin was earlier available at 220kV Fatehgarh-III PS (Section-II). Considering the connectivity quantum of 2110 MW at 220 kV level (Connectivity granted: 2060 MW, connectivity margin in Khaba Bay:50MW) at Fatehgarh-III PS(Sec-II), augmentation of 1x500 MVA, 400/220 kV ICT at Fatehgarh-III PS (6th ICT in Section-2) was required to meet N-1 compliance which was also agreed in the 34th CMETS-NR held on 20.09.2024.

POWERGRID vide mail 30.10.24 informed that space for additional 400/220KV ICT is not available at Fatehgarh-III S/s (Sec-II). In view of these developments, augmentation of 1x500 MVA, 400/220 kV ICT at Fatehgarh-III PS (6th ICT in Section-2) is not feasible.

Now, without space for ICT augmentation, no additional connectivity incl. 50 MW capacity can be accommodated in Fatehgarh-III PS (Sec-II). Further, there is no sufficient margin available at Fatehgarh-IV PS (Sec-1 & 2). However, 50MW margin is available at Barmer-I PS, which is in the same Fatehgarh-Barmer Complex in sharing with M/s Hinduja Renewables Energy Pvt. Ltd (App. No. 2200000425). Accordingly, it is agreed to grant connectivity to M/s HCSPL (50MW) at Barmer-I PS at 220kV level in sharing with M/s Hinduja Renewables Energy Pvt. Ltd. (App. No. 2200000425-250MW). M/s Hinduja & Hexa shall be required to sign sharing agreement in this regard.

M/s HCSPL has requested Start Date of Connectivity under GNA from 31.10.2026. Considering the same and expected commissioning date of transmission system (i.e. 31.03.2027), the start date of Connectivity under GNA shall be 31.03.2027 (interim). Transmission system for connectivity of HCSPL under GNA is as below:

Details of Transmission system for Connectivity under GNA:

A. Associated Transmission System (ATS): NIL

B. Transmission System under applicant scope:

i. Through sharing of dedicated transmission of M/s Hinduja Renewables Energy Pvt. Ltd. RE Power Project – Barmer-I PS 220 kV S/c line (suitable to carry minimum 300 MW at nominal voltage)
ii. Infrastructure required for sharing dedicated transmission system – under the scope of M/s Hexa Climate Solutions Pvt. Ltd.

C. Transmission system for Connectivity under GNA: As per **Annexure-II**

Start Date of Connectivity under GNA: 31.03.2027 (Interim). Final date shall be confirmed upon award of the system.

As informed earlier, Barmer-I PS was planned for 4000MW. With the above grant(50MW), total connectivity at Barmer-I PS shall be 4000MW. Accordingly, Barmer-I PS shall be closed for further connectivity grants.

11.	2200001398	Enren-IV Energy Private Limited	Barmer distt., Rajasthan	24.10.2024	Generator (Solar)	Land BG Route	300	30.08.2027	Barmer-III PS	• Conn BG1: Rs. 50 Lakh • Conn BG2: Rs 3 Cr • Conn BG3: Rs. 2 lakh/MW

It was informed that M/s Enren-IV Energy Pvt. Ltd. has applied for 300MW connectivity at Barmer-III PS. Accordingly, it was agreed to grant connectivity at Barmer-III PS at 220kV level through 220kV S/c line. M/s Enren confirm that the tower configuration shall be S/c on D/c tower and requested bay allocation under ISTS

It may be noted that the transmission system for evacuation of power from Barmer-III is presently under evolution. Upon evolution, the scheme shall be discussed in a separate joint study meeting among CEA, CTUIL, Grid India & Stakeholders followed by the subsequent CMETS meeting. The detailed transmission system shall be informed upon finalization and approval of the scheme.

M/s Enren-IV Energy has requested Start Date of Connectivity under GNA from 30.08.2027. Considering the same and expected commissioning date of transmission system (i.e. 30.09.2030), the start date of Connectivity under GNA shall be 30.09.2030 (interim). Details of Transmission system for connectivity of M/s Enren-IV under GNA is as below:

Details of Transmission system for Connectivity under GNA:

A. Associated Transmission System (ATS): NIL

B. Transmission System under applicant scope

i. Enren-IV Energy Private Limited RE Power Project – Barmer-III PS 220 kV S/c line on D/c tower (suitable to carry minimum 300 MW at nominal voltage)

C. Transmission system for Connectivity under GNA: As per **Annexure-I**

Start Date of Connectivity under GNA: 30.09.2030 (Interim). Final date shall be confirmed upon award of the system.

12.	2200001404	Aright Foods and Energy Private Limited	Bikaner distt., Rajasthan	25.10.2024	Renewable Power Park developer (Solar)	Land Route	2000	30.09.2027	Bhadla-III PS	• Conn BG1: Rs. 50 Lakh • Conn BG2: Rs 12 Cr

										• Conn BG3: Rs. 2 lakh/MW

It was informed that M/s Aright Foods and Energy Pvt. Ltd. (AFEPL) has applied for 2000MW connectivity at Bhadla-III PS. However, there is no sufficient margin available at Bhadla-III PS. Accordingly, it was agreed to grant connectivity at Bhadla-IV PS at 400 kV level through 400 kV D/c line. M/s AFEPL requested to include bay scope at Bhadla-IV PS under ISTS.

It may be noted that the transmission system for evacuation of power from Bhadla-IV is presently under evolution. Upon evolution, the scheme shall be discussed in a separate joint study meeting among CEA, CTUIL, Grid India & Stakeholders followed by the subsequent CMETS meeting. The detailed transmission system shall be informed upon finalization and approval of the scheme.

M/s AFEPL has requested Start Date of Connectivity under GNA from 30.09.2027. Considering the same and expected commissioning date of transmission system (i.e. 31.03.2030), the start date of Connectivity under GNA shall be 31.03.2030 (interim). Details of Transmission system for connectivity of M/s AFEPL under GNA is as below:

Details of Transmission system for Connectivity under GNA:

A. Associated Transmission System (ATS): NIL

B. Transmission System under applicant scope:

i. Aright Foods and Energy Pvt. Ltd. RE Power Park – Bhadla-IV PS 400 kV D/c line (suitable to carry minimum 1000 MW per circuit at nominal voltage)

C. Transmission system for Connectivity under GNA: As per **Annexure-III**

Start Date of Connectivity under GNA: 31.03.2030 (Interim). Final date shall be confirmed upon award of the system.

CTUIL has stated that with proposed grant, total connectivity granted/agreed for grant at Bhadla-IV shall be 5825 MW, leaving a margin of only 175 MW available for accommodation at Bhadla-IV PS. Accordingly, it was informed that subsequent applications at Bhadla-IV PS shall be considered for grant at Bhadla-V PS based on application quantum.

13.	2200001407	Unique Hytech Renewable Energy Private Limited	Jaisalmer, Barmer distt., Rajasthan	26.10.2024	Generator (Wind)	Land Route	150	31.10.2029	Barmer-III PS	• Conn BG1: Rs. 50 Lakh • Conn BG2: NIL (Bay in sharing)

										• Conn BG3: Rs. 2 lakh/MW

It was informed that M/s Unique Hytech Renewable Energy Pvt. Ltd. has applied for 150MW connectivity at Barmer-III PS. In this regard, it is informed that in the present meeting, 208.5MW connectivity is also agreed for grant to M/s TEQ Green Power IX Ltd. at Barmer-III PS through 220kV S/c line, thus leaving the margin to accommodate the subject connectivity. Accordingly, it is agreed to grant connectivity at Barmer-III PS at 220kV level in sharing with M/s TEQ Green Power (App. No. 2200001300). M/s Unique Hytech Renewable Energy Private Limited has confirmed that they will enter into sharing agreement with M/s TEQ Green Power and submit the same to CTUIL.

It may be noted that the transmission system for evacuation of power from Barmer-III is presently under evolution. Upon evolution, the scheme shall be discussed in a separate joint study meeting among CEA, CTUIL, Grid India & Stakeholders followed by the subsequent CMETS meeting. The detailed transmission system shall be informed upon finalization and approval of the scheme.

M/s Unique Hytech has requested Start Date of Connectivity under GNA from 31.10.2029. Considering the same and expected commissioning date of transmission system (i.e. 30.09.2030), the start date of Connectivity under GNA shall be 30.09.2030 (interim). Details of Transmission system for connectivity of M/s Unique Hytech under GNA is as below:

Details of Transmission system for Connectivity under GNA:

A. Associated Transmission System (ATS): NIL

B. Transmission System under applicant scope

i. Through sharing of dedicated transmission of M/s TEQ Green Power IX Ltd. RE Power Project – Barmer-III PS 220 kV S/c line (suitable to carry minimum 358.5 MW at nominal voltage)
ii. Infrastructure required for sharing dedicated transmission system – under the scope of M/s Unique Hytech Renewable Energy Pvt. Ltd.

C. Transmission system for Connectivity under GNA: As per **Annexure-I**

Start Date of Connectivity under GNA: 30.09.2030 (Interim). Final date shall be confirmed upon award of the system

14.	2200001417	Sprng Green Energy 4 Private Limited	Bikaner distt., Rajasthan	29.10.2024	Generator (Solar)	Land BG Route	400	30.06.2029	Bhadla-IV PS	• To be discussed

15.	2200001420	Azure Power Fifty One Private Limited	Jodhpur distt., Rajasthan	30.10.2024	Generator (Solar)	Land Route	600	31.12.2029	Bhadla-IV PS	• To be discussed
It was informed that M/s Sprng Green Energy and M/s Azure Power have applied for connectivity at Bhadla-III PS. It is informed that there is no sufficient margin available at Bhadla-III PS. Further as indicated above, at Bhadla-IV, total connectivity was agreed to be granted is 5825MW, thus leaving only 175MW margin to be accommodated at Bhadla-IV. Accordingly, M/s Sprng Green Energy and M/s Azure Power can only be granted connectivity for the application quantum at Bhadla-V PS. However, transmission system for evacuation of power from Bhadla-V is to be evaluated and discussed with CEA, CTUIL, Grid India & other Stakeholders. Accordingly, it was informed that above applications shall be discussed in next CMETS-NR meeting based on system evolution.										
16.	2200001422 (Next Meeting)	Avaada Energy Private Limited	Barmer distt., Rajasthan	30.10.2024	Generating station(s), including REGS(s), with ESS (Solar)	SJVN LOA	800	30.06.2027	Barmer-II PS	• To be discussed
It was informed that M/s Avaada Energy Pvt. Ltd. (AEPL) has applied for 800MW connectivity at Barmer-II PS. However, there is no sufficient margin available at Barmer-II PS. Further, as indicated above, one more application from M/s AEPL (App no.- 2200001352) for 750MW connectivity was discussed for connectivity at Barmer-II PS. During the meeting, it was discussed that the proposed location of the generating station of M/s AEPL is very close to the GIB area. It appears that there is a significant transmission line length involved between the proposed solar plant and Barmer-II S/s to avoid infringement with the GIB zone. Accordingly, it was agreed that M/s AEPL will review their location of the generating station, and details of connectivity shall be discussed in the next CMETS meeting.										

F3. Application for addition of Generation Capacity including ESS within the quantum of connectivity granted under Regulation 5.2

Sl. No.	Application ID	Applicant	Project Location	Submission Date	Nature of Applicant	Application number of already granted Connectivity	Planned additional capacity (MW	Date from which additional generation capacity will be added (As per Application)	Connectivity location (As per Application)
1.	2200001376	Acme Solar Holdings Limited	Jaisalmer distt., Rajasthan	18.10.2024	Standalone ESS	1200001602	300 (BESS)	31.12.2026	Fatehgarh PS

It was informed that M/s Acme Solar Holdings Ltd. (ASHL) has applied for 300MW connectivity at Fatehgrah PS under regulation 5.2 of GNA Regulations, 2022. In this regard, it is to mention that M/s ASHL (St-II - 1200001602/LTA-1200001664) is already granted deemed GNA for 300MW at Fatehgarh PS for which deemed GNA is already effective. 400kV bay at Fatehgarh PS is implemented by M/s ASHL. Accordingly, it is agreed to grant 300MW connectivity to M/s ASHL at Fatehgarh PS under regulation 5.2 of GNA Regulations. M/s ASHL is requested to note that as per GNA Regulations, the net injection at any point of time shall not exceed the quantum of total Connectivity granted to the existing Connectivity grantee i.e., M/s ASHL (Appl. No. 1200001602) for 300 MW. Further, M/s ASHL (Appl. No. 1200001602) shall be responsible for compliance with the Grid Code and other regulations of the Central Commission for the above additional generation capacity as 'Lead generator' in terms of clause (y)(ii) of Regulation 2.1. Further, M/s ASHL shall submit the technical connection data i.r.o. above additional capacity for checking necessary compliances at the earliest so as to provide sufficient time for ensuring necessary compliances..

M/s ASHL informed that they are installing BESS of 1760MWh by considering degradation of batteries over its life span & other losses so that net injection at any point of time will be 300MW for duration of four (4) hours. CTUIL has iterated that as per GNA Regulations, the net injection at any point of time shall not exceed the quantum of total Connectivity granted to the existing Connectivity grantee and M/s ASHL has agreed for the same.

Further, M/s ASHL vide their letter dated 16.01.2025 requested to revise the date from which additional generation capacity will be added of all the four applications (App no. 2200001376, 2200001377, 2200001378 & 2200001379) under the existing connectivity at Fatehgarh PS from 31.12.26 to 25.06.2027.

M/s ASHL has requested Start Date of Connectivity under GNA from 25.06.2027 (revised). Considering the same and availability of transmission system for App. No. 1200001602 & 1200001664, the start date of Connectivity under GNA shall be 25.06.2027. Details of Transmission system for connectivity of M/s ASHL under GNA is as below:

Details of Transmission system for Connectivity under GNA:

A. Associated Transmission System (ATS): NIL

B. Transmission System under applicant scope:

i. Through sharing of dedicated transmission of M/s Acme Solar Holdings Ltd. (App. No. 1200001602)
ii. Infrastructure required for sharing dedicated transmission system – under the scope of present applicant

C. Transmission system for Connectivity under GNA: Existing transmission System

Start Date of Connectivity under GNA: 25.06.2027

Sl. No.	Application ID	Applicant	Project Location	Submission Date	Nature of Applicant	Application number of already granted Connectivity	Planned additional capacity (MW	Date from which additional generation capacity will be added (As per Application)	Connectivity location (As per Application)
2.	2200001377	Acme Solar Holdings Limited	Jaisalmer distt., Rajasthan	18.10.2024	Standalone ESS	1200001603	300 (BESS)	31.12.2026	Fatehgarh PS

It was informed that M/s Acme Solar Holdings Ltd. (ASHL) has applied for 300MW connectivity at Fatehgrah PS under regulation 5.2 of GNA Regulations, 2022. In this regard, it is to mention that M/s ASHL (St-II - 1200001603/LTA-1200001669) is already granted deemed GNA for 300MW at Fatehgarh PS for which deemed GNA is already effective. 400kV bay at Fatehgarh PS is implemented by M/s ASHL. It was agreed to grant 300MW connectivity to M/s ASHL at Fatehgarh PS under regulation 5.2 of GNA Regulations. M/s ASHL is requested to note that as per GNA Regulations, the net injection at any point of time shall not exceed the quantum of total Connectivity granted to the existing Connectivity grantee i.e., M/s ASHL (Appl. No. 1200001603) for 300 MW. Further, M/s ASHL (Appl. No. 1200001603) shall be responsible for compliance with the Grid Code and other

regulations of the Central Commission for the above additional generation capacity as 'Lead generator' in terms of clause (y)(ii) of Regulation 2.1. Further, M/s ASHL shall submit the technical connection data i.r.o. above additional capacity for checking necessary compliances at the earliest so as to provide sufficient time for ensuring necessary compliances.

M/s ASHL informed that they are installing BESS of 1760MWH by considering degradation of batteries over its life span & other losses so that net injection at any point of time will be 300MW for duration of four (4) hours. CTUIL has iterated that as per GNA Regulations, the net injection at any point of time shall not exceed the quantum of total Connectivity granted to the existing Connectivity grantee and M/s ASHL has agreed for the same.

Further, M/s ASHL vide their letter dated 16.01.2025 requested to revise the Date from which additional generation capacity will be added of all the four applications (App no. 2200001376, 2200001377, 2200001378 & 2200001379) under the existing connectivity at Fatehgarh PS from 31.12.26 to 25.06.2027.

M/s ASHL has requested Start Date of Connectivity under GNA from 25.06.2027. Considering the same and availability of transmission system for App. No. 1200001603 & 1200001669, the start date of Connectivity under GNA shall be 25.06.2027. Details of Transmission system for connectivity of M/s ASHL under GNA is as below:

Details of Transmission system for Connectivity under GNA:

A. **Associated Transmission System (ATS):** NIL

B. **Transmission System under applicant scope:**

   i. Through sharing of dedicated transmission of M/s Acme Solar Holdings Ltd. (App. No. 1200001603)
   ii. Infrastructure required for sharing dedicated transmission system – under the scope of present applicant

C. **Transmission system for Connectivity under GNA**: Existing transmission System

   Start Date of Connectivity under GNA: 25.06.2027

Sl. No.	Application ID	Applicant	Project Location	Submission Date	Nature of Applicant	Application number of already granted Connectivity	Planned additional capacity (MW	Date from which additional generation capacity will be added (As per Application)	Connectivity location (As per Application)
3.	2200001378	Acme Solar Holdings Limited	Jaisalmer distt., Rajasthan	18.10.2024	Standalone ESS	1200001643	300 (BESS)	31.12.2026	Fatehgarh PS

It was informed that M/s Acme Solar Holdings Ltd. (ASHL) has applied for 300MW connectivity at Fatehgrah PS under regulation 5.2 of GNA Regulations, 2022. In this regard, it is to mention that M/s ASHL (St-II - 1200001643/LTA-1200001737) is already granted deemed GNA for 300MW at Fatehgarh PS for which deemed GNA is already effective. 400kV bay at Fatehgarh PS is implemented by M/s ASHL. Accordingly, it is agreed to grant 300MW connectivity to M/s ASHL at Fatehgarh PS under regulation 5.2 of GNA Regulations. M/s ASHL is requested to note that as per GNA Regulations, the net injection at any point of time shall not exceed the quantum of total Connectivity granted to the existing Connectivity grantee i.e., M/s ASHL (Appl. No. 1200001643) for 300 MW. Further, M/s ASHL (Appl. No. 1200001643) shall be responsible for compliance with the Grid Code and other regulations of the Central Commission for the above additional generation capacity as 'Lead generator' in terms of clause (y)(ii) of Regulation 2.1. Further, M/s ASHL shall submit the technical connection data i.r.o. above additional capacity for checking necessary compliances at the earliest so as to provide sufficient time for ensuring necessary compliances.

M/s ASHL informed that they are installing BESS of 1760MWH by considering degradation of batteries over its life span & other losses so that net injection at any point of time will be 300MW for duration of four(4) hours. CTUIL has iterated that as per GNA Regulations, the net injection at any point of time shall not exceed the quantum of total Connectivity granted to the existing Connectivity grantee and M/s ASHL has agreed for the same.

Further, M/s ASHL vide their letter dated 16.01.2025 requested to revise the Date from which additional generation capacity will be added of all the four applications (App no. 2200001376, 2200001377, 2200001378 & 2200001379) under the existing connectivity at Fatehgarh PS from 31.12.26 to 25.06.2027.

M/s ASHL has requested Start Date of Connectivity under GNA from 25.06.2027 (revised). Considering the same and availability of transmission system for App. No. 1200001643 & 1200001737, the start date of Connectivity under GNA shall be 25.06.2027. Details of Transmission system for connectivity of M/s ASHL under GNA is as below:

Details of Transmission system for Connectivity under GNA:

A. Associated Transmission System (ATS): NIL

B. Transmission System under applicant scope:

i. Through sharing of dedicated transmission of M/s Acme Solar Holdings Ltd. (App. No. 1200001643)
ii. Infrastructure required for sharing dedicated transmission system – under the scope of present applicant

C. Transmission system for Connectivity under GNA: Existing transmission System

Start Date of Connectivity under GNA: 25.06.2027

Sl. No.	Application ID	Applicant	Project Location	Submission Date	Nature of Applicant	Application number of already granted Connectivity	Planned additional capacity (MW	Date from which additional generation capacity will be added (As per Application)	Connectivity location (As per Application)
4.	2200001379	Acme Solar Holdings Limited	Jaisalmer distt., Rajasthan	18.10.2024	Standalone ESS	1200001642	300 (BESS)	31.12.2026	Fatehgarh PS

It was informed that M/s Acme Solar Holdings Ltd. (ASHL) has applied for 300MW connectivity at Fatehgrah PS under regulation 5.2 of GNA Regulations, 2022. In this regard, it is to mention that M/s ASHL (St-II - 1200001642/LTA-1200001742 & 1200003297) is already granted deemed GNA for 300MW at Fatehgarh PS for which deemed GNA is already effective. 400kV bay at Fatehgarh PS is implemented by M/s ASHL. Accordingly, it is agreed to grant 300MW connectivity to M/s ASHL at Fatehgarh PS under regulation 5.2 of GNA Regulations. M/s ASHL is requested to note that as per GNA Regulations, the net injection at any point of time shall not exceed the quantum of total Connectivity granted to the existing Connectivity grantee i.e., M/s ASHL (Appl. No. 1200001642) for 300 MW. Further, M/s ASHL (Appl. No. 1200001642) shall be responsible for compliance with the Grid Code and other regulations of the Central Commission for the above additional generation capacity as 'Lead generator' in terms of clause (y)(ii) of Regulation 2.1. Further, M/s ASHL shall submit the technical connection data i.r.o. above additional capacity for checking necessary compliances at the earliest so as to provide sufficient time for ensuring necessary compliances.

M/s ASHL informed that they are installing BESS of 1760MWH by considering degradation of batteries over its life span & other losses so that net injection at any point of time will be 300MW for duration of four(4) hours. CTUIL has iterated that as per GNA Regulations, the net injection at any point of time shall not exceed the quantum of total Connectivity granted to the existing Connectivity grantee and M/s ASHL has agreed for the same

Further, M/s ASHL vide their letter dated 16.01.2025 requested to revise the Date from which additional generation capacity will be added of all the four applications (App no. 2200001376, 2200001377, 2200001378 & 2200001379) under the existing connectivity at Fatehgarh PS from 31.12.26 to 25.06.2027.

M/s ASHL has requested Start Date of Connectivity under GNA from 25.06.2027(revised). Considering the same and availability of transmission system for App. No. 1200001642, 1200001742 & 1200003297 the start date of Connectivity under GNA shall be 25.06.2027. Details of Transmission system for connectivity of M/s ASHL under GNA is as below:

Details of Transmission system for Connectivity under GNA:

A. **Associated Transmission System (ATS):** NIL

B. **Transmission System under applicant scope:**

i. Through sharing of dedicated transmission of M/s Acme Solar Holdings Ltd. (App. No. 1200001642)
ii. Infrastructure required for sharing dedicated transmission system – under the scope of present applicant

C. **Transmission system for Connectivity under GNA**: Existing transmission System

Start Date of Connectivity under GNA: 25.06.2027

Sl. No.	Application ID	Applicant	Project Location	Submission Date	Nature of Applicant	Application number of already granted Connectivity	Planned additional capacity (MW	Date from which additional generation capacity will be added (As per Application)	Connectivity location (As per Application)
5.	2200001385	Acme Heergarh Powertech Pvt. Limited	Jodhpur distt., Rajasthan	21.10.2024	Standalone ESS	1200002471	300 (BESS)	30.06.2026	Bhadla-II PS

It was informed that M/s Acme Heergarh Powertech Pvt. Ltd. (AHPPL) has applied for 300MW connectivity at Bhadla-II PS under regulation 5.2 of GNA Regulations, 2022. In this regard, it is to mention that M/s AHPPL (St-II – 1200002471/LTA-1200003505) is already granted deemed GNA for 300MW at Bhadla-II PS. Transmission system for 300MW deemed GNA is under advance stage of implementation and expected to be commissioned by Mar'25. Accordingly, it was agreed to grant 300MW connectivity to M/s AHPPL at Bhadla-II PS under regulation 5.2 of GNA Regulations. M/s AHPPL is requested to note that as per GNA Regulations, the net injection at any point of time shall not exceed the quantum of total Connectivity granted to the existing Connectivity grantee i.e., M/s AHPPL (Appl. No. 1200002471) for 300 MW. Further, M/s ASHL (Appl. No. 1200002471) shall be responsible for compliance with the Grid Code and other regulations of the Central Commission for the above additional generation capacity as 'Lead generator' in terms of clause (y)(ii) of Regulation 2.1. Further, M/s ASHL shall submit the technical connection data i.r.o. above additional capacity for checking necessary compliances at the earliest so as to provide sufficient time for ensuring necessary compliances.

M/s ASHL informed that they are installing BESS of 1760MWH by considering degradation of batteries over its life span & other losses so that net injection at any point of time will be 300MW for duration of four(4) hours. CTUIL has iterated that as per GNA Regulations, the net injection at any point of time shall not exceed the quantum of total Connectivity granted to the existing Connectivity grantee and M/s ASHL has agreed for the same

M/s ACME informed that they want to revise the dates of connectivity for which they will intimate within 1-2 days. Further, M/s ASHL vide their letter dated 16.01.2025 requested to revise the date from which additional generation capacity will be added of above application (App no. 2200001385) under the existing connectivity at Bhadla-II PS from 30.06.2026 to 25.06.2027.

M/s ASHL has requested Start Date of Connectivity under GNA from 25.06.2027 (Revised). Considering the same and availability of transmission system for App. No. 1200002471 & 1200003505, the start date of Connectivity under GNA shall be 25.06.2027. Details of Transmission system for connectivity of M/s ASHL under GNA is as below:

Details of Transmission system for Connectivity under GNA:

A. **Associated Transmission System (ATS):** NIL

B. **Transmission System under applicant scope:**

i. Through sharing of dedicated transmission of M/s Acme Solar Holdings Ltd. (App. No. 1200002471)
ii. Infrastructure required for sharing dedicated transmission system – under the scope of present applicant

C. **Transmission system for Connectivity under GNA**: Details are attached at **Annexure-VI**.

Start Date of Connectivity under GNA: 25.06.2027 (subject to availability of transmission system mentioned at **Annexure-VI**).

G. Network Expansion Scheme

G1. Augmentation of 2x500 MVA (7th & 8th), 400/220 kV ICTs at Bikaner-IV PS

It was stated that 765/400/220 kV Bikaner-IV PS is an under implementation RE pooling station with transformation capacity of 6x1500MVA at 765/400kV level and 6x500MVA at 400/220kV level with the schedule of Nov'26. At present, total connectivity granted at Bikaner-IV PS is 6000MW, out of this, 3150 MW is granted at 220 kV level and 2850 MW is granted at 400 kV level.

As per manual on Transmission planning criteria 2023 "N-1' reliability criteria may be considered for ICTs at the ISTS / STU pooling stations for renewable energy based generation of more than 1000 MW after considering the capacity factor of renewable generating stations. Considering the total connectivity granted of 3150 MW at 220 kV level at Bikaner-IV PS, augmentation of 2x500 MVA ICTs (7^{th} & 8^{th}) is required to be taken up to facilitate transfer of power as well as to meet N-1 compliance.

CEA and NRLDC agreed on the proposal. As deliberated in 34^{th} CMETS-NR meeting, considering small difference in cost and homogeneity of all 500 MVA transformer units, it was recommended that transformer augmentation may be carried out with 400/220 kV, 2x500MVA ICT (7^{th} & 8^{th}) at Bikaner-IV PS.

Accordingly, the following ICT augmentation scheme is agreed at Bikaner-IV PS in ISTS:

- Augmentation of 400/220 kV, 2x500 MVA (7^{th} & 8^{th}) ICTs at Bikaner-IV PS along with associated transformer bays

G2. Augmentation with 400/220 kV 1x500 MVA (3rd) ICT at Neemrana (PG) S/s to meet N-1 compliance

It was stated that POWERGRID vide letter dated 27.08.2024 regarding issue of N-1 contingency criteria in some of the substation of Northern region, informed that ICTs in few of the substations (including Neemrana S/s) in Northern region are having high utilization and violating N-1 contingency criteria. POWERGRID also mentioned that for Neemrana ICTs, peak Utilization in Jun'24 is 76%.

Further In the 225th OCC meeting held on 12.11.24, NRLDC agenda for N-1 non-compliance of 400/220kV ICT at Neemrana (PG) Substation was discussed. In the OCC meeting CTUIL was asked to take up ICT augmentation of 400/220kV Neemrana, Sikar and Jaipur South (PG) substations in upcoming CMETS meeting.

At present, 400/220kV Neemrana (PG) Substation has total transformation capacity of 815 MVA (1x500MVA+1x315MVA). From the loading pattern of Neemrana ICTs (1x500 MVA+1x315MVA), it is observed that cumulative maximum loading on 400/220 kV ICTs is about 530 MW. From the CTU study analysis, it emerged that loading is breaching N-1 limit (490 MW) for few duration of time over the year. The loading pattern of Neemrana ICTs for past one year is as below:

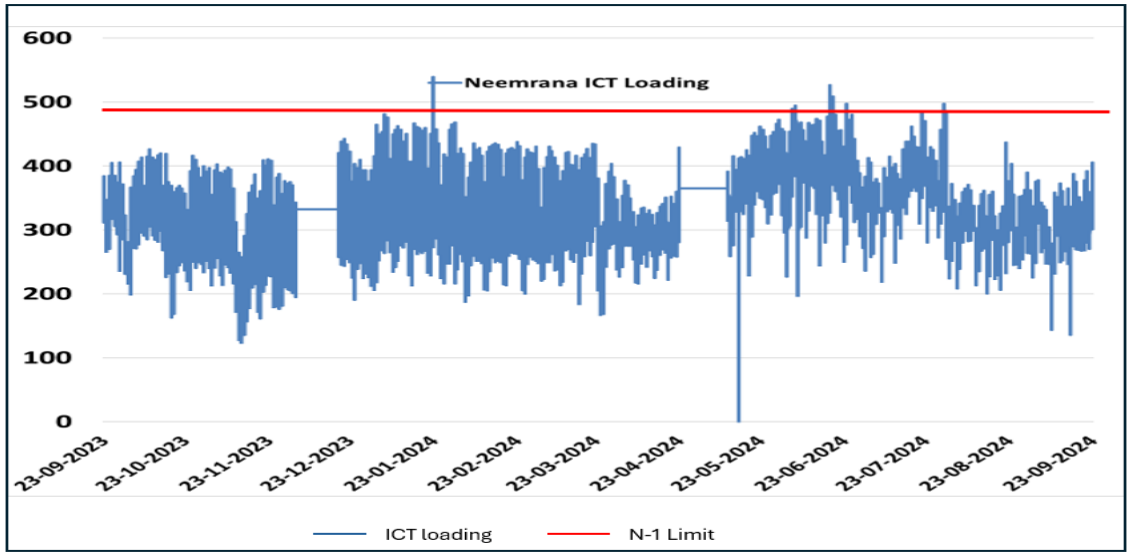


Fig : Loading of Neemrana ICTs of Past one year (Source: Grid-India)

RVPN stated that ICT augmentation (3rd,1x500MVA) is required at 400/220kV Neemrana (PG) S/s as load growth is envisaged in Neemrana complex. CEA and NRLDC agreed on proposal of ICT augmentation.

POWERGRID vide mail dated 30.09.2024 confirmed space availability for Augmentation of 400/220 kV transformer (3rd, 500MVA) along with transformer bays at 400/220kV Neemrana (PG) S/s.

In view of above, following ICT augmentation scheme was agreed in ISTS :

- Augmentation of 400/220 kV ,1x500 MVA (3rd) ICT at 400/220kV Neemrana (PG) S/s along with associated transformer bays

G3. Augmentation with 400/220 kV 1x500 MVA (3rd) ICT at Jaipur South (PG) S/s to meet N-1 compliance

POWERGRID vide letter dated 27.08.2024 regarding issue of N-1 contingency criteria in some of the substation of Northern region, informed that ICTs in few of the substations (including Jaipur South S/s) in Northern region are having high utilization and violating N-1 contingency criteria. POWERGRID also mentioned that for Jaipur South ICTs peak Utilization in May'24 is 77%.

Further In the 225th OCC meeting held on 12.11.24, NRLDC agenda for issue of N-1 non-compliance of 400/220kV ICT at Jaipur South (PG) Substation was discussed. In the OCC meeting CTUIL was asked to take up the proposal of ICT augmentation of 400/220kV Neemrana, Sikar and Jaipur South substations in upcoming CMETS meeting.

At present, 400/220kV Jaipur South (PG) Substation has total transformation capacity of 1000 MVA (2x500MVA). From the loading pattern of Jaipur South ICTs (2x500 MVA), it is observed that cumulative maximum loading on 400/220 kV ICTs is about 720 MW. From the analysis, it emerged that loading is breaching N-1 limit (660 MW) for some duration of time over the year. The loading pattern of Jaipur South ICTs for past one year is as below:

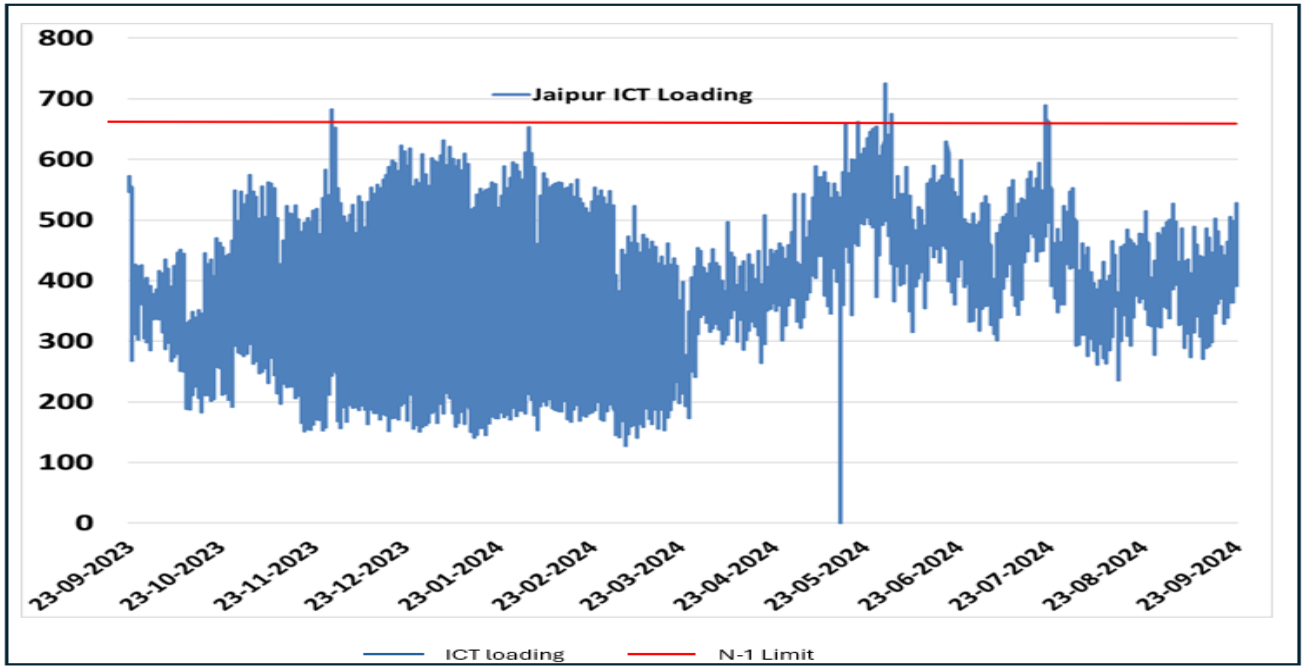


Fig : Loading of Jaipur South ICTs of Past one year (Source: Grid-India)

RVPN stated that LILO of one ckt of 220kV Dausa- Sawai Madhopur at Jaipur (South) is under implementation which may further increase the loading of Jaipur (South) ICTs. Considering above there is urgent requirement of ICT augmentation at 400/220kV Jaipur South (PG) S/s. CEA and NRLDC agreed on proposal. No other comments were received.

POWERGRID vide mail dated 30.09.2024 confirmed space availability for Augmentation of 400/220 kV transformer (3rd, 500MVA) along with transformer bays at 400/220kV Jaipur South (PG) S/s.

In view of above, following ICT augmentation scheme was agreed in ISTS :

- Augmentation of 400/220 kV ,1x500 MVA (3rd) ICT at 400/220kV Jaipur South (PG) S/s along with associated transformer bays

G4. LILO of 220 kV Chittorgarh-RAPP B D/c Lines at RVPNs proposed 220 kV GSS Begun(Chittorgarh)

It was stated that RVPN vide letter dated 04.09.2024 to CTU requested for in principle approval for making LILO of 220kV Chittorgarh-RAPP-B D/c lines at RVPN's proposed 220 kV Begun (Chittorgarh) S/s. In the letter, RVPN mentioned that total length of 220 kV D/c RAPP-B- Chittorgarh line is 130kM (approx.) and LILO length would be about 5 kms. Further RVPN mentioned that 220kV D/c RAPP-B-Chittorgarh line is passing near to the proposed site of 220kV GSS Begun and after making LILO of this line at proposed 220 kV GSS Begun, length of 220kV D/c line between Begun-RAPP-B will be approximately 70kM. This will help to minimize the tripping on the line and will ensure availability of grid to units of RAPP-B.

CTUIL vide mail dated 19.09.24 to CEA, Grid-India & RVPN requested to provide comments/observations on RVPN's proposal (05km LILO of 220 kV D/C Chittorgarh-RAPP B Lines at RVPNs proposed 220 kV GSS Begun (Chittorgarh)) at the earliest for taking up in ensuing CMETS-NR meeting. CEA vide mail dated 10.10.2024 intimated following observations:

(i) It may be clarified whether LILO of both circuits or only one circuit of Chittorgarh-RAPP B 220 kV D/c line has been proposed at Begun (Chittorgarh).
(ii) Following details may be furnished:
- Timeline of the Begun substation as well as details of anticipated load.
- Details of additional connectivity of Begun substation at 220 kV level, if any.
- Peak loading experienced till date on 220 kV D/C Chittorgarh-RAPP B lines.
- Load flow studies for the above proposal.

Subsequently, RVPN vide letter dated 21.10.2024, submitted following clarification on the observations intimated by CEA

(i) LILO of both circuits of 220 kV D/C Chittorgarh-RAPP-B lines has been proposed for creation of 220 kV GSS Begun (Chittorgarh).
(ii) Following details are furnished as following

(a) Tentative timeline of the proposed 220 kV GSS Begun (Chittorgarh) will be 02 years from the date of approval of RERC. RERC approval will be received in 6 months.
(b) Additional connectivity at proposed 220 kV GSS Begun at 220 kV level is NIL
(c) Peak loading experienced till date on both 220 kV D/c Chittorgarh-RAPP-B line-I and II circuits are 150 MW and 150 MW respectively.
(d) A detailed justification note for creation of proposed 220 kV GSS Begun is attached. Load flow studies for above proposal are attached at Exhibit-1, Exhibit2, Exhibit-3 and Exhibit-4

Further Grid-India vide mail dated 22.10.2024 also intimated following comments /observations-:

- 220kV RAPPB-Chittorgarh line is also part of RAPS islanding scheme, therefore, islanding scheme would have to be modified after commissioning of 220kV Begun.
- Chittorgarh(220kV) substation is also fed from 400/220kV Chittorgarh substation of RVPN. To control loading of 400/220kV Chittorgarh ICTs, 220kV Chittorgarh-Chittorgarh line is often kept open by Rajasthan SLDC. Accordingly, it is suggested that ICT capacity augmentation at 400/220kV ICTs at Chittorgarh is also done timely so that opening of 220kV Chittorgarh-Chittorgarh line to control loading of 400/220kV ICTs is avoided.
- Further, as nuclear stations are generally not providing significant reactive power support in real-time, reactive power requirement at 220kV Begun may be met locally to avoid low voltage issues. Voltage profile of 400/220kV Chittorgarh (220kV bus) and 220kV RAPP B during winter 2023-24 is shown below:

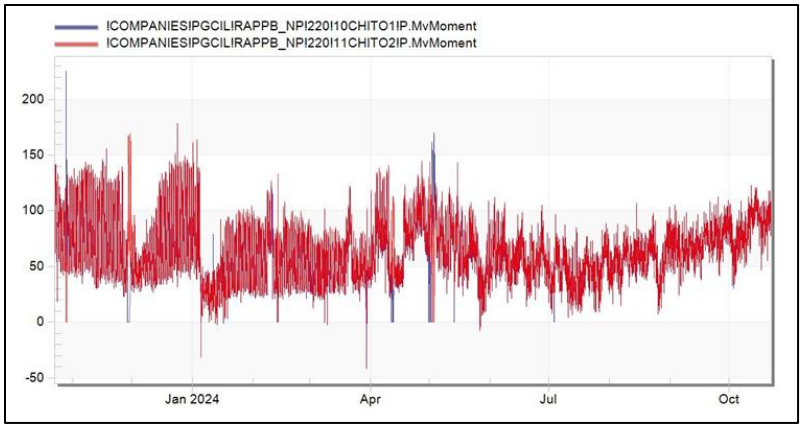
Further RVPN vide letter dated 04.11.2024, submitted following clarification on the comments /observations intimated by Grid-India:-

(i) It may be noted that 220kV RAPPB-Chittorgarh line is also part of RAPS islanding scheme and LILO has been proposed of both circuits of 220kV RAPPB-Chittorgarh line at RVPN's proposed 220 kV GSS Begun (Chittorgarh). Therefore, islanding scheme will be modified accordingly after commissioning of proposed 220kV Begun.

(ii) 220 kV GSS Chittorgarh (RVPN) is fed from 400 kV GSS Chittorgarh (RVPN). To control loading of 400/220kV Chittorgarh ICTs, 220kV Chittorgarh-Chittorgarh line is often kept open by Rajasthan SLDC. In this regards it is submitted that augmentation of additional 500 MVA, 400/220 kV ICT at 400 kV GSS Chittorgarh is under feasibility examination.

(iii) Nuclear stations are generally not providing significant reactive power support in real time. Therefore, to avoid low voltages issues, reactive power support at 220kV Begun has been taken as 5.43 MVAR shunt capacitor bank at 33 kV voltage level. Further, additional shunt capacitor bank will be installed by RVPN, if required.

Line loading pattern of 220kV RAPPB-Chittorgarh D/C lines and voltages of RAPPB and Chittorgarh buses for last one year was also provide by Grid-India which is shown below:



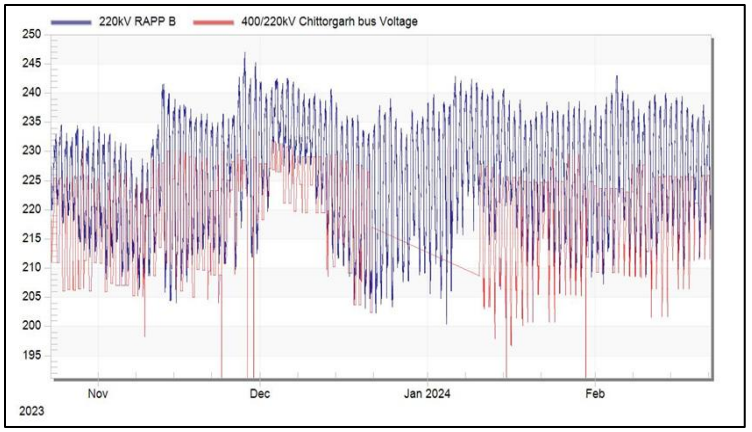


FIg : Line loading pattern and voltages of 220kV RAPP-B-Chittorgarh D/C lines (Source-Grid-india)

CTUIL also carried out studies on above proposal in planning file. In CTU planning files it emerged that loadings on 400/220kV ICTs (3x 315 MVA) of Chittorgarh (RVPN) S/s already higher (~295MW/ICT & ~342MW/ICT in 2027 & 2030 timeframe respectively) and these ICTs are already N-1 non-compliant in Planning study files. Further with proposed transmission scheme (5km LILO of 220 kV D/c Chittorgarh-RAPP B Lines at RVPN's proposed 220 kV GSS Begun S/s (considering 50MW load at Begun S/s) , loadings on 400/220 kV ICTs of Chittorgarh (RVPN) S/s further increases by 13-15 MW/ICT.

Therefore, in future ICT augmentation (4^{th} ICT) may be required at 400/220 Chittorgarh (RVPN) S/s. it is recommended that RVPN may take up the augmentation of 400/220kV ICT (4^{th}) at Chittorgarh (RVPN) S/s or replace 400/220kV, 3x315MVA ICTs with 3x500MVA ICTs (at least 2 nos. ICTs) in case of space constraint at Chittorgarh (RVPN) S/s on urgent basis to meet the drawl requirement from Chittorgarh (RVPN) S/s .

RVPN stated that replacement of 400/220kV, 1 no. 315MVA ICT with 500MVA ICT at Chittorgarh (RVPN) S/s is already approved with 18 months time schedule and based on future drawl requirement, replacement of other 315MVA ICTs with 500MVA ICT at Chittorgarh (RVPN) S/s may be taken up.

NRLDC also highlighted the N-1 non compliance issue of 400/220kV ICTs (3x315MVA) at Chittorgarh S/s and ICT loading will be reviewed and will be highlighted as part operational feedback report. NRLDC enquired about schedule of replacement of 1 no. 315MVA ICT with 500MVA ICT at Chittorgarh (RVPN) S/s. RVPN stated that implementation schedule for above replacement of 400/220kV ICT at Chittorgarh PG) is 18 months from award, however the ICT is not yet taken up for award due to approval at later stage. It was concluded that based on loading pattern and Grid-India operational feedback, RVPN may take up advance actions for replacement of other 2 nos. of 315MVA ICTs with 500MVA ICT at Chittorgarh (RVPN) S/s.

The comprehensive scheme proposal is intra state in nature, however the proposal involves LILO of ISTS line i.e. LILO of 220 kV D/C Chittorgarh-RAPP B Line at RVPNs proposed 220 kV GSS Begun (Chittorgarh)-. In view of above, the proposal is being discussed in present CMETS-NR meeting. NPCIL vide mail 28.01.25 informed their consent to consider the LILO of both the 220kV Chittorgarh- RAPP B D/C lines at Begun GSS.

During the meeting, RVPNL asked that whether they need to install OPGW on the LILO portion of 220kV Chittorgarh-RAPP B D/c line, they also asked who shall install OPGW on POWERGRID line if OPGW is not available. CTUIL stated that as per CEA (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations, 2022, "The primary path for tele-protection shall be on point-to-point Optical Ground Wire", further as per CEA letter dtd. 22.05.24 all the Central and State utilities to ensure the OPGW on their transmission network (attached at **Annexure-IA**). Therefore RVPNL needs to install OPGW on their LILO portion, for the main line i.e. 220kV Chittorgarh-RAPP B D/c if OPGW is not available POWERGRID shall needs to install the same. CTUIL asked availability of OPGW from POWERGRID, as Concerned representative from POWERGRID was not present in the meeting, later on vide email dtd. 24.01.25 POWERGRID informed that OPGW is not available on this line. CTUIL stated that as OPGW not available on 220kV Chittorgarh-RAPP B D/c line, a separate scheme shall be formed by CTU for review in the upcoming NRPC, forum agreed for the same

Considering above following scheme proposed to be implemented by RVPN under Intra state was agreed :

- LILO of 220 kV D/C Chittorgarh-RAPP B Lines at RVPNs proposed 220 kV GSS Begun (Chittorgarh)-5kms

G5. Deletion of Augmentation of 1x500 MVA, 400/220 kV ICT at Fatehgarh-III PS (6th ICT in Section-2)

It was stated that in 34th Consultation Meeting for Evolving Transmission Schemes in Northern Region held on 20.09.2024, it was stated that considering the connectivity quantum of 2120 MW at 220 kV level (Connectivity granted: 2070MW, connectivity margin:50MW) at Fatehgarh-III PS(Sec-II), augmentation of 1x500 MVA, 400/220 kV ICT at Fatehgarh-III PS (6th ICT in Section-2) is required to meet N-1 compliance. Accordingly, above ICT augmentation was agreed in the above meeting.

Earlier, POWERGRID vide mail 23.05.23 informed that space is available for 2 nos. ICTs (One ICT is 220kV Section-1 (ICT-5) and remining One ICT in 220kV Section-4 (ICT-11) at Fatehgarh-III PS. The above space requirement was communicated by POWERGRID to CTUIL after considering 2 nos. 400kV line Bays utilized for Barmer-I PS interconnection as part of Transmission System for Rajasthan Ph-IV scheme(Jaisalmer/Barmer) scheme. Based on above space confirmation, proposal for augmentation of 1x500 MVA, 400/220 kV ICT at Fatehgarh-III PS (6th ICT in Section-2) was put up in 34th CMETS-NR meeting.

Further during costing for ICT augmentation (6th ICT in Section-2) at Fatehgarh-III PS, POWERGRID vide mail 30.10.24 informed that space for additional 400/220KV ICT is not available at Fatehgarh-III S/s (Sec-2). POWERGRID vide mail dated 18.11.2024 to CTUIL informed that earlier earmarked bays (Main Bays -446, 449), for ICTs (ICT11 &12), have been utilized for termination of transmission line for RE Developers (Spring & Azure) and hence no additional ICT bay is available at 765/400/220kV Fatehgarh-III S/s.

POWERGRID informed that earlier space for ICT was available which was also informed in May'23, however during bay allocation which was carried out by CTU-Engg, the space for additional 400/220KV ICT (6th) bay was utilized.

CTU-Engg informed that communication for ICT deletion from future scope was inadvertently missed out during bay allocation. It was suggested that a process will be developed for future projects wherein all the elements i.e. space for future bays, transformers, Stacoms/SVCs is to be frozen as part of scheme and can't be modified during bay allocation without consultation.

Recently M/s ReNew Surya Pratap Pvt. Ltd. (RSPPL) has requested for relinquishment of part capacity i.e. 10MW w.e.f. 23.11.2024 at Fatehgarh-III (Sec-2) PS. Considering space constraint for ICT augmentation at Fatehgarh-III PS (Sec-2), earlier 50MW margin available as well as 10MW additional margin vacated due to relinquishment of M/s Renew shall not be available for further connectivity grant at Fatehgarh-III PS (Sec-2) and Fatehgarh-III PS (Sec-2) will be closed .

In view of above augmentation of 1x500 MVA, 400/220 kV ICT at Fatehgarh-III PS (6th ICT in Section-2), which was agreed in 34th CMETS-NR meeting was agreed to be deleted.

G6. LILO of one ckt of 400kV Mandola – Dadri D/c line at Harsh Vihar S/s (DTL) (Incl. 400kV cable portion)

It was stated that, a report was prepared by CTUIL(Aug'24) in consultation with CEA & DTL on **Transmission System Planning for Delhi (2027-28)**. As part of above report, it was mentioned that Power Supply to Delhi is ensured through a high capacity 400 kV D/c Ring i.e. 400 kV Mandola – Dadri- Maharani Bagh – Samaypur –Tughlakabad-Bamnauli –Jhatikara - Mundka – Bawana –Mandola line & underlying network. Additionally, 400kV Dadri-Harsh Vihar D/c Line and underlying 220 kV network is also supplying Power to Delhi. Delhi Network (400kV) is also interconnected with high Capacity 765/400kV Jhatikaran(PG) S/s (6000 MVA).

Further in the report it is also mentioned that requirement of future upgradation of intra state network was to be studied. Therefore a meeting was held with CEA/DTL officials on 11.07.24 & 07.08.24 to collect & analyse Delhi network data, deliberate upon various issues in intra state transmission network as well as status of award of planned intra state system. In this meeting DTL emphasized that at present 400/220kV Harsh Vihar S/s is interconnected with Dadri S/s through 400kV D/c line (Quad). To provide redundancy, an additional 400kV interconnection may be planned to feed alternate power supply to Harsh Vihar S/s to bring it into ring main network with extension of existing GIS bays. This will also help to relieve load fed by Mandola S/s.

Studies have been carried out to identify additional transmission requirements if any for strengthening of transmission system, therefore LILO of one ckt of 400kV Mandola – Dadri D/c line at Harsh Vihar S/s (DTL) (Incl. 400kV cable portion) has been proposed in the report prepared by CTUIL on Transmission System Planning for Delhi (2027-28).

Further from the Studies it is also emerging that with proposed LILO, loading of 400/220kV ICTs at Mandola S/s may relieve (~30MW for each ICT)

Further CTUIL vide mail dated 05.11.2024 requested to DTL to provide following information:

1. space availability of 2 nos. of 400kV line bays for proposed LILO at Harsh Vihar S/s
2. Tentative LILO length along with feasibility of LILO portion through Overhead/Cable, if any
3. Other issues i.e. ROW or any other requirement for proposed LILO at Harsh Vihar S/s

In response to this, DTL vide mail dated 12.11.2024 given following information:

1. In existing 400kV GIS building, the space for 2.nos of 400kV line bays is not available, existing 400kV GIS Hall shall be required to be extended for accommodation new 400kV GIS bays for proposed LILO at Harsh Vihar Substation.
2. Tentative routes of LILO portion shall be involve the overhead section as well as the underground section. Tentative routes have been worked out with the help of google Earth map. The overhead section route length would be approx. 11km and underground would be approx. 0.7KM.
3. Other issues like RoW permission from Land owing agencies (mostly agriculture land) and Airport authority (Hindon air force Station) shall be involved. The same is required to be worked out at the time of actual survey of routes.

The loading pattern of 400kV Mandola(PG)- Dadri(NTPC) D/c line is as below fig :

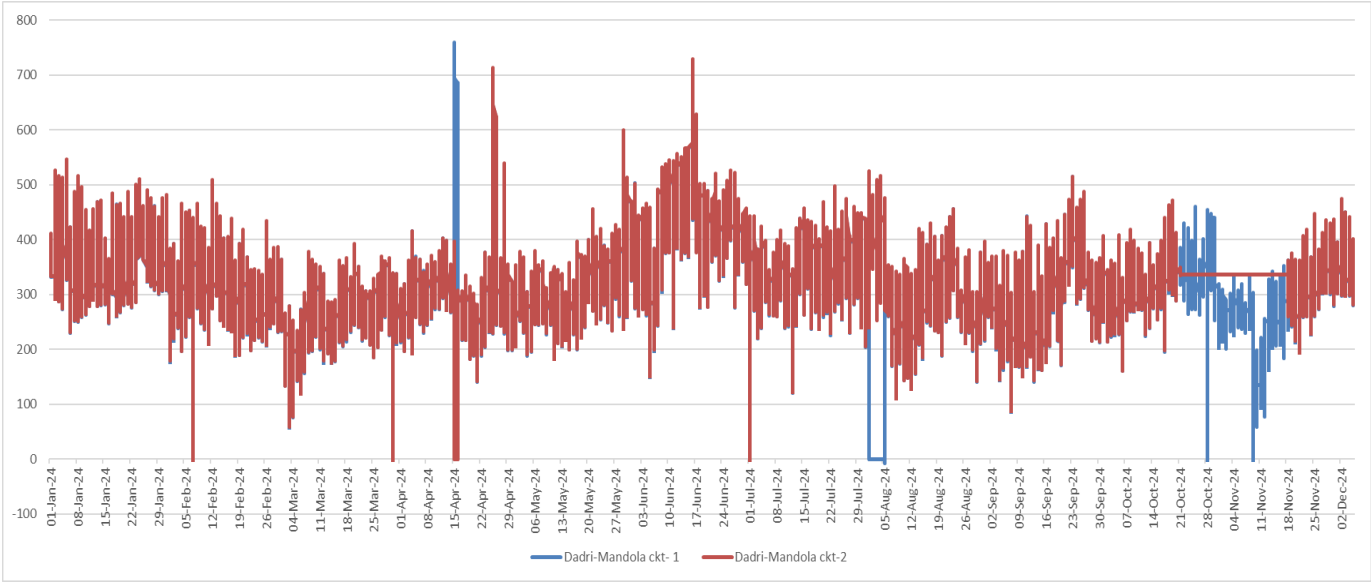


Fig: Loading of 400kV Mandola(PG)- Dadri(NTPC) D/c line (Source: Grid-India)

In the meeting DTL stated that 400kV line bay is not readily available at existing GIS of Harsh Vihar S/s, further they also stated that space is available for the extension of GIS, so that 400kV line bay may accommodate there.

CTUIL enquired DTL that as genesis of proposed scheme is to provide redundancy to Harsh Vihar S/s for their drawl requirements, LILO portion in the proposed transmission scheme (i.e. LILO of one ckt of 400kV Mandola – Dadri D/c line(Quad Bersimis) at Harsh Vihar S/s (DTL)) may be implemented by DTL as part of intra state scheme. Further, LILO portion in proposed transmission scheme is shorter in length with RoW issue which DTL may better handle and implement scheme in scheduled time.

CTU also stated that all such cases where transmission system is planned for drawl requirements of STUs, is planned and implement in intra state scheme. CEA also endorsed the views of CTU and opined that it would be advisable that proposed scheme may be kept in DTL scope along with 400kV line bays at Harsh Vihar S/s in matching with LILO portion.

On this DTL replied that, they can implement 400kV bays at Harsh Vihar S/s (DTL) & implementation of LILO portion may be keep in ISTS scope. Further CTU suggested that natural mismatch will be created in case bays are being implemented in intra state and LILO portion is being implemented in inter state. The mismatch may create bilateral commercial disputes also in case of delay of line or bays. In the meeting Grid India also enquired about the fault level of Harsh Vihar S/s , CTU replied that fault level of Harsh Vihar S/s is within limit.

Based on deliberations, it was agreed that proposed transmission scheme is being implemented as part of intra state scheme & DTL may implement the work by their own or may allocate to this work to POWERGRID on deposit work basis to expedite implementation considering severe RoW issue. DTL agreed for the same.

During the meeting, CTUIL asked regarding the availability of OPGW on 400kV Mandola –Dadri D/c line. Concerned representative from POWERGRID was not present in the meeting, however, later vide email dated 24.01.25, POWERGRID informed that 24 Fibre OPGW is available on the existing 400kV Mandola –Dadri D/c line. Further they stated that this link is a critical data link in NR catering various inter-regional, intra-region ICCP channels. As Under Ground Fiber is also proposed alongwith Power cable on the LILO portion of Harsh Vihar, that may have vulnerable of link breaking due to digging and other works.

CTUIL suggested that on existing 24F OPGW on 400kV Mandola –Dadri 12 nos. of fibers can be bypassed to remain the Dadri – Mandola link and 12 nos. of fibers can be utilised for LILO portion at Harsh Vihar as being a critical link. Further in the response of DTL, CTUIL stated that on the LILO portion of Harsh Vihar containing OPGW & UGFO shall be installed by DTL as implementor of this LILO portion line. Same was agreed in the meeting**.**

In view of above, following transmission scheme is agreed to be implemented by DTL under Intra state: :

- LILO of one ckt of 400kV Mandola – Dadri D/c line(Quad Bersimis) at Harsh Vihar S/s (DTL) (Incl. 400kV cable portion) (LILO length-12km incl. 0.7km cable)

G7. LILO of one circuit of 400kV Sikar – Agra D/c (Quad Moose) line at 400 kV GSS Kumher (6.5 ckm) along with 80 MVAR, 420 kV switchable line reactor at Kumher end of Sikar – Kumher 400 kV section

It was stated that a meeting was held among CEA, Grid-India, CTUIL & RVPN on 25.10.2024 through VC to discuss the Intra-State Transmission Schemes proposed by RVPNL. In the meeting Proposal for Establishment of 400/220 kV, 2x500 MVA GSS and associated transmission system at Kumher, Bharatpur district, Rajasthan was deliberated. In the meeting, RVPN stated that presently, load of Bharatpur area is being fed mainly from Dholpur GTPS and Agra through 220 kV lines. However, generation at Dholpur GTPS is not being scheduled due to comparatively costly power due to prevailing high gas price. Hence, there is high power flow is from Chhabra TPS to 400 kV GSS Hindaun to Dholpur GTPS which in turn is connected to Bharatpur (load centre).

Further, 400 kV GSS Alwar is also fed radially from 400 kV GSS Hindaun. Due to radial nature of 400 kV network at 400 kV GSS Hindaun and 400 kV GSS Alwar, there is large voltage variations in the region especially during high agriculture load conditions. Condition further worsens with opening of Bharatpur – Agra 220 kV S/c line due to operational and maintenance activities. In order to address the above issues and to ensure reliable power supply in Bharatpur area, RVPN has proposed following intra state transmission scheme:

- New substation at Kumher with 2×500 MVA, 400/220 kV ICTs and 125 MVAR, 420 kV Switchable Bus Reactor
- LILO of one circuit of Sikar – Agra 400 kV D/c (Twin Moose) line at 400 kV GSS Kumher (6.5 ckm) along with 50 MVAR, 420 kV switchable line reactor at Kumher end of Sikar – Kumher 400 kV Section (km)
- LILO of Hindaun – Alwar (Twin Moose) 400 kV S/c line at 400 kV GSS Kumher (45 ckm)
- LILO of Nadbai – Bharatpur 220 kV S/c line at 400 kV GSS Kumher (5 ckm)
- LILO of Sikri – Bharatpur 220 kV S/c line at 400 kV GSS Kumher (10 ckm)
- Future Elements at Kumher GSS:
  - Space for 4 Nos. 220 kV line bays
  - Space for 1×500 MVA (3rd), 400/220 kV ICT along with bays

In the same meeting CTUIL stated that this proposal seems to be in order & would enhance the stability of the system through LILO of 400kV Sikar- Agra line (386km) at Kumher GSS. Further it is suggested that instead of 50 MVAr line reactor, 80 MVAr line reactor may be considered at Kumher end of Sikar – Kumher 400 kV line section (formed after LILO) as considerable voltage rise is being observed for which 50 MVAr line reactor may not be adequate.

After the deliberations, the transmission scheme proposed by RVPN for establishment of a new 400 kV Kumher substation in Bharatpur district, Rajasthan was agreed in that meeting with following scope of work:

- New substation at Kumher with 2×500 MVA, 400/220 kV ICTs and 125 MVAR, 420 kV Switchable Bus Reactor. Future provisions:
  (i) Space for 4 Nos. 220 kV line bays
  (ii) Space for 1×500 MVA (3rd), 400/220 kV ICT along with bays

- LILO of one circuit of Sikar – Agra 400 kV D/c (Twin Moose) line at 400 kV GSS Kumher (6.5 ckm) along with 50 MVAR, 420 kV switchable line reactor at Kumher end of Sikar – Kumher 400 kV section
- LILO of Hindaun – Alwar (Twin Moose) 400 kV S/c line at 400 kV GSS Kumher (45 ckm)
- LILO of Nadbai – Bharatpur 220 kV S/c line at 400 kV GSS Kumher (5 ckm)
- LILO of Sikri – Bharatpur 220 kV S/c line at 400 kV GSS Kumher (10 ckm)

Subsequently, Grid-India vide email dated 27.12.2024 has clarified that the Sikar – Agra 400 kV D/c line has been implemented with Quad Moose conductor. POWERGRID has confirmed that conductor type of Sikar – Agra 400 kV D/c line is Quad Moose.

CTUIL also carried out studies on above proposal. In CTU planning files it emerged that loadings are in order. Further with the proposed 50 MVAr, 420 kV switchable line reactor at Kumher end of Sikar – Kumher 400 kV line section (316 km), reactive compensation is on lower side (~40%) with Ferranti rise of about 17kV. Considering above, 80 MVAr, 420 kV switchable line reactor at Kumher end of Sikar – Kumher 400 kV line section may be suggested in place of 50 MVAr, 420 kV switchable line reactor.

Subsequently, the minutes of the meeting circulated vide CEA letter dated 04.12.2025 were modified (vide CEA letter dated 03.01.25) with proposed Transmission scheme as below

- New substation at Kumher with 2×500 MVA, 400/220 kV ICTs and 125 MVAR, 420 kV Switchable Bus Reactor.
  Future provisions:
  (i) Space for 4 Nos. 220 kV line bays
  (ii) Space for 1×500 MVA (3rd), 400/220 kV ICT along with bays

- LILO of one circuit of Sikar – Agra 400 kV D/c (Quad Moose) line at 400 kV GSS Kumher (6.5 ckm) along with 80 MVAR, 420 kV switchable line reactor at Kumher end of Sikar – Kumher 400 kV section
- LILO of Hindaun – Alwar (Twin Moose) 400 kV S/c line at 400 kV GSS Kumher (45 ckm)
- LILO of Nadbai – Bharatpur 220 kV S/c line at 400 kV GSS Kumher (5 ckm)
- LILO of Sikri – Bharatpur 220 kV S/c line at 400 kV GSS Kumher (10 ckm)

The comprehensive scheme proposal is intra state in nature, however the proposal involves LILO of ISTS line i.e. LILO of one circuit of Sikar – Agra 400 kV D/c (Quad) line at 400 kV GSS Kumher. In view of above, the proposal is being discussed in present CMETS-NR meeting.

During the meeting, RVPNL asked that whether they need to install OPGW on the LILO portion of Sikar – Agra 400 kV D/c line at Kumher, they also asked who shall install OPGW on POWERGRID line if OPGW is not available. CTUIL stated that as per CEA (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations, 2022, "The primary path for tele-protection shall be on point-to-point Optical Ground Wire", further as per CEA letter dtd. 22.05.24 all the Central and State utilities to ensure the OPGW on their transmission network (attached at **Annexure-IA**). Therefore, RVPNL needs to install OPGW on their LILO portion of Kumher S/s, for the main line i.e. Sikar – Agra 400 kV D/c if OPGW is not available POWERGRID shall needs to install the same. CTUIL asked availability of OPGW from POWERGRID, as Concerned representative from POWERGRID was not present in the meeting, later on vide email dtd. 24.01.25 POWERGRID informed that OPGW is not available on this line. CTUIL stated that as OPGW not available on Sikar – Agra 400 kV D/c line, a separate scheme shall be formed by CTU for review in the upcoming NRPC. Same was agreed in the meeting**.**

Considering above following scheme is agreed to be implemented by RVPN as part of comprehensive scheme discussed above under Intra state along with necessary communication infrastructure:

- LILO of one circuit of Sikar – Agra 400 kV D/c (Quad) line at 400 kV GSS Kumher (6.5 ckm) along with 80 MVAr, 420 kV switchable line reactor at Kumher end of Sikar – Kumher 400 kV section

G8. Augmentation of 400/220 kV, 1x315 MVA (3rd) ICT at 400/220kV New Wanpoh substation

It was stated that in 21st CMETS-NR meeting, based on the request of JKPTCL to meet the growing demand of power in J&K, as well as to fulfill the N-1 criteria of ICTs in future, proposal to implement one no. of 400/220kV, 315 MVA ICT (3rd) at New Wanpoh (PG) S/s under ISTS was agreed.

Further, JKPTCL vide letter dated 07.10.23 informed that as per the present trend of power demand and the upcoming downstream projects, it is imperative that 400/220kV New Wanpoh substation is augmented by the end of 2025. In reply to CTU mail to provide firm schedule to implement 315 MVA ICT (3rd) at New Wanpoh (PG) S/s, JKPTCL vide mail dated 01.02.24 mentioned the firm schedule to be considered as 31.12.25 for above ICT augmentation.

Subsequently, as per CTU OM 22.03.24, CTU approved the implementation of the transmission scheme "Augmentation of Transmission Capacity at 400/220kV New Wanpoh (PG) S/s in Jammu and Kashmir by 400/220kV, 1x315 MVA ICT(3rd)" by the implementing agency "Power Grid Corporation of India Ltd." with timeline of 31.12.25

Recently, in the POWERGRID vide letter dated 24.12.24 informed about several challenges are being faced in awarding the contract execution of substation extension work at New-Wanpoh Substation with a completion schedule of 21 months i.e., Dec'25 based on CTUIL OM dated 22.03.24. POWERGRID also mentioned that the NIT had been issued in July'24 for the subjected work with a completion schedule up to Dec'25 and already 17 extensions have been given to bidders for submission of bids but not even a single

response has been received till date. The bidders had not shown any interest in the above project due to a very challenging terrain as well as non-standard rating of transformer. Bidders had shown their apprehension for supply of transformer rating of 3x105MVA single phase units (315MVA) at higher altitude and it is learnt from their pre-bid meetings that supply of this type of transformer itself will take 21 months and further require considerable time for execution.

Considering the above challenges POWERGRID requested CTUIL to consider revising schedule with a fresh schedule project to 30 months from revised CTUIL OM. In view of the above developments, JKPTCL may review its requirement and completion schedule.

JKPTCL stated that Mirbazar capacity augmentation (475VA to 630MVA) will likely to come up by Mar'26. In addition Salal S/s is being implemented in TBCB with commissioning schedule of Mar'27, however ICT augmentation may be required by Mar'26 and POWERGRID can avail that time for ICT augmentation.

POWERGRID stated that they would require at least 30 months (24 months for supply and 6 months for execution) from revised OM date. CTU enquired about present bid status of augmentation of ICT. POWERGRID stated that present bid will be annulled and now in new bid, transformer supply and execution packages kept separately. CTU stated that with present bid status, it is envisaged that ICT would not be available before Aug'27. JKPTCL stated that with increased load of Mirbazar S/s, New Wanpoh ICTs may cater the load, however with their proposed Salal S/s, ICT augmentation is required with best effort schedule of Mar'27. CEA requested POWERGRID to expedite the implementation for reliable dispersal of power in J&K.

CTU stated that recently lot of developments & infrastructure activities were carried out in J&K and with above developments in roads, tunnels, bridges, there may be feasibility of transportation of 315MVA unit rather than 105MVA (Single phase) unit.

POWERGRID stated that Mar'27 implementation schedule is not feasible due to 3 months non working period in winters and therefore it is suggested that Jun'27 schedule may be kept for ICT augmentation. POWERGRID emphasized that single phase configuration may be considered at present as no three phase transformer yet transported through new infrastructure. CTU stated that there is issue in supply and delivery of single phase 105MVA units due to non standard size, therefore to expedite the implementation possibility of 315MVA transformer transportation on new infrastructure (tunnel/road/bridges) may be explored by POWERGRID and informed it within 1 month.

JKPTCL stated that they also faced issue of 3 months non working season in winters and therefore based on tendering issues in 105MVA unit as well as POWERGRID request for extension of commissioning of ICT augmentation, Jun'27 schedule may be kept for ICT augmentation.

G9. Transmission scheme for evacuation of power as part of Rajasthan REZ Ph-IV (Part-5 : 6GW) (Barmer Complex)

It was stated that Renewable Energy Zones (REZs) were identified by MNRE/SECI with a total capacity of 181.5 GW for likely benefits by the year 2030 in eight states, which includes 75GW REZ potential in Rajasthan comprising of 15 GW Wind and 60 GW Solar. In this

regard a Committee on Transmission Planning for RE was constituted by MOP for planning of the requisite Inter State Transmission System required for the targeted RE capacity by 2030 for which a Comprehensive transmission plan for evacuation of 75GW RE potential from Rajasthan evolved.

Details of schemes approved/Under Planning scheme as part of above is as under:

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	Under Implementation
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 Implementation
3	Rajasthan REZ Ph-IV (Part-3 :6GW) (Bikaner Complex)	6 GW (Solar) Bikaner-IV:6GW	Under Implementation
4	Rajasthan REZ Ph-IV (Part-4 :3.5GW) (Jaisalmer/Barmer Complex)	3.5 GW (Solar) Fatehgarh-IV: 1 GW Barmer-I: 2.5 GW	Under Implementation
5	Rajasthan REZ Ph-V (Part-1: 4GW) (Sirohi/Nagaur Complex)	4 GW (Solar) Sirohi: 2 GW Nagaur: 2 GW	Under Bidding
B	**Planned/Under Planning**		
1	**Rajasthan REZ Ph-IV (Part-5 : 6GW) (Barmer Complex)**	**6 GW (Solar)** **Barmer-II : 6GW**	**Timeframe : 2029 (HVDC)**
2	Rajasthan REZ Ph-IV (Part-6 : 6GW) (Bikaner Complex)	6 GW (Solar) Bikaner-V: 6 GW	Timeframe : 2030 (HVDC)
3	Rajasthan REZ Ph-V (Part-7 : 6GW) (Bhadla Complex)	6 GW (Solar) Bhadla-IV: 6 GW	

4	Rajasthan REZ Ph-V (Part-2 : 6GW) (Ramgarh Complex)	6 GW (Solar) Ramgarh-II: 6 GW	

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).

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. It was decided in the meeting 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) (Bikaner Complex). Accordingly, Transmission scheme for Rajasthan REZ Ph-V (Part-1: 4GW) (Sirohi/Nagaur Complex) was agreed in 30th CMETS-NR meeting held on 18.06.24.

Considering application received at Barmer-II PS, transmission scheme is evolved for as part of Rajasthan REZ Ph-IV (Part-5 : 6GW) (Barmer Complex) and being discussed in present meeting.

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

As part of Renewable Energy Zones (REZs) identified by MNRE/SECI with a total capacity of 75 GW REZs in Rajasthan, evacuation system for 13GW was planned at Fatehgarh (5GW) & Barmer (8GW) complex. Transmission scheme for Rajasthan REZ Ph-IV (Part-2:5.5GW) (Jaisalmer/Barmer Complex) was approved in 14th NCT meeting for injection at Fatehgarh-IV PS (4GW) & Barmer-I PS (1.5GW) in Rajasthan and also under implementation

For evacuation of power beyond 5.5GW from Fatehgarh-IV PS/Barmer-I PS, hybrid transmission system (EHVAC(3.5GW)+HVDC(6GW)) from Fatehgarh/Barmer complex was planned. EHVAC evacuation system comprises 3.5 GW capacity transmission system from Fatehgarh-IV/Barmer-I (thus making total planned capacity of 9GW (5.5GW+3.5GW)) was approved in 19th NCT meeting

In the joint study meeting held on 28.12.23 & 09.01.24, CTU stated that as per committee report Barmer-II PS was planned for 6GW RE potential (2GW BESS capacity) with 4GW evacuation capacity. In 27th CMETS-NR meeting held on 10.01.24, SECI informed that at present there is no clear visibility for RE projects with BESS before 2027 as award process will take time (1-2 years). In view of that 7.5 GW RE potential (solar) remains untapped due to non-materialisation of BESS capacity (Fatehgarh- IV:4GW+Barmer-I : 1.5GW+Barmer-II: 2GW). Accordingly, it was suggested that 2 GW additional RE potential may be considered for planning of transmission scheme from Barmer- II

PS. SECI informed that they will provide their inputs on enhancement of potential at Barmer- II PS (4GW to 6GW) in consultation with MNRE and RE developers. SECI may update on the same.

At present connectivity of about 6GW capacity is already granted at Barmer-II PS. Beyond that about 1.5 GW connectivity applications are granted and 2.7GW application received for connectivity at Barmer-III PS .

Based on earlier Grid India observation and recent planned scheme in other regions, studies files were modified for 2030 time frame. For evacuation of 6GW capacity from Barmer-II PS, HVDC system from Barmer-II PS is being planned comprises establishment of Barmer-II PS and HVDC line from Barmer-II PS to Western region (near South of Kalamb) as well as EHVAC system for injection of power at Barmer-II PS and onwards dispersal of power in Western region. Studies were carried out in 2030 time frame in for solar maximized scenario and shared on 22.11.24 with all constituents. Grid-India vide mail dated 11.12.24 provided their observation on All India files as well as on proposed transmission scheme (copy of Grid-India observations is enclosed in **Annexure-B1**). The main observation of Grid-India is as under :

- SCR & inertia requirement at Barmer-I PS
- Comparison of VSC and LCC technology
- Justification of termination of HVDC at South Kalamb
- Congestion in WR & SR-WR
- Inputs on load generation balance

Reply of Grid-India observations for Rajasthan REZ Ph-IV (Part-5 : 6GW) (Barmer Complex) is enclosed in **Annexure-B2.** As per discussion held in 25th NCT meeting on 28.11.24, both VSC & LCC technology are considered in the present proposal and to be discussed along with comparative analysis in NCT meeting. A comparative analysis of VSC and LCC technology (incl. Grid-India inputs) are as under:

Feature	LCC-HVDC	VSC-HVDC
Important parameters for technology adoption		
Reactive Power Requirements	Requires substantial reactive power compensation (e.g., Filter Banks, SVC, STATCOM, SynCons). The maximum reactive power required will be almost 60% of rated power	Capable of independent reactive power control. Generally, no external compensation needed. (with inbuilt STATCOM mode of operation)
Grid Strength Dependency	Strong AC systems at both rectifier and inverter end are necessary for commutation. may fail in weak grids (SCR > 2.5)	Strong AC systems are not necessary since there are no issues of commutation failures.

		Operates effectively in weak or even "islanded" grids.
Network restart time during DC line faults	Less (depend on de-ionization time) in milli-secs (<500 ms)	>1 sec (1.5 secs in case of HVDC Pugalur – Trichur for Line to Ground faults); highly dependent on AC side circuit breaker opening/reclosing. DC line Fault recovery time in VSC is of about ~1.5 to 1.8 Sec (for 1100 km)
Efficiency/Losses	Slightly higher efficiency in steady-state operation. Lower line and converter losses	Lower efficiency due to switching losses in IGBTs. Line losses are about 25-30% higher in VSC (for1000km)
Cost	Lower initial cost for converters, but higher for filters and compensators. Overall initial cost is lower in LCC technology.	Higher initial cost for converters, lower for ancillary components. Overall initial cost is higher in VSC technology.
Other technological Differences	**LCC-HVDC**	**VSC-HVDC**
Converter Technology	Uses semiconductors which are capable of withstanding voltage in both direction (Thyristor-based)	Uses semiconductors which are capable of blocking unidirectional voltage only (IGBT with antiparallel diodes or similar switching devices)
Direction of Current and power	Current flow is allowed in single direction. Power direction is changed by changing the voltage polarity.	Current flow can be bidirectional. Power direction is changed by changing the direction of current flow.
Switching Philosophy	Turned on by firing pulses but turn off with assistance of line voltage	Turned on and turn off can be controlled by firing pulses.
Power transfer capability	Thyristors have huge current carrying capability, huge amount of power transfer is possible using LCC technology	IGBTs have lesser current carrying capability and hence the power flow capable is limited.
Source	LCC appears like a current source to AC system (Inductive energy storage)	VSC appears like a voltage source to AC system (Capacitive energy storage)
Black Start Capability	Not suitable for black start without additional support.	Capable of providing black start services.

Area	The AC and DC yard of LCC are spread over a large area.	Area requirement is much lesser for the same power flow since there are no AC and DC filters
Harmonics	Harmonics are quite high. Harmonics are present both on the AC as well as DC side.; requires large filters.	Minimal harmonics due to PWM-based control. Smaller filters required.
Transformer size	Converter transformers are used which are heavier, bulkier and costlier.	Normal AC transformers could be used as there is no DC stress and harmonics in the secondary
Power Reversal	Possible. Requires changing DC polarity for power reversal.	Possible (seamless). Achieved by changing current direction without altering DC polarity.
Fault Ride-Through	Limited ability to ride through grid faults. May trip under disturbances.	Superior fault ride-through capability.
Overload Capability	Possible (usually 10-20% for short durations).	Not available as standard, may be full converter rating (depends on standard rating vs extra overload expected)
Converter Footprint	Large, due to filters, reactive power compensators, and transformers.	Compact, as filters and external compensators are minimized.
Grid Support Functions	Limited (e.g., no independent voltage control).	Can provide grid-forming services, voltage regulation, and frequency support. ability to maintain appropriate system parameters in different renewable generation scenarios
Bidirectional Power Flow	Achieved but with slower transition.	Seamless bidirectional power flow

Details of HVDC VSC configuration (Double Bipole with parallel DMR/ Parallel Bipole with parallel DMR) is enclosed in **Annexure B3**.

Grid-India in the meeting further reiterated that SCR of Barmer-II is on lower side even with considering 2 nos. of Syncon units. CTU stated that SCR of Barmer-II PS is about 3 which is under most pessimistic scenario with calculation methodology suggested by Grid-India, however in actual the SCR would be much higher. Additional as per our understanding and discussion with OEMs in earlier HVDC packages, minimum SCR requirement for HVDC operation for VSC technology is >1 whereas for LCC technology is > 2.5. The SCR of

400kv Barmer-II PS will further improve with future interconnection planned for Barmer-III PS (HVDC) with Barmer-II PS in next 5-6 months.

Grid-India vide mail 22.01.25 as well as in the meeting highlighted the following advantages of VSC based HVDC.

- Strong AC systems may not be required as there are no issues of commutation failures and the HVDC operates effectively in weak or even "islanded" grids.
- Capable of providing black start services: One LCC HVDC (Bhadla3-Fatehpur) is under implementation, having one VSC HVDC would help to harness advantages of both configurations
- Minimal harmonics due to PWM-based control. Smaller filters required.
- Superior fault ride-through capability
- Can provide grid-forming services, voltage regulation, and frequency support i.e. ability to maintain appropriate system parameters in different renewable generation scenarios

Grid-India in the comments received on 22.01.25 (**copy enclosed in Annexure B4**) further emphasized that technically VSC based HVDC is a better alternative than LCC based HVDC keeping in view the low system strength at Barmer-II (SCR < 2.0 without SynCons and ~2.5 with SynCons) and the reactive power and oscillations issues already being faced in the complex. Grid -India further emphasized on control interaction studies, POD studies and filter arrangement modelling. Reply of Grid-India observations for Rajasthan REZ Ph-IV (Part-5 : 6GW) (Barmer Complex) is already enclosed in **Annexure-B2.**

Grid-India in the meeting stated that they do not have any major observation on revised cases, however there are minor observations on LGB which they will communicate in meanwhile time. Grid-India emphasis that space for STATCOMs & additional Syn Cons and to be kept at Barmer-II PS as part of future scope so that in case, LCC HVDC is approved and any operational issues are faced in future, additional syncon or STATCOM can be provided for system strengthening. CEA agreed on the proposed scheme for taken up in NCT meeting with both configurations (LCC/VSC). No other comments were received from stakeholders in the meeting. It was deliberated that the final decision regarding implementation of HVDC as LCC or VSC would be taken in NCT meeting.

Considering grant of connectivity to new RE generators/applicants in Barmer complex, following transmission scheme is agreed for evacuation of power from Rajasthan REZ Ph-IV (Part-5 : 6GW)

Proposed Transmission system for evacuation of power from Rajasthan REZ Ph-IV (Part-5 :6 GW) [Barmer Complex] Barmer-II : 6GW (Solar)

A. Alternative-1 : LCC Configuration

Sl. No.	Description of Transmission Element	Scope of work (Type of Substation/Conductor capacity/km/no. of bays etc.)
1	Establishment of 400/220kV, 6x500MVA S/s at suitable location near Barmer (Barmer-II Substation) along with 2x125 MVAr bus reactor **Future provisions (excl. scope of present scheme):** ➢ 400 kV line bays along with switchable line reactor –6 ➢ 400 kV line bays –4 nos. ➢ 400 kV Bus Reactor along with bays: 1 no. ➢ 400/220 kV ICT along with bays-4 Nos. ➢ 400 kV Sectionalization bays: 2 sets ➢ 220 kV line bays for connectivity of RE Applications -5 Nos. ➢ 220kV Sectionalization bay: 2 sets ➢ 220 kV BC (2 Nos.) & TBC (2 Nos.) ➢ 2 nos. of Syncon units at 400kV level along with 2 nos. of 400kV bays ➢ STATCOM (2x±300 MVAr, 4x125 MVAr MSC, 2x125 MVAr MSR) along with 400 kV bays (2 Nos.)	Barmer-II PS - AIS • 400/220 kV 500 MVA ICTs- 6 nos. • 400 kV ICT bays- 6 no. • 220 kV ICT bays- 6 no. • 125 MVAr Bus Reactor-2 nos. • 400 kV Bus reactor bays- 2 no. • 400kv line bays– 4 nos. (for RE interconnection) • 220KV line bays – 7 nos. (for RE connectivity) • 220kV Sectionalization bay: 1 set • 220 kV BC (2 Nos.) & TBC (2 Nos.)
2	LILO of both ckts of 400kV Fatehgarh-IV PS - Barmer-I PS at Barmer-II PS	Line Length ~ 20 km (LILO length ~ 20 km) • 400 kV line bays-4 nos. (at Barmer-II PS end)
3	400kV Barmer-II PS - Barmer-I PS D/c line (Quad)	Line Length – (~30 km) • 400 kV line bays at Barmer-II PS – 2 nos. • 400 kV line bays at Barmer-I PS S/s – 2 nos.
4	Establishment of 2 nos. 3000 MW (Bipole configuration), ± 800 kV Barmer-II (HVDC) [LCC] terminal station (2x1500 MW) at a suitable location near Barmer-II substation	HVDC terminal station (± 800 kV, 3000 MW (Bipole configuration)- 2nos.) ➢ 400/33 kV, 2x50 MVA transformers for exclusively supplying auxiliary power to HVDC terminal. ➢ 400kV bus sectionaliser -2 nos. (1 Set) at Barmer-II (HVDC) station

Sl. No.	Description of Transmission Element	Scope of work (Type of Substation/Conductor capacity/km/no. of bays etc.)
5	Establishment of 2 nos. 3000 MW (Bipole configuration), ± 800kV South Kalamb S/s (HVDC) [LCC] terminal station (2x1500 MW) at a suitable location near South of Kalamb	HVDC terminal station (± 800 kV, 3000 MW (Bipole configuration)- 2nos.) ➢ 400kV bus sectionaliser -2 nos. (1 Set) at South Kallamb (HVDC) station
6	±800 kV HVDC Bipole line (Hexa lapwing) between Barmer-II (HVDC) & South Kalamb (HVDC) (with parallel Dedicated Metallic Return) (capable to evacuate 6000MW) (1100kms) [with 100% reactive power capability]	Line Length – (~1100 km)
7	Augmentation of South Kalamb S/s# by 4x1500MVA, 765/400kV ICTs (3 on 400kV & 765kV Section-II & 1 No. on 400kV & 765kV Section-I) alongwith 2x330 MVAR, 765 kV bus reactor & 2x125 MVAR, 420 kV bus reactor on Section-II which will be established under a different network expansion scheme in WR as per details given below. * (2x1500 MW HVDC Bipole-I to be terminated on 400 kV Sec-I & 2x1500 MW HVDC Bipole-II to be terminated on 400 kV Sec-II of South Kallamb S/s & both 765kV & 400kV bus sectionalizers to be kept normally closed)	• 765/400 kV 1500 MVA ICTs- 4 nos. • 765 kV ICT bays- 4 no. • 400 kV ICT bays- 4 no • 330 MVAr Bus Reactor-2 nos. (at bus section-II) • 765 kV Bus reactor bays- 2 nos. (at bus section-II) • 125 MVAr Bus Reactor-2 nos. (at bus section-II) • 400 kV Bus reactor bays- 2 nos. (at bus section-II)
8	2 nos. of Syncon units at 400kV level of Barmer-II PS (1 no. of SynCon unit comprises dynamic support of +300MVAr/-150MVAr (Minimum) & Short circuit contribution at PCC of 1200MVA (Minimum) **** Value of inertia constat (H) shall be provided in RfP document.***	• Syncon units – 2 nos. • 400kv line bays – 2nos.

#South Kalamb S/s establishment with 2x1500 MVA, 765/400 kV ICTs with 2x330 MVAR, 765 kV bus reactor and 2x125 MVAR, 420 kV bus reactor alongwith LILO of Pune-III – Boisar-II 765 kV D/c line (presently under bidding stage).

**** Network Expansion Scheme: Creation of New 765kV & 400kV Bus Sections-II & III through 765 kV Sectionalization bay: 2 sets & 400 kV Sectionalization bay: 2 sets alongwith 2x330 MVAR, 765 kV bus reactor & 2x125 MVAR, 420 kV bus reactor on Section-III is being proposed along with ICT augmentation (3x1500MVA, 765/400kV ICTs) at Bus Section -III at both 765kV & 400kV levels alongwith downstream 400kV lines at bus section-III from South Kallamb S/s with implementation timeframe of 24 months from effective date. [400kV Sectionaliser between Sections-I & II to be kept normally closed & between sections-II & III to be normally open. Further, 765kV sectionaliser between***

Sections-I & II & between II & III shall be kept normally closed. The 400kV sectionalisers can be closed under contingency conditions. Further, all space provisions as per RfP document of South Kalamb S/s shall be kept while implementing this scheme].

B. Alternative-2: VSC Configuration

Sl. No.	Description of Transmission Element	Scope of work (Type of Substation/Conductor capacity/km/no. of bays etc.)
1	Establishment of 400/220kV, 6x500MVA S/s at suitable location near Barmer (Barmer-II Substation) along with 2x125 MVAr bus reactor **<u>Future provisions (excl. scope of present scheme):</u>** ➢ 400 kV line bays along with switchable line reactor –6 ➢ 400 kV line bays –4 nos. ➢ 400 kV Bus Reactor along with bays: 1 no. ➢ 400/220 kV ICT along with bays-4 Nos. ➢ 400 kV Sectionalization bays: 2 sets ➢ 220 kV line bays for connectivity of RE Applications -5 Nos. ➢ 220kV Sectionalization bay: 2 sets ➢ 220 kV BC (2 Nos.) & TBC (2 Nos.) ➢ 2 nos. of Syncon units at 400kV level along with 2 nos. of 400kV bays ➢ STATCOM (2x+300 MVAr, 4x125 MVAr MSC, 2x125 MVAr MSR) along with 400 kV bays (2 Nos.) ***(1 no. of SynCon unit comprises dynamic support of +300MVAr/-150MVAr (Minimum) & Short circuit contribution at PCC of 1200MVA (Minimum). Value of inertia constat (H) shall be provided in RfP document).***	Barmer-II PS - AIS • 400/220 kV 500 MVA ICTs- 6 nos. • 400 kV ICT bays- 6 no. • 220 kV ICT bays- 6 no. • 125 MVAr Bus Reactor-2 nos. • 400 kV Bus reactor bays- 2 no. • 400kv line bays– 4 nos. (for RE interconnection) • 220KV line bays – 7 nos. (for RE connectivity) • 220kV Sectionalization bay: 1 set • 220 kV BC (2 Nos.) & TBC (2 Nos.)
2	LILO of both ckts of 400kV Fatehgarh-IV PS - Barmer-I PS at Barmer-II PS	Line Length ~ 20 km (LILO length ~ 20 km) • 400 kV line bays-4 nos. (at Barmer-II PS end)
3	Establishment of 2 nos. 3000 MW (Double Bipole configuration), ±600kV Barmer-II (HVDC) [VSC] terminal station (2x1500 MW) at a suitable location near Barmer-II substation	HVDC terminal station (± 600 kV, 3000 MW (Double Bipole configuration)- 2nos.)

Sl. No.	Description of Transmission Element	Scope of work (Type of Substation/Conductor capacity/km/no. of bays etc.)
		➢ 400/33 kV, 2x50 MVA transformers for exclusively supplying auxiliary power to HVDC terminal. ➢ 400kV bus sectionaliser -2 nos. (1 Set) at Barmer-II (HVDC) station
4	Establishment of 2 nos. 3000 MW (Double Bipole configuration), ± 600kV South Kalamb S/s (HVDC) [VSC] terminal station (2x1500 MW) at a suitable location near South of Kalamb	HVDC terminal station (± 600 kV, 3000 MW (Double Bipole configuration)- 2nos.)
5	±600 kV HVDC Double Bipole line (2xD/c) (Quad Lapwing on same tower) between Barmer-II (HVDC) & South Kalamb (HVDC) (with parallel Dedicated Metallic Return) (capable to evacuate 6000MW) (1100kms) [with 100% reactive power capability]	Line Length – (~1100 km)
6	Augmentation of South Kalamb S/s# by 4x1500MVA, 765/400kV ICTs (3 on 400kV & 765kV Section-II & 1 No. on 400kV & 765kV Section-I) alongwith 2x330 MVAR, 765 kV bus reactor & 2x125 MVAR, 420 kV bus reactor on Section-II which will be established under a different network expansion scheme in WR as per details given below. * (2x1500 MW HVDC Bipole-I to be terminated on 400 kV Sec-I & 2x1500 MW HVDC Bipole-II to be terminated on 400 kV Sec-II of South Kallamb S/s & both 765kV & 400kV bus sectionalizers to be kept normally closed)	• 765/400 kV 1500 MVA ICTs- 4 nos. • 765 kV ICT bays- 4 no. • 400 kV ICT bays- 4 no • 330 MVAr Bus Reactor-2 nos. (at bus section-II) • 765 kV Bus reactor bays- 2 nos. (at bus section-II) • 125 MVAr Bus Reactor-2 nos. (at bus section-II) • 400 kV Bus reactor bays- 2 nos. (at bus section-II)

#South Kalamb S/s establishment with 2x1500 MVA, 765/400 kV ICTs with 2x330 MVAR, 765 kV bus reactor and 2x125 MVAR, 420 kV bus reactor alongwith LILO of Pune-III – Boisar-II 765 kV D/c line is presently under bidding stage).

**** Network Expansion Scheme: Creation of New 765kV & 400kV Bus Sections-II & III through 765 kV Sectionalization bay: 2 sets & 400 kV Sectionalization bay: 2 sets alongwith 2x330 MVAR, 765 kV bus reactor & 2x125 MVAR, 420 kV bus reactor on Section-III is being proposed along with ICT augmentation (3x1500MVA, 765/400kV ICTs) at Bus Section -III at both 765kV & 400kV levels alongwith downstream 400kV lines at bus section-III from South Kallamb S/s with implementation timeframe of 24 months from effective date. [400kV Sectionaliser between Sections-I & II to be kept normally closed & between sections-II & III to be normally open. Further, 765kV sectionaliser between***

Sections-I & II & between II & III shall be kept normally closed. The 400kV sectionalisers can be closed under contingency conditions. Further, all space provisions as per RfP document of South Kalamb S/s shall be kept while implementing this scheme.]

G10. Power flow congestion to Delhi Ring Main unit through 400 kV Switchyard at 765/400KV Jhatikra substation

It was stated that Power flow congestion to Delhi Ring Main unit through 400 kV Switchyard at 765/400KV Jhatikra substation was deliberated in 224th OCC meeting held on 18.10.24. In the meeting, POWERGRID stated that 400 kV Bus at Jhatikra is sectionalised in 02 sections (Section-1 feeds load to Bamnauli/Dwarka S/s through 765/400 kV ICT-1&2, whereas Section-II feeds loads to Mundka S/s through 765/400 kV ICT-3&4)

POWERGRID further stated that maximum load recorded through both the sections in 2024 Summer peak is ~ 2500 MW (~ 4000 Amp). In case of breakdown of any tie bay across 400 kV switchyard, the power flow through remaining tie bay in section is 4000 Amps which is much higher than bay equipment rating of (3150 Amp). In order to overcome the situation, following three options were deliberated to relieve the congestion:

- Option 1:- Upgradation of rating of switchyard equipment of 400 kV tie bay at Jhatikra from 3150 to 4000 Amp.
- Option 2:- Provision of additional bus coupler in both sections of 400 kV buses to share the load in case of tie bay contingency.
- Option 3:-Considering time duration in implementation of above proposed solutions, direct coupling arrangement of 400 kV buses may be allowed from April-Oct'25 to cater smooth power transition to Delhi.

In the meeting, it was concluded that CTU to carry out detailed study in consultation with NRLDC on load congestion relieving measures at Jhatikara S/s including provision for upcoming ICTs at Jhatikra S/S and Narela S/s and submit the report to OCC forum.

Subsequently, in 225th OCC meeting held on 12.11.24, CTU informed that 765/400kV Jhatikra S/s has two separate 400 kV sections with two 1500 MVA ICTs in each section. If these sections are connected through sectionalizer, the loading relief observed (100-150MW) on each ICT) in the event of a contingency. CTU has requested Powergrid to confirm the availability of space for the bus sectionalizer and bay upgradation works. CTU has also asked NRLDC to provide the loading patterns for both the Jhatikra-Bamnauli and Jhatikra-Mundaka sections.

To resolve above issue, a meeting was held on 04.12.24 with POWERGRID officials for preliminary discussion on feasibility of various options to relieve congestion at Jhatikra S/s in short term as well as long term. Further a joint meeting was held on 11.12.2024 among CTUIL, NRPC, CEA, Grid-India & POWERGRID to deliberate on above congestion issues.

In the meeting POWERGRID stated that the primary issue is the heavy loading on the tie bays due to radial power feeding to Delhi. In the event of an outage of any line or one of the tie bays in either section, the load on the remaining tie bay in that section exceeds the

continuous rated current capacity (3150A) of the tie bay. This results in formation of hot spots on the tie bay disconnectors, which on failure can potentially lead to considerable load shedding in Delhi.

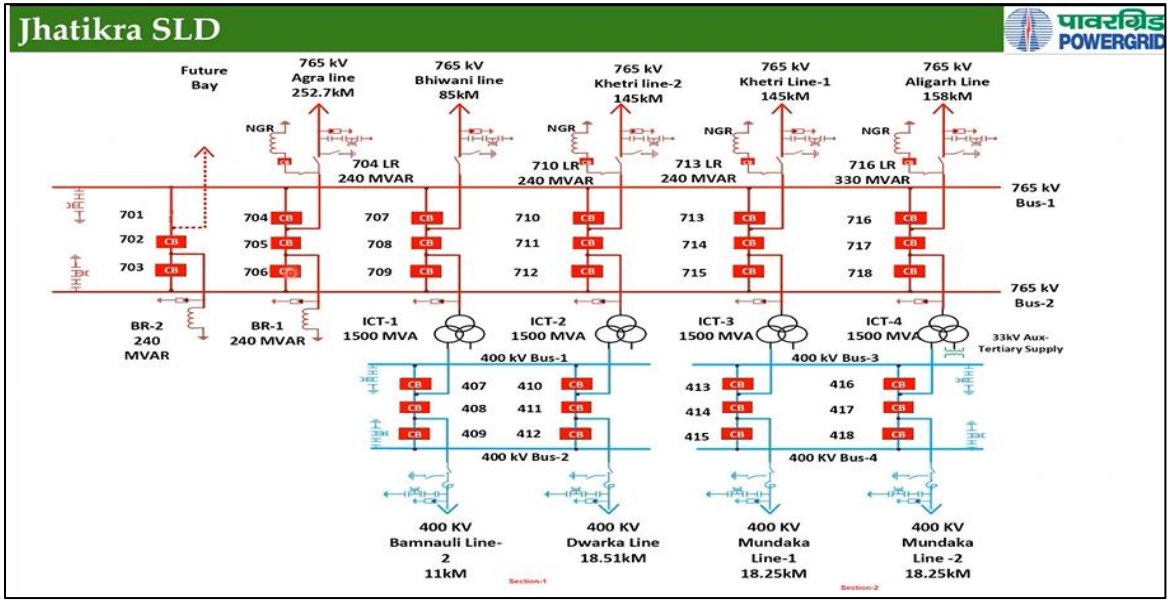


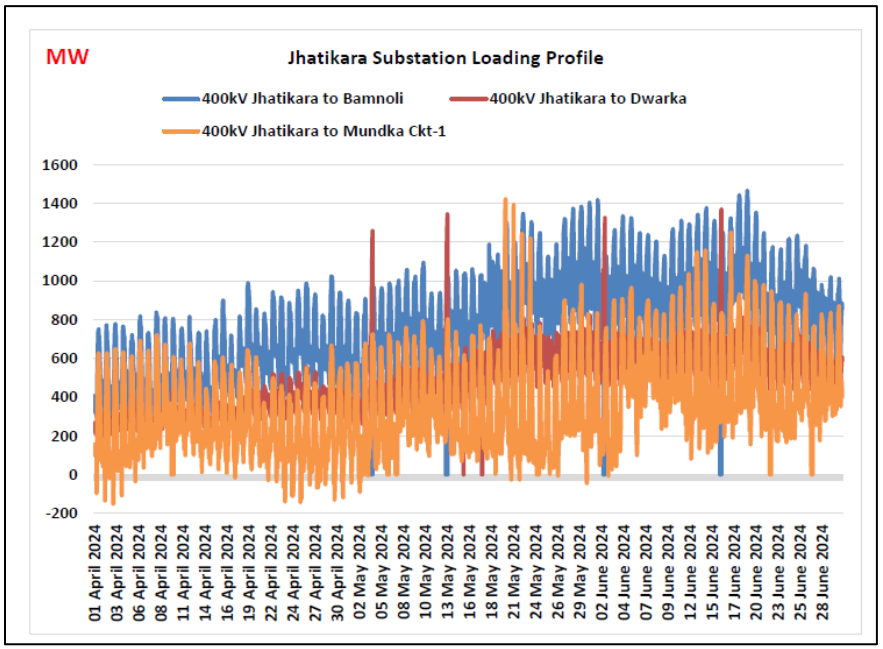
Fig : SLD of 765/400kv Jhatikra S/s (Source-Powergrid)

In the meeting it was stated that additional 765/400kV ICT-5 along with 400kV Jhatikra- Dwarka D/c line is under implementation in section -1. With above ICT implementation, an additional Dia is being implemented, which will resolve the issue of high loading in tie bay in section-1 at the event of contingency. However, issue of critical loading in tie bay of section-2 needs to be resolve.

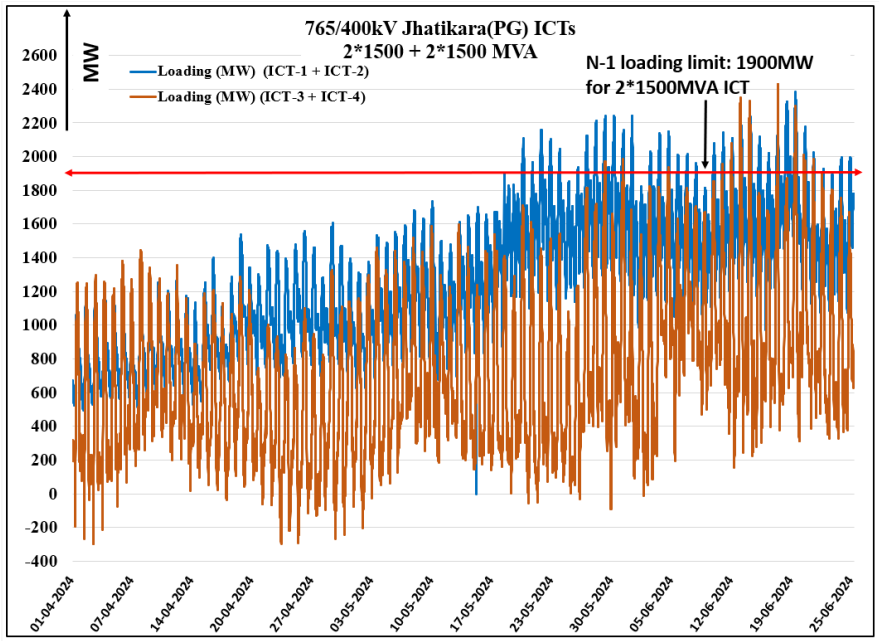
In the meeting, various options were explored to resolve the critical loading issue in tie bay of section-2 i.e. upgradation of existing tie bay, implementation of new tie bay as part of new diameter, direct coupling of both 400kV sections etc. Based on short term and long-term requirement of Delhi region as well as implementation timeframe for various options, it was decided by that a new tie bay (in new diameter) is to be implemented in section-2 as part of short-term solution with implementation timeframe of 6 months. The above diameter will also be utilized for termination of 765/400kV ICT-6 (3rd in section-2) to cater growing demand of Delhi.

Further, POWERGRID vide mail 08.01.25 informed that in case of LBB condition of this Coupler Bay, both the 400kV Bus shall required to be isolated. This will defeat the benefit of One and a Half CB System. Hence, it is proposed that in place of 01 Bay, complete Diameter comprising 02 Nos Bay may be provided. The same shall be utilised in case of future extension projects also. CTU stated

that the proposal technically required 2 CBs (Main+Tie) as suggested by POWERGRID and Main bay is to be formed towards termination of future 765/400kV ICT-6 (3rd in section-2).



Jhatikara Substation Loading Profile (Source-Grid-India)



765/400kV Jhatikara ICT loading for Q1 2024-2025(Source-Grid-India)

Further, Grid-India in operational feedback report Q2 (Apr-Jun'24) & Q3 (Jul'24-Dec'24) mentioned that 765/400kV Jhatikra S/s has 4x1500MVA ICTs of which two 1500MVA ICTs are connected to one section of 400kV bus and the other two 1500MVA ICTs are connected to other section of 400kV bus. The 400kV buses are separated from each other. In Section-I, two ICTs are having sensitivity of 58% on each other and section-II two ICTs are having sensitivity of 55% on each other. N-1 loading limit of (ICT-1 + ICT-2) is 1900MW and (ICT-3 + ICT-4) is 1940MW. Plot shows loading of (ICT-1 + ICT-2) reaching ~1500-1700MW and sometimes exceeding the N-1 loading limit of 1900MW. Similarly, loading of (ICT-3 + ICT-4) in section-II reaching ~1600-1800MW and sometimes reaching the N-1 loading.

In the above report, it is also mentioned that during high WR-NR flow, lines from Jhatikra remain also highly loaded as illustrated in figure above. In the event of any outage of outgoing 400kV lines from Jhatikra S/s, where split bus arrangement exists, the other lines are prone to overloading which may lead to cascading effect in Delhi.

In the report Grid-India stated that with growing demand of Delhi, commissioning of planned system i.e. 400kV Jhatikra-Dwarka ckt.2 & 3 along with 765/400kV ICT-3 (in section-1), which would relieve high loading issue on 400kV Jhatikra-Bamnouli and 400kV Jhatikara-Dwarka section needs to be expedited by POWERGRID. In the meeting, Grid-India further requested POWERGRID to expedite the implementation of 400kV Jhatikra-Dwarka D/c line as part of Ph-III scheme. POWERGRID stated that 400kV Jhatikra-Dwarka D/c line is not yet awarded, however they are expediting the same. CTU stated that delay in 400kV Jhatikra-Dwarka D/c line is a matter of serious concern will impact RE evacuation.

In 224th OCC meeting, Power Grid also highlighted that Critical N-1 situation has been observed for 765/400 ICT-1&2 connected at Bus section-1 (Bamnauli/Dwarka) and 765/400 kV ICT-3&4 (Mundka) connected at Bus section-II with violation of N-1 criteria on regular basis from April-June'25. Any tripping of one of the 765/400 ICT at Jhatikra may lead to cascading tripping and eventual power interruption to Delhi.

Transmission system for Transmission System Strengthening Scheme for Evacuation of Power from Solar Energy Zones in Rajasthan (8.1 GW) under Phase-II Part-G/G1 i.e. 765/400KV Narela & associated transmission system is under implementation with schedule of Mar'25(as provide by POWERGRID). From CTU analysis it is envisaged that with above transmission scheme, there is immediate relief of about 250MW in N-1 contingency of 765/400kV ICT in either section. The Phase-II Part-G/G1 scheme will also relieve the loading of 400kV Jhatikra- Bamnauli/Dwarka D/c line and 400kV Jhatikra- Mundka D/c line at the event of contingency (250-300MW in other ckt of either section contingency)

Further in the meeting held on 11.12.2024 among CTUIL, CEA, Grid-India & POWERGRID CTUIL it was deliberated that with commissioning of 765/400kV ICT augmentation (ICT-3 in section 1) and 400kV Jhatikra-Dwarka D/c line, N-1 compliance issue of ICTs as well in 400kV downstream network (Bamnauli/Dwarka) in Section-1 will be resolved. However, 765/400kV ICTs (2x1500MVA) and 400kV downstream network (Mundka D/c line) in Section-2 may become N-1 non-compliant even after commissioning of Phase-II Part-G/G1 scheme i.e. 765/400KV Narela & associated transmission system. Considering above there may be requirement of 765/400kV ICT augmentation(3rd 1500MVA) to meet N-1 compliance of ICTs in Section-2 which may take at least 21 months from approval.

Considering above constraints as well as implementation schedule of ICTs, 400kV sectionalizer may be taken Up for implementation as part of medium term solution (9-12 months) to relive the loading of 765/400kV ICTs as well as 400kV outgoing lines at the event of contingency. CTU carried out the studies (Jun'25) to assess the impact of 400kV sectionalizer at 765/400kV Jhatikra S/s.

Study Case	ICT Loading (MW) (Bamnauli/Dwarka section)	ICT Loading (MW) (Mundka section section)	400kV Jhatikara-Bamnauli line loading (MW)	400kV Jhatikara-Dwarka line loading (MW)	400kV Jhatikara-Mundka line loading (MW)
Base Case(split bus arrangement)	3x960 (N-1: 1288/ICT)	2x812 **(N-1: 1213)**	1238	571+(2x536)	2x812 **(N-1: 1484)**

			(Jhatikara-Bamnauli one ckt out:1407)		
Both 400kV sections at Jhatikra S/s connected through sectionalizer	3x897 (N-1: 1058/ICT)	2x897 **(N-1: 1058)**	1286 (Jhatikara-Bamnauli one ckt out:1456)	588+(2x553)	2x753 **(N-1: 1332)**

From the studies, it is envisaged that if both 400kV sections are interconnected through 400kV Sectionalizer at the event of contingency of 765/400kV ICTs (2x1500MVA) or 400kV Jhatikra-Mundka D/c line in section-2, loadings on 765/400kV ICTs in section-2 will be relieved about 150MW (one ICT outage) whereas loading on other ckt of 400V Jhatikra-Mundka line (one ckt outage) will be relieved about 170MW.

CTU vide mail 23.12.24 requested to Power Grid to confirm the space availability for 400kV Bus sectionaliser bay (1 set) at 765/400kV Jhatikra (PG) S/s. Power Grid stated that space is available for 400kV Sectionalization bay (Main bay-1&2) at 765/400kV Jhatikra (PG) S/s. CTU also stated that 765/400kV ICT augmentation (6th 1500MVA, 3rd in section-2 (Mundka section)) shall be taken up progressively along with 400kV corridor requirement. Grid-India and CEA agreed on the proposal.

In view of above following ISTS scheme is agreed:

1. 1 no. 400kV bay (Main+Tie) (2 Breaker) (in Mundka section) at Jhatikara (PG) S/s – implementation schedule : 9 months (best effort 6 months)
2. 400kV Sectionalization bay (1 set) at 765/400kV Jhatikara (PG) S/s to interconnect both 400kV sections at the event of contingency - implementation schedule: 18 months (best efforts 15 months)

G11. 2 nos. of Synchronous Condensers (SynCon) units in 765/400/220kV Fatehgarh-II PS

It was stated that in the 71st NRPC meeting held on 29.01.24, it was deliberated that RE power is being integrated in fast pace country-wide and to ensure grid stability and provide inertial support in RE complex, requirement of dynamic compensation like Synchronous Condensers needs to be identified separately based on the detailed reactive power planning studies and the Short Circuit Ratios (SCRs) at different locations.

Accordingly, a committee was formed under Chairmanship of Member Secretary, NRPC along with members from CEA, NRPC, NRLDC, NLDC, NTPC, BHEL, CTU and STUs to do futuristic analysis for the requirement of Synchronous Condensers based on the inertia considerations for NR. Subsequently, the Committee conducted various meetings (Apr'24-Dec'24) wherein deliberations were

held on the requirements of Synchronous Condenser including other available technologies. During the committee meetings, presentations by different OEMs viz BHEL, Hitachi and Andritz Hydro were also made, highlighting various technological options available and its suitability under different system requirements.

Committee has concluded that in view of huge RE capacity addition in the Northern Region, particularly in Rajasthan State, and the challenges thereafter like Oscillations in RE complexes, Reactive Power, Inertia & Short Circuit ratio (SCR) requirements must be addressed accordingly. The Committee is in, therefore, consensus of installation of SynCons in RE complexes because of the following advantages of SynCons :

- Enhancement in System Strength/ Short Circuit Ratio (SCR)
- Fast Reactive Power Support during Faults/Transients
- Increased Inertia and Frequency Response
- Damping of Low Frequency Oscillations
- Steady-state Reactive Power Support

A methodology has been adopted to identify optimal location for installation of SynCons, which includes low SCR (<5), proximity of HVDC station, dynamic compensation requirement, real time grid issues etc.

Location of SynCons as close to the generation [220kV] may appear to increase the SCR. However, at the same time at 400kV level its efficacy in supporting the grid will be more. Therefore, a prudent decision for SynCon placement at 220kV or 400kV needs to be taken on case-to-case basis. Based on the selection criteria discussed above, 7 nos. RE pooling stations were identified in RE complexes in Rajasthan for placement of SynCons with implementation schedule of 2026-27 to 2029-30, subject to availability of space at respective station. The committee recommends installation of first SynCon of 2 x+300/-200 MVAr at 400kV level either at Fatehgarh-II (Priority-1) or Fatehgarh-I (Priority-2) Substation with the completion timeline of 2026-2027 at Fatehgarh-II PS. The committee also recommended that CEA/MoP may consider the installation of proposed Syn Cons in TBCB or RTM mode similar to other transmission projects.

Report of Committee on Futuristic analysis for requirement of Synchronous Condensers based on System Strength and Inertia considerations for Northern Region was published in Dec'24 and deliberated in 52th TCC/77TH NRPC meeting held on 27-28th Dec'24.

Grid India observed sustained oscillations on real time basis at Fatehgarh-II PS. Further, M/s POWERGRID vide mail 05.10.24 confirmed the space for 2x(80x95sqm) for installation of 2 nos. 300MVAr SynCon units. Considering NRPC report study results, criteria for selection for installation of SynCons and space availability as discussed above, installation of SynCon of 2 x+300/-200 MVAR at 400kV level of Fatehgarh-II PS is proposed in present meeting.

In view of above following ISTS scheme is agreed

- 2 nos. of Synchronous Condensers (SynCon) units* at 400kV level of 765/400/220kV Fatehgarh-II PS along with 2 nos. of 400kV bays

**** 1 no. of SynCon unit comprises dynamic support of +300MVAr/-200MVAr (Minimum) & Short circuit contribution at PCC of 1200MVA (Minimum) with Minimum H (natural) >3 s***

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Annexure-I

Transmission system for Connectivity under GNA at Barmer-III PS(Tentative)

1. Establishment of 400kV Pooling Station at suitable location near Barmer (Barmer-III PS) along with 2x125 MVAr bus reactor
2. 400/220kV 5x500MVA ICTs at Barmer-III PS (for connectivity agreed for grant at 220kV level)
3. LILO of both ckts of 400kV Barmer-I PS – Barmer-II PS D/c line (Quad) at Barmer-III PS
4. Establishment of 6000 MW, Barmer-III(HVDC) terminal station (4x1500 MW) at a suitable location near Barmer-III PS
5. Establishment of 6000 MW, HVDC terminal station (4x1500 MW) at suitable location in WR/SR/ER
6. HVDC line between Barmer-III (HVDC) & HVDC terminal station in WR/SR/ER (with Dedicated Metallic Return)
7. Associated EHVAC system strengthening in WR/SR/ER
8. 2x[+]300/(-)150MVAr Synchronous condenser at 400kV level of Barmer-III PS

Annexure-II

Transmission system for Connectivity under GNA at Barmer -I PS(Tentative)

1. Augmentation of 5x500 MVA (5th to 9th), 400/220 kV ICTs at Barmer-I PS
2. Augmentation with 765/400 kV, 3x1500 MVA Transformer (3rd, 4th & 5th) at Barmer-I PS
3. Fatehgarh-III (Section-2) PS – Barmer-I PS 400 kV D/c line (Quad)
4. Establishment of 2x1500 MVA, 765/400 kV Substation at suitable location near Sirohi along with 2x240 MVAr (765 kV) & 2x125 MVAr (400 kV) Bus Reactor
5. Barmer-I PS– Sirohi PS 765 kV D/c line along with 240 MVAR switchable line reactor for each circuit at each end
6. Sirohi PS-Chittorgarh (PG) 400 kV D/c line along with 80 MVAr switchable line reactor for each circuit at Sirohi PS end (Quad)
7. Establishment of 765 kV Substation at suitable location near Rishabdeo (Distt. Udaipur) along with 2x240 MVAr (765 kV) Bus Reactor
8. Sirohi PS- Rishabdeo 765 kV D/c line along with 330 MVAr switchable line reactor for each circuit at Sirohi end
9. Rishabdeo - Mandsaur PS 765 kV D/c line along with 240 MVAr switchable line reactor for each circuit at Rishabdeo end
10. LILO of one circuit of 765 kV Chittorgarh-Banaskantha D/c line at Rishabdeo S/s
11. Establishment of 765 kV Mandsaur PS along with 2x330 MVAR (765 kV) Bus Reactors
12. Mandsaur PS–Indore (PG) 765 kV D/c Line along with 1x330 MVAR switchable line reactor on each ckt at Mandsaur end of Mandsaur PS – Indore (PG) 765 kV D/c Line
13. Establishment of 765/400 kV 2x1500 MVA Kurawar S/s with 2x330 MVAr 765 kV bus reactor and 1x125 MVAr 420 kV bus reactor
14. Mandsaur – Kurawar 765 kV D/c line along with 240 MVAr switchable line reactors on each ckt at both ends of Mandsaur – Kurawar 765 kV D/c line
15. Kurawar – Ashtha 400 kV D/c (Quad ACSR/AAAC/AL59 moose equivalent) line
16. LILO of Indore – Bhopal 765 kV S/c line at Kurawar
17. LILO of one circuit of Indore – Itarsi 400 kV D/c line at Astha
18. Shujalpur – Kurawar 400 kV D/c (Quad ACSR/AAAC/AL59 moose equivalent) line
19. Establishment of 765/400 kV, 2x1500 MVA & 2x500 MVA, 400/220 kV S/s at suitable location near Merta (Merta-II Substation) along with 2x125 MVAr & 2x240 MVAr bus reactor at Merta-II S/s
20. STATCOM (2x$\pm$300MVAr) along with MSC (4x125 MVAr) & MSR (2x125 MVAr) along with 2 nos. 400kV bays at Barmer-I PS
21. 400kV Sectionalizer bay (1 set) at Barmer-I S/s
22. Barmer-I PS – Merta-II 765 kV D/c line along with 330 MVAr switchable line reactor for each circuit at each end of Barmer-I PS – Merta-II 765 kV D/c line
23. Merta-II – Beawar 400 kV D/c line (Quad)
24. Merta-II – Dausa 765 kV D/c line along with 240 MVAr switchable line reactor for each circuit at each end of Merta-II – Dausa 765 kV D/c line
25. Establishment of 765/400kV, 2x1500 MVA S/s at suitable location near Ghiror (Distt. Mainpuri) along with 2x125 MVAr & 2x240 MVAr bus reactor at Ghiror S/s (UP)

26. Dausa - Ghiror 765 kV D/c line along with 330MVAr switchable line reactor at Ghiror end and 240 MVAr switchable line reactor at Dausa end for each circuit of Dausa - Ghiror 765 kV D/c line
27. LILO of both ckt of 765 kV Aligarh (PG) -Orai (PG) D/c line at Ghiror S/s along with 240 MVAr switchable line reactor for each circuit at Ghiror S/s end of 765 kV Ghiror -Orai D/c line
28. LILO of one ckt of 765kV Agra (PG) – Fatehpur (PG) 765kV 2xS/c line at Ghiror along with 240 MVAr switchable line reactor at Ghiror S/s end of 765 kV Ghiror -Fatehpur line
29. 400kV Ghiror-Firozabad (UPPTCL) D/c line (Quad)
30. Sirohi – Mandsaur PS 765KV D/c line 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
31. Mandsaur PS – Khandwa (New) 765kV D/c line along with 240MVAr switchable line reactor for each circuit at each end of Mandsaur PS – Khandwa (New) 765kV D/c line

Annexure-III

Transmission system for Connectivity under GNA at Bhadla-IV PS(Tentative)

1. Establishment of 765/400kV, 4x1500 MVA pooling station at suitable location near Bhadla (Bhadla-IV PS) along with 2x125 MVAr & 2x240 MVAr bus reactor along with 2x125 MVAr & 2x240 MVAr bus reactor
2. Bhadla-IV PS – Bhadla-III PS 400kV D/c line (Quad)
3. 765kV Bhadla-IV PS – Bikaner-V PS D/c line
4. Establishment of 6000 MW, ± 800 kV Bhadla-IV (HVDC) terminal station (4x1500 MW) at suitable location near Bhadla
5. Establishment of 6000 MW, ±800 kV terminal station (4x1500 MW) at suitable location in WR/ER
6. ±800 kV HVDC line between Bhadla-IV (HVDC) & Suitable location in WR/ER (with Dedicated Metallic Return)
7. Establishment of 765/400kV, 2x1500 MVA S/s substation station at Suitable location in WR/ER along with 2x125 MVAr & 2x240 MVAr bus reactor
8. Associated transmission system in WR/ER for onwards dispersal of power

Annexure-IV

Transmission system for Connectivity under GNA at Bikaner-V PS(Tentative)

1. Establishment of 765/400kV, 4x1500 MVA pooling station at suitable location near Bikaner (Bikaner-V PS) along with 2x125 MVAr & 2x240 MVAr bus reactor
2. 8x500 MVA, 400/220kV ICTs at Bikaner-V PS ((for connectivity agreed for grant at 220kV level)
3. LILO of both ckts of 400kV Bikaner-II PS- Khetri D/c line at Bikaner-V PS
4. 765kV Bhadla-IV PS – Bikaner-V PS D/c line
5. Establishment of 6000 MW, ± 800 kV Bikaner-V (HVDC) terminal station (4x1500 MW) at suitable location near Bikaner
6. Establishment of 6000 MW, ±800 kV Begunia (HVDC) terminal station (4x1500 MW) at Begunia (Distt. Khordha), Orissa (ER)
7. ±800 kV HVDC line between Bikaner-V (HVDC) & Begunia (HVDC) (with Dedicated Metallic Return)
8. Establishment of 765/400kV, 5x1500 MVA S/s substation station at Begunia along with 2x125 MVAr & 2x240 MVAr bus reactor
9. Begunia – Paradeep (ISTS) 765kV D/c line along with associated bays at both ends
10. Begunia – Gopalpur (ISTS) 765kV D/c line along with associated bays at both ends along with 240MVAr switchable line reactor for each circuit at Begunia end of Begunia –Gopalpur (ISTS) 765kV D/c line
11. Begunia – Khuntuni (OPTCL) 765kV D/c line

For connectivity at 220kv level

Annexure-V

Transmission system for Connectivity under GNA at Ramgarh-II PS (Tentative)

1. Establishment of 2x1500 MVA, 765/400 kV Ramgarh-II Pooling Station at a suitable location near Ramgarh along with 2x125 MVAr & 2x240 MVAr bus reactor
2. 400/220kV, 3x500 MVA ICTs at Ramgarh-II PS
3. Ramgarh-II PS – Bhadla-IV PS 765 kV D/c line along with 240 MVAr switchable line reactor for each circuit at Ramgarh-II PS end
4. Ramgarh PS – Ramgarh-II PS 400 kV D/c line (Quad)
5. LILO of both ckts of 765kV Ramgarh PS – Bhadla-III PS D/c line at Ramgarh-II PS along with 240 MVAr switchable line reactor for each circuit at Ramgarh-II PS end
6. Establishment of 6000 MW, Ramgarh (HVDC) terminal station (4x1500 MW) at a suitable location near Ramgarh-II substation
7. Establishment of 6000 MW, HVDC terminal station (4x1500 MW) at suitable location in WR/SR/ER
8. HVDC line between Ramgarh (HVDC) & HVDC terminal station in WR/SR/ER (with Dedicated Metallic Return)
9. Associated EHVAC system strengthening in WR/SR/ER
10. 2x[+]300/(-)150MVAr Synchronous condenser at 400kV level of Ramgarh-II PS

Annexure-VI

A. Transmission system for present applications for Bhadla-II PS

1. Augmentation of 2x500 MVA, 400/220kV ICT (4th & 5th) at Bhadla-II Pooling station (220kV Section-I)
2. Augmentation of 2x1500 MVA, 765/400 kV ICT (3rd & 4th) at Bhadla-II Pooling station

B. Common Transmission system (Part of Transmission system associated with SEZ in Rajasthan under 8.1 GW Phase-II scheme)

1. Establishment of 765/400kV, 2x1500 MVA S/s at suitable location near Sikar (Sikar-II Substation) with 1x125 MVAr at 400kV level & 2x330 MVAr bus reactors at 765kV level at Sikar -II
2. Bhadla-II PS – Sikar-II 765kV 2xD/c line
3. Sikar-II – Neemrana 400kV D/c line (Twin HTLS)*
4. 1x330 MVAr Switchable line reactor for each circuit at Sikar-II end of Bhadla-II –Sikar-II 765kV D/c line
5. 1x240 MVAr Switchable line reactor for each circuit at Bhadla-II end of Bhadla-II – Sikar-II 765kV D/c line
6. Sikar-II – Aligarh 765kV D/c line
7. 1x330 MVAr switchable line reactor for each circuit at each end of Sikar-II – Aligarh 765kV D/c line
8. Establishment of 765/400 kV, 3X1500 MVA GIS substation at Narela with 765 kV (2x330 MVAr) bus reactor and 400kV (1x125 MVAR) bus reactor.
9. Khetri – Narela 765 kV D/c line
10. LILO of 765 kV Meerut- Bhiwani S/c line at Narela
11. 1x330 MVAr Switchable line reactor for each circuit at Narela end of Khetri – Narela 765kV D/c line
12. Removal of LILO of Bawana – Mandola 400kV D/c (Quad) line at Maharani Bagh /Gopalpur S/s. Extension of above LILO section from Maharani Bagh/ GopalpuruptoNarela S/s so as to form Maharanibagh – Narela 400kV D/c(Quad) and Maharanibagh-Gopalpur-Narela 400 kV D/c (Quad) lines.
13. 2 no of line bays at Narela each for Maharanibagh – Narela 400 kV D/c (Quad) and Maharanibagh –Gopalpur**-Narela 400 kV D/c (Quad) lines formed after removal of LILO of Bawana – Mandola 400kV D/c(Quad) line at Maharani Bagh/Gopalpur S/s and Extension of above LILO section from Maharani Bagh/Gopalpur upto Narela S/s.

14. STATCOM:

- Fatehgarh – II S/s: STATCOM: ± 2x300 MVAr, 4x125 MVAR MSC, 2x125 MVAr MSR
- Bhadla – II S/s: STATCOM: ± 2x300 MVAr, 4x125 MVAR MSC, 2x125 MVAr MSR

*with minimum capacity of 2100 MVA on each circuit at nominal voltage
**Gopalpur Substation is under implementation by DTL by LILO of Bawana – Maharanibagh 400kV D/c(Quad) at Gopalpur substation.

Annexure-A

List of Participants of 36th Consultation meeting for Evolving Transmission Schemes in NR held on 15.01.2025

CEA	
Shri Nitin Deswal	Deputy Director
SECI	
Shri Vineet Kumar	DGM
Grid India	
Shri Gaurav Malviya	Manager
Shri Ankur Gulati	
Shri Raj Kishan	
CTU	
Shri Shri V Thiagarajan	Sr. GM (CTUIL)
Shri K. K. Sarkar	Sr. GM (CTUIL)
Shri Kashish Bhambhani	GM (CTUIL)
Shri Sandeep Kumawat	DGM (CTU)
Shri Tej Prakash Verma	DGM (CTU)
Shri Mahendranath Malla	Ch. Manager (CTU)
Shri Pratyush Singh	Ch. Manager (CTU)
Shri Yatin Sharma	Manager (CTU)

Shri Madhusudan Meena	Engineer (CTU)
Shri Partha Sarathi Bhattacharya	ET
Shri Anshul Mahawar	ET

POWERGRID

Shri Somiran Das	Sr. GM
Shri Shafat Ahmad Wani	Sr. GM
Shri Ravendra Pal Singh Rana	GM
Shri Pradeep Kumar Chaurasia	Sr.DGM
Shri Rohit Kumar Jain	DGM
Shri Rakesh Kumar Gupta	Ch. Manager

DTL

Shri Dinesh Singh	Mgr. (T)SS & LM. Plg
Shri Niraj Sharma	

JKPTCL

Shri Vikas Anand	CE
Mr. Ehtisham Andrabi	

RVPNL

Smt Sona Shishodia	SE (P&P)

PTCUL

Shri Rakesh Kumar	SE
Shri Lalit Kumar	SE

UPPTCL

Shri Satyendra Kumar	SE

Connectivity/GNA Applicants

Shri Rajat Sangwan	Acme Gamma Urja Private Limited , ACME Solar Holdings Limited & ACME Heergarh Powertech Private Limited
Shri Rahul Kumar	Acme Gamma Urja Private Limited , ACME Solar Holdings Limited & ACME Heergarh Powertech Private Limited
Shri Ajay Peri	Aright Foods and Energy Private Limited
Shri Sandeep Jain	Aright Foods and Energy Private Limited
Shri Vineet Pandey	Enren-IV Energy Private Limited
Smt Rasika Balchandra Ghongade	Enren-IV Energy Private Limited
Shri Angshuman Rudra	Avaada Rjbikaner Private Limited, Avaada Rjsustainable Private Limited & Avaada Energy Private Limited
Shri Vishal Kumar	Azure Power Fifty One Private Limited
Shri Anshu Kumar	Hexa Climate Solutions Private Limited
Shri Rohit Ahuja	Hexa Climate Solutions Private Limited
Shri Harshit Gupta	Hexa Climate Solutions private Limited
Shri Rajas Acharya	Junachay Wind Energy Private Limited, Dharvi Kalan Wind Energy Private Limited & Dangri Wind Energy Private Limited
Smt Jyoti Thakur	Nuclear Power Corporation of India Limited
Shri Abhishek Khanna	NTPC Limited

Shri Sudhanshu Vishwakarma	Rohat Solar Park Private Limited & Rays Power Infra Limited
Shri Dhir Singh	Solarcraft Power India 17 Private Limited
Shri Chinmay Sirdeshmukh	Sprng Green Energy 4 Private Limited
Smt Poorva Pitke	Sprng Green Energy 4 Private Limited
Shri K A Vishwanath	Teq Green Power IX Private Limited
Shri Tushar Garg	Teq Green Power IX Private Limited
Shri Varun Bhatnagar	Unique Hytech Renewable Energy Private Limited
Mr Md Fahim Alam	Vismaya Five Renewables Private Limited
Shri Animesh Manna	NTPC REL

Annexure-IA

सत्यमेव जयते

भारत सरकार
Government of India
विद्युत मंत्रालय
Ministry of Power
केन्द्रीय विद्युत प्राधिकरण
Central Electricity Authority
विद्युत प्रणाली संचार विकास प्रभाग
Power System Communication Development Division

सेवा में / To

As per list enclosed

विषय/ Subject: Compliance with CEA (Technical Standards for Construction of Electric Plants and Lines), 2022 - Installation of Optical Ground Wire on Transmission Lines - reg

This is to bring to the attention , the crucial requirement outlined in the Central Electricity Authority (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations, 2022, pertaining to the installation of Optical Ground Wire (OPGW) on transmission lines of 110 kV and above voltage level.

The aforementioned CEA standard **under Chapter IV, PART-A "SUBSTATIONS AND SWITCHYARDS (66 kV AND ABOVE)" Clause 48 , sub clause (5),** mandates the provision of Optical Ground Wire, along with necessary terminal equipment, on transmission lines of voltage rating 110 kV and above for speech transmission, line protection, and data channels. Additionally, it specifies that the primary path for tele-protection should be on point-to-point Optical Ground Wire, with an alternative path on either Power Line Carrier Communication or predefined physically diversified Optical Ground Wire paths.

The use of Optical Ground Wire facilitates speech transmission, data channels and also plays a crucial role in enhancing line protection. Ensuring compliance with these standards is paramount for the efficient and reliable operation of grid.

Therefore, as directed by Chairperson, CEA in the 19th meeting of National Committee on Transmission, it is requested that all the Central and State Sector utilities prioritize the implementation of the OPGW laying across its transmission network to ensure compliance with regulatory requirements.

Transmission utilities are requested to furnish the monthly progress report pertaining to OPGW installation.

Powergrid and CTU are requested to identify all such ISTS links wherein the OPGW implementation is still to be done and take up its implementation.

Signed by Suman Kumar Maharana
Date: 22-05-2024 17:25:26

भवदीय,
(एस.के.महाराणा / **S. K. Maharana**)
मुख्य अभियन्ता /**Chief Engineer**

प्रतिलिपि/ Copy to,

(i) Member (Power System), CEA
(ii) Member Secretary, NRPC
(iii) Member Secretary, WRPC
(iv) Member Secretary, ERPC
(v) Member Secretary, SRPC
(vi) Member Secretary, NERPC

With a request to issue suitable instructions to states for expediting furnishing of requisite data

1.	**Executive Director(AM and LD&C)** Power Grid Corporation of India Ltd., Saudamini, Plot No.2, Sector-29, Gurugram-122001.
2.	**COO** Central Transmission Utility of India Ltd., Plot No. 2, Sector-29, Gurugram, Haryana-122001.

ISTS Licensees:

1.	**Chief-Business & Regulatory** Sterlite Power Transmission Ltd., F-1, The Mira Corporates Suits, Plot No. 1 &2, C-Block, 2nd Floor, Ishwar Nagar, Mathura Road, NewDelhi-110065.	**2.**	**Head Projects** Adani Transmission Ltd., Adani Corporate House, Shantigram, SG Highway, Ahmedabad-382421, Gujarat.
3.	**CFO** Essel Infraprojects Ltd., NRSS XXXVI Transmission Ltd., (Essel Infraprojects Ltd.), Sec 16A, Plot No.-19, Filn City, Gautam Budhha Nagar-201301.	**4.**	**Director** Kalpataru Power Transmission Ltd., Plot No. 101, Part-III, G.I.D.C., Sector-28, Gandhinagar-382028.
5.	**Director** Kudgi Transmission Ltd., Mount Poonamallee Road, Manapakkam, P.B. No. 979, Chennai-600089.	**6.**	**AGM (Comm. & Reg. Affairs)** Sekura Energy Pvt. Ltd., 504 & 505, 5th Floor, Windsor, Off CST Road, Kalina, Santacruz, Mumbai-400098.
7.	**Project Incharge** Raichur Sholapur Transmission Company Ltd., Patel Estate, S.V. Road, Jogeshewari(West), Mumbai-400102.		

Northern Region:

1.	**Director (Projects)** Himachal Pradesh Power Transmission Corporation Ltd., Barowalias, Khalini, Shimla- 171002.	**2.**	**Director(W&P)** Uttar Pradesh Power Transmission Company Ltd., Shakti Bhawan Extn, 3rd floor, 14, Ashok Marg, Lucknow-226 001.
3.	**Director (Technical)** Punjab State Transmission Corp.Ltd. Head Office, The Mall, Patiala - 147001, Punjab.	**4.**	**Director (Projects)** Power Transmission Corporation of Uttrakhand Ltd., Vidyut Bhawan, Near

			ISBT Crossing, Saharanpur Road, Majra, Dehradun.
5.	**Development Commissioner (Power)** Power Development Department, Grid Substation Complex, Janipur, Jammu.	**6.**	**Director (Technical)** Rajasthan Rajya Vidyut Prasaran Nigam Ltd., Vidyut Bhawan, Jaipur, Rajasthan-302005.
7.	**Director (Technical)** Haryana Vidyut Prasaran Nigam Ltd. Shakti Bhawan, Sector-6, Panchkula-134109, Haryana.	**8.**	**Chief Engineer (Operation)** Administration of Chandigarh Electricity Department, UT Secretariat Sector-9 D, Chandigarh – 161009.
9.	**Director (Operations)** Delhi Transco Ltd., Shakti Sadan, Kotla Road, New Delhi-110002.		

Eastern Region:

1.	**CMD** Damodar Valley Corporation DVC Towers, VIP Road, Kolkata-700054.	**2.**	**CMD** Odisha Power Transmission Corporation Ltd. (OPTCL), Bhoinagar Post Office, Jan path, Bhubaneshwar-751022.
3.	**CMD** Bihar State Power Transmission Company Ltd. (BSPTCL), Vidyut Bhavan, 4th floor, Bailey Road, Patna-800021.	**4.**	**CMD** Jharkhand Urja Sancharan Nigam Ltd. (JUSNL), Engineering Building, HEC, Dhurwa, Ranchi -834004.
5.	**Principal Chief Engineer cum Secretary** Power Department, Government of Sikkim, Gangtok, Sikkim.	**6.**	**Managing Director** West Bengal State Electricity Transmission Company Ltd. (WBSETCL), Vidyut Bhavan, 8th Floor, A-Block Salt Lake City, Kolkata-700091.

North Eastern Region:

1.	**Managing Director** Manipur State Power Company Ltd. (MSPCL), Electricity Complex, Patta No. 1293 under 87(2), Khwai Bazar, Keishampat, Imphal West, Manipur- 795001.	**2.**	**CMD** Tripura State Electricity Corporation Ltd., Bidyut Bhavan, Banamalipur, Agartala, Tripura.
3.	**Managing Director** Assam Electricity Grid Corporation Ltd., Bijulee Bhawan, Paltan Bazar Guwahati (Assam) - 781001.	**4.**	**Engineer-in-Chief** Power & Electricity Department, Kawlphetha Building, New Secretariat Complex, Khatla, Aizawl, Mizoram- 796001.
5.	**CMD** Meghalaya Energy Corporation Ltd., Lum Jingshai, Short Round Road, Shillong (Meghalaya) - 793001.	**6.**	**Chief Engineer (T&G)** Department of Power, Electricity House, A.G. Colony, Kohima, Nagaland- 797001.
7.	**Chief Engineer (Power)** Vidyut Bhawan, Department of Power Zero Point Tinali, Itanagar (Arunachal Pradesh)- 791111.		

Western Region:

1.	**Managing Director** Gujarat Energy Transmission Corp. Ltd., Sardar Patel Vidyut Bhawan, Race Course, Vadodara -390007.	**2.**	**Director (Operation)** Maharashtra State Electricity Transmission Co. Ltd., 4th Floor, "Prakashganga", Plot No. C-19, E- Block, Bandra – Kurla Complex, Bandra (East), Mumbai- 400051.
3.	**Managing Director,** Chhattisgarh State Power Transmission Co. Ltd., Dangania, Raipur- 492013.	**4.**	**Chairman & Managing Director** Madhya Pradesh Power Transmission Co. Ltd., Block No. 3, Shakti Bhawan, Rampur, Jabalpur-482008.
5.	**Executive Engineer** Administration of Union Territory of Dadra & Nagar Haveli and Daman & Diu Secretariat, Moti Daman -395 220.	**6.**	**The Chief Engineer** Electricity Department The Government of Goa, Panaji.

Southern region:

1.	**Director (Grid Operation)** Transmission Corp. of Telangana Ltd., Vidyut Soudha, Hyderabad – 500082.	**2.**	**Director (Transmission)** Karnataka State Power Transmission Corp. Ltd., Cauvery Bhawan, Bangalore – 560009.
3.	**Director (Trans. & System Op.)** Kerala State Electricity Board Ltd., Vidyuthi Bhawanam, Pattom, P.B. No. 1028, Thiruvananthapuram – 695004.	**4.**	**Director (Transmission Projects)** Tamil Nadu Transmission Corporation Ltd. (TANTRANSCO), 6th Floor, Eastern Wing, 800 Anna Salai, Chennai – 600002.
5.	**Superintending Engineer –I** First Floor, Electricity Department Gingy Salai, Puducherry – 605001.	**6.**	**Director (Transmission)** Transmission Corp. of Andhra Pradesh Ltd. (APTRANSCO), Vidyut Soudha, Gunadala, Eluru Rd, Vijayawada, Andhra Pradesh – 520004.

Grid-India Inputs on Rajasthan REZ Ph-IV (Part-5 :6 GW) Barmer-II : 6GW (Solar) scheme

Proposed Transmission system for evacuation of power from Rajasthan REZ Ph-IV (Part-5 :6 GW) [Barmer Complex] Barmer-II: 6GW (Solar):

- LILO of both ckts of 400kV Fatehgarh-IV PS - Barmer-I PS at Barmer-II PS (~20km)
- Establishment of 2 nos. 3000 MW, ± 600 kV Barmer-II (HVDC) [VSC] terminal station (2x1500 MW) at a suitable location near Barmer-II substation
- 400/33 kV, 2x50 MVA transformers for exclusively supplying auxiliary power to HVDC terminal.
- 400kV bus sectionaliser -2 nos. (1 Set) at Barmer-II (HVDC) station
- Establishment of 2 nos. 3000 MW, ± 600kV South Kalamb S/s (HVDC) [VSC] terminal station (2x1500 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
- Installation of 1x240 MVAr switchable line reactor on each ckt at South Kalamb end of Boisar-II – South Kalamb 765 kV D/c line (formed after above LILO)
- ±600 kV HVDC Bipole line between Barmer-II (HVDC) & South Kalamb (HVDC) (with Dedicated Metallic Return) (capable to evacuate 6000MW) (1100 kms)

Grid-India Inputs:

1. In the scheme, the evacuation of 6000 MW is proposed from VSC HVDC link from Barmer-II (new) substation to South Kalamb (Murbad).

   It is mention here that Barmer-II is a new substation which will be connected only to 400 kV Fatehgarh-IV PS and Barmer-I PS via LILO of 400kV Fatehgarh-IV PS - Barmer-I PS D/C. This connectivity means that Barmer-II would be a radial/hanging station with low system strength.

   Fault level at Barmer-II:

S. No.	Cases	Fault level (MVA) – 220 kV	Fault level (MVA) – 400 kV
1.	Without considering the contribution of RE getting connected	10788	23409
2.	Considering the contribution of RE getting connected	13560	29058

   - *Installed capacity considered at 220 kV level:* ***2000 MW***
   - *Installed capacity considered at 400 kV level:* ***4000 MW***
   - *SCR at 220 kV level – (10788/2000):* ***5.394***
   - *SCR at 400 kV level – (23409/12000):* ***1.95 (HVDC capacity of 6000 MW also included)***

Grid-India Inputs on Rajasthan REZ Ph-IV (Part-5 :6 GW) Barmer-II : 6GW (Solar) scheme

Considering that Barmer-II would be a radial station with low system strength, evacuating 6000 MW capacity via HVDC from this substation may not be ideal. The inertia of the system around Barmer-II station is also expected to be very low, AC system feeding to HVDC from such weak network may witness stability related issues. The suitable alternatives to add fault level as well as inertia like SynCon may be considered in such pockets. It is proposed that RE capacity may be **pooled to a nearby station** which has adequate interconnection (and hence system strength) such as **Chittorgarh (SCMVA at 400 kV - ~34000 MVA in current time-frame).** The HVDC may then be planned from such station to a suitable location.

2. Comparison of VSC and LCC based HVDC

Feature	LCC-HVDC	VSC-HVDC
Converter Technology	Thyristor-based	IGBT-based (or similar switching devices)
Reactive Power Requirements	Requires substantial reactive power compensation (e.g., Filter Banks, SVC, STATCOM, SynCons).	Capable of independent reactive power control. Generally, no external compensation needed.
Grid Strength Dependency	Requires a strong AC grid for commutation. May fail in weak grids. (SCR > 3)	Operates effectively in weak or even "islanded" grids.
Black Start Capability	Not suitable for black start without additional support.	Capable of providing black start services.
Harmonics	Produces significant harmonics; requires large filters.	Minimal harmonics due to PWM-based control. Smaller filters required.
Power Reversal	Possible. Requires changing DC polarity for power reversal.	Possible (seamless). Achieved by changing current direction without altering DC polarity.
Fault Ride-Through	Limited ability to ride through grid faults. May trip under disturbances.	Superior fault ride-through capability.
Network restart time during DC line faults	Less (depend on de-ionization time) in milli-secs	>1 sec (1.5 secs in case of HVDC Pugalur – Trichur for Line to Ground faults); highly dependent on AC side circuit breaker opening/reclosing,
Overload Capability	Possible (usually 10-20% for short durations).	Not available as standard, may be full converter rating (depends on standard rating vs extra overload expected)
Converter Footprint	Large, due to filters, reactive power compensators, and transformers.	Compact, as filters and external compensators are minimized.
Grid Support Functions	Limited (e.g., no independent voltage control).	Can provide grid-forming services, voltage regulation, and frequency support.
Efficiency/Losses	Slightly higher efficiency in steady-state operation.	Lower efficiency due to switching losses in IGBTs.
Cost	Lower initial cost for converters, but higher for filters and compensators.	Higher initial cost for converters, lower for ancillary components.
Bidirectional Power Flow	Achieved but with slower transition.	Seamless bidirectional power flow

Both LCC and VSC based HVDCs have certain advantages and disadvantages. While LCC based HVDC is not suitable for low system strength pockets, the reliability of VSC HVDC during DC line fault always depends on switching of AC side CB and it is possible that high stress is experienced by equipment during DC line fault. Since the length of this HVDC link is expected to be around 1100 kM, the chances of DC line fault owing to higher exposure may be of high probability. The Technical requirement for HVDC shall clearly specify that HVDC shall be designed with redundancy so that system shall be able to operate under transient fault conditions. These aspects shall be taken in due consideration while specifying the technical specification of the HVDC in the RfP.

3. Other inputs on the proposed HVDC scheme are as under:

a) The rationale for terminating the HVDC in WR (Maharashtra) may be provided. Another HVDC from Khavda-V to Alephata (Maharashtra) is also terminating in the same area.

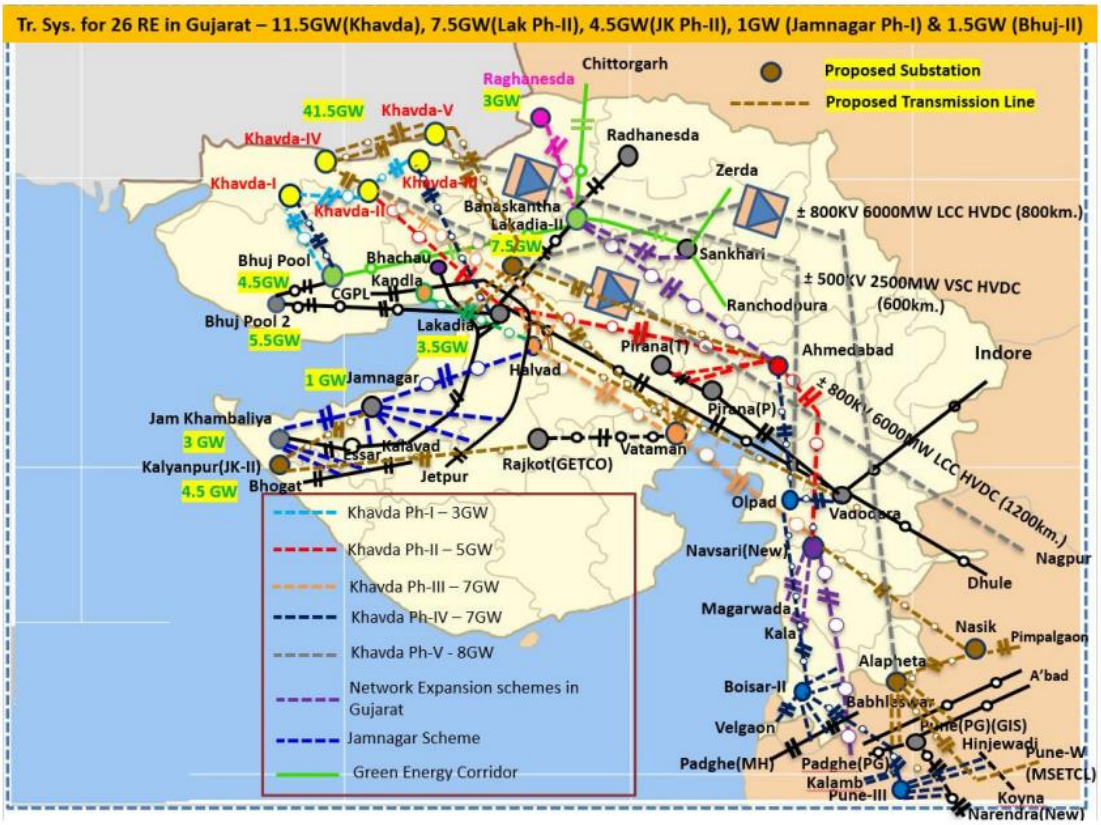
In the February solar case, the Southern Region is importing power. Even in the June solar case, which represents a peak SR export scenario, key SR-WR lines planned for evacuating RE from the Southern Region such as - 765 kV Narendra New–Pune–III D/C and 765 kV Raichur–Solapur D/C - are observed carrying power in the WR-to-SR direction. The all India level LGB may be reviewed.

Many 400 kV lines in Pune / Mumbai area are loaded beyond their permissible limits in the Sce-4 and Sce-7 cases e.g. 400 kV Kalwa- Estella S/C, 400 kV Pagdhe – Estella S/C, 400 kV Boisar-II - Pagdhe D/C etc.

Further, as highlighted in section on Load-Generation Balance below, the LGB of the case is subject to change with the proposed corrections which may lead to change in location of HVDC terminal.

b) Khavda (41.5 GW), Lakadia (3.5 GW & 7.5 GW), Raghanesda (3 GW), Bhuj (4.5 GW & 5.5 GW), Jamnagar (1 GW), Jam Khambaliya (3 GW & 4.5 GW) RE evacuation system is shown below

Grid-India Inputs on Rajasthan REZ Ph-IV (Part-5 :6 GW) Barmer-II : 6GW (Solar) scheme



As per above planning, most of the above RE generation will be consumed in Maharashtra (MMR & Pune) area. Two major HVDC (± 800 kV, 6000 MW LCC HVDC from Khavda-II to Nagpur and ± 800 kV 6000 MW LCC HVDC (or ± 600 kV VSC) from Lakadia-II to Alepheta) links from Khavda complex to Maharashtra system are already planned.

c) Terminating of HVDC at South Kalamb (Murbad) may be reviewed as already two HVDCs are terminating in Maharashtra and distance between Alephata to Kalamb is less than 50 km.

d) Number of new In-STS S/s (Dolvi, Kandalgaon, Estella, Velgaon, Ambernath, Theur, Padghe-Split, Kalwa Split, Estella Coromandel etc.) in MMR & Pune area is considered. Therefore, constraints faced in the Mumbai/Pune area are not reflected much in study cases. Timely commissioning of In-STS in the Mumbai/Pune area is very essential. Inordinate delays in commissioning of In-STS are generally observed. Hence, remedial measures need to be mentioned for delays in commissioning of In-STS.

e) Currently, constraints are being observed in Southern part of Maharashtra (Kolhapur/Karad area) during high injection from SR to WR. Another scenario (i.e. high injection from SR to WR along with low generation in Khavda/NR area) to be studied for assessing the transmission constraints and identification of remedial measures.

f) On the outage of a 3000/6000 MW poles of HVDC Barmer – II – South Kalamb, the loading of 765/400 kV ICTs and other elements nearby Barmer – I is seen to be nearing N-1 non-compliant. Accordingly, the solar developers coming up at Barmer-II may be advised now itself to commission their generation in synch with HVDC system.

g) As mentioned earlier, controller interaction studies may be carried out to identify the potential interaction issues in the complex or the same may be included in the project technical specifications with specific mention of involvement of CTUIL/GRID-INDIA in such studies with HVDC executing agency.

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

i) 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. Also, as VSC based HVDC is being proposed, it is understood that complete capacity in reverse direction is available.

j) Filter arrangement modelling at HVDC terminal (in case of LCC) at Barmer – II to be checked. Keeping in view the low SCR/fault level, as mentioned earlier by GRID-INDIA, the filter sizing shall be granular to avoid wide voltage variations during switching.

4. **Addition of BESS:** In the 500 GW RE Transmission Report by CEA, ~22.5 GW BESS was planned at different pooling stations in NR (Rajasthan). However, so far, the BESS capacity addition has not taken place as per the plan. Planning of the envisaged BESS capacity as a generation resource could help in optimizing the transmission being planned for RE evacuation in Rajasthan and will also provide necessary flexibility support during the non-solar hours.

5. **Planning of Bulk Loads in the Rajasthan RE complex:** It is suggested that CTUIL shall provide necessary recommendations to the MOP for planning of bulk loads such as electrolyzers, data centers etc. in the Rajasthan RE complex. This would help in local consumption of RE generation and would significantly reduce the requirement of transmission while also providing necessary damping (load side).

   A sample study with cost benefit analysis may be carried out by CTUIL in this regard for discussion at higher level.

Grid-India Inputs on Rajasthan REZ Ph-IV (Part-5 :6 GW) Barmer-II : 6GW (Solar) scheme

6. Inputs on Load Generation Balance:

In base cases shared, demand of Rajasthan considered in scenario-4: Jul month(31GW) seems to be on higher side. Similarly, in scenario-7: Feb month (35.4GW) seems to be on very higher side. Powerfactor of load also to be revised according to practical values to get correct picture of any low voltage scenario.

State		Scen7	Scen7 p.f.	Scen4	Scen4 p.f.
CHANDIGARH	P	353.2	0.95	411.6	0.96
	Q	112.7		120	
J&K	P	4193.4	0.99	2840.6	0.96
	Q	615.8		828.5	
HIMACHAL	P	2395.4	0.99	1780.1	0.96
	Q	399		519.2	
PUNJAB	P	12742.1	0.99	17627.8	0.96
	Q	1903.2		5138.9	
HARYANA	P	12981.3	0.99	16580.6	0.96
	Q	1930.6		4836	
DELHI	P	6045.8	0.98	9367.3	0.96
	Q	1118.8		2864.4	
RAJASTHAN	P	35442.5	0.99	31266.8	0.96
	Q	4427.2		8839.5	
UP	P	26303.5	0.99	31161.5	0.96
	Q	3833.8		9088.8	
LADAKH	P	40.1	0.99	27.3	0.96
	Q	5.9		8	
UTTARAKHAND	P	2581.5	0.98	2955	0.96
	Q	504		844.5	
NR	P	103078.7	0.99	114018.5	0.96
	Q	14851		33087.7	

Feb Solar (Scenario - 7)

S. No.	Region	Load (MW)	Gen. (MW)	IR Exchange (MW)#	20th EPS Peak Load in 2029-30 (MW)	Average Demand Met in Solar Hours in Feb 2024 (MW)*	Peak Demand met during Solar Hours, Feb 2024 (MW)
1	NR	103722	146006	42284	116745	54890	63791
2	WR	112173	137614	25441	107050	68960	74167
3	SR	104357	90900	-13457	97440	60929	65591
4	ER	41435	17785	-23650	45752	19429	22745
5	NER	2902	2025	-877	5835	2013	2209
6	All India	366648	396728	x	334811	206123	221989

Grid-India Inputs on Rajasthan REZ Ph-IV (Part-5 :6 GW) Barmer-II : 6GW (Solar) scheme

S. No.	State	Load (MW)	Gen (State+ Central) (MW)	20th EPS Peak Load in 2029-30 (MW)	Average Demand Met in Solar Hours in Feb 2024 (MW)	Peak Demand Met in Solar Hours, Feb 2024 (MW)
1	Rajasthan	35468	110783	25058	17000	18058
2	Gujarat	41433	71297	33964	19113	21258
3	Maharashtra	40627	30993	39891	27379	29821
4	MP	21288	23092	25596	14553	16885

***Peak solar considered from 10:30 Hrs to 15:30 Hrs, # Export is considered positive**

June Solar (Scenario - 4)

S. No.	Region	Load (MW)	Gen. (MW)	IR Exchange (MW) #	20th EPS Peak Load in 2029-30 (MW)	Average Demand Met in Solar Hours in June 2024 (MW)	Peak Demand met during Solar Hours, June 2024 (MW)
1	NR	114849	156993	42144	116745	80252	91040
2	WR	108797	130420	21623	107050	64167	74882
3	SR	98015	95583	-2432	97440	48363	58488
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1	Rajasthan	31266	113355	25058	16199	18425
2	Gujarat	44908	76899	33964	21934	26054
3	Maharashtra	39589	29129	39891	23622	28715
4	MP	15757	18715	25596	11155	13828

***Peak solar considered from 10:30 Hrs to 15:30 Hrs, #Export is considered positive**

- In both February solar and June Solar case, the Southern Region is importing power. Even in the June solar case, which represents a peak SR export scenario, key SR-WR lines planned for evacuating RE from the Southern Region—such as the 765 kV Narendra New–Pune–III D/C and 765 kV Raichur–Solapur D/C—are observed carrying power in the WR-to-SR direction

- Dispatch of Thermal Plants:

    - The thermal generation of some of the plants i.e. APL/CGPL has been backed down to very low levels (~35%).
    - Pit head plant: Talcher backed down to ~35% level
    - Pit head plant: V'chal backed down to ~34% level
    - Pit head plant: Korba backed down to ~34% level

  The tech minimum level considered in the case may be mentioned, and the generators' dispatch should be considered per merit order.

- The demand in Rajasthan and Gujarat is seen to be on a higher end than the figures from EPS. The reason for the high demand may be mentioned.

Grid-India Inputs on Rajasthan REZ Ph-IV (Part-5 :6 GW) Barmer-II : 6GW (Solar) scheme

- Consideration of GH2 and other bulk consumer loads may be mentioned in the planning scheme itself, duly citing the uncertainty behind the assumptions and requirement of further transmission planning in case of delay/deferment of GH2/Bulk load projects.

  The production cost modelling studies duly factor in the RPO 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.

7. Punjab internal generation considered in scenario-7 to be corrected:

Bus Number	Bus Name	Id	Area Num	Area Name	Zone Num	Zone Name	Code	VSched (pu)	In Service	PGen (MW)	PMax (MW)
132204	LEHRAMOHBT 220.00	T 1	13	PUNJAB	131	PB_STU	-2	1	1	52.5	210
132204	LEHRAMOHBT 220.00	T 2	13	PUNJAB	131	PB_STU	-2	1	1	52.5	210
132270	GOINDWALSB 220.00	T 1	13	PUNJAB	131	PB_STU	2	1	1	67.5	270
132270	GOINDWALSB 220.00	T 2	13	PUNJAB	131	PB_STU	2	1	1	67.5	270
132323	SPL_ROPAR 220.00	T 1	13	PUNJAB	131	PB_STU	2	1	1	52.5	210
132323	SPL_ROPAR 220.00	T 2	13	PUNJAB	131	PB_STU	2	1	1	52.5	210
132323	SPL_ROPAR 220.00	T 3	13	PUNJAB	131	PB_STU	2	1	1	52.5	210
134401	TALWNDISABO4 400.00	T 1	13	PUNJAB	131	PB_STU	2	1	1	165	660
134401	TALWNDISABO4 400.00	T 2	13	PUNJAB	131	PB_STU	2	1	1	165	660
134406	RAJPURA_TH4 400.00	T 1	13	PUNJAB	131	PB_STU	2	1	1	175	700
134406	RAJPURA_TH4 400.00	T 2	13	PUNJAB	131	PB_STU	2	1	1	175	700

8. **Dynamic Simulation Studies –** With more than 100 GW solar generation and two 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.

9. Bara TPS generation model to be corrected, same is modelled at 400kV whereas it is existing at 765kV level.

Annexure B2

Reply of Grid-India inputs on Rajasthan REZ Ph-IV (Part-5 :6 GW) Barmer-II : 6GW (Solar) scheme

Grid-India Inputs:

1. In the scheme, the evacuation of 6000 MW is proposed from VSC HVDC link from Barmer-II (new) substation to South Kalamb (Murbad).

   It is mention here that Barmer-II is a new substation which will be connected only to 400 kV Fatehgarh-IV PS and Barmer-I PS via LILO of 400kV Fatehgarh-IV PS - Barmer-I PS D/C. This connectivity means that Barmer-II would be a radial/hanging station with low system strength.

   Fault level at Barmer-II:

S. No.	Cases	Fault level (MVA) – 220 kV	Fault level (MVA) – 400 kV
1.	Without considering the contribution of RE getting connected	10788	23409
2.	Considering the contribution of RE getting connected	13560	29058

   - *Installed capacity considered at 220 kV level:* ***2000 MW***
   - *Installed capacity considered at 400 kV level:* ***4000 MW***
   - *SCR at 220 kV level – (10788/2000):* ***5.394***
   - *SCR at 400 kV level – (23409/12000):* ***1.95 (HVDC capacity of 6000 MW also included)***

   Considering that Barmer-II would be a radial station with low system strength, evacuating 6000 MW capacity via HVDC from this substation may not be ideal. The inertia of the system around Barmer-II station is also expected to be very low, AC system feeding to HVDC from such weak network may witness stability related issues. The suitable alternatives to add fault level as well as inertia like SynCon may be considered in such pockets. It is proposed that RE capacity may be **pooled to a nearby station** which has adequate interconnection (and hence system strength) such as **Chittorgarh (SCMVA at 400 kV - ~34000 MVA in current time-frame).** The HVDC may then be planned from such station to a suitable location.

CTU Reply :

As per our understanding and discussion with OEMs in earlier HVDC packages, minimum SCR requirement for HVDC operation for VSC technology is >1 whereas for LCC technology is > 2.5.

Integration of RE power to other intermediate sub stations through EHVAC system i.e. Ajmer, Chittorgarh, Beawar, Rishabdeo etc. and its further evacuation through HVDC from intermediate substations is not feasible due to space constraint on above substations. SCR values of Barmer-II and South Kalaamb (Murbad) S/s is as below:

S. No.	Voltage level	Envisaged generation (MW)	Wo Considering additional Barmer-II-Barmer-I D/c line (present file)		With Considering additional Barmer-II-Barmer-I D/c line & Syncons (2 units*)	
			SCMVA (Considering no contribution from incident bus)	SCR	SCMVA (Considering no contribution from incident bus)	SCR
1.	Barmer-II (220kV)	2180	11510	5.27	12500	**5.75**
2.	Barmer-II (400kV)	(3812+2180) 5992	23290	3.88	29550	**4.95**
3	Murbad (400kV)	3000	26300 (13200)	8.7 (4.4)	26300 (13200)	**8.7 (4.4)**
3	Murbad Splt (400kV)	3000	13200	4.4	13200	**4.4**

1 no. of SynCon unit comprises dynamic support of +300MVAr/-150MVAr (Minimum) & Short circuit contribution at PCC of 1200MVA (Minimum) with Minimum H (natural) =4 s

From the table, it is envisaged that SCR at 400kV and 220kV level of Barmer-II PS is adequate for HVDC operation (LCC/VSC). The SCR of 400kv Barmer-II PS will further improve with future interconnection planned for Barmer-III PS (HVDC) with Barmer-II PS in next 2-3 months.

2 units of Syncons shall be considered with LCC technology alternative. Space provision of 2 units of SyCon shall be kept in VSC technology alternative as part of comprehensive scheme and taken up for implementation as per future requirement.

2. Comparison of VSC and LCC based HVDC

Feature	LCC-HVDC	VSC-HVDC
Converter Technology	Thyristor-based	IGBT-based (or similar switching devices)
Reactive Power Requirements	Requires substantial reactive power compensation (e.g., Filter Banks, SVC, STATCOM, SynCons).	Capable of independent reactive power control. Generally, no external compensation needed.

Feature	LCC-HVDC	VSC-HVDC
Grid Strength Dependency	Requires a strong AC grid for commutation. May fail in weak grids. (SCR > 3)	Operates effectively in weak or even "islanded" grids.
Black Start Capability	Not suitable for black start without additional support.	Capable of providing black start services.
Harmonics	Produces significant harmonics; requires large filters.	Minimal harmonics due to PWM-based control. Smaller filters required.
Power Reversal	Possible. Requires changing DC polarity for power reversal.	Possible (seamless). Achieved by changing current direction without altering DC polarity.
Fault Ride-Through	Limited ability to ride through grid faults. May trip under disturbances.	Superior fault ride-through capability.
Network restart time during DC line faults	Less (depend on de-ionization time) in milli-secs	>1 sec (1.5 secs in case of HVDC Pugalur – Trichur for Line to Ground faults); highly dependent on AC side circuit breaker opening/reclosing,
Overload Capability	Possible (usually 10-20% for short durations).	Not available as standard, may be full converter rating (depends on standard rating vs extra overload expected)
Converter Footprint	Large, due to filters, reactive power compensators, and transformers.	Compact, as filters and external compensators are minimized.
Grid Support Functions	Limited (e.g., no independent voltage control).	Can provide grid-forming services, voltage regulation, and frequency support.
Efficiency/Losses	Slightly higher efficiency in steady-state operation.	Lower efficiency due to switching losses in IGBTs.
Cost	Lower initial cost for converters, but higher for filters and compensators.	Higher initial cost for converters, lower for ancillary components.
Bidirectional Power Flow	Achieved but with slower transition.	Seamless bidirectional power flow

Both LCC and VSC based HVDCs have certain advantages and disadvantages. While LCC based HVDC is not suitable for low system strength pockets, the reliability of VSC HVDC during DC line fault always depends on switching of AC side CB and it is possible that high stress is experienced by equipment during DC line fault. Since the length of this HVDC link is expected to be around 1100 kM, the chances of DC line fault owing to higher exposure may be of high probability. The Technical requirement for HVDC shall clearly specify that HVDC shall be designed with redundancy so that system shall be able to operate under transient fault conditions. These aspects shall be taken in due consideration while specifying the technical specification of the HVDC in the RfP.

CTU Reply : Comments are noted as part of agenda.

3. Other inputs on the proposed HVDC scheme are as under:

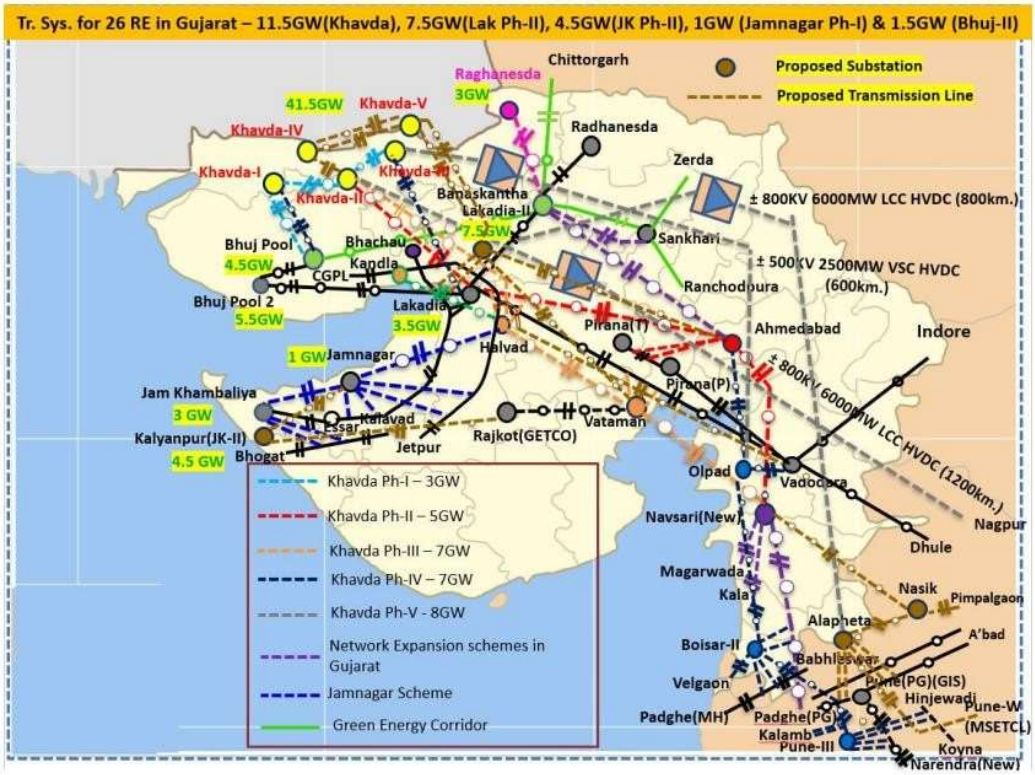
a) The rationale for terminating the HVDC in WR (Maharashtra) may be provided. Another HVDC from Khavda-V to Alephata (Maharashtra) is also terminating in the same area.

In the February solar case, the Southern Region is importing power. Even in the June solar case, which represents a peak SR export scenario, key SR-WR lines planned for evacuating RE from the Southern Region such as - 765 kV Narendra New–Pune–III D/C and 765 kV Raichur–Solapur D/C - are observed carrying power in the WR-to-SR direction. The all India level LGB may be reviewed.

Many 400 kV lines in Pune / Mumbai area are loaded beyond their permissible limits in the Sce4 and Sce-7 cases e.g. 400 kV Kalwa- Estella S/C, 400 kV Pagdhe – Estella S/C, 400 kV BoisarII - Pagdhe D/C etc.

Further, as highlighted in section on Load-Generation Balance below, the LGB of the case is subject to change with the proposed corrections which may lead to change in location of HVDC terminal.

b) Khavda (41.5 GW), Lakadia (3.5 GW & 7.5 GW), Raghanesda (3 GW), Bhuj (4.5 GW & 5.5 GW), Jamnagar (1 GW), Jam Khambaliya (3 GW & 4.5 GW) RE evacuation system is shown below



As per above planning, most of the above RE generation will be consumed in Maharashtra (MMR & Pune) area. Two major HVDC (± 800 kV, 6000 MW LCC HVDC from Khavda-II to Nagpur and ± 800 kV 6000 MW LCC HVDC (or ± 600 kV VSC) from Lakadia-II to Alepheta) links from Khavda complex to Maharashtra system are already planned.

c) Terminating of HVDC at South Kalamb (Murbad) may be reviewed as already two HVDCs are terminating in Maharashtra and distance between Alephata to Kalamb is less than 50 km.

d) Number of new In-STS S/s (Dolvi, Kandalgaon, Estella, Velgaon, Ambernath, Theur, Padghe-Split, Kalwa Split, Estella Coromandel etc.) in MMR & Pune area is considered. Therefore, constraints faced in the Mumbai/Pune area are not reflected much in study cases. Timely commissioning of In-STS in the Mumbai/Pune area is very essential. Inordinate delays in commissioning of In-STS are generally observed. Hence, remedial measures need to be mentioned for delays in commissioning of In-STS.

e) Currently, constraints are being observed in Southern part of Maharashtra (Kolhapur/Karad area) during high injection from SR to WR. Another scenario (i.e. high injection from SR to WR along with low generation in Khavda/NR area) to be studied for assessing the transmission constraints and identification of remedial measures.

CTU Reply (a) to (e): The Lakadia-II – Alephata HVDC has been terminated at a point parallel to the EHVAC network which emanates from Khavda area and traverses from North Gujarat to load centres in Maharashtra (Boisar-II/ Nasik/ Alephata/ Pune(GIS) / Pune-III). The HVDC system emanates from Lakadia-II (Central Gujarat) and terminates at Alephata

(parallel to AC network) and is expected to maintain a balanced power flows on the AC lines along with controllability as per requirement. The other HVDC link from NR to South Kalamb has been planned to complement PSPs in Talegaon / Data centre & other load requirement in the Neral area.

4. Further, the present files have been prepared considering Max RE injection in Gujarat & Rajasthan (which are contiguous pockets) so as to simulate worst case scenario as far as immediate evacuation of power is concerned. In case the generation is backed down in these pockets, it would represent a better load flow case.

CTU Reply : Scenario-4 & 7 is prepared considering Rajasthan (100% solar dispatch) and Gujarat (80% solar dispatch). One additional sensitivity case considering Rajasthan (90% solar dispatch) and Gujarat (100% solar dispatch) is also prepared & shared with agenda

5. Nevertheless, SR export scenario has also been prepared in consultation with SR constituents and was studied in detail in presence of GRID-INDIA on 22.11.2024 for Bijapur evacuation studies at Bangalore. The proposed system was found adequate in that scenario as well.

CTU Reply : Noted.

6. Regarding constraints in Mumbai/MMR region, timely commissioning of In-STS in the Mumbai/Pune area is very essential. MSETCL is being continuously requested to adhere to agreed upon time-lines as per review meetings carried out by CEA as well as in various CMETS-WR meetings by CTU as well as GRID-INDIA.

a) On the outage of a 3000/6000 MW poles of HVDC Barmer – II – South Kalamb, the loading of 765/400 kV ICTs and other elements nearby Barmer – I is seen to be nearing N-1 noncompliant. Accordingly, the solar developers coming up at Barmer-II may be advised now itself to commission their generation in synch with HVDC system.

CTU Reply : No violation of N-1 compliance is observed in studies on the outage of 3000MW (one Bipole) of HVDC as per manual on transmission planning criteria 2023, however necessary augmentation works shall be taken up for implementation after detail deliberation with Grid-India/CEA/NRPC.

b) As mentioned earlier, controller interaction studies may be carried out to identify the potential interaction issues in the complex or the same may be included in the project technical specifications with specific mention of involvement of CTUIL/GRID-INDIA in such studies with HVDC executing agency.

CTU Reply : Noted. To be taken care during finalization of RfP.

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

CTU Reply : Noted.

d) 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. Also, as VSC based HVDC is being proposed, it is understood that complete capacity in reverse direction is available.

CTU Reply : Noted. Matter shall be discussed during the meeting by our CTU-Engg Deptt. As per discussion in NCT meeting, both VSC & LCC technology are being discussed in present proposal. HVDC system shall be planned with 100% reverse power capability.

e) Filter arrangement modelling at HVDC terminal (in case of LCC) at Barmer – II to be checked. Keeping in view the low SCR/fault level, as mentioned earlier by GRID-INDIA, the filter sizing shall be granular to avoid wide voltage variations during switching.

CTU Reply : Noted. To be discussed with OEMs during finalization of RfP to explore the possibility.

7. **Addition of BESS:** In the 500 GW RE Transmission Report by CEA, ~22.5 GW BESS was planned at different pooling stations in NR (Rajasthan). However, so far, the BESS capacity addition has not taken place as per the plan. Planning of the envisaged BESS capacity as a generation resource could help in optimizing the transmission being planned for RE evacuation in Rajasthan and will also provide necessary flexibility support during the non-solar hours.

CTU Reply : Noted.

8. **Planning of Bulk Loads in the Rajasthan RE complex:** It is suggested that CTUIL shall provide necessary recommendations to the MOP for planning of bulk loads such as electrolyzers, data centers etc. in the Rajasthan RE complex. This would help in local consumption of RE generation and would significantly reduce the requirement of transmission while also providing necessary damping (load side).

A sample study with cost benefit analysis may be carried out by CTUIL in this regard for discussion at higher level.

CTU Reply : Noted.

9. **<u>Inputs on Load Generation Balance:</u>**

In base cases shared, demand of Rajasthan considered in scenario-4: Jul month(31GW) seems to be on higher side. Similarly, in scenario-7: Feb month (35.4GW) seems to be on very higher side. Power factor of load also to be revised according to practical values to get correct picture of any low voltage scenario.

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State		Scen7	Scen7 p.f.	Scen4	Scen4 p.f.
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Himachal	P	2395.4	0.99	1780.1	0.96
	Q	399		519.2	
Punjab	P	12742.1	0.99	17627.8	0.96
	Q	1903.2		5138.9	
Haryana	P	12981.3	0.99	16580.6	0.96
	Q	1930.6		4836	
Delhi	P	6045.8	0.98	9367.3	0.96
	Q	1118.8		2864.4	
Rajasthan	P	35442.5	0.99	31266.8	0.96
	Q	4427.2		8839.5	
Up	P	26303.5	0.99	31161.5	0.96
	Q	3833.8		9088.8	
Ladakh	P	40.1	0.99	27.3	0.96
	Q	5.9		8	
Uttarakhand	P	2581.5	0.98	2955	0.96
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	Q	14851		33087.7	

Feb Solar (Scenario - 7)

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***Peak solar considered from 10:30 Hrs to 15:30 Hrs, # Export is considered positive**

June Solar (Scenario - 4)

S. No.	Region	Load (MW)	Gen. (MW)	IR Exchange (MW) #	20th EPS Peak Load in 2029-30 (MW)	Average Demand Met in Solar Hours in June 2024 (MW)	Peak Demand met during Solar Hours, June 2024 (MW)
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2	Gujarat	44908	76899	33964	21934	26054
3	Maharashtra	39589	29129	39891	23622	28715
4	MP	15757	18715	25596	11155	13828

***Peak solar considered from 10:30 Hrs to 15:30 Hrs, #Export is considered positive**

- In both February solar and June Solar case, the Southern Region is importing power. Even in the June solar case, which represents a peak SR export scenario, key SR-WR lines planned for evacuating RE from the Southern Region—such as the 765 kV Narendra New–Pune–III D/C and 765 kV Raichur– Solapur D/C—are observed carrying power in the WR-to-SR direction

- Dispatch of Thermal Plants:

    - The thermal generation of some of the plants i.e. APL/CGPL has been backed down to very low levels (~35%).
    - Pit head plant: Talcher backed down to ~35% level to Pit head plant: V'chal backed down to ~34% level
    - Pit head plant: Korba backed down to ~34% level

  The tech minimum level considered in the case may be mentioned, and the generators' dispatch should be considered per merit order.

CTU Reply : Files are modified to incorporate minimum 40% dispatch from thermal generating stations in WR as per merit order as well as load pf (0.95-0.97) in NR.

- The demand in Rajasthan and Gujarat is seen to be on a higher end than the figures from EPS. The reason for the high demand may be mentioned.

CTU Reply :

S.No	State	EPS demand (2030)-GW	Demand Considered in studies (GW)		
			Sc-4*	Sc-5	Sc-7*
1	Rajasthan	25.1	19.2	18	23.3
2	Gujarat	34	44.9	37.2	41.4

excl. 12GW lumped load at Ramgarh-II and Bhadla-IV for HVDC

CTU Reply – From the demand data, it is envisaged that demand in Rajasthan is in order. In Gujarat, about 60% of the projected Green Hydrogen Load by 2027-28 has been considered in studies [9250MW out of 15000MW (Kandla:3GW, MUL: 12GW)]. In case same does not materialize as planned, additional transmission system would be required. Further, other bulk consumer loads have also been considered in studies such as 3GW at Mundra(Navinal) S/s, 3.5GW at Jamnagar, etc.

- Consideration of GH2 and other bulk consumer loads may be mentioned in the planning scheme itself, duly citing the uncertainty behind the assumptions and requirement of further transmission planning in case of delay/deferment of GH2/Bulk load projects.

The production cost modelling studies duly factor in the RPO 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.

CTU Reply – to be discussed in meeting

7. Punjab internal generation considered in scenario-7 to be corrected:

Bus Number	Bus Name	Id	PGen (MW)	PMax (MW)
132204	LEHRAMOHBT 220.00	T1	52.5	210
132204	LEHRAMOHBT 220.00	T2	52.5	210
132270	GOINDWALSB 220.00	T1	67.5	270
132270	GOINDWALSB 220.00	T2	67.5	270
132323	SPL_ROPAR 220.00	T1	52.5	210
132323	SPL_ROPAR 220.00	T2	52.5	210

132323	SPL_ROPAR 220.00	T3	52.5	210
134401	TALWNDISABO4 400.00	T1	165	660
134401	TALWNDISABO4 400.00	T2	165	660
134406	RAJPURA_TH4 400.00	T1	175	700
134406	RAJPURA_TH4 400.00	T2	175	700

CTU Reply : Corrected in Revised PSSE files (in Sc-7)

8. **Dynamic Simulation Studies –** With more than 100 GW solar generation and two 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- In 30th CMETS-NR meeting, CTU requested that Grid-India may share present time frame converged dynamic file which will help to resolve convergence issues in dynamics file for 2027 timeframe w.r.t Generator models (conventional/RE) used by Grid-India. In the CMETS-NR meeting Grid-India stated that they are also facing convergence issues for present timeframe file and prepared dynamics file with some assumptions.

   It was agreed in the meeting that 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. CTU also stated that considering the severe convergence issues in dynamics file, it will be converged on truncated network specific to RE pockets in Rajasthan rather than to converge the file on All India level. In the meeting, NRLDC stated that for transient studies, truncated network modelling will be sufficient.

   Considering above, it is requested that a committee may be formed comprising members from CEA, CTUIL and Grid-India for preparation of planning horizon dynamics files.

9. Bara TPS generation model to be corrected, same is modelled at 400kV whereas it is existing at 765kV level.

   CTU Reply : Corrected in Revised PSSE files

Annexure-B3

HVDC VSC Configuration

- ***±600kV, 6 GW (Parallel Bipole with parallel DMR)***
- In this configuration, +ve Terminal of Pole-1 & 3 and -ve Terminal of Pole-2 & 4 shall be combined at the Gantry side and single +ve and -ve bundle conductor each shall be traversed on either side of the Tower along with parallel DMR.
- In this configuration, reliability of overall HVDC system shall be enhanced in comparison to Double Bipole with Parallel DMR configuration.
- Control & Protection design for co-ordinated control is complex and is offered only by one OEM (M/s SIEMENS) and is first of its kind in the world.

- ***600kV, 6 GW (Double Bipole with parallel DMR)***
- In this configuration, each Bipole shall have their independent bundle conductors on either side of the Tower along with parallel DMR.
- Control & Protection design for each Bipole control is simple and is offered by more than one OEM.

Note: DC line Fault recovery time in VSC is of about ~1.5 to 1.8 Sec

Proposed Transmission system for evacuation of power from Rajasthan REZ Ph-IV (Part-5 :6 GW) [Barmer Complex] Barmer-II: 6GW (Solar)

1. Grid-India representative mentioned that Barmer-II is a new substation which will be connected only to 400 kV Fatehgarh-IV PS and Barmer-I PS via LILO of 400kV Fatehgarh-IV PS - Barmer-I PS D/C. This connectivity means that Barmer-II would be a radial/hanging station with low system strength.

Fault level at Barmer-II:

S. No.	Cases	Fault level (MVA) – 220 kV	Fault level (MVA) – 400 kV
1.	Base Case	11510	23410
2.	Base Case + SynCons (2 units) (+300/-150 MVAR each unit)	12500	25300

- *Installed capacity considered at 220 kV level:* ***2000 MW***
- *Installed capacity considered at 400 kV level:* ***4000 MW***
- *SCR at 220 kV level – (11510/2000):* ***5.755***

- *SCR at 400 kV level – (23409/12000):* ***1.95 (HVDC capacity of 6000 MW also included)***
- *SCR at 400 kV level after SynCons – (25300/12000):* ***2.10 (HVDC capacity of 6000 MW also included)***

Grid-India representative further highlighted the following advantages of VSC based HVDC.

- Strong AC systems may not be required as there are no issues of commutation failures and the HVDC operates effectively in weak or even "islanded" grids.
- **Capable of providing black start services:** One LCC HVDC (Bhadla3-Fatehpur) is under implementation, having one VSC HVDC would help to harness advantages of both configurations
- Minimal harmonics due to PWM-based control. Smaller filters required.
- Superior fault ride-through capability
- Can provide grid-forming services, voltage regulation, and frequency support i.e. ability to maintain appropriate system parameters in different renewable generation scenarios

It was agreed that technically VSC based HVDC is a better alternative than LCC based HVDC keeping in view the low system strength at Barmer-II (SCR < 2.0 without SynCons and ~2.5 with SynCons) and the reactive power and oscillations issues already being faced in the complex.

The final decision regarding implementation of HVDC as LCC or VSC may be taken in the NCT meeting.

2. Following other points were also highlighted by Grid-India:

a) Considering that Barmer-II would be a radial station with low system strength, evacuating 6000 MW capacity via HVDC from this substation may not be ideal. The inertia of the system around Barmer-II station is also expected to be very low, AC system feeding to HVDC from such weak network may witness stability related issues. It is proposed that RE capacity may be **pooled to a nearby station** which has adequate interconnection. The HVDC may then be planned from such station to a suitable location.

b) On the outage of a 3000/6000 MW poles of HVDC Barmer – II – South Kalamb, the loading of 765/400 kV ICTs and other elements nearby Barmer – I is seen to be nearing N-1 non-compliance limits. Accordingly, the solar developers coming up at Barmer-II may be advised now itself to commission their generation in synch with HVDC system.

c) Controller interaction studies may be carried out to identify the potential interaction issues in the complex or the same may be included in the project technical specifications with specific mention of involvement of CTUIL/GRID-INDIA in such studies with HVDC executing agency.

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

e) As HVDCs 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 HVDC.

f) Filter arrangement modelling at HVDC terminal (in case of LCC) at Barmer – II to be checked. Keeping in view the low SCR/fault level, as mentioned earlier by GRID-INDIA, the filter sizing shall be granular to avoid wide voltage variations during switching.

g) **Addition of BESS:** In the 500 GW RE Transmission Report by CEA, ~22.5 GW BESS was planned at different pooling stations in NR (Rajasthan). However, so far, the BESS capacity addition has not taken place as per the plan. Planning of the envisaged BESS capacity as a generation resource could help in optimizing the transmission being planned for RE evacuation in Rajasthan and will also provide necessary flexibility support during the non-solar hours.

h) **Planning of Bulk Loads in the Rajasthan RE complex:** It is suggested that CTUIL shall provide necessary recommendations to the MOP for planning of bulk loads such as electrolyzers, data centers etc. in the Rajasthan RE complex. This would help in local consumption of RE generation and would significantly reduce the requirement of transmission while also providing necessary damping (load side).

A sample study with cost benefit analysis may be carried out by CTUIL in this regard for discussion at higher level.

No. 15/3/2018-Trans-Part(5)
Government of India
Ministry of Power
Shram Shakti Bhawan, Rafi Marg, New Delhi- 110001

Date: 18th February, 2025

OFFICE ORDER

Subject: Amendment in the composition of the "National Committee on Transmission" (NCT) - reg.

The undersigned is directed to state that the composition of the existing National Committee on Transmission (NCT), issued vide this Ministry's Office Order No. 15/3/2018-Trans-Pt(5) dated 28.10.2021 (copy enclosed), is hereby amended as follows:

Composition of NCT:

1	Chairperson, CEA	Chairman
2	Member (Power System), CEA	Member
3	Member (Economic & Commercial), CEA	Member
4	Joint Secretary level officer looking after transmission in M/O of New & Renewable Energy, Govt. of India	Member
5	Director (Trans), M/o Power, Govt. of India	Member
6	Chief Operating Officer, Central Transmission Utility	Member
7	CMD, GRID-INDIA	Member
8	Advisor (Energy), NITI Aayog	Member
9	Two Experts from Power Sector to be nominated by MoP *	Members
10	Nominee of each of the five Regional Power Committees (RPCs)	Members
11	Chief Engineer (from Power System Wing), CEA	Member Secretary

*will be nominated for a maximum period of two years from the date of their nomination.

2. The Terms of Reference (ToR) of the NCT and other conditions shall remain the same as mentioned in this Ministry's Office Order No. 15/3/2018-Trans-Pt(5) dated 28.10.2021.

3. This issues with the approval of the Minister of Power.

18/2/25

(Naorem Indrakumar Singh)
Under Secretary (Trans)
Tele-Fax: 2332 5242
Email: transdesk-mop@nic.in

To

1. All Members of NCT.
2. Secretary, Ministry of New & Renewable Energy, Govt. of India.
3. Chairperson, CEA, New Delhi.
4. Secretary, CERC
5. Chairperson of all five Regional Power Committees (RPCs)
6. CMDs of all CPSUs under the Ministry of Power, Govt. of India.
7. Heads of all autonomous bodies under the Ministry of Power, Govt. of India
8. Finance/ Budget Section, Ministry of Power.
9. Power/ Energy Secretaries of all States/UTs.
10. Chief Executives of all State Power Transmission Utilities.
11. CEO, NITI Aayog, New Delhi.

Copy to:

i. PS to Hon'ble MoP/ PS to Hon'ble MoSP/Sr PPS/ PPS/ PS to Secretary(Power)/ AS(T)/AS(IC)/ all Joint Secretaries/ Economic Advisor/ All Chief Engineers/ all Directors/ Dy. Secretaries, Ministry of Power.
ii. Technical Director, NIC, M/o Power, for publishing this order on the website of M/o Power.

18/2/25

No.15/3/2018-Trans-Pt(5)
Government of India
Ministry of Power
Shram Shakti Bhawan, Rafi Marg, New Delhi
Dated, the 28h October 2021

OFFICE ORDER

Subject: - Re-constitution of the "National Committee on Transmission" (NCT) - reg.

In super-session of this Ministry's Office Order No. 15/3/2017-Trans dated 04.11.2019, regarding constitution of the National Committee on Transmission (NCT) and subsequent amendment issued vide this Ministry's Office Order No. 15/3/2018-Trans Pt(5) dated 20.05.2021, the undersigned is directed to state that the composition and terms of reference of the existing NCT are amended as mentioned below:

1. Composition of NCT

1	Chairperson, Central Electricity Authority (CEA)	Chairman
2	Member(Power System), CEA	Member
3	Member(Economic & Commercial), CEA	Member
4	Joint Secretary level officer nominated by Secretary, MNRE	Member
5	Director(Trans), M/o Power, Govt. of India	Member
6	Chief Operating Officer, Central Transmission Utility	Member
7	CMD POSOCO	Member
8	Advisor(Energy) , NITI Aayog	Member
9	Two experts from Power Sector to be nominated by MoP*	Members
10	Chief Engineer (from Power System Wing), CEA	Member Secretary

* Will be nominated for a maximum period of two years from the date of their nomination.

2. Terms of Reference (ToR) of the NCT are as under:

i. The NCT shall evaluate the functioning of the National Grid on a quarterly basis.
ii. The Central Transmission Utility (CTU), as mandated under the Electricity Act, 2003, is to carry out periodic assessment of transmission requirement under Inter-State Transmission System (ISTS). The CTU shall also make a comprehensive presentation before the NCT every quarter for ensuring development of an efficient, co-ordinated and economical ISTS for smooth flow of electricity. The CTU, in the process, may also take inputs from the markets to identify constraints and congestion in the transmission system.

28/10/2021

iii. The CTU after consulting Regional Power Committee(s) [RPC(s)] shall submit the proposal for expansion of ISTS to the NCT for their consideration. For proposal upto Rs. 500 crores, prior consultation with RPC would not be required.

iv. As per provision of Electricity (Planning, Development and Recovery of ISTS charges) Rules 2021, the CTU shall also prepare a five-year rolling plan for ISTS capacity addition every year. The Annual Plan shall be put up to the NCT six months in advance, e.g. The Annual Plan for FY 2023-24 will be put up before the NCT by 30th September 2022..

v. After considering the recommendations of the CTU and views of the RPCs, the NCT shall propose expansion of ISTS after assessing the trend of growth in demand and generation in various regions, constraints, if any, in the inter- State, inter- Region transfer of power, which are likely to arise in the near term/ medium term, so that transmission does not constrain the growth.

vi. The NCT shall formulate the packages for the proposed transmission schemes for their implementation.

vii. The NCT shall estimate the cost of transmission packages and may constitute a cost committee for this purpose.

viii. The NCT shall recommend to Ministry of Power (MoP) for implementation of the ISTS for projects with cost more than Rs 500 crore, along with their mode of implementation i.e. Tariff Based Competitive Bidding (TBCB) / Regulated Tariff Mechanism (RTM), as per the existing Tariff Policy. However, the NCT shall approve the ISTS costing between Rs 100 crore to Rs.500 crore or such limit as prescribed by MoP from time to time, along with their mode of implementation under intimation to MoP. The ISTS costing less than or equal to Rs. 100 crores, or such limit as prescribed by MoP from time to time, will be approved by the CTU along with their mode of implementation under intimation to the NCT and MoP. After approval of the ISTS by the NCT or the CTU (as the case may be), the TBCB project shall be allocated to Bid Process Coordinators through Gazette Notification, while the RTM project shall be allocated to CTU.

ix. The NCT shall allocate the task of carrying out survey amongst the CTU and Bid Process Coordinators by maintaining a roster.

3. The NCT meetings shall be held every quarter, and on monthly basis, if required.

4. While making their recommendations,

i. the NCT shall keep in mind the relevant Act, Rules, Regulation, policies and guidelines such as but not limited to - Electricity Act 2003, National Electricity Policy, Tariff Policy, Electricity (Transmission System Planning, Development and Recovery of Inter-State Transmission Charges) Rules, 2021, Guidelines for Encouraging Competition in Development of Transmission Projects, Tariff based Competitive Bidding Guidelines for Transmission Service and any specific advice received from MoP.

ii. For enabling growth of Renewable Energy (RE) capacity, areas which have high solar/wind energy potential, as identified by Ministry of New and Renewable Energy

28/10/2021.

(MNRE), need to be connected to ISTS, so that the RE capacity can come up there. This is a national mission as a part of our energy transition goal.

5. This issues with the approval of the Hon'ble Minister of Power and New & Renewable Energy.

28/10/2021

(Bihari Lal)
Under Secretary to the Govt. of India
Telefax: 23325242
Email: transdesk-mop@nic.in

To

1. All Members of NCT.
2. Secretary, Ministry of New & Renewable Energy, Govt. of India.
3. Chairperson, CEA, New Delhi.
4. Secretary, CERC
5. CMDs of all CPSUs under the Ministry of Power, Govt. of India.
6. Heads of all autonomous bodies under the Ministry of Power, Govt. of India.
7. Finance/ Budget Section, Ministry of Power.
8. Power/ Energy Secretaries of all States/UTs.
9. Chief Executives of all State Power Transmission Utilities.
10. CEO, NITI Aayog, New Delhi.

Copy to:

i. PS to Hon'ble MoP/ PS to Hon'ble MoSP/Sr PPS/ PPS/ PS to Secretary(Power)/ AS&FA/ AS(SKGR)/ AS(VKD)/ all Joint Secretaries/ Economic Advisor/ Chief Engineer(Th)/ all Directors/ Dy. Secretaries, Ministry of Power.

ii. Technical Director, NIC, M/o Power, for publishing this order on the website of M/o Power.

28/10/2021

Annexure -II

Feature	LCC-HVDC	VSC-HVDC
Important parameters for technology adoption		
Reactive Power Requirements	Requires substantial reactive power compensation (e.g., Filter Banks, SVC, STATCOM, SynCons). The maximum reactive power required will be almost 60% of rated power	Capable of independent reactive power control. Generally, no external compensation needed. (with inbuilt STATCOM mode of operation)
Grid Strength Dependency	Strong AC systems at both rectifier and inverter end are necessary for commutation. May fail in weak grids (SCR > 2.5)	Strong AC systems are not necessary since there are no issues of commutation failures. Operates effectively in weak or even "islanded" grids.
Network restart time during DC line faults	Less (depend on de-ionization time) in milli-secs (<500 ms)	>1 sec (1.5 secs in case of HVDC Pugalur – Trichur for Line to Ground faults); highly dependent on AC side circuit breaker opening/reclosing. DC line Fault recovery time in VSC is of about ~1.5 to 1.8 Sec (for 1100 km)
Efficiency/Losses	Slightly higher efficiency in steady-state operation. Lower line and converter losses	Lower efficiency due to switching losses in IGBTs. Line losses are about 25-30% higher in VSC (for1000km)
Cost	Lower initial cost for converters, but higher for filters and compensators.	Higher initial cost for converters, lower for ancillary components.
Other technological Differences	**LCC-HVDC**	**VSC-HVDC**
Converter Technology	Uses semiconductors which are capable of withstanding voltage in both direction (Thyristor-based)	Uses semiconductors which are capable of blocking unidirectional voltage only (IGBT with antiparallel diodes or similar switching devices)
Direction of Current and power	Current flow is allowed in single direction. Power direction is changed by changing the voltage polarity.	Current flow can be bidirectional. Power direction is changed by changing the direction of current flow.
Switching Philosophy	Turned on by firing pulses but turn off with assistance of line voltage	Turned on and turn off can be controlled by firing pulses.
Power transfer capability	Thyristors have huge current carrying capability, huge amount of power transfer is possible using LCC technology	IGBTs have lesser current carrying capability and hence the power flow capable is limited.
Source	LCC appears like a current source to AC system (Inductive energy storage)	VSC appears like a voltage source to AC system (Capacitive energy storage)
Black Start Capability	Not suitable for black start without additional support.	Capable of providing black start services.
Area	The AC and DC yard of LCC are spread over a large area.	Area requirement is much lesser for the same power flow since there are no AC and DC filters

Harmonics	Harmonics are quite high. Harmonics are present both on the AC as well as DC side.; requires large filters.	Minimal harmonics due to PWM-based control. Smaller filters required.
Transformer size	Converter transformers are used which are heavier, bulkier and costlier.	Normal AC transformers could be used as there is no DC stress and harmonics in the secondary
Power Reversal	Possible. Requires changing DC polarity for power reversal.	Possible (seamless). Achieved by changing current direction without altering DC polarity.
Fault Ride-Through	Limited ability to ride through grid faults. May trip under disturbances.	Superior fault ride-through capability.
Overload Capability	Possible (usually 10-20% for short durations).	Not available as standard, may be full converter rating (depends on standard rating vs extra overload expected)
Converter Footprint	Large, due to filters, reactive power compensators, and transformers.	Compact, as filters and external compensators are minimized.
Grid Support Functions	Limited (e.g., no independent voltage control).	Can provide grid-forming services, voltage regulation, and frequency support. ability to maintain appropriate system parameters in different renewable generation scenarios
Bidirectional Power Flow	Achieved but with slower transition.	Seamless bidirectional power flow